Feasibility Study To Evaluate the *Activities To Promote Research Collaborations* Program

Final Report

Submitted to:

Kelly Kim, Project Officer
National Cancer Institute
National Institutes of Health
6130 Executive Blvd.
Rockville, MD 20892

Submitted by:

CSR, Incorporated
Suite 1000
2107 Wilson Blvd.
Arlington, VA 22201
www.csrincorporated.com

Contract No. GS10F0114L/Order No. 263-FD-412887 ■ September 30, 2004

CSR Incorporated
Consulting Services & Research

Contents

LIST OF EXHIBITS

Feasibility Study To Evaluate the *Activities To Promote Research Collaborations* Program

1. INTRODUCTION

Under a contract awarded in June 2004 by the Division of Cancer Biology (DCB), National Cancer Institute (NCI), CSR, Incorporated conducted a feasibility study to evaluate the *Activities to Promote Research Collaborations* program. This report describes our findings from the study and our recommendations for a full-scale evaluation. Following this introduction, we provide some background on the program in Section 2 and on the Division of Cancer Biology's plans for evaluating the program in Section 3. The evaluation design is presented in Section 4, including results from CSR's pretests of data collection approaches. We make recommendations for a full-scale evaluation in Section 5. Appendices are provided at the end of the report.

2. BACKGROUND OF THE PROGRAM

The mission of DCB, NCI, is (1) to ensure continuity and stability in basic cancer research while encouraging and facilitating the emergence of new ideas, concepts, technologies, and possibilities, and (2) to promote a balance between the continued support of existing research areas and selective support of emerging research areas. Some of the most novel and exciting discoveries in cancer biology have derived from the integration of disparate fields of research. In order for such advances to move forward, investigators with varying interests need to engage in collaborative research interactions.

To support and encourage scientific collaboration among NCI grantees as well as with other members of the scientific community, DCB developed the *Activities to Promote Research Collaborations* (APRC) program in 1998. The program provides funding in the form of administrative supplements to DCB grantees to establish new consortia with investigators from complementary fields and to conduct joint research that would not be possible in the absence of the pooled set of skills and expertise of the consortium. The program is distinct from other funding mechanisms and is not intended to replace other grant mechanisms. Collaborative activities that can be supported are those that bring together ideas and approaches from different scientific disciplines, including those not currently supported by DCB.

The specific goals of the APRC include (1) generation of innovative concepts and advances in cancer biology, such as new knowledge generated from collaborative projects, and (2) the increased productivity of program participants and their enhanced ability to pursue other, future collaborations. Two administrative mechanisms are available under the APRC to facilitate scientific collaboration. The first mechanism is limited to awards of $25,000 to establish collaborations through exploratory meetings or workshops that bring together investigators from a broad range of fields to discuss and develop new insights, paradigms, reagents, or technologies that will move a field forward in a different direction, establish a new field, or address unique research opportunities or controversial topics. These APRC meetings typically include 5 to 20 participating investigators.

The second approach to supporting research collaboration is the establishment of new research consortia among investigators in complementary fields in developing or rapidly moving areas of cancer research. Research is focused on achieving specific research objectives by pooling investigators' respective expertise and efforts. Typically, APRC consortia are composed of two to five investigators focused on achieving specific research objectives by pooling their respective expertise and efforts. Preference in funding this mechanism is given to applicants where the proposed researchers have no history of prior collaboration in the past 5 years. The laboratory-associated direct cost for collaborative research is limited to a maximum of $40,000 per year per investigator with a combined total direct consortium cost of $120,000 per year.

3. EVALUATION OF THE APRC PROGRAM

DCB intends to conduct an evaluation of the APRC program. The evaluation will focus on those APRC awards that supported research consortia. The design of the evaluation will be based on the results of the feasibility study reported herein and will include outcome and process evaluation components.

3.1 The Need for an Evaluation

DCB has been funding APRC supplements for approximately 5 years. It is now time to take a hard look at the program and determine its success. Data on the successes (or failures) of this funding mechanism will enable DCB to determine whether the program is accomplishing its stated goals and, if so, how to improve the implementation of the program. This evaluation effort is consistent with the recommendations of the Institute of Medicine (IOM). IOM noted that despite decades of discussion about the importance of interdisciplinary research, little data are available to document the success of such efforts (IOM, 2000). To meet the challenge of accomplishing a sound evaluation of its commitment to interdisciplinary research through the APRC program, DCB has determined that the evaluation of the APRC program should include both process and outcome measures. The outcome evaluation will assess the extent to which the program was successful in reaching its intended goals. The process evaluation will assess the extent to which the APRC program has been implemented as intended and will provide insights on how the program could be improved in the future.

3.2 Purpose of the Evaluation

Evaluation of the APRC will enhance DCB's understanding of the success of the program and provide insights to how administrative and other changes will improve the program in the future. Findings will add to the knowledge gained during two workshops held in January 2002 and October 2003. The purpose of the workshops was to bring together successful APRC supplement recipients and to provide them with a forum to discuss their progress. While pleased with the quality and range of proposals submitted by successful applicants, representing a wide spectrum of cancer biology, DCB wanted to learn more about the actual experiences of participating collaborators. The workshops provided an opportunity for APRC-funded researchers to present their findings and to forge new collaborative ties. Both workshops provided positive feedback from the APRC-funded researchers and useful insights to the successes that had been realized.

Researchers also offered recommendations for improving the APRC experience in the future. However, the comments were anecdotal in nature and offered by a small number of investigators on each occasion.

At the end of a 5-year experience, DCB concluded that it was important to conduct a systematic evaluation of a larger number of APRC-funded researchers. DCB decided to conduct a preliminary study to assess the feasibility of evaluating the outcomes of the APRC and the likelihood that the findings would be useful in guiding decisions about future funding and management of the APRC. The feasibility study included a pretest of an interview guide with former APRC-funded researchers, a pretest of an interview guide with APRC applicants that had not been successful in obtaining funding, and an examination of secondary data on APRC-funded projects. The results of the study confirmed that the methodology tested is feasible and has tremendous promise for documenting the extent to which the APRC program has been successful. Additionally, if an evaluation of the APRC program documents positive outcomes resulting from the funding of these supplements, the study will provide DCB with information to support continuous quality improvement to the program.

3.3 Use of Evaluation Results

DCB supports and funds grants in basic cancer cell biology, tumor biology and metastasis, cancer immunology and hematology, cancer etiology, including chemical and physical carcinogenesis, and viral cancer carcinogenesis, mechanisms underlying DNA and chromosome aberrations, and structural biology and technology development. Many of the advances that have been made in these related fields in recent years have resulted from the collaboration of researchers who have contributed knowledge from multiple disciplines to develop innovative procedures and technologies that increase NCI's understanding of the etiology, prevention, and treatment of cancer.

The results of the APRC evaluation will strengthen DCB's understanding of the value of interdisciplinary research and inform NCI's approach to supporting and encouraging scientific collaboration among researchers from multiple disciplines in the future. The evaluation findings will also support NCI's commitment, as stated in its Fiscal Year 2005 Plan, to "increase funding for…research grants and provide incentives for transdisciplinary and collaborative research" (The Nation's Investment in Cancer Research, p. ix). The ultimate goal of this evaluation is to position DCB and NCI to maximize its available resources to encourage and support collaborative research in a manner that will move the field of cancer research forward, address unique research opportunities or controversial topics, and provide answers to serious concerns about the health of our nation.

Finally, the results of the evaluation will support NCI's established framework for accountability, consistent with the President's Management Agenda (PMA) and the congressionally mandated Government Performance and Results Act (GPRA).

3.4 Review of the Literature on Evaluation of Collaborations

The past two decades have witnessed a growing interest and international investment in interdisciplinary approaches to problems, along with encouragement for greater

collaborations and networking among researchers. Bruce et al. (2004) note that this encouragement is based on the assumptions that the research will contribute to more effective innovations and encourage competitiveness. "Pressure to encourage interdisciplinary research comes from the need to solve complex socio-scientific problems, where one discipline on its own cannot provide an answer" (Bruce et al., 2004, p. 458). The IOM has noted the groundswell of support for interdisciplinary research: "As scientists and health care providers examine the intricate interplay among genes, environments, behaviors, and diseases, health problems newly emerging, as well as those that have plagued us over time, present complex challenges for research" (IOM, 2000). To encourage collaboration, federal funding agencies and private foundations have established a number of funding mechanisms that require interdisciplinary, interagency partnerships.

For almost a decade, the National Institutes of Health (NIH) has been committed to the integration of qualitative and quantitative research methodologies. For example, in 1999, a diverse team of researchers from three University of Massachusetts Lowell (UML) colleges (health professions, engineering, and arts and sciences) began meeting to consider a response to an NIH request for application (RFA) that addressed the mechanisms resulting in health disparities. The RFA's stated purpose was to "…foster multidisciplinary research…" (NIH, RFA ES-00-004). The National Institute for Nursing Research (NINR) provides several mechanisms to build interdisciplinary research, including the Nursing Partnership Centers on Health Disparities and the Nursing Exploratory Centers. The National Institute of Allergy and Infectious Diseases (NIAID)'s multiyear research plan calls for sustained, collaborative research in the fight against malaria as well as better training and funding support for scientists from malaria-endemic areas (NIAID, 1997). The National Institute on Drug Abuse (NIDA) has a long tradition of funding collaborative research (see Gilchrist et al., 2003–2008).

New research centers are being created every day with the specific goal of promoting interactions among the disciplines. There is ongoing discussion across NIH about the importance of supporting interdisciplinary research. Recently, for example, Dr. Richard Verville coauthored an article that facilitated discussion about whether there should be an institute or an independent center for medical rehabilitation research within NIH to support interdisciplinary research (Verville et al., 2003). Peer review at NIH has been revamped, in part, to facilitate interdisciplinary research. The transdisciplinary tobacco use research centers funded by the NCI exemplify large-scale scientific collaborations undertaken for the explicit purpose of promoting novel conceptual and methodological integration bridging two or more fields. With all of this activity, there appears to be a consensus that interdisciplinary research is an appropriate direction for today's science. In spite of these efforts, however, the evidence on the best way to proceed is limited.

