Published in final edited form as:

J Cancer Educ. 2012 June ; 27(2): 233–242. doi:10.1007/s13187-011-0297-9.

Introducing Students to Cancer Prevention Careers through Programmed Summer Research Experiences

Carrie Cameron, Candice L. Collie, and Shine Chang

Department of Epidemiology, The University of Texas MD Anderson Cancer Center, P. O. Box 301439, Mail Code 1340, Houston, TX 77230-1439, USA

Carrie Cameron: ccameron@mdanderson.org

Abstract

Training programs in cancer prevention research play an important role in addressing impending shortages in the cancer prevention workforce. Published reports on the effectiveness of these programs, however, often focus on a program's success in recruiting and retaining a demographically diverse trainee population or on academic successes of the trainees, in general. Little has been reported about programs' success in stimulating long-term interest in cancer prevention per se, whether in research or in other choATsen applications. We set out to examine the success of our National Cancer Institute (NCI) R25E American Recovery and Reinvestment Act (ARRA)-funded summer research experiences program for undergraduates at fostering awareness of and career interest in cancer prevention. Fourteen summer research undergraduates participated in a 12-week structured training program which featured a variety of experiences designed to create awareness of and interest in cancer prevention and cancer prevention research as career tracks. Experiences included career talks by faculty, informational interviewing of role model faculty, career exploration workshops, and structured interactions with graduate students, postdoctoral fellows, and junior faculty. Students were surveyed about the effectiveness of the program via SurveyMonkey 8 months after completing the program. This article reports on the results of the survey and analyzes the relative effectiveness of the various types of programming strategies used. Implications for use in training program development are discussed.

Keywords

Research experience; Cancer education; Undergraduate research; Cancer prevention training; Cancer prevention careers

Introduction

Evidence that cancer prevention and control strategies can make an impact on morbidity and mortality is well established in the scientific community [1]. A rapidly growing field, cancer prevention now encompasses a broad variety of activities ranging from identifying the causes and early diagnosis of cancer, to preventing or controlling cancer through behaviorally based lifestyle interventions and use of chemopreventive agents, and, ultimately, to translating this knowledge into practice [2].

Despite these advances, the cadre of researchers in cancer prevention has not kept pace proportionately with the rapid transformation of knowledge, technology, and intervention strategies [3–5]. Education and training programs in cancer prevention research are needed to recruit students into long-term academic careers dedicated to cancer prevention [6]. The NCI's Cancer Education Grant Program's (NCI CEGP) primary goal is to motivate students to choose cancer-related careers. However, specifically prevention-focused researchers are still relatively few for a variety of reasons. Successful cancer prevention training programs based on the NCI CEGP, such as the Harvard Cancer Prevention Education Program, the UAB Cancer Research Experiences for Students, the UCSF Increasing Diversity in Cancer Control Research, and others, exist, but the volume of trainees exiting these programs may be low in comparison to that of cancer treatment training programs and in comparison to future need for cancer prevention professionals [5]. Little published information is available on the relative success of training programs in *recruiting* future researchers to cancer prevention careers. Most outcomes studies of cancer prevention training programs focus on success in retaining members of groups underrepresented in the sciences [7, 8] or on general productivity of trainees [9]. While several studies have been published that examine the effects of undergraduate research experiences in Science, Technology, Engineering, and Math (STEM) fields, in general, on students' aspirations to academic science careers, most have found that these experiences tend to *clarify, confirm*, or rule out students' interest in science careers, rather than initiating or stimulating interest, where it did not yet exist [10–15] (A. Vineet and D. Meltzer, personal communication, 08/05/2011). But student interest in cancer prevention research fields is difficult to clarify or confirm if awareness of the field is low to begin with. Our experience in 19 years of recruiting and training students for cancer prevention research is that one of the main barriers to entry in the field is a general lack of awareness of the many possible career opportunities in the transdisciplinary field [16] of cancer prevention research. Most students are aware of opportunities for practice in medicine, nursing, and public health and opportunities for research careers in biological, public health, and behavioral science research, but many may not make the connection between these many options and cancer prevention.

