

REPORT

FINAL

Impact Evaluation of the RWJF Summer Medical and Dental Education Program (SMDEP)

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Clemencia Cosentino

Cecilia Speroni

Margaret Sullivan

Raúl Torres

Submitted to:

Robert Wood Johnson Foundation

Route 1 and College Road East

Princeton, NJ 08543

Project Officer: Nancy Fishman

Contract Number: 71955

Submitted by:

Mathematica Policy Research

1100 1st Street, NE

12th Floor

Washington, DC 20002-4221

Telephone: (202) 484-9220

Facsimile: (202) 863-1763

Project Director: Clemencia Cosentino

Reference Number: 40401

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ACRONYMS

AACC	American Association of Community Colleges
AAMC	Association of American Medical Colleges
ADA	American Dental Association
ADEA	American Dental Education Association
GPA	Grade point average
LCME	Liaison Committee on Medical Education
NAC	National Advisory Committee
NPO	National Program Office
NSC	National Student Clearinghouse
PBL	Problem-based learning
PI	Principal investigator
PSM	Propensity score matching
QED	Quasi-experimental design
RWJF	Robert Wood Johnson Foundation
MMEP	Minority Medical Education Program, offered from 1989 through 2002
SMDEP	Summer Medical and Dental Education Program, offered since 2006
SMEP	Summer Medical Education Program, offered from 2003 through 2005
URM	Underrepresented minority (students underrepresented in medical or dental professions, including Hispanics/Latinos, Blacks or African Americans, Native Americans, Pacific Islanders, and Hawaiian Natives)

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EXECUTIVE SUMMARY

Today, underrepresented minorities (URMs) are estimated to account for about 12 percent of physicians and 9 percent of dentists, although they represent roughly 30 percent of college students and the nation's population (Castillo-Page 2010; ADA 2011; NCES 2012; Humes 2011).¹ People from socioeconomically disadvantaged backgrounds—many of whom are also minorities—are similarly underrepresented in the physician workforce (Grbic et al. 2013). In addition, projections released by the Association of American Medical Colleges (AAMC) point to growing shortages of physicians and surgeons (Kirch 2014). To address these persistent problems, for the past 25 years, the Robert Wood Johnson Foundation (RWJF) has sponsored a summer program designed to increase the number of college students of minority and disadvantaged backgrounds who become physicians and dentists. Since its first cohort participated in summer 1989, the Summer Medical and Dental Education Program (SMDEP) has served more than 22,000 students and invested more than \$70 million. This report presents the results of Mathematica's evaluation of SMDEP.

SMDEP

SMDEP—as the program has been known since 2006—is a free, six-week residential science enrichment program offered during the summer to rising college sophomores and juniors of minority and socioeconomically disadvantaged background who are interested in attending medical or dental school. The immediate goal of the program is to help these students become more competitive applicants to medical and dental schools, with the ultimate goal of increasing the number of successful applicants from underrepresented groups and eventually diversifying the medical and dental labor force.

SMDEP is offered at the following 12 universities throughout the nation:

- Case Western Reserve University, Schools of Medicine and Dental Medicine
- Columbia University College of Physicians and Surgeons and College of Dental Medicine
- Duke University School of Medicine
- Howard University Colleges of Art and Sciences, Dentistry, and Medicine
- David Geffen School of Medicine at UCLA and UCLA School of Dentistry
- University of Louisville, Schools of Medicine and Dentistry
- University of Medicine and Dentistry of New Jersey, New Jersey Medical School, and Rutgers School of Dental Medicine
- University of Nebraska Medical Center, Colleges of Medicine and Dentistry
- University of Texas Health Science Center at Houston, Schools of Medicine and Dentistry

¹ The estimates correspond to the latest year of publicly available data. URMs in medicine and dentistry include Hispanics/Latinos, blacks or African Americans, Native Americans, Native Hawaiians, Alaskan Natives, and Pacific Islanders. Throughout this report, we use URM and minority interchangeably to refer to students of these races and ethnicities, unless otherwise stated.

- University of Virginia School of Medicine
- University of Washington Schools of Medicine and Dentistry
- Yale University School of Medicine

Three sites—Duke, University of Virginia, and Yale—offer only the program’s medical component while the others offer both the medical and dental components. Despite the difference, all sites share the program’s main elements. Program participants receive science instruction, gain exposure to the practice of medicine or dentistry through clinical experiences, and participate in workshops and attend lectures that provide other relevant exposure or skills related to, for example, health disparities, study skills, financial planning to attend graduate school, and preparation to apply for medical or dental school.

The SMDEP evaluation

In late 2012, RWJF commissioned an external evaluation of SMDEP. Conducted by Mathematica, the evaluation was designed to contribute to the existing research by providing rigorous evidence of program effectiveness under the current SMDEP model (implemented since 2006) and by helping to identify the critical components of the program in order to facilitate replication efforts.

To align with these two evaluation objectives, Mathematica’s mixed-methods evaluation included two components. The first was formative; we used qualitative methods to learn about the characteristics and key components of the program as implemented by different institutions. The second was summative; we used a quasi-experimental design through propensity score matching methods to assess the impact of SMDEP on key expected student outcomes (noted below) by comparing average outcomes for SMDEP participants to those of a group of similar students who did not participate in the program. In subgroup analyses, we modeled outcomes by institutional and individual characteristics of interest, such as the type of program offered (medical-only versus medical and dental), the academic and pedagogical approaches adopted, and participants’ gender, ethnicity, and home institution (two- versus four-year).

We used this evaluation approach to answer five main research questions:

1. **Student recruitment:** Is the program reaching the target student population?
2. **Student outcomes:** What are the educational outcomes of students who do not pursue a career in medicine or dentistry?
3. **Student impacts:** What is the impact of the program on students’ health career trajectories? Are SMDEP participants more likely than similar matched comparison students to complete college, obtain a health-related college degree, and apply and matriculate in medical or dental school? Do average outcomes vary by student characteristics?
4. **Institutional impacts:** What is the impact of the program on institutional culture, policies, and procedures?
5. **Key components:** What are the program’s critical ingredients or components? Are certain program characteristics correlated with observed impacts?

To answer these questions, we focused on the following student outcomes:

- College graduation (as of summer 2013)
- College graduation with a degree in a health field; science, technology, engineering, or mathematics (STEM) field; or other field (as of summer 2013)
- Medical or dental school application (as of fall 2012)
- Medical or dental school matriculation (as of fall 2012)
- Medical or dental school matriculation in a school that hosts SMDEP (as of fall 2012).²

The study relied on data from several sources, including student applications to SMDEP (collected from the National Program Office), applications to medical and dental school (collected from AAMC and the American Dental Education Association), student enrollment in and graduation from postsecondary institutions (collected from the National Student Clearinghouse), SMDEP project directors (collected through telephone interviews), and SMDEP staff, collaborators, and students (collected during site visits).

Descriptive findings

1. **The program has become increasingly competitive.** Applications grew by 32 percent between 2006 and 2012, and enrollment targets remained fixed at 80 students per site, causing sites to experience a decline in enrollment rates, from 18 percent in 2006 to 13 percent in 2012.
2. **The program has succeeded in reaching the target student population.** It selects students who are more likely than nonparticipants to be from a minority group, report low family income levels, have parents who have not completed college, and self-identify as disadvantaged. Students from two-year colleges are not, however, likely to participate in SMDEP (only 7 percent of participants and nonparticipants come from such colleges).
3. **The majority of participants stay on the path to a potential career in health.** The vast majority of participants earn bachelor's degrees in a health- or science-related field, and, within one to four years of obtaining their degree (depending on the cohort), more than half apply to medical or dental school.³ Specifically:
 - a. Over 80 percent of participants obtain a bachelor's degree.⁴
 - b. More than two-thirds (67 percent) obtain a bachelor's degree in a science- or health-related field.

² We did not use data on matriculation institution for dental school students because the data have not been recorded consistently over the years.

³ Findings are based on students who participated in 2006, 2007, and 2008 as rising sophomores and juniors.

⁴ Nationally, about 59 percent of students (40 percent for blacks and American Indian/Alaskan Native and 52 percent for Hispanics) obtain bachelor's degrees within six years, though these statistics underestimate the true graduation rates as they exclude transfer students (NCES 2013, 2014).

- c. More than half (55 percent) apply to medical or dental school.
- d. More than one-third (38 percent) matriculate in medical or dental school.

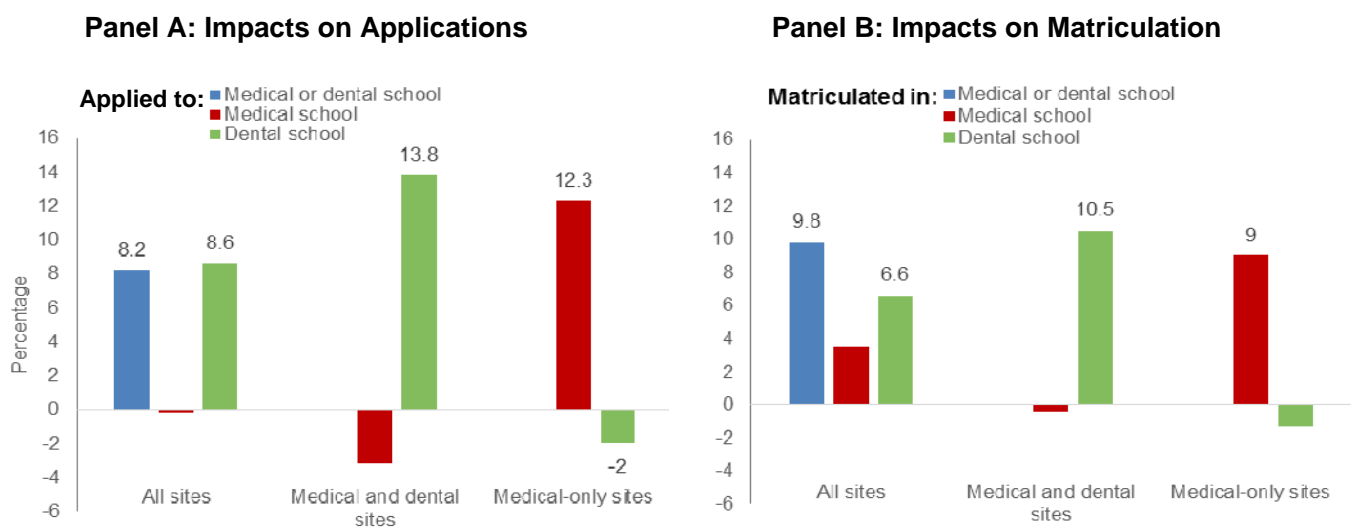
In other words, for every 10 students who participate in SMDEP, about 8 obtain a bachelor’s degree, 6 apply to medical or dental school, and 4 matriculate in medical or dental school.

Of the approximately 60 percent who do not matriculate in medical or dental school within four to six years of program participation, the majority obtain a bachelor’s degree in a health- or science-related field (64 percent), and some obtain a master’s degree (14 percent).

Program impacts

1. **There is no evidence that SMDEP has an effect on bachelor’s degree attainment or major.** Participants and comparison students are similarly likely to obtain a bachelor’s degree. Over two-thirds of SMDEP participants and comparison students obtain a bachelor’s degree in a science-related field (science, technology, engineering, or mathematics), with a small percentage obtaining a degree in health.
2. **The program helps diversify medical and dental schools, as it increases the likelihood of applying to and matriculating in medical and dental school.** SMDEP has a positive impact on medical school applications and matriculation in sites offering only the medical component and on dental school applications and matriculation in sites that offer both the medical and dental components (Figure ES.1).

Figure ES.1. SMDEP impact estimates on the probability of applying to and matriculating in medical or dental school



Source: Tables V.1 and V.2

Notes: Estimates are regression-adjusted difference between the participant and comparison group means. The impact estimates presented here are statistically significant at 1 percent.

Figure reads: Across SMDEP sites, program participants are, on average, 8.2 percentage points more likely to apply to medical or dental school than similar comparison students.

The magnitude of the impacts is similar across program type. SMDEP participants from medicine-only sites are 12 percentage points more likely to apply to medical school than comparison students, and those from sites that include a dental component are about 14 percentage points more likely to apply to dental school than comparison students (Figure ES.1, Panel A). The corresponding estimates for matriculation are 9 percentage points (for medical school) and 10.5 percentage points (for dental school) for the sites without and with a dental program, respectively (Figure ES.1, Panel B). The program also has a small impact on matriculating in medical school *at an SMDEP institution*, both overall and across sites with or without the dental component.

3. **Three program characteristics—staffing, clinical experiences, and leadership approach—are related to program effectiveness.** Specifically:
 - a. **Sites that recruit new instructors every year—compared with those maintaining a stable group of faculty over time—have an adverse impact on medical school applications and matriculation.** A smaller share of participants pursues careers in medicine at sites that annually recruit new faculty (19 versus 26 percent).
 - b. **Sites that offer less exposure to clinical experiences have greater impacts in terms of dental school applications and matriculation.** On average, the offer of clinical experiences (such as shadowing a doctor or dentist) has a positive impact on student outcomes, but students in sites offering less clinical exposure apply to and matriculate in dental school at higher rates than those in sites with more intense clinical experiences (18 versus 11 percent of participants apply and 13 versus 8 percent enroll in dental school).
 - c. **Sites where leadership is not collaborative across program components (medical and dental) have better dental school outcomes than sites with a collaborative leadership approach.** Sites led by staff in either the medical or dental program have better outcomes (in terms of dental school applications and matriculation) than those that establish a collaborative administrative structure across both components. On average, both leadership approaches are associated with positive outcomes, but the noncollaborative approach is relatively more effective.

Implications

- Increased interest in the program over time—as reflected by increased applications—may help explain sites’ ability to select students with the target demographic characteristics.
- Given that we measured outcomes within four to six years of program participation and that the majority of those not matriculating in medical or dental school obtained degrees in a science- or health-related field, it is likely that some of these students will eventually pursue medical, dental, or other health-related careers.
- The lack of impacts on medical school outcomes at sites offering both medical and dental components suggests that the program may face competition from similar programs. Such programs were rare at the time of SMDEP’s creation 25 years ago, but they have since proliferated in response to new medical school accreditation requirements.

- The positive impacts on dental school outcomes reinforce the importance of SMDEP in fields where such programs are rare.
- The negative impact associated with low faculty engagement—as well as the higher relative effectiveness of noncollaborative leadership—suggests that these factors should be considered when reviewing proposals or establishing requirements for similar programs in other fields.
- The higher relative effectiveness of sites offering less clinical exposure to participants suggests that such exposure may take time away from activities that are more relevant to dental school, and supports the program’s cap on such activities (currently set at 5 percent of SMDEP time).

I. INTRODUCTION

This month, September 2014, K–12 schools throughout the nation are expected to hit a major milestone: for the first time, they will enroll more racial and ethnic minority students than majority or non-Hispanic white students. This milestone has been much anticipated by educators, policymakers, advocates, and researchers, as the nation’s changing demographics push them to consider the opportunities available to groups traditionally underserved and underrepresented in key areas of the U.S. economy. One of these key areas is health—specifically, medicine and dentistry. Today, underrepresented minorities (URMs) are estimated to account for about 12 percent of physicians and 9 percent of dentists, although they represent roughly 30 percent of college students and the nation’s population (Castillo-Page 2010; ADA 2011; NCES 2012; Humes 2011).⁵ People from socioeconomically disadvantaged backgrounds—many of whom are also minorities—are similarly underrepresented in the physician workforce (Grbic et al. 2013). This underrepresentation not only creates inequity for minorities in the medical professions but can lead to inadequate care for the entire population. Projections released by the Association of American Medical Colleges (AAMC) point to a shortage of 45,000 primary care physicians and 46,000 surgeons and medical specialists by 2020 (Kirch 2014). These shortages are likely to be particularly acute in communities already suffering from inadequate access to medical services, such as low-income and rural areas, which are more likely to be served by minority doctors and dentists—currently underrepresented in the health care workforce (National Research Council 2004).

Students from minority and disadvantaged backgrounds represent an untapped pool of talent that can help fill these gaps, benefitting not only themselves but their communities and the nation as a whole. Recognizing this potential and seeking to address the related equity and shortage problems, the Robert Wood Johnson Foundation (RWJF) has sponsored a program for the past 25 years designed to increase the number of college students of minority and disadvantaged backgrounds who become physicians and dentists. This program—known since 2006 as the Summer Medical and Dental Education Program (SMDEP)—is a free, six-week residential science enrichment program offered during the summer to rising sophomores and juniors of minority and socioeconomically disadvantaged background who are interested in attending medical or dental school. SMDEP is offered at 12 universities throughout the nation. Since its first cohort participated in the summer of 1989, the program has served more than 22,000 students and invested more than \$70 million.

In late 2012, RWJF commissioned an external impact evaluation of SMDEP. Previous evaluations, conducted internally, were either somewhat dated or focused solely on descriptive program outcomes. The current evaluation, conducted by Mathematica Policy Research, was designed to contribute to the existing research by providing rigorous evidence of program effectiveness under the current model (implemented since 2006) and helping to identify the critical components of the program to facilitate replication efforts. To align with these two evaluation objectives, Mathematica’s mixed-methods evaluation included two components. The

⁵ These estimates correspond to the latest year of publicly available data. URMs in medicine and dentistry include Hispanics/Latinos, blacks or African Americans, Native Americans, Native Hawaiians, Alaskan Natives, and Pacific Islanders. Throughout this report, we use URM and minority interchangeably to refer to students of these races and ethnicities, unless otherwise stated.

first was formative; we used qualitative methods to learn about the characteristics and key components of the program as implemented by different grantee institutions, and considered whether SMDEP participation has spillover effects on the participating institutions in ways that might foster program goals and help scale up program impacts. The second was summative; we used a quasi-experimental design (QED) to assess the impact of SMDEP on key student outcomes aligned with the program logic model, including college graduation and application to and enrollment in medical or dental school. Leveraging the qualitative work conducted and the data available on individual demographic characteristics, we conducted subgroup analyses. Specifically, we modeled outcomes by institutional and individual characteristics of interest, such as the type of program offered (medical only versus medical and dental), the academic and pedagogical approaches adopted, and the gender and ethnicity of participants.

The remainder of this report describes the program and its evolution over time (Chapter II); provides an overview of our research questions, design, and methods (Chapter III); presents descriptive qualitative (Chapter IV) and quantitative (Chapter V) findings regarding program implementation and outcomes; and discusses results from the impact analysis (Chapter VI). We conclude by answering the research questions guiding this evaluation and discussing their implications (Chapter VII). The appendices contain detailed information regarding our methodological approach (Appendix A), the protocols we used to conduct telephone interviews and site visits (Appendix B), and other supporting tables and information referenced in this report (Appendix C).

II. PROGRAM OVERVIEW

SMDEP is a six-week science enrichment program designed to serve students who (1) are in their first two years of college (rising sophomores or juniors and community college students), (2) come from demographic groups underrepresented among medical doctors and dentists (that is, racial and ethnic minorities and students from disadvantaged socioeconomic backgrounds), and (3) are interested in attending medical or dental school. As designed by RWJF, the immediate goal of the program is to help these students become more competitive applicants to medical and dental schools, with the ultimate goal of increasing the number of successful applicants from underrepresented groups and eventually diversifying the medical and dental labor force. Participants receive science instruction, gain exposure to the practice of medicine or dentistry through clinical experiences, and participate in workshops and attend lectures that provide other relevant exposure or skills (such as issues regarding health disparities, financial planning to attend graduate school, study skills, preparation to apply for medical or dental school, and others). Originally established in 1987, the program has evolved in important ways since it served its first cohort in 1989.

A. Programmatic changes

Over the past 25 years, programmatic changes were made to focus more broadly on:

- **Disadvantaged populations underrepresented in medicine and dentistry**, as the program expanded from serving minorities⁶ to targeting disadvantaged students of any ethnicity and others (such as students from rural areas)
- **Health professions**, as the program expanded to serve students interested in dentistry as well as medicine

These changes are reflected in the changing names of the program—from Minority Medical Education Program (MMEP, 1989–2002) to Summer Medical Education Program (SMEP, 2003–2005) to Summer Medical and Dental Education Program (SMDEP, since 2006).

In recent years, the program also narrowed its *participation criteria* and revised its *selection procedures*.⁷ Specifically, SMDEP restricted participation to rising sophomores and juniors, whereas in the past the program served college students in any year and undergraduate degree holders. The program also decreased the minimum GPA admissions requirement from 3.0 to 2.5 and added a geographic focus to encourage sites to serve students from their communities. At

⁶ Originally, the program focused on serving “African Americans, Mexican Americans, Native Americans (meaning American Indians, Alaska natives, and native Hawaiians) and mainland Puerto Ricans (people of Puerto Rican heritage who live in the U.S. mainland rather than in the Commonwealth of Puerto Rico),” and in 2003 expanded to include Hispanics and Pacific Islanders as RWJF adopted a more flexible and time-invariant definition of minority (RWJF 2011). This definition anchors the meaning of minority to “those racial and ethnic populations that are underrepresented in the medical profession relative to their numbers in the general population” (RWJF 2011).

⁷ We highlight only the most important programmatic changes here, though others have been made to facilitate implementation. Further, SMDEP piloted some changes—such as expanding to serve commuter students—but did not implement them permanently.

present, sites are required to recruit 30 percent of participants from their state and 20 percent from the surrounding region, as defined by the program's national program office (NPO).⁸

Additionally, to encourage participation across SMDEP sites and facilitate participation of late applicants, the program made two other changes to the selection process. Since 2007, it has set a maximum number of applications that sites could receive; at present, the cap is set at about 500 applications. SMDEP intended this change to ensure that all sites receive sufficient applicants to make selection decisions, and it affected the sites that attracted the highest number of applicants (such as Columbia University). Second, since 2010, the program has followed a two-stage admission process that includes two notification dates (one in the fall and one in winter) to facilitate review of all applications compared to the rolling admissions process. It made this change to increase participation among those who tended to apply later in the admissions process, when most sites likely no longer had spaces available due to the rolling admissions policy.

B. Program sites and participants

To date, the program has served more than 20,000 students throughout the nation (Appendix Table C.1).⁹ It began in 1989 with its first cohort of 664 students spread across six sites. Over the years, the program expanded in both participating students and institutions until 2006, when the program (1) made awards to 12 new and existing sites so they could offer the program, (2) set a fixed number of students (80) to participate at each site, and (3) established the distribution of these 80 slots among students interested in medical school (60) and dental school (minimum of 20) (Table II.1).

C. Program management: the National Program Office (NPO)

The program is managed by its NPO. The Association of American Medical Colleges (AAMC) in Washington, DC, served as the NPO for many years and, since 2006, has managed the program in collaboration with the American Dental Education Association (ADEA). The NPO leads recruitment and communication efforts, manages the centralized application process, recommends and enforces selection guidelines, manages the financial planning workshop, leads alumni initiatives, and monitors implementation of the program across sites. In addition, it maintains data on program applicants and participants, and uses these data for reporting to RWJF and disseminating information to grantee sites and others. Specifically, the NPO:

- Maintains a database with application data that helps monitor the characteristics of program applicants and participants.
- Sponsors a survey of participants' knowledge and attitudes before and after they participate in the program (called the pre-/post-surveys) that helps provide feedback to the sites to guide program improvements.

⁸ The 12 sites are sorted into eight regions of the country. For example, Case Western is in the Great Lakes Region, which includes Minnesota, Wisconsin, Illinois, Indiana, Michigan, and Ohio. Regional targets were introduced in 2012 and originally set at 20 percent for the state and 15 percent for the region.

⁹ Based on latest available data (2012). The NPO estimates that including 2013 and 2014 increases this figure to more than 23,000.

Table II.1. SMDEP sites offering medical and dental or medical programs

	Location	New sites in 2006
Offering medical and dental programs		
Case Western Reserve University, Schools of Medicine and Dental Medicine	Cleveland, OH	
Columbia University College of Physicians and Surgeons and College of Dental Medicine	New York, NY	
Howard University Colleges of Art and Sciences, Dentistry, and Medicine (Washington, DC)	Washington, DC	✓
David Geffen School of Medicine at UCLA and UCLA School of Dentistry	Los Angeles, CA	✓
University of Louisville, Schools of Medicine and Dentistry	Louisville, KY	✓
University of Medicine and Dentistry of New Jersey, New Jersey Medical School and Rutgers School of Dental Medicine	Newark, NJ	
University of Nebraska Medical Center, Colleges of Medicine and Dentistry	Omaha, NE	✓
University of Texas Health Science Center at Houston, Schools of Medicine and Dentistry	Houston, TX	✓
University of Washington Schools of Medicine and Dentistry	Seattle, WA	
Offering medical programs		
Duke University School of Medicine	Durham, NC	
University of Virginia School of Medicine	Charlottesville, VA	
Yale University School of Medicine	New Haven, CT	

- Conducts an alumni survey to learn about education and employment after participation in SMDEP.
- Uses application data from medical and dental schools (to which the NPO has access through AAMC and ADEA) to monitor application and matriculation into medical and dental schools among program participants.

In conducting its work, the NPO follows guidance provided by RWJF and the program's national advisory committee (NAC). The NAC is composed of 12 members who are faculty or high-level administrators—mostly doctors, dentists, or scientists (a list of current members is included in Appendix C). NAC members participate in annual visits to grantee sites that the NPO conducts, review proposals, and recommend programmatic changes based on the NPO's information. The NPO is responsible for overseeing the adoption of changes or initiatives recommended by the NAC and approved by RWJF, such as focusing on core science prerequisites for medical school and offering seminars in test-taking skills and financial planning.

D. Previous evaluations

The RWJF Research and Evaluation Unit has sponsored two internal evaluations, conducted by Cantor, Baker, and Miles, to study program outcomes and inform programmatic decision making. In 1993, in anticipation of a 1994 program reauthorization, these authors conducted an evaluation to (1) describe characteristics of program participants from 1989 through 1993; and (2) measure the MMEP’s impact on acceptance to medical school, compared to other underrepresented minority medical school applicants (Cantor et al. n.d.). Controlling for academic achievement (as measured by grades and MCAT and SAT scores) and competitiveness of undergraduate academic institutions, the authors found that program participation increased the odds of acceptance to medical school in 1993 by 82 percent. The authors also found that freshman and sophomores appeared to benefit more from the program than did older students—likely influencing the program’s decision to focus on underclassmen beginning in 2006.

In 1998, Cantor and colleagues expanded their earlier analysis to (1) study additional cohorts (1992, 1996, and 1997); and (2) experiment with a variety of model specifications, including adjustments for academic achievement (using both pre- and post-MMEP performance), time elapsed between college graduation and application to medical school, prior medical school application attempts, medical school interest expressed while in high school, and parental education (Cantor et al. 1998). As with the previous analysis, the authors used logistic regression to model the influence of program participation on the probability of acceptance to medical school. Their results confirmed the 1993 findings, although they suggested that the impact might not be as large as originally estimated. For all additional years analyzed (1992, 1996, and 1997), MMEP participation appears to have increased the odds of acceptance to medical school. For the most recent cohort studied (1997), the benefit of MMEP participation increased the odds of acceptance by 60 to 69 percent, depending on the model. To put these impacts into a metric comparable to the ones used in this report, a 69 percent increase in the odds of medical school acceptance is equivalent to an increase in the probability of admissions of 31 percentage points.¹⁰

In 2003, the NAC expanded on these earlier outcomes studies by collecting qualitative data to understand whether “the structure and processes of MMEP successfully support the goals of MMEP” (Showstack et al. 2003). The study included 53 interviews with program staff and a web survey of 1,200 student participants from the 2001–2003 program sessions. Staff and student respondents described the implementation of key program components and the program’s role in increasing the pool of minority applicants to medical/dental school. This feedback led to recommendations for program improvements, including urging the NPO to take a more active role in administering the program and encouraging the adoption of a broader definition of “disadvantaged” beyond minority status; the program adopted both recommendations for future years. A 2005 NAC report provided additional feedback from program directors on “what works” and mapped out a plan for incorporating a dental component into the program based on informal pilots at some program sites (Deal 2005). The program implemented this change in 2006.