There are excellent examples in the literature that describe and evaluate collaborative research efforts, but most of these evaluations have focused on community–academic partnerships (e.g., Larson, 2003), on community–industry collaborations (Torii, K., Nara Institute of Science an Technology, Ikoma, Nara, Japan), on the university partnerships sponsored by the National Science Foundation (e.g., the Knowledge and Dissemination Intelligence Program, see Porac et al., 2004), or on community-based coalitions, such as

the Community Partnership Program funded in the late 1990s by the Center for Substance Abuse and the Comprehensive Child Development Program, authorized by Congress in 1988. Other collaborative efforts have focused on developing partnerships between organizations at the state level to develop pilot training in health prevention. For example, "The Partnership To Increase Cervical and Breast Cancer Screening in High Mortality Countries: Pilot Training" is jointly funded by the Centers for Disease Control and Prevention (CDC), the U.S. Department of Agriculture (USDA) Cooperative State Research, Education and Extension Service (Cooperative Extension Service), NCI, and the American Cancer Society (ACS). These collaborative efforts have typically focused on improving health, educational, or economic conditions, but these collaborations have not been designed to promote the generation of new hypotheses for research, integrative theoretical frameworks, or novel methodologies for producing new scientific breakthroughs in the prevention and treatment of disease. There are few studies regarding the effectiveness of collaboration on improving outcomes and accomplishing their defined goals (Roussos and Fawcett, 2000.)

Evaluation of the type of scientific collaboration fostered by programs such as the APRC has been limited. In fact, there appears to have been minimal effort to evaluate the collaborative processes and the scientific and public policy outcomes of these various efforts. As Stokols et al. (2003, p. S22) note, "efforts to evaluate the cumulative outcomes of collaborative scientific ventures…are enormously complex…." They note that experimental research designs for comparing and evaluating alternative approaches to science are difficult if not impossible to achieve because of the nonrandom selection of scientists into collaborative research teams. There are also few tools or "yardsticks" for evaluating the scientific, policy, and health outcomes of collaborative research. In addition, no standard definition of interdisciplinary research exists at this time and the currently employed definitions vary widely. The Committee on Science, Engineering, and Public Policy (COSEPUP), a joint unit of the National Academy of Sciences, National Academy of Engineering, and the IOM, is now conducting a study on Facilitating Interdisciplinary Research. One of their primary aims is to review proposed definitions of interdisciplinary research, including similarities and differences from research characterized as cross-disciplinary, intradisciplinary, and multidisciplinary, and to develop measures to determine whether research is interdisciplinary or not (Stokols, 2003).

3.5 Timeliness of the Evaluation

Congress enacted the Government Performance and Results Act of 1993 to focus on improving program performance and providing greater accountability for results in the Federal Government. The APRC evaluation plan is designed to satisfy this mandate and yield feedback for results-oriented management of the program.

Results of the APRC evaluation will help NCI and DCB to make important decisions about the future funding of APRC supplements and to better manage the program. The results of the evaluation will be available before important funding decisions have to be made about the Spring cycle of funding for Fiscal Year 2005. Results of the evaluation will also position DCB to be a major contributor to other NCI divisions and NIH

institutes that are facing the challenge of how to conduct responsible evaluation of similar initiatives to support collaborative research.

4. EVALUATION DESIGN

Guided by the recommendations of the IOM, the evaluation design will include process and outcome components and will use both quantitative and qualitative methods.

4.1 Study Questions

NCI and CSR have identified specific research questions and measures to guide the development and implementation of both evaluation components. The process evaluation will focus on three research questions, each with a series of measures:

- Question l: How did the APRC collaborators come together to form the consortium?
  - Description of early experiences with the proposal process
  - Methods used to plan and establish collaboration with investigators from other disciplines
- Question 2: How did the APRC collaborators work together to achieve their research objectives?
  - Methods used to communicate with APRC collaborators
  - Methods used to incorporate knowledge/facts/understanding from one discipline to another
  - Types of professional relationships developed
  - Skill development activities in which co-investigators engaged during the course of the APRC award
- Question 3: What changes should be made in the APRC consortium to strengthen its use as a mechanism for promoting research collaborations?
  - Administrative issues
  - Communication issues
  - Funding issues/review of applications

The impact evaluation will focus on two research questions, each again with a series of measures:

- Question l: Does the APRC support and encourage scientific collaboration for NCI grantees (the capacity building goal)?
  - Joint research is carried out by researchers from disparate scientific disciplines
  - Research is not duplicative of any active or previously funded research topic for any of the consortium members
  - APRC co-investigators participate in interdisciplinary research that they would not have pursued in the absence of the APRC award

  - APRC increases the productivity of the participants
  - APRC collaboration adds value to the underlying funded research of the principal investigator's (PI's) DCB-funded parent grant
  - APRC co-investigators secure funding for future research that is built on knowledge or products developed under the APRC project
  - APRC investigators continue to communicate and share information following completion of APRC award that leads to related interdisciplinary research
- Question 2: Does the APRC collaboration result in novel and promising concepts and advances in cancer research (the innovative goal)?
  - Investigators develop a new technology that contributes to an understanding of cancer biology
  - New knowledge is generated from collaborative projects as opposed to individual investigator-driven projects
  - Application for a patent is filed for a product developed under the APRC award
  - Publications are co-authored by the APRC co-investigators that would not have been prepared in the absence of the APRC
  - APRC co-investigators develop hypotheses/new research topics that are pursued by research efforts that follow the APRC project
  - APRC co-investigators enter into the field testing of a diagnostic instrument or other methodology developed under the APRC award
  - APRC co-investigators develop conference papers/poster sessions to report on work performed under the APRC award
  - PI or other collaborator earns award/other professional recognition for work performed under the APRC award

4.2 Target Population

DCB decided to focus the feasibility evaluation on those APRC-funded researchers who were funded in Fiscal Year 2001. Each APRC-funded project has up to 2 years to complete its collaborative research effort. By limiting the eligible sample to those researchers who will have completed their work no later than the end of Fiscal 2003 (September 30, 2003), it would be possible to capture and measure outcomes such as joint publication of an article, presentation of a newly developed technology at a professional conference, or success in obtaining funding to pursue hypotheses developed under the APRC project. At the time the feasibility study was planned, it was thought that it would be unrealistic to expect such outcomes to have occurred and be measurable in less than one full year following the completion of the APRC project.

DCB also decided to limit the focus of the feasibility study to that component of the APRC that funds supplemental awards to grantees that are pursing collaborative consortia. While some APRC awardees have received funding to attend a meeting or a workshop, this mechanism is much more limited in size and level of funding. In recent

years, DCB has focused its attention on awarding APRC supplements to those applicants who propose the collaborative research mechanism, as opposed to the workshop or meeting mechanism. Therefore, the decision was made to focus the evaluation on that dominant component of the APRC to maximize the potential for developing lessons that would best inform DCB's future management and fiscal funding decisions.

APRC funding is treated as an administrative supplement to other NCI grants. The design of the program precludes the opportunity to identify a true control group. The decision was made, therefore, to identify a comparable group of NCI-funded researchers that could be treated as a valid comparison to the researchers that received APRC funding. DCB maintains a complete list of all applicants that are not funded by fiscal year. A random selection of these researchers served as the comparison group for the APRC-funded PIs.

4.3 Study Components

During the feasibility study, CSR developed and pretested the evaluation design and data collection tools. They collected process and outcome indicators through telephone semistructured interviews with APRC-funded researchers and with APRC applicants who were not funded. They collected additional outcome information from reviews of secondary data, such as grant applications and descriptive information on APRC-funded researchers that is contained in NCI's Portfolio Management Application (PMA) and e-Grants systems.

4.4 Telephone Surveys

4.4.1 *Survey Development*

Separate semi-structured interview protocols were designed to guide the interviews with the APRC-funded researchers and nonfunded APRC applicants. CSR was guided by a preliminary set of questions developed by NCI and designed interview tools that included both closed-ended and open-ended questions. This provided both a mix of quantifiable response data—both 'yes/no' questions and Likert scale questions—as well as more in-depth contextual information on each PI's experience with the APRC program. Through a series of discussions and correspondence between NCI staff and CSR, the interview protocols were finalized and prepared for pretesting.

CSR pretested the interview protocols with eight APRC-funded researchers and eight applicants who did not receive the award. A full-scale evaluation survey will require clearance by the Office of Management and Budget (OMB). OMB regulations, however, allow for pretesting of an instrument with up to nine respondents in order to estimate the level of burden involved in the data collection. The pretest also provides valuable information on the structure, included elements, and wording of the draft survey that can be used to revise the protocol as needed.

DCB developed a list of possible APRC-funded researchers from the FY 2001 award cycle to interview. DCB Program Directors made the initial contact with these PIs to introduce the pretest and confirm their willingness to participate in the pretest. A standard message (see Appendix A) was sent to each prospective respondent to explain the

purpose of the evaluation and to introduce the contractor, CSR, Incorporated, that would follow up to conduct the interview. If a PI was unwilling or unable to participate in the pretest, DCB staff selected a replacement PI and made the initial contact with that person. CSR staff followed up with each prospective respondent to schedule an interview time. In most cases, e-mail was determined to be the most efficient and productive manner for communicating all scheduling issues with the respondents.

CSR staff randomly selected a sample of nonfunded FY 2001 APRC applicants for the comparison group, and DCB reviewed and approved the list. CSR then contacted these researchers directly through e-mail to request their participation in the study and schedule interviews.

