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The Junior Fellows Program: Motivating Urban Youth toward Careers in Health, Science, and Medicine

Gardith-Eileen Marcelin, Leslie Goldman, William L. Spivey, Joanne DeSimone Eichel, Freya Kaufman, and Alan R. Fleischman

ABSTRACT *Lack of diversity in the health, science, and medical professions has been documented as a contributor to health disparities in the United States, and early intervention is essential for the recruitment of underrepresented students into the health professions. The Junior Fellows Program, a partnership between the New York Academy of Medicine, New York City public schools, and regional academic medical centers, is designed to stimulate students' interest in health, science, medicine, and research. From seminars designed to advance Junior Fellows' skills in identifying concrete strategies for improving health and preventing illness, to understanding the research process and the nature of scientific inquiry, the program engages Junior Fellows in project-based learning, works to enhance their critical thinking skills, and helps them to foster positive interactions with practicing physicians and health professionals. Surveys of program graduates indicate the program has been influential in creating a high level of motivation to pursue careers related to health, science, and medicine. The program continues to work on enhancing educational opportunities for urban public school students and promoting career awareness for the health professions, with a special emphasis on improving the proportion of minorities and women who enter these fields.*

KEYWORDS *Health professions, Library research, Minorities, Science, Partnerships, Urban youth.*

INTRODUCTION

Healthy People 2010, a comprehensive report on the public health needs of the United States and the primary resource for the development of the nation's health promotion and disease prevention agenda, identified the elimination of health disparities among different segments of the population as an overarching goal.[1] Recently, an Institute of Medicine (IOM) report reaffirmed the call for national attention to the crisis of disparities in health care among minorities in the United States.[2] These findings have been echoed in other recent reports, including the

Ms. Marcelin is Project Director, the Junior Fellows Program, Office of School Health Programs, Ms. Goldman is Director, Office of School Health Programs, Mr. Spivey is Coordinator of Outreach and Education Services, Division of Information Management, Ms. Eichel is Associate Director, Office of School Health Programs, Ms. Kaufman is Senior Program Officer, Office of School Health Programs, and Dr. Fleischman is Senior Vice President, the New York Academy of Medicine, New York, New York; Dr. Fleischman is Clinical Professor of Pediatrics, Clinical Professor of Epidemiology and Social Medicine, Albert Einstein College of Medicine, New York, New York.

Correspondence: Gardith-Eileen Marcelin, MA, CHES, Project Director, the Junior Fellows Program, Office of School Health Programs, the New York Academy of Medicine, 1216 Fifth Avenue, New York, NY 10029. (E-mail: gmarcelin@nyam.org)

survey on health disparities by the Commonwealth Fund and the IOM's Symposium on Diversity in the Health Professions.[3,4]

Although many variables contribute to these disparities, among the problems identified is the need for increased diversity in the medical and health professions. Because so few underrepresented minority youths enter health, science, research, and medical career tracks, experts in the recruitment of these populations note that programs to motivate and train minority young people who are likely to pursue these careers must begin early in their educational path and "actively engage the K–12 educational system to provide early exposure to the sciences and health professions."[5,6]

The Junior Fellows Program was initiated by the New York Academy of Medicine to introduce selected urban middle and high school students to current issues in health, science, medicine, and medical research; engage them in conducting self-directed research projects in these areas; and motivate them to pursue careers in health, science, and medicine. Since its inception in 1996, the Junior Fellows Program has made an ongoing commitment to increasing the proportion of underrepresented populations, including women and minorities, in the health professions. The program fosters interaction between the students and professionals in the urban medical community through educational seminars with health professionals, site visits to hospital facilities, and a role model experience. The Junior Fellows Program provides opportunities for students to engage in a broad and enriching educational experience to widen and deepen their understanding of their potential, not only for careers in the health professions, but for academic and personal success.

PROGRAM DESCRIPTION

The Partnership

The Junior Fellows Program is a collaborative activity of the New York Academy of Medicine, the New York City Department of Education's instructional regions (formerly called community school districts), and regional academic medical centers.