¹⁰ We converted odds ratios (OR) into risk ratio (RR) by using the following formula: $RR = \frac{OR}{(1-P+(P \times OR))}$, where P is the probability of being accepted into medical school for minority nonparticipant. A RR of 1.31 translates into a program impact of 31 percentage points.

E. Contributions of the present evaluation

The present study contributes to the existing knowledge of program effectiveness by (1) updating prior research (completed before 2006) to focus on the program as currently implemented under SMDEP; and (2) estimating program impacts on medium-term participant outcomes, including degree attainment and application to medical and dental school,¹¹ both overall and by subgroups of interest. In addition to focusing on recent cohorts of SMDEP participants, our work departed from previous studies in important ways.

Whereas the previous outcomes study—published by Canton and colleagues in the *Journal of the American Medical Association (JAMA)* in 1998—also modeled participant outcomes, the study sample was selected among the subset of MMEP participants who applied to medical school, rather than drawing from the entire MMEP participant population. Thus, findings from that study were conditional on application to medical school and measured the success of program participants in being admitted; this group—medical school applicants—already was a select subset that experienced the target program outcome. In the present study, we treated medical (and dental) school applications as the main outcome of the program, and employed rigorous methods to measure impacts on this and other outcomes.

This study also expanded the previous work by measuring educational outcomes of former SMDEP participants who do not apply to medical or dental school and by estimating impacts for different subgroups based on student characteristics (such as gender, minority status, and college type) and site characteristics (such as high versus low leadership support, faculty commitment, academic focus, or clinical exposure). Using rich qualitative data collected through telephone interviews with program staff at all SMDEP institutions and site visits to four institutions, we complemented the 2005 qualitative study of “what works” by leveraging heterogeneity in program characteristics across sites to model their impact on participant outcomes.

¹¹ Our impact analysis is based on students participating between 2006 and 2008; this should ensure that sufficient time elapsed between program participation and data collection for this study to observe outcomes of interest, such as college graduation and application to medical or dental school.

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III. DESIGN AND METHODS

This chapter presents the logic model of the program and the research questions that guided our evaluation, the mixed-methods design we employed to answer those questions (including the data used and estimation approach), and the limitations of this study.

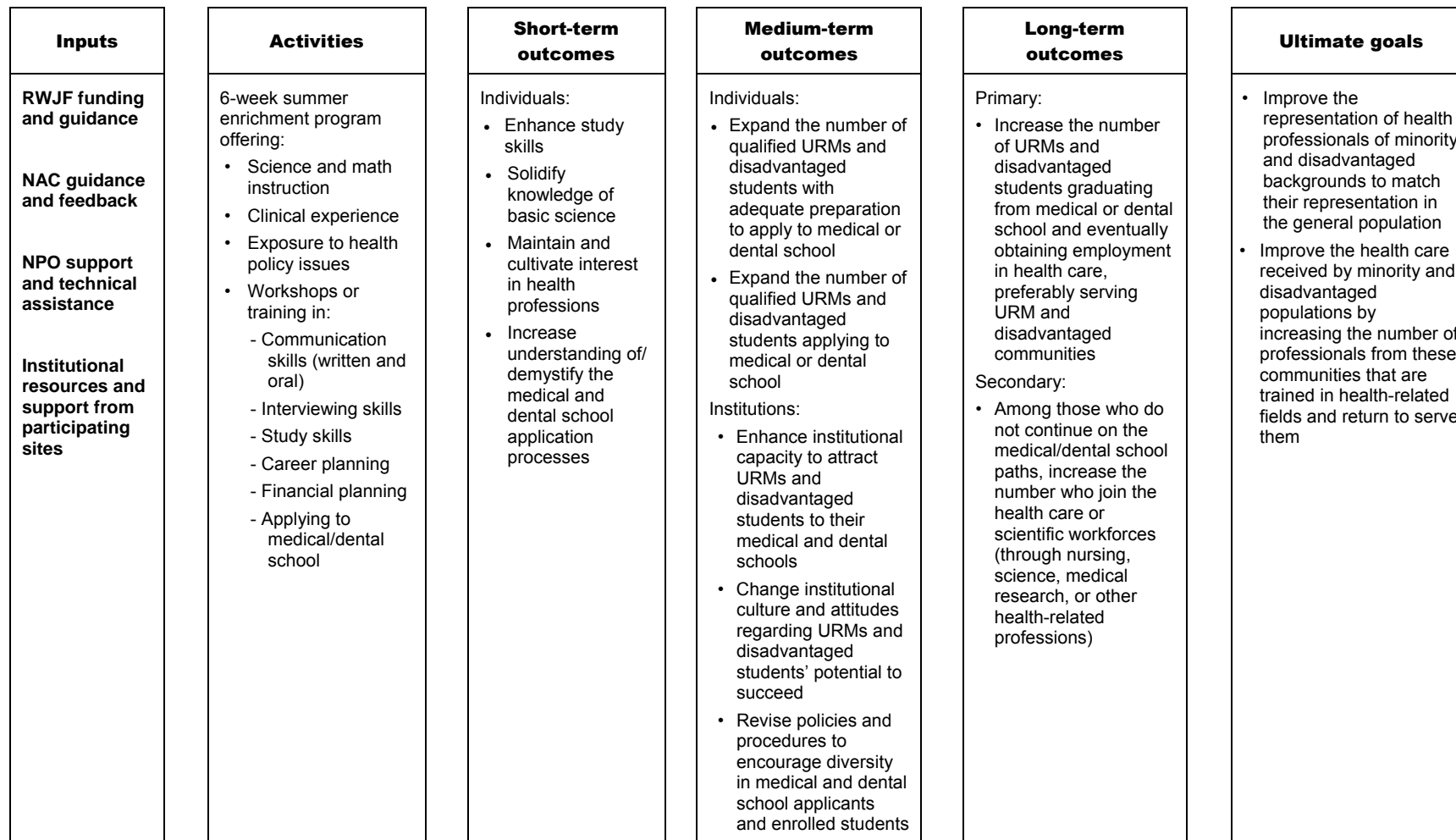
A. Logic model

As shown in Figure III.1, the ultimate goal of SMDEP is to address a well-documented disparity in the labor force by increasing the number of minority and disadvantaged students who become physicians and dentists. For example, only 12 percent of physicians and 9 percent of dentists are URMs, although they represent nearly 30 percent of the population nationally. In addition to diversifying the workforce, RWJF hopes to improve health services to disadvantaged populations and underserved areas of the nation (such as rural areas), as minority and disadvantaged students who become doctors and dentists may be more likely to return to and serve their communities (AAMC 2014). A secondary program goal is to contribute more broadly to the health and scientific workforce through program participants who do not become physicians or dentists but instead pursue other health-related careers, such as nursing and research in the sciences, and work with underserved populations or issues affecting them.

To achieve these goals, the SMDEP program provides relevant science and math training and exposure to the fields of medicine and dentistry to minority and disadvantaged students. The program aims to keep these students on the path to medical or dental school by enhancing their knowledge and preparing them to be competitive applicants. Evidence suggests that URMs indeed are underrepresented among applicants to medical and dental schools, and those who apply may be a select group. At present, URMs account for just 16 and 13 percent of medical and dental school applicants, respectively (Castillo-Page 2012; Gonzalez et al. 2011). Of all applicants to medical school in 2011–12, 46 percent of URMs were accepted, compared with 48 percent of non-Hispanic whites (Castillo-Page 2012). Thus, if the program achieves its medium-term goals, URMs may be more likely to apply and be admitted to medical or dental school (eventually expanding the share of URMs to match their representation in the general population).

We assessed the impact of this program by focusing on these medium-term outcomes on students. In addition, as a way of scaling up its impact, the program aims at influencing changes in culture, attitudes, and policies at grantee institutions that may result in increased diversity in the medical and dental professions. Through our qualitative work, we studied whether these changes have taken place.

Figure III.1. SMDEP logic model



B. Research questions

Seven research questions guided our evaluation:

1. **Student recruitment:** What are the demographic characteristics, academic background, and socioeconomic characteristics of students who apply to and matriculate in the SMDEP program? Is the program reaching the target student population?
2. **Student outcomes:** What are the educational outcomes of students who do not pursue a career in medicine or dentistry?
3. **Student impacts:** What is the impact of the program on students' health career trajectories? Are SMDEP participants more likely to finish college, obtain a health-related college degree, and apply and matriculate in medical or dental school than similar matched comparison students? Do average outcomes vary by institution or student characteristics?
4. **Institutional impacts:** What is the impact of the program on institutional culture, policies, and procedures?
5. **Key components:** What are the critical ingredients or components of this program? Is there a SMDEP model? Are certain program characteristics correlated with observed impacts?
6. **Technical support:** Is the NPO providing adequate support and technical assistance to the sites?
7. **Data collection and analysis:** How might ongoing efforts to collect and analyze data be improved to capture additional information, especially on students?

This report focuses on answering questions 1 through 5, which are related to assessing program effectiveness. Questions 6 and 7—which are focused on a specific supports provided to grantees implementing the program—are addressed in separate documents.^{12, 13}

C. Mixed-methods design

The evaluation included two components: (1) a *formative assessment* to identify key program components, learn about whether and how certain program characteristics may contribute to the success of SMDEP, and consider whether SMDEP participation has spillover effects on the participating institution, and (2) a *summative component* to establish the impact of the program on its ultimate goal of contributing to increased representation of individuals of minority and disadvantaged backgrounds in the health workforce. This section provides an overview of key elements of our design and methods for each component. The appendices include more detailed information.

¹² Speroni, C., and C. Cosentino. “Enhancing Data Collection for Program Monitoring and Evaluation.” Prepared for the Robert Wood Johnson Foundation and the SMDEP National Program Office. Washington, DC: Mathematica Policy Research, September, 2014.

¹³ Cosentino, C., and C. Speroni “SMDEP Tracking Survey and SMDEP Evaluation Pre/Post Surveys.” Memorandum to Norma Poll, Sarah Conrad, and Sakima Jones. May 23, 2014.

1. Formative evaluation

We collected and analyzed qualitative data through a thorough review of project documents, telephone interviews with staff at all current SMDEP sites, and visits to four sites.

Document review. Our review of project documents included grantee proposals, annual reports, websites, previous evaluation and descriptive reports, program brochures, instruction booklets for grantees, and other documents. Although we focused our review heavily on documents since 2006 to align with the beginning of SMDEP, we also visited the program archives at AAMC and reviewed documents available since the inception of the program. We analyzed this information to learn about the establishment and evolution of the program, the challenges addressed and opportunities leveraged across sites implementing it, and the characteristics of current projects as implemented by different grantees.

Telephone interviews. Based on our review of project documents, we drafted protocols to conduct telephone interviews with program staff at all grantee institutions (Appendix B). In consultation with RWJF and NPO staff, we prepared a list of 34 individuals to interview, including principal investigators (PIs), co-PIs, program coordinators, and program directors. In fall 2012, we conducted one-hour interviews with 32 program staff across all 12 sites. The goal of the interviews was to obtain more detailed information regarding current implementation, including program administration and governance, curriculum and other offerings, and student recruitment and selection; factors that facilitated or inhibited effective program implementation; program impact on institutional policies and practices; and support and technical assistance provided by the NPO. We used Atlas.ti, a qualitative coding software, to analyze the interview data.¹⁴

Site visits. We used findings from the telephone interviews, along with some preliminary results from data analysis, to develop criteria to select grantees for *site visits*. We leveraged variation in key program characteristics across sites to sort sites into a 2 x 2 matrix defined by whether the site (1) offered a high versus low level of clinical exposure to participants, as measured by the frequency and duration of experiences; and (2) employed a primarily lecture-based versus a more active pedagogical approach, such as problem-based learning (PBL). Based on these criteria, and in consultation with RWJF, we selected four SMDEP sites to visit in summer 2013. Selected sites are not necessarily representative of all SMDEP sites. For example, on average, case-study sites are more likely to enroll non-minority students (15 versus 8 percent) and less likely to enroll students from two-year colleges (3 versus 9 percent) (Appendix Table C.4). The goal of the site visits was to obtain an in-depth understanding of program implementation from the perspective of various stakeholders; identify the conditions necessary for successful implementation; and learn about potential program impact on the participating institutions that may help foster program goals, such as changing attitudes and even practices

¹⁴ Before the interviews, we created a coding scheme using the protocols and evaluation research questions as a guide. Following the interviews, we refined the coding scheme to capture details on key themes that emerged during the interviews. We then tested the coding scheme on a handful of write-ups to ensure that all coders understood the code definitions and could apply the codes consistently. Two junior staff members were responsible for assigning the codes; a researcher then conducted inter-rater reliability checks and made final coding decisions in cases of disagreement. We transferred the final codes into an SAS data set for analysis.

regarding the admission of minority and disadvantaged students to their medical or dental schools.

During each site visit, we interviewed an average of 12 program and university staff, and conducted one to two focus groups with students. We interviewed three different types of staff at each institution: (1) institutional leadership, including deans, provost, and admissions staff, to understand how SMDEP fits into the structure and mission of the university, and whether the program influences institutional policies and admissions decisions; (2) program leadership, to discuss the program's organizational structure, implementation problems and challenges, and budget; and (3) instructional and support staff (such as faculty, instructors, and teaching assistants) to learn about their approach to teaching and supporting SMDEP students. Finally, we conducted focus groups with an average of eight students in each group to learn about their background, goals for SMDEP participation, and program experiences. In all except one site, we grouped students in focus groups based on interest in medicine versus dentistry. Appendix B includes the protocols used during site visits.

Other in-person interviews and meetings. During the 2013 annual meeting of grantees, we met with three members of the NAC to learn about their involvement with the program. They provided insights into the contribution of the NAC as an advisory board composed of experts in a range of health- and science-related fields who could help inform potential revisions to the program. Also, starting with a kickoff meeting in late 2012, we have met with NPO staff from AAMC and ADEA on several occasions (in person and by telephone) to learn about the program and their role in it, talk about available data and our evaluation approach, provide feedback on their data collections, and receive their input on work related to this study.

2. Summative evaluation

The summative component of the evaluation focused on estimating the impact of SMDEP on key career decisions and outcomes. In this section, we describe these outcomes and the quasi-experimental design, analytic methods, data sources, and samples used.

Outcomes. Although the program intentionally recruits and serves students interested in medicine and dentistry, it might also influence (1) students' interest in a wide range of health- and science-related careers, and (2) the institutions to which they decide to apply for professional school. To capture these other potential impacts of the program, we assessed the relationship between program participation and the following outcomes:

- College graduation (as of summer 2013)
- College graduation with a health- or science-oriented field (including science, technology, engineering or mathematics (STEM)), or other degree (as of summer 2013)
- Medical or dental school application (as of fall 2012)

- Medical or dental school matriculation (as of fall 2012)
- Medical or dental school matriculation in a school that hosts SMDEP (as of fall 2012).¹⁵

Quasi-experimental design. To assess the impact of SMDEP on these participant outcomes, we used a comparison group design and compared average outcomes for SMDEP participants and those of a group of similar students who did not participate in the program. This approach allowed us to establish what would have happened to the participants if they had not participated in SMDEP. We used propensity score matching (PSM) to construct a comparison group that was similar on observable characteristics to the participant group, employing a one-to-one nearest neighbor matching approach (with replacement) to find appropriate comparison students from the pool of SMDEP applicants who did not participate in the program, and excluding those who were rejected in all sites or withdrew their applications.¹⁶ Because students who apply to a particular site likely share some unobserved commonalities, we matched participants in a given site with similar nonparticipants who applied to that site. Appendix A provides more detailed technical information.

Analytic methods. We measured the impact of the program by estimating the difference between the average outcomes for the participant group (those who participated in SMDEP) and the comparison group (those who did not participate in SMDEP). We measured this difference, or program effect, by estimating logit regression models with the binary outcome of interest as the dependent variable. We reported regression-adjusted estimates obtained through these models that predict the outcome of interest (for example, application to medical school) as a function of participation in the program (the dependent variable of interest), controlling for several pre-program characteristics likely correlated with the outcomes (such as prior academic performance) and also used in the propensity score matching models. We used the same set of variables to estimate models for all outcome measures. Inclusion of the pre-participation characteristics as control variables in the regression models allowed us to increase the precision with which we estimated effects and adjust for any remaining differences between the participant and comparison groups on these characteristics, which include parental education, family income, GPA, SAT and ACT scores, among others.

In addition to the main impact analyses, we used the same modeling approach to study the relationship between program outcomes and variations in (1) program characteristics across sites and (2) student characteristics. More specifically, we used a difference-in-differences approach to compare the differences between participant and comparison group outcomes by subgroup of interest. The goal of this analysis was to study whether impacts varied by subgroups. This analysis was important for understanding whether the components and characteristics of sites

¹⁵ We did not use data on matriculation institution for dental school students because they have not been recorded consistently over the years.

¹⁶ The pool of candidates for comparison were applicants who (1) withdrew from the program after being admitted (WA), (2) withdrew their application to some but not all sites before being accepted (WB), or (3) had at least one of their applications “closed without review” (CL)—a code typically used when sites reach the maximum enrollment. Some of these students were rejected by some sites but did not have all of their applications rejected. Unfortunately, the data do not record whether nonparticipants ever were admitted to a site.

(defined based on results of the qualitative analysis)¹⁷ were associated with more successful outcomes and informing potential programmatic revisions or efforts. For example, we compared sites offering medical versus medical and dental components, or varying in leadership support, faculty engagement, academic focus, pedagogical style, and clinical exposure. We also assessed the characteristics of students—such as gender, or whether they were enrolled in a two- or four-year college—to study whether these were associated with more successful outcomes and could inform recruitment and selection efforts. Appendix A provides more detailed technical information.

Data sources. To conduct analyses, we relied on data from the following sources (Table A.1. in Appendix A provides a list of data elements obtained from each source):

- **Student applications to SMDEP.** The NPO provided individual-level records with detailed background information that it collected through student applications to SMDEP between 1989 and 2012. Background data used in this study include information on applicants' socioeconomic and demographic characteristics (such as parental education and occupation, estimated family income, and ethnicity), and self-reported measures of academic achievement (such as college GPA at the time of application and scores on college aptitude tests).
- **Applications to medical and dental school.** The NPO provided information collected through applications to and enrollment in medical and dental schools from the administrative records of its component associations. Specifically, AAMC provided historical records on application and matriculation to medical schools as well as medical school graduation. ADEA provided dental school application and matriculation information for 2006–2012 SMDEP applicants. (ADEA does not collect data on dental school graduation that can be linked to applications.) We merged data from both of these sources with SMDEP applicant data (2006–2012).
- **University enrollment and completion data.** The National Student Clearinghouse (NSC) offers access to enrollment and completion data for more than 3,600 colleges and universities nationwide, which enroll 98 percent of postsecondary students in public and private U.S. institutions. Through the NSC, we obtained information on university degrees and majors for the subset of SMDEP participants for whom this information was unavailable through the NPO because they had not applied to medical or dental school (the NPO relies mainly on medical and dental school applications to measure whether a student graduates from college). We also requested degree information for comparison group students (applicants who did not participate in SMDEP).

Merging the NPO data on applicants to SMDEP medical and dental schools with NSC data on degree attainment, we created a comprehensive database that contains demographic, background, and degree information for all SMDEP applicants from 2006 to 2008 (participants and nonparticipants). We used this database to create a comparison group using PSM and estimate impacts on the outcomes listed above.

¹⁷ We include definitions of variables created through our qualitative work and used in subgroup impact analyses in Appendix A.

Analysis samples. Our work, focused on SMDEP since its beginning in 2006, includes the following:

- Descriptive analyses of 6,826 SMDEP participants between 2006 and 2012—the most recent year of available data—to present changes in enrollment rates and demographic characteristics and educational outcomes for all participants
- Outcomes analysis for 1,840 students who participated in SMDEP in 2006–2008 and did not apply to medical or dental school, to learn about their educational attainment and assess whether they pursued a health- or science-related career
- Impact analysis of 2,864 SMDEP participants and 894 comparison students from 2006 to 2008 to allow sufficient time (four to six years) for medium-term outcomes of interest to occur—that is, obtain a college degree, apply to medical or dental school, and matriculate in medical or dental school

D. Limitations

Every study encounters limitations, and this one is no exception. Unlike most studies, however, we had access to very rich and complete data that enabled us to address the challenges we encountered in designing a rigorous evaluation that would contribute to previous evaluation efforts by providing new information for decision making.

In this study, we were not able to randomize participation into SMDEP. Quasi-experimental methods, such as the one used here, generally have high internal validity, although they do not provide evidence as rigorous as that produced through random assignment. To the extent that participants and nonparticipants differ in ways not captured by program administrative data, the PSM estimates produced might confound program effects with differences in unobserved students' traits, such as motivation or commitment to succeed in the medical or dental profession. To reduce the chances of encountering this potential problem, we matched participants to nonparticipants within sites, as students who apply to the same sites are more likely to be alike on unobservable characteristics than those who apply to different sites (such as the University of Nebraska versus Duke University).

A limitation of our data is that we do not have information on whether candidates applied to the program interested in the medical or dental component of the program; we have that information only for those who matriculated into the program. Yet these students have different professional interests and motivation to enroll in the program. Ideally, the matching exercise would take these differences into consideration by matching individuals within the dental and medical applicant groups separately. However, given the importance of also matching within site to capture students' site preferences (which are likely correlated with unobservable factors that may be related to the outcomes of interest), limits on the sample size would have prevented us from matching both within site and by type of applicant. To match within sites, we split the data into 12 groups and, to match by student interest in medical or dental school, we would have needed to split the data into 21 groups (2 groups in each of the 9 sites with a dental component). That would have yielded very small sample sizes within these 21 cells to find appropriate matches. We could have matched by student interest instead of site—if we had had the key variable needed for all applicants (not just participants)—but, because the dental program was

launched for the first time in 2006 and most students learn about the program through peers, it is unlikely that sites would be sufficiently oversubscribed to have enough dental candidates for matching in the early cohorts used in this study (we could not use later cohorts because of insufficient time to observe outcomes).

Last, the impact analysis is based on program participants from 2006 to 2008. This allowed us to focus on SMDEP, which began in 2006, and allow sufficient time for outcomes such as college completion and application to a medical or dental school to be observed by 2012, when the evaluation began. Yet this also presented a potential limitation, as about half of the SMDEP sites that received grants to participate in SMDEP had not previously implemented the program and likely were still ironing out their programmatic approach in the years included in this evaluation. To address this issue, and in particular to assess whether the impacts observed overall or by type of program (medical only versus medical and dental) might be influenced by early implementation challenges, we reproduced our analysis by whether the site was a new SMDEP grantee. We found no differences in impacts between these groups—namely, existing versus new SMDEP sites. We speculate that this is likely attributable to the fact that (1) SMDEP is a well-established program that could provide clear implementation guidelines to new grantees, (2) it is managed by an experienced NPO that provides support to new grantees, in particular support for student recruitment, applications, and some offerings (such as the financial planning workshop).

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IV. DESCRIPTIVE FINDINGS: IMPLEMENTING SMDEP

Although all SMDEP sites receive the same general guidelines for administering the program, there is some variation in program implementation across sites likely aligned with their goals, strengths, and institutional resources. This chapter describes variation in (1) program goals, (2) leadership and organizational structure, (3) staffing, (4) approach to delivering program components (curriculum, instructional approach, and complementary offerings), (5) clinical experiences, and (6) student recruitment and selection.

A. Program goals

Staff across SMDEP sites share the program’s short-term and ultimate goals.

In their grant applications, universities described the goals for their SMDEP programs, as did project directors and PIs during telephone interviews. Two-thirds of sites aim to diversify the medical profession and/or address health disparities—goals consistent with the mission of SMDEP as envisioned by RWJF. To meet these ultimate goals, sites also establish short-term program objectives. Enhancing the academic preparation of participants was the most commonly cited short-term goal of SMDEP programs (mentioned by staff at 10 of the 12 sites). Half of sites also seek to expose students to careers in medicine and dentistry to provide a preview of various career opportunities. Both of these short-term goals align with the logic behind the program, which focuses on providing academic preparation and career exposure as the mechanisms for enhancing the competitiveness of participants when they apply to medical or dental school.

SMDEP sites pursue other goals that enhance the program’s logic model.

Sites also stated program goals focused on less tangible factors that may influence student outcomes. Four sites referenced building student confidence in pursuit of medical or dental school as a key goal, by instilling in them a belief in their ability to succeed in medical or dental school and teaching them to seek out additional support at their home institutions. Eight sites also emphasized the importance of exposing students to role models and “inspirational” individuals who had overcome great odds to succeed in their medical or dental careers. Their goal is to enhance students’ sense of self-efficacy—the belief that they too can succeed. These additional goals are complementary to the main goal of increasing student preparation, and provide an insight into the mechanisms through which sites hope to have an impact on student outcomes—namely, increased learning and skills, self-confidence, and self-efficacy. These align with the needs of the student population served—those who tend to be socioeconomically disadvantaged as first-generation, low-income, and/or minority college students (as described in the findings reported in Chapter V).

B. Leadership and organizational structure

The leadership structure at sites implementing the program reflects a focus on expanding to serve students interested in dentistry.

To achieve the program’s goals, sites have established the organizational structure they need to offer the program every summer. Since 2006, SMDEP has expanded to offer a dental component at those sites with schools of dentistry. At most institutions, the SMDEP leadership structure is based on whether an institution offers that component. Of the nine sites offering a

dental component, all but one are led by a PI, co-PI, and at least one program coordinator to support program implementation. Generally, the co-PI and program coordinator each oversee implementation of one component of the program—either the medical or dental. The three medical-only sites do not have a co-PI; in all of these, a PI and program coordinator administer the program directly. This suggests that the SMDEP expansion to offering a dental program has led most sites to use a PI, who serves as the overarching lead for the project and delegates implementation for many tasks to a lead person in the medical and dental schools. The implementation leads are responsible for such tasks as reviewing applications, hiring faculty, and scheduling courses and clinical experiences. A medical or dental clinician leads all SMDEP programs but one.¹⁸

Advisory committees do not play a central role in implementing the program.

In addition to program staff, half of the sites have an advisory committee, but only three of them reported that this committee provides guidance on designing or implementing the program. At sites where the advisory panel does not actively provide programmatic guidance, SMDEP leadership provide the committees with regular progress reports, and many monitor SMDEP activities as well as other pipeline programs for younger students.

Located in medical schools, dental schools, or within integrated health science centers, programs often leverage resources and create synergies with other pipeline programs.

At most sites, the program location coincides with the PI's home academic unit. Not surprisingly, given the goals of SMDEP as described in the logic model presented in Chapter III, half of sites house SMDEP in their office of diversity. Doing so enables many programs to administer SMDEP alongside other medical and dental pipeline programs that fit within the institution's strategic plan.

