Barriers to Racial/Ethnic Minority Application and Competition for NIH Research Funding

Vickie L. Shavers, PhD; Pebbles Fagan, PhD, MPH; Deirdre Lawrence, PhD, MPH;
Worta McCaskill-Stevens, MD; Paige McDonald, PhD; Doris Browne, MD, MPH;
Dan McLinden, ED; Michaele Christian, MD; and Edward Trimble, MD
Bethesda, Maryland and Montgomery, Illinois

Disclaimer: The views expressed are those of the authors or those of project participants as noted and are not to be considered official views or opinions of the National Cancer Institute.

Background: Despite recognition of the need to increase the pool of racial/ethnic minority investigators, racial/ethnic minority representation among National Institutes of Health (NIH)-funded investigators remains low. Racial/ethnic minority investigators bring unique perspectives and experiences that enhance the potential for understanding factors that underlie racial/ethnic variation in health and health status. Identification of barriers to successful minority competition for NIH funding and suggestions for strategies to overcome them were obtained from a concept mapping project and a meeting of minority investigators and investigators at minority-serving institutions.

Methods: Concept mapping, a mixed-methods planning approach that integrates common data collection processes with multivariate statistical analyses, was used in this exploratory project. The concept mapping approach generated a series of related "concept maps" that were used for data interpretation and meeting discussions.

Results: Barriers to minority investigator competition for NIH funding identified by concept mapping participants include: 1) inadequate research infrastructure, training and development; 2) barriers to development as independent researchers; 3) inadequate mentoring; 4) insensitivity, misperceptions and miscommunication about the specific needs of investigators involved in research with minority communities; 5) institutional bias in NIH policies; 6) unfair competitive environment; 7) lack of institutional support; 8) lack of support for research topics/methods relevant to research with minority communities; and 9) social, cultural and environmental barriers.

Discussion: Data from both the concept mapping and the meeting discussions suggest the need to use a multilevel approach to increase minority representation among funded NIH investigators. Specifically, the NIH should use strategies that overcome barriers at the home institution, within NIH and at the investigator level.

Key words: race ■ ethnicity ■ research funding ■ minority underrepresentation

BACKGROUND

Despite recent scientific gains in screening, diagnosis and treatment, racial/ethnic minorities continue to experience disproportionate morbidity and mortality. The disconnect between discovery and delivery is mentioned as a factor that contributes to the disparate health of racial/ethnic minorities in the 1999 Institute of Medicine (IOM) committee report, *The Unequal Burden of Cancer*[1] and its 2002 report on *Unequal Treatment*.[2] In the more recent report, the IOM indicated the need to supplement investigator-initiated research to ensure that the needs of racial/ethnic minorities and other medically underserved populations are addressed. The IOM committee also recommended that the National Cancer Institute (NCI) coordinate and leverage programs and resources across divisions and branches to stimulate research to specifically address the needs of these groups, and that training and educational strategies be used in conjunction with other strategies/approaches to eliminate racial/ethnic disparities in healthcare. Expanding minority investigator competition for and minority population involvement in health disparities research is one of four areas of emphasis for addressing health disparities in the

NCI's fiscal year 2004 budget request.[3]

There are several factors that support increasing the number of racial/ethnic minority investigators:

1) public health statistics show that racial/ethnic minorities suffer disproportionately from diseases that can be prevented or controlled.[4]
2) other statistics show that racial/ethnic minority investigators are more likely than their white counterparts to focus on diseases and/or risks that have a disproportionate impact/prevalence among racial/ethnic minority populations.[5]
3) racial/ethnic minority investigators bring unique perspectives and experiences that enhance the potential for understanding the factors that underlie racial/ethnic variation in health and health status among the American population.[6]

NCI is one of the 27 institutes and centers that comprise the National Institutes of Health (NIH), whose mission is to acquire new knowledge to help prevent, detect, diagnose and treat disease and disability.[7] The NIH accomplishes its mission through "1) research conducted in its own laboratories, supporting the research of nongovernmental scientists at universities, medical schools, hospitals and research institutions both domestically and internationally; 2) training of research investigators, and 3) fostering communication of medical and health science information."

Despite recognition of the need to increase the pool of racial/ethnic minority investigators by the NIH in general, racial/ethnic minorities comprised approximately 13.8% of funded principal investigators on NIH research and program grants (RPGs) in fiscal year 2002 for whom race/ethnicity were identified (Table 1). Investigators from underrepresented minority groups (African Americans, Hispanics, Native Americans), however, only comprised 3.2%

of funded principal investigators on RPGs, 5.5 % on NIH training grants and 10.7% on NIH fellowships,[8] while these minority groups comprise nearly 25% of the U.S. population.[9] The underrepresentation of racial/ethnic minority scientists among NIH-funded principal investigators may be due to several factors, including the small numbers of minority scientists, number of minority scientists who apply for NIH funding and the low success rates of minority NIH funding applications. African Americans, Hispanics and Native Americans comprised 4.1%, 3.9% and 0.7% of recipients of doctoral degrees in science and engineering in 1999,[10] and 3.1%, 3.9% and 0.1% of U.S. medical school faculty in 2003, respectively.[11]

The purpose of this exploratory project was to identify:

a) factors that impede racial/ethnic minority investigator application and successful competition for NIH research funding and
b) specific actions that could be undertaken by NIH to increase minority representation among NIH-funded principal investigators.

A concept-mapping exercise was conducted with minority investigators and investigators at minority-serving institutions. These data can help NIH better design programs and tailor activities to increase minority application and funding by NIH based on the self-identified needs of minority investigators.

METHODS

Minority investigators identified from participant lists of NCI programs, other conferences attended by NCI staff or personally identified by NCI staff formed a convenience sample of 160 potential participants. All participants were contacted by e-mail and invited to participate in the concept-mapping. Thirty-five of these individuals were also selected to

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Table 1. National Institutes of Health funding awards for selected mechanisms, fiscal year 2002 by race/ethnic group

	Research Program, Grants n (%)	NIH Training Awards n (%)	NIH Awards n (%)	NIH Research Career Program n (%)
Race/Ethnic Group				
American Indian/Alaska Native	53 (0.1%)	4 (0.2%)	11 (0.4%)	10 (0.3%)
Asian/Pacific Islander	3,891 (10.6%)	95 (4.3%)	243 (8.7%)	335 (9.4%)
Black	298 (0.8%)	52 (2.3%)	123 (4.4%)	90 (2.5%)
Hispanic	844 (2.3%)	66 (3.0%)	164 (5.9%)	122 (3.4%)
White	29,094 (79.3%)	1,942 (87.4%)	1,529 (54.9%)	2,218 (62.3%)
Unknown race/ethnicity	2,495 (6.8%)	62 (2.8%)	713 (25.6	784 (22.0%)
Total	35,575 (100%)	2,221 (100%)	2,783 (100%)	3,559 (100%)

