Analysis of the Curriculum of a Summer Pipeline Program for Economically Disadvantaged Premedical Students in the Bronx, NY

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ABSTRACT

The authors analyze the curriculum of a summer pipeline program for underserved premedical students. They compare qualitative data on the delivery and experience of curricular activities obtained from 48 activity descriptions, participant surveys, and faculty/staff observations against the 15 American Association of Medical Colleges (AAMC) core competencies. Retrospective and follow-up data obtained from program applications and alumni surveys are used to describe the demographics and longitudinal career outcomes for the 228 participants from 2002 to 2018. The analysis identifies 10 fully addressed and 5 partially addressed AAMC competencies in the 6-week curriculum. Ninety-two graduates matriculated into medical school, 83 (90 percent) from groups underrepresented in medicine. A description of the curriculum and methods used to assess its objectives provides a framework for pipeline programs generally.

INTRODUCTION

Racial and ethnic health disparities are a growing concern for the United States (Chin et al., 2012; Flores & Tomany-Korman, 2008; Mead et al., 2008), and increasing the diversity of the US physician and allied health professional workforce is a well-documented necessary first step toward equity (Koh, Graham, & Glied, 2011; Smith, Nsiah-Kumi, Jones, & Pamies, 2009). Physicians from racial and ethnic minority groups improve the quality of care for minority and medically underserved populations through the delivery of culturally and linguistically appropriate care, improved patient communication, and increased physician trust (Dunlap et al., 2015; Traylor, Schmittdiel, Uratsu, Mangione, & Subramanian, 2010). While Blacks/African Americans and Hispanics/Latinos comprise 13.4 percent and 18.1 percent of the US population, respectively, together they constitute only 8.5 percent of the physician workforce (AAMC, 2014; 2016; US Census Bureau, 2018). Estimates project that they will account for 42.1 percent of the US population by 2050 (Vespa, Medina, & Armstrong, n.d.). Further, medical school application and acceptance rates for minorities underrepresented in medicine (URM)—specifically, Blacks/African American and Hispanics/Latinos—have remained largely stagnant since the 1980s, despite national efforts to increase their representation (AAMC, 2016; Acosta, Poll-Hunter, & Eliason, 2017). The shortage of URM physicians coupled with the rapidly changing demographics of the US population challenge our ability to address the health needs of our diverse, often vulnerable communities (Xierali & Nivet, 2018).

Diversifying the physician workforce helps to promote quality health care for all underserved populations. URM physicians are more likely to serve uninsured, impoverished, and minority populations and to work in health-professions shortage areas than non-URM physicians (Grumbach & Chen, 2006; Walker, Moreno, & Grumbach, 2012; Xierali, Castillo-Page, Conrad, & Nivet, 2014; Xierali & Nivet, 2018; Xierali, Nivet, & Fair, 2014). However, URM and economically disadvantaged students face a number of challenges to medical school matriculation, including discouragement from college counselors and other professionals and lack of physician role models, educational preparation, and financial resources to meet medical school requirements (Alexander, Chen, & Grumbach, 2009; Freeman, Landry, Trevino, Grande, & Shea, 2016; Toretsky, Mutha, & Coffman, 2018; Uwaezuoke, 2018). Additional barriers include inadequate institutional resources, familial and social conflicts, and lack of mentorship and guidance during their undergraduate college experience (Barr, Gonzalez, & Wanat, 2008; Freeman et al., 2016; Toretsky et al., 2018; Uwaezuoke, 2018).

Pipeline programs like the Summer Undergraduate Mentorship Program (SUMP) at the Albert Einstein College of Medicine were created to address these factors in order to improve medical school application and matriculation rates of disadvantaged and URM students. SUMP was established in 2002, seven years prior to the Liaison Committee on Medical Education's 3.3 mandate added Diversity/Pipeline Programs and Partnerships to its accreditation standards for medical education programs (LCME, 2016). Since then, several pipeline programs have emerged to meet LCME diversity standards intended to facilitate the entry of students from diverse and disadvantaged backgrounds into medical schools.

Although many premedical pipeline programs like SUMP have arisen, clearly defined curricular objectives associated with program outcomes are often missing from the literature, especially for summer or brief interventions. Most of the literature centers on medical or graduate school matriculation outcomes, often achieved years after the intervention (Campbell, Berne-Anderson, Wang, Dormeus, & Rodriguez, 2014; Keith & Hollar, 2012). While career outcome data are important, short-term outcomes based on specific program objectives provide accountability benchmarks and opportunities for program evaluation.