C. Staffing

Sites follow two different models to recruit instructional staff for their programs, mostly driven by their ability to maintain a core group of faculty instructors over time.

To recruit faculty to teach the courses at the core of the SMDEP program, program staff either rely exclusively or mostly on their own tenured faculty, or on instructors hired for the summer that are more likely to change every year. Specifically, three sites hire tenured faculty from within their respective institutions to teach SMDEP courses, whereas six rely on a combination of tenured faculty, graduate students, local professionals, and adjuncts from nearby institutions (both two- and four-year colleges). The other three sites do not employ in-house faculty to teach SMDEP courses; two rely exclusively either on instructors from a nearby community college or tenured faculty from other colleges in the state, whereas the third hires graduate students each year who receive extensive training and curricular materials from program staff.

¹⁸ The 12th program is led by the director of minority services within the institution's health science center, with support from faculty and administrators who are trained physicians.

Approaches to recruiting faculty and instructors align with site instructional philosophies and staffing needs.

Most sites expressed a strong commitment to their staffing model of choice because it aligns with either their program philosophy or staff availability (or lack thereof). Project staff at institutions employing in-house tenured faculty, as well as the PI from the one institution that hires external tenured faculty, underscored the importance of faculty support and involvement as a critical program component. Many sites do not pay faculty and thus rely on them to volunteer their time for SMDEP year after year. In contrast, sites following the hybrid staffing model, particularly those that rely heavily on graduate student instructors, often are faced with hiring new staff each year. Despite staff turnover, one graduate student instructor described the importance of his role: “Sometimes I’ll talk to my students and ask them why they don’t go to office hours [at their home institution], and they’ll say because they’re scared. Why replicate that [at SMDEP]? . . . I think that because they see us as students, they feel a little more comfortable. If anything, we’re closer to where they are than a faculty member would be. Because I struggled in my own academics, I can teach them in a way that’s effective.”

Assistants provide instructional support and mentoring.

All sites hire current medical students or pre-med undergraduates to work as teaching assistants (TAs) and/or residential assistants (RAs). These students support SMDEP students in their coursework and often live in the dorms with them. Some of these TAs facilitate organized study groups and small-group learning sessions, whereas others make themselves available for tutoring or other support. Many stay in touch with students after they complete the SMDEP program and provide them with ongoing support, including putting them in touch with other SMDEP alumni and minority student organizations at their home institutions. Staff also reported helping students with the medical/dental school application process, including reading and editing their personal statements.

D. Program components**Sites offer the same academic content to students interested in medicine or dentistry, and nearly all programs offer multiple science courses.**

Eleven of the 12 SMDEP programs are course based and provide students with an overview of key science and math concepts covered in undergraduate courses—as expected, given the general program guidance provided by the NPO. Ten of these programs offer abbreviated courses (not for credit) in the core sciences, including various strands of biology, chemistry, and physics. A few also offer courses in human anatomy and physiology. Students at these sites enroll in two to four science courses during the program (Table IV.1). The 11th site offers three credits for the completion of an integrated science course covering three primary subject areas also taught by many of the other sites. Though not emphasized as heavily as the sciences, 6 of these programs also offer a stand-alone or applied math course, such as statistics; two others teach math through the science courses or applied learning opportunities.¹⁹ All sites cover the same academic content for students interested in both medicine and dentistry.

¹⁹ The remaining three sites did not mention math as a key program component.

Table IV.1. Number of science courses offered, by institution

Number of science courses offered	Number of institutions
No distinct courses	1
1 integrated course	1
2 courses	5
3 courses	3
4 courses	2
Total	12

One site follows a case-based learning approach instead of offering science courses.

One program does not offer distinct or integrated science courses, seeking instead to teach scientific and mathematical principles solely through case-based learning and student research assignments. Though some other sites also provide similar interactive and applied learning opportunities (as described in the next section), only one uses an exclusively case-based curriculum. This curriculum was developed by its PI, who is a learning specialist and has worked with SMDEP and similar pipeline programs for 25 years. Under this curriculum, students break into groups to tackle problem-based learning scenarios on topics such as cardiovascular or mental health issues. When asked about this approach, the PI stated, “In the broadest sense, it tends to follow our medical school curriculum,” adding that “we’re more worried about competencies than bodies of knowledge . . . We see identifying the community, identifying the disparities, and identifying the problems as part of the development of what we’re looking for in terms of lifelong learning.”

About half of the sites practice ability grouping for core courses.

Sites group students in a variety of ways for instruction, and most PIs expressed a strong commitment to their model of choice (Table IV.2). Seven sites practice ability grouping—that is, they place students in different courses based on prior courses taken, grades in those courses, and/or pretests of knowledge administered upon program entry. Students at these sites are placed in different levels of the same course (such as chemistry I or chemistry II) or in different courses (such as organic chemistry or biochemistry). Many of these sites view the SMDEP coursework as giving students an edge for the following semester. As one PI stated, “The intent of the academic piece of this program is to give them enough skills that they can attack the courses that they will take in the fall and have academic success.” The other five sites do not track students or group them for courses according to prior course-taking or performance; these sites recognize that SMDEP coursework will be a refresher for some students and a preview of new content for others. In the opinion of one PI, some students who have taken the courses previously “are not solid in them”; therefore all students stand to learn something from the courses offered.

Table IV.2. Number of institutions that are ability grouping students, by instructional setting

	Core academic courses	Small group work outside of class (if mentioned)
Ability grouping	7	2
Mixed-ability grouping	n.a.	2
No grouping (or n.a.)	5	8

n.a. = not applicable

Some sites use ability grouping for work outside of class.

Four other sites also practice a form of ability grouping by sorting students for work in small groups outside of class, but following strikingly different approaches. Two sites group students with those who may have similar needs so they can use the time working outside of class to receive additional help tailored to their needs. The other two create mixed-ability clusters of students for small-group work so that students can learn from one another and become accustomed to working with people of diverse backgrounds. The PI of one site described how it frames these small groups to encourage teamwork: “On day one, we say ‘You are your brother or sister’s keeper. You will be a servant. If you want to be a doctor or dentist, you will need to serve others,’” adding “Teamwork makes the dream work.”

Most sites use interactive, hands-on instructional approaches.

Eight sites, including the five that do not practice ability grouping for core courses, incorporate interactive lessons and provide students with opportunities for applied learning. Seven of these sites use these interactive instructional approaches to supplement some form of lecture in the core sciences and math, whereas the eighth employs an entirely case-based approach to instruction (as described earlier). Hands-on experiences include activities such as waxing and drilling a dental mold, working with mannequins to conduct a physical examination or splint a broken bone in a simulation lab, or communicating with “actors” who play the role of patients during various standardized patient exercises. As described earlier, at the solely case-based site, instructors guide students through a series of weekly PBL cases that enable students to work in small groups to address common problems experienced by patients. After presenting students with a case, instructors give them a few days to research the problem independently before contributing to a group discussion. A second site implements a similar “team-based learning” approach, in which instructors assign students weekly clinical cases that pull together the core science content taught during lectures throughout the week.

All sites complement coursework with other offerings to enhance key skills, expose students to health policy issues, and prepare them to apply to medical or dental school.

Sites complement their academic training with other offerings to enhance participants’ knowledge and skills, thus seeking to better prepare them to tackle their future coursework and increase awareness of health policy issues. For example, 9 sites teach courses or offer seminars on writing and communications. In fact, a few cited the writing course as among their most important program offerings. Also, staff at 11 of the 12 sites said that they provide workshops and seminars on learning styles, study skills, and/or time management strategies to help students

develop the skill sets necessary to tackle challenging material in college and graduate school. Three sites hire the UCLA SMDEP PI, an expert on study and test-taking strategies, to teach these workshops. In addition, most sites cover at least one of two topics—health disparities or health policy and ethics. Eleven sites reported offering a health policy or disparities seminar or integrating this topic into other program offerings, such as case-based learning, and some sites mentioned that this was a recent RWJF requirement for the program. Five sites also cover integrity and ethics as they relate to the medical profession.²⁰

Programs also offer workshops and seminars on key topics related to their students' applications to medical school (Table IV.3). The most frequently reported offerings include financial planning workshops (10 sites); workshops or presentations providing an overview of the medical/dental school application process (5 sites); preparation of an individualized plan for meeting application milestones (3 sites); mock interviews (3 sites) or MCAT training (3 sites); and help in preparing draft application essays for professional school, including receiving feedback from peers and/or program staff (2 sites).²¹ Students highlighted these offerings as being extremely helpful, not only because they were informative, but because they opened students' eyes to what it takes to apply and be accepted into medical school. One student summarized this sentiment by stating that these offerings made her realize that “I need to get on my A game right now.”

Table IV.3. Number of medical school planning topics covered, by institution

Planning topic	Number of institutions
Financial planning	10
Attending a workshop providing an overview of the medical/dental school application process	5
Participating in a mock interview, typically with representative(s) from an admissions committee	3
Developing an individualized plan for completing requirements and meeting deadlines for application to medical/dental school	3
Preparation for MCAT exam	3
Drafting/editing an application essay	2

²⁰ Note that both the health policy/disparities component and the financial planning workshop (described below) are NPO requirements. However, we are reporting only the number of sites that described offering these components during telephone interviews; thus, these figures may underestimate their implementation.

²¹ The counts reported here likely underestimate implementation of each component, as they are based on interviews with all sites (to learn about program implementation generally) and site visits to only four of them (to obtain more in-depth information). For example, the financial planning workshop is an NPO requirement offered at all sites (not the ten that mentioned it) with technical support from the NPO, including working with experts to develop the workshop and sending speakers to the sites. To obtain a more precise count of offerings, we would have to survey all sites or visit the remaining six sites.

E. Clinical experiences

All sites offer clinical experiences to program participants, although the number, duration, and type of experiences differ considerably.

Sites offer clinical and shadowing experiences to expose students to the real-life practice of medicine and dentistry, and help inform their choice of careers. According to Norma Poll-Hunter, a director at AAMC and co-deputy director of SMDEP, “Clinical experience typically refers to exposure to a setting where medical [or more generally health care] services are provided. For example, some students shadow a physician or other health professional providing patient care or observe a medical [or dental] procedure” (Poll-Hunter 2014). Though many sites use a broader definition of clinical exposure, including simulation labs and work with standardized patients (individuals acting as patients), we describe those clinical experiences at each site that adhere to the more targeted definition so as to sharpen the distinction between experiences that are part of a course or lab associated with a course and others that take place in a clinical setting.

Although the NPO requires that total time spent in clinical experiences be restricted to 5 percent of the time spent during the six-week program, the number, duration, and type of clinical experiences offered by each participating institution vary considerably. They offer students anywhere from one to six clinical experience opportunities, ranging from as few as 4 to as many as 24 hours in total. On average, students participate in 2.5 experiences, for a total of almost 12 hours (aligning with the NPO’s 5 percent guideline). Some sites assign students to a single mentor, who allows them to shadow him/her in a clinical setting throughout the program and also meets with them to offer career guidance. Whenever possible, students are matched to these mentors based on their interest in particular fields of medicine or dentistry. In contrast, other sites rotate students through a series of clinical experiences, including the emergency room, operating room, mortuary, nursing home, family practice, and even a migrant worker health care clinic. These experiences help expose students to various career opportunities in medicine and dentistry.

Students voice a desire to increase their opportunities to participate in clinical experiences.

A common theme in student focus groups across sites was a strong desire to participate in more clinical experiences. Students reported this regardless of how much clinical exposure their site offered. Many students reported that they simply enjoyed the clinical piece, although a few specifically noted that observing particular types of doctors solidified their interest in a specific field of medicine. Although students overwhelmingly suggested increasing the clinical component, only three sites cited the clinical experience as a critical program component.

F. Student recruitment and selection

Both the NPO and individual sites play an active role in admitting new cohorts of SMDEP students each year. This section describes what we learned about this process, which involves operationalizing eligibility criteria, actively recruiting students, managing the application process, and selecting students.

All sites aim to serve minority and disadvantaged students, but some target specific subgroups.

The NPO transmits basic guidelines regarding program eligibility to the sites implementing the program (as described in Chapter II), but sites have flexibility in operationalizing those guidelines. For example, although sites target minority or disadvantaged rising sophomores or juniors in college, four specifically target minority men, and a fifth focuses on Native Americans. Others aim to serve students whose parents have low levels of education (four sites) and students from rural areas (three). Seven institutions also are interested in recruiting not only students who are themselves disadvantaged, but also those committed to working with disadvantaged populations or eliminating health disparities. All of these variations in focus align with the overall goals of the program.

Sites vary in their academic achievement targets, targeting high achievers, low achievers, or mixed-achievement groups of students for their programs.

In addition to considering disadvantaged status or interest in working with these populations, a few sites are strategic in recruiting students who meet academic criteria based on grades and test scores on such standardized tests as the SAT. One site intentionally recruits higher-achieving students, as they are looking for those likely to be successful in medical or dental school. Conversely, another site targets lower achievers, as their focus is on expanding the pool of disadvantaged students on track to attend medical or dental school. Five additional sites intentionally seek a mix of higher- and lower-achieving students.

Sites appreciate the NPO's assistance in recruiting participants.

The NPO assists with student recruitment by having staff attend major conferences and alerting sites to recruitment opportunities. It also provides materials to help disseminate information about the program, such as brochures; CDs or DVDs containing program-specific information that can be posted to each institution's website; and promotional items for the students, including plastic cups, calendars, pens, and lanyards. Most of the sites found these materials to be helpful.

Sites use various strategies to recruit students and leverage recruitment efforts for other pipeline programs.

Institutions employ a variety of recruitment strategies to draw in potential program participants, including making in-person visits to K–12 schools and postsecondary institutions locally and nationwide, giving on-campus presentations to students and representatives from other colleges, mailing brochures, and advertising via the program website and social media. These activities often take place in tandem with those for other pipeline programs, and in association with established events, such as the AAMC Annual Minority Fair, National Dental Association annual conference, and recruitment fairs sponsored by the Student National Medical and Latino Medical Student Associations.

Programs see word of mouth as an effective recruitment tool.

Many sites perceive recruitment efforts that capitalize on personal relationships as successful. Several institutions reported utilizing the “SMDEP Ambassador” program, a formal program sponsored by the NPO through which SMDEP alumni apply to work as SMDEP

recruiters, both at their home institutions and national conferences. SMDEP staff also actively engage pre-med advisors at colleges with whom they have longstanding relationships to help with recruitment by conducting presentations at their campuses or inviting them to observe the program when it is in session.

One site leverages national and local data to identify potential candidates.

One program site employs an interesting approach to drawing in local participants. It links NSC enrollment data to local school district identifiers to identify currently enrolled college students who graduated from the local K–12 school system, and then identifies those who have participated in one of its earlier science-related pipeline programs. It actively recruits these students for SMDEP.

Sites value the NPO’s assistance in managing student applications and, in particular, the subsidy this provides for sites that do not need to set up and manage an application system.

Students apply to the program through a web-based platform created and maintained by the NPO, through which applicants complete an online application form and submit an essay and transcripts. SMDEP allows applicants to apply to up to 3 of the 12 SMDEP program sites. Most apply to 3 sites, which receive the applications in batches as they are released by the NPO.²² This system encourages standardization of admissions decisions, as all sites have access to the same information for decision making in the same time frame. It also creates efficiencies, as each site does not need to set up and manage its own application system. One site mentioned the challenge of potentially having to manage the application process on its own, exclaiming, “It’s the cost that’s the killer. You’re talking about people hours . . . The university has no money to give to this.” The unified application system also enables the NPO to administer programmatic decisions regarding admissions, such as the two-round admissions system implemented since 2010.

Most sites make admissions decisions based on a holistic review of applications.

Sites employ different processes to review applications and make selection decisions. All sites focus on the key selection criteria described above, but only 2 sites review applications against these pre-established criteria using a scoring rubric. The other 10 conduct a more holistic review of applications to decide which students to admit. This aligns with our experience in working with pipeline programs, most of which take a holistic approach to admissions, but limits opportunities for rigorous evaluations because there is no clear admissions standard that can be used to select a comparison group.

Across all sites, several program staff participate in admissions decisions as part of a joint or staggered decision making process.

Sites also differ in the number of reviewers and rounds of review conducted per application. One-third of sites have two to three reviewers who read all applications and make selection decisions—they do so either jointly, or by deciding separately and then coming together to compare notes and make final decisions. In contrast, 7 sites use a two-round selection process. In

²² Although there are about 300 possible combinations of sites selected by students on the application forms, applicants use a few popular application strategies, such as applying to the three most prestigious programs or to three sites that are geographically close.

the first round, program staff screen applicants and narrow the pool for consideration. In the second round, more senior leaders at each institution (2 sites) or a full selection committee comprising program staff and institutional leadership (2 sites) convene and weigh in before making final decisions. The 12th site uses a staggered selection process; the program coordinator reviews all applications and sorts them into three groups—accept, reject, or uncertain—before passing them along to a second, and sometimes a third, reviewer (if needed) to award all slots.

In the next chapter, we focus on the results of this process by describing the characteristics of students recruited and selected for the program and assessing the extent to which participants meet program selection criteria and achieve the outcomes of interest.

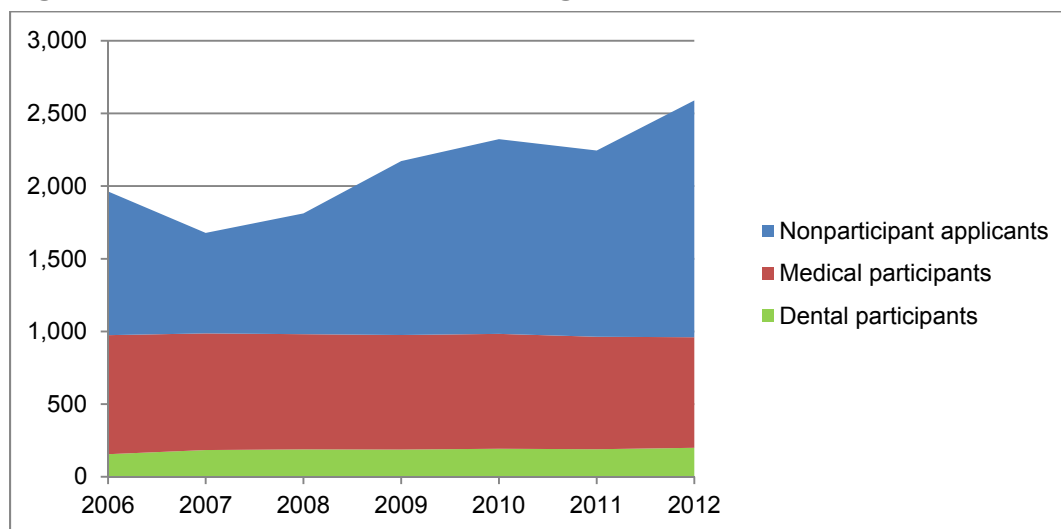
V. DESCRIPTIVE FINDINGS: STUDENT OUTCOMES

This chapter presents the results of our quantitative analysis to describe the program's success in recruiting and selecting students that meet program criteria (assessed through applications, enrollments, and demographic and achievement characteristics of students), and in observing the outcomes of interest among program participants. In the next chapter, we assess whether these outcomes may be associated with program participation.

The program has become increasingly competitive over time.

Interest in the program has grown over time, as reflected by rising applications and declining enrollment rates²³ (from 53 percent of applicants in 1995²⁴ to 37 percent in 2012) (Appendix Table C.1). Since the program became SMDEP in 2006, program admissions have become increasingly competitive (Figure V.1). Applications grew by 32 percent between 2006 and 2012 (from 1,963 to 2,589 applicants), and enrollment targets remained fixed at 80 students per site, causing sites to experience a decline in enrollment rates, from 18 percent in 2006 to 13 percent in 2012, a 5 percentage-point difference (Table V.1).²⁵

Figure V.1. SMDEP nonparticipating applicants and participants



Source: NPO program data.

Note: The figure is based on Table C.2 in Appendix C.

²³ We use enrollment as a proxy for admission because the data codes do not permit separating these two events.

²⁴ This is the first year for which applicant data are available.

²⁵ Small variations exist in the total number of participants every year due to late admissions decisions, such as student withdrawals. Also, the number of students served has changed over time; under SMDEP, it is fixed at 80 students per site in each year, or 960 students in total.

Some sites become more competitive as applications are capped.

Average enrollment rates conceal important variations by site, as some sites have experienced more drastic reductions in enrollment rates than others (Table V.1). Between 2006 and 2012, enrollment rates ranged from an average of 9 percent at Columbia University to 26 percent at the University of Nebraska or Louisville. This variation occurred in spite of the fact that, beginning in 2007, the NPO experimented with setting limits on the number of applications that sites could receive (at present set at 500) to encourage applicants to consider those sites that receive fewer applications and are therefore more likely to have spaces available. These sites experienced the largest increase in applications after the NPO introduced the cap; for example, enrollment rates at the University of Nebraska and Case Western declined from more than 30 percent of applicants in 2006 to about 20 percent in 2012.

Table V.1. SMDEP enrollment rates, by site and year

Sites	2006	2007	2008	2009	2010	2011	2012	Average	Change 2006– 2012
Louisville	27.8	33.5	34.5	23.9	28.5	17.9	26.6	26.4	-1.2
Howard	15.7	19.5	20.3	14.4	18.2	13.9	14.5	16.3	-1.3
Columbia	9.0	9.5	11.3	9.5	7.1	11.7	8.7	9.3	-0.3
Virginia	17.2	25.7	19.5	14.2	19.0	17.3	15.9	17.8	-1.3
Duke	14.3	16.6	14.4	18.3	11.6	19.4	11.1	14.5	-3.2
New Jersey	19.1	28.1	22.8	16.4	19.1	16.7	15.4	18.9	-3.6
Yale	16.0	17.4	13.9	15.6	10.0	18.9	10.0	13.9	-6.0
UCLA	19.4	23.5	20.0	14.0	15.2	13.6	11.3	15.8	-8.1
Washington	18.4	21.2	18.1	11.8	12.6	11.4	9.0	13.4	-9.4
Texas	24.0	21.5	21.2	22.1	17.5	16.5	14.1	19.0	-9.9
Case Western	32.4	34.0	33.3	22.5	25.6	15.5	21.0	24.6	-11.4
Nebraska	35.1	44.9	34.0	28.2	24.3	15.8	19.7	25.8	-15.5
All sites	18.2	21.1	19.4	16.0	15.0	15.3	13.2	16.5	-5.0

Source: NPO program data.

Note: We calculated enrollment rates as the number of participants divided by the number of applicants to each site. We sorted sites in descending order by the magnitude of their enrollment rate change between 2006 and 2012.

Participants' demographic characteristics reflect SMDEP's focus on diversity.

The above findings suggest that most sites have an increasingly larger pool of potential applicants from which to select those that best fit their targets.²⁶ Descriptive analyses suggest that sites are selecting students who meet program criteria; on average, participants are more likely than nonparticipants to be from a minority group (black, Hispanic, and Native Americans), report low family income levels, have parents who have not completed college, self-identify as disadvantaged, and be enrolled at a public instead of a private institution (Table V.2). This is not

²⁶ Only those sites that already have reached the current cutoff of 500 applicants have not experienced growth in the pool of applicants from which they select students.

surprising, as interviewees indicated that minority and disadvantaged status, as well as parental education and family income, are taken into account in making admissions decisions.

Through regression analyses, we tested whether these relationships hold—that is, whether each of these target demographic characteristics is associated with participation in the program—after controlling for other relevant factors.²⁷ Results indicate that students who are minority or multiracial (compared with whites and Asian Americans), self-identify as disadvantaged, and report low levels of family income are more likely to participate in the program, holding other background characteristics constant.²⁸ Surprisingly, having a merit-based scholarship also is associated with participation, but having a need-based scholarship reduces the likelihood of participation, although the coefficient estimate is small. (Regression results are not shown but are available upon request.)

Two-year and community college students are not likely to participate in SMDEP.

Only a small percentage of SMDEP applicants and participants come from a two-year or community college (7 percent of applicants and participants), although minority and disadvantaged students tend to be overrepresented at these colleges (Table V.2) (AACC 2014; NCES 2010).²⁹ Not surprisingly, our regression analysis indicates that community college students are not more likely to participate in SMDEP than four-year college students, controlling for other relevant factors. In other words, college type may not be given much weight in the student selection process, as students from two-year colleges are as likely to be admitted than not. This also suggests that programs either do not recruit heavily at community colleges or are not effective in their recruitment efforts.³⁰

Evidence regarding participants' prior academic achievement level is mixed.

Another criterion used in selection is prior achievement, which we measured through GPA and SAT and ACT scores to assess program selectivity. We find that the average GPA of participants and nonparticipants is the same (3.5), and significantly higher than the 2.75 cutoff

²⁷ Because data on admissions decisions are not available, we used participation as a proxy for admissions decisions.

²⁸ Students attending public colleges are slightly more likely to participate than those from private colleges (by less than 2 percentage points, significant at 5 percent). The analysis also indicates that males are more likely to participate in SMDEP, which supports the earlier qualitative finding that some sites target their recruitment efforts to specific groups, such as males. Also, parental education is not significantly related to program participation after controlling for family income and other demographic characteristics.

²⁹ Community colleges enroll nearly half of the nation's undergraduates (45 percent), and high shares of minority students (59 percent of Native American, 56 percent of Hispanic, and 48 percent of Black undergraduates) and first-generation students (36 percent of community college students) (AACC 2014).

³⁰ During our telephone interviews, one site did describe actively recruiting students from community colleges, since most racial and ethnic minorities in the state attend such colleges.

mandated by the program.³¹ However, we also find that GPA is positively correlated with program participation, holding other factors constant. This supports earlier qualitative findings that some sites target higher-achieving students who have a greater probability of admission to medical or dental school, but does not support the finding that some sites take the opposite approach to increasing the pool of potential applicants by supporting those who are not already high achievers. Given the high incidence of missing GPA data, these results may not be reliable.

Table V.2. Characteristics of SMDEP applicants and participants, 2006–2012 (percentages, unless otherwise noted)

	All applicants	Participants	Non-participants	p-value
Gender				
Female	69.2	67.4	70.7	0.000*
Race/ethnicity				0.000*
White, non-Hispanic	13.4	9.4	16.8	
Black, non-Hispanic	32.8	40.9	25.8	
Native Americans, non-Hispanic	0.4	0.5	0.3	
Asian, non-Hispanic	22.5	14.0	29.8	
Multirace, non-Hispanic	9.6	9.9	9.3	
Hispanic	18.7	23.3	14.8	
Other	2.6	2.0	3.2	
Age				
Average	20	20	20	0.000*
Range (minimum–maximum)	15–40	16–40	15–39	n.a.
Undergraduate institution				
Two-year college (versus four-year)	7.1	7.3	6.9	0.379
Public (versus private)	55.4	56.6	54.5	0.012*
Academic background (averages)				
Undergraduate GPA	3.50	3.50	3.51	0.336
SAT total score	1,183	1,149	1,211	0.000*
SAT Verbal	578	562	591	0.000*
SAT Math	605	586	620	0.000*
ACT composite score	26	25	26	0.000*
ACT Reading	26	25	26	0.000*
ACT English	26	25	26	0.000*
ACT Math	26	25	26	0.000*
ACT Science	25	24	25	0.000*
Parental background (at least one parent)				0.000*
Parent highest level of education				
High school or less	25.2	28.5	22.4	
Some college	13.4	14.8	12.3	
College degree	23.9	24.4	23.6	
Some graduate or graduate degree	36.4	31.4	40.8	
Parent is doctor or dentist	4.1	3.9	4.3	0.178

³¹ The available evidence suggests that, on average, participants meet the basic threshold currently set by the program as well as the earlier threshold (3.0). In fact, 91 percent of participants exceeded the earlier 3.0, and 97 percent exceed the 2.75, threshold. However, it is possible that students with lower GPAs are more likely to be among the 40 percent that did not provide this information in their applications. (We used application data, but sites have access to transcripts that provide more complete and accurate information.)