Adapted from data from the NIH IMPAC II database, courtesy of Dr. Belinda Seto.

attend a 1.5-day planning meeting to discuss the concept-mapping results and to suggest items to include in an upcoming workshop. To acquire a diverse group of participants for the planning meeting, NCI planning committee members selected meeting attendees from investigators who submitted statements of contribution, which summarized their training, knowledge, experience and NIH funding history. About 68% of the planning meeting attendees had received NIH funding; however, only four (11.8%) had received a research project (R01) grant.[12] The most frequent NIH mechanism of funding for attendees was the K-series career development awards (K01, K22, K08).[13] About 26% of meeting attendees were basic scientists, 38% clinicians, 14.7% each were social scientists and epidemiologists and 6% were from other disciplines. Planning meeting attendees were also racial/ethnically diverse. Together with the seven members of the NCI planning committee, which included six African-American NCI staff members from diverse disciplines, they formed the core group of participants. A second group of participants, the extended group, included members of the core group and the other individuals in the sample who were not selected to attend the planning meeting (n=125). The extended group participated in the all concept-mapping activities except for sorting. The race/ethnicity and research disciplines of members of the extended group who were not on the planning committee or who did not attend the meeting are unknown due to the anonymity of the concept-mapping exercise.

Concept-mapping,[14] a mixed-methods planning approach that integrates common data collection processes (e.g., brainstorming, categorization of ideas and the assignment of value ratings) with multivariate statistical analyses, was used to generate a series of related concept maps. Data were collected in several steps, including: 1) the brainstorming or statement generation step, 2) statement synthesis, 3) sorting, and 4) rating. Participant responses were obtained via the Internet or by fax.

Brainstorming

During this initial step, all participants were asked to submit statements to complete each of the following two focus prompts hereafter referred to as the barriers prompt and the actions prompt, respectively:

1. "Specific barriers that need to be overcome in order to increase the success of racial and ethnic minority researchers in competing for NIH funding are …"
2. "Specific actions that need to be taken to increase the success of racial and ethnic minority researchers in competing for NIH funding are…."

Each of the two focus prompts generated a separate set of statements and concept maps.

Statement Synthesis

Two-hundred-fifty-four statements were generated from the barriers prompt and 201 for the actions prompt. Statement synthesis and editing were performed by the NCI planning committee to reduce statement redundancies and to improve clarity. After this process, 86 statements remained for the barrier prompt and 98 for the action prompt. The final statement sets maintained the general themes identified during brainstorming.

Figure 1. Importance of factors identified as barriers to minority investigator application and successful competition for NIH funding

Inadequate research infrastructure, training and development (4.01)

Barriers to development as Independent researchers (3.94)

Inadequate mentoring (3.86)

Insensitivity, misperceptions and miscommunications (3.71)

Institutional bias in NIH policies (3.67)

Unfair competitive environment (3.56)

Lack of institutional support (3.55)

Unsupported research topics/methods (3.50)

Social, cultural and environmental barriers (3.39)

MORE IMPORTANT

LESS IMPORTANT

Sorting

Members of the core group worked individually to identify themes among the ideas by completing a sorting task. In the sorting task, individuals organized or sorted the statements in the final statement sets into groups or themes based on similarity of the ideas. Two dedicated websites were provided for this purpose, one for each focus prompt. Participants were also permitted to complete the task on paper and fax their results for entry into the software.

Rating

Both the core and extended groups rated the brainstormed statements on a five-point Likert scale ranging from 1 (least important) to 5 (most important). The barrier prompt, designed to identify specific barriers to minority funding, was rated on its importance as a barrier to minority competition for NIH funding. The actions prompt, designed as a basis for recommendation, was rated on two dimensions: importance and feasibility of implementation.

Statistical Methods

Multidimensional scaling and hierarchical cluster analysis were used to integrate the sorted informa-tion from each individual and develop a series of concept maps and reports using the Concept System software.[15] The sorted statements were used to construct an NxN binary matrix of similarities. The total similarity matrix was analyzed using nonmetric multidimensional scaling (MDS) analysis with a two-dimensional solution.[16] The two-dimensional solution yields a configuration in which statements that were sorted together most often are located more closely in two-dimensional space than those less frequently sorted together. The goodness of fit was assessed with stress values where a lower stress value (i.e., closer to zero) indicates a better fit. The stress values for the barrier and action concept maps were 0.31 and 0.30, respectively. The x, y configuration resulting from the MDS analysis provided the input for the hierarchical cluster analysis, which was performed using Ward's method.[17]

Individual ratings were averaged for each item and then for all items within each cluster. Because the statements for the action prompt were rated as to importance and feasibility, we were able to compare the rating patterns and depict them graphically in a manner analogous to Trochim.[14] These patterns form the focus for interpretation and discussion.

Figure 2. A nine-cluster concept map of the main barrier topics or concepts
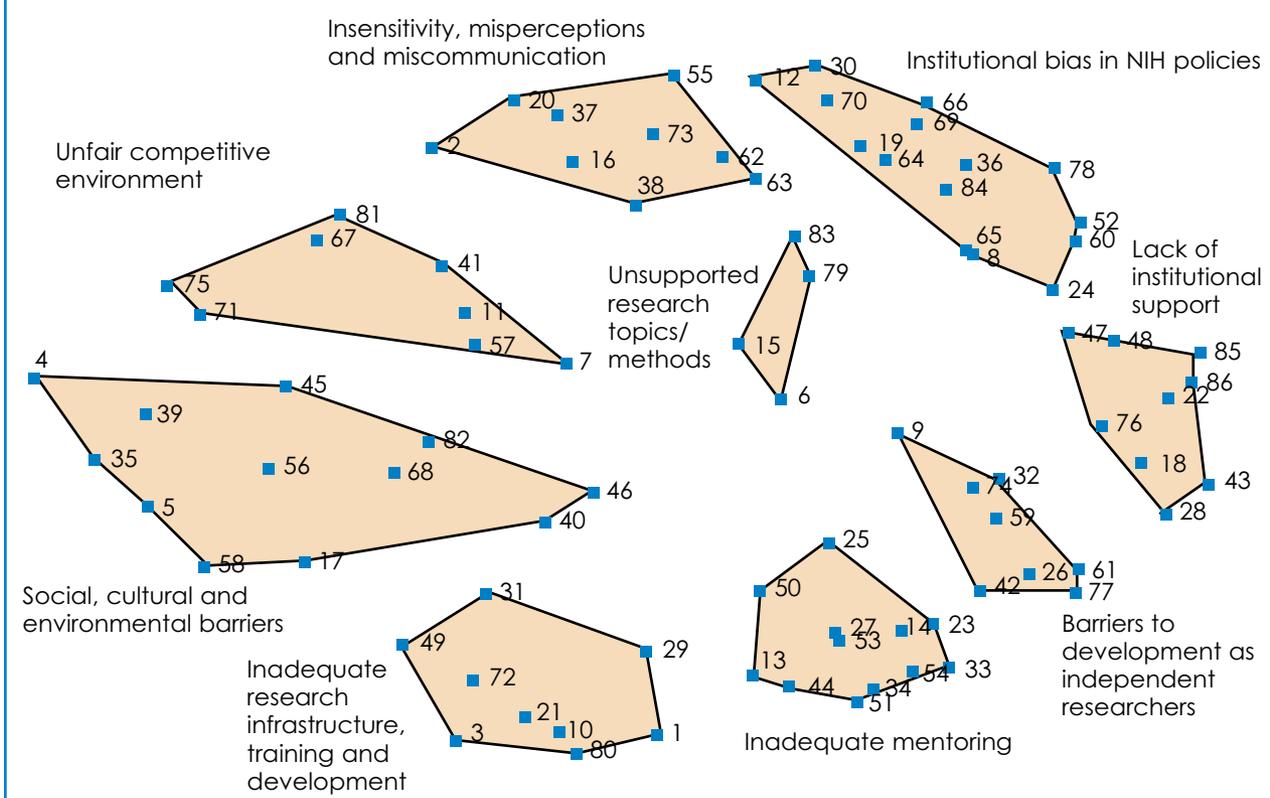
The numbers on the map correspond to the numbers on the statement lists in Table 2.