4.4.2 *Key Variables for APRC-Funded Researchers*

The categories of variables collected through the interview guide for APRC-awardees include basic descriptors on each of the PIs, variables that describe the PI's early experiences with the APRC application process and the PI's actual experience while working on the APRC supplement, variables that measure accomplishments resulting from APRC participation, and variables that describe the PI's overall assessment of the APRC experience (see Appendix B). More detail on these, and justification for inclusion, is provided below.

- *Principal Investigator Descriptors.* An Interview Guide Face Sheet was designed to record data that could be extracted from DCB's L Drive that provides contact information and other basic descriptors of each APRC applicant. The variables include name of the PI interviewed, e-mail and phone number, the type of application, the names of collaborators, the name of the parent grant, the name of the DCB Project Officer, the originating DCB branch, the name of the interviewer, and the date and beginning and ending time for the actual interview.
- *Early Experiences with the APRC Program*. Background information describing the PI's experience with the application process was collected to describe key inputs and the context of the APRC involvement. These data are required to explain the early process of the APRC experience and to account for variations in measures of outcomes. Questions were asked to determine the PI's source of information about the APRC funding, involvement with DCB during the application period, and early experiences with recruiting potential collaborators to participate in the APRC project.
- *Variables Describing APRC Experience*. Questions were posed to determine the type of support that PIs received from their colleagues and institution, problems encountered during the APRC project, the range of disciplines involved in the collaboration, types of interactions with collaborators during the APRC project, and history of working with APRC collaborators.
- *Measures of Accomplishments*. PIs were asked to report on a variety of accomplishments that would have resulted from their participation in the APRC, reasons for success or lack of success, and plans for continued collaboration beyond the life of the APRC funding.

- *Assessment of the APRC Experience*. A series of scales was developed to measure outcomes of the APRC program. These scales ranged from obtaining additional funding to the development of new products, technologies, and publications, to the forging of new collaborative research endeavors. Questions were also posed to assess the extent to which the APRC funding accounted for successful outcomes, other benefits that might have resulted from participating in the APRC research, and recommendations for improving the APRC program in the future.
- *Length and Type of Interview*. Efforts to minimize respondent burden and the constraints of survey resources contributed to the design of the interview. Because the subject matter of each APRC funded project could vary considerably, the number of collaborators ranged from two to five, and the length of the APRC experience ranged from several months to several years, it was important to design an interview that included both closed-ended questions and the flexibility of open-ended probes that could capture the diversity of experiences of all funded researchers. These requirements led to the design of an interview that would be up to 30 minutes in duration.

Most of the APRC-funded researchers operate in university or clinical settings that require their attention to multiple projects outside the APRC-funded research. Their schedules are demanding and they do not have the time to engage in lengthy face-to-face interviews. DCB was also concerned that their busy schedules and demanding positions would interfere with their willingness to respond to a mail questionnaire. Therefore, the decision was made to conduct the interviews by telephone with adequate clearance from their DCB project directors to facilitate timely and responsive participation in the interview process. As the results of the pretest demonstrate, these decisions proved to be feasible and successful.

4.4.3 *Key Variables for Nonfunded APRC Applicants*

A separate interview protocol was designed to guide interviews with a sample of researchers that had applied for APRC funding but did not receive awards. The interview included questions concerning the researcher's experience during the application process, the type of feedback they received from DCB concerning their proposal, their experience with other interdisciplinary collaborations, and their assessment of the APRC program (see Appendix C).

- *Early experiences with the APRC program*. There was considerable overlap between this first part of the survey and the initial component of the APRC-funded researcher survey. The survey asked about how researchers had heard of the funding opportunity, whether they communicated with staff at DCB about the application, and previous experience with non-APRC collaborations.
- *Experiences after submitting the APRC application*. The second part of the survey included questions to learn about the kind of feedback each researcher received from DCB about the application and the researcher's reaction to this feedback. The survey also asked about whether the researcher pursued the proposed project without APRC funding, and the researcher's experiences with, and plans for participating in, other collaborations after the APRC application process.

4.4.4 *Telephone Interview Pretest Results*

Information obtained during the pretest of the interviews with APRC-funded researchers and researchers who had applied for but not received APRC funding will guide the full-scale evaluation of the APRC. Exhibit 1 displays the quantitative responses to close-ended survey questions.

The average interview with the APRC-funded researchers was 23 minutes. Because the survey instrument was shorter, the average interview time for nonfunded applicants was 13 minutes. All respondents were cooperative and willing to participate in the interviews, and frequently elaborated on their responses beyond the survey questions.

4.4.4.1 *Experiences With the APRC Application Process*

Although some interviewees had difficulty remembering exactly how they heard about the APRC program award, applicants reported learning about the funding opportunity from several different sources—and sometimes from more than one source. Over half (10/16) of all funded and nonfunded researchers interviewed found out about the APRC program from the NIH Guide Notice. Seven researchers reported hearing about the funding opportunity from a DCB staff person, including three that had also seen the notice in the NIH Guide. Other (5/16) researchers also heard about the award from colleagues at their own institutions (e.g., grants administrators or research colleagues). Once they decided to apply, most applicants (14/16 or 87.5%) discussed their application with a DCB staff person before submission. Those researchers who remembered the conversations found these discussions "very helpful" in preparing their applications.

About a third of applicants (5/16) had been part of a formal research consortium before applying for the APRC. Only two applicants reported knowing of other researchers who were aware of the APRC award but decided not to apply, and only one APRC-funded researcher reported approaching a potential collaborator who decided not to participate in the proposal.

4.4.4.2 *APRC-Funded Researcher Experiences With the APRC Program*

APRC award recipients were asked about their experiences with the APRC program. Half of the APRC-funded researchers reported receiving particular institutional support for submitting the APRC application. Other funded interviewees noted that, although their institutions did not provide exceptional support for this particular submission, neither did they put up barriers to preparing the application.

When asked about problems encountered in forming or participating in the APRC collaborative project, researchers listed a variety of issues, from personality differences between PIs that complicated the collaborative process, to the "book-keeping nightmare" of figuring out the subcontracts of partner institutions. Overall, however, most collaborative research projects seemed to have worked well.

PIs reported interacting frequently with their collaborators, often on a daily or weekly basis. Some collaborators were able to have frequent face-to-face meetings, as their

offices or institutions were physically near one another. Others relied, as expected, on e-mail and telephone communication to confer on project issues.

Five of the eight APRC-funded researchers had previous experience working with researchers in the fields with which they collaborated on the APRC project, and three of the five noted that they had previously worked with at least one of their APRC collaborators. Three-fourths (6/8) of the APRC-funded researchers said they would have worked with researchers from the APRC collaborators' disciplines even if they had not received the APRC award. However, the award allowed collaborators to "focus" ongoing collaborations or move the work forward faster.

4.4.4.3 *Gains From Participating in APRC Program*

APRC-funded researchers were asked whether their participation in the APRC program had resulted in one or more of a series of outcomes. Exhibit 1 shows the number of researchers who reported each type of result. Over three quarters said they had developed a new technology, diagnostic tool or other methodology, based on the APRC-funded work. Half had joined or become active in new professional areas. Three quarters reported co-authoring one or more publications with their APRC collaborators, and 62.5 percent reported submitting or developing a conference abstract or presentation with their collaborators. All funded researchers had developed new hypotheses to be researched or had developed a proposal to continue the APRC research.

Four of the eight researchers reported participating in other non-APRC collaborations, and four continue to collaborate with their APRC partners, including working on projects together or applying for grants together.

4.4.4.4 *APRC-Funded Researcher Overall Assessment of APRC*

In providing an overall assessment of the APRC program, all but one of the funded researchers reported that they could not have conducted their research project without the APRC award, and the eighth PI noted that, even if he could have done the work, it would not have been as extensive as it was with the APRC funding.

APRC-funded interviewees were asked to rate on a 5-point Likert scale whether they strongly disagreed, disagree, neither disagreed nor agreed, agreed, or strongly agreed with a set of statements about the APRC. Exhibit 1 shows the number and percent of respondents who either agreed or strongly agreed with each survey item.

Over half of respondents in this group said that there was no other funding mechanism besides the APRC to support the kind of research they did. This corroborates the earlier point that most could not have conducted their research without this funding. Six of the eight interviewed researchers reported that the APRC helped them to launch important follow-up research. Six interviewees believed that the award helped them make new professional contacts, and six reported that the program allowed them to form new collaborative ties that otherwise would not have developed. All but one researcher saw their APRC research as helping them to build new insights and paradigms, and three quarters believed the award offered the opportunity for training in new research

techniques or the use of new instrumentation or technology. The APRC award did not seem to increase researchers' awareness of other funding mechanisms, or provide the impetus to read more journals or attend conferences outside their base discipline.

Summing up the benefits of the APRC, funded researchers described the funding as an opportunity to pursue "really innovative science" in areas new to the PIs and an opportunity to "change directions". Two researchers specifically tied the award to the papers they published and grants or other recognition they received.

4.4.4.5 *Experiences of Nonfunded Researchers After APRC Application Process*

Applicants who did not receive the APRC award were asked about their experiences after submitting the application. Three fourths of them said they were surprised by DCB's decision not to fund them, as they thought they had put forward a strong and interesting proposal. Several of the interviewees noted that the formal letter they received from DCB about the Institute's decision did not provide enough information on the reason for the decision. One researcher pointed out that it took quite a long time to get more specific feedback from DCB about the reviews.

On the other hand, five of the eight nonfunded applicants went on to pursue the proposed work through other funding mechanisms. Five went on to collaborate with the same research partners proposed in the APRC application. Three researchers reported that the process of developing the APRC application provided momentum to pursue other collaborative research efforts. All but two of the unsuccessful applicants said they would consider applying for another APRC award in the future. The two who would not reapply noted that this was not the right kind of award for them at this point in their career, or the award was too small. A researcher who would consider resubmitting qualified his response with the hope for "more clear" criteria from DCB for the funding.