One of the primary objectives of the MD Anderson Cancer Center's Cancer Prevention Research Training Program is to grow the field of cancer prevention research. The NCI-funded R25E program provides 3- to 6-month mentored research experiences for upper division undergraduates and graduate students, nursing, and medical students. In the summer of 2010, we received an American Recovery and Reinvestment Act (ARRA)-funded supplement to the R25E which provided additional summer research experiences over 2 years to undergraduate students. In order to boost awareness of and stimulate interest in cancer prevention and prevention research careers, we designed a variety of enrichment activities. This article describes the activities in detail and student response to them from two sources: student program evaluations and progress reports submitted by the program cohort of 14 students, as well as responses to an 8-month follow-up survey received from 10 of the 14 students (a response rate of 71%). We intend this article to serve as a resource for others seeking to create or augment similar undergraduate summer research programs.

ARRA-funded Summer Research Experiences for Undergraduate Students

We conducted a national call for applications in the early spring of 2010 and received 83 applications from students at universities across the country. Of these applications, 32 (39%) received were from members of groups underrepresented in the sciences, and 59 (71%) were from women. Twenty-four (29%) were of the first generation in their family to attend college. A two-phase review process resulted in the selection of 14 candidates (seven men and seven women; three African-Americans, one Latina, ten other). The selected students had an average grade point average of 3.68; seven students had prior biomedical research

experiences, six were entering graduate school, one was entering medical school, four were rising seniors, two were rising juniors, and one was entering undergraduate studies. Students were subsequently matched with mentors and research projects in the Departments of Epidemiology (four students), Behavioral Science (three), Health Disparities Research (four), and Clinical Cancer Prevention (three). In accordance with our training mission to recruit students into the field of cancer prevention research, and given the earlier educational stage of these students than our typical trainees, we designed a special series of career exploration and discovery events to take place alongside the mentored research experiences of this varied group of students. With this enrichment program, we sought to provide students with an explicit and comprehensive view of the opportunities, challenges, and breadth of the field of cancer prevention research as well as to supplement their career skills and build self-efficacy.

Cancer Prevention Research Career Awareness and Development Activities

In addition to the traditional summer research experience of working directly with mentors and carrying out the research project, we designed a curriculum built around three learning goals: learning about cancer prevention research and the breadth of the field of cancer prevention; personal career decision-making and self-exploration; and acquisition of specific career skills.

The Field of Cancer Prevention and Cancer Prevention Research

Why Prevention is a Hard Sell?—Presented by Harvey Fineberg, the President of the Institute of Medicine, this recorded 1-h presentation was originally delivered at a special Cancer Prevention Grand Rounds in MD Anderson's Division of Cancer Prevention and Population Sciences in 2010. The inspiring and accessible presentation provides an excellent articulation of the challenges and opportunities of working in preventive medicine and public health and is especially apt for defining key issues in cancer prevention and prevention research careers. For this student event, a brief introductory slideshow focusing on the need for cancer prevention efforts to improve public health was given by the training program director; a discussion of the key themes followed the presentation.

Cancer Prevention Grand Rounds—Students were required to attend the two grand rounds presentations scheduled during the summer months. One talk featured a biostatistician speaking on future directions of genomewide association studies, the other corporate CEO discussing self-funded insurance plans and wellness programs. These formal professional presentations gave students an idea of the wide range of issues that cancer prevention research encompasses.

Attendance at Health Disparities Conference—Students were given the opportunity to attend the weeklong 8th Annual "Disparities in health in the global context" conference at MD Anderson, sponsored by the institution's Center for Research on Minority Health and Professor Lovell Jones. Attendance was optional. National and international invited speakers as well as experts from MD Anderson spoke on a wide variety of topics related to health and cancer-related racial/ethnic disparities in the USA. Students attended as many sessions as their interests and schedule allowed.