The Academy The Office of School Health Programs of the New York Academy of Medicine has a long history of providing health education programs to New York City public schools. The office oversees the implementation of the Junior Fellows Program and provides the citywide coordination, professional staff, and training for participating program sites (i.e., the schools and academic medical centers). Each school is partnered with a participating academic medical center in its community, and the office equips each with the tools necessary to focus on its distinct contribution to the program.

The Division of Information Management of the Academy is responsible for one of the world's largest privately owned medical libraries and is part of the National Network of Libraries of Medicine. Junior Fellows have the opportunity to use the biomedical library and computer facilities as a learning center. Students visit the Academy library, where Division staff provides a series of instructional sessions on enhancing library and research skills through the use of online technology.

New York City Public Schools The New York City Department of Education is responsible for educating 1.1 million students. This urban educational system is administered through instructional regions. Some regions choose to participate in the Junior Fellows Program as a multisite activity, selecting 4–5 students from several different schools to participate. Other sites elect to participate by selecting 12–25

Junior Fellows from one school to matriculate into the program. The program's school-based staff is often comprised of science teachers and school librarians, although many schools create interdisciplinary teams that include technology specialists, language arts teachers, and research and career-planning staff.

Academic Medical Centers The Junior Fellows Program partnership includes six regional academic medical centers in New York City, including Mount Sinai Medical Center and New York University Downtown Hospital in Manhattan, Montefiore Medical Center/the University Hospital for the Albert Einstein College of Medicine in the Bronx, North Shore University Hospital and Schneider Children's Hospital in Queens/Long Island, and New York Methodist Hospital and Maimonides Medical Center in Brooklyn. Each participating medical center provides the physicians, residents, medical students, and other health professionals who act as a support system to the Junior Fellows by offering insight and guidance on pursuing careers in the health professions, providing expertise, and assisting the students with choosing a research question. The academic medical centers also offer the opportunity for the Junior Fellows to see clinical and laboratory settings and observe multicultural professionals as role models.

The Program

At the beginning of each school year, orientation sessions and professional development are conducted to prepare middle and high school staff to implement the Junior Fellows Program. Each participating school site provides students; a school-based or region-level program coordinator; a team of school staff, including science teachers, technology specialists, and librarians; and classroom instruction to support the students between sessions at the Academy or medical centers. To assist school personnel, an implementation guidebook was developed to provide a number of planning tools, lesson plans, and worksheets for the library research component and the culminating research project. Additional resources, including New York State Learning Standards and New York City Performance Standards, are provided to school teams.

Following the orientation and professional development, school sites select students for participation in the Junior Fellows Program. Each school identifies between 12 and 25 students in grades 8 through 12 and between 13 and 18 years of age. At minimum, criteria for inclusion in the program are (1) student must be in good academic standing, with a preferred grade average of B+ or higher; (2) student must be self-motivated as identified by his or her classroom teacher; (3) student must demonstrate an interest in learning more about science, health, medicine, and research as determined by school staff; and (4) student must have parent consent to participate in the Junior Fellows Program, particularly for off-site and afterschool activities related to the program. In addition to these criteria, schools sites request that interested students write entrance essays, which school staff use to select their Junior Fellows. A final list of students is submitted to the Academy for induction into the program.

After students have been selected, they are inducted as Junior Fellows during a formal ceremony at the Academy attended by their school principals and administrators, teachers, parents, and invited guests. The program is a course of study (Table) that takes place for 15–20 sessions during the school year. In the following months, Junior Fellows attend instructional sessions to develop library research skills. Many of the selected students have taken middle or high school classes in biology, life and environmental science, and health and nutrition; however, most