4.4.4.6 *Recommendations From Nonfunded Researchers To Improve the APRC Application Process*

Asked for recommendations to improve the APRC program, nonfunded applicants called for clearer communication upfront from DCB about the "requirements" and the definition of "multidisciplinary" research to ensure that DCB and applicants are "on the same page" regarding proposed collaboratives. One applicant suggested having examples of funded projects available for applicants to review.

Several respondents stressed the importance of supporting innovative research and the challenge of obtaining such funding. They supported the APRC program vision, but called for "more flexibility with the greatest possible openness; budding collaborations need to be fostered."

As noted earlier, many of the respondents thought DCB could provide more detailed feedback on the reasons for rejecting the proposals. One researcher recommended including a "ranking, so you know if you are close to being funded or far away; if you know you are close, you will be motivated to try again."

Finally, it is important to note that several of the comparison group PIs interviewed had to be reminded or had to pull files to remind themselves about the APRC application. This has implications for the full-scale evaluation, in terms of the reliability of the information they are able to recall and report, as well as the burden on these researchers in terms of time needed to review their own archived application materials.

4.4.4.7 *Recommendations From Funded Researchers To Improve the APRC Program*

APRC awardees were asked for recommendations to improve the overall program. Several suggested developing a funding mechanism to be able to continue the APRC-type research on a larger scale, for example having the APRC "feed into" "program project grants" or an R01 "with a special study section to nurture innovation," or providing some kind of mechanism to provide follow-on support and funding to the "most successful" APRC researchers. One researcher suggested developing a "broad RFA for collaborative grants."

Two respondents recommended increasing the funding amount for the APRC award, while another recommended expanding the allowed number of collaborators beyond three without having to increase the funding amount. Two respondents noted that salary support should be included in the awards for both the main PI and the collaborating investigators. Providing salary support makes it easier to attract other established researchers to such collaboratives, one interviewee noted.

One researcher who had had particular difficulties putting subcontracts in place recommended having DCB contract directly with each collaborating investigator, rather than only with the main investigator who then subcontracts with others.

Other suggestions included continuing to keep the application short at 25 pages, but not necessarily tying it to the base grant. A respondent remarked that it was hard to link the APRC proposed research to the base DCB grant while also moving beyond it. Another interviewee noted that the fact that the decision to have APRC program was always a "last minute" decision made it hard to "line up co-investigators"—it would be helpful to have this program permanently established. Finally, one researcher particularly stressed the success of the 2-day meeting in Washington, DC.

Exhibit 1. Results of Survey Pretest

Indicator	Funded		Nonfunded Comparison Group	
	Number	(%)	Number	(%)
Total sample	8	(100)	8	100
Average duration of interview (min.)	23		13	
Application Process				
Source of awareness on APRC				
Colleague in discipline	0		1	(12.5)
Researcher outside discipline	0		1	(12.5)
NIH Guide Notice	6	(75)	2	(25)

Indicator	Funded		Nonfunded Comparison Group	
	Number	(%)	Number	(%)
DCB staff	3	(37.5)	3	(37.5)
Other	4	(50)	3	(37.5)
Contacted DCB to discuss	7	(87.5)	7	(87.5)
Know of others who did not apply	2	(25)	0	(0)
Previously part of consortium	2	(25)	3	(37.5)
Approach collaborators who didn't participate	1	(12.5)		
Experience Post Application—Award Not Received				
Surprised by decision not to fund			6	(75)
Pursued proposed project			5	(62.5)
Engaged in other consortia/collaborations			5	(62.5)
Collaborations across disciplines			3	(37.5)
Process helped network or provided momentum for collaborative research			3	(37.5)
Consider applying for other APRC			6	(75)
Experience During APRC Program				
Support received from colleagues/institution	4	(50)		
History of working with researchers in fields	5	(62.5)		
Would have worked with these disciplines without APRC	6	(75)		
Gains from APRC Program				
New technology developed	7	(87.5)		
Joined/active in new professional areas	4	(50)		
Patent filed/product developed	1	(12.5)		
Co-authored publication(s)	6	(75)		
Conference submissions made	5	(62.5)		
Developed new hypotheses to be researched	6	(75)		
Established trust/collegiality with APRC collaborators	4	(50)		
Developed proposal to continue APRC work	4	(50)		
Work with other non-APRC collaborators	4	(50)		
Access new information/datasets and tools	5	(62.5)		
Recognition received	3	(37.5)		
Other	1	(12.5)		
Continued to collaborate with APRC partners	4	(50)		
Overall Assessment of APRC				
Could not have accomplished work without APRC	7	(87.5)		
Scaled items (agree or strongly agree)				
No funding for research besides APRC	5	(62.5)		
APRC research helped launch follow-up research	6	(75)		
Provided introduction to new professional contacts	6	(75)		
Scientists across disciplines brought expertise	7	(87.5)		
Forged new collaborative ties	6	(75)		
Strengthened capabilities of researchers	6	(75)		
Developed new insights and paradigms	7	(87.5)		
Increased awareness of other funding mechanisms	2	(25)		
Opportunity for training	6	(75)		

Indicator	Funded		Nonfunded Comparison Group	
	Number	(%)	Number	(%)
More time collaborating with outside researchers	3	(37.5)		
More reading and conferences outside discipline	1	(12.5)		

4.5 Review of Secondary Data

The secondary data analysis component of the pretest was designed to explore the feasibility, practicality and usefulness of collecting and analyzing information from existing NCI and NIH databases on grant applicants and recipients. Prior to beginning collection of secondary data, CSR explored the IMPACII/PMA database to determine what elements would be relevant to evaluation of the APRC program, as well as the most efficient process of retrieval of these data. Based on information derived from this exercise and input from DCB staff, CSR created the document *IMPACII/PMA Data Retrieval Process Recommendations* (Appendix D). This document provides additional details regarding the rationale for data selection.

4.5.1 *Data Sources*

Two data sources were utilized: The Portfolio Management Application (PMA), a customized database that is linked to the IMPAC II server, and e-Grants, a Web-based, electronic imaging system for storage and retrieval of all documents contained in the official NCI grant files, which is maintained by NCI's Grants Administration Branch.

4.5.2 *Sample Selection*

A sample of nine APRC awardee collaborative teams from the FY2001 funding year was identified, including all of the awardees that were interviewed. Therefore, our sample consisted of 25 researchers, including 9 PIs and 16 Collaborating Investigators.

4.5.3 *Key Variables*

Key variables included:

- Number and type of post-APRC grant applications in which APRC collaborators are involved;
- Number and type of post-APRC grant applications in which APRC work is built upon;
- Number of post-APRC publications in which APRC collaborators are coauthors;
- Number of post-APRC publications in which APRC work is built upon.

4.5.4 *Data Extraction Protocol*

Separate usernames and passwords were provided for the DCB network including e-Grants and the PMA. PMA was utilized to search for other grant applications that were submitted to the NIH by our sample of investigators.

4.5.4.1 *Data extraction from PMA*

As outlined in Appendix D, the PMA was searched for type 1 and type 2 applications including amended applications and applications for supplements submitted at least 18 months after the initiation of the APRC award, using the Name Query Form. The result of the name query listed the investigator's other NIH awards including:

- Grant ID;
- Activity;
- Status;
- Fiscal Year;
- Project Title;
- Start and End Dates;
- Council ID; and
- Percentile and Score.

The above information was transferred to a PMA data spreadsheet. In addition, the original grant application and the summary statement (both Acrobat documents) were downloaded to the local hard disk. Usually, these documents were downloadable from a link/button within PMA. In some instances, where such a link was not present, we were able to enter e-Grants to access and download these documents. Each summary statement was printed. Care was taken to avoid double counting in cases of multiple iterations of the same application. In fact, the structure of the system guards against such double counting because when an application is withdrawn in favor of an amended application, the summary statement for the amended application automatically replaces that of the previous application in the system. In instances in which no summary statement was available because the application had not yet been reviewed, the application was printed.

The two items of interest in the summary statements were the applicant's abstract and the discussion of the investigator team in each of the reviewer critiques. Each summary statement was reviewed for mention of collaborative partners in the critique sections of the write up. In the case of the grant applications, the items of interest were the applicant's abstract and the key personnel and expanded budget/budget justification sections of the proposal. Reviewing the summary statements was found to be time consuming and unproductive. On the other hand, reviewing the pertinent sections of the grant applications required little time and effort to ascertain whether APRC collaborators were listed on the grant. Because so little information about collaborators was found on the summary statements, the decision was made to go back and examine the actual applications for each investigator. Therefore, using the folder created on the hard drive, CSR staff reviewed each application and noted whether any member of the APRC team was proposed as personnel on the application.

4.5.4.2 *Data Extraction From e-Grants*

Since the APRC awards were made as administrative supplements rather than grant awards, no information about the APRC applications is contained in the IMPACII/PMA system. This information is, however, available in the NCI e-Grants system. The

username and password for access to e-Grants were provided. At the opening search screen, a search was performed on the investigator's name. This resulted in a list of all grants ever held by that investigator. The list was then scanned for the parent grant of the APRC award. Clicking on the grant number produces a number of additional menu choices such as "all," "application," "correspondence", as well as each individual grant year (e.g., 01, 02, 03S, etc.). Choosing "all" generates a list of all documents in the system for each year as well as the date of each document for that particular grant. Using the APRC award date that had been previously ascertained from the "L drive" files, this list was scanned to identify documents in the corresponding time frame. It was discovered that if the number of the parent grant at the time of submission of the APRC application was 1R01CAxxxxxx-03, then information about the APRC application and award were filed in grant year 1R01CAxxxxxx-03S. In general, the description of the proposed research was found in documents called "award files." The pertinent pages were printed. One of the nine APRC applications could not be located in e-Grants despite extensive searching.

