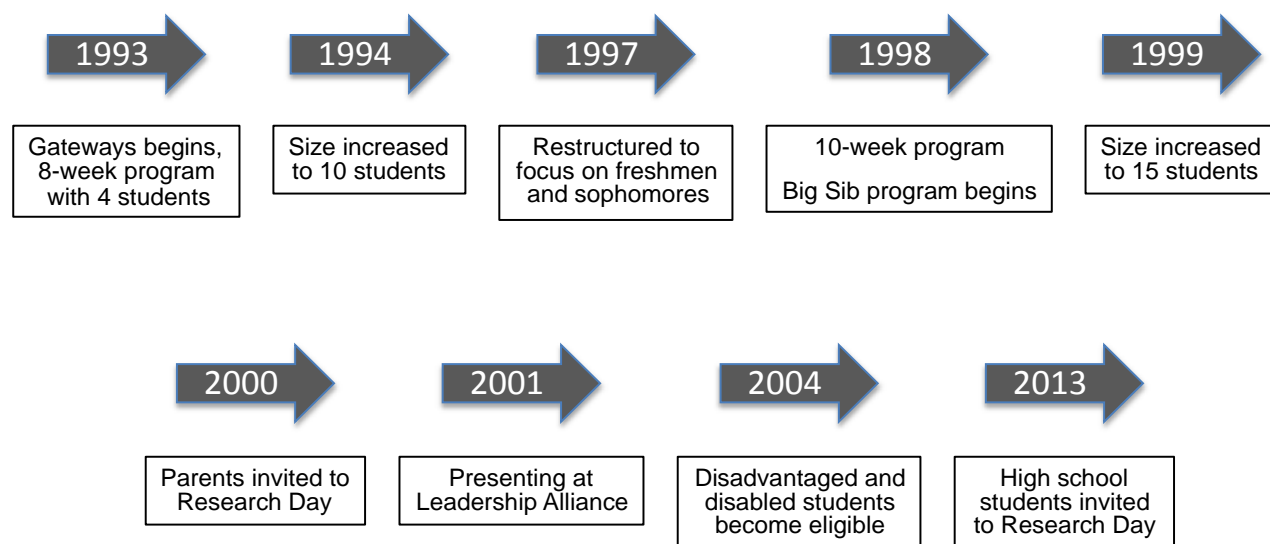


## Supplemental Digital Appendix 1

### Evolution of Gateways to the Laboratory



The timeline shows how Gateways evolved between 1993 and 2013.

The key changes that we believe had the most impact are the following:

- 1997 – Gateways modified admissions eligibility to focus on college freshman and sophomores.
- 1998 – Big Sib mentoring created in order to provide peer mentoring.
- 2000 – Parents were invited to the final research presentations and were able to foster relationship with program leadership.
- 2001 – Gateways students attended and presented at the Leadership Alliance National Symposium, thereby introducing them to hundreds of other students with similar goals.

The increase in class size, from 4 to 10 (in 1994) to the current size of 15 (in 1999) is likely to have benefited the Program by virtue of providing a critical mass of like-minded of students, which in turn promotes the development of a culture of excellence.

## **Supplemental Digital Appendix 2**

### **Detailed Training Plan**

The Gateways to the Laboratory Program is a cohort model, whereby the success of the individual student is enhanced by the success of the overall group. There are weekly goals that need to be met. It is natural for the group to work together to make sure these goals are achieved. The students are formally evaluated by their faculty advisors midway through the program, to allow for corrective actions if problems have arisen, and at the end of the program.

To create the cohesive unit we deem to be critical for the Program’s success, the Gateways students meet several times per week as a group for both formal and informal activities ranging from scientific discussion and career development workshops to cultural and social activities (including movie nights with the Program Director, that end up being informal discussion about how science progresses). During their tenure in the Program, the students meet with the program leadership, peer mentors (Big Sibs), journal club tutors, other physician-scientists, institutional leaders, and students in the Tri-Institutional MD-PhD Program.