Table 2. Brainstormed statements for barrier clusters

"Specific barriers that need to be overcome in order to increase the success of racial/ethnic minority researchers in competing for NIH funding are…"

CLUSTER 1. Inadequate Research Infrastructure, Training and Development
1. Inadequate training in research methods, including how to conduct data analysis.
3. Lack of health and science training and career development throughout the educational pipeline from grade school through postgraduate levels.
10. Limited experience in developing independent research programs (e.g., protocol development).
21. Insufficient knowledge of what an excellent/outstanding R01 application looks like.
29. The low attendance of minority students at high-caliber undergraduate and graduate schools with well-funded research programs.
31. Lack of training in the culture and expectations of the NIH review process.
49. Lack of a research culture in minority institutions.
72. Insufficient scientific infrastructure in elementary, secondary, postsecondary and graduate environments that serve racial/ethnic minorities.
80. Lack of grant-writing experience and knowledge of the grant application process.

CLUSTER 2. Barriers to Development as Independent Researchers
9. Senior investigators not including minorities as coinvestigators on grants.
26. The small number of mentors who encourage independent research by their minority postdocs.
32. Lack of funds to travel to meetings and training programs.
42. Lack of internal and external financial support to develop as a researcher.
59. Lack of funding support for minority and nonminority senior investigators to perform mentoring of minority junior investigators.
61. The inability to find collaborators at the investigators home institution with interest in the proposed research area.
74. Lack of protected time for research due to a variety of factors [e.g., heavy teaching loads at historically black colleges and universities (HBCUs), lack of time to prepare grant applications].
77. Lack of support and commitment on the part of academic institutions to recruit and train minority junior faculty to become independent investigators.

CLUSTER 3. Inadequate Mentoring
13. Lack of opportunities for minority students at academic institutions (scholarships, mentoring, work-study programs).
14. Lack of training opportunities at academic institutions for cancer control researchers.
23. Decreased access to grant-writing workshops.
25. Lack of pipeline programs to encourage minority researchers.
27. Few opportunities to collaborate with appropriate senior investigators who might assist with grants and include the investigator as an author on research publications.
33. Insufficient guidance in NIH grant-writing and lack of awareness of various available NIH funding mechanisms.
34. Lack of first time hands-on assistance about how to apply for funding.
44. Lack of pregrant submission mock reviews.
50. The small number of minority researchers available to serve as mentors and role models.
51. Lack of mentoring of racial/ethnic minority researchers in the technical aspects of producing fundable proposals.
53. The lack of available colleagues knowledgeable in a particular area and willing to critique the application prior to submitting in order to provide feedback.
54. Absence of substantive mentoring relationships at all levels of training.

CLUSTER 4. Insensitivity, Misperceptions and Miscommunications
2. A system which awards aggressive, outspoken individuals who can network effectively at the expense of other peoples whose cultures place a high priority on respect for others and a reserved character (i.e., a lack of political influence).
16. Communication gap between the National Institutes of Health (e.g., Scientific Research Administration), researchers, teachers and potential minority students/researchers.
20. Community participatory research and translations take more time to be done correctly than reviewers often allow, either by time or through the budget.
37. The stigmatization of minority-based grants and/or minority-focused research.

Planning Meeting Brainstorming

Results of the concept-mapping project were presented at the planning meeting. Meeting attendees were organized into small workgroups to evaluate, synthesize and prioritize suggested action steps and to make recommendations for an upcoming workshop. A summary of the results of the planning meeting discussion and recommendations is provided.

RESULTS

Response Rates

The majority of responses were provided via the website. Because the brainstorming process was anonymous, the number of participants are estimated by combining the number of faxed responses with the number of visits to the website. One-hundred-ten individuals are estimated to have participated in the barrier brainstorming and 85 in the action brainstorming phases. Overall response rates for those invited to participate in the concept-mapping were 31%, 25% and 23% for the importance ratings for the barrier prompt and importance and feasibility ratings for the action prompt, respectively.

Barriers from Concept-Mapping

The 86 unique statements in response to the barrier prompt that remained after statement synthesis

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Table 2 continued

38. Lack of consideration for the long start-up time required to establish partnerships with minority communities and groups.
55. The belief among grant reviewers that minority researchers' training is substandard or that minority researchers cannot produce quality research results.
62. Perceived lack of respect for HBCUs.
63. Perception that the NIH desires applications from minorities, but the minority investigators doing the research are not valued.
73. The lack of sensitivity and understanding among grant reviewers of differences in the contextual environment for research involving racial/ethnic minority communities and/or health disparities research.

CLUSTER 5. Institutional Bias in NIH Policies
8. Systemic bias that makes the conduct of research in minority communities challenging (i.e., lack of quality surveillance data).
12. Absence of truly peer review process.
19. Lack of support from program officers for research applications from minority investigators that are near the funding line (e.g., funding by exception).
24. Policies that restrict minority investigators from being principal investigators on their research projects.
30. Bias, prejudice, racism and discrimination in peer-review groups.
36. Inadequate representation of racial/ethnic minorities on grants review and other NIH committees.
52. Lack of any real commitment by NIH to reduce health disparities.
60. Misuse of minorities in requests for applications (RFAs) to force partnering with majority institutions.
64. Study sections that are not responsive to research issues primarily involving minority populations.
65. Lack of accountability of the principal investigators for training grants.
66. Review committees that are not multidisciplinary or multidimensional with regards to expertise, career level and demographic characteristics.
69. Lack of NIH staff belief in the necessity of including minority investigators in research.
70. The extra scrutiny that grant proposals on minority health are subjected to.
78. The number of restrictions placed on special awards granted to minority scientists (e.g., rewards that allow the awardees flexibility based on individual needs to use the funding for either salary or research expenses).
84. Bias against underrepresented scientists, HBCUs and other minority-serving institutions.