4.5.4.3 *Data Extraction From PubMed*

Using the same 18-month-post-APRC-award date as the initial date, PubMed was searched to identify all subsequent publications by each PI and collaborating investigator and to retrieve the abstract of each publication. The original plan was to search PubMed and retrieve the list of publications and abstracts through IMPACII/PMA. However, this procedure was found to be an extremely time-consuming and labor-intensive drill down process. Therefore this strategy was abandoned. Instead, a senior research librarian with extensive experience in searching PubMed, performed searches on each of the 25 investigators and generated a list of publications accompanied by an abstract of each.

The following procedures were performed by the same senior physician researcher. Each APRC application was read carefully. Following the review of a given APRC application, the applicant's abstract from each of the summary statements or applications for each member of a collaborative team was reviewed for "relatedness" to the work proposed in the APRC application. Then the titles, coauthors, and abstracts of publications from members of this team were reviewed for the presence of APRC collaborators as coauthors and relatedness of the science to the APRC work. When APRC-related publications were identified, the publication date was also recorded.

4.5.4.4 *Data Security*

To protect confidentiality, following the abstraction of data, the files stored on the local hard drive were moved to a secure network location and the folder on the desktop was deleted. In addition all paper copies of applications, summary statements, and other confidential documents are kept in a locked file drawer and will be shredded after acceptance of the final report for the pretest.

4.5.4.5 *Quality Control*

The usual precautions were taken to insure accuracy and consistency in data manipulations and calculations. Early in the course of the discussion and design of the

pretest, it was suggested that the secondary data collected from PMA and PubMed might serve as a quality check for the information reported on the phone interviews. Discussion of the findings in PubMed serves to illustrate this point. In the APRC awardee interviews, six of the eight investigators reported publications with collaborators under item #12 "publication that is coauthored with other APRC investigators." The PubMed search confirmed that three of the investigators had coauthored publications with APRC collaborators within the time frame that we had established. The three investigators for whom we did not locate coauthored publications may have had coauthored publications prior to our cutoff date and/or may have publications that are still in press. One of these authors subsequently e-mailed us the actual citation—the paper she mentioned was published in 2001. In addition this investigator published a paper substantively related to APRC work which was picked up and recorded on our search. Another of these investigators reported that he and his collaborators had published three or four papers together. In all, this investigative team has published 32 papers since the cut off date, with the APRC awardee coauthoring 17 papers. We did identify one of the papers by this author as substantively related to APRC work. With this volume of publication, it is possible that the awardee's memory was a bit unclear as to the coauthorship on various papers or perhaps our search strategy was faulty. The later explanation is unlikely because during the review of the PubMed abstracts, it was noted that a publication coauthored by all members of one APRC team appeared on the list generated for the APRC team PI but not on those of both collaborating investigators. At this point, all searches were reviewed to insure that no additional publications had been omitted.

4.5.5 *Secondary Data Extraction Pretest Results*

4.5.5.1 *Findings for Post-APRC Applications*

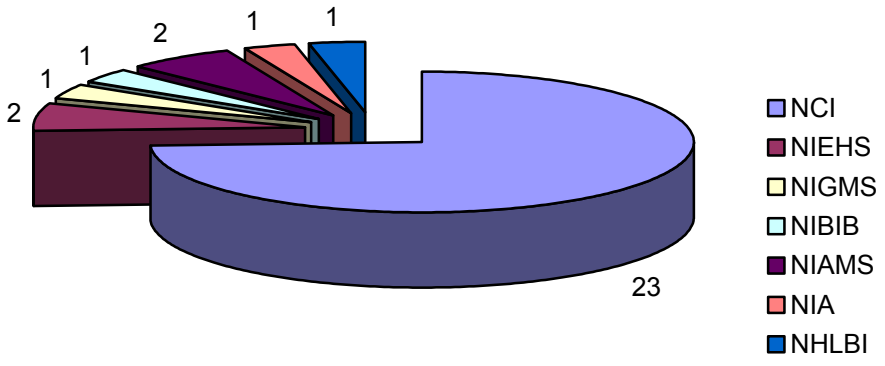
Records of a total of 88 post-APRC applications were identified in PMA. For these records, three summary statements and four applications were missing. Seven applications had not yet been reviewed and so summary statements were not available. A total of 66 summary statements were reviewed. An additional 12 summary statements were duplicates because the application had been withdrawn in favor of an amended application. When this happens, the system automatically replaces the old summary statement with that of the summary statement for the amended application. Review of the summary statements disclosed that the names of APRC collaborators were mentioned on three summary statements. One of these applications was a program project (P01) in which both collaborators were named as project directors. A review of the funding mechanisms for the 88 applications disclosed that 3 of the applications were not research grants—rather one was a conference grant, one an NIH Director's pioneer award and the third an equipment grant application. These were arbitrarily excluded from further analysis. The distribution of the remaining 85 grants by funding mechanism is shown in Exhibit 2.

Exhibit 2. Post-APRC Grant Applications by Funding Mechanism

Number of Applications	Funding Mechanism
53	R01 (Regular Research Project Grant)
11	R21 (Exploratory/Developmental Grant)
8	P01 (Research Program Project)
4	R33 (Exploratory/Developmental Grant Phase II)
3	U54 (Specialized Center Cooperative Agreement)
3	P50 (Specialized Center Grant)
1	R41 (Small Business Technology Transfer Grant-Phase I)
1	U01 (Research Project cooperative Agreement)
1	P51 (Primate Research Center Grant)
85	Total number of applications

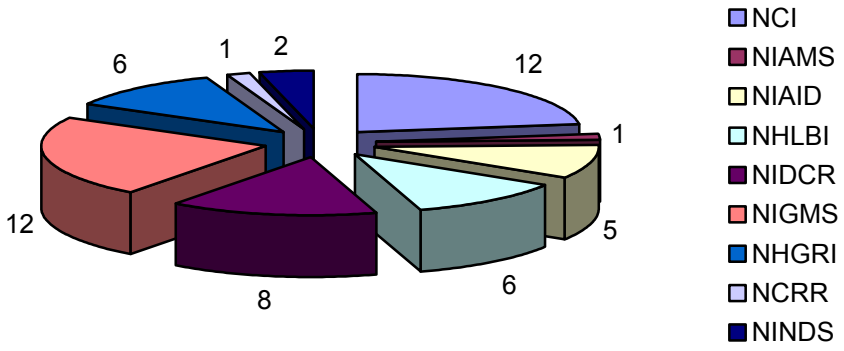
PIs had a total of 31 post-APRC applications. The distribution of these applications by primary funding institute is shown in Exhibit 3.

Exhibit 3. Distribution of Applications by Primary Funding Institute—Principal Investigator



Collaborating investigators had 54 post-APRC applications, the distribution of which is shown in Exhibit 4.

Exhibit 4. Distribution of Funding by Primary Institute—Collaborating Investigators



4.5.5.2 *Findings for Post-APRC related to APRC work*

Post-APRC applications were determined to be related to APRC work in two ways—the presence of at least two APRC collaborators on the application (the PI and one collaborator) and the nature of the science. A total of nine post-APRC applications were identified in which at least two APRC investigators were named on the application. All of these applications were submitted by two of the collaborative teams. One team has four applications and the other five.

The first team consisted of a PI and two collaborating investigators. Details of the four applications are displayed in Exhibit 5.

Exhibit 5. Post-APRC Applications Related to APRC Work—Team 1

Investigator	Funding Mechanism	IC with Primary Assignment	Funding Status	Collaborators on Application
PI	P50	NCI	Pending review	Both collaborators are named as project directors—A2 application
PI	R01	NCI	Awarded	Collaborator 1
Collaborator 1	R01	NCI	Awarded	PI and Collaborator 2
Collaborator 2	R01	NIAMS	Awarded	PI

The second team consisted of three collaborators in addition to the PI. Details of the five applications submitted by members of this team are displayed in Exhibit 6.

Exhibit 6. Post-APRC Applications Related to APRC Work—Team 2

Investigator	Funding Mechanism	IC with Primary Assignment	Funding Status	Collaborator(s) on Application
PI	P50	NCI	Score of 199 10/03 council—award pending	All three collaborators
PI	R01	NCI	Score of 172; PCT 23.3 1/04 council—award pending	Collaborator 1
PI	U01	NCI	Pending council review—score 230	Collaborator 2
Collaborator 1	U54	NIAID	Awarded	Collaborator 3
Collaborator 2	R01	NCI	Pending review	PI

An additional nine applications appear to be substantively related to APRC work although no APRC collaborators were proposed. In one of the applications, the PI specifically mentions that the proposal is derived from multiple collaborations with scientists at her institution and mentions two APRC collaborators by name. The details of these nine applications are displayed in Exhibit 7.

Exhibit 7. Post-APRC Applications Related to APRC Work by Subject Matter

Investigator	Funding Mechanism	IC with Primary Assignment	Funding Status	Notes
APRC PI	R21	NCI	Pending review	Proposal derived from multiple collaborations at home institution
APRC PI	R01	NCI	Awarded	Built on APRC work
APRC PI	R01	NCI	Awarded	Built APRC work into competing continuation—A2 application funded
APRC PI	R01	NHLBI	Pending review	Extension of APRC work
APRC PI	P01	NIEHS	Pending	APRC PI directs a project related to APRC work
APRC Collaborator	R21	NIAMS	Awarded	Tangentially related
APRC PI	R01	NCI	Awarded	Built APRC work into competing continuation
APRC PI	R01	NCI	Awarded	New application
APRC Collaborator	R01	NIDCR	Pending 1/03 Council score 199; PCT 42.5	A2 competing continuation

It should be noted at this juncture that a status of "pending" does not mean that an application will be funded. The longer an application has been pending, the less likely it will be funded. An application remains active for 1 year following Council review and

approval and can be funded at any time during the year. Once a year has elapsed, the application can no longer be funded, but the status will continue to be listed as "pending".