The Program concludes with a formal “Graduation” or Research Day, where the parents are invited. At the Research Day, we have an invited Keynote Speaker, and each student gives an oral and a poster presentation and receives a diploma that certifies their completing the Program.

Each student also writes a paper summarizing their research activities during the summer; these papers are reviewed by the Program Director, who provides written comments about each, and the students revise their papers based on the comments.

<b>Weekly schedule</b>	
<b>Week #</b>	<b>Activity</b>
Week 1	<ul style="list-style-type: none"> <li>• Arrive in New York City and check into housing</li> <li>• Welcome party with Big Sibbs</li> <li>• Orientation, meet program administration, PI and lab members</li> <li>• Mock Journal Club</li> <li>• Abstracts due on Friday of Week 1</li> <li>• Mentoring and career development meeting with Administrative Director (through Week 10)</li> </ul>
Week 2	<ul style="list-style-type: none"> <li>• Journal Club (through Week 9)</li> <li>• Clinical Skills Workshop</li> </ul>
Week 3	<ul style="list-style-type: none"> <li>• Learn how to write a scientific CV</li> <li>• Clinical Observations (through Week 10)</li> </ul>
Week 4	<ul style="list-style-type: none"> <li>• How to prepare a MD-PhD application workshop</li> </ul>
Week 5	<ul style="list-style-type: none"> <li>• MD-PhD Admissions &amp; Career Workshop</li> <li>• Meet local MD-PhD Program leadership</li> <li>• Mock MCAT exam and review</li> </ul>
Week 6	<ul style="list-style-type: none"> <li>• How to prepare a manuscript and scientific poster</li> </ul>
Week 7	<ul style="list-style-type: none"> <li>• Interview Skills Workshop</li> <li>• Oral presentation rehearsals</li> </ul>
Week 8	<ul style="list-style-type: none"> <li>• Oral presentations at national meeting</li> <li>• Mock MD-PhD Interview</li> </ul>
Week 9	<ul style="list-style-type: none"> <li>• Final paper due</li> <li>• Final poster due</li> </ul>
Week 10	<ul style="list-style-type: none"> <li>• Gateways Graduation/Research Day (Oral and poster presentations)</li> </ul>

## **Supplemental Digital Appendix 3**

### **Gateways Role Models**

The foundation of the Gateways to the Laboratory Program is solid, positive, and consistent mentoring, and the program consists of three pillars: program leadership, the laboratory, and the current students in the MD-PhD Program. These individuals also serve as key role models for the Gateways students.

**Program Leadership:** The Program Director and Administrative Director oversee the management of Gateways. The Program Director is responsible for the sustainability, competitiveness, and academic progress of the Program and its students. The Administrative Director is responsible for the overall management and the daily function of Gateways. Between them, they lead all mentoring and career development workshops. Because of the many unexpected challenges that arise during the course of the ten weeks, it is essential that the Program Director and Administrative Director communicate closely and regularly to resolve the issues as they arise and make the appropriate strategic changes. Each one must be aware of the ongoing issues so that they speak with one voice and can fill in for each other as needed.

Both work to “be visible” and available for discussions about careers and any other issues that may come up.

**Members of the Laboratory:** The Principal Investigator (PI) and the members of the lab see their Gateways student more often than anyone else. In addition to providing lab space and a research project, they provide scientific mentoring (both formally and informally) to the Gateways student and serve as role models (it is important to select the participating laboratories with care). The lab mentor provides the direction of the project and checks in regularly with the

Gateways student to ensure progress is being made, and the PI and immediate mentor are encouraged to communicate any concerns to the program leadership.

**Students in the MD-PhD Program:** Over the last five years, between one-quarter and one-third (both minority and majority) of the MD-PhD students participate in Gateways in roles that range from the pivotal Big Sibs (student mentors), journal club leaders, presentation reviewers, workshop leaders and mock interviewers; most other MD-PhD students are involved in some, more informal ways. The goal is to introduce the Gateways students to as many MD-PhD students as possible, so that the idea of embarking on this career is no longer foreign — and the Gateways students remain in contact with some of the MD-PhD students they met also after “graduation” from the Program. The Gateways students view these students as role models, and it is important to select the right students for the different activities.