Personal Career Decision-making and Self-exploration

Informal Career Talks—Once a week during lunch, a speaker or pair of faculty speakers in the field of cancer prevention research and/or practice led an informal student discussion of how they developed their career and what words of advice and guidance they might have for others thinking of similar careers. Speakers were invited from a variety of disciplines and

career stages including clinical cancer prevention, health disparities, biostatistics, behavioral science, survivorship, epidemiology, integrative medicine, and clinical practice and ranged in rank from divisional vice presidents to junior faculty. Student participation in these talks was robust.

Panel Presentation with Speakers from Graduate to Junior Faculty Levels—

The training program sponsors a quarterly “Trainee forum” to allow students and trainees to come together, have lunch, network, and learn about career development. For the summer Trainee forum, a panel discussion of junior cancer researchers from the graduate student through junior faculty levels was organized, and students interested in cancer prevention research from Prairie View A&M University were invited to attend as guests. Students learned about the steps of career development going from undergraduate through entry-level faculty stages.

“What Color is your Parachute? ” Guided Career Awareness Activities—Once a week students participated in guided exercises adapted from Richard Bolles’ *What color is your parachute?* best-selling career decision-making book. The centerpiece activity from this book is known as the Flower exercise; it is designed to help users elicit and identify key personal values and competencies and to then shape those characteristics into a personalized and highly detailed template for making career decisions. Students focused particularly on: Step 1: determining their values, goals, and purposes in life; Step 2: identifying special knowledge they possess, such as statistics or a foreign language, which will complement their career choice; and Step 3: identifying their existing transferable skills. As these exercises draw deeply from students’ personal background and introspection and are highly detailed, they were completed over eight sessions. Students submitted their completed Flower charts at the end of the summer program.

Individual Informational Interviews—As a companion activity to the “parachute” exercises, students were encouraged to set up brief informational interviews with faculty throughout the institution. Students were allowed to select whom they wished to contact or were given recommendations of faculty representing disciplines of interest; they were coached in effective and appropriate strategies for contacting and interviewing their subjects. Students were encouraged to request interviews with several different people in different disciplines and to include leadership in their list. Some students were a bit intimidated by the idea of contacting senior leaders, aiming more for interviews with early career individuals who “had more time,” but were pleasantly surprised when they were successful obtaining interviews at all levels. One especially persistent student managed to interview both the provost and the president of the institution. Like the informal career talks, the interviews were designed to allow students to discover career pathways, but in this case, on an individual and selfselected level.

Acquisition of Specific Career Skills

Scientific Elevator Speech—Students were required to develop, with guidance, an “elevator speech” of the research project they were conducting for the summer (scientific elevator speech). A scientific elevator speech is a very brief oral introduction (less than 3 min) to an individual’s project and incorporates many of the elements of a research abstract. No more than two sentences are allowed for background, purpose/hypothesis, or significance. Although students typically find it surprisingly difficult to summarize so intensely, they soon realize how useful the elevator speech can be for explaining their projects to others, such as in an informational interview. Developing an elevator speech requires careful analysis of audience and critical thinking about the nature and purpose of one’s work.

Other career development activities included sessions on email etiquette, ghost-writing letters of recommendation, poster and slide presentation design, and presentation rehearsal.

In the first year of the program, students were required to complete either an oral presentation or a poster presentation of their research projects (their choice). In the second year of the program, students were required to both present their elevator speech with slides and create and present a poster of their projects. Student efforts on these research presentations were intensively coached by program staff as well as mentors.

Evaluation of the Career Awareness and Development Activities

To determine the effectiveness of the eight activities described above in increasing awareness of and interest in cancer prevention and prevention research careers, we reviewed student feedback during and immediately after their experience via progress reports and program evaluations, as well as longitudinally 8 months after students completed the program, via SurveyMonkey™.

Progress Reports and Program Evaluations

All 14 students participating in the program submitted halfway and final progress reports about their particular experiences as well as an evaluation form for the program. Progress reports varied in length from 1 to 3 pages of text; students were asked to report on (a) what they had learned about cancer prevention; (b) what they had learned about career development; and (c) what personal growth they had experienced. Program evaluations consisted of a series of questions rating program and administrative effectiveness on ten-point Likert scales, with a free response section.