Since SUMP's main objective is to prepare students to successfully matriculate into medical school, we decided to use to the Association of American Medical Colleges' Competencies for Entering Medical Students to assess our curriculum (AAMC, n.d.-a). Pipeline programs designed to prepare students for medical and graduate school admission may benefit from including measurable outcomes related to the activities and intended program goals.

Our study illustrates the career path status of all participants in the 16-year-long program and analyzes the gaps between the AAMC Core competencies and SUMP 2017 curricular activities. Our objective was to assess the efficacy of the SUMP curriculum in preparing our URM and economically disadvantaged students for medical school matriculation.

METHODS

Program Description

The Summer Undergraduate Mentorship Program (SUMP) was established in 2002 as a 6-week pipeline program at the Albert Einstein College of Medicine in the Bronx, NY. The Bronx is one of the most diverse counties in the nation and the only NY county in which most residents are from minority backgrounds (US Census Bureau, 2017). It is also the poorest congressional district, with over 50 percent of residents living in high or extreme poverty, and the least healthy, ranking last out of the 62 NY counties for the past 8 years, (Austensen, Been, O'Regan, Rosoff, & Yager, 2016; Catilin, Jovaag, Van Dijk, & Remington, 2014; Lewis, Burd-Sharps, Garon, Gluskin, & Powers, 2016; US Census Bureau, 2017; University of Wisconsin Population Health Institute, 2018). High school completion rates are low (New York

State Education Department, 2017), and most areas of the Bronx are considered Health Profession Shortage Areas (Health Resources & Services Administration, n.d.).

SUMP is designed to meet the need for URM health professionals who can address the health disparities in this diverse community. It was initially funded as part of the Health Resources and Services Administration's (HRSA) Hispanic Center of Excellence (HCOE) program and then its Health Career Opportunities Program (HCOP). SUMP meets HCOP's goals by promoting the recruitment of qualified students from disadvantaged backgrounds and facilitating their entry into medical school and health professions schools through enrichment and mentoring activities. Additional funding from foundations obtained through Albert Einstein College of Medicine has sustained SUMP during periods without federal support.

Recruitment and Enrollment

Applicants to SUMP are recruited through diversity fairs, school list-serves, online and social media advertisements, and printed brochures. Rising sophomores through recent college graduates from historically underserved racial and ethnic minority groups and/or educationally or economically disadvantaged backgrounds are eligible to apply. Applicants must have or be able to secure housing in or around New York City and commute to and from the program during the summer. Local transportation assistance is provided along with a stipend distributed at the end of the program. Each summer, SUMP accepts 10–14 students out of approximately 60–100 applications received through the online application portal. Each application is reviewed and rated by two faculty and/or staff members. Priority is given to applicants considered economically or educationally disadvantaged and/or from URM backgrounds. An official transcript, a letter of recommendation, and a personal statement are parts of the application. While a GPA over 3.0 is generally required, SUMP accepts applicants with lower GPAs who provide an explanation for their academic performance and whose recent grades illustrate an upward trend.

SUMP Curriculum

The curriculum includes 15 hours of lectures, workshops, and activities delivered by health professionals each week. Students also complete a systematic literature review on a health disparity topic under the guidance of Einstein's medical librarians and MD/PhD candidates. In addition, students are paired with physician mentors with whom they complete 8–16 hours of clinical shadowing each week. The program also includes informal discussions led by SUMP alumni and an evening informational workshop for students' families.

Data Collection and Analysis of Demographics and Career Outcomes

Descriptive data for program participants were obtained from SUMP applications completed between the years of 2002 and 2018. We gathered career and educational outcome data through follow-up surveys administered annually by program staff. Albert Einstein College of Medicine's Institutional Review Board deemed this study exempt. The Statistical Package for Social Sciences Version 21.0 (SPSS Inc., Chicago, IL) was used to conduct analyses for demographic and follow-up data.