	All applicants	Participants	Non-participants	p-value
Disadvantaged status				
Disadvantaged indicator (self-identified)	35.4	40.5	31.0	0.000*
Loan recipient (2008 forward)	33.6	32.9	34.2	0.106
Need-scholarship recipient (2008 forward)	42.9	42.4	43.3	0.278
Household income (2008 forward)				0.000*
\$10,000–\$29,999	27.7	30.4	25.6	
\$30,000–\$49,999	25.8	28.9	23.5	
\$50,000–\$99,999	33.5	32.5	34.2	
\$100,000 or more	13.0	8.2	16.8	

Source: NPO program data and Integrated Postsecondary Education System (IPEDS) 2011.

Notes: Table is based on 14,782 applicants (6,826 participants and 7,956 nonparticipants). Percentages are calculated over the sample with non-missing information for each characteristic. The incidence of missing data is reported in Appendix Table A.3.

Applicants' characteristics are self-reported in the SMDEP application. Data on college financing and household income were not collected before 2008.

GPA is the self-reported cumulative undergraduate grade point average at the time of application. This is not a standardized measure. Although most values are close to the mean, about 11 percent of the values are higher than 4.0.

The disadvantaged indicator comes from the following question in the program application form: "Do you consider your community of residence financial status or educational experience to be disadvantaged?" (Yes or No).

Household income comes from a survey question about the income level of the family during the majority of the person's life for the period from birth to age 18.

n.a. = not applicable.

*Difference between participants and nonparticipants is statistically significant at the .05 level, two-tailed test, using a t-test for means and a chi-squared test for distribution.

Consequently, we assessed applicants' and participants' SAT and ACT scores to provide additional measures of selectivity, and found that scores on these exams are, on average, lower among program participants than nonparticipants but not correlated with program participation. Given the information gathered regarding various strategies used by the sites in considering achievement in admissions decisions—targeting high achievers, low achievers, or both—it is likely that differences in achievement dissipate when averaging across sites.

Student outcomes

This section describes the academic and career trajectories of SMDEP participants. We present bachelor's degree completion and application and matriculation to medical or dental schools for all 6,826 SMDEP participants from 2006 to 2012. Although we present outcomes for all participants, we focus our discussion on the subset of participants from 2006 to 2008—the sample used for the impact analysis—who have had at least four years since participation in the program to pursue a medical or dental career. For these 2006 through 2008 cohorts, we also are able to describe their undergraduate degree fields of study and analyze their graduation from medical or dental school.

The vast majority of SMDEP participants graduate from college with a bachelor's degree, and most earn a degree in STEM.

Eighty-three percent of participants from cohorts 2006–2008 earned a bachelor's degree (Table V.3). This graduation rate is considerably higher than national graduation rates for other URM students as well as white students.³² We expected this finding, given that program participants need to be current college students who are in at least their second semester of college to apply to the program and most are highly motivated, as described by program staff during our telephone interviews and observed during site visits. Most participants earn bachelor's degrees in STEM (59 percent), followed by a health-related field of study (8 percent). Examples of a STEM degree are biology and chemistry, and examples of a health degree are medical preparatory programs and nursing. Both degree types—STEM and health—support SMDEP's mission of diversifying the workforce in these fields.

More than half of SMDEP participants apply to medical or dental school; most matriculate, and a few attend SMDEP host institutions.

Fifty-five percent of participants from cohorts 2006–2008 applied to either medical or dental school or both (Table V.3). On average, three times as many students apply to medical school as to dental school, reflecting the program's primary focus on medicine. Of those who apply, 68 percent go on to enroll in medical or dental school—a figure that is significantly higher than medical and dental matriculation rates nationally, particularly for URM students (Mann 2012, Gonzalez et al. 2011). Despite the large number of participants who apply and/or matriculate in medical school, less than 6 percent of participants (or 20 percent of participants who matriculate in medical school) enroll at SMDEP host institutions in any given year.

As expected, the percentage of students able to apply and/or matriculate in professional schools decreases for those participating in later years, since students still are likely to be pursuing their undergraduate degrees or have recently graduated at the point of observation. In fact, post-bachelor's degree outcomes for cohorts 2009–2012 should be interpreted with caution, as these have had only limited time since participation to apply or matriculate in medical or dental school.

³² Nationally, about 59 percent of all students (40 percent for blacks and American Indian or Alaskan Native and 52 percent for Hispanics) obtain a bachelor's degree within six years (NCES 2013, 2014).

Table V.3. SMDEP participant educational outcomes, 2006–2012

	Number of participants								Percentage of participants							
	2006–2008	2006	2007	2008	2009	2010	2011	2012	2006–2008	2006	2007	2008	2009	2010	2011	2012
Completed bachelor’s degree:	2,445	838	797	810	n.a.	n.a.	n.a.	n.a.	83.1	85.9	80.7	82.6	n.a.	n.a.	n.a.	n.a.
Health bachelor’s	230	83	83	64	n.a.	n.a.	n.a.	n.a.	7.8	8.5	8.4	6.5	n.a.	n.a.	n.a.	n.a.
STEM bachelor’s	1,745	587	561	597	n.a.	n.a.	n.a.	n.a.	59.3	60.2	56.8	60.9	n.a.	n.a.	n.a.	n.a.
Other bachelor’s	413	146	134	133	n.a.	n.a.	n.a.	n.a.	14.0	15.0	13.6	13.6	n.a.	n.a.	n.a.	n.a.
Major missing	57	22	19	16	n.a.	n.a.	n.a.	n.a.	1.9	2.3	1.9	1.6	n.a.	n.a.	n.a.	n.a.
Applied to:																
Medical school	1,227	478	401	348	317	131	4	0	41.7	49.0	40.6	35.5	32.5	13.3	0.4	0.0
Dental school	403	128	141	134	114	57	1	1	13.7	13.1	14.3	13.7	11.7	5.8	0.1	0.1
Medical or dental school	1,621	602	539	480	431	188	5	1	55.1	61.7	54.6	48.9	44.2	19.1	0.5	0.1
Matriculated in:																
Medical school	816	332	261	223	179	82	3	0	27.7	34.1	26.4	22.7	18.3	8.3	0.3	0.0
Dental school	288	101	93	94	84	39	1	1	9.8	10.4	9.4	9.6	8.6	4.0	0.1	0.1
Medical or dental school	1,103	432	354	317	263	121	4	1	37.5	44.3	35.9	32.3	26.9	12.3	0.4	0.1
Medical school at SMDEP [†]	168	75	49	44	32	15	0	0	5.7	7.7	5.0	4.5	3.3	1.5	0.0	0.0
Completed:																
Medical or dental school	124	105	19	0	0	0	0	0	4.2	10.8	1.9	0	0	0	0	0
SMDEP participants	2,943	975	987	981	976	983	964	960								

Source: NPO program data, AAMC warehouse data, ADEA warehouse data, and NSC data. All data were withdrawn between fall 2012 and summer 2013.

Note: Outcomes for cohorts 2009–2012 should be interpreted with caution because there has not been sufficient time for them to experience outcomes. We coded bachelor’s degree field of studies using the typology of the 2008 NSCG. STEM stands for science, technology, engineering, and mathematics.

n.a. = not applicable. We obtained degree information from the NSC data for cohorts 2006–2008. See appendix A for detailed information on how we requested these data.

[†] Medical school at any SMDEP site.

The majority of participants who do not matriculate in medical or dental school obtain a bachelor's degree.

Although the majority of SMDEP participants apply to medical or dental school, and many matriculate, 63 percent do not enroll in these programs. The majority of these students from the 2006–2008 cohorts—about two-thirds (64 percent)—have obtained a bachelor's degree as their highest degree and some (14 percent) have gone on to obtain a master's degree (Table V.4). Eleven percent of these students (or 7 percent of all SMDEP participants) have not graduated from college.

Table V.4. Highest degree attained by SMDEP participants who did not enroll in medical or dental school, 2006–2008

	Number of participants	Percent
No degree	195	10.6
Certificate or associate's	39	2.1
Bachelor's	1,182	64.2
Master's	257	14.0
Doctorate	2	0.1
Missing degree data ^a	165	9.0
SMDEP participants who did not enroll in medical or dental school	1,840	

Source: NPO program data, AAMC warehouse data, ADEA warehouse data, and NSC data. All data were withdrawn between fall 2012 and summer 2013.

Note: Appendix A provides detailed information on how we constructed degree variables.

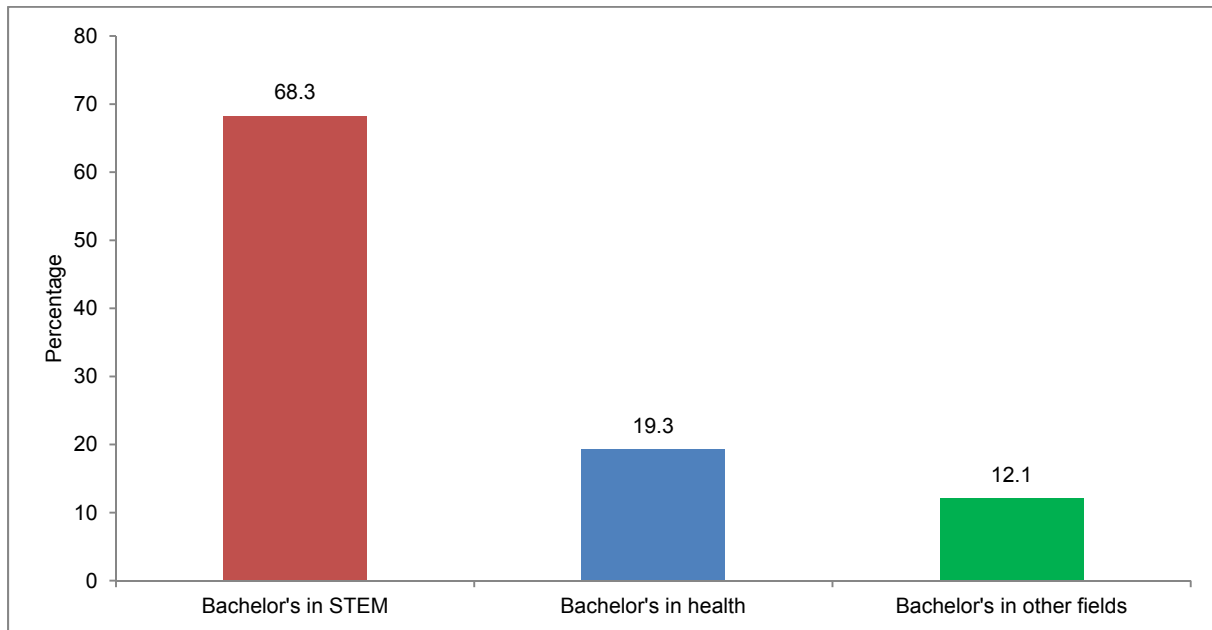
Most SMDEP participants who do not matriculate to medical or dental school still pursue a STEM or health-related career.

Although the goal of SMDEP is to encourage students to pursue medical or dental careers, program participants may also contribute to the health and scientific workforce by pursuing other health- or science-related careers. Of program participants who do not continue to medical or dental school, we find that most earn a bachelor's degree in STEM (68 percent), followed by a health-related field of study (19 percent) (Figure V.2).³³ The vast majority of the STEM degrees are in biology (61 percent of STEM degrees) and other biological sciences (18 percent). Among health-related degrees, the most frequent fields of study include public health, nursing, or other health/medical sciences.³⁴

³³ We categorized degree majors into field of studies using the typology included in the NSG and analyzed degrees in health; science, technology, engineering, and mathematics (STEM); and other fields.

³⁴ Appendix Table C.4 lists all bachelor's degree fields of studies for SMDEP participants in 2006–2008 cohorts who did not enroll in medical or dental school, and the frequency of each; Appendix Table C.5 shows similar results for all 2006–2008 SMDEP participants.

Figure V.2. Bachelor's degree fields of studies of SMDEP participants who did not enroll in medical or dental school, 2006–2008



Source: AAMC warehouse data and NSC data.

Notes: The sample consists of SMDEP participants (2006–2008 cohorts) who did not enroll in medical or dental school and obtained a bachelor's degree. About 77 percent of participants who did not enroll in medical or dental school obtained a bachelor's degree (N = 1,418).

Percentages do not add to 100 due to rounding and a small percentage (0.2 percent) of bachelor's degrees with missing data in the field of studies.

We coded the field of studies using the typology of the 2008 NSCG. We categorized students holding bachelor's degree(s) in more than one major as having a degree in health if they had at least one major in health and as STEM if they had a STEM and non-STEM major.

Appendix C provides detailed information on how we constructed degree variables.

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VI. PROGRAM IMPACTS

This chapter presents the findings from the impact analysis of the SMDEP program on student outcomes (Section A), as well as the subgroup analyses examining the relationship between student outcomes and program characteristics (Section B) and between outcomes and student characteristics (Section C). We based all estimates on regression-adjusted comparisons of participants to similar nonparticipants who had applied to the program and matched them to a rich set of student-level characteristics using propensity score methods. Chapter III and Appendix A include detailed information on the methodology we used. We end with a discussion of the influence of the program on participating institutions based on our qualitative work (Section D).

A. Impact on student outcomes

SMDEP has no impact on the likelihood of obtaining a bachelor’s degree, either overall or in a health- or science-related field of study.

SMDEP participants are as likely as comparison students to obtain a bachelor’s degree overall (Table VI.1), and there are no statistically significant differences between the groups based on whether the site offers only a medical program or a medical and dental program (Table VI.2). These findings may not be surprising, given that SMDEP applicants and participants are freshmen and sophomores in college at the time of application, and thus already on the path to obtaining a bachelor’s degree (discussed in Chapter IV). In addition, by virtue of their application during their freshman or sophomore year in college, SMDEP applicants demonstrate a high level of motivation and interest in pursuing a career in medicine or dentistry.

However, based on the program’s logic model, we hypothesized that SMDEP may help solidify students’ interests and, consequently, participants may be more likely to remain on track (instead of switching fields) and obtain their degree in health (such as premedical or pre dental) or a health-related field in science (such as biology or chemistry). This is not the case. More than two-thirds of students in both groups—SMDEP participants and comparison students—are expected to obtain a bachelor’s degree in a science-related field, and about 10 percent in a health-related field. The apparent impact shown in Table VI.1 on obtaining a science-related degree is small and not robust to model specification.³⁵

³⁵ The findings presented here are based on our preferred model specification. In this instance, the small and significant impact on STEM degree completion may have been observed by chance. We conducted sensitivity analyses using different model specifications, and the impact on completing a STEM degree was consistently statistically insignificant. Specifically, we estimated models using a more conservative propensity score matching process that requires smaller differences between participants and nonparticipants to produce a match (caliper range of 0.04 instead of the 0.05 shown in the report), and used nonclustered standard errors. We also conducted analyses using the full sample of applicants, controlling for student characteristics and site fixed effects.

Table VI.1. SMDEP program impacts, 2006–2008

	Participant group mean	Comparison group mean	Difference	p-value	Sample size
Impact on college graduation					
Obtained a bachelor's (B.A./B.S.)	89.6	88.5	1.1	0.52	3,447
Bachelor's in health-related/prep field	9.6	13.2	-3.5	0.06	2,997
Bachelor's in STEM	73.0	68.1	4.9 *‡	0.04	2,997
Bachelor's in non-STEM	17.5	18.5	-1.0	0.60	2,997
Impact on career path					
Applied to medical or dental school	55.0	46.8	8.2 **	0.00	3,758
Applied to dental	13.8	5.1	8.6 **	0.00	3,758
Applied to medical	41.8	42.0	-0.2	0.95	3,758
Matriculated in medical or dental	38.1	28.3	9.8 **	0.00	3,758
Matriculated in dental	10.0	3.4	6.6 **	0.00	3,758
Matriculated in medical	28.4	24.9	3.5	0.11	3,758
Matriculated in medical in SMDEP†	6.1	3.5	2.6 **	0.00	3,758

Source: NPO program data, AAMC warehouse data, ADEA warehouse data, and NSC data. All data were withdrawn between fall 2012 and summer 2013.

Note: Outcomes for each cohort are for the period up to 2012. Sample sizes vary by outcome due to missing data on outcome.

*Difference between SMDEP participant and comparison group is statistically significant at 5 percent, two-tailed test

**Difference between SMDEP participant and comparison group is statistically significant at 1 percent, two-tailed test

‡ Difference between SMDEP participant and comparison group is statistically significant at 5 percent but not robust to model specification.

† Matriculated in medical school in an SMDEP institution.

SMDEP increases the likelihood of applying to and matriculating in medical and dental school, although this impact is driven mostly by a large effect on dental school application and enrollment.

Across sites, SMDEP participants are about 8 percentage points more likely to apply to medical or dental school and 10 percentage points more likely to matriculate in these schools than nonparticipants. However, this is driven by a large and significant effect on dental school applications and enrollment, with no overall effect on medical school outcomes (Table VI.1). This finding likely is not explained by student characteristics, as students interested in medicine and dentistry are similar on observable characteristics (Appendix Table C.3).³⁶ What may help explain this finding is the comparison group or, more specifically, the potential for comparison students to access similar programs. Unlike medicine, which offers many alternative programs to

³⁶ The few differences observed between medical and dental participants are not necessarily associated with improved outcomes in any consistent way. For example, although there is a larger proportion of nonminority dental students than medical students, dental students tend to have the same or slightly lower GPA and test scores than medical students (Appendix Table C.3).

students wishing to pursue an SMDEP-type experience in preparation for medical school, such opportunities are harder to find in dentistry.³⁷ Consequently, comparison students interested in dentistry are less likely to have had the opportunity to pursue such an experience; thus, it is more likely that an effect will be found when comparing participating in SMDEP to not participating in it or similar programs. In contrast, students interested in medicine who do not participate in SMDEP are likely to participate in another program eventually. Thus, on average, for students interested in medicine, we are likely comparing participation in SMDEP to participation in other similar programs. It is more difficult to find an impact through this comparison, which would measure SMDEP effectiveness relative to similar programs. As described below, this only provides a partial explanation, as some sites have an impact on medical school outcomes.

SMDEP has an impact on dental school outcomes among participants in sites offering a dental component and on medical school outcomes among participants in sites offering only the medical component.

Program impacts vary by whether sites offer programs focused on preparation for medical school or both medical and dental school. In other words, the aforementioned overall program impacts on medical and dental school application and enrollment mask substantial heterogeneity by the type of SMDEP program offered. Table VI.2. shows estimates broken down by whether the sites offer the dental in addition to the medical program (nine sites) or only the medical program (three sites). To isolate effects by program type, we used a difference-in-differences approach to compare the differences between participant and comparison group outcomes in the sites that offer only medical programs versus those that also offer dental programs. We find that sites offering both components are effective at increasing dental school applications and enrollment, whereas sites offering only a medical program are effective at increasing applications to and enrollment in medical school. The magnitude of these effects is similar: SMDEP participants from sites that include a dental component are about 14 percentage points more likely to apply to dental school than comparison students, and participants from sites focused only on medicine are 12 percentage points more likely to apply to medical school than comparison students. The corresponding estimates on matriculation are 10.5 percentage points (for dental school) and 9 percentage points (for medical school) for the sites with and without a dental program, respectively. These findings align with program goals.

Two related findings are noteworthy. First, sites offering a dental component in their SMDEP programs have no significant effect on medical school outcomes, despite the fact that 75 percent of their participants applied to the program with an interest in medical school. Program maturity may help explain this finding. The three medical-only sites where we observed a positive impact are longstanding and already were offering the predecessor program when it

³⁷ As Dr. Poll-Hunter of AAMC stated, “Medical schools have a longstanding history of sponsoring programs, including programs like SMDEP, to increase the diversity at their institutions. This is also part of the medical school accreditation requirements put forth by the LCME (Liaison Committee on Medical Education). ... Therefore, premed students generally have more options to participate in academic enrichment programs compared to pre dental students.... If applicants did not attend SMDEP, it is highly probable that they participated in a similar program somewhere else compared to their pre dental counterparts.”

Table VI.2. SMDEP program impacts by whether sites offer dental program, 2006–2008

	Sites with medical and dental program					Sites with medical program only					Difference between subgroups
	Participant group	Comparison group	Difference	p-value	Sample size	Participant group	Comparison group	Difference	p-value	Sample size	
Impact on college graduation											
Obtained a bachelor's degree (B.A./B.S.)	89.3	88.8	0.5	0.76	1,937	91.0	88.8	2.2	0.20	1,510	-1.7
Bachelor's in health-related/prep field	9.4	11.4	-2.0	0.28	1,663	8.8	11.4	-2.5	0.09	1,334	0.6
Bachelor's in STEM	73.5	71.2	2.4	0.18	1,663	73.0	71.2	1.9	0.39	1,334	0.5
Bachelor's in non-STEM	17.2	17.4	-0.2	0.90	1,663	18.0	17.4	0.6	0.77	1,334	-0.8
Impact on career path											
Applied to medical or dental school	55.1	44.5	10.6 **	0.00	2,124	55.8	44.5	11.2 **	0.00	1,634	-0.7
Applied to dental	18.0	4.2	13.8 **	0.00	2,124	2.3	4.2	-2.0 **	0.01	1,634	15.7 **
Applied to medical	37.6	40.8	-3.2	0.16	2,124	53.1	40.8	12.3 **	0.00	1,634	-15.5 **
Matriculated in medical or dental	38.3	28.2	10.1 **	0.00	2,124	36.8	28.2	8.6 **	0.00	1,634	1.5
Matriculated in dental	13.2	2.7	10.5 **	0.00	2,124	1.4	2.7	-1.3	0.11	1,634	11.8 **
Matriculated in medical	25.4	25.7	-0.4	0.84	2,124	34.7	25.7	9.0 **	0.00	1,634	-9.3 **
Matriculated in medical SMDEP site	6.0	3.2	2.8 **	0.01	2,124	5.6	3.2	2.4 *	0.03	1,634	0.4

Source: NPO program data, AAMC warehouse data, ADEA warehouse data, and NSC data. All data were withdrawn between fall 2012 and summer 2013.

Note: Outcomes for each cohort are for the period up to 2012. Sample sizes vary by outcome due to missing data on outcome.

*Difference between SMDEP participant and comparison group is statistically significant at 5 percent, two-tailed test.

**Difference between SMDEP participant and comparison group is statistically significant at 1 percent, two-tailed test.

became SMDEP in 2006. In contrast, more than half of the sites that offer both medical and dental components are new to the program (five of nine). To allow sufficient time between program participation and measurement of outcomes, this evaluation focuses on the first three cohorts of SMDEP—2006, 2007, and 2008. Those were the first few years of implementation for new sites, and during this time they may have encountered challenges as they established the program. We hypothesized that such early implementation challenges may be diluting the perceived overall impact of these programs. But we tested this hypothesis and ruled it out (discussed in Section B below).

Second, we observe small negative impacts on applications to and matriculation in dental school among students participating at sites that offer the medical program only. Students at these sites are 2 percent less likely to apply to dental school and 1 percent less likely to matriculate than comparison students. Although these sites serve students who mostly are interested in medicine, some are interested in dentistry. These findings suggest that students may be diverted away from dentistry through their exposure to a medicine-focused program. It is possible that these students then apply to medical school (as we observe a large impact at these sites) or pursue other studies. Interestingly, we have anecdotal evidence of the opposite effect at sites offering dental in addition to medical components. Program faculty and staff interviewed indicated that some of their students initially interested in medicine switched to dentistry, and a handful of medical students in focus groups expressed an interest in switching.

SMDEP participants are more likely to enroll at an SMDEP medical school.

SMDEP has a small impact on medical school matriculation at an SMDEP institution, both overall and by type of program (medical only or medical and dental). SMDEP participants are 2.5 to 3 percent more likely to matriculate at an SMDEP institution than nonparticipants (Tables VI.1 and VI.2). This is consistent with qualitative information from interviews and site visits. At some sites, administrators indicated that their admissions officers are familiar with the program, value the SMDEP experience, and take into account program participation when making admissions decisions. Some of them have formalized this by awarding a fixed number of shadowing hours to SMDEP alumni, automatically granting interviews to SMDEP alumni, and counting them as in-state applicants (which gives them a better chance of getting an interview and helps reduce costs should they enroll at that institution). Section D below provides additional details.

B. Impact on student outcomes by program characteristics

In this section, we explore variation in impacts across sites by integrating what we learned from them about how they implement the program so as to test the hypothesis that program impacts are associated with key program components. Our findings address the RWJF question regarding whether there are “key” components or ingredients for success of the SMDEP program that may be replicated by those interested in implementing similar programs. They may also help explain observed program impacts by identifying factors that may enhance or detract from SMDEP program effectiveness. These results should be interpreted carefully, however, as other unmeasured factors may be correlated with the institutional characteristics we measure and may help to explain findings.

Based on in-depth qualitative analyses of interview and site visit data, we classified salient program features (which are common to all sites) and developed binary measures to sort sites into two categories—those having a high or low level of each feature. Specifically, we classified the 12 SMDEP sites according to the following six program characteristics:³⁸

Program staffing

- Academic program leader or leadership support for program, defined as having an academic leader serve as PI/co-PI or offer strong support to the program
- Leadership approach, defined as collaborative leadership between medical and dental program or led primarily by one of the programs
- Degree of faculty engagement, defined as having in-house or highly involved faculty teach SMDEP courses

Program experience

- New site in 2006, defined by the year site started offering the program (based on sites that offer both medical and dental programs)

Academic components

- Academic coursework exposure, defined as highly academic based on the number of courses and alignment with student needs
- Ability grouping, defined as tracking or placing students in different courses or varying levels of the same course, based on courses completed, grades earned, and/or placement tests
- Interactive pedagogy, defined by the use of interactive or applied learning techniques in addition to traditional lectures

Clinical component

- Intensity of clinical exposure, defined by the number and length of clinical experiences offered.³⁹

For most program implementation characteristics, variation across sites is not correlated with program impacts on student outcomes.

Differences across sites related to the academic components of the program (intensity of academic coursework, course placement practices, and degree of interactive learning) do not play a significant role in predicting differences in professional school outcomes across sites (Tables VI.3 and VI.4). This suggests that what matters is having access to the bundle of activities offered through the program, rather than a particular program component or feature. We also

³⁸ Appendix A includes a more detailed description of these measures.

³⁹ Several sites referred to lab work and other hands-on activities as clinical experiences. For our classification scheme, following AAMC, we counted experiences as clinical only if they involved shadowing a physician or being exposed to a clinical setting (Poll-Hunter 2014).