Survey-based Evaluation

After obtaining a waiver from the MD Anderson Institutional Review Board, we created an 18-question, anonymous SurveyMonkey™ survey, which was sent to the 14 program alumni. Questions included demographic information (gender, ethnicity, family educational background, educational level, and major field of study), change in level of awareness of cancer prevention, current career goals, any change in career goals as a result of the program, perceptions of careers in academic research as a result of the program, enjoyment of program activities, and usefulness of program activities. Responses were framed as four-point Likert scales, with open text boxes for providing free explanations of responses. An “Additional comments” section was provided. The survey questions are included in the Appendix A.

Of the 14 students, ten responded a 71% response rate. By gender, seven respondents were women, two were men, and one was unspecified. By race/ethnicity, four were white, three were black African-American, two were Asian, and one was Hispanic/Latino. By family educational background, two were of the first generation in their family to attend college, eight were not first-generation college students. By educational level, five were first-year graduate students, one a first-year medical student, two were college seniors, and two were college juniors at the time of the survey. (For the second year of the program, we have introduced an additional immediate exit survey in addition to the 8-month follow-up survey in order to increase the potential response rate.)

Eight had majors or chosen fields of study in the health sciences including biochemistry and cell biology (2), biology (1), evolutionary biology (1), public health (1), health and medical geography (1), epidemiology (1), and infection control (1). (Two left the question unanswered.) Of eight responses for “current career goals,” seven specified “physician,” two of which included a secondary goal of MPH or epidemiologist. The eighth career goal

response was “population scientist.” While the number of premedical students in this research-oriented program was high, we sought to educate the students about many possible ways to approach cancer prevention in their careers.

Learning about Cancer Prevention—Student responses on the progress reports and program evaluations provided during the program suggested a high level of learning about the scope of cancer prevention research and careers. The following comments were submitted by high-performing students majoring in prevention-related disciplines at leading universities, who had little prior knowledge of the many avenues for contributing to cancer prevention. The students providing these comments included a communications major, a biochemistry/cell biology major, a population sciences major, and a medical geography major. Their responses underscore the opportunities for increasing awareness of cancer prevention careers among college and precollege students:

- “When I applied for this internship, even I was unsure of how a communications major... would fit into a cancer prevention program. I quickly found out that there are many components to cancer prevention that are not restricted solely to clinical research. ...Through working with Dr. B, Dr. P, and Dr. P, I have been able to experience or observe various stages of the life of a research project.”
- “... I had no idea of the scope of studies in cancer prevention. As a biochemistry and cell biology major, I am accustomed to microbiology, bench work, and papers about signaling and transcription complexes as a definition of ‘research...’ I had no concept of the variety of other preventive research areas that exist—population studies on innate and behavioral risk factors, research on the effects of education and screening programs, and even studies on disparities which might lead to more equitable medical care in areas where prevention measures have been poor. Looking for my mentors, attending talks, and comparing projects with my fellow trainees has broadened my definition of cancer prevention.”
- “I was moved and fascinated by the insightful 8th Health Disparities Conference... The conference made me think over the complicated nature and arena of very different health treatments and outcomes for different health groups.”
- “The speakers at the Disparities in health conference have inspired me to work on disparities in healthcare in my future career. I found listening to issues faced by minorities in USA very compelling... The discussion about Galena Park has given me drive to improve the health for minorities right here in Houston... More important than the facts that I learned at the conference is gaining a sense of the work that still needs to be done to address health disparities in America... I am charged to address this issue in my future career.”

The survey data collected 8 months after students completed the program further confirmed the need for students to be exposed to a variety of learning experiences about cancer prevention. For Q3.1 (“Participating in the program increased my understanding of what cancer prevention research is about”), all ten participants strongly agreed or agreed. Question 3.3 asked students to specify up to two program activities that had the most impact on their learning and provided seven response choices (see Fig. 1). Notably, the majority of students indicated that the career talk lunches and the Cancer Prevention Grand Rounds had the most impact on learning about cancer prevention, while the research project itself was among the activities selected as lower in impact. Based on additional input discussed below, the students appeared to benefit greatly from a variety of experience (different career talks and research talks and a research project) rather than a single focused experience (research project) in their exploration of cancer prevention and academic research careers.