CLUSTER 6. Unfair Competitive Environment
7. Senior researchers' lack of awareness of barriers faced by minority researchers.
11. Overwhelming competition from large and more established institutions that are predominantly mainstream (historically Anglo-oriented).
41. Increased competition for limited supply of money.
57. Lack of validated tools that could be applied (since the questions haven't been asked yet, the measures haven't been developed).
67. Staying faithful to randomized controlled trial design when it is unfeasible and often inappropriate in community-based research.
71. Fear of an unfair evaluation at study section.
75. Intimidation felt by racial/ethnic minorities that prevent them from considering NIH funding.
81. Research priorities of nonmainstream cultures that differ rather significantly from mainstream culture.

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are provided in Table 2. These statements were sorted into clusters that represented nine central themes or major barrier categories (Figure 1). The point map in Figure 2 is a graphical representation of the nine main barrier clusters/themes identified in the concept-mapping. Each number represents one of the 86 unique responses to the barrier prompt listed in Table 2. Statements that are closer together were more frequently sorted together in the concept-mapping, which indicates that they were perceived by participants to capture similar concepts/themes. The name given to each cluster reflects the theme or topic expressed in the statements contained in that cluster. Barriers clusters in rank order of importance include:

1) inadequate research infrastructure, training and development,
2) barriers to development as independent researchers,
3) inadequate mentoring,
4) insensitivity, misperceptions and miscommunications,
5) institutional bias in NIH policies,
6) unfair competitive environment,
7) lack of institutional support,
8) unsupported research topics/methods, and
9) social, cultural and environmental barriers (Figure 2).

Table 2 continued

CLUSTER 7. Lack of Institutional Support
18. Lack of appropriate staff at institutions to implement grants.
22. Poor incentive for institutions to encourage minority researchers to apply for special monies because of the cap on indirect cost rates.
28. Insufficient support and/or commitment from the researcher's home department up to and including the provost.
43. Lack of equitable release time from teaching responsibilities.
47. Lack of opportunities for funding translational research.
48. Few organized opportunities sponsored by NIH to network with other minorities at national/international conferences.
76. Lack of importance of NIH funding for the academic promotion of minority investigators.
85. The lack of new pilot funding streams to provide a foundation for future submissions for competitive funding.
86. Relative shortage of funds to provide a funding bridge for recent graduates and to allow time for submission of K Awards, RO3s and RO1s.

CLUSTER 8. Unsupported Research Topics/Methods
6. Criteria used to review research proposals are not always clear.
15. Little emphasis on innovative types of researchers (community-based, epidemiologic), as this type of research may appeal more to minority students than traditional bench research.
79. A research environment that devalues minority-based-/-focused research.
83. Absence of a formal NIH commitment to active community-based participatory research.

CLUSTER 9. Social, Cultural and Environmental Barriers
4. Language barriers that cover the spectrum of communication skills.
5. The many community obligations of minority researchers that deplete the time, personal energy and the intensity needed to write strong research grant applications.
17. Fear by minority researchers that their research is not to the level of others and that it is not fundable.
35. The large number of minority investigators who opt for careers in government rather than academia or private industry.
39. Lack of self-confidence and necessary contacts.
40. Insufficient numbers of investigators from underrepresented groups.
45. Discrimination and internalized feelings of inferiority that translate into decreased self-confidence among junior minority investigators, which cause them to give up.
46. The invisibility of minority investigators due to low rates of publication, meeting presentations and other factors required to establish a track record in a specific research area.
56. Lack of motivation to participate in research (e.g., low financial incentives).
58. The fact that minority researchers are often the first in their families and communities to get into the academic world (they are unacculturated).
68. Lack of awareness of the increasing importance of multiple disciplines in cancer care that have significant funding potential.
82. Perceived conflict between teaching mission of minority-serving institutions and scientific research.

Table 3. Brainstormed statements for actions prompt

"Specific actions that need to be taken to increase the success of racial and ethnic minority researchers in competing for NIH funding are…"

CLUSTER 1. Create opportunities for mentorship/collaboration
5. NIH should make a commitment to provide and support mentorship both within NIH and within the institutions supported by NIH.
6. Create mentored research opportunities specifically for minority investigators in population-based sciences.
8. Establish an African-American consortium and yearly meetings to foster mentoring.
14. Develop and implement structured mentoring activities to facilitate scientific development and grantsmanship.
19. Allow mentors from outside the geographic region of the applicant.
24. Develop an online minority research community to facilitate collaboration and mentoring, and to exchange ideas and information.
25. Develop a database of senior minority (or nonminority) researchers who are willing to serve as mentors for junior minority investigators.
27. Increase opportunities for racial and minority researchers to network and collaborate.
34. Increase the mentoring of racial/ethnic minority predoctoral, doctoral and junior investigators.
65. Create and support "distant" mentoring for minority junior faculty since many institutions lack qualified mentors.
70. Develop mentoring programs for scientific development and grantsmanship.
76. Build relationship with minority researchers at the graduate level.
82. Connect minorities with NCI internal researchers for collaboration.
89. Establish a database of senior active researchers who are willing to collaborate on research projects.

CLUSTER 2. Increase Commitment and Accountability
1. Prioritize the funding of R01 applications submitted by minority scientists in cases when the application is relevant and scientifically justified.
16. Increase inclusion of appropriate persons from underrepresented groups on the NIH advisory boards and on the advisory boards of the Institutes'.
23. Have guidelines and regulations that require NIH institutes to abide by the short review time for those submitting supplemental grants to support minority investigators.
29. Emphasize the importance of having minority scientific staff within all NIH divisions.
51. Increase the number of scientific administrators from underrepresented groups at the NIH (e.g., more minorities in the development of RFAs).
53. Ask for greater accountability for Institutional support to minority researchers.
57. Make it a Health and Human Services priority to train more minority scientists in population sciences.
67. Engage universities in recruiting more racial/ethnic minority researchers into their programs (e.g., provide financial incentives).
73. Condition financial support to NCI-designated cancer centers on fulfillment of the commitment to hire a specified number of minority faculty.
79. Increase representation by investigators from underrepresented groups as presenters at NIH-funded forums/conferences.