Table VI.3. SMDEP impacts on professional school application by program characteristics, 2006-2008

	Applied to medical			Applied to dental			Sample size
	Participant group	Comparison group	Difference	Participant group	Comparison group	Difference	
Program leadership							
(1) Strong	41.2	40.9	0.3	15.3	4.2	11.1**	2,402
(2) Not strong	44.5	40.9	3.7	7.6	4.2	3.4	1,356
Difference between subgroups (1) - (2)			-3.4			7.7	
Leadership approach							
(1) Medical or dental leadership	40.7	40.9	-0.1	18.7	4.3	14.4**	1,183
(2) Collaborative leadership	42.4	40.9	1.5	10.3	4.3	6.0*	2,575
Difference between subgroups (1) - (2)			-1.6			8.4**	
Program experience (only sites with dental and medical program)							
(1) New SMDEP site in 2006	36.8	40.0	-3.2	19.0	4.3	14.7**	1,160
(2) Existing SMDEP site in 2006	36.7	40.0	-3.3	17.2	4.3	13.0**	1,858
Difference between subgroups (1) - (2)			0.1			1.7	
Faculty engagement							
(1) High	43.8	40.8	3.0	14.0	4.3	9.7**	2,396
(2) Low	29.8	40.8	-11.1**	14.5	4.3	10.2**	1,362
Difference between subgroups (1) - (2)			14.0**			-0.5	
Coursework							
(1) Highly academic	43.4	40.9	2.5	15.0	4.3	10.7**	1,419
(2) Not highly academic	39.9	40.9	-1.0	12.9	4.3	8.7**	2,339
Difference between subgroups (1) - (2)			3.5			2.0	
Ability grouping							
(1) Tracking	41.1	40.9	0.2	13.9	4.3	9.6**	1,704
(2) No tracking	42.5	40.9	1.6	14.2	4.3	9.9**	2,054
Difference between subgroups (1) - (2)			-3.4			-0.83	

Table VI.3. (continued)

	Matriculated in medical school			Matriculated in dental			Sample size
	Participant group	Comparison group	Difference	Participant group	Comparison group	Difference	
Pedagogical approach							
(1) More interactive	41.7	40.9	0.9	13.0	4.3	8.8**	1,918
(2) Less interactive	41.5	40.9	0.7	16.4	4.3	12.1**	1,840
Difference between subgroups (1) - (2)			0.2			-3.3	
Clinical experience							
(1) High incidence or intensity	43.7	40.8	2.9	11.1	4.3	6.8*	1,680
(2) Low incidence or intensity	38.8	40.8	-2.0	17.7	4.3	13.4**	2,078
Difference between subgroups (1) - (2)			4.9			-6.6*	

Source: NPO program data, AAMC warehouse data, ADEA warehouse data, and NSC data. All data were withdrawn between fall 2012 and summer 2013.

Note: Outcomes for each cohort are for the period up to 2012. We describe program features in Chapter V.

*Difference between SMDEP participant and comparison group is statistically significant at 5 percent, two-tailed test

**Difference between SMDEP participant and comparison group is statistically significant at 1 percent, two-tailed test

Table VI.4. SMDEP impacts on professional school matriculation by program characteristics, 2006–2008

	Matriculated in medical school			Matriculated in dental			Sample size
	Participant group	Comparison group	Difference	Participant group	Comparison group	Difference	
Program leadership							
(1) Strong	27.5	25.7	1.7	11.0	2.7	8.3**	2,402
(2) Not strong	30.8	25.7	5.1	5.6	2.7	2.9	1,356
Difference between subgroups (1) - (2)			-3.3			5.4	
Leadership approach							
(1) Medical or dental	27.7	25.7	2.0	13.5	2.7	10.8**	1,183
(2) Collaborative	28.2	25.7	2.4	7.4	2.7	4.7*	2,575
Difference between subgroups (1) - (2)			-0.5			6.2**	
Program experience (only sites with dental and medical program)							
(1) New SMDEP site in 2006	25.3	24.7	0.6	13.9	2.7	11.2**	1,160
(2) Existing SMDEP site in 2006	23.1	24.7	-1.5	12.4	2.7	9.8**	1,858
Difference between subgroups (1) - (2)			2.1			1.5	
Faculty engagement							
(1) High	29.3	25.7	3.6	9.9	2.7	7.2**	2,396
(2) Low	19.3	25.7	-6.4**	11.5	2.7	8.8**	1,362
Difference between subgroups (1) - (2)			10.0**			-1.7	
Academic courses							
(1) Highly academic	29.6	25.8	3.9	10.7	2.7	8.0**	1,419
(2) Not highly academic	26.2	25.8	0.5	9.4	2.7	6.7**	2,339
Difference between subgroups (1) - (2)			3.4			1.3	
Ability grouping							
(1) Tracking	26.6	25.8	3.9	9.7	2.7	7.0**	1,704
(2) No tracking	30.0	25.8	0.5	10.6	2.7	7.9**	2,054
Difference between subgroups (1) - (2)			-3.4			-0.8	

Table VI.4. (continued)

	Matriculated in medical school			Matriculated in dental			Sample size
	Participant group	Comparison group	Difference	Participant group	Comparison group	Difference	
Pedagogical approach							
(1) More interactive	28.5	25.7	2.8	9.6	2.7	6.9**	1,918
(2) Less interactive	26.9	25.7	0.5	11.3	2.7	8.6**	1,840
Difference between subgroups (1) - (2)			1.6			-1.6	
Clinical experience							
(1) High incidence or intensity	28.7	25.7	3.0	7.8	2.7	5.1*	1,680
(2) Low incidence or intensity	26.8	25.7	1.1	13.0	2.7	10.2**	2,078
Difference between subgroups (1) - (2)			1.9			-5.1*	

Source: NPO program data, AAMC warehouse data, ADEA warehouse data, and NSC data.

Note: Outcomes for each cohort are up until 2012. We describe program features in chapter V.

*Difference between SMDEP participant and comparison group is statistically significant at 5 percent, two-tailed test

**Difference between SMDEP participant and comparison group is statistically significant at 1 percent, two-tailed test

find, however, that staffing matters. In particular, the programs' leadership approach and level of faculty engagement in the program and exposure to clinical experiences are correlated with observed student outcomes, as discussed below.⁴⁰

Sites led primarily by one program (medical or dental) have better dental school outcomes than those with a more collaborative leadership approach.

We divided sites by whether they are led by (1) staff in either the medical or dental component of the program, or (2) collaboratively between individuals in both of these components.⁴¹ We found that the leadership approach is associated with differences in student outcomes. Although both leadership approaches are associated with positive outcomes, sites that are led mainly by either the medical or the dental sides are more effective in improving dental school application and matriculation than those with collaborative leadership between the two programs (Tables VI.3 and VI.4). Echoing the overall findings, differences in impacts are present for dental school outcomes only but not for medical school outcomes.

Low faculty engagement has a negative impact on medical school outcomes.

Faculty engagement matters for medical school applications and matriculation (Tables VI.3 and VI.4). In particular, low faculty engagement can be detrimental to both. For example, in sites with low faculty engagement, a smaller percentage of participants than nonparticipants pursue a career in medicine—19.3 versus 25.7 percent, respectively (Table VI.4). Low engagement is generally characterized as having to recruit faculty every year to teach (the institution's own faculty, outside faculty, adjuncts, graduate students) as opposed to having in-house or outside (but stable) faculty teaching and providing support.

Limiting time spent on clinical experiences (such as shadowing a doctor or dentist) is correlated with improved dental school outcomes.

Sites offering less clinical exposure have a relative advantage in dental school applications and matriculation compared to those dedicating more time to clinical experiences. Although participation in both types of sites is positively associated with dental school applications and matriculation, students in sites offering less clinical exposure apply to and matriculate in dental school at higher rates than those in sites with more intense clinical exposure (18 versus 11 percent of participants apply and 13 versus 8 percent enroll in dental school, respectively) (Tables VI.3 and VI.4). This suggests that clinical experiences may be taking time away from other activities more relevant to dental school. This finding also supports the program requirement that no more than 5 percent of the time be spent on clinical experiences.

⁴⁰ Results on bachelor's degree attainment generally support the findings reported here (Appendix Table C.7). Overall, we found no impact on bachelor's degree completion and observe graduation rates above 89 percent across programs offering only the medical component or both medical and dental components. However, low faculty commitment and less interactive instruction are associated with lower rates of bachelor's degree attainment compared to high faculty commitment and more interactive instruction, respectively, though the effects are small.

⁴¹ We thank Norma Poll for suggesting this program typology.

New sites are just as effective as those that have implemented SMDEP for many years.

As described before, the dental program was implemented in 2006 in five sites which had not offered SMDEP before and in four sites that were previously offering the SMDEP medical program. The introduction of the dental component in both new and old sites generates a unique opportunity to assess whether experience matters. We hypothesized that site inexperience with SMDEP could hinder program effectiveness as new sites are generally more prone to experience early implementation problems. However, we do not find evidence that experience with SMDEP matters. New and existing sites were similarly likely to improve dental school applications and matriculation and neither has an effect on medical school outcomes (Tables VI.3 and VI.4).

C. Impact on student outcomes by student characteristics

SMDEP aims to serve not only URMs, but also students who might be facing socioeconomic or educational barriers to entering the medical and dental professions. In this section, we explore whether students who share certain characteristics might benefit more than others from the SMDEP experience. We do so by comparing the impacts (difference between participants and nonparticipants) among students with a given characteristic (for example, females) to the impacts among those without that characteristic (males). We studied the differential impacts by gender, minority status, type of undergraduate institution (two- versus four-year), disadvantage status, and academic preparation before the program. We find no consistent relationships between program impacts on different outcomes and student characteristics, but one finding may be worth highlighting (Appendix Tables C.9 and C.10). The SMDEP program seems to be more effective at encouraging nonminority (Whites and Asians) than minority students to apply to dental school, as the former are twice as likely to apply than the latter (9.9 versus 21 percent, respectively). This difference in applications does not translate into differences in matriculation, however, as both groups are equally likely to enroll in dental school (Appendix Tables C.9 and C.10).

D. Influence on participating institutions

In addition to measuring the impacts of SMDEP on student outcomes, we analyzed telephone interview and site visit data to determine the program's influence on participating institutions from the perspective of institutional staff. We find that SMDEP primarily influences institutional policies and attitudes about admitting former SMDEP participants—and URM and disadvantaged students more generally—to medical and dental school, although the degree to which institutions develop formal policies embodying this influence varies greatly.

Of the 12 participating SMDEP institutions, all but one reported that SMDEP participation strengthens a student's application to their medical and/or dental school. The institutions often do not formalize this influence, however. Instead, they consider SMDEP participation favorably during a holistic review of each application. As one PI said, "When an applicant mentions that he or she has participated in SMDEP, the committee goes, 'Oh, wow!' Especially if they've done the program here, they really value the SMDEP program. It doesn't get them into the schools. It doesn't give them automatic admission, but it makes a difference. It's not overlooked."

Admissions officers at four institutions described institutionalizing changes driven by SMDEP. At one institution, the admissions dean indicated that SMDEP counts as 32 hours of

shadowing. At another, admissions officers explained that SMDEP is “highlighted on the ranking and scoring sheets we use” during the review of medical school applications. At the other three institutions, SMDEP participation helps students to get an interview when applying to medical or dental school. At two institutions, staff described granting automatic interviews to medical and/or dental school applicants who are SMDEP alumni; one of these institutions implemented this policy several years ago and the other was attempting to formalize this process at the time of the interview. At one site, SMDEP alumni are counted as in-state applicants, which gives them a better chance of getting an interview.

In addition to influencing admissions decisions, staff at two institutions—both highly competitive schools—spoke about the role of the SMDEP program in shifting institutional culture and attitudes toward accepting disadvantaged students more generally. As one PI explained, SMDEP has “definitely made the school more sensitive to the challenges these students face compared to the average student who comes through the pipeline of elite colleges and universities They become much more sensitive of that because they’ve admitted these students and they’ve succeeded tremendously. It’s kind of subtle; it’s not something you can pinpoint with statistics. The attitude of the school and their conviction around pursuing and meeting goals of being more inclusive with bringing in students underrepresented in medicine—I think they are savvier about how to do it and why they’re doing it.”

These shifts in policies and attitudes often can be credited to the influence of “program champions”—as they were dubbed by one site—at each institution. For example, at one institution, the PI reported sitting down with the dean each summer following SMDEP and discussing which students he felt the institution “should keep an eye on” when it came time for reviewing medical school applications. At another institution, the PI described his commitment to change the attitude of the dean, who believed that “we should only accept students from Ivy League schools” into their medical school. When he first came on board, the PI was able to convince the dean to accept a few SMDEP alumni into the medical school; over the past decade, this institution increasingly has accepted more SMDEP alumni and other disadvantaged and minority students.

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VII. CONCLUSION

This study sought to answer five research questions developed by RWJF to enhance its understanding of the impact of SMDEP, help generate and disseminate information about effective models to diversify the medical and dental professions, and inform similar efforts in related health fields. This chapter presents key findings to answer the research questions (Section A) and discusses the implications of those findings (Section B).

A. Key findings

1. The program has succeeded in reaching the target student population

The program serves students who meet program selection criteria—those who are racial or ethnic minorities or socioeconomically disadvantaged. Some evidence indicates that SMDEP also succeeds in recruiting college students who exceed the 2.75 GPA cutoff for participation, but not those who come from two-year or community colleges.⁴² Increased interest in the program over time—as reflected by increased applications—may help explain the program’s ability to select students with the target demographic characteristics.

2. The majority of participants stay on the path to a potential career in health

The vast majority of participants earn bachelor’s degrees in a health- or science-related field and, within one to four years of obtaining this degree (depending on the cohort), more than half apply to medical or dental school.⁴³ About 40 percent of participants enroll in one of these schools. Of the 60 percent who do not matriculate in a medical or dental school within four to six years of program participation, the majority obtain a bachelor’s degree in a health- or science-related field (88 percent), and some participants obtain a master’s degree (14 percent). We measured outcomes within four to six years of program participation and, given that the majority obtained degrees in a health- or science-related field, it is likely that some of these students will eventually pursue a medical, dental, or other health-related career.

3. The program helps diversify dental and medical professional schools

We find an overall program effect on medical and dental school applications and enrollment, but it has been driven by the type of program offered. Findings indicate that SMDEP has a positive impact on medical school applications and matriculation among participants in sites offering only the medical program, and on dental school applications and matriculation among participants in sites that also offer a dental component. Our findings do not change by whether sites are new to the program as of 2006 (the year the original program transitioned to SMDEP by including the dental component).

⁴² GPA information was missing for 40 percent of participants.

⁴³ Findings are based on students who participated in 2006, 2007, and 2008 as rising sophomores and juniors.

4. Implementing sites are more likely to admit former SMDEP participants to their medical schools

The program has a small positive impact on medical school enrollment at an SMDEP site, which may result from increased applications from participants at those sites, increased admissions of SMDEP alumni at those sites, or both. Although we cannot establish the exact mechanism that leads to the observed impact on enrollment at SMDEP sites, this finding aligns with changes in institutional policies and attitudes described by admissions officers at SMDEP institutions. Although generally not formalized, these changes included counting SMDEP as 32 hours of shadowing, granting automatic interviews to SMDEP alumni, considering SMDEP favorably during holistic reviews of applications, and changing attitudes about admissions of minority and disadvantaged students in general among university admissions staff.

5. Positive program impacts cannot generally be attributed to institutional or individual characteristics, but the leadership approach and level of faculty engagement influence outcomes

An important question for this study was whether the program included some key components or “ingredients” that could help focus replication efforts. Differences in academic program offerings—such as intensity of coursework, course placement practices, and pedagogical approaches—had no impact on student outcomes, suggesting that it is the bundle of SMDEP offerings that has an effect, irrespective of how that bundle is delivered. We find, however, that program staffing matters. Having the program led by a single component (medical or dental) as opposed to collaborative leadership has a positive impact on dental school outcomes, whereas having low faculty engagement has a negative impact on medical school outcomes.

6. Self-confidence and self-efficacy are leveraged as mechanisms of change

The theory of change behind the SMDEP program, as reflected in the program’s logic model, is anchored in acquiring academic knowledge and skills, and obtaining the preparation needed to succeed academically and become competitive applicants to medical or dental school. The engine for change in this model is academic preparation. In implementing the program, staff at grantee institutions expanded this theory of change to include other mechanisms potentially influencing students’ career outcomes—self-confidence and self-efficacy. Staff across sites hope to increase students’ academic performance in their subsequent college coursework but also build students’ self-confidence so they succeed not only because they have a more solid academic foundation, but because they believe in their ability to succeed and feel empowered to seek help when they need it. Through offerings such as mentoring and exposure to role models and inspirational speakers, the program sites also hope to enhance students’ sense of self-efficacy. The message is clear: If others overcame great odds, so can they. This aligns with the needs of the student population served—those who tend to be socioeconomically disadvantaged as first-generation, low-income, and/or minority college students—and complements the program’s logic model.

B. Implications

This study led to some expected findings (the program has a positive impact on dental school outcomes) and some unexpected ones (new sites are as effective as existing ones). These findings have implications for the future implementation and possible scale-up of SMDEP in medical and dental professions but potentially in other health-related fields as well.

SMDEP is a general science and math enrichment program that, in addition to academics, includes activities to help prepare students for careers in medical or dental professions. All students go through the same program and participate in activities targeted to medical or dental careers (such as presentations from invited speakers or workshops), but they may pursue different clinical experiences based on their interests (this is true not only between but also within the medical and dental fields, as the range of clinical experience opportunities is wide).

A central question of this study was whether SMDEP has helped diversify the medical and dental professions. Although we find that the answer is positive—medical programs have a large and positive impact on medical school applications and enrollment, whereas programs offering a dental component have an equally large and positive impact on dental school applications and enrollments—we are puzzled by the finding that the latter sites do not have an impact on medical school outcomes. We speculated that this may be driven by new programs potentially experiencing early implementation challenges, but we tested this hypothesis and ruled it out. A key question remains—why does SMDEP have a positive impact on medical school outcomes at some sites but not others? Part of the answer may lay in the spread of similar programs sponsored by medical schools around the nation in compliance with accreditation requirements.⁴⁴ These programs may provide similar opportunities for students who do not participate in SMDEP. In this report, we describe how SMDEP evolved over the years, widening or sharpening programmatic guidance in response to changing priorities and needs. It will be important to study the availability of these alternative programs in considering next steps for SMDEP and the role it could play in informing such programs, based on its 25 years of experience.

Another important question raised by RWJF was whether some components of the SMDEP program model were essential to its success, and whether others were not so critical and could be excluded without detracting from the program's effectiveness. Our evaluation suggests no program component is key to the success of SMDEP; rather, it is the bundle of program offerings that has an impact on participant outcomes. However, we also find that staffing is important for program success. Specifically, having a program lead from either component has a larger positive impact on dental school outcomes than having a collaborative leadership team across components.⁴⁵ Intuitively, this makes sense, as it may signal clarity of guidance and efficiency in decision making. Similarly, staff at sites attributed their success in implementing the program to the engagement and commitment of their faculty—which they felt was critical. Our work

⁴⁴ As stipulated by LCME, “An institution that offers a medical education program must have policies and practices to achieve appropriate diversity among its students . . . and must engage in ongoing, systematic, and focused efforts to attract and retain students. . . from demographically diverse backgrounds” (LCME 2014).

⁴⁵ This leadership typology (medical/dental led versus collaborative) was defined by the NPO.

confirms that not having a stable core group of faculty—that is, having to recruit new faculty every year—has a negative impact on participant outcomes. These findings have programmatic implications. In making award decisions—whether of renewal or new proposals—the NPO and RWJF should consider the staffing plans proposed for (1) leadership (single versus collaborative) and (2) having a core group of faculty committed to implementing the program.

This information could also be important when considering scaling up the program or disseminating this model to other areas in health, as this model could easily be adapted to accommodate other health careers (the basic math and science content is common to different professions, and the career-specific components could be adapted to the relevant fields). Two findings from this study are worth highlighting. First, the fact that variation in program components—whether a site was more or less academic, used interactive instructional techniques, practiced ability grouping, or provided more clinical exposure⁴⁶—had no impact on outcomes indicates that the NPO can give sites some latitude in implementing different components without detracting from their potential effectiveness. In other words, the SMDEP model is highly adaptable to the institutional setting. Second, we also find that new grantees (sites that joined SMDEP in 2006 for the first time) are as effective as existing ones (sites that had been implementing the program before 2006). This likely is explained by the fact that, based on its 25 years of implementation, this is a well-developed program that has an NPO that can transmit detailed guidance to new implementers and provide support in critical areas to help prevent early implementation problems, such as recruiting students and managing applications. Providing similar supports may help establish new programs successfully.

⁴⁶ We find that sites offering fewer opportunities for clinical exposure have a larger positive impact on student applications and enrollment in dental school than those sites offering more clinical opportunities; both have a positive impact on students, however.

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APPENDIX A

DATA SOURCES AND TECHNICAL SPECIFICATIONS

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A. Data sources

Data used for this report come from several different sources. In Table A.1, we expand on the information provided in Chapter III and list the data elements obtained from different sources. With the exception of National Student Clearinghouse data, all other data were provided to Mathematica by the NPO and ADEA and were drawn between fall 2012 and summer 2013. Although the focus of the evaluation is to study the SMDEP program (years 2006–2012), we used pre-2006 data to provide a descriptive historical analysis of the trends in applications and enrollments since the program's inception.

Table A.1. SMDEP data

Agency	Data element	MMEP		SMEP		SMDEP	
		1989– 1994	1995– 2002	2003– 2004	2005	2006– 2008	2009– 2012
NPO	SMDEP applicants						
	Admission	✓ s1	✓	✓	✓	✓	✓
	Matriculation	✓ s1	✓	✓	✓	✓	✓
	Demographic characteristics	✓ s1	✓	✓	✓	✓	✓
	Educational background					✓	✓
	Family economic background					✓	✓
AAMC & NSC	SMDEP applicants' educational outcomes						
	Completion of degrees (yes/no, institution, year, degree, major)					✓ *	✓ s2
AAMC	SMDEP applicants' medical school outcomes						
	Application	✓	✓	✓	✓	✓	✓
	Admission	✓	✓	✓	✓	✓	✓
	Matriculation	✓	✓	✓	✓	✓	✓
	Application scores					✓	✓
ADEA	SMDEP applicants' dental school outcomes						
	Application	n.a.	n.a.	n.a.	n.a.	✓	✓
	Admission	n.a.	n.a.	n.a.	n.a.	✓	✓
	Matriculation	n.a.	n.a.	n.a.	n.a.	✓	✓
	Application scores	n.a.	n.a.	n.a.	n.a.	✓	✓
	Completion (yes/no, year)	n.a.	n.a.	n.a.	n.a.	n.a. ^c	n.a. ^c

Source: National Program Office (NPO) program data, Association of American Medical Colleges (AAMC) warehouse data, American Dental Education Association (ADEA) warehouse data, and National Student Clearinghouse (NSC) data. All data were drawn between fall 2012 and summer 2013.

Notes: MMEP (Minority Medical Education Program), SMEP (Summer Medical Education Program), SMDEP (Summer Medical Education Program). Outcomes data are available for the program applicant pool unless otherwise indicated. Variables available within each of the domains (rows) change across years.

Applicants include program participants.

S1: Sample is composed of program participants only

S2: Sample is composed of medical school applicants and SMDEP participants who did not apply to medical/dental school and did not respond to tracking survey by the time the NPO requested National Student Clearing House Data (around 2011).

n.a.= not applicable for cohort years

* National Student Clearinghouse data was requested for this study to complement initial data requested by the NPO.

^a Crosswalk to link pre-SMDEP and post-SMDEP codes for sites.

^b Crosswalk between database code for undergraduate institution and IPEDS fice_id or unit_id.

^c Dental school graduation information is not collected by ADEA. Dental school graduation is only available through an anonymous survey that cannot be linked to other data sources.

All databases can be merged by a unique identifier ("aamc_id") with the exception of National Student Clearinghouse data, which can only be merged by name and date of birth.

B. Database construction

1. Defining SMDEP cohort

We define SMDEP cohorts by the year in which they apply to the program, which is generally the same as the year of participation for those admitted into the program. Students who applied more than once are only counted in the last year they were admitted to the program, or in the last year if they were never admitted.

2. College degree outcomes

We measured college degree outcomes for the three cohorts of SMDEP applicants (2006 to 2008) that could be reasonably expected to have finished college by 2012—the latest year for which we could obtain outcomes data at the time the evaluation began in late 2012. To measure outcomes, we merged the SMDEP applications data with the NSC data and AAMC data. AAMC data contain college degree information for students who apply to medical school. We complemented these data by requesting the NSC to provide college enrollment and degree attainment for those SMDEP applicants who did not apply to medical school or who applied but either did not matriculate in medical school or had missing information for college degree attainment or college degree major.¹

We requested the NSC data on 4,537 applicants (2,448 participants and 2,089 nonparticipants) out of the 5,453 in the 2006–2008 SMDEP cohorts. The NSC searched for applicants using full name and date of birth and was able to provide information on 82 percent of the records requested.² We coded an applicant as having a bachelor's degree (bachelor of arts or bachelor of science) if either the NSC data or the AAMC data so indicated. By using multiple sources of data, we were able to track bachelor's degree attainment for 91.22 percent of the 2006–2008 SMDEP applicant cohorts.

3. Bachelor degree field of studies

Bachelor's degree majors were coded into field of studies using the typology of the National Survey of College Graduates (2008). (A copy of the survey's typology is available in Appendix B.) We grouped fields of studies into three broad categories of health, STEM, and non-health or STEM.

About 9 percent of bachelor's degree holders in the 2006 to 2008 SMDEP applicant cohorts had bachelor's degrees in more than one category (either multiple bachelor's degrees or a bachelor's degree with two majors). These applicants were considered as having a degree in health if they had at least one degree or major in health, and as STEM if they had at least one STEM degree or major (even if they had another non-STEM degrees or major).

¹ The NPO had already requested data from the NSC on a small subset of these students. We requested their data again to have all applicant records consistently tracked until the same point in time.

² This matching rate was lower than expected given that all SMDEP applicants are college students and the NSC covers most colleges and universities in the U.S. Discrepancies in the spelling of names between SMDEP application data and college's registrar records likely explain a large proportion of these mismatches. Use of social security numbers for matching requires explicit participant consent; if used, they would likely improve matching.

4. Applicant's type of undergraduate institution

We obtained applicants' type of undergraduate institution (two-year versus four-year colleges, or private versus public) by merging SMDEP application data with Integrated Postsecondary Education Data System (IPEDS).³ To conduct the merge, we converted the college IDs used in the SMDEP data into the IPEDS *fice* IDs using a crosswalk provided by the NPO, and then the *fice* IDs into IPEDS *unitid* (used in IPEDS since 1997). We used data from the IPEDS institutional characteristics survey of 2011 and were able to code all but 14 of the undergraduate home institutions from which applicants were applying, leaving about 4.7 percent of applicants between 2006 and 2008 with missing information on undergraduate school type.

C. Analytical approach

1. Estimation approach

To assess the SMDEP impact, we use a quasi-experimental design that employs propensity score matching methods to create a comparison group observationally similar to the participant group. We use nearest neighbor matching (with replacement) to match participants with nonparticipants who had applied to the program, using a rich set of individual characteristics—including measures of academic ability and income. In an attempt to also adjust for students' unobserved characteristics in estimating the effect of SMDEP participation, we exploit the information provided by students' application patterns. Specifically, we match participants in a given site to nonparticipants who had applied to that particular site.⁴ Students that have applied to the same site are likely to share site preferences. For example, they are likely to have information about the differences in programmatic features across sites, as well as the potential benefit from attending a given site. In addition, students may know more about their own academic ability and match with the site than what the observed SAT or ACT score might reflect; therefore, the sites to which students apply also provide additional information about students' unobservable traits.