Career Decision-making—We were also interested in whether the program had an effect on the career goals of the students with respect to both their intentions of entering a cancer prevention-related field and their intentions of working in academic research. In the progress reports and program evaluations, several students commented on the effects of the career development activities on their personal career goals:

- “I discovered through my parachute journey that I most want to work in an academic research environment... I like the uncertainty of research, I love the journey to discovery, working with data, and interacting with collaborators... I have enjoyed the Parachute series so much that I have required all of my girlfriends to get a copy of the book so that we can go through my exercises upon my return.”
- “This ‘research’ environment is no joke! At first I was not sure if this type of life is for me, but the longer I stay here the more it seems that research is anything and everything.”
- “Career development has been one of the most enjoyable experiences I have had this summer... [I]n the beginning of this program I really did not think that I needed much career development. However, as the summer progressed, I became more and more unsure of the career path I had chosen... After doing a majority of the parachute exercises I now feel much more prepared for my future career.
- “My outlook on research and career development has been influenced tremendously by my project in breast cancer this summer. I am finding medical research a very fascinating career path and hope that future experiences in research will be just as fulfilling.”

The survey investigated career decision-making including student attitudes before and after completing the program. These questions were asked 8 months after students finished the program and had had a chance to reflect on their experience outside the program environment. Questions 4.3 and 4.4 queried inclusion of cancer prevention in career goals, and Questions 4.5, 4.6, and 4.7 queried interest in pursuing an academic research career. Regarding inclusion of cancer prevention in career plans, before entering the program, one student “definitely” included cancer prevention in career plans, eight said “maybe/some” cancer prevention was included in their career plans, and one had no plans including cancer prevention, while after the program, nine responded “maybe/some” cancer prevention was included and one responded as “focused” on cancer prevention. No students responded that they had no intentions to include cancer prevention in some form in their career plans. It is not clear how much change occurred in the career plans of those who answered that they had “maybe/some” focus both before and after the program. One student did state that he or she had initiated an interest in research (*a* below). Overall, however, this trend is consistent with previous research [10–15] showing that short-term research experiences provide clarification, refinement, or ruling out of existing career plans rather than stimulating new plans. The five comments provided in the open-ended response portion of this question (Q4.2) illustrate the students’ thoughts on their career plans 8 months after the experience:

- a. “I had never considered a career in research before the summer of 2010. Now, not only can I see myself possibly doing research, I see myself glancing more and more at cancer prevention and what that would mean for my career.”
- b. “I always knew I wanted to be a physician, but after this program I realized that I really want to work in cancer prevention and specialize in oncology.”
- c. “My original goal even before entering MD Anderson was to become a physician. However, rather than having a change in career goals, it was more of a change in

direction, though the final goal is identical. After my internship, I decided to take more of a primary care approach to medicine in the future.”

- d. “Still want to be a doctor, still do not want to do bench work, but I am more interested in public health work (especially education and nutrition programs) now.”
- e. “I have decided not to pursue an MD/PhD but to pursue an MD instead.”

These comments reveal the participants’ overall increase in knowledge of and interest in promoting cancer prevention, whether in research or practice. While the goals of our program are ultimately to stimulate interest in research careers, such as stated in (a) above, it is gratifying that although some of the participants (especially premedical students) may not have chosen a research career track, they nevertheless still intended to incorporate prevention into their plans.

Questions regarding interest in academic research careers also revealed that students clarified, refined, or confirmed existing career choices. Figure 2 illustrates self-reported changes in student interest in academic careers after exiting the program, together with brief explanations of the responses. As shown, some students became more interested in academic research, but others less so. Student comments *d* and *e* listed above provide additional detail on those who responded “less interested” in a research career. Two respondents wrote in free-response comments regarding the lifestyle choices and values priorities driving their decision-making:

- “I resolved my issues with prioritizing my interest in practicing clinically, which directly benefits patients, versus conducting research, which more or less indirectly benefits patients.”
- “It seems like you have to give up everything else you love in life to really accomplish something great in research. A lot of the speakers talked about balance, but they also talked about only working in clinic 4 h/week and spending 12 h/day at MDA.”