CLUSTER 3. Sensitize and Diversify the Review Process
11. Conduct workshops for study section members and NIH administrators to sensitize them to relevant research questions and approaches in minority health research.
20. Include in NIH staff performance evaluations accomplishments in reducing health disparities.
30. Use selection criteria for grant reviewers that consider their effective and productive history and/or reputation of working with racial/ethnic groups.
37. Train NIH staff on the importance of reducing health disparities.
39. Have a diverse study review section that incorporates scientists that value qualitative research and the importance of cross-cultural validation of surveillance instruments and behavioral interventions.
62. Create review panels that are responsive to minority focused research applications.
68. Identify and actively recruit racial/ethnic minorities to serve on standing and ad hoc study sections.
71. Involve an adequate number of experienced racial/ethnic/minority researchers at all levels of NIH research funding process.
74. Educate reviewers about HBCUs.
80. Simplify application procedures.
92. Discourage the use of standard verbiage on study sections that promote the use of broad statements that encompass multiple problems without directly stating what the exact criticism is.

Suggested Actions from Concept-Mapping

Eight general themes emerged as actions that NIH might take to help reduce barriers to minority application and competition for NIH funding. For the most part, suggested actions were consistent with items identified as barriers. In order of ranked importance these include:

1) create opportunities for mentorship/collaboration,
2) increase commitment and accountability of institutions funded by NIH as well as NIH
3) sensitize and diversify the grants review process,
4) provide more technical assistance and skill-building programs,
5) increase funding opportunities for career development,
6) cultivate long-term relationships between NIH

Table 3 continued

95. Ensure that all study section reviewers follow the review criteria and do not let bias interfere with their scoring.

CLUSTER 4. Provide More Technical Assistance and Skill-Building Programs
2. Provide advising teams to build adequate research infrastructure at every level (space, equipment, staffing, training grants, etc.) with well-planned oversight.
10. Fund minority arms of professional associations, such as the American Association for Cancer Research, to conduct technical assistance workshops.
15. Provide grant management instruction for HBCU principal investigators, including workshops specifically designed for principal investigators.
22. Advertise funding availability in journals and other mechanisms routinely accessed by minority investigators.
26. Create a system whereby minority researchers can be given more feedback on how to make their grants better.
44. Increase literacy in minority communities about health research.
45. Recommend protected time for minority researchers as junior faculty to learn how to write grants.
46. Provide more opportunities for communicating with NIH (e.g., technical assistance, newsletters and program staff).
50. Conduct focus groups among leadership of minority-serving institutions to discuss benefits of changes in institutional missions and practices to include research.
60. Increase core facilities at historically black institutions to improve infrastructure.
61. Conduct regional and national NIH-sponsored scientific symposia to update minority researchers on the state of the science.
63. Provide an annual grant-funding seminar for first-time R01 interested applicants that are taught by senior minority researchers.
75. Establish evaluation plans for the principal investigator (training grant and minority supplement) to ensure trainees are well mentored and supervised.
78. Provide samples of funded R01 research applications in basic, epidemiological, ecological and community-based research.
83. Provide assistance with interpreting summary sheets to help young investigators, in particular, to read between the lines.
90. Increase awareness of faculty at research institutions so that they are aware of programs that exist to mentor disparate students.
94. Hold regional workshops for minority scientists on grant-writing and current funding mechanisms available to them.

CLUSTER 5. Increase Funding Opportunities for Career Development
32. Provide opportunities for minority investigators to buy research time.
54. Encourage applications from senior minority investigators who are funded outside of NIH.
55. Implement program announcements (PAs) and RFAs with emphasis on disparity research.
58. Fund social science research that is cancer-focused.
59. Award minority investigator supplements to investigator rather than principal investigator institution.
69. Instill a reward system (such as the MERIT awards) for young and mid-career minorities.
72. Promote the creation of Minority Centers for Excellence in academic institutions and give incentive packages that the institutions can use to for initial support for the career of qualified minority faculty.
77. Tie minority supplements to more funding mechanisms.
81. Increase the availability of K awards and extend eligibility period to five years from receipt of degree or completion of postdoc.
93. Renew the national minority cancer research and training networks.
98. Make available funding mechanisms, like K01 awards, that support minorities at critical junctures in their careers.

Table 3 continued

CLUSTER 6. Cultivate Long-term Relationships between NIH and Its Constituencies

12. Follow-up on previous awardees of minority grants and determine their success rate in achieving an R01.
21. Work more closely with academic institutions' grants and contract offices.
28. Identify minority investigators' grants through the review and revision process and, if necessary, provide cogent advice on how to improve the grant.
40. Engage in dialogue with faculties at HBCUs and other minority serving institutions to better understand the priorities of their institution.
42. Provide information about NIH study sections, including research focus, composition and expertise of reviewers and scoring of proposals previously reviewed by specific study sections.
52. Educate graduate students about racial/ethnic minorities as part of their NIH ethics requirement course.
88. Provide mentoring for minority investigators to serve on review committees.
91. Improve tracking of successful and unsuccessful applicants in the investigator-initiated pool.

CLUSTER 7. Broaden Scope and Type of Funding

4. Expand the scope of the National Center for Minority Health and Health Disparities to allow investigator-initiated proposals to be considered for funding.
7. Address financial issues, such as the amount of grant funding that is provided to summer students and/or fellows from nondisparate backgrounds, and require the principal investigator to provide matching funds to someone from a disparate background.
17. Fund community-based research.
35. Fund collaborative grants between HBCUs and industry.
42. Provide direct financial support to college/university departments for minority investigators' time away from routine duties/responsibilities to minimize loss to university.
43. Provide financial support for outreach programs and for minority investigators' travel to minority institutions and communities with large minority populations.
48. Fund sabbaticals for minority researchers health professionals and researchers to write journal articles and other manuscripts required for hiring, retention and promotions.
49. Fund and encourage more international studies in poor and underdeveloped countries.
56. Provide opportunities for minority investigators to participate in multicenter studies.
66. Expand and increase the amount of funding available for pilot programs.
84. Provide funding to support infrastructure establishment.
85. Increase financial assistance to programs that are already devoted to increasing minority representation, such as the Comprehensive Minority Biomedical Branch.
86. Allow minority faculty to offer supplemental grants for nonminority students.

CLUSTER 8. Facilitate Professional and Organizational Development

3. Consider the ASPH Planning Grant for Trans-Association Partnership as a model database of pilot projects for future research.
9. Provide mentored research awards that are not restricted to clinical scholars but appropriate for social scientists and other researchers as well.
13. Create a database of minority health professionals and researchers interested in federal employment to make recruitment of minority research administrators more effective.
18. Support joint collaborations, such as between minority and majority institutions, and provide mechanisms to facilitate such collaborations.
31. Provide technical support funds (e.g. grant administration).
33. Develop incentives for majority institutions to create a true partnership with minority-serving institutions for collaborative research.
36. Provide partnerships with offices of sponsored programs to identify funding opportunities and support applications for each institution's minority researchers.
38. Support professional development of mid-career or senior minority health professionals who are ready to transition into research/research administrative roles.
41. Provide funding for researchers at majority institutions to provide substantive mentoring.
47. Advance the science of cross-cultural behavioral research by guiding researchers to grants for instrument development and/or validation.
64. Develop fellowship programs that can take place a couple of times per year, such as a cancer health disparities fellowship.
96. Fund more scientifically diverse training opportunities (e.g., CERTA, CURE) for students at all levels so that they can explore careers as researchers in social sciences and population sciences.

and its constituencies,
7) broaden the scope and type of funding and
8) facilitate professional and organizational development.