Curriculum Analysis

The AAMC Group on Student Affairs Committee on Admissions has developed 15 core competencies defined in 4 domains: Interpersonal, Intrapersonal, Thinking and Reasoning, and Science (see Appendix A; AAMC, n.d.-a). The competencies were developed in consultation with experts in medical education and advisory panels and are considered the standard for rating medical school applicants (AAMC, n.d.-b). Although our curriculum was not based on the AAMC core competencies, our faculty identified many commonalities. We itemized the AAMC's 15 competencies and SUMP's 2017 curricular activities to create a curriculum map (see Appendix B) and conduct a gap analysis, which consists of (1) listing current attributes and performance levels (what is), (2) cross-listing the factors required to achieve the desired objectives (what should be), and (3) identifying the gaps.

Curriculum Mapping

A curriculum map is a matrix of the desired learning outcomes (AAMC core competencies) and the delivered activities (SUMP 2017). Our curriculum mapping and gap analysis are based on the University of Rhode Island's Student Learning, Outcomes Assessment, and Accreditation methodology (University of Rhode Island Graduate School, n.d.). A curriculum matrix was created with 48 SUMP 2017 calendar activities, grouped by 5 activity types, and 20 topics/themes (see Appendix C). The activity types were *lectures and workshops*, including didactic and interactive sessions; *clinical skills*, including experiential learning and simulation; research project, a systematic literature review and oral presentation on a health disparities topic; *mentorship*, defined as structured opportunities to interact with physicians, MD/PhD candidates, and program alumni; and *other activities*, including a trip to a correctional facility or a teambuilding exercise (see Appendix C). Three members of the SUMP leadership team used the curriculum matrix and the list of all 48 activities in the categories and subcategories to individually evaluate and record the degree to which SUMP 2017 activities met the AAMC competencies. Outcomes were labeled according to the following criteria: (I) The activity *introduces* a concept or a few aspects of the concept; (R) The activity *reinforces* a concept introduced

earlier or co-currently in the program; and (E) The activity *emphasizes* a reiterated concept to integrate it with material presented throughout the program.

Gap Analysis

A gap analysis is a quantitative and qualitative comparison of current performance against a target or potential outcomes to identify disparities. The team members met to compare and discuss the results of their independently created curriculum maps. On factors where consensus was lacking, lecture materials and student feedback were adduced as supporting evidence. The team was conservative in its assessment of outcomes. Only curricular components that substantively contributed to the AAMC competencies were mapped, and this determination required the agreement of at least two team members. The team then decided on a single curriculum map to identify gaps in 2017 program activities based on the AAMC competencies.

RESULTS

Of the 228 students who participated in SUMP between 2002 and 2018, 204 (90 percent) are URM. For the 224 participants for whom data were available, mean cumulative GPA (SD) at time of acceptance was 3.3 (0.36). Of the total 228, 133 matriculated (n=92) or are progressing toward matriculation (n=13) into medical school, and 118 (89 percent) of them are URM (see Table 1). Because 30 participants (13 percent) are still enrolled in college or recent graduates, they cannot be included in measuring the outcomes of interest. Additionally, we could not locate 24 participants (11 percent), so we could not determine their current educational and career outcomes. Of the alumni who matriculated into medical school, 49 (53 percent) are current medical students and 40 (43 percent) are practicing physicians (see Figure 1). Another 71 (41 percent) pursued other health/science-related professions or nonhealth science-related professions.

Based on the gap analysis, SUMP 2017 activities successfully introduced, reinforced, and emphasized 10 of the 15 AAMC competencies within the four domains (see Table 2). In the interpersonal domain, the curriculum introduced, reinforced, and emphasized service orientation, social skills, cultural competence, teamwork, and oral communication. In the intrapersonal domain, the curriculum introduced, reinforced, and emphasized two of the four competencies, reliability and dependability and capacity for improvement, but only introduced and reinforced ethical responsibility to self and others, resilience, and adaptability. In the thinking and reasoning domain, the curriculum introduced, reinforced, and emphasized two of the four competencies, scientific inquiry and written communication, while only introducing and reinforcing critical thinking and quantitative reasoning. Last, in the science domain, human behavior was emphasized, while living systems were only reinforced.