These reflections highlight the desire and need students have at this stage to explore and “try on” possible careers. While some students ended up learning that a career in research was probably not a good fit for them, we view this as a positive personal outcome for the students. Moreover, the students who answered the survey had all maintained a heightened interest in promoting cancer prevention in the career track of their choice; we view this as a very positive outcome.

Appeal and Self-reported Effectiveness of Program Elements

The survey asked students which elements of the program they liked or disliked the most and, separately, which elements of the program helped or did not help them (Table 1). Overall, response in both categories was highly positive, as shown. The activities that rated the highest in appeal for the students were “working with my mentor” and “career talk lunches with faculty,” followed by “other career and professional talks.” The activity that rated lowest in appeal was “creating my poster or my presentation,” perhaps not surprising since it was a required assignment rather than an experience.

The activities that students rated most helpful were “other career and professional talks” and “career talk lunches with faculty.” Second most helpful was “research talks such as Grand Rounds.” “Working with my mentor” ranked 8th.

Rating the overall impact of program activities, one respondent wrote in:

- “This program was very focused on recruiting researchers. There was a lot of pressure to continue research, and the idea of ‘just’ being a clinician did not seem good enough. Not everyone will enjoy a career in research.”

Finally, in a free-form question soliciting additional comments about the program or the student’s experience, two respondents wrote in:

- “I really liked the program overall... I have cancer prevention thoroughly established in my mind. :) Still, the basic science researchers had to work a lot harder to accomplish something worthwhile and were left out in some cases because of that.”
- “This program really helped me to see all the different aspects of cancer prevention. I can easily say that this program changed my career outlook, and I look forward to being a physician researcher working in cancer prevention for many years to come!”

These comments reiterate the themes of increased knowledge of and interest in cancer prevention, in general, together with reflection on the implications of choosing a career in research.

Discussion

The results of the 2010 cohort survey and the additional student feedback from student evaluations and progress reports provide insight into the impact that a structured, enriched research experience can have on interests and plans of students interested in medical and scientific careers. As one of the primary goals of the program is to increase awareness of the range of opportunities in the field of cancer prevention, we were encouraged to see that all students expressed substantially greater awareness of and interest in cancer prevention as part of their careers, whether focused on research or on medical practice (The majority were premedical students.) The effect of the program on stimulating interest in research as a career track was mixed, with some students becoming more interested in research careers, others simply confirming an existing interest, and still others discovering that a research career was not a good fit for them. This is consistent with other findings in the literature that research experiences do not determine the choice of research as a career but rather refine, reinforce, or clarify an existing desire to do research. [10] Those students who became less interested in research careers generally liked their mentors and their projects, but indicated that the lifestyle of a researcher did not appeal to them.

The fact that the activities rated most helpful were the career talk lunches and Grand Rounds is noteworthy. We expected that students would rate the research project and working with the mentor as the most helpful. It seems likely that the lower rating on the research project and working with the mentor was due to variability among the students’ experiences, with some students having outstanding experiences and others less so, while the career talk lunches and Grand Rounds were numerous and varied. We draw two important conclusions from this information: first, that having significant structured group experiences can help augment and compensate for variability of individual research experiences, and second, that exposure to a variety of career types and trajectories (through career chats, guest lectures, and interviews) is valuable for students at this stage in their academic careers, as they begin to refine their interests. Even learning about one another’s projects, from health communications to geographic information systems to tumorigenesis, helped students understand the range of specializations available to them. A single research experience with a single mentor may—or may not—be a milestone in a student’s career development, yet still may not provide enough of an overview of possibilities for career choice.

Lessons Learned

We offered the curriculum the following summer (2011) to a similar group of students. Based on the survey evaluations received and our experiences during the initial summer program, we emphasized some program elements more and downplayed or eliminated others.