The distribution of post-APRC applications related to APRC work by funding mechanism compared with that of all post-APRC applications is found in Exhibit 8. Since one of the purposes of the Exploratory/Developmental Grant (R21) mechanism is to foster innovative research, one might imagine that R21s would be overrepresented in the post-APRC applications related to APRC work. This, however, is not the case. The proportions of R01s and R21s are similar for both groups. It is interesting to note that one of the three U54 applications, two of the three P50 applications, and the only U01 application are based on APRC work. Since these funding mechanisms allow for multiple components, it makes sense that APRC-related work would be incorporated into new applications in this way.

Exhibit 8. Post-APRC Applications Related to APRC Work Compared to All Post-APRC Applications

Number (Percent) of Post-APRC Applications*	Number (Percent) of Post-APRC Applications Related to APRC Work*	Funding Mechanism
53 (62.4%)	11 (61.1%)	R01 (Regular Research Project Grant)
11 (12.9%)	2 (11.1%)	R21 (Exploratory/Developmental Grant)
8 (9.4%)	1 (5.6%)	P01 (Research Program Project)
4 (4.7%)	0 (0.0%)	R33 (Exploratory/Developmental Grant Phase II)
3 (3.5%)	1 (5.6%)	U54 (Specialized Center Cooperative Agreement)
3 (3.5%)	2 (11.1%)	P50 (Specialized Center Grant)
1 (1.2%)	0 (0.0%)	R41 (Small Business Technology Transfer Grant-Phase I)
1 (1.2%)	1 (5.6%)	U01 (Research Project cooperative Agreement)
1 (1.2%)	0 (0.0%)	P51 (Primate Research Center Grant)
85 (100%)	18 (100%)	Total number of applications

* Percents may not add to 100% due to rounding

Concerns are sometimes expressed that investigators may have difficulty obtaining funding for different and innovative research. Therefore the funding status of all post-APRC applications was compared to that for post-APRC applications proposing APRC-related work. These comparisons are shown in Exhibit 9. Since the APRC-related applications fell into only three funding categories, only these were examined.

Exhibit 9. Funding Status for All Post-APRC Applications and Post-APRC Applications With APRC-related Work

Funding Status	Number (percent) All Post APRC Applications*	Number (percent) APRC-Related Post-APRC* Applications
Awarded	33 (38.8%)	9 (50%)
Pending Award Non-fellowship	12 (14.1%))	5 (27.8%)
Pending IRG Review	9 (10.6%)	4 (22%)

* Percentages do not total to 100% because APRC-Related applications fell into only the 3 funding categories listed in the table

4.5.5.3 *Findings for Post APRC Publications*

After the cutoff dates, the 25 investigators in our sample published 265 papers that were retrieved by searching PubMed. Of these, nine were coauthored with at least one additional APRC collaborator. Two additional papers were identified as covering subject matter obviously related to work proposed under the APRC awards. In both cases, the APRC award PI was an author but no other APRC collaborators were coauthors. It should be noted that all of these papers were published relatively recently—four were published in the latter half of 2003 and the rest in 2004 with three of these just being published in August of 2004. This finding has implications for the full-scale study as investigators who have received APRC awards in more recent years may not have had time to publish their findings. However, interviews with investigators funded in later years will reveal their plans for publishing and progress toward that goal.

4.5.5.4 *Time Required for Data Retrieval*

During the course of data retrieval, the time required to perform each task was tracked. The times recorded are estimates. The calculations below are based on a number of assumptions. Investigators differed in numbers of applications and publications. In addition, APRC teams varied in the number of collaborators. Three teams had two collaborators including the PI, five teams had three collaborators, and one team had four. Obviously more time would be required to collect and assess the output of a prolific team of four investigators relative to a less productive team of two investigators. The estimated time required for specific tasks as well as the total effort are shown in Exhibit 10.

Exhibit 10. Length of Time Required for Data Retrieval by Task

Task	Unit of Analysis	Approximate Time per Item (minutes)	Number of Units	Approximate Total Time per Task (minutes)
Generate information from PMA Name Query form, transfer data to spread sheet and folder in hard drive	Investigator	20	25 Investigators	500
Locate and send summary statements to printer	Investigator	1	25 Investigators	25

Task	Unit of Analysis	Approximate Time per Item (minutes)	Number of Units	Approximate Total Time per Task (minutes)
Review summary statement for collaborators names in investigator section of critiques	Summary Statement	1	59 Summary Statements	59
Locate and review grant application on screen for collaborators listed in key personnel and budget/budget justification	Application	2	85 Applications	85
Search PubMed, create a file of abstracts for PI and print abstracts	Investigator	16	25 Investigators	400
Locate APRC application in e-Grants and print*	APRC team	10	9 APRC Teams	90
Aggregate all summary statements, applications and publication abstracts for each team with APRC application	APRC Team	5	9 APRC Teams	45
Carefully read APRC application	APRC Team	12	9 APRC Teams	108
Read applicant abstracts for all summary statements/applications and tabulate data**	APRC Team	15	9 APRC Teams	135
Review publication titles, coauthors, and abstracts to determine presence of APRC collaborators as coauthors and relatedness of science to APRC work and tabulate results***	APRC Team	35	9 APRC Teams	315
Total time required: 1,762 minutes (29.4 hours) (3.3 hours per team) (1.2 hours per investigator)				

Notes:

* Ten minutes is an average time. Approximately 7–8 minutes were required to find each of the eight applications; 30 minutes were invested in attempting to locate the ninth application.

** Sixty-six applicant abstracts were reviewed (59 in summary statements and 7 in applications); although the number of applicant abstracts varied per team, for ease of calculation, it was assumed there were equal numbers for all teams.

*** Abstracts from 265 publications were reviewed. Although the number of publications varied by team, it was assumed the numbers were equal (about 30).

4.5.5.5 *Summary of Findings and Implications for Full-Scale Study*

With regard to the APRC program, we learned that a total of 85 post-APRC grant applications were submitted. For APRC PIs, NCI was the primary funding institute with a large majority of applications (75%), while for APRC collaborators, this distribution was more diverse with NCI being the primary funding institute on 22 percent of applications.

Eighteen of the 85 applications (21.2%) were related to APRC work. For these APRC-related applications, the distribution of funding mechanisms was similar to that of the total sample. Prior to the study, it was speculated that the R21 (Exploratory/ Developmental Grant) mechanism would be overrepresented in subsequent APRC-related applications; however, this was found not to be the case. Although the numbers were very small, it was interesting to note that Specialized Center Grants (P50s) were overrepresented among the APRC-related applications. Concerns are sometimes expressed that truly innovative research might not do well in review and thus would be less likely to be funded. We found that half of APRC-related applications were awarded compared to 38.8 percent of all post-APRC applications. Since the APRC awards were relatively recent, it is not surprising that 22 percent of the APRC-related applications are pending review compared to 10.6 percent of all post-APRC applications. With regard to post-APRC publications, we learned that 11 of 265 (4.2%) were APRC-related and that these publications are relatively recent.

With regard to the data collection and analysis protocol itself, issues arose related to the usefulness and efficiency of collecting information from the summary statements, the procedure for accessing publications, and funding mechanisms. Clearly the protocol for the full-scale study will need to be revised accordingly to reflect these and other lessons learned. The pretest has demonstrated that the secondary data collection and analysis are feasible and useful. The study also showed that a significant amount of time was required to perform these functions—an average of 1.2 hours per investigator. The methodological issues and the time requirements will play a critical role in shaping the design of the full-scale study.

5. RECOMMENDATIONS FOR A FULL-SCALE EVALUATION

In this section, we outline our recommendations for a full-scale evaluation of NCI's APRC program. We make suggestions regarding study design, target population, data sources, and data collection instruments. We also provide information to serve as an outline for developing a package for OMB clearance.

5.1 Study Design

Based on the results of the feasibility study, we recommend including both process and outcome components in a full-scale evaluation of the APRC program. Process elements will provide NCI with information on experiences while applying for the award and subsequently while conducting the research supported by the award. Process data will inform and provide context for data collected on outcomes of the program—whether the outcomes are based on researcher perceptions of the benefits of the program or more quantifiable items such as resulting publications or follow-up research proposals.

We further recommend that data collection tools include both quantitative and qualitative components. Such a mix of types of data will provide quantifiable results that can be aggregated across respondents, as well as more in-depth qualitative information that can provide a contextual base for interpreting the quantitative findings. The semi-structured interview survey tool we pretested collects process and outcome indicators and uses

closed-ended and open-ended questions that provide quantitative and qualitative data, respectively.

5.2 Study Population

As described above, during the feasibility study we pulled study samples from the pool of applicants from Fiscal Year 2001. The population frame for the full-scale study will depend on NCI's decisions about which specific program outcomes it wants to focus on. For example, in examining publications from researchers funded in the FY 2001 cycle, we found that most award-related publications did not come out until 2004, that is, close to 3 years after receipt of the award. In fact, it is possible that other publications will appear after the date of this report. If NCI decides to use award-related publications as a key outcome indicator, the population frame for the larger evaluation should be researchers funded in FY 2002 and earlier. On the other hand, if NCI considers other outcome indicators, such as researcher perceived benefits of the award, as a more relevant set of outcomes, then the study population could be broadened to awardees from FY 2003 and before. We do not recommend drawing from the group funded in FY 2004, as these projects are likely to still be underway.

To obtain a complete picture of the APRC program, it would be useful to collect information from the inception of the awards program in 1998. If interviews are conducted with multiple investigators from each research team, up to approximately 300 investigators will be included in the data collection for the full-scale evaluation study. The feasibility of this will depend on the quality of identifying and contact information data available in NCI files.