Table 1: Race/Ethnicity, Sex, and Academic Year of the 228 Alumni from the 2002 to 2018 Cohorts of the Summer Undergraduate Mentorship Program at the Albert Einstein College of Medicine, 2018–2019[a]

	In Progress to Medical School[b]		Matriculated into Medical School		Other Health Professions		Nonhealth Professions		Unknown[c]		Total	
No. of alumni	41		92		49		22		24		228	
Race/Ethnicity (no.[%])												
African American/Black	11	(26.8)	27	(29.3)	9	(18.4)	1	(4.5)	4	(16.7)	52	(22.8)
Hispanic/Latino	23	(56.1)	56	(60.9)	34	(69.4)	21	(95.5)	18	(75)	152	(66.7)
Asian	7	(17.1)	7	(7.6)	5	(10.2)	0	0	2	(8.3)	21	(9.2)
White	0	0.	2	(2.2)	1	(2)	0	0	0	0	3	(1.3)
Sex (no.[%])												
Female	25	(61)	63	(68.5)	37	(75.5)	15	(68.2)	19	(79.2)	159	(69.7)
Male	16	(39)	29	(31.5)	12	(24.5)	7	(31.8)	5	(20.8)	69	(30.3)
Academic Year[de] (no.[%])												
Rising Sophomore	3	(7.3)	23	(25.3)	14	(28.6)	2	(9.5)	4	(17.4)	46	(20.4)
Rising Junior	13	(31.7)	28	(30.8)	20	(40.8)	11	(52.4)	10	(43.5)	82	(36.4)
Rising Senior	21	(51.2)	28	(30.8)	12	(24.5)	8	(38.1)	6	(26.1)	75	(33.3)
Recent Graduate	4	(9.8)	12	(13.2)	3	(6.1)	0	0	3	(13)	22	(9.8)
Cumulative GPA[fg] mean (SD)	3.43	(0.27)	3.36	(0.36)	3.24	(0.37)	3.21	(0.35)	3.1	(0.39)	3.3	(0.36)

[a]Source: Annual data collection from Summer Undergraduate Mentorship Program student applications.
[b]Alumni in a structured Master's or postbacceleaurtae program, studying for the MCAT, and/or currently applying to medical school.

[c]Alumni whose current educational and/or career outcomes could not be determined.
[d]Academic year of students at the time of acceptance into the program.
[e]Academic year is not available for three students.

[f]Mean cumulative overall GPA as indicated in academic transcripts at the time of acceptance into the program.

[g]Mean cumulative overall GPA is not available for four students.

Table 2: 2017 Analysis of Gaps between Summer Undergraduate Mentorship Program 2017 Activities and AAMC Core Competenciesa

AAMC Learning Competencies for Entering Medical Students		**I Introduced** (The activity *introduces* a concept or only a few aspects of the concept)	**R Reinforced** (The activity *reinforces* a concept introduced earlier or co-currently in the program)	**E Emphasized** (The activity *emphasizes* reiterated concepts to integrate them with material presented throughout the program)
Interpersonal Competencies	1. Service Orientation	FDNY CPR Training	Shadowing experience with physician	Community Service Project
	2. Social Skills	General Professional Development (2 workshops)	Patient-centered Care (2 lectures)	Shadowing experience with physician
	3. Cultural Competence	• Special Interest Topics (3 lectures) • MECIS Simulation Lab • Systematic Literature Review • Bronx Tour • Shadowing experience with physician • Riker's Island Field Trip • Health Disparities (9 lectures)		
	4. Teamwork	Teambuilding Exercise	MECIS Simulation Lab	Systematic Literature Review Final Research Presentation
	5. Oral Communication	General Professional Development (1 workshop)	Patient-centered Care (2 lectures)	Final Research Presentation
Intrapersonal Competencies[a]	6. Ethical Responsibility to Self and Others	Special Interest Topics (1 lecture)	Riker's Island Field Trip	None

AAMC Learning Competencies for Entering Medical Students		I **Introduced** (The activity *introduces* a concept or only a few aspects of the concept)	R **Reinforced** (The activity *reinforces* a concept introduced earlier or co-currently in the program)	E **Emphasized** (The activity *emphasizes* reiterated concepts to integrate them with material presented throughout the program)
	7. Reliability and Dependability	• Systematic Literature Review • Final Research Presentation • Research experience with MD/PhD Mentor		
	8. Resilience and Adaptability	Medical School Application Prep (1 workshop)	Informal "rap" sessions	None
	9. Capacity for Improvement	General Professional Development (3 workshops)	Medical School Application Prep (1 workshop)	Research experience with MD/PhD Mentor
Thinking and Reasoning Competencies	10. Critical Thinking	MECIS Simulation Lab	Systematic Literature Review	None
	11. Quantitative Reasoning	Medical Informatics	Systematic Literature Review	None
	12. Scientific Inquiry	• Systematic Literature Review • Final Research Presentation		
	13. Written Communication	General Professional Development (3 workshops)		Systematic Literature Review
Science Competencies	14. Living Systems	Special Interest Topics (2 lectures)	Anatomy Lab	None
	15. Human Behavior	• Special Interest Topics (2 Lectures) • Systematic Literature Review • Riker's Island Field Trip • Health Disparities (9 lectures)		

[a]Shaded regions indicate AAMC competencies that were not emphasized in the SUMP curriculum.