There are two features of the SMDEP application process that make matching an attractive and feasible approach to study program impacts. First, the SMDEP program is highly oversubscribed: in the 2006 to 2008 cohorts used for the impact analysis, only 54 percent of the applicants achieved admission (Table A.2). This ensures a sufficient number of nonparticipants applying to each site who are potential candidates for the comparison group. Second, the SMDEP application process is designed in such a way that qualified candidates may be denied admission. Admissions decisions for these early SMDEP cohorts were done on a rolling basis as applications came in. (This was before the program established two application deadlines and rounds of admissions decisions discussed in Chapter II.) When doing rolling admissions, sites made admissions decisions without access to the entire pool of applicants and often filled all slots before the application website was closed. This implied that late applicants were less likely

³ Data downloaded from <http://nces.ed.gov/ipeds/datacenter/DataFiles.aspx> on June, 2013.

⁴ There are no data on sites' admissions decisions, so it is not possible to restrict the matching to nonparticipants who were admitted to the program. However, sites do not make admissions decisions independently. Oftentimes, applicants at a site do not get reviewed because the site is full or the students have already accepted an offer from another site. Thus, even if admission data were available, it is unclear whether restricting the nonparticipant sample to those who were admitted would improve matching.

to get admitted regardless of their qualifications, and many would have been admitted had the sites been able to review all applications before making admissions decisions.

Table A.2. SMDEP applicants, participants, and medical:dental ratios

Year	Applicants total	Participants			Ratio medical:dental
		Total	Medical	Dental	
2006	1,963	975	820	155	5.3
2007	1,678	987	803	184	4.4
2008	1,812	981	793	188	4.2
2009	2,172	976	789	187	4.2
2010	2,323	983	790	193	4.1
2011	2,245	964	774	190	4.1
2012	2,589	960	761	199	3.8

Source: National Program Office (NPO) program data.

Note: All sites accept medical students. Nine of the 12 sites accept dental students. Sites with a dental program accept about 60 medical students and about 20 dental students.

Analysis samples. The analysis of the impact of SMDEP on student outcomes focuses on three cohorts of program applicants—namely, those who applied to participate in 2006, 2007, and 2008. Our participant group includes all students who participated in SMDEP in those three years. Our comparison group is based on students who applied and did not participate in the program, after making some important exclusions. Specifically, we excluded nonparticipants who (1) were rejected admissions to all sites to which they applied (49 percent of all nonparticipants) or (2) withdrew their application before being considered for admissions (N = 10 nonparticipants). These students are likely different from participants on characteristics we cannot observe but that (1) led sites to reject them or (2) led applicants to decide not participate and withdraw their applications. Imposing these restrictions leads to a total sample of 4,225 individuals to be used in the matching process: 2,943 participants and 1,282 nonparticipants.

2. Main model specification

We implemented our estimation approach in two steps. First, we estimated the predicted probability of participation—the propensity score—for each applicant to a given site. For each site, we estimated a regression of the following form:

$$(1) T_{is} = \alpha + \delta X_{is} + \varepsilon_{is}$$

where T_{is} is the treatment indicator, which is equal to 1 if applicant i to site s participated in SMDEP and equal to zero otherwise, X_{is} is a vector of applicant characteristics (described below), and ε_{is} is the error term. The vector X_{is} includes the following variables derived from the SMDEP application forms:

- Gender indicator
- Race/ethnicity indicators (white, African American, Hispanic, Asian, multi-race)
- Age at application

- Type of undergraduate institution applicant is applying from (two-year college and public institution)
- Academic background (undergraduate GPA at time of application, SAT and ACT total scores)
- Parental education (highest parental education is high school or less, some college, college or some graduate; parent is a doctor or dentist)
- Parental income (reported estimated family income from birth to 18 years of age is \$10,000–\$29,000, \$30,000–\$49,000, or \$50,000–\$99,000)
- Disadvantaged status (indicator for whether the applicant self-identifies as disadvantaged and/or is the recipient of a loan, merit scholarship, or need scholarship)

We then matched each SMDEP participant to the nonparticipant with the closest propensity score allowing comparison students to be matched more than once (one-to-one nearest neighbor matching with replacement). In other words, the same nonparticipant may be matched to more than one participant.

Caliper. To ensure that participants and their matched pairs are indeed similar, we restricted the matching algorithm to generate matches only if nonparticipants were “sufficiently close” to the participant—defined as having a propensity score within a range of 1/20th of the pooled standard deviation of the propensity score (that is, a caliper range of 0.05). This constraint in matching allowed us to find suitable matches for most participants at the cost of excluding from the estimation a small number of participants with no appropriate comparison student. Across sites, we were able to find matches for 97 percent of all participants.

In the second step, we estimate the impact of the program on the matched sample (participants and their closely matched comparison students). After matching at each site, we combine the 12 matched-samples to estimate one pooled estimate of the impact of SMDEP on student outcomes. The basic equation to estimate the SMDEP impact takes the following form:

$$(2) Y_{im} = \alpha + \beta T_{im} + \gamma X_{im} + \varepsilon_{im}$$

where Y_{im} is the outcome of applicant i in the matched sample m . T_{ism} is an indicator equal to 1 if applicant i participated in SMDEP and equal to zero otherwise, X_{ism} is a vector of controls for individual applicants characteristics at time of SMDEP application, and ε_{ism} is a random error term.

Even though participants and nonparticipants have similar background characteristics in the matched-sample, we control for those characteristics in the outcome equation to improve precision and adjust for any residual differences between the two groups.

Weights. A given comparison student could be matched to more than one participant. This is because applicants were considered for matching in the three sites to which they applied, and matching was done with replacement to increase the number of participants for whom an adequate match was found. To adjust for this approach, we constructed weights that are equal to the number of times each observation is used in the analysis—that is, the weight is equal to 1 for

each participant and equal to the inverse of the frequency of matches for each matched comparison. We use this weight as a probability weight in the estimation of equation (2).

Standard errors. To adjust for possible correlation in outcomes for students with similar application or matriculation behaviors, we cluster standard errors by site (for participants) and by the combination of schools to which they applied and with which they were matched (for comparison). This avoids underestimating standard errors and increasing the probability of incorrectly identifying significant differences (that is, making a Type I error).

Binary outcomes. We estimate equation (2) using logit regression models because all of the outcomes of interest are binary outcomes and take the value of 1 if the individual experiences the outcome (for example, applies to medical or dental school) and zero otherwise. We report marginal effects in all tables.

3. Subgroup analysis: Relationships between program features and impacts

Based on the formative evaluation of program implementation across all sites, we categorize sites into program types according to the following dimensions:

Program Staffing

- Academic leadership/support for program (N=10 yes, N=2 no)
- Defined as having an academic leader (such as a dean) serving as PI/Co-PI and/or offering strong support for program
- Leadership approach (N=5 collaborative, N=7 medical or dental lead)
- Defined as having a collaborative leadership between the medical and dental program or being led primarily by one of the programs
- Faculty engagement (N=10 high, N=2 low)
- Defined as high versus low depending on whether faculty are in-house, highly-involved in teaching SMDEP courses, or otherwise heavily involved with the program (as measured by the respondent's opinion that faculty engagement is critical to their program's success)

Program Experience

- New site in 2006 (N=5 yes, N=4 no)
 - Defined for the nine sites that offer both the medical and dental components based on the year they started offering the program

Academic Components

- Academic coursework (N=6 high, N=6 low)
 - Defined highly academic sites as those where students take three or more academic science or math courses, or their equivalent

- Ability grouping (N=7 yes, N=5 no)
 - Defined as using tracking for course placement based on courses completed, grades earned, and/or pretests
- Pedagogical approach (N=8 more, N=4 less)
 - Defined as more or less interactive by the use of interactive or applied learning opportunities in addition to traditional lectures

Clinical Exposure

- Intensity of clinical exposure (N=7 moderate/high, N=5 low)
 - Defined based on both the number and length of clinical experiences offered

We assess whether the program impacts vary with program features by estimating a variant of equation (2) that adds an interaction term between participation (T) and the program type attended ($Ptype$):

$$(3) Y_{im} = \alpha + \beta T_{im} + \varphi T_{im} * Ptype_i + \gamma X_{im} + \varepsilon_{im}$$

The coefficient of interest in this analysis is the coefficient of the interaction term (φ), which indicates whether there is a differential impact for sites that have the particular program feature compared to those sites that do not.

4. Subgroup analysis based on participants' characteristics

The impact of the program might also vary with participant characteristics, such gender, type of college attended, or academic ability. We interact each of these characteristics ($Char$) with a treatment indicator to measure whether the program seems to have a differential impact for certain types of students. The model also controls for the independent effect of the characteristics on the outcome.

$$(4) Y_{ism} = \alpha + \beta T_{ism} + \varphi T_{ism} * Char_i + \sigma Char_i + \gamma X_{ism} + \varepsilon_{ism}$$

The coefficient of interest in this analysis is the coefficient of the interaction term (φ), which indicates whether the impact of the program varies with student characteristics.

D. Handling of missing data

1. Missing covariates

Because data on student characteristics come from application data file maintained by the NPO, and applicants have an incentive to provide as much information as possible to increase their chances of admission into the program, the incidence of missing data on independent variables collected through the application is low across most variables used in the analysis (Table A.3.). The only two variables with a high incidence of nonresponse are college GPA and scores on academic aptitude tests. About 40 percent of the applicants left the GPA missing and about 11 percent of applicants did not report either SAT or ACT scores. It is likely that some of the missing values in SAT and ACT scores are “true missing” and the students did not take those

exams—especially given that about 7 percent of the applicants come from community colleges. Because the survey question from which we obtain these data does not allow for students to report “not applicable,” we cannot disentangle true missing from non-applicable values.

Also, the SMDEP application form was revised in 2008 to include additional questions related to socioeconomic status, such as family income and college financing. Therefore, this information is missing for prior years. Cases with missing data were imputed a value of zero and included in the regression analysis with a missing indicator. This modeling approach enables us to use records in the analysis even if they have some missing data on one or two control variables, while it avoids biasing the estimated effect on the variable of interest due to a possible correlation between cases with missing values and measured outcomes.

2. Missing outcome data

Degree attainment information is missing for about 9 percent of the records. Because this share is small and similar for participants and nonparticipants, excluding them from the analysis should not bias our results. No data on medical or dental school applications or matriculation are missing. Since application and matriculation outcomes are drawn from the universe of medical and dental school applicants, we consider students who cannot be found in those files to have not applied to or matriculated in medical or dental school.

E. Assessing balance between the participant and comparison group

Table A.4 shows the characteristics of participants and their matched pairs by site. Across all sites, we are able to find nonparticipants who are similar to participants in most characteristics reported in their program applications. High-profile institutions such as Yale or Columbia have significantly more applications than other SMDEP sites and, therefore, a larger pool of potential comparison students for matching. Consequently, it is easier to achieve perfect balance (that is, no statistically significant differences) between the characteristics of participants and nonparticipants in the sites that were greatly oversubscribed. Nevertheless, after combining site-specific matches into a pooled matched-sample for analysis, we obtained good balance across all students’ characteristics. Table A.5 shows differences between participants and nonparticipants in (1) the full sample and (2) the matched sample. Results indicate that the matched sample represents an improvement over using the full (unmatched) sample for analysis. To adjust for any remaining difference between participants and nonparticipants (even if not significant), we control for these covariates in estimating impacts.

Table A.3. Percentage of SMDEP applicants and participants with missing data, 2006–2012

	SMDEP program (overall)	
	Applicants	Participants
Gender	0.0	0.0
Race/ethnicity	1.4	0.8
Age	0	0
Undergraduate institution		
Two-year college (versus four-year)	4.2	4.1
Public (versus private)	4.2	4.1
Academic background (averages)		
Undergraduate GPA	40.2	40.6
SAT total score	33	35
ACT composite score	59	58
Parental background (at least one parent)		
Parent highest level of education	0.9	0.8
Parent is doctor or dentist	1.8	1.7
Disadvantaged status		
Disadvantaged indicator	0.0	0.0
Loan recipient (2008 forward)	0.0	0.0
Need scholarship (2008 forward)	0.0	0.0
Household income (2008 forward)	0.0	0.0

Source: National Program Office (NPO) program data and Integrated Postsecondary Education System (IPEDS) 2011

Notes: Applicants' characteristics are self-reported in their SMDEP application. Data on college financing and household income were not collected before 2008. The disadvantaged indicator comes from the following question in the program application form: "Do you consider your community of residence, financial status, or educational experience to be disadvantaged? Yes or No." Household income comes from a survey question about the income level of the family during the majority of the applicant's life from birth to age 18.

Table A.4. Baseline characteristics of participants and comparison group by site, 2006–2008

	SAT total scores		ACT total scores		Disadvantaged status		Percentage of other matching variables
	Participants	Comparison	Participants	Comparison	Participants	Comparison	
Louisville	474	459	25.1*	26.1	26.9	25.2	7.7
Howard	799	821	24.3	25.0	38.8	38.8	7.7
Columbia	849	895	25.3	25.7	42.2	41.4	0.0
Virginia	914	895	25.5	25.1	29.5	37.9	3.8
Duke	888	899	25.8	25.7	29.1	30.8	0.0
New Jersey	849	902	24.7	24.7	31.5*	41.9	15.4
Yale	946	948	26.0	25.8	38	35.8	0.0
UCLA	662	655	23.6	25.2	59.2	63.9	0.0
Washington	710	744	24.7	24.6	50.4	50.4	0.0
Texas	828	869	24.7	24.9	30	26.2	0.0
Case Western Reserve	754	771	25.2	24.5	35.3	42.6	7.7
Nebraska	479*	603	26.3	26.4	33.6	27.4	30.8

Source: National Program Office (NPO) program data.

Notes: The following variables were used to match participants to comparisons within sites: gender; indicators for race/ethnicity (Hispanic, black, Asian, multi-race, and other race); age; indicator for whether undergraduate institution is a community college and a public college; total college GPA at time of application; indicator for scholarships (merit and need) and loans; indicator for whether parental education is high school or less, some college, college or more than college; indicator for whether at least one parent is a doctor or dentist; and family income (\$10,000–\$29,000, \$30,000–\$49,000, \$50,000–\$99,000, and more than \$100,000), and the three variables shown in the table: SAT, ACT, and disadvantaged status as self-reported in students' SMDEP applications.

*Difference between SMDEP participant and comparison group is statistically significant at 5 percent, two-tailed test.

Table A.5. Baseline characteristics of participants and comparison group, 2006–2008

	Full sample			Analyses sample		
	Participants	Applicants	Difference	Participants	Matched comparison group	Difference
Female	68.9	69.6	-0.7	68.9	69.7	-0.8
Race/ethnicity						
White, non-Hispanic	10.1	16.8	-6.7*	10	9.5	0.5
Black, non-Hispanic	43	26.6	16.3*	42.2	41.1	1.1
Asian, non-Hispanic	15.9	30.4	-14.6*	15.7	14.5	1.3
Multi-race, non-Hispanic	8.1	7.4	0.7	8	8.1	-0.2
Hispanic	20.6	15.3	5.3*	20.6	22.2	-1.6
Other	2.4	3.4	-1*	2.3	3	-0.7
Age (average)	19.6	20.0	-0.4*	19.6	19.6	0.0
Undergraduate institution						
Two-year college (versus four-year)	8.4	8.9	-0.5	7.7	7.6	0.1
Public (versus private)	54	55.9	-1.9	51.5	52.1	-0.6
Academic background						
College GPA (average)	3.5	3.5	0.0	2.0	2.0	0.0
SAT total score (average)	1,164	1,214	-49*	766	791	-25
ACT composite score (average)	25.2	25.6	-0.4	25.2	25.4	-0.2
Parental education (at least one parent)						
Parent highest level of education						
High school or less	25.2	21.1	4*	24.5	25.9	-1.4
Some college	13.8	12.4	1.4	13.7	14.1	-0.5
College degree	26.5	25	1.5	26.2	24.7	1.5
Some graduate or graduate degree	30.6	37.2	-6.6*	30.3	31	-0.7
Parent is doctor or dentist	5.6	7.1	-1.4*	5.3	6.2	-0.9
Disadvantaged status						
Disadvantaged indicator	37.1	31.4	5.7*	37	38.5	-1.5
Need scholarship	17.7	17.2	0.5	17.9	16.2	1.7
Household income						
\$10,000–\$29,999	33.4	28.5	4.9*	11.3	10.3	1
\$30,000–\$49,999	26.2	24.2	2	8.7	8.2	0.6
\$50,000–\$99,999	31.5	34.7	-3.2	10.6	10.6	0.0
\$100,000 or more	8.9	12.6	-3.8*	8.7	11	-2.3
Sample Size	2,943	5,453		2,864	894	

Source: National Program Office (NPO) program data.

Notes: Matched comparison group was constructed using propensity score matching between participant and nonparticipant applicants separately for each site. Matched sample statistics shown are pooled estimates of all site-level matches.

*Difference is statistically significant at the .05 level, two-tailed test.

APPENDIX B

DATA COLLECTION INSTRUMENTS

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RWJF Summer Medical and Dental Education Program

Telephone Interview Protocol 1

Principal Investigator

Interviewer: Tailor to sites. Fill in available information to facilitate probes. Note that information (for example, in proposals) may differ from what is implemented. Alignment with research questions flagged by [RQ#].

Interviewee Name:

Interviewee Institution:

Interviewer Name:

Notes by:

Date and Time:

Comments:

INTRODUCTORY REMARKS

I am [] of Mathematica Policy Research and my colleague [] is joining as well. Thank you for taking the time to speak with us today. As we mentioned in our email, the Robert Wood Johnson Foundation is supporting a study of the SMDEP program. We requested to speak with you today to get your insights regarding the characteristics of your program and the factors that you think are critical to successful implementation.

Before we begin, let me mention that everything you say will remain confidential. In our report to the foundation, we will not attribute any information to you or your site.

Do you have any questions before we begin?

Do you mind if I tape this conversation? It will help me transcribe it.

Note to reviewers and interviewers:

- Black font flags questions used across three protocols (not necessarily identical)
- Blue font flags questions used in two protocols (PI and Dental; or PI and Coordinator)
- Green font flags questions unique to the given protocol
- Red font is used for interviewer background notes
- If pressed for time, focus on questions that are unique to the given protocol (green font), then question on student selection, questions that elicit opinions that are important to gather from all three respondents (challenges and facilitating factors; most and least successful strategies), and questions that are common to two protocols (in particular the question on changes in policies and practices).

Interviewee Background Information

1. What is your position at [name of institution]?

Interviewer: If have their updated position from their email signature, fill in and don't ask.

How long have you been the PI of the SMDEP program at [institution name]?

IF APPLICABLE: Before becoming PI, were you involved in the program in a different capacity? For how long?

Probe: If recent PI, find out who preceded him or her and what motivated the change in leadership.

How long has [institution name] hosted the SMDEP program or one of its predecessors (MMEP, SMEP)?

Administrative and Governance Structure [RQ3]

1. To whom do you report as PI of the SMDEP program? How frequently do you report to []? What do you report on?

Interviewer: Do they report on implementation, outcomes, or both?

2. Can you describe your responsibilities briefly?

Interviewer: We want to get a sense of how involved they are with the program to guide probes throughout this protocol. Some PIs are very involved, others are not.

3. Who is responsible for the day-to-day operations of your program? What does this entail?

Probe: How do responsibilities vary during the academic year versus the summer?

4. IF APPLICABLE: Who is responsible for the dental program? What are his/her responsibilities?

5. Is there an advisory committee for your program? If yes: Can you describe its role and composition?

Probe: How frequently does it meet? In what ways does it help the program?

6. Where is the program located within the structure of your institution? Why was it located there?

Probe: Was that important to implement the program?

Interviewer: We are trying to understand what motivated the particular location of the program.

Goals [RQ3]

1. What are the goals of your program?

Curriculum and Other Offerings [RQ3]

1. How would you describe a typical summer program at [institution name]?

Probes: Please tell me briefly about your program's academic and support offerings. What do you offer to participants?

If not answered already, probe (selectively) with the following:

- a. **Curriculum.** What does your curriculum cover (subjects, # of hours)? Who developed the curriculum you offered?
- b. **Approach.** Do you follow a particular approach to delivering the curriculum? Probes:
 - i. Do you separate students into groups based on prior knowledge or achievement?
 - ii. Do you follow a particular pedagogy—such as hands-on, interactive activities; problem-based learning; small group instruction; project-based teaching; team-based learning?
 - iii. Do you focus on developing specific competencies or mastering particular bodies of knowledge?

- c. **Clinical experience.** Do you offer a clinical experience? Tell me about it (Interviewer: find out what it entails, how long it is, where, partners, different for medical versus dental?)
- d. **Other offerings.** Do you offer seminars, elective courses, laboratory experiences, or other academic enrichment opportunities?
- e. **Support services.** Do you offer other services, such as mentoring? (Interviewer—other examples: MCAT training, networking opportunities, academic support, resident advisers or TAs?)

Probe: Is participation in the activities you mentioned required of all participants or are some optional?

2. Has the program always been implemented as you just described or has it changed over time?

Interviewer: Find out for how long the program has been running as described.

IF CHANGED, in what ways have program offerings changed over time? Why?

Interviewer: If they talk about changes as a result of the admission of students interested in dental school, continue with Q13 and Q14 and then return to Q11.

3. Which of your program's offerings do you think are the most successful or effective? Why do you think they are successful?

Interviewer: Find out how they are measuring success.

4. Which offerings have been the least successful? Why?

Interviewer: Failed in implementation or just not successful in achieving goals? Example: MCAT training (will discuss in training)

5. IF APPLICABLE: Please tell me about the dental program. How does it differ from the medical program? How did you integrate it with the offerings for students interested in medical school?

6. IF APPLICABLE: What challenges did you encounter in expanding to include the dental program?

Student Recruitment and Selection [RQ1] / The NPO and Student Data [RQ5, RQ6]

Let's talk about the students that participate in your program.

7. How do you recruit students for your program?

Does the National Program Office (the NPO) help with recruitment? If so, how? [RQ6]

8. [In addition to helping with recruitment] What [other] types of support does the NPO offer? Which of these are most helpful? Which services are least helpful? What suggestions do you have to improve the support provided by the NPO?
9. The NPO collects data on applicants and participants. Do you also collect data or do you have access to the NPO data? What types of data do you collect [or get from the NPO]? How do you use the data?

IF HAVE ACCESS TO NPO DATA: How are the NPO data helpful to you? Are there data that you need that are not currently collected? Can you think of ways the NPO could improve the data or analysis conducted for this project?

10. The NPO is also looking for ways to track participants to find out what happened to them. Does your program track participants? If yes, how? If not, is this something that you could do? How?

Interviewer: Find out if they could get help from the office of institutional research, or if students are assigned a mentor who might stay in touch with them.

11. Once students apply, the NPO sends the applications to your program. How do you select students? Can you walk me through the selection process from the moment the NPO sends you the application materials? [\[Also for impact analysis\]](#)

Probes: What characteristics do you look for in applicants? How do you determine whether a student is from a disadvantage background? After meeting basic screening criteria, what are the most important factors that determine admission? Are applicants ranked in some way (for example, according to a score based on a preestablished scale)? Is a cutoff GPA or SAT score used? Is this information retained? Who makes final decisions? Is there a selection committee involved? If so, tell me about it. Are there differences in the way selection is done, or the outcomes of the process, in the two application rounds?

Interviewer: See “Basic Qualifications” tab of “Sites Background Info.xlsx,” verify and fill in missing information. Note that the program changed selection criteria—originally minority, added disadvantaged, added dental, restricted mostly to rising sophomores and juniors, most recently added recruitment within state (.25) and region (.15))

12. Have you been able to fill all available slots for students interested in medicine and dentistry? If not, why?

Interviewer: Is the problem recruitment (insufficient number of qualified applicants), selection (insufficient numbers selected), or acceptances (insufficient numbers accept offers)?

Probe: Have you noticed any internal competition for students among SMDEP programs at different universities? Do admissions criteria for your own medical or dental school influence

your selection of students for your program? (*Interviewer: we want to find out if the program functions as a pipeline into their medical and dental schools.*)

Barriers and Facilitating Factors [RQ3, RQ6]

As part of this study we are gathering information to facilitate program replication at other sites. It would be helpful to know:

13. What factors contributed the most to successful implementation?

Probe: Which of these do you consider critical to successful implementation?

Interviewer: The above is covered partially re: offerings, this is more general: leadership support? faculty buy-in? prior experience? etc. If respondent has a hard time answering, ask: what are the most important lessons that they've learned in implementing the program?

14. What factors posed the greatest challenge to your program? How did you overcome or manage these problems?

Probes: Have you encountered difficulty staffing the program or finding enough qualified applicants? Did you have funding problems? Was it difficult to meet the matching requirements? Are funds sufficient to cover program costs or do you have to cover more than 50 percent of costs? [*Interviewer: dollar-for-dollar matching is required, from both medical and dental schools*]

15. Given that there are institutions interested in replicating the program, in your opinion, what are some conditions that **must** be present to successfully implement the SMDEP program?

Interviewer: We are looking for necessary conditions.

Institutional Policies and Practices [RQ4]

16. Has the program influenced attitudes or policies at your institution regarding minorities and disadvantaged students? Has it influenced medical or dental school admissions policies, procedures, or practices in any way? **IF NOT DISCUSSED ALREADY:** Has your own recruitment for SMDEP been influenced by admissions expectations of your medical or dental schools?

Probe: Have there been any changes to existing institutional policies, practices, or procedures to recruit and admit minority and disadvantaged students into medical or dental school? If so, please tell me about these changes. Did your program contribute to these changes? In what way?

Interviewer: Ask for examples. Examples of broad changes: In other programs staff lobbied successfully for the creation of a "diversity" VP or other high-level post charged with overseeing equity in recruitment and selection. Others got changes in policies (in writing), in procedures (such as the requirement that all recruitment and selection committee members undergo equity training), or in practices, such as the fact that no committee now accepts short lists without balanced representation. Specific changes: Have they forged connections with medical/dental school admissions? Noticed that they look for former participants among applicants or that participants are more likely to be admitted to their schools?)

Sustainability [RQ3]

Last, I'd like to talk about sustainability.

17. In addition to RWJF funds, what resources contributed to the implementation of your program?

Probe: If not answered already, do you have to cover more than 50 percent of costs from other sources? Have you been able to leverage RWJF funding to obtain external support for this program? And for other similar efforts at [institution name]? If so, in what ways?

Interviewer: Respondents are likely to discuss internal funding (given the matching requirement); if not addressed, ask about external or extramural funding, both in support of this program and in support of other similar efforts on campus.

18. Are you making plans to sustain the program once RWJF funding ends? If yes: Please tell me about them.

Interviewer: Respondents are likely to talk about getting institutional support to continue the program, ask about how the program might differ if sustained by the institution (fewer students, fewer offerings, not residential, etc.)

END REMARKS

I've asked you all my questions. Is there is anything you would like us to know that we did not cover already?

Thank you very much for taking the time to speak with me. The information you provided will be really helpful to us.

RWJF Summer Medical and Dental Education Program

Telephone Interview Protocol 2

Dental Program Coordinator/Lead

Interviewer: Tailor to sites. Fill in available information to facilitate probes. Note that information (for example, in proposals) may differ from what is implemented. Alignment with research questions flagged by [RQ#].