The 98 unique statements in response to the action prompt that remained after statement synthesis are provided in Figure 3, and a pattern map showing participant importance and feasibility ratings by cluster is provided in Figure 4.

Specific ideas with high ratings included establishing a formal commitment to mentorship programs, broader racial/ethnic diversity at an organizational level and outreach programs aimed at minority researchers and their institutions. These themes were reiterated during the planning meeting large and small group discussions, which are summarized in the following paragraphs.

Summary of the Planning Meeting Discussion

Creating opportunities for mentoring and collaboration was ranked as both the most important and the most feasible action item to implement in the concept-mapping project. The importance of mentoring to the success of minority researchers was a major component of the planning meeting discussion. Meeting participants felt that there was a need to define the "ideal" mentor and mentee and their respective roles. The lack of substantive incentive for senior investigators, many whom have competing interests and/or responsibilities, to mentor junior minority researchers was also acknowledged as problematic. Meeting attendees thought that NIH could highlight the importance of mentoring by making it more financially rewarding. Other suggestions were to develop and implement structured mentoring, establish a database of senior investigators interested in mentoring minority investigators, establish minority-specific consortiums, a listserv for minority investigators and a telementoring program (e.g., mentoring via phone or computer) to allow investigators to identify and access senior investigators with knowledge and interest in their specific research area, which was felt by many to be difficult to obtain at their home institutions.

Increasing the commitment and accountability of the NIH and the investigator's institution was rated as the second most import action item but ranked fifth among the eight action items in terms of feasibility for NIH to implement. The pairing of institutional accountability for recruiting, retaining, training and mentoring minority investigators to future NIH funding was frequently repeated as an action that could be taken by NIH to help increase institutional commitment. Meeting attendees felt that there

was also a need to develop and support technical assistance programs for historically black colleges and universities (HBCUs) and other minority-serving institutions. To inform NIH in this area, it was suggested that NIH establish an expert working group to identify the types of mentoring relationships that work as well as those that have been unsuccessful. The expert working group should include NIH staff involved in grants administration.

Sensitizing and diversifying the grants review process was also considered an important action that NIH could take to increase minority application and competition for NIH funding. Although study participants rated this as a low-feasibility item to implement, planning meeting attendees had several suggestions for actions that NIH could take. One suggestion was to obtain data from the Center for Scientific Review (CSR) with regard to the diversity of peer reviewers and that these data be used by NIH/NCI to identify recruitment needed to adequately diversify study sections with regard to race/ethnicity and research discipline. Attendees also suggested the NIH conduct an internal review of grant summary statements to identify comments that reflect racism/bias and that peer reviewers, including NIH staff reviewers, be sensitized so that such comments are avoided. Mandatory sensitivity training for all current and future members of study sections could also be implemented. Attendees also suggested that NIH, through the CSR, assure that reviewers adhere to established guidelines for reviewing grant applications during study section meetings so that each application is evaluated only on information contained in that application.
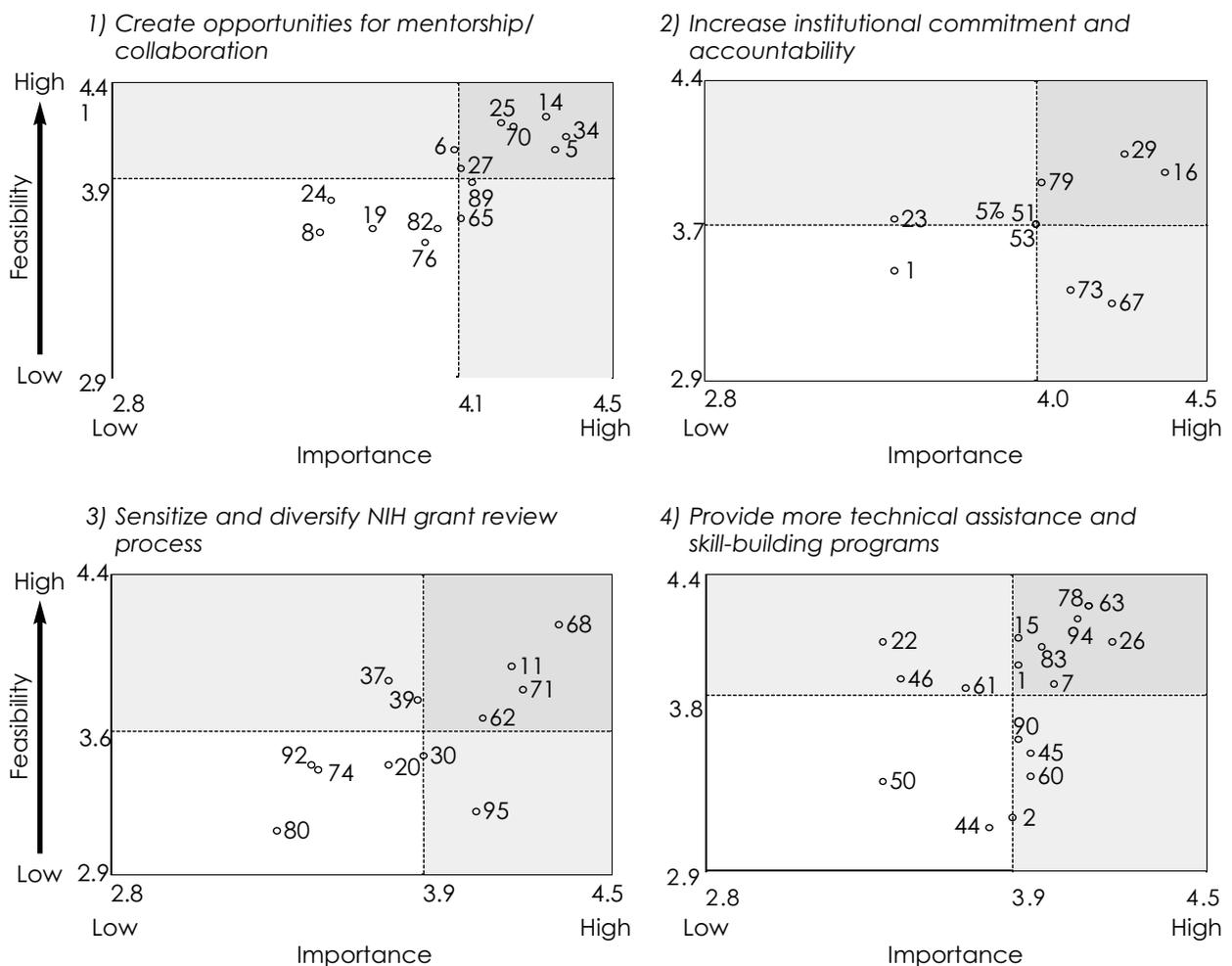
Providing additional technical assistance and skill-building programs and cultivating long-term relationships between NIH and its constituencies were rated fourth and sixth in importance and second and fourth in terms of feasibility of implementation, respectively. Planning meeting attendees suggested a three-tiered approach to implementing actions to address these two barriers, which include strategies aimed at the individual investigator, institutions where they work and the NIH. Attendees suggested that NIH define as a target group for its programs mid-level investigators who have been unsuccessful in obtaining NIH funding, who are unaware of funding opportunities at NCI and NIH, who receive funding from sources other than NIH or investigators on nonmentored research awards. At the individual level, attendees suggested that NIH develop multiple strategies for mentoring, provide ongoing training and education, establish a tracking system to evaluate minority investigator progress from training programs through funding at the R01 level, establish a pool of mid-level minority investi-