Interpersonal was the only domain in which no gaps were found. We discovered five partial curriculum gaps, in which items were introduced and reinforced but not emphasized, in the intrapersonal (n = 2), thinking and reasoning (n = 2), and science domains (n = 1). The competencies were achieved through the topics covered in lectures and workshops, clinical shadowing, the research project, mentorship, and other activities. The exposure to other health professions topics did not address any of the AAMC competencies.

DISCUSSION

SUMP Outcomes

Our findings demonstrate successful career path outcomes for over half of SUMP graduates: 60 percent have matriculated into medical school or progressing toward it. Although our primary objective is to prepare disadvantaged and URM students to enter medical school, they are not limited to this track. Many graduates have pursued other health/science professions, thus meeting HCOP's health workforce diversity objectives; 28 graduates matriculated into doctoral programs in such areas as dentistry, physical therapy, and behavioral neuroscience and Master's programs in physician assistance and nursing.

SUMP Curriculum Outcomes

Based on our curriculum gap analysis, our 2017 program activities addressed most of the AAMC core competencies. This success during a 6-week summer program demonstrates the efficiency of its design. The gap analysis provides an objective measure of our performance, while highlighting the AAMC core competencies that were not emphasized and presenting opportunities for assessment of competencies throughout the program. Career outcomes suggest that SUMP graduates are well prepared to gain acceptance to medical school.

Comparison to Other Pipeline Programs

Although many pipeline programs are designed to support disadvantaged preprofessional candidates, notable differences set SUMP apart. Many interventions last for the full academic year or longer and include MCAT/academic support. Other programs recruit high-performing students from their own campuses, and some serve as a direct pathway to their affiliated medical schools (Campbell et al., 2014; Keith & Hollar, 2012). Despite its shorter duration, SUMP outcomes show URM matriculation rates into medical school comparable to those of Undergraduate Science Students Together Reaching Instructional Diversity and Excellence (USSTRIDE), a program that provides academic and social support to quali-
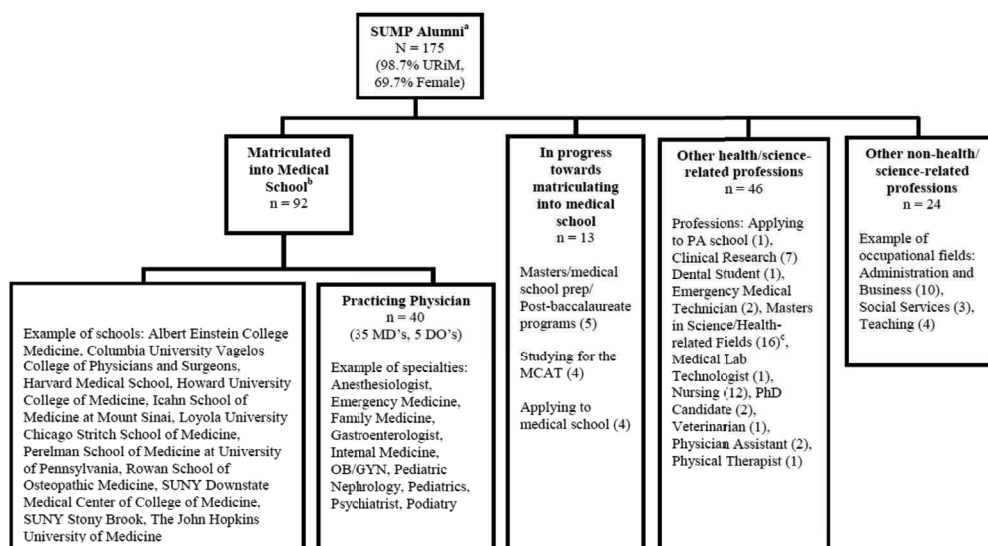
Figure 1 Career path status of 175 Summer Undergraduate Mentorship alumni (2002-2016 cohorts) who are eligible for the outcomes of interest, 2018-2019. Abbreviation: URM indicates underrepresented minorities.