TABLE. General course of study, the Junior Fellows Program

No. of sessions	Activity	Location	Time line
1	Training for school staff	The New York Academy of Medicine	October
1	Induction of Junior Fellows	The New York Academy of Medicine	November
5	Research skills	The New York Academy of Medicine	November–February
1	Hospital and laboratory tour	Academic medical center	December–February
5 (or more)	Role modeling activities with health professionals	Academic medical center/school site	December–February
1	Medical ethics	The New York Academy of Medicine	January–February
2	"Writing the abstract"	School site	February–March
1	Educational seminar: selected topics	The New York Academy of Medicine/school site	February–March
1	Presentation skills (1 of 2)	The New York Academy of Medicine	February–April
1	Medical school visit (optional)	Academic medical center	March–April
1	Presentation skills (2 of 2)	School site	April–May
1	Practice poster presentations	School sites	April–May
1	Culmination and research poster session	The New York Academy of Medicine	May–June

have yet to perform in-depth research using the literature of a particular discipline such as medicine. They select a research topic (often choosing a disease or health issue of personal interest), conduct library research over a number of months, and synthesize findings into a written research abstract and poster. Between library research sessions, Junior Fellows tour and explore an academic medical center, meet with physicians and other health professionals, and attend educational seminars on various topics including medical ethics. These seminars are an important part of the program, as they provide an opportunity for Junior Fellows to examine complex issues, think critically, and deepen their interest in health, science and medicine well beyond specific knowledge about disease and illness.

Junior Fellows work closely with their school staff to refine their topics and analyze the literature retrieved in the research sessions; each student is required to produce a final product that includes a written full-page abstract and poster presentation of his or her research findings. In addition, students at the high school level produce a research paper. Although the amount of effort for each student varies across grade levels, the culminating research projects are uniform in quality and suggest considerable individual effort on the part of each Junior Fellow. The level of school involvement contributes significantly to the overall experience for students in the program and results in the high quality and sophistication of the final presentations.

Although the emphasis is on creating a research project with a focus on health and medicine, the sessions help to build skills such as critical thinking, information gathering, data analysis, and decision making. They also achieve other learning objectives around reading and literacy, such as making inferences from text, comparing

and contrasting themes in written work, integrating new information with prior knowledge, and organizing and producing written and oral presentations. By emphasizing these skills that are not specific to health or medicine, the program increases the likelihood that the skills, research principles, and strategies learned will transfer into other areas to enrich students' future academic and professional endeavors.

The frequency of interaction between students and physicians and other health professionals is variable; each of the six regional academic centers provides between 3 and 10 physicians to work with the group of Junior Fellows from a local participating school. To meet the needs of the Junior Fellows and to make best use of the available pool of physicians and health professionals, activities occur in small groups, with the average ratio of approximately 1 health professional to 3 or 4 Junior Fellows. The physicians and health professionals are volunteers, and all are pediatricians or internists interested in motivating young minority students. Their interaction with Junior Fellows can range from weekly meetings at the hospital or school over the span of 2 or 3 months, to less-frequent meetings over 4 or 5 months. At their meetings, the medical and health professionals work with students to help them understand the medical literature and to refine their research topics; they also host informal discussions on students' career aspirations and provide insight on practical issues, such as what to expect in college and in health and medical training.

The Junior Fellows Program culminates in the spring with a poster session, at which each Junior Fellow presents and discusses research findings. A graduation ceremony follows to honor the Junior Fellows and formally recognize them as members of the Academy fellowship and a larger community of young scholars.

Examples of Junior Fellows research projects that have been presented are

What is the correlation between living in urban areas and the increase of childhood asthma?

How does diabetes cause a loss of vision and affect the progression of some eye disorders?

A comparative study of the side effects caused by various treatments for laryngeal cancer.

What is the relationship between maternal age and children born with Down syndrome?

What is the effect of beta-carotene on congenital heart disease?

What are the pharmacological and behavioral treatments for adolescent female patients with bulimia nervosa?

Library Skills Sessions

Every Junior Fellow receives a minimum of 10 hours of instruction, typically held in 2-hour blocks, focused on developing basic research and on-line search skills using clinical biomedical databases and literature. The first session begins by defining the research process and identifying appropriate information resources to use at each step throughout the process. Students begin to build a fundamental knowledge of their topics by consulting simple reference works such as dictionaries, encyclopedias, and handbooks, as well as core medical textbooks from the library's collections.

In the initial sessions, students choose a research topic and continue to explore this area in subsequent research instruction sessions. Students receive assistance

from program staff, teachers, and librarians on choosing and refining their research question and on retrieving sufficient, reliable sources of information to answer it. Primarily using the Academy library's information systems, students locate and consult specialized information resources such as monographs, research reports, and other full-length works. Students also use similar resources in their school libraries and local public libraries.