A key element in Gateways’ evolution was the introduction of the Big Brothers/Sisters initiative, also known as the “Big Sibs” in 1998, which created a more coherent support system. The goal was twofold; first that the Gateways students have role models that are close to them age and, initially, look like them. Second, that they have mentors who are knowledgeable about the challenges of dual degree training.

The journal club leaders and moderators are MD-PhD students at various stages of their training. They create an environment whereby the enthusiasm for science becomes contagious, and the journal clubs have become a great motivator for the Gateways students. The journal club has become the place to ask provocative questions that really get the Gateways students to think about the problem discussed and the role of research in modern healthcare. After each journal club session, their confidence grows exponentially. The Gateways students now consider the

Gotian R, Raymore JC, Rhooms SK, Liberman L, and Anderson OS. Gateways to the Laboratory: How an MD–PhD program increased the number of minority physician–scientists. *Acad Med*.

journal clubs to be a “must have” in the summer’s program because of the growth they see in themselves.

## **Supplemental Digital Appendix 4**

### **Testimonials from former Gateways to the Laboratory students**

#### **Arnaldo Mercado-Perez**

Gateways 2015

*Undergraduate, Johns Hopkins University*

“...the most important aspect for me was the opportunity it gives us students to visualize ourselves as physician-scientists. One skill they seem to use to the max is good and smart time management; a good example of that was coordinating the shadowing experience, for we had to make sure that we were still running experiments in the lab, and that our absence by the lab bench did not set back our research project. To me, this helped bring the life of a physician-scientist into perspective, particularly if one chose to become a researcher and practitioner.”

#### **Abigail Shilvock**

Gateways 2015

*Undergraduate, Cornell University*

“Participating in the Gateways to the Laboratory Program was critical in building up my confidence as a scientist. The training and advice I received during the program gave me a sense of capability and qualification as a researcher that has allowed me to successfully work on my own project at my home institution.”

#### **Michael Pineda**

Gateways 2015

*Undergraduate, Arizona State University*

“Gateways has continued to enable my professional and personal development. I am still working with my mentor Dr. Christopher Mason, and our colleagues, on two manuscripts on my work of metagenomic sequencing of Southern American waterways (such as the Amazon River). I also have pursued an opportunity to join the Extreme Microbiome Project with Dr. Mason, and I am in the processing of submitting two grants to National Geographic and Barrett, the Honors College at ASU, to allow me to travel, sample, and sequence sites of interest around the world. With the fantastic support system give to me through Gateways, I have been able to do this while

pursuing my research interest in CRISPR technology at ASU, and this summer at MIT — and I also have been given opportunities to shadow previous Tri-I alumni at Brigham and Women’s Hospital. As I continue my interest in pursuing the MD-PhD, I could not have asked for better preparation and support than what was given to me during Gateways.”

**Camila Villasante**

Gateways 2015

*Undergraduate, Johns Hopkins University*

*(applicant to MD-PhD programs for 2017 matriculation)*

“My experience in the Gateways program- especially the mentoring, journal clubs, workshops, and my wonderful lab- gave me the skillset and confidence to become a stronger scientist and student when I returned to Hopkins. It also spurred me to take the initiative to attend a variety of scientific conferences (specifically, the Scientist Symposium and the Annual Biomedical Research Conference for Minority Students), which have been wonderful opportunities for me. In addition, being in Gateways opened my eyes to underrepresentation of minority groups and women in the sciences and in MD/PhD programs. I am now a much more of an advocate for increasing the representation of minority groups in the sciences. Through Gateways, I was also able to develop a strong and wonderful network of both professionals and fellow aspiring physician-scientists, a network which has proven to be truly invaluable so far!”