For the full-scale evaluation, CSR recommends collecting information only from researchers who were awarded APRC funding. Although we collected information from non-awardees as well during the feasibility study, the benefits of such data collection appear minimal. Nonfunded researchers frequently did not recall the details or the application process, making the reliability of their responses suspect. In addition, over half of those nonfunded researchers we interviewed reported still going on to pursue the proposed research under different funding mechanisms, and over half continued on to collaborate with the partners proposed on the APRC application. Given these findings, it appears that NCI would maximize its resources and efforts by focusing the larger evaluation on collecting information from APRC-funded researchers only.

5.3 Data Sources and Quality Control

As shown in the feasibility study, APRC-funded researchers provided the most useful and reliable data. Once initial contact was made with each researcher, most were willing to participate and were able to schedule a telephone interview within a short 2-week period. In the full-scale study, funded researchers from the designated funding cycles should serve as the primary source of both process and outcome data.

The e-Grants and PMA database systems, as well as PubMed, can provide additional information on possible outcomes of the APRC award, such as follow-on proposal submissions and publications. This is a labor-intensive data collection process, however. NCI will need to decide whether available resources exist to include this component in

the evaluation. We recommend that a reasonable option would be to retrieve data from the e-Grants and PMA systems on only a sample of approximately 75 investigators. Such data could be used as a reliability check for comparable information collected through the survey. For example, a search of PubMed could serve as a check of a researcher's response about publications co-authored with other APRC investigators (survey question 9).

It will be important that all interviewers receive training in conducting the telephone survey. In addition, the quality of each interviewer's technique should be monitored on a regular basis. One way to do this would be to have another data collection staff person listen in on a sample of interviews done by all interviewers immediately following the training. The second staff person would not interfere in the interview process, but would monitor the interview and provide feedback to the interviewer after the completion of the interview. Given the background and credentials of the interviewees and the scientific nature of the topics to be discussed, we recommend that all interviewers be trained researchers.

5.4 Data Collection Instruments and Data Analysis

The telephone interview survey tool used during the feasibility study should serve as the prime data collection tool for the full-scale evaluation as well, with some modifications. Experience from pretesting this instrument showed that some questions were redundant, others were not clearly worded or could better be rephrased, and others did not lend useful data. Appendix B shows the original survey used in the pretest. Appendix E shows a revised tool that we recommend for the larger evaluation. Specific changes to the original instrument are as follows:

- Question 1: How did you become aware of the APRC program?
  - Most respondents used the third, fourth, or fifth response option. The first two answer options can be deleted, as they can be covered in the "other" response option.
- Question 3: Did you approach any potential collaborators who did not participate?
  - No respondent answered "yes" to this question. This question does not seem to provide useful information for evaluating the program.
- Question 4: Do you know of other investigators or colleagues who were aware of the APRC but who did not apply for the award?
  - Similarly, it is not clear what additional value this question offers, especially as very few respondents answered positively to the question.
- Question 8: Please describe the disciplines included in your APRC team.
  - Respondents have different definitions of discipline. Therefore, what one respondent may consider a different discipline (e.g., different kinds of cell biology), another respondent may consider the same discipline. Given the goal of the APRC program to foster multidisciplinary research, NCI made the evaluation, in deciding to fund each proposed study, that the disciplines were different enough to be

considered cross-disciplinary. We do not believe that Question 8 would provide additional helpful information.

- Question 10: Did you have any history of working with researchers in this (these) field(s) before you were associated with the APRC program?
  - The more salient question is whether the APRC provided the first opportunity for researchers to work with others from the different fields. The revised questionnaire includes our recommended rewording.
- Question 12: Did your collaboration on the APRC result in any of the following?
  - The response on "Development of trust and collegiality with other APRC investigators" fits better at the end of the response option list, before "other".
- Question 17(f): The APRC collaboration strengthened the capabilities of each of the collaborators in their other research endeavors.
  - Several respondents said they could not comment on the experiences of their partner researchers in the study. We therefore recommend rephrasing the question to ask each researcher interviewed about how the collaboration strengthened his or her own capabilities.
- Question 17(h): Participation in the APRC increased our awareness of other funding mechanisms to support our work.
  - Very few respondents agreed with this statement, and it seems appropriate to delete it from the revised survey tool.
- Question 17(k): The APRC experience has encouraged me to spend more time reading journals and attending conferences outside my major field to pursue new approaches to my work.
  - Similarly, as very few respondents agreed with this statement, we recommend that this item be omitted from the revised interview instrument.

All data from the interview survey will be entered into a database, such as Access. To monitor the quality of data entry, data from a sample of questionnaires will be entered twice into the database, and any discrepancies will be examined for correction. Alternatively, a data entry form could be created to allow interviewers to enter the responses directly into the database. With this system, it would not be possible to monitor for data entry errors; however, the time and effort saved from removing the paper-to-database data entry step may be substantial.

Data will be extracted from the database into a statistical analysis software program, such as SPSS. Basic descriptive analytic methods will be used to analyze the data from the interview surveys. This may include such methods as frequencies, means, and cross tabulations across categories of researchers, for example, researchers funded in different cycle years. The nature of the data will not lend itself to more sophisticated statistical modeling techniques.

5.5 Estimated Timeline and Cost

Based on the length of time and staff hours required to conduct the feasibility study, we estimate that it will take approximately 8 months to complete the full-scale evaluation. We recommend that interviews be conducted with all available collaborators who participated in the APRC awards selected for study. To provide evaluation findings that will cover the entire period of the APRC program, we estimate that approximately 100 awardees will be included in the study, with an average of 3 investigators per APRC team. We have recommended that approximately one-fourth of these investigators be included in the secondary analysis study component described in Section 4.5 of this report. Exhibit 11 provides an estimate of the level of effort that will be required to conduct this study. The total level of effort of approximately 2,896 hours will require funds in the amount of $249,000 to cover estimated expenses associated with the full-scale evaluation of the APRC program.

Exhibit 11. Level of Effort and Timeline

Tasks	Level of Effort	Timeline
Task 1: Planning Meetings/Finalizing Research Design	104	Month 1
Task 2: Preparation/Defense of OMB Package	216	Months 1–2
Task 3: Sample Selection/Survey Clearance Procedures	360	Month 2
Task 4: Conduct of Interviews	728	Months 3–5
Task 5: Data Entry/Analysis of Survey Data	680	Months 3–6
Task 6: Extraction of Data from Secondary Sources	164	Months 2–4
Task 7: Analysis of Secondary Data	88	Month 5
Task 8: Preparation of Final Report/Publications	556	Months 7–8
Total Hours	**2,896**	**Months 1–8**

5.6 OMB Submission Requirements

The Office of Management and Budget (OMB) clearance function, similar to institutional review boards, is designed to ensure that studies undertaken by government agencies are safe, efficient, and useful. The Paperwork Reduction Act of 1995 (PRA), P.L. 104-13 outlines the process for gaining clearance from OMB for systematic collection of information by Federal agencies. Most clearances expire after 3 years and require new clearance for continued usage. OMB's reviews of information collections typically focus on two things: the need for the information—including whether the information may exist elsewhere—and the burden on the public to provide the information. Results from the feasibility study provide the framework for completing an OMB clearance package for the full-scale evaluation. We briefly outline below some of the key components of the OMB package and supporting information drawn from the feasibility study.

5.6.1 *Cover Form (OMB 83-I)*

The cover form for the OMB package—form OMB 83-I—requests basic information about the proposed data collection effort. Key elements are the *annual reporting and recordkeeping hour burden* (item 13) and the *annual reporting and recordkeeping cost burden* (item 14).

- *Annual reporting and recordkeeping hour burden.* Depending on the funding cycle years to be included in the full evaluation, the number of respondents may be up to 300. This is based on an estimate of interviews with 100 primary PIs and 200 collaborating PIs (an average of two collaborators in addition to the primary PI for each APRC collaborative team). This would be a one-time data collection process from each researcher, making for 300 *total annual responses*. Apart from scheduling correspondence, none of the responses would be collected electronically, although respondents would not have to complete a paper questionnaire either, as the interview would be conducted over the telephone. We estimate that each interview will take approximately 20 minutes. Adding 10 minutes for scheduling correspondence, we estimate a per-researcher burden of 30 minutes. The *total annual hours requested* would therefore be 150 hours (300 X 0.5).
- *Annual reporting and recordkeeping cost burden.* We do not foresee any *capital/startup costs* to respondents for participating in the survey. Assuming that responding to the survey takes away from time spent on their other professional activities, the *total annual costs (O&M)* to the 300 researchers would be $4,840.50. This figure was computed using the average hourly wage from the Bureau of Labor Statistics for the biochemists and biophysicists category (#19-1021) of $32.27 and multiplying it by the 30 minute estimated hour burden.

5.6.2 *Justification*

In support of form 83-I, OMB requires a written justification for the proposed data collection. We outline below the main points under each section of this justification.

- *Justification for need for data collection.* There is growing interest within the scientific and research funding community in fostering cross-disciplinary collaborative research partnerships to move the field forward. This is especially the case for research on cancer, a disease which continues to affect millions in the United States and worldwide. The APRC is one of NCI's innovative programs to further such collaborative science; however, since its inception, no evaluation of the implementation and impact of the program has been conducted. The proposed data collection would be the first such evaluation to be conducted.
- *Use of resulting information.* The findings from the data collection effort would be used to improve the program.
- *Description of any technological data collection techniques.* Data will be retrieved from existing NCI database systems, including the e-Grants and the PMA systems, as well as from the scientific publications database PubMed. The data collection team will apply a systematic protocol for such data retrieval.
- *Efforts to identify duplicate, existing information.* The NCI has examined existing reports and databases about the APRC program and funded researchers; however, these data sources do not provide the information on program process or outcomes that would help the NCI improve the program in the future. Such programmatically-useful information would only be available from interviews with the funded researchers.