gators and send/share information among investigators in the pool, hold mentoring workshops, establish a scholars mentor award, and create long-lasting partnerships between investigators at research institutions and investigators at minority-serving institutions. At the institutional level, attendees suggested that NIH visit institutions and hold conferences with investigators and institutions to explore strategies used by institutions to recruit and retain minority faculty, ways of awarding mentors for minority research and systems for measuring progress of minority faculty. Attendees also suggested that NIH hold accountable institutions receiving NIH funding for working with minority investigators, elicit response to plans to address health disparities in the NIH strategic plan and how these institutions might collaborate or assist in carrying out the strategic plan. It was also suggested that NIH prepare an institutional funding profile and compare NIH funding

at majority institutions to minority-serving institutions. Attendees suggested that special emphasis be given to minority-serving institutions, including site visits. It was suggested that during these site visits, NIH should hold technical workshops with grants management staff; have discussions with administration representatives about releasing time, empowering and developing mentoring opportunities for minority faculty; and hold workshop to discuss faculty challenges and concerns with regard to conducting research at minority-serving institutions.

Increasing funding opportunities for career development and broadening the scope and type of funding were rated fifth and sixth in importance and rated third and eighth in terms of feasibility of implementation, respectively. Planning meeting attendees suggested that NIH publish the findings from the concept-mapping and planning meeting, conduct a longitudinal study of mentor/mentee rela-

Figure 3. Go-zone plots for selected themes from the action prompt

1) Create opportunities for mentorship/ collaboration

2) Increase institutional commitment and accountability

3) Sensitize and diversify NIH grant review process

4) Provide more technical assistance and skill-building programs

The numbers correspond to the statement numbers in Table 3.

tionships to evaluate how well mentees do with regard to publications and receiving independent R01 and other funding. Meeting attendees also suggested that NIH empower minority investigators by awarding supplements directly to the investigators as opposed to the institution and require that institutions stipulate how indirect costs will be used as a condition of receiving NIH funding and establish an online database of minority investigators.
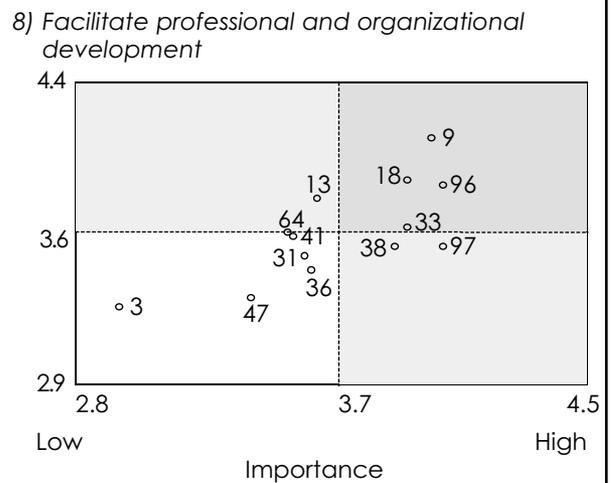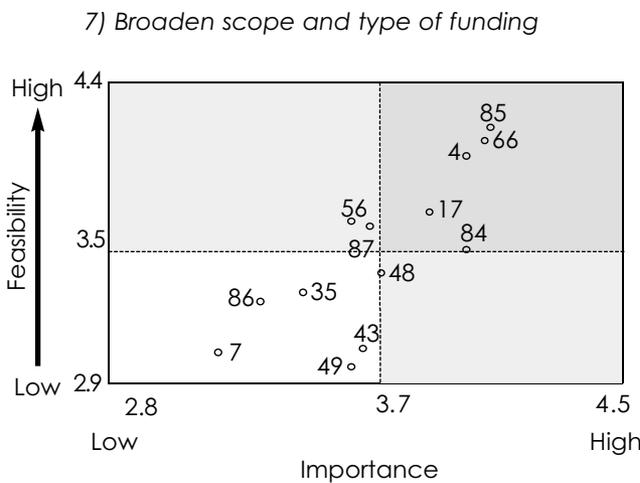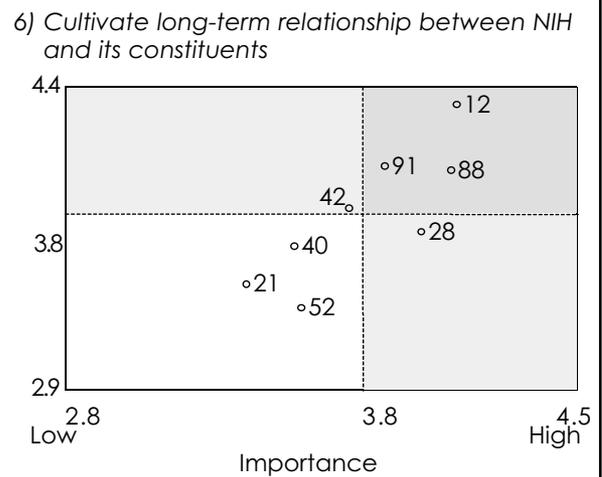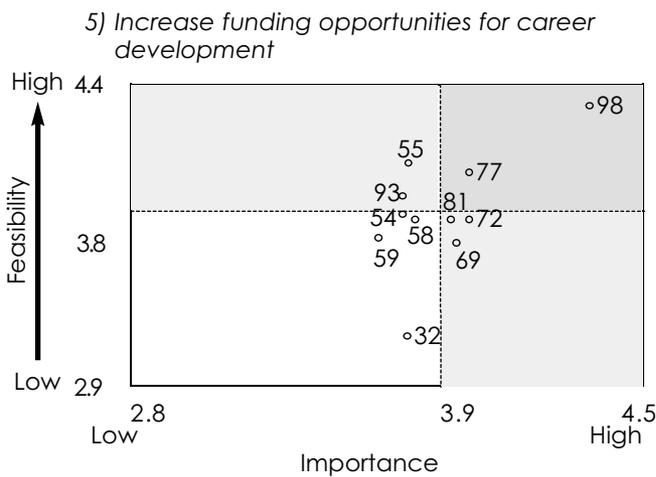
The facilitation of professional and organizational development was rated eighth in terms of importance and sixth in terms of feasibility. To accomplish this, planning meeting attendees suggested that NIH provide more mentored research awards and support for joint collaborations. Successful mentored clinical programs could be used to model programs designed for social scientists. These programs could be integrated to facilitate transdisciplinary mentoring opportunities. Meeting attendees also had several suggestions for supporting joint collaborations. These include developing incentives for majority institutions to enter into "true partnerships" with minority-serving institutions and conduct workshops for accounting, budget and other department heads to help facilitate better information exchange among these offices and principal investigators. Attendees strongly felt that frequently partnerships between minority investigators and majority institutions are not substantive.