- Based on our observations of the robust benefits provided by variety in programming, we increased opportunities for students to experience a wide range of topics and perspectives, such as the career talk lunches and informational interviews. Students were also strongly encouraged to attend as many research talks around the institution as time permitted and visited a neighboring children's cancer hospital.
- The panel discussion of students and trainees at the 2010 Trainee forum was one of the lowest rated elements, both in the survey itself and in terms of immediate student reaction. Since most of the panelists had very similar experiences and messages, much of the material was repetitive, and this event had limited value. In 2011, we redesigned the Trainee forum, inviting postdoctoral fellows to organize and design the event. The redesigned forum was much more interactive. Students rotated at 30-min intervals among discussion tables with themes of various types of research including behavioral science, epidemiology, clinical research laboratory research, community-based research, and health disparities research. Each table was "staffed" with a senior faculty member, a junior faculty member, and a postdoctoral fellow representing that branch of research and students engaged in discussions to learn about the issues, challenges, and lifestyles of different disciplines. Again, the increased variety afforded by this redesigned program as well as the interactivity elicited a positive response from students.
- The amount of weekly written assignments for students was reduced. In the initial program, in addition to their final research presentation, students were asked to submit three monthly reports, their elevator speech, write-ups of informational interviews, group write-ups of career talk lunches, and several incremental assignments of the "What color is your parachute?" career exploration exercises. While the quality of student products was excellent, students seemed to struggle to complete all of them, especially the career exploration exercises, and program staff struggled to review all of them. For 2011, students were asked to complete just the elevator speech, which also served as the foundation for their final poster presentation and could be used as self-introduction during informational interviews, and a halfway and final report, in addition to their research presentation. Many also submitted their medical and graduate school admissions essays to the program directors for review, although this was optional.
- In the first year of the program, students were offered a choice of either delivering an oral presentation or creating a poster for their final product. In the second year, all students were required to do a poster as well as a very brief oral presentation based on their elevator speech. Students were also required to attend their colleagues' rehearsal sessions for the oral presentations. This enhancement provided consistency of experience for the students and promoted camaraderie and peer learning. The changes also facilitated planning and choreographing the formal presentation session.

Final Thoughts

Reflecting on the reason for our program's existence—raising awareness of cancer prevention and recruiting the future cancer prevention workforce—invigorated our programming of the summer research experience. We created a series of stimulating activities to increase awareness and understanding of the many opportunities in cancer prevention research. Our observations so far suggest that while the student's research project and mentor relationship may provide the intensity needed to develop functional skills, simultaneously providing a wide variety of perspectives and developmental experiences plays a vital role in fostering student awareness of, interest in, and enthusiasm for a rapidly evolving, highly interdisciplinary field. Regardless of their ultimate career track, whether research, clinical practice, or public education, students with such training will be prepared to play a role in cancer prevention.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Appendix A. Survey questions

A.1 ARRA summer research experience—program graduate survey

Please rate the impact of the following aspects of the program overall. Provide answers for both columns, indicating how much you liked the activities and how helpful they were to you.

References

1. Willet W. Cancer prevention and early detection. *Cancer Epidemiol Biomarkers Prev.* 2003; 12:252s. [PubMed: 12646521]
2. Lippman SM, Hong WK. Cancer prevention science and practice. *Cancer Res.* 2002; 62(18):5119–5125. [PubMed: 12234971]
3. Chang S, et al. The characteristics and training of professionals in cancer prevention and control: a survey of the American Society for Preventive Oncology. *Cancer Epidemiol Biomarkers Prev.* 2004; 13(7):1094–1098. [PubMed: 15247118]
4. Blazer KR, et al. "Future directions in cancer prevention and control: workforce implications for training, practice, and policy" symposium, October 17 to 18, 2009, The University of Texas M.D. Anderson Cancer Center. *Cancer Epidemiol Biomarkers Prev.* 2009; 19 (6):1655–1660. [PubMed: 20501765]
5. Chang S, Collie CL. The future of cancer prevention: will our workforce be ready? *Cancer Epidemiol Biomarkers Prev.* 2009; 18 (9):2348–2351. [PubMed: 19723910]
6. Nash JM. Transdisciplinary training: key components and prerequisites for success. *Am J Prev Med.* 2008; 35(2 Supplement 1):S133–S140. [PubMed: 18619393]
7. Coronado G, et al. Undergraduate cancer training program for underrepresented students: findings from a minority institution/cancer center partnership. *J Cancer Educ.* 2010; 25:32–35. [PubMed: 20082168]
8. Garrison E, et al. Development and pilot evaluation of a cancer-focused summer research education program Navajo undergraduate students. *J Cancer Educ.* 2010; 25:650–658. [PubMed: 20411446]
9. Dores GM, et al. Evaluating research training outcomes: experience from the cancer prevention fellowship program at the national cancer institute. *Acad Med.* 2006; 81(6):535–541. [PubMed: 16728801]
10. Lopatto D. Survey of undergraduate research experiences (SURE): first findings. *Cell Biol Educ.* 2004; 3(4):270–277. [PubMed: 15592600]