[a] 24 SUMP alumni are unknown/lost contact, and SUMP 2017-2018 cohorts are excluded
[b] 3 students matriculated into medical school but left.
[c] Master's in Clinical Nutrition (3), Master's in Engineering (1), Master's in Health Administration (1), Master's in Psychology (2), Master's in Public Health (5), Master of Science (1), Master of Science in Biotechnology Engineering (1), Master of Science in Neuropsychology (1), Master of Science in Translational Medicine (1)

fied students over their entire undergraduate career (Campbell et al., 2014). SUMP medical school matriculation rates are also consistent with those of the University of North Carolina at Chapel Hill School of Medicine's summer intensive Medical Education Development (MED) program, which exposes students to strategies for academic rigor and doing well on standardized admission tests (Keith & Hollar, 2012). Thus, while SUMP is a relatively brief program it is preparing disadvantaged premedical students as well as longer-term academically intensive pipeline programs.

CONCLUSION

To address the areas highlighted in our gap analysis, new additions to the 2018 curriculum included the bioethical care of people and mental health first-aid training to meet the science and intrapersonal domains. SUMP will continue to evaluate program and student performance to provide competency-based interventions. It will also continue to perform gap analyses for program planning and assessment to reinforce the AAMC core competencies.

One limitation of this study is its reliance on recall and interpretation of SUMP curricular activities. The gap analysis used the 2017 calendar of events, which included lecture/workshop titles, and some subjectivity was involved in recalling their content. We launched an observation tool to record descriptive information about presentations and workshops as well as students' reactions to the content and delivery style. These tools aim to help us learn about any differences between the intended and experienced curriculum. Further, curricular activities, such as the family evening workshop, exposure to other health professions, lectures, and the suturing workshop, were included to address the needs of URM and economically disadvantaged students and their families, not the AAMC core competencies, and therefore were not assessed in the curriculum map. These activities prepare and motivate students and families to persist along the often steep and rocky premedical journey, which can be especially discouraging for first-generation college students. Many participants reported that the lack of experience with, and knowledge of, the medical school process often created family tension that further discouraged them from pursuing a career in medicine. Therefore, we developed the family workshop to impart the knowledge and resources needed to support their premedical preparation, including financial aid and medical school application planning information. This forum allows students and families to openly discuss their goals, fears, and questions about the medical school process with experienced faculty. SUMP also addresses social capital and the motivational needs of our students through physician mentors, many of whom belong to URM groups and/or practice in underserved communities.

While career outcomes for our graduates are promising, our study does not account for the complexity and number of factors that contribute to successful medical school matriculation, including those that arise between the time of participation and admission into a medical degree program. The SUMP leadership team is conducting a study to understand how some factors, such as discouragement and social support, affect our graduates' career paths and to better understand whether and how SUMP mediates these factors.

We hope that our findings and processes provide a framework for other pipeline programs with a similar focus and mission as well as opportunities for full or partial replication on other college campuses, as the Stanford Medical Youth Science Programs replicated at the University of San Diego School of Medicine (Winkleby, 2007). While pipeline programs can improve the medical career trajectory for disadvantaged students, more work is needed to address the inequalities in medical school matriculation and the lack of diversity in the physician workforce. We must understand how to design and share our interventions to best support the needs of URM and disadvantaged students.

APPENDIX A: CATEGORIES AND DEFINITIONS OF THE AAMC CORE COMPETENCIES FOR ENTERING MEDICAL STUDENTS

Competency Categories	*Competency*	*Definition*
Interpersonal Competencies	Service Orientation	Demonstrates a desire to help others and sensitivity to others' needs and feelings; demonstrates a desire to alleviate others' distress; recognizes and acts on his/her responsibilities to society locally, nationally, and globally
	Social Skills	Demonstrates an awareness of others' needs, goals, feelings, and the ways that social and behavioral cues affect peoples' interactions and behaviors; adjusts behaviors appropriately in response to these cues; treats others with respect
	Cultural Competence	Demonstrates knowledge of socio-cultural factors that affect interactions and behaviors; shows an appreciation and respect for multiple dimensions of diversity; recognizes and acts on the obligation to inform their own judgment; engages diverse and competing perspectives as a resource for learning, citizenship, and work; recognizes and appropriately addresses bias in themselves and others; interacts effectively with people from diverse backgrounds
	Teamwork	Works collaboratively with others to achieve shared goals; shares information and knowledge with others and provides feedback; puts team goals ahead of individual goals
	Oral Communication	Effectively conveys information to others using spoken words and sentences; listens effectively; recognizes potential communication barriers and adjusts approach or clarifies information as needed