SUMMARY

Several factors were identified as important barriers to minority successful competition for NIH funding in the concept-mapping and were reiterated during the planning meeting discussion. The majority of identified barriers were associated with factors that were perceived as institutional bias in NIH policies,[15] followed by social, cultural and environmental

Figure 3 continued

5) Increase funding opportunities for career development

6) Cultivate long-term relationship between NIH and its constituents

7) Broaden scope and type of funding

8) Facilitate professional and organizational development

The numbers correspond to the statement numbers in Table 3.

barriers,[12] and barriers to adequate mentoring[11] (Figure 2). All identified barriers were perceived as important as noted by the small differences in the importance ratings.

In general, suggested actions were consistent with the identified barriers, which appear to center around four main actions that participants felt that NIH should pursue. These include increasing technical assistance and skill-building programs, opportunities for mentorship/collaboration, funding and career development opportunities and the scope and type of funding. Figure 3. shows the suggested actions for the eight themes plotted along two axes representing their importance and feasibility of implementation. Specific action items rated both high in importance, and feasibility reflected what is perceived by participants to be the most practical approach for NIH to take to help minority investigators overcome identified barriers. Our findings suggest that NIH efforts to increase funding to minority investigators should focus on creating more opportunities for mentorship and collaboration, providing more technical assistance, increasing funding opportunities and increasing NIH focus on cultivating long-term relationships with its minority constituents.

There are current NIH programs and policies, which could also be enhanced or better utilized to address some of the identified barriers. For example, training efforts at the NCI have, in general, focused on the training and support needs of minority students and junior-level faculty through the Comprehensive Minority Biomedical Training Branch training programs.[18] Although this program has been very successful, there is a need to continue support to minority investigators who have completed this and similar programs and/or who are mid-career and

interested in obtaining funding to conduct large studies typically funded by R01 and other large research grants. Grant applicants could also be made more aware of existing grant review policies, including the right to appeal reviews that are perceived as unfair or that implicitly or explicitly reflect racism or bias as provided for in the CSR grant review policies.[19] Efforts to increase the pool of funded minority investigators will also increase the pool of scientists available to serve on grant review study sections, which can facilitate additional diversification of these committees. Programs can be developed to specifically address other identified barriers. For example, the NCI-sponsored Minority Investigator Career Development Workshop held in Palm Desert, CA during the summer of 2004 addressed the need for research skills training.[20] The workshop, which was attended by 134 minority investigators, focused on technical skill development, professional growth and development, and mentoring for mid-career and/or transitioning minority investigators. Topics included case studies of both successful and unsuccessful grant applications; mock reviews; overview of NIH funding mechanisms and scientific review guidelines; sessions on research methodology, including instrument development; and formative research methods; principals of good mentoring; and strategies for obtaining appropriate mentoring, which were identified by planning meeting participants as important topics. A 2006 workshop is currently being planned.

Study Limitations

Some degree of caution should be utilized in interpreting these findings given the low response

Figure 4. Participant-rated importance and feasibility for suggested actions that NIH might take to increase minority application and competition for NIH funding
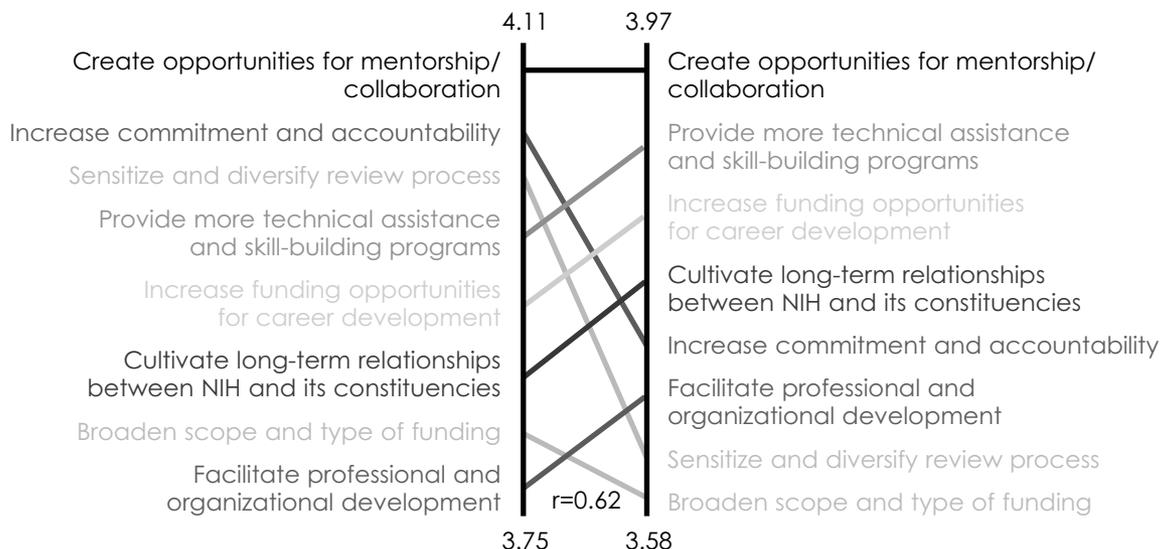
rates for the rating portions of the project and the convenience sample used. Nonetheless, these data do provide some insight about factors that may be barriers to minority investigator receipt of NIH funding and can be used to help inform future programs and activities.

CONCLUSION

Both the research data and the planning meeting discussions suggest that a multilevel approach will be necessary if minority representation among funded NIH investigators is to be increased. Strategies used by NIH must involve overcoming barriers at the home institution, within NIH and at the investigator level.

ACKNOWLEDGEMENTS

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