To add depth and currency to the resources used by students, two research skills sessions are devoted exclusively to searching and evaluating the medical journal literature. Using a commercial, subscription journal database and the National Library of Medicine's MEDLINE database, students explore different types of online access to information and various database interfaces and search mechanisms. These sessions focus on helping students understand and formulate proper keyword searches while researching and introduce the controlled vocabulary of the National Library of Medicine's Medical Subject Headings. Once students demonstrate a fundamental understanding of subject and keyword searching, other types of searches are introduced to allow students to retrieve additional information on their topics.

A final research session addresses issues around the use of Internet search engines and identification of appropriate ways to use such tools for medical research. The Junior Fellows apply the skills they have learned to the largely unstructured environment of the Internet. Emphasis is placed on in-depth evaluation of the quality of Web sites retrieved in searches.

EVALUATION

From 1996 to 2003, the program had 505 student participants. The program was initiated with 25 students from one community school district in Queens and has expanded to include students each year from 7 of 10 instructional regions in four New York City boroughs: Manhattan, Queens, Brooklyn, and the Bronx. In the 2003–2004 school year, 175 Junior Fellows were selected to participate in the program, with participation limited only by program capacity. Of those students selected, approximately 80% were female, and 86% were from minority backgrounds (34.6% Hispanic/Latino, 30.2% black/African American, 21.4% Asian, and 13.7% Caucasian/non-Hispanic.)

In 2001, an evaluation survey was mailed to the first 160 students in the Junior Fellows Program who participated from 1996 to 2000. There were 64 surveys returned for a response rate of 40%. Of the Junior Fellows who responded to the survey,

> 56% stated they were more interested in pursuing a career in health, science, medicine, or research as a result of the Junior Fellows Program.
>
> 76% stated that the Junior Fellows Program had influenced their ideas about a career. Of these, 57% were interested in medicine, 19% in medical/scientific research, 14% in the allied health professions, and 9% in science.
>
> 100% of respondents from the Junior Fellows Program in 1996 and 1997 (while in eighth grade) were enrolled in a college or university in 2001.

In responses to open-ended questions, alumni of the Junior Fellows Program stated that they were inspired to participate in other programs during high school as a result of their involvement in the Junior Fellows Program. Activities included

participation in advanced placement science, bioethics, and research courses; involvement in a program at local colleges and universities designed to assist students to pursue medical careers; and volunteering at various hospitals and health-related agencies.

The Junior Fellows viewed exposure to positive role models as an essential part of the program and a critical factor in motivating and inspiring them into professional careers. This connection to medical and health professionals allowed students to build a rapport with the physicians and staff during the visits to the medical facilities and through seminars on careers in the health professions. Junior Fellows have described the opportunity to be advised and counseled by physicians, scientists, and medical students as "beneficial," "insightful," "amazing," and "rare."

FUTURE DIRECTIONS

As Junior Fellows move into high school and beyond, the Academy continues to provide resources and opportunities to build and sustain their interest in careers in the science, medicine, research, and health professions. Through relevant career development, networking and educational activities, peer leadership opportunities, an alumni Web site, and other resources, the program works to understand and meet the long-range needs of its graduates.

CONCLUSION

The New York Academy of Medicine developed the Junior Fellows Program to help urban middle and high school students gain an interest in and career awareness of health, science, medicine, and medical research. The more a young student is exposed to positive educational experiences in health and science, the more their desire may increase to pursue careers that incorporate those subjects. However, in an urban setting with competing forces for the time and attention of youths, young people from minority backgrounds need concrete opportunities to help enhance learning and to apply that learning to realize their potential and advance their life goals. Through involvement in this program, students are provided with powerful incentives to invest in themselves and be recognized for their achievements by their schools, instructional regions, and the medical and health community.

The Academy, a not-for-profit private sector institution, has been able to deliver an engaging and enriching program via unique partnerships with New York City public schools and local academic medical centers. Using project-based learning, technology, and role models in medicine and the health professions, the Junior Fellows Program helps students build skills and knowledge about health and medical research and inspires them to pursue careers in these areas.

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