(continued)

APPENDIX A (*continued*)

Competency Categories	Competency	Definition
Intrapersonal Competencies	Ethical Responsibility to Self and Others	Behaves in an honest and ethical manner; cultivates personal and academic integrity; adheres to ethical principles and follows rules and procedures; resists peer pressure to engage in unethical behavior and encourages others to behave in honest and ethical ways; develops and demonstrates ethical and moral reasoning
	Reliability and Dependability	Consistently fulfills obligations in a timely and satisfactory manner; takes responsibility for personal actions and performance
	Resilience and Adaptability	Demonstrates tolerance of stressful or changing environments or situations and adapts effectively to them; is persistent, even under difficult situations; recovers from setbacks
	Capacity for Improvement	Sets goals for continuous improvement and for learning new concepts and skills; engages in reflective practice for improvement; solicits and responds appropriately to feedback
Thinking and Reasoning Competencies	Critical Thinking	Uses logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems
	Quantitative Reasoning	Applies quantitative reasoning and appropriate mathematics to describe or explain phenomena in the natural world
	Scientific Inquiry	Applies knowledge of the scientific process to integrate and synthesize information, solve problems, and formulate research questions and hypotheses; is facile in the language of the sciences and uses it to participate in the discourse of science and explain how scientific knowledge is discovered and validated
	Written Communication	Effectively conveys information to others using written words and sentences

(*continued*)

APPENDIX A (*continued*)

Competency Categories	Competency	Definition
Science Competencies	Living Systems	Applies knowledge and skill in the natural sciences to solve problems related to molecular and macro systems including biomolecules, molecules, cells, and organs
	Human Behavior	Applies knowledge of the self, others, and social systems to solve problems related to the psychological, socio-cultural, and biological factors that influence health and well-being

APPENDIX B: CURRICULUM MAP OF THE AAMC CORE COMPETENCIES AND SUMMER UNDERGRADUATE MENTORSHIP PROGRAM 2017 ACTIVITIES AND CUMULATIVE OUTCOME OF CURRICULAR COMPONENTS

SUMP Activities

Some curricular components may not align directly with AAMC Core Competencies. They are incorporated into the curriculum to comply with the following guidelines outlined by HRSA/HCOP: recruitment of UiM students; facilitating entry into health professions school; counseling, mentoring, and other retention activities; financial aid dissemination; primary care exposure activities; development of a more competitive applicant pool; and stipends

The AAMC Learning Competencies for Entering Medical Students

*Map Legend:
I = Introduced
R = Reinforced
E = Emphasized

Interpersonal Competencies	Lectures and Workshops						Clinical Skills				Research Project			Mentorship			Other Activities			
	General Professional Development	Medical School Application Prep	Exposure to other health professions	Health Disparities	Patient-Centered Care	Special Interest Topics	Suturing Lab	MECIS Simulation Lab	Anatomy Lab	FDNY CPR Training	Medical Informatics	Systematic Literature Review	Final Research Presentation	Shadowing experience with physician mentor	Research experience with MD/PhD mentor	Informal "rap sessions"	The Bronx Tour	Teambuilding Exercise	Riker's Island Field Trip	Community Service Project
1. Service Orientation										I				R						E
2. Social Skills	I (2 Workshops)				R (2 Lectures)			E						E			E		E	
3. Cultural Competence				I, R, E (9 Lectures)		E (3 Lectures)						E		E			E		E	
4. Teamwork								R				E	E					I		
5. Oral Communication	I (1 Workshop)				R (2 Lectures)								E							

Intrapersonal Competencies	6. Ethical Responsibility to Self and Others				I (1 Lecture)								R
	7. Reliability and Dependability							E	E	E		E	
	8. Resilience and Adaptability	I (1 Workshop)										R	
	9. Capacity for Improvement	I (3 Workshops)	R (1 Workshop)							E		E	
Thinking and Reasoning Competencies	10. Critical Thinking						I		R				
	11. Quantitative Reasoning							I	R				
	12. Scientific Inquiry								E	E			
	13. Written Communication	I (3 Workshops)							E				
Science Competencies	14. Living Systems				I (2 Lectures)		R						
	15. Human Behavior			I, R, E (9 lectures)	E (2 Lectures)	E (2 Lectures)			E				E

*Learning outcomes are labeled I, for introduced, R, for reinforced, and E, for emphasized using the following criteria: (1) The activity *introduces* a concept or only a few aspects of the concept; (2) the activity *reinforces* a concept introduced earlier or co-currently in the program; (3) the activity *emphasizes* reiterated concepts to integrate them with material presented throughout the program

Shaded regions indicate AAMC competencies that were not emphasized in the SUMP curriculum.