**Wangui Mbuguiro**

Gateways 2014

*Undergraduate, Massachusetts Institute of Technology*

“Since working in Dr. Levine's lab, I have presented the research that I had done at two conferences. I gave an oral presentation that summer at the Leadership Alliance's National Symposium, as well as a poster presentation at the Annual Biomedical Research Conference for Minority Students (ABRCMS) in November. I really appreciated getting to see other Gateways alumni at ABRCMS as well as your help in finding opportunities. At that conference, I met someone who introduced me to a program at Duke University called Engineering World Health, which I was subsequently accepted into with a full scholarship. For the next two months, I will be working in a hospital in Arusha, Tanzania, repairing biomedical devices and working together



with the community to engineer solutions to the problems they encounter that hinder their health care delivery. I would not be in Tanzania right now if it were not for the training that I received during your program, the hard work done by the leadership and the mentorship that I received from your amazing MD-PhD students. I am incredibly thankful to have had this opportunity. Now, as an upperclassman, I can inform underclassmen of the MD-PhD route and the amazing resources available to them, such as the Gateways to the Laboratory Program. I appreciate your continued support as I venture into the next stage of my academic development.”

**Imaani Easthausen**

Gateways 2013

*B.A. Bard College 2015*

“The Gateways Program was perhaps one of the most powerful experiences of my undergraduate career. The program absolutely did what it set out to do in terms of teaching me how to critically examine scientific data and write scientifically. But I think, even more importantly, and maybe as a result of teaching me how to write and think critically, Gateways gave me the confidence to believe that I even could pursue science and the communication and professionalism skills to do that successfully.”

**Folasade Sofela**

Gateways 2013

*B.S. Harvard College 2016*

*MD-PhD student, University of Pennsylvania MD-PhD Program*

“I entered the Gateways class of 2013 with a strong interest in pursuing the MD/PhD, but no real idea of the type and amount of work it would take to achieve this goal. Gateways provided me with an abundance of information about the dual degree, from what it would take to get in (MCATs, personal statements, research future experiences) to what it would look like at the end (future career paths and lots of shadowing opportunities), while providing me with an extensive network of people to reach out to for advice at any stage in my career. I'm currently finishing up my last year in my undergraduate studies at Harvard College, and will be matriculating into an MD/PhD program in the summer.”

**Shanira Suazo**

Gateways 2013

*B.S. Clarkson University 2015*

“Summer 2013 was one of the most challenging, interesting, and rewarding summers of my life. I was pushed to my limits as a student while having the opportunity of working in an amazing laboratory at MSKCC, shadowing physicians at NY Presbyterian, and dissecting scientific articles weekly. That summer I was also the first place winner of an essay competition, an achievement that I never thought I would be able to accomplish if it were not for the mentorship from my big sib. Lastly, the fabulous students I had the opportunity of sharing all of these amazing experiences with are, to this day, people that I keep in touch with often and consider my friends. Overall, I completed the Gateways to the Laboratory program feeling as though there are absolutely no limitations to my dreams! It has been one of the most meaningful stepping stones in my journey to becoming a physician.”

**Danielle Miyagishima**

Gateways 2012

*B.S. Mexico State University 2014*

*MD-PhD Student, Yale University School of Medicine*

“Gateways to the Laboratory was hands-down the most influential experience of my entire undergraduate education. If it were not for the program, I feel that I would not have had the confidence or the knowledge to be a competitive MD-PhD applicant. It gave me my first look into what an MD-PhD career can look like and a 'family' that I know will always be there to mentor me.”

**Alejandro Lopez**

Gateways 2009

*B.S. University of Puerto Rico 2011*

*MD-PhD student, Weill Cornell/Rockefeller/Sloan-Kettering Tri-Institutional MD PhD Program*

“Participating in the Gateways to the Laboratory Summer Program was the pivotal experience in my decision to pursue an MD-PhD degree. While at the program I was able to truly experience what a career as a physician scientist could be like, gaining significant exposure to both basic

research and clinical medicine, and to the translational work that can bridge those two worlds.

By the end of the summer, I was convinced that I wanted to pursue an MD-PhD and become a physician scientist.”