11. Seymour E, et al. Establishing the benefits of research experiences for undergraduates in the sciences: first findings from a three-year study. *Sci Educ*. 2004; 88(4):493–534.
12. Alexander, B.; Foertsch, J.; Daffinrud, S. The spend a summer with a scientist program: an evaluation of program outcomes and the essential elements of success. University of Wisconsin-Madison LEAD Center; Madison, WI: 1998. <http://www.wcer.wisc.edu/publications/LEADcenter/sas.pdf>. Accessed 10-20-11
13. Foertsch, J.; Alexander, B.; Penberthy, D. Evaluation of the UW-Madison's summer undergraduate research programs: final report. University of Wisconsin-Madison LEAD Center; Madison, WI: 1997. <http://www.wcer.wisc.edu/publications/LEADcenter/srop.pdf>. Accessed 10-20-11
14. Fitzsimmons, S.J., et al. A preliminary evaluation of the research experiences of the research experiences for undergraduates (REU) program of the national science foundation. Program Evaluation Staff, Office of Budget and Control, National Science Foundation; Washington, DC: 1990.
15. Strayhorn, TL. Work in progress—does learning about research affect the graduate degree aspirations of STEM undergraduates? A path analysis In: Proceedings—Frontiers in Education Conference, FIE. IEEE; Washington, DC: <http://dx.doi.org/10.1109/FIE.2010.5673403>. <http://fie-conference.org/fie2010/papers/1827.pdf>. Accessed 10-20-11
16. Colditz GA, Wolin KY. Transdisciplinary training in cancer prevention: reflections on two decades of training. *J Cancer Educ*. 2011; 26(3):586–590. [PubMed: 21698522]

Fig. 1.
Student evaluation of program activities' impact on learning about cancer prevention

Fig. 2.
Effects of research experience on perception of research careers in cancer prevention

Table 1

Student evaluation of impact of program activities

Answer options	Really liked it	Liked it	Disliked it	Really disliked it	Response count
Like/dislike					
The research project itself	3	6	1	0	10
Creating my poster or my presentation	1	8	1	0	10
Working with my mentor	7	3	0	0	10
Career talk lunches with faculty	6	4	0	0	10
Health disparities conference in June	4	5	1	0	10
Panel talk with graduate students and postdocs	2	7	1	0	10
Research talks such as grand rounds	3	6	1	0	10
Informational interviews	2	7	1	0	10
“What color is your parachute?”	3	6	1	0	10
Other career and professional talks (email etiquette, understanding letters of recommendation, elevator speech, etc.)	3	7	1	0	10
Helpful/not helpful					
The research project itself	4	5	0	1	10
Creating my poster or my presentation	3	6	1	0	10
Working with my mentor	5	3	2	0	10
Career talk lunches with faculty	6	3	1	0	10
Health disparities conference in June	3	5	2	0	10
Panel talk with graduate students and postdocs	3	4	2	1	10
Research talks such as grand rounds	5	4	1	0	10
Informational interviews	4	5	1	0	10
“What color is your parachute?”	4	5	1	0	10
Other career and professional talks (email etiquette, understanding letters of recommendation, elevator speech, etc.)	4	6	0	0	10