APPENDIX C: A BREAKDOWN OF THE CURRICULUM MATRIX INTO 5 ACTIVITY TYPES AND 20 TOPICS/THEMES WITH THEIR CORRESPONDING LECTURES, WORKSHOPS, ACTIVITIES, TRIPS, PROJECTS, AND EVENTS.

SUMP Activity	Topics/Themes	Description
Lectures (L) & Work-shops (W)	General Professional Development	• Mind Your Manners (W) [2,13 • Networking 101 (W) [2] • How to Give Your Best Speech (W) [5] • Journaling (W) [13] • Reflective Writing (W) [13] • Résumé Building (W)
	Medical School Application Prep	• Overview and Best Study Practices for the MCAT [8] • Medical School Admissions and Financial Aid • Tour through AMCAS • General Study Strategies
	Exposure to other Health Professions	• So You Like Research?: Considered MD/PhD? • Exploring a Career in Public Health • Health Psychology and PhD Programs
	Health Disparities [3,15]	• Health Problems in Urban Communities • Bronx Health Disparities Jeopardy • Maternal Health and the Bronx • Culture and Health • Infant Mortality and Health Disparities • Housing and Health • Immigrant Health in the Pediatric Population • Public Health Case Study • Diversity in Medical/Scientific Training and Disparities in Health Care
	Patient-centered Care [2,5]	• At the Bedside: Professionalism, Communications, and Family-centered Care • Doctor-Patient Communications and Care
	Special Interest Topics	• International Health Programs • Implicit Bias Work-shop [3] • Nutrition Challenges and Innovation [3] • Promoting Population Health [3] • Neonatal Pallia-tive Care [6] • The Affordable Care Act • Obesity in Children [14] • Adverse Childhood Experiences (ACEs) [15] • Signs and Symptoms of Lung Disease [14] • Autism Spectrum Disorders [15]

APPENDIX C (*continued*)

SUMP Activity	*Topics/Themes*	*Description*
Clinical Skills	Suturing Lab	Students learn and practice suturing techniques from a current health professional
	MECIS Simulation Lab [3,4,5,10]	Discussion/activity using manikins and role play to demonstrate diabetes, opioid overdose, gunshot wounds, and patient-provider communication scenarios
	Anatomy Lab [14]	Students receive an anatomy lecture followed by a structured lab that introduces them to the body's organ systems and their functions
	FDNY CPR Training [14]	Students complete on-site CPR training from FDNY officials
Research Project	Medical Informatics [11]	Students receive a 3-part series that includes an introduction to PubMed, Endnote, and health statistics
	Systematic Literature Review [3,4,7,10,11,12,13,15]	Two-student teams complete a literature review on a health topic of their choice under the guidance of an MD/PhD mentor and medical librarians at Einstein
	Final Research Presentation [4,5,7,12]	Student teams present their research findings to Einstein faculty and staff, family, and friends
Mentorship	Shadowing experience with physician mentor [1,2,3]	Each student is assigned two clinical mentors whom they shadow twice a week for five weeks in the summer
	Research experience with MD/PhD mentor [7,9]	Student teams meet with research mentors at least twice a week to develop final research projects
	Informal "rap sessions" [8]	SUMP alumni, current medical students, and physicians share experiences and offer advice to current SUMP students
Other Activities	The Bronx Tour [3]	Students explore NGOs and community health centers in the Bronx to become familiar with its patient populations and community needs
	Teambuilding Exercise [4]	Students are instructed to build a complex puzzle in silence, prompting them to use nonverbal communication cues to successfully complete the assignment
	Correctional Facility [3,6,15]	Students receive a lecture on health and substance use among the incarcerated population and on-site Narcan training
	Community Service Project [1]	Students volunteer at a farmer's market at Harlem Hospital

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