**Chidiebere Akusobi**

Gateways 2009

*B.S. Yale University 2012*

*MD-PhD Student, Harvard MD-PhD Program*

*2016 recipient of a P.D. Soros Fellowship for New Americans*

“I wrote about the impact of the Gateways program in both of my personal essays. I credit the start of my research career and really my interest in the MD-PhD degree to Gateways. I am still in touch with Dennis Spencer, my Gateways Big Sib. He's been such a great resource and mentor over the years and am grateful for being paired with him that summer.”

**Raul Martinez-McFaline**

Gateways 2008 and 2009

*B.S. Stonehill College 2011*

*MD-PhD student, Weill Cornell/Rockefeller/Sloan Kettering Tri-Institutional MD-PhD Program*

“The Gateways to the Laboratory Program paved the path towards becoming a physician-scientist. I am currently in the Tri-Institutional MD-PhD Program and the skills that I use on an every-day basis were founded in Gateways. Without a doubt I would not be where I am today were it not for this exemplary program.”

**Anny Reyes**

Gateways 2008

*B.S. SUNY Albany 2011*

*Masters student in Psychology, NYU*

“As a Hispanic immigrant who was raised in an underrepresented community, Washington Heights and didn't have many opportunities, Gateways opened the doors to a world of opportunities, academic and professional growth, and resources. I did my summer research at The Rockefeller University in the department of Neurobiology and Behavior. I was welcomed to

continue doing research during my summer breaks until graduation. After graduating college I returned to Rockefeller. Although I did not pursue an MD-PhD, my experience with Gateways assured me that conducting research was my career goal.”

**Chiamaka Nwakeze**

Gateways 2008

*B.S. Harvard 2010*

*Post-bacc research*

“The Gateways to the Laboratory program has so positively impacted my career trajectory. Through the program, I began to first envision the life of a physician-scientist and conceptualize why these individuals are essential components of medical care and treatment. Shadowing doctors, meeting with scientists, journal clubs and the Big Sibling program were all ways in which I could consider if this path was right for me and my experiences motivated me to work harder than ever before when I returned to college. Almost a decade afterwards, I still relied on Ruth and the mentors I met through the program to answer my academic questions and strengthen my application to MD-PhD programs when I finally decided to apply. Ultimately, a paragraph is not enough to discuss how much I benefited from this program and in my career, I look forward to meeting and collaborating with other scientists who are alumni of this program.’

**Barry Breaux, MD**

Gateways 2006

*B.S. Harvard University 2008*

*Resident, Internal Medicine, NewYork-Presbyterian Hospital/Columbia*

“My Gateways experience both confirmed and launched my career path in Medicine. The exposure to basic science research with clinical implications as well as physician and student mentors was invaluable. It was early enough in my education where I could have chosen any path while having just a general interest in the life sciences. Gateways gave me the confidence and reassurance to make a commitment. Although eventually I realized research was not my calling, my eyes were opened to the vast importance and possibilities created from such an investigational foundation. I would definitely point to my summer spent at the Tri-Institute as a

pivotal moment in my education and training, and I will always be grateful for the tremendous opportunity.”

**Christopher D. Velez, MD**

Gateways 2002

*B.S. Harvard University 2005*

*Fellow, Gastroenterology at Einstein/Montefiore, Bronx, NY*

“The Gateways program was critical to helping prepare me for the rigors of the medical school application process, while fostering continued growth in my academic career through research. I was fortunate to have been mentored by many wonderful people throughout high school, college, medical school, residency, and fellowship. What the Gateways program did, though, was to demystify the process of becoming a doctor: quite a daunting prospect being the first doctor in my family. It helped instilled me with a confidence that allowed me to weather the difficult parts of the journey to becoming a physician. Thirteen years later, as a gastroenterology fellow at Einstein/ Montefiore, I remember my Gateways experience fondly. I'm so thankful for the impact Gateways had on my development that I hope my sister will be a part of the Gateways program summer 2016 as she also pursues a career in medicine.”