Interviewee Name:

Interviewee Institution:

Interviewer Name:

Notes by:

Date and Time:

Comments:

INTRODUCTORY REMARKS

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Before we begin, let me mention that everything you say will remain confidential. In our report to the foundation, we will not attribute any information to you or your site.

Do you have any questions before we begin?

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Interviewee Background Information

1. What is your position at [name of institution]?

Interviewer: If have their position from their email signature, fill in and don't ask.

What is your position in the SMDEP? How long have you been involved with SMDEP?

Interviewer: The dental coordinator has different titles at different institutions

2. How did you become involved with the program?

Administrative and Governance Structure [RQ3]

3. Can you describe briefly your responsibilities in the SMDEP?

Probes: Are you a member of the selection committee? Advisory committee? Organize clinical experience? Teach? Find faculty to teach or offer seminars?

4. To whom do you report as [dental program coordinator]?

Goals [RQ3]

5. What are the goals of your program?

Curriculum and Other Offerings [RQ3]

6. I understand that the program was originally designed for students interested in attending medical school. Please tell me: **What is the dental program?** What academic and support services do you offer to participants?

If not answered already, probe (selectively) with the following (skip if same as medical program):

- f. **Curriculum.** What does your curriculum cover (subjects, # of hours)? Who developed the curriculum you offered?
- g. **Approach.** Do you follow a particular approach to delivering the curriculum? Probes:
- i. Do you separate students into groups based on prior knowledge or achievement?
 - ii. Do you follow a particular pedagogy—such as hands-on, interactive activities; problem-based learning; small group instruction; project-based teaching; team-based learning?
 - iii. Do you focus on developing specific competencies or mastering particular bodies of knowledge?
- h. **Clinical experience.** Do you offer a clinical experience? Tell me about it (Interviewer: find out what it entails, how long it is, where, partners, different for medical versus dental?)
- i. **Other offerings.** Do you offer seminars, elective courses, laboratory experiences, or other academic enrichment opportunities?
- j. **Support services.** Do you offer other services, such as mentoring? (*Interviewer—other examples: MCAT training, networking opportunities, academic support, resident advisers or TAs?*)
- Probe: Is participation in the activities you mentioned required of all participants, or are some optional?
7. IF NOT ANSWERED ALREADY: In what ways do these offerings vary from those offered to students interested in attending medical school?
8. Which of your program's offerings do you think are the most successful or effective? Why do you think they are successful?

Interviewer: Find out how they are measuring success.

9. Which offerings have been the least successful? Why?

Interviewer: Failed in implementation or just not successful in achieving goals?

Student Recruitment and Selection [RQ1] /

The NPO and Student Data [RQ5, RQ6]

Let's talk about the students that participate in your program.

10. How do you participate in student recruitment?

Does the National Program Office (the NPO) help with recruitment? If so, how?

11. [In addition to helping with recruitment] What [other] types of support does the NPO offer? Which of these are most helpful? Which services are least helpful? What suggestions do you have to improve the support provided by the NPO?

12. The NPO collects data on applicants and participants. Do you also collect data or do you have access to the NPO data? What types of data do you collect [or get from the NPO]? How do you use these data?

IF HAVE ACCESS TO NPO DATA: How are the NPO data helpful to you? Are there data that you need and are not currently collected? Can you think of ways the NPO could improve the data or analysis conducted for this project?

13. The NPO is also looking for ways to track participants to find out what happened to them. Does your program track participants? If yes, how? If not, is this something that you could do? How?

Interviewer: Find out if they could get help from the office of institutional research, or if students are assigned a mentor who might stay in touch with them.

14. **How do you participate in student selection?** IF APPLICABLE: Can you walk me through the selection process from the moment the NPO sends you the application materials? [For impact analysis]

Probes: What characteristics do you look for in applicants? How do you determine whether a student is from a disadvantage background? After meeting basic screening criteria, what are the most important factors that determine admission? Are applicants ranked in some way (for example, according to a score based on a pre-established scale)? Is a cutoff GPA or SAT score used? Is this information retained? Who makes final decisions? Is there a selection committee involved? If so, tell me about it. Are there differences in the way selection is done or in the outcomes of the process in the two application rounds?

Interviewer: See “Basic Qualifications” tab of “Sites Background Info.xlsx,” verify and fill in missing information. Note that the program changed selection criteria—originally minority, added disadvantaged, added dental, restricted mostly to rising sophomores and juniors, most recently added recruitment within state (.25) and region (.15))

15. Have you been able to fill all available slots for students interested in medicine and dentistry? If not, why?

Interviewer: Is the problem recruitment (insufficient number of qualified applicants), selection (insufficient numbers selected), or acceptances (insufficient numbers accept offers).

Probe: Have you noticed any internal competition for students among SMDEP programs at different universities? Do admissions criteria for your own medical or dental school influence your selection of students for your program?

Interviewer: We want to find out if the program functions as a pipeline into their medical and dental schools.

Barriers and Facilitating Factors [RQ3, RQ6]

As part of this study we are gathering information to facilitate program replication at other sites. It'd be helpful to know:

16. What factors contributed the most to successful implementation?

Probe: Which of these do you consider critical to successful implementation?

Interviewer: The above is covered partially re: offerings, this is more general: leadership support? faculty buy-in? prior experience? etc. If respondent has a hard time answering, ask: what are the most important lessons that they have learned in implementing the program?

17. What problems posed the greatest challenge to establishing your program? Implementing it? How did you overcome or manage these problems?

Probes: What challenges did you encounter in joining the SMDEP program? Have you encountered difficulty integrating a dental component into the original medical program? Funding problems? Was it difficult to meet the matching requirements? Are funds sufficient to cover program costs or do you have to cover more than 50 percent of costs?

18. Given that there are institutions interested in replicating the program, in your opinion, what are some conditions that **must** be present to successfully implement the SMDEP program?

Interviewer: We are looking for necessary conditions.

Institutional Policies and Practices [RQ4]

19. Has the program influenced attitudes or policies at your institution regarding minorities and disadvantaged students? Has it influenced medical or dental school admissions policies, procedures, or practices in any way? IF NOT DISCUSSED ALREADY: Has your own recruitment for SMDEP been influenced by admissions expectations of your medical or dental schools?

Probe: Have there been any changes to existing institutional policies, practices, or procedures to recruit and admit minority and disadvantaged students into medical or dental school? If so, please tell me about these changes. Did your program contribute to these changes? In what way?

*Interviewer: Ask for examples. Examples of **broad changes**: In other programs staff lobbied successfully for the creation of a “diversity” VP or other high level post charged with overseeing equity in recruitment and selection. Others got changes in policies (in writing), in procedures (such as the requirement that all recruitment and selection committee members undergo equity training), or in practices (such as the fact that no committee now accepts short lists without balanced representation). **Specific changes**: Have they forged connections with medical/dental school admissions? Noticed that they look for former participants among applicants or that participants are more likely to be admitted to their schools?)*

Sustainability [RQ3]

Last, I'd like to talk about sustainability.

20. In addition to RWJF funds, what resources contributed to the implementation of your program?

Probe: If not answered already, do you have to cover more than 50 percent of costs from other sources? Have you been able to leverage RWJF funding to obtain external support for this program? And for other similar efforts at [institution name]? If so, in what ways?

Interviewer: Respondents are likely to discuss internal funding (given the matching requirement); if not addressed, ask about external or extramural funding, both in support of this program and in support of other similar efforts on campus.

21. Are you making plans to sustain the program once RWJF funding ends? If yes: Please tell me about them.

Interviewer: Respondents are likely to talk about getting institutional support to continue the program, ask about how the program might differ if sustained by the institution (fewer students, fewer offerings, not residential, etc.) Dental needs medical program in place to function?

END REMARKS

I've asked you all my questions. Is there is anything you would like us to know that we did not cover already?

Thank you very much for taking the time to speak with me. The information you provided will be really helpful to us.

RWJF Summer Medical and Dental Education Program

Telephone Interview Protocol 3

Program Director / Coordinator

Interviewer: Tailor to sites. Fill in available information to facilitate probes. Note that information (for example, in proposals) may differ from what is implemented. Alignment with research questions flagged by [RQ#].

Interviewee Name:

Interviewee Institution:

Interviewer Name:

Notes by:

Date and Time:

Comments:

INTRODUCTORY REMARKS

I am [] of Mathematica Policy Research and my colleague [] is joining as well. Thank you for taking the time to speak with us today. As we mentioned in our email, the Robert Wood Johnson Foundation is supporting a study of the SMDEP program. We requested to speak with you today to get your insights regarding the characteristics of your program and the factors that you think are critical to successful implementation.

Before we begin, let me mention that everything you say will remain confidential. In our report to the Foundation, we will not attribute any information to you or your site.

Do you have any questions before we begin?

Do you mind if I tape this conversation? It will help me transcribe it.

Note to reviewers and interviewers:

- Black font flags questions used across three protocols (not necessarily identical)
- Blue font flags questions used in two protocols (PI and Dental; or PI and Coordinator)
- Green font flags questions unique to the given protocol
- Red font is used for interviewer background notes
- If pressed for time, focus on questions that are unique to the given protocol (green font), then question on student selection, questions that elicit opinions that are important to gather from all three respondents (challenges and facilitating factors; most and least successful strategies), and questions that are common to two protocols (in particular the question on changes in policies and practices).

Interviewee Background Information

1. How long have you been the [director/coordinator] of the SMDEP program?
2. Do you hold other positions at [name of institution]?

Interviewer: If you have their position from their email signature, fill in and don't ask.

Administrative and Governance Structure [RQ3]

3. Can you describe your responsibilities as SMDEP [director / coordinator]?
4. To whom do you report?
5. Who else is involved in the administration of the program? What are their responsibilities?
IF APPLICABLE: Who administers activities in the dental program?

Curriculum and Other Offerings [RQ3]

6. How would you describe a typical summer program at [institution name]?

Probes: Please tell me briefly about your program's academic and support offerings. What do you offer to participants?

Interviewer: If PI addressed this, please focus on those offerings not well covered by PI.

IF NOT ANSWERED ALREADY, probe (selectively) with the following:

- k. **Curriculum.** What does your curriculum cover (subjects, # of hours)? Who developed the curriculum you offered?
- l. **Approach.** Do you follow a particular approach to delivering the curriculum? Probes:
 - i. Do separate students into groups based on prior knowledge or achievement?
 - ii. Do you follow a particular pedagogy—such as hands-on, interactive activities; problem-based learning; small group instruction; project-based teaching; team-based learning?
 - iii. Do you focus on developing specific competencies or mastering particular bodies of knowledge?
- m. **Clinical experience.** Do you offer a clinical experience? Tell me about it (Interviewer: find out what it entails, how long it is, where, partners, different for medical versus dental?)
- n. **Other offerings.** Do you offer seminars, elective courses, laboratory experiences, or other academic enrichment opportunities?
- o. **Support services.** Do you offer other services, such as mentoring? (Interviewer—other examples: MCAT training, networking opportunities, academic support, resident advisers or TAs?)

Probe: Is participation in the activities you mentioned required of all participants or are some optional?

- 7. Has the program always been implemented as you just described or has it changed over time?

Interviewer: Find out for how long the program has been running as described.

IF CHANGED, in what ways have program offerings changed over time? Why?

- 8. IF APPLICABLE AND NOT MENTIONED IN Q6: Tell me about the dental program. In what ways do offerings vary for students interested in medical versus dental school?
- 9. Which of your program's offerings do you think are the most successful or effective? Why do you think they are successful?

Interviewer: Find out how they are measuring success.

- 10. Which offerings have been the least successful? Why?

Interviewer: Failed in implementation or just not successful in achieving goals? Example: MCAT training (will discuss in training). The coordinator should be in a good position to know about problems in implementation.

- 11. IF APPLICABLE: What challenges did you encounter in expanding to include the dental program?

Staffing [RQ3]

Let's talk about staffing.

- 12. Please tell me about the faculty and staff who work in the program. What are their responsibilities?

Probe: Regular faculty at your institution or faculty hired for the summer? Tenured/tenure-track faculty or adjuncts/visiting/graduate students/etc.? TAs and residential advisors? Clinical experiences?

13. Have you encountered problems staffing any components of the program? Organizing clinical experiences?

Probe: Medical versus dental offerings?

14. Have you built partnerships or collaborations with other institutions or individuals outside of your own institution to recruit students or provide services? If so, please tell me about them.

Student Recruitment and Selection and the NPO [RQ1]

*Interviewer: If the coordinator is involved in recruitment and selection (see Q3 and PI interview) and questions not answered well by PI, administer them. **Otherwise, skip.***

Let's talk about the students that participate in your program.

15. Please tell me about how you recruit students for your program. Does the National Program Office (the NPO) help with recruitment? If so, how? [RQ6]
16. What other support or services does the NPO provide to your program? Which of these are most helpful? Which services are least helpful? [RQ6]
17. What suggestions do you have to improve the support provided by the NPO? [RQ6]
18. [TR to selection] How do you select students? Can you walk me through the selection process from the moment the NPO sends you the application materials? [Also for impact analysis]

Probes: What characteristics do you look for in applicants? How do you determine whether a student is from a disadvantage background? After meeting basic screening criteria, what are the most important factors that determine admission? Are applicants ranked in some way (for example, according to a score based on a preestablished scale)? Is a cutoff GPA or SAT score used? Is this information retained? Who makes final decisions? Is there a selection committee involved? If so, tell me about it. Are there differences in the way selection is done, or the outcomes of the process, in the two application rounds? Do admissions criteria for your own medical or dental schools influence your selection of students for your program?

Interviewer: We want to find out if the program functions as a pipeline into their medical and dental schools.

Interviewer: See "Basic Qualifications.xlsx" and fill in missing information/verify. Note that the program changed selection criteria—originally minority, added disadvantaged, added dental, restricted mostly to rising sophomores and juniors, most recently added recruitment within state (.25) and region (.15)

19. Have you been able to fill all available slots for students interested in medicine and dentistry? If not, why?

Interviewer: Is the problem recruitment (insufficient number of qualified applicants), selection (insufficient numbers selected), or acceptances (insufficient numbers accept offers).

Probe: Have you noticed any internal competition for students among SMDEP programs at different universities?

Student Package [RQ1]

20. Your website and proposal indicate that students receive [go over what is in the “Packages” tab of “Sites Background Info.xlsx”.] Is this up-to-date or have there been any changes?

Student Assessments [RQ3]

21. How is student progress in the program monitored?

Probe: through pre- and post-tests, weekly performance/feedback, etc.

22. How are results used?

Probe: To tailor offerings to participants, to revise program offerings, to offer letters of recommendation, to suspend students from the program, etc.

23. How do you assess student outcomes after they participate in your program? [RQ2]

Probe: pre- and post-tests, GPA before/after, post-program surveys, data from the NPO (medical/dental school applications and admissions).

Barriers and Facilitating Factors

As part of this study we are gathering information to facilitate program replication at other sites. It would be helpful to know:

24. What factors have facilitated implementation of the program? [RQ3] Probe: Which of these do you consider critical to successful implementation? [RQ6]

Interviewer: The above is covered partially re: offerings, this is more general: leadership support? faculty buy-in? prior experience? etc.

25. What are the most important problems that you have encountered in implementing the program? How did you overcome or manage these problems? [RQ3]

Probes: Have you encountered difficulty staffing the program or finding enough qualified applicants? Funding problems?

26. Given that there are institutions interested in replicating the program, in your opinion, what are some conditions that **must** be present to successfully implement the SMDEP program?

Interviewer: We are looking for necessary conditions.

END REMARKS

I've asked you all my questions. Is there is anything you would like us to know that we did not cover already?

Thank you very much for taking the time to speak with me. The information you provided will be really helpful to us.

SMDEP Site Visit Protocol

Project Director / Principal Investigator Interview

45 minutes

GOAL: What is the essence of SMDEP (critical elements), how is it hypothesized to have an effect (theory of change: training or increased motivation and sense of self-efficacy), and what does it take to implement it (staffing, funding).

PROGRAM GOALS AND COMPONENTS

1. You mentioned earlier that your program hopes to {PI: increase the number of URMs in health professions, help interested students figure out if this is the right career for them, and make them more competitive applicants} {Proposal: strengthen the academic preparation of students and introduce them to the realities of medicine and dentistry in order to position them to gain acceptance to medical or dental school}

How does your program hope to achieve these goals? [(1) strengthen preparation, (2) gain exposure, and (3) position them to gain acceptance]

Probe: The program offers multiple components—courses, clinical exposure, advising, individualized education plan, reading/writing. What does each component contribute? How are the pieces helping achieve the goals of the program? (Ask about the ed plans)

2. Are all of the pieces necessary?

Probe: How much time is devoted to each component (coursework, clinical experience, other prep courses such as test-taking skills/MCAT, financial planning, career advice, etc.)

3. Are all fellows required to participate in everything or is participation customized to needs or background? Does participation in clinical experiences vary?
4. Tell me about SMDEP and admissions to your medical school. Is participation considered in reviewing applications and making decisions?

Probe: From own or any site? Recruit former participants?

PROGRAM IMPLEMENTATION

5. What does it take to implement the SMDEP program? (Thinking in terms of infrastructure, staffing, collaborations, and funding.)
6. What role do collaborators play? (Probe: committee members, faculty, visiting scholars, etc.)
7. What about program staff? How is staffing currently structured to provide support during the academic year versus the summer?
8. How have faculty been recruited to teach? Internally and externally.

9. What guidance does faculty receive? Do they decide what to teach and how, or does the program provide guidance?
10. Have you had problems finding faculty to teach during the summer?

REPLICATION

Let's talk about what it takes to replicate the program.

11. Funding. Some costs require actual funding, and others can be covered through donations from the university (say, space) or individuals (such as volunteer speakers or mentors). What are the costs that require funding—either from an external source or internally from the university? What share of funding goes to each of these costs?
12. Lessons learned. What advice would you give to other universities considering offering an SMDEP-type program?

Probe: What have been the biggest impediments to implementing the program? What keeps you up at night? What has helped you the most?

FUTURE

13. What needs further development over the next few years?

Probe: What would you like to change in your program?

SMDEP Site Visit Protocol

Interview with Dean

30 minutes

GOAL: ROLE OF LEADERSHIP IN ESTABLISHING AND GUIDING SMDEP

GOALS OF SMDEP / VISION / FIT WITH INSTITUTIONAL VISION & PRIORITIES

1. **How long have you been the {position}? How long have you been at {site name}? In what positions?**
2. **How have you been involved with SMDEP?** [Depending on answer, probe re: role vis-à-vis the project]
3. **In your opinion, what is the goal of SMDEP?**
4. **How does SMDEP fit with {site name} vision or goals?**

Probe: Why does your institution offer the SMDEP program? How is SMDEP different from other similar efforts on campus? In what ways can SMDEP potentially contribute to [university name] goals?

5. **How does SMDEP hope to achieve its goal(s)?**

Probe: What are the key elements of SMDEP? How are they related to its goals?

6. **Tell me about SMDEP and admissions to your medical school. Is participation considered when reviewing applicants or making admissions decisions?**

Probe: From this institution or any site? Recruit former participants?

7. **What do you think are SMDEP's greatest accomplishments?**
8. **What problems has SMDEP encountered in implementing its activities? (Recruiting students, TAs, or instructors?)**
9. **What advice would you give to other universities considering offering an SMDEP-type program?**
10. **How will the program be supported after RWJF is no longer providing funding?**

SMDEP Site Visit Protocol

Faculty / Instructor Interview

30 minutes

1. Please tell me about yourself. Where do you teach? What position do you hold?
2. What position do you hold in the SMDEP program? How long have you been teaching [organizing the clinical experiences] in the SMDEP program? What do you teach [Can you describe the clinical component]?

3. How did you get involved with SMDEP? What attracted you to SMDEP?

Interviewer: What is their motivation, why are they involved with the program? How does participating in SMDEP fit with interests/other academic activities?

4. How do you decide what to cover in your courses [what to offer as part of the clinical experiences]?

Probe: Is math covered? Same/separate course?

5. How does what you cover differ from what you would teach to students of the same courses during the regular school year?

[Clinical: What do you hope to accomplish through the clinical component? How does it fit with the logic of the program?]

6. How do you teach the material? For example, do you separate students in groups according to ability, use case-based or problem-solving teaching techniques? If all take same courses, how do you handle teaching to those with varying preparation? (U of L: Clusters? Course for credit stressful?)

Interviewer: Get at pedagogical approach.

7. Tell me about the fellows. How well prepared are they to tackle the material covered in your course? What problems are they having? What do you feel is working well to prepare students?
8. What would you change or do differently in the SMDEP program if you could?
9. What advice would you give to other universities considering offering an SMDEP-type program?

10. IF MENTOR: What are your responsibilities as a student mentor? How many students have you mentored? How have you helped them?

Interviewer: Get at problems they helped with, student needs

11. IF IN COMMITTEES: Have you participated in any SMDEP committees (recruitment, for example)? If so, how long have you been a member? Please tell me what the committee does and what your role is.

Probe to get details (who qualifies [students/faculty anywhere or own], criteria used, characteristics to look for, process to select, issues, etc.)

SMDEP Site Visit Protocol

Admissions Officers

20 minutes

GOAL: Find out how admissions involved in the program (if at all) and whether SMDEP is considered in admissions (and if so, how)

1. Please tell me about yourself. What position do you hold?
2. How are you [is the office of admissions] involved with the program?
3. In your opinion, what is the goal of SMDEP?

Let's talk about SMDEP and admissions to your medical [or dental] school.

4. How does SMDEP fit with your goals with respect to student admissions to your medical [or dental] school? Probe: In what ways can SMDEP potentially contribute to [university name] goals, to achieving your admissions targets?
5. Is participation considered in reviewing applications and making decisions? How?

Probe: From your own or any site? Recruit former participants? Try to see if policy versus individual initiative (for example, a person in admissions who happens to be involved with the program).

6. What would you like to change in terms of your involvement [admissions office] with the program?
7. What advice would you give to other universities considering offering an SMDEP-type program? Probe: What have been the biggest impediments to implementing the program? What kept you up at night? What helped you the most?

SMDEP Site Visit Protocol

Focus Groups with Scholars

45 minutes

Find out: College, Year in College, Major, Medical / Dental SMDEP

Interviewer: Adapt to site (for example, if all take the same courses, skip the main question 2 and go to probe about what they think of the courses)

QUESTION 1: WHY DID YOU APPLY TO THE PROGRAM?

Probes: What did you hope to get out of it? How did you find out about it? Why did you choose {site name}?

QUESTION 2: WHAT COURSES ARE YOU TAKING?

Probes: What do you think of these courses? Are they helpful? Why or why not? What courses have you had the most difficulty with? Why?

QUESTION 3: WHAT ABOUT THE CLINICAL EXPERIENCE?

Probes: What is the clinical experience? How frequently did you get these opportunities? What did you think of them? Were they helpful?

QUESTION 4: WHAT OTHER ACTIVITIES ARE OFFERED?

Probes: Seminars, training (financial), career advising, mentoring, etc.
Which would you say have been the most useful? Why?
Which would you say are not really helpful? Why?

QUESTION 5: IN WHAT WAY DO YOU FEEL THE PROGRAM HAS HELPED YOU?

Probes: How will the program help you make progress in your degree?
Do you think additional services are needed? What are they?
Do you think the program could exclude some current offerings?

QUESTION 6: WHAT ARE YOUR PLANS FOR THE FUTURE?

Probes: What do you plan to do after you graduate from college?
Have those plans changed since participating in SMDEP? How? Why?
Has SMDEP helped you decide whether to apply for medical/dental school?



2008 National Survey of College Graduates

Conducted for
National Science Foundation
by
U.S. Department of Commerce
Economics and Statistics Administration

U S C E N S U S B U R E A U

This information is solicited under the authority of the National Science Foundation Act of 1950, as amended, and the Confidential Information Protection and Statistical Efficiency Act of 2002. The information you provide will be used for statistical purposes only. Your responses will be kept confidential. Your response is voluntary and failure to provide some or all of the requested information will not in any way adversely affect you. The average time to complete this survey is about 25 minutes. Please send any comments on the time required for this survey to National Science Foundation, 4201 Wilson Blvd., Suite 295, Arlington, VA 22230, Attn: NSF Reports Clearance Officer.

Please make any name/address changes below:

First Name M.I.

Last Name

Number and Street

City/Town

State ZIP Code

OMB No.: 3145-0141
Approval Expires: 7/2011

Form NSCG-1

2108983

FIELD OF STUDY

If you cannot find the code that best describes your field of study, use the "OTHER" code under the most appropriate broad category. If none of the codes fit your field of study, use Code 995.