**Abimbola Pratt, MD**

Gateways 2001

*B.S. Columbia University 2003*

*Resident, General Surgery, New York Methodist Hospital*

“Gateways was instrumental in my understanding the harmony of scientific investigation and clinical practice. The mentoring, and fellowship from that summer has been long-lasting. The biological basis of behavior 14 years ago project has evolved now into traumatic brain injury research.”

**Efrain Talamantes, MD, MBA, MSHPM**

Gateways 1999 & 2000

*B.S. University of California, Los Angeles 2001*

*Assistant Professor, Department of Medicine, UCLA School of Medicine*

*Medical Director at Martin Luther King Community Hospital*

“As an unrepresented minority in the sciences at the University of California, Los Angeles and the first in my family to attend college, the Gateways program reinforced my commitment to medicine and the program allowed me to develop a practical appreciation for medical research to improve health. Given my family’s low socioeconomic background, a paid summer opportunity was instrumental in my decision to participate in the program. The mentorship was unparalleled and I still keep in touch with my mentor Dr. Jose Trevejo has was critical in helping me develop the confidence I needed to be successful in the sciences. Without this program, I would never have realized my dream of becoming an Assistant Professor in academic medicine.”

**Ronda E. Alexander, MD**

Gateways 1996

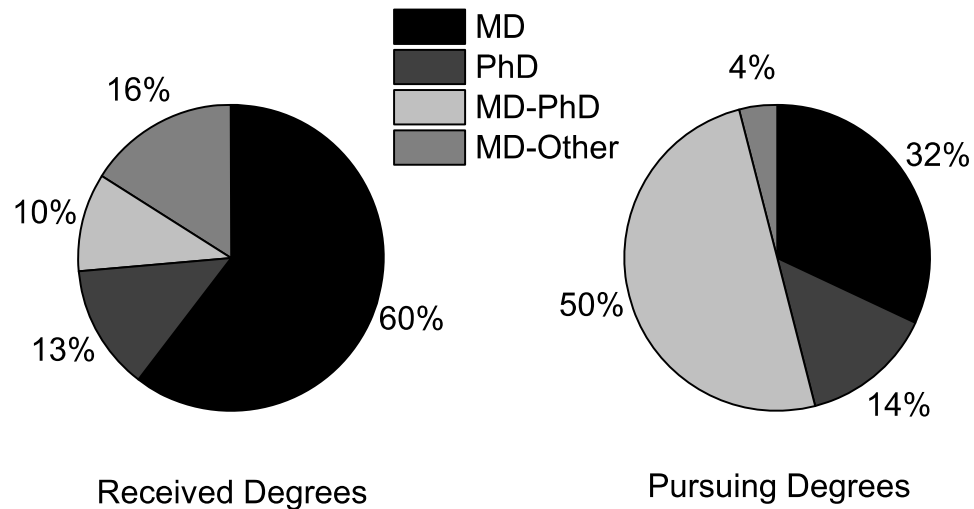
*B.S. Xavier University 1998*

*Assistant Professor, Department of Otorhinolaryngology, University of Texas Medical School at Houston*

“The program was absolutely an asset to my career development. It helped me see that I don’t want to be a basic scientist on my own. While this may sound negative, it prevented me from enrolling as a MD-PhD student who would not use both degrees to their maximum synergy. It also afforded me opportunities to develop critical reasoning skills by reading journal articles and sparked my interest in clinical medicine by offering structured shadowing of medical teams at the hospital. It was an amazing, eye-opening summer and helped build me in the Faculty physician that I am today. I respect inquiry and work alongside a team of translational investigators who are bringing bench to bedside in a clinically impactful manner.”

## Supplemental Digital Appendix 5

### Changes in the career choices of Gateways to the Laboratory alumni over time



Changes in the distribution of Gateways alumni's decisions to pursue MD, PhD, MD-PhD, and MD-other training for alumni who have received their degrees (students who were in the Program in the 1990s and early 2000s) and students who are pursuing their degrees (students who were in the Program in the 2000s).