• Agricultural Business and Production	601 Agricultural economics – <i>Also consider 655 Business and managerial economics and 923 Economics</i>	602 OTHER agricultural business and production
• Agricultural Sciences	605 Animal sciences 606 Food sciences and technology – <i>Also consider 638 Nutritional sciences</i>	607 Plant sciences – <i>Also consider 633 Botany</i> 608 OTHER agricultural sciences
• Architectural/Environmental Design	610 Architectural/environmental design <i>Also consider 723 Architectural engineering</i>	
• Biological/Life Sciences	631 Biochemistry and biophysics 632 Biology, general 633 Botany – <i>Also consider 607 Plant sciences</i> 634 Cell and molecular biology 635 Ecology 636 Genetics, animal and plant 637 Microbiological sciences and immunology 638 Nutritional sciences – <i>Also consider 606 Food sciences and technology</i>	639 Pharmacology, human and animal – <i>Also consider 788 Pharmacy</i> 640 Physiology and pathology, human and animal 641 Zoology, general 642 OTHER biological sciences
• Business Management/ Administrative Services	651 Accounting 652 Actuarial science – <i>Also consider 841 Applied mathematics and 843 Operations research</i> 653 Business administration and management 654 Business, general 655 Business and managerial economics – <i>Also consider 601 Agricultural economics and 923 Economics</i>	656 Business marketing/marketing management 657 Financial management 658 Marketing research 843 Operations research 659 OTHER business management/ administrative services
• Communication	661 Communication, general 662 Journalism	663 OTHER communication
• Computer and Information Sciences	671 Computer and information sciences, general 672 Computer programming 673 Computer science – <i>Also consider 727 Computer and systems engineering</i>	674 Computer systems analysis 675 Data processing 676 Information services and systems 677 OTHER computer and information sciences
• Conservation and Natural Resources	680 Environmental science or studies 681 Forestry sciences	682 OTHER conservation and natural resources
• Criminal Justice/Protective Services	690 Criminal justice/protective services – <i>Also consider 922 Criminology</i>	
• Education	701 Education administration 702 Computer teacher education 703 Counselor education and guidance 704 Educational psychology 705 Elementary teacher education 706 Mathematics teacher education 707 Physical education and coaching	708 Pre-school/kindergarten/early childhood teacher education 709 Science teacher education 710 Secondary teacher education 711 Special education 712 Social science teacher education 713 OTHER education
• Engineering <i>Also consider 751 to 754 under Engineering-Related Technologies</i>	721 Aerospace, aeronautical, astronautical engineering 722 Agricultural engineering 723 Architectural engineering 724 Bioengineering and biomedical engineering 725 Chemical engineering 726 Civil engineering 727 Computer and systems engineering – <i>Also consider 673 Computer science</i> 728 Electrical, electronics and communications engineering 729 Engineering sciences, mechanics and physics 730 Environmental engineering 731 Engineering, general	732 Geophysical and geological engineering 733 Industrial and manufacturing engineering – <i>Also consider 752 Industrial production technologies</i> 734 Materials engineering, including ceramics and textiles 735 Mechanical engineering 736 Metallurgical engineering 737 Mining and minerals engineering 738 Naval architecture and marine engineering 739 Nuclear engineering 740 Petroleum engineering 741 OTHER engineering

FIELD OF STUDY (Continued)

<ul style="list-style-type: none"> • Engineering-Related Technologies <i>Also consider 721 to 741 under Engineering</i> 	751	Electrical and electronics technologies	753	Mechanical engineering-related technologies
	752	Industrial production technologies – <i>Also consider 733 Industrial and manufacturing engineering</i>	754	OTHER engineering-related technologies
<ul style="list-style-type: none"> • Languages, Linguistics, Literature/Letters 	760	English language, literature and letters	772	OTHER foreign languages and literature
	771	Linguistics		
<ul style="list-style-type: none"> • Health and Related Sciences 	781	Audiology and speech pathology	787	Nursing (4 years or longer program)
	782	Health services administration	788	Pharmacy – <i>Also consider 639 Pharmacology, human and animal</i>
	783	Health/medical assistants	789	Physical therapy and other rehabilitation/therapeutic services
	784	Health/medical technologies	790	Public health (including environmental health and epidemiology)
	785	Medical preparatory programs (e.g., pre-dentistry, pre-medical, pre-veterinary)	791	OTHER health/medical sciences
	786	Medicine (e.g., dentistry, optometry, osteopathic, podiatry, veterinary)		
<ul style="list-style-type: none"> • Home Economics 	800	Home economics		
<ul style="list-style-type: none"> • Law/Prelaw/Legal Studies 	810	Law/prelaw/legal studies		
<ul style="list-style-type: none"> • Liberal Arts/General Studies 	820	Liberal arts/general studies		
<ul style="list-style-type: none"> • Library Science 	830	Library science		
<ul style="list-style-type: none"> • Mathematics and Statistics 	841	Applied mathematics – <i>Also consider 843 Operations research and 652 Actuarial science</i>	843	Operations research – <i>Also consider 841 Applied mathematics and 652 Actuarial science</i>
	842	Mathematics, general	844	Statistics
			845	OTHER mathematics
<ul style="list-style-type: none"> • Parks, Recreation, Leisure, and Fitness Studies 	850	Parks, recreation, leisure, and fitness studies		
<ul style="list-style-type: none"> • Philosophy, Religion, Theology 	861	Philosophy of science	862	OTHER philosophy, religion, theology
<ul style="list-style-type: none"> • Physical Sciences 	871	Astronomy and astrophysics	875	Geology
	872	Atmospheric sciences and meteorology	876	Geological sciences, other
	631	Biochemistry and biophysics	877	Oceanography
	873	Chemistry, except biochemistry	878	Physics, except biophysics
	874	Earth sciences	879	OTHER physical sciences
<ul style="list-style-type: none"> • Psychology 	891	Clinical psychology	894	General psychology
	892	Counseling psychology	895	Industrial/Organizational psychology
	704	Educational psychology	896	Social psychology
	893	Experimental psychology	897	OTHER psychology
<ul style="list-style-type: none"> • Public Affairs 	901	Public administration	903	OTHER public affairs
	902	Public policy studies		
<ul style="list-style-type: none"> • Social Work 	910	Social work		
<ul style="list-style-type: none"> • Social Sciences and History 	921	Anthropology and archaeology	926	History, other
	922	Criminology – <i>Also consider 690 Criminal Justice/Protective Services</i>	927	International relations
	923	Economics – <i>Also consider 601 Agricultural economics and 655 Business and managerial economics</i>	928	Political science and government
	924	Geography	929	Sociology
	925	History of science	620	Area and ethnic studies
			910	Social work
			930	OTHER social sciences
<ul style="list-style-type: none"> • Visual and Performing Arts 	941	Dramatic arts	943	Music, all fields
	942	Fine arts, all fields	944	OTHER visual and performing arts
<ul style="list-style-type: none"> • OTHER FIELDS 	995	OTHER FIELDS (Not Listed)		

APPENDIX C

SUPPLEMENTAL TABLES

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Table C.1. Number of MMEP, SMEP, and SMDEP sites, applicants, and participants

Year	Sites	Applicants	Participants
1989	6	n.a.	664
1990	6	n.a.	785
1991	6	n.a.	712
1992	6	n.a.	772
1993	6	n.a.	717
1994	6	n.a.	757
1995	4	906	476
1996	9	1,301	746
1997	9	1,411	853
1998	9	n.a. ^a	828 ^a
1999	9	1,632	920
2000	9	1,598	817
2001	12	n.a. ^b	1,028
2002	11	2,185	1,134
2003	12	2,134	1,098
2004	14	1,763	1,188
2005	14	1,992	1,150
2006	12	1,963	975
2007	12	1,678	987
2008	12	1,812	981
2009	12	2,172	976
2010	12	2,323	983
2011	12	2,245	964
2012	12	2,589	960
Total		29,704	20,643

Source: National Program Office (NPO) program data.

Notes: Authors' calculations based on three data sets from the National Program Office: (1) enrollment data from 1989 to 2005, (2) applicants and enrollment data from 1995 to 2005, and (3) applicants and enrollment data from 1996 to 2012. When data from a given year were available from more than one data source, we relied on the most recent one.

Color shades indicate the three main phases of the program. The program began operating in 1989 as MMEP (Minority Medical Education Program); to reflect shifts in focus and policy it was renamed SMEP (Summer Medical Education Program) in 2003 and SMDEP (Summer Medical and Dental Education Program) in 2006.

^a Applicants data for year 1998 is missing from database with SMDEP applicants from 1995 to 2005. Participant data for 1998 comes from the 1989 to 2005 enrollment database.

^b Count suppressed because number of participants was equal to applicants.

n.a. = not available.

Table C.2. SMDEP applicants, participants, and medical:dental ratios

Year	Applicants total	Participants			Ratio medical:dental
		Total	Medical	Dental	
2006	1,963	975	820	155	5.3
2007	1,678	987	803	184	4.4
2008	1,812	981	793	188	4.2
2009	2,172	976	789	187	4.2
2010	2,323	983	790	193	4.1
2011	2,245	964	774	190	4.1
2012	2,589	960	761	199	3.8

Source: National Program Office (NPO) program data.

Note: All sites accept medical students. Nine of the 12 sites accept dental students. Sites with dental program accept about 60 medical students and about 20 dental students.

Table C.3. Characteristics of SMDEP medical and dental participants, 2006–2012 (percentages unless otherwise noted)

	Medical participants	Dental participants
Gender		
Female	66.8	69.6
Race/ethnicity	*	
White, non-Hispanic	8.1	15.0
Black, non-Hispanic	43.2	31.1
Asian, non-Hispanic	12.8	19.5
Multi-race, non-Hispanic	10.2	8.5
Hispanic	23.5	22.5
Other	2.3	3.4
Age		
Average	20*	20
Range (minimum–maximum)	16–40	17–36
Undergraduate institution		
Two-year college (versus four-year)	7.3	7.6
Public (versus private)	54.8*	63.9
Academic background (averages)		
Undergraduate GPA	3.51	3.47
SAT total score	1,153*	1,127
SAT Verbal	566*	545
SAT Math	587	582
ACT composite score	25*	24
ACT Reading	26*	25
ACT English	25*	25
ACT Math	25*	25
ACT Science	24*	24
Parental background (at least one parent)		
Parent highest level of education		
High school or less	28.8	27.4
Some college	15.0	14.0
College degree	24.0	25.8
Some graduate or graduate degree	31.3	31.9
Parent is doctor or dentist	3.4*	5.6
Disadvantaged status		
Disadvantaged indicator	41.3*	36.8
Loan recipient (2008 forward)	32.6	34.0
Need scholarship recipient (2008 forward)	42.7	41.5
Household income (2008 forward)	*	
\$10,000–\$29,999	31.3	27.1
\$30,000–\$49,999	29.1	28.0
\$50,000–\$99,999	31.5	36.8
\$100,000 or more	8.2	8.2

Source: National Program Office (NPO) program data and Integrated Postsecondary Education System (IPEDS) 2011

Notes: Applicants' characteristics are self-reported in the SMDEP application. Data on college financing and household income were not collected before 2008.

*Difference between medical and dental participants is statistically significant at the .05 level, two-tailed test, using a t-test for means and a chi-squared test for distribution.

Table C.4. Characteristics of participants at the case study and non-case study sites, 2006–2012 (percentages unless otherwise noted)

	Participants	
	Case study sites	Non-case study sites
Gender		
Female	68.0	67.2
Race/ethnicity		
White, non-Hispanic	14.6*	7.8
Black, non-Hispanic	44.8*	39.6
Asian, non-Hispanic	12.7	14.5
Multi-race, non-Hispanic	9.5	10.0
Hispanic	16.9*	25.4
Other	1.6*	2.8
Age (average)	20*	20
Undergraduate institution		
Two-year college (versus four-year)	3.0*	8.7
Public (versus private)	55.6	56.9
Academic background (averages)		
Undergraduate GPA	3.53*	3.49
SAT total score	1,156	1,146
SAT Verbal	566	561
SAT Math	590	585
ACT composite score	25	25
ACT Reading	25	25
ACT English	26*	25
ACT Math	25	25
ACT Science	24	24
Parental background (at least one parent)		
Parent highest level of education		
High school or less	25.9*	29.4
Some college	14.8	14.8
College degree	24.5	24.3
Some graduate or graduate degree	34.1*	30.5
Parent is doctor or dentist	3.9	3.8
Disadvantaged status		
Disadvantaged indicator (self-reported)	38.7	41.0
Scholarship or loan recipient (2008 forward)	66.5	64.6
Household income (2008 forward)		
\$10,000–\$29,999	30.2	30.5
\$30,000–\$49,999	31.3*	28.1
\$50,000–\$99,999	29.3*	33.6
\$100,000 or more	9.3	7.9
Number of sites	4	8

Source: National Program Office (NPO) program data and Integrated Postsecondary Education System (IPEDS) 2011

Notes: Applicants' characteristics are self-reported in the SMDEP application.

*Difference between case study sites and non-study sites is statistically significant at the .05 level, two-tailed test.

Table C.5. Bachelor's degree fields of studies for SMDEP participants who did not enroll in medical or dental school (2006–2008)

	(A) Number of participants who did not enroll in medical or dental school	Percent		
		Of (A)	Of (A) with bachelor's	Of (A) with bachelor's in field
No bachelor's degree	251	13.6		
Missing degree data ^a	171	9.3		
Bachelor's degree	1,418	77.1		
Bachelor's in health	172	9.3	12.1	
Health services administration	3	0.2	0.2	1.7
Health/medical assistants	5	0.3	0.4	2.9
Health/medical technology	8	0.4	0.6	4.7
Medical preparatory programs	26	1.4	1.8	15.1
Medicine	3	0.2	0.2	1.7
Nursing	31	1.7	2.2	18.0
Physical therapy and other rehabilitation	7	0.4	0.5	4.1
Public health	36	2.0	2.5	20.9
Other health/medical sciences	53	2.9	3.7	30.8
Bachelor STEM	969	52.7	68.3	
Applied mathematics	1	0.1	0.1	0.1
Biochemistry and biophysics	36	2.0	2.5	3.7
Bioengineering and biomedical engineering	13	0.7	0.9	1.3
Biology	588	32.0	41.5	60.7
Cell and molecular biology	34	1.8	2.4	3.5
Chemical engineering	1	0.1	0.1	0.1
Chemistry	36	2.0	2.5	3.7
Engineering	3	0.2	0.2	0.3
Environmental science	6	0.3	0.4	0.6
Food sciences	1	0.1	0.1	0.1
Genetics	15	0.8	1.1	1.5
Mathematics	8	0.4	0.6	0.8
Mechanical engineering	3	0.2	0.2	0.3
Microbiological sciences and immunology	18	1.0	1.3	1.9
Nutritional sciences	22	1.2	1.6	2.3
Operations research	1	0.1	0.1	0.1
Pharmacology, pharmacy	1	0.1	0.1	0.1
Physics	1	0.1	0.1	0.1
Physiology and pathology	5	0.3	0.4	0.5
Statistics	1	0.1	0.1	0.1
Zoology	3	0.2	0.2	0.3
Other biological sciences	171	9.3	12.1	17.6
Other computer and information sciences	1	0.1	0.1	0.1
Bachelor other fields	274	14.9	19.3	
Accounting	2	0.1	0.1	0.7
Anthropology	29	1.6	2.0	10.6
Area and ethnic studies	29	1.6	2.0	10.6
Business	2	0.1	0.1	0.7

Table C.5. (continued)

	(A) Number of participants who did not enroll in medical or dental school	Percent		
		Of (A)	Of (A) with bachelor's	Of (A) with bachelor's in field
Business administration and management	7	0.4	0.5	2.6
Communication	8	0.4	0.6	2.9
Criminal justice	5	0.3	0.4	1.8
Dramatic arts	2	0.1	0.1	0.7
Economics	3	0.2	0.2	1.1
English, literature and letters	19	1.0	1.3	6.9
Financial management	2	0.1	0.1	0.7
General psychology	10	0.5	0.7	3.6
History of science	1	0.1	0.1	0.4
History, other	14	0.8	1.0	5.1
International relations	5	0.3	0.4	1.8
Journalism	1	0.1	0.1	0.4
Liberal arts/general studies	12	0.7	0.8	4.4
Linguistics	1	0.1	0.1	0.4
Music, all fields	3	0.2	0.2	1.1
OTHER FIELDS (not listed)	6	0.3	0.4	2.2
Other: philosophy, religion, theology	26	1.4	1.8	9.5
Other: social sciences	6	0.3	0.4	2.2
Political science	15	0.8	1.1	5.5
Social work	9	0.5	0.6	3.3
Sociology	27	1.5	1.9	9.9
Elementary teacher education	1	0.1	0.1	0.4
Other: foreign languages and literature	20	1.1	1.4	7.3
Other: business/administrative services	3	0.2	0.2	1.1
Other: communication	1	0.1	0.1	0.4
Other: visual and performing arts	3	0.2	0.2	1.1
Physical education and coaching	1	0.1	0.1	0.4
Science teacher education	1	0.1	0.1	0.4
Bachelor's field missing	3	0.2	0.2	
Number of participants who did not enroll in medical or dental school		1,840		

Source: Association of American Medical Colleges (AAMC) warehouse data, and National Student Clearinghouse (NSC) data.

Notes: Field of studies was coded using the typology of the National Survey of College Graduates (2008). STEM stands for Science, Technology, Engineering, and Mathematics. Students holding bachelor's degree(s) in more than one major were categorized as having a degree in health if they had at least one major in health and as STEM if they had both a STEM and non-STEM major.

^a Participants could not be matched to the National Student Clearinghouse Data. Appendix A provides detailed information on how degree variables were constructed.

Table C.6. Bachelor's degree fields of studies for SMDEP participants (2006–2008)

	(A) Number of participants	Percent		
		Of (A)	Of (A) with bachelor's	Of (A) with bachelor's in field
No bachelor's degree	286	9.7		
Missing degree data ^a	212	7.2		
Bachelor's degree	2,445	83.1		
Bachelor's in health	232	7.9	9.5	
Health services administration	3	0.1	0.1	1.3
Health/medical assistants	5	0.2	0.2	2.2
Health/medical technology	10	0.3	0.4	4.3
Medical preparatory programs	49	1.7	2.0	21.1
Medicine	5	0.2	0.2	2.2
Nursing	33	1.1	1.3	14.2
Pharmacy	1	0.0	0.0	0.4
Physical therapy and other rehabilitation	10	0.3	0.4	4.3
Public health	51	1.7	2.1	22.0
Other health/medical sciences	65	2.2	2.7	28.0
Bachelor's in STEM	1,746	59.3	71.4	
Applied mathematics	1	0.0	0.0	0.1
Astronomy and astrophysics	1	0.0	0.0	0.1
Biochemistry and biophysics	104	3.5	4.3	6.0
Bioengineering and biomedical engineering	23	0.8	0.9	1.3
Biology	1,064	36.2	43.5	60.9
Cell and molecular biology	64	2.2	2.6	3.7
Chemical engineering	4	0.1	0.2	0.2
Chemistry	70	2.4	2.9	4.0
Engineering	3	0.1	0.1	0.2
Environmental science	10	0.3	0.4	0.6
Food sciences	1	0.0	0.0	0.1
Genetics	22	0.7	0.9	1.3
Mathematics	13	0.4	0.5	0.7
Mechanical engineering	4	0.1	0.2	0.2
Microbiological sciences and immunology	41	1.4	1.7	2.3
Nutritional sciences	32	1.1	1.3	1.8
Operations research	1	0.0	0.0	0.1
Pharmacology, pharmacy	2	0.1	0.1	0.1
Physics	3	0.1	0.1	0.2
Physiology and pathology	12	0.4	0.5	0.7
Statistics	1	0.0	0.0	0.1
Zoology	4	0.1	0.2	0.2
Other biological sciences	265	9.0	10.8	15.2
Other computer and information sciences	1	0.0	0.0	0.1
Bachelor's in other fields	414	14.1	16.9	
Accounting	4	0.1	0.2	1.0
Anthropology	46	1.6	1.9	11.1
Area and ethnic studies	33	1.1	1.3	8.0
Business	3	0.1	0.1	0.7
Business administration and management	11	0.4	0.4	2.7
Communication	10	0.3	0.4	2.4
Criminal justice	5	0.2	0.2	1.2

Table C.6. (continued)

	(A) Number of participants	Percent		
		Of (A)	Of (A) with bachelor's	Of (A) with bachelor's in field
Dramatic arts	2	0.1	0.1	0.5
Economics	13	0.4	0.5	3.1
English, literature and letters	23	0.8	0.9	5.6
Financial management	2	0.1	0.1	0.5
Fine arts, all fields	1	0.0	0.0	0.2
General psychology	50	1.7	2.0	12.1
History of science	1	0.0	0.0	0.2
History, other	20	0.7	0.8	4.8
International relations	6	0.2	0.2	1.4
Journalism	2	0.1	0.1	0.5
Liberal arts/general studies	16	0.5	0.7	3.9
Linguistics	1	0.0	0.0	0.2
Music, all fields	4	0.1	0.2	1.0
Other fields (not listed)	9	0.3	0.4	2.2
Other philosophy, religion, theology	39	1.3	1.6	9.4
Other social sciences	6	0.2	0.2	1.4
Political science	18	0.6	0.7	4.3
Social work	12	0.4	0.5	2.9
Sociology	36	1.2	1.5	8.7
Elementary teacher education	1	0.0	0.0	0.2
Other foreign languages and literature	29	1.0	1.2	7.0
Other business / administrative services	3	0.1	0.1	0.7
Other communication	1	0.0	0.0	0.2
Other education	2	0.1	0.1	0.5
Other visual and performing arts	3	0.1	0.1	0.7
Physical education and coaching	1	0.0	0.0	0.2
Science teacher education	1	0.0	0.0	0.2
Bachelor's field missing	53	1.8	2.2	
Number of participants	2,943			

Source: Association of American Medical Colleges (AAMC) warehouse data, and National Student Clearinghouse (NSC) data.

Notes: Field of studies was coded using the typology of the National Survey of College Graduates (2008). STEM stands for Science, Technology, Engineering, and Mathematics. Students holding bachelor's degree(s) in more than one major were categorized as having a degree in health if they had at least one major in health, and as STEM if they had both a STEM and non-STEM major.

^a Participants could not be matched to the National Student Clearinghouse Data. Appendix A provides detailed information on how degree variables were constructed.

Table C.7. SMDEP program impacts on bachelor's degree attainment by program characteristics, 2006–2008

	Participant group	Comparison group	Difference	p-value	Sample size
Program leadership					
(1) Strong	89.8	88.8	1.0	0.88	2,234
(2) Not Strong	89.2	88.8	0.4	0.02	1,213
Difference between subgroups (1) - (2)			0.6		
Leadership approach					
(1) Medical or dental leadership	89.8	88.8	1.1	0.48	1,118
(2) Collaborative leadership	89.6	88.8	0.8	0.68	2,329
Difference between subgroups (1) - (2)			0.3		
Program Experience (only sites with dental and medical program)					
(1) New SMDEP site in 2006	89.4	88.3	1.0	0.60	1,074
(2) Old SMDEP site in 2006	88.4	88.3	0.1	0.97	1,660
Difference between subgroups (1) - (2)			0.9		
Faculty engagement					
(1) High	90.7	88.8	1.9	0.19	2,248
(2) Low	85.3	88.8	-3.4*	0.03	1,199
Difference between subgroups (1) - (2)			5.4**		
Coursework					
(1) Highly academic	90.1	88.8	1.3	0.39	1,312
(2) Not highly academic	89.3	88.8	0.5	0.79	2,135
Difference between subgroups (1) - (2)			0.7		
Ability grouping					
(1) Tracking	90.0	88.8	1.2	0.50	1,577
(2) No Tracking	89.2	88.8	0.4	0.80	1,870
Difference between subgroups (1) - (2)			0.8		
Pedagogical approach					
(1) More Interactive	88.5	88.8	-0.2	0.88	1,746
(2) Less interactive	91.9	88.8	3.2*	0.02	1,701
Difference between subgroups (1) - (2)			-3.4**		
Clinical experience					
(1) High incidence or intensity	90.3	88.8	1.5	0.42	1,554
(2) Low incidence or intensity	88.9	88.8	0.2	0.92	1,893
Difference between subgroups (1) - (2)			1.3		

Source: National Program Office (NPO) program data, Association of American Medical Colleges (AAMC) warehouse data, American Dental Education Association (ADEA) warehouse data, and National Student Clearinghouse (NSC) data. All data were withdrawn between fall 2012 and summer 2013.

Note: Outcomes for each cohort are up until 2012. Program features are described in Chapter V.

*Difference between SMDEP participant and comparison group is statistically significant at 5 percent, two-tailed test

**Difference between SMDEP participant and comparison group is statistically significant at 1 percent, two-tailed test

Table C.8. SMDEP program impacts on bachelor's degree attainment by student characteristics, 2006–2008

	Participant Group	Comparison Group	Difference	p-value	Sample Size
By gender					
(1) Women	89.9	87.3	2.6	0.22	2,416
(2) Men	89.1	92.0	2.6	0.10	1,031
Difference between subgroups (1) - (2)			5.5*		
By race/ethnicity					
(1) Minority	90.2	89.0	1.2	0.54	2,167
(2) Non-minority	88.0	87.2	1.2	0.77	1,280
Difference between subgroups (1) - (2)			0.4		
By type of undergraduate institution					
(1) Four-year	91.5	90.1	1.4	0.40	3,063
(2) Two-year	71.7	68.1	1.4	0.72	236
Difference between subgroups (1) - (2)			-2.1		
By academic preparation level					
(1) High academic preparation	92.6	92.2	0.4	0.83	1,551
(2) Not high academic preparation	88.6	85.0	0.4	0.06	1,474
Difference between subgroups (1) - (2)			-3.2		
By level of disadvantage					
(1) High disadvantaged status	88.5	85.6	2.9	0.31	1,267
(2) Not high disadvantaged status	90.4	90.5	2.9	0.94	2,180
Difference between subgroups (1) - (2)			3.0		

Source: National Program Office (NPO) program data, Association of American Medical Colleges (AAMC) warehouse data, American Dental Education Association (ADEA) warehouse data, and National Student Clearinghouse (NSC) data.

Note: All characteristics are measured at time of SMDEP application. Minority students are defined as Hispanic, black, and other race/ethnicity. High academic preparation indicates that the applicant has a total SAT score above the median or an ACT composite score above the median if the SAT score is not available. The disadvantaged indicator comes from the following question in the program application form: "Do you consider your community of residence, financial status, or educational experience to be disadvantaged? Yes or No."

*Difference between SMDEP participant and comparison group is statistically significant at 5 percent, two-tailed test

**Difference between SMDEP participant and comparison group is statistically significant at 1 percent, two-tailed test

Table C.9. SMDEP program impacts on professional school application by student characteristics, 2006–2008

	Applied to medical			Applied to dental			Sample size
	Participant group	Comparison group	Difference	Participant group	Comparison group	Difference	
By gender							
(1) Women	40.2	42.0	-1.8	14.4	4.8	9.6**	2,606
(2) Men	45.6	42.2	3.4	12.4	5.8	6.6*	1,152
Difference between subgroups (1) - (2)			-5.2			3.0	
By race/ethnicity							
(1) Minority	44.4	42.4	2.0	9.9	4.3	5.6**	2,377
(2) Non-minority	37.3	41.3	-4.0	21.0	6.7	14.3**	1,381
Difference between subgroups (1) - (2)			6.0			-8.7**	
By type of undergraduate institution							
(1) 4-year	43.5	43.4	0.1	14.7	5.5	9.2**	3,291
(2) 2-year	26.4	26.4	0.0	6.6	4.3	2.3	284
Difference between subgroups (1) - (2)			0.1			6.9*	
By academic preparation level							
(1) High academic preparation	51.6	50.7	0.9	11.9	3.7	8.2**	1,669
(2) Not high academic preparation	34.8	33.3	1.6	17.3	8.3	9.1**	1,609
Difference between subgroups (1) - (2)			-0.7			-0.8	
By level of disadvantage							
(1) High disadvantaged status	41.5	41.8	-0.3	13.3	7.6	5.8*	1,387
(2) Not high disadvantaged status	42.0	42.2	-0.2	14.0	4.0	10.0**	2,371
Difference between subgroups (1) - (2)			-0.1			-4.3	

Source: National Program Office (NPO) program data, Association of American Medical Colleges (AAMC) warehouse data, American Dental Education Association (ADEA) warehouse data, and National Student Clearinghouse (NSC) data.

Note: Applicants' characteristics are self-reported in their SMDEP application. Minority students are defined as Hispanic, black, and other race/ethnicity. High academic preparation indicates that the applicant has a total SAT score above the median or an ACT composite score above the median if the SAT score is not available. The disadvantaged indicator comes from the following question in the program application form: "Do you consider your community of residence, financial status, or educational experience to be disadvantaged? Yes or No."

*Difference between SMDEP participant and comparison group is statistically significant at 5 percent, two-tailed test

**Difference between SMDEP participant and comparison group is statistically significant at 1 percent, two-tailed test

Table C.10. SMDEP National Advisory Committee

Last, first	Position	Organization
Hamos, James	Program Director, Math and Science Partnership Program	National Science Foundation
Story, James	Professor Emeritus	Meharry Medical College
Soto, Nilda	Assistant Dean	Yeshiva University, Albert Einstein College of Medicine
Begay, Tamana	Staff Dentist	Phoenix Indian Medical Center
Flores, Katherine	Director, Fresno Latino Center	University of California, San Francisco, Center for Medical Education and Research
Southerland, Janet	Professor and Dean	Meharry Medical College School of Dentistry
Shotton, Heather	Assistant Professor	University of Oklahoma
Chance, Kenneth	Professor and Division Chief	University of Kentucky College of Dentistry
Putnam, Jeremiah	Professor of Biology and Pre-Medical Director	Davidson College
Johnson, Leon	President and CEO	EAS Group, LLC
Bolivar, Sandra	Assistant Dean	University of Southern California, School of Dentistry
Landry, Alden	Faculty Assistant Director	Harvard Medical School

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