- *Consequences of not collecting the data.* Without collecting information about the implementation and impact of the APRC program, the NCI will not know whether and how the program is functioning as planned and what effect it is having. The NCI relies on such information in order to make decisions about whether or not to fund this and similar programs.
- *Description of assurance of confidentiality.* All respondents will be asked to read and sign a consent form before participating in the study. The form will describe the study and procedures used to assure confidentiality of all responses. Although identifying information will be collected in order to make contact with the respondents, this information will not be linked in any way to the responses provided by the interviewees.
- *Estimated hour burden and cost burden to respondents.* As described above, the estimated total hour burden to respondents is 150 hours, and the estimated total cost is $4,840.50.
- *Estimated annual cost to Federal government.* Based on CSR's experience conducting the feasibility study, we estimate that the annual cost to the Federal government for conducting the full-scale evaluation of the APRC program would be $249,000.
- *Plans for data tabulations and publication.* The NCI will need to decide whether or not it intends to publish results from the evaluation. If it plans to develop publications, e.g., reports made available to the public or research journal articles, plans for such publication will need to be described.

5.6.3 *Collection of Information Employing Statistical Methods*

Quantitative data from the interview survey will be analyzed using basic statistical methods. The OMB requires a brief description of statistical approaches.

- *Study sample size.* As noted above, NCI will need to decide which funding cycle years to include in the study. We estimate a sample size of 300 respondents.
- *Expected response rate.* Based on response rates from the feasibility study, we expect a response rate for the full evaluation at 80 percent.
- *Data collection procedures (i.e., stratification and sample selection, estimation, etc.).* Given the small number of collaborative studies funded over the course of the APRC program, CSR recommends surveying all collaborative teams within the selected funding cycles. This would avoid the need for sampling.
- *Methods to maximize response rate.* To maximize the response rate, NCI staff will contact all researchers in the study population first through e-mail or letter correspondence to explain the purpose of the study and encourage them to participate. The survey team will then follow-up with each potential respondent to confirm their willingness and ability to participate and to schedule the most convenient time for the interview.
- *Tests of procedures or methods to be undertaken.* The primary form of data collection will be a telephone interview survey with researchers participating in the APRC

research studies funded during the selected funding cycles. For a sample of researchers interviewed, the survey will be supplemented with data retrieval from PubMed, as well as the NCI e-Grants and PMA systems.

6. REFERENCES

Bruce, A., Lyall, C. Tait, J., and Williams, R. 2004. Interdisciplinary integration in Europe: the case of the Fifth Framework programme. *Futures* 36:457–470.

Committee on Science, Engineering, and Public Policy (COSEPUP). Committee on Facilitating Interdisciplinary Research. Available at: http://www7.nationalacademies.org/interdisciplinary/About.html. Accessed 7/13/2004

Gilchrist, L.D., Gillmore, M., Morrison, D., Oxford, M., and Spieker, S. *Tandem Risk: Outcomes for Children of Teen Mothers*. NIDA grant funded for April 2003–March 2008. Available at: http://depts.washington.edu/sswweb/resweb/PDF/Tandem%20Risk.pdf

Institute of Medicine (IOM), Committee on Building Bridges in the Brain, Behavioral, and Clinical Sciences, Division of Neuroscience and Behavioral Health. *Bridging Disciplines in the Brain, Behavioral, and Clinical Sciences*. T.C. Pellmar and L.Eisenberg, Editors. National Academy Press: Washington, DC. 2000. Available at: http://books.nap.edu/html/bridging_disciplines/

Larson, E.L. 2003. Minimizing disincentives for collaborative research *Nursing Outlook* 51(6):267–271.

National Institute of Allergy and Infectious Diseases (NIAID). NIAID Expands Malaria Research Efforts. *Dateline: NIAID. September 1997.* Available at: http://www.niaid.nih.gov/publications/dateline/0997/nemre.htm. Accessed: June 6, 2004.

National Institute for Nursing Research (NINR). Nursing Partnership Centers on Health Disparities, and the Nursing Exploratory Centers. Information available at: http://www.nih.gov/ninr/research/exploratory_centers.html

National Institutes of Health (NIH) Guide. *Health Disparities: Linking Biological and Behavioral Mechanisms With Social and Physical Environments.* Release Date: November 4, 1999. RFA: ES-00-004. Available at: http://grants.nih.gov/grants/guide/rfa-files/RFA-ES-00-004.html

National Institutes of Health. The Nation's Investment in Cancer Research. A Plan and Budget Proposal for Fiscal Year 2005. Prepared by the Director, National Cancer Institute, October 2003.

Porac, F.F., Wade, J.B., Fischer, H.M., Brown, J., Kanfer, A., and Bowker, G. 2004. Human capital heterogeneity, collaborative relationships, and publication patterns in a multidisciplinary scientific alliance: a comparative case study of two scientific teams. *Research Policy* 33:661–678.

Torii, K., Nara Institute of Science an Technology, Ikoma, Nara, Japan, torii@is.aist-nara.ac.jp

Roussos, S.T., and Fawcett, S.B. 2000. A review of collaborative partnerships as a strategy for improving health. *Annual Review of Public Health* 2l:369–402.

Stokols, D., Fuqua, J., Gress, J., Harvey, R., Phillips, K., Baezconde-Garbanati, L., Unger, J., Palmer, P., Clark, M.A., Colby, S.M., Morgan, G., and Trochim, W. 2003. Evaluating transdisciplinary science. *Nicotine & Tobacco Research*. 5(Suppl 1):S21–39.

Verville, R., and DeLisa, J.A. 2003. Evolution of National Institutes of Health options for rehabilitation research. *American Journal of Physical Medicine & Rehabilitation* 82(8):565–79.

Feasibility Study To Evaluate the *Activities To Promote Research Collaborations* Program

Appendix A: Standard NCI Letter to Prospective Respondents

CSR Incorporated
Consulting Services & Research

APPENDIX A: STANDARD NCI LETTER TO PROSPECTIVE RESPONDENTS

Dear :

NCI's Division of Cancer Biology (DCB) has contracted with CSR, Incorporated, to develop a sound approach to evaluating the outcomes of the Activities to Promote Research Collaborations (APRC) Program, and it will be important to hear from the researchers who have received APRC supplements. I am writing to ask you to participate, if called, in an interview/feasibility study that will ask questions about your experience with the APRC program and your overall assessment of your APRC experience. We have given the contractor a few more names than needed, assuming that they will be unable to reach some awardees within the necessary timeframe. Thus, you may not be called, but we would appreciate your help.

Your participation will only require about 30 minutes and we do not anticipate any other burden on you or your colleagues. Please call me or e-mail me to confirm your availability to participate in this study. As soon as I have heard from you, I will notify Dr. Sherrie S. Aitken, President of CSR, Incorporated, so that she can assign one of her staff to call you directly and schedule the interview at a mutually convenient time within the weeks of August 9th or August 16th. The next step will be for you to receive a call directly from one of three CSR staff that will be conducting the interviews: Dr. Aitken, Dr. Mary C. Dufour, or Dr. Gabriella Newes-Adeyi.

I look forward to hearing from you soon and will follow up in a couple of days if I have not heard from you.

Sincerely,

Feasibility Study To Evaluate the *Activities To Promote Research Collaborations* Program

Appendix B: Awardee Face Sheet and Survey

CSR Incorporated
Consulting Services & Research

APPENDIX B: AWARDEE FACE SHEET AND SURVEY

APRC Evaluation - PI Information Sheet

Sample	*PI or Collaborator?*	*Confirmed?*

Name

Address

Phone1 ***Phone2***

Email

Grant Title

Grant

Collaborators

Number of Collaborators ***Branch***

Program Director ***Program Director****

Request Type

Requested Years ***Recommended Years***

Requested Year 1 Funding

Total Funding Recommended ***Year 1 Funding***

CSR Interviewer *Notes:*

Interview Date

Interview Time

ACTIVITIES TO PROMOTE RESEARCH COLLABORATIONS
INTERVIEW GUIDE—PRETEST VERSION

I would like to start by asking you a few questions about your early experiences with the APRC Program.

1. **How did you become aware of the APRC program?**
   - ☐ Heard about it from a colleague within my own discipline (*Identify institution* _____).
   - ☐ Heard about it from a researcher in a discipline outside my own research area (*Identify institution/ discipline* _____)
   - ☐ Read about it in an NIH Guide Notice.
   - ☐ Heard about it from a DCB staff member.
   - ☐ Other (*Please specify:* _____).

2. **Did you contact your Program Director or another DCB staff member to discuss the APRC application prior to applying for the award?** ☐ Yes ☐ No

   If yes, did you find their advice helpful? Why or why not? _____

3. **Did you approach any potential collaborators who did not participate?** ☐ Yes ☐ No

   If yes, what were their reasons for not participating? _____

4. **Do you know of other investigators or colleagues who were aware of the APRC but who did not apply for the award?** ☐ Yes ☐ No

5. **Before submitting your application for an APRC award, had you ever been a member of an organized research consortium?** ☐ Yes ☐ No

Now, I would like to ask you a few questions about your experience during the time that you worked on the APRC program.

6. **Did you receive support or encouragement in applying for this award from your colleagues or your institution?** ☐ Yes ☐ No

   If yes, please describe: _____

7. **Please describe any problems you had in forming or participating in the APRC consortium.** (*Probe for problems encountered during pre-application and during period of collaboration*.)

8. **Please describe the disciplines included in your APRC team.**

9. Please describe the frequency and types of interactions you had with your collaborators on the APRC.

Frequency of contacts: _____

Primary means of communication (e.g., telephone, e-mail, face-to-face meetings): _____

10. Did you have any history of working with researchers in this (these) field(s) before you were associated with the APRC program? ☐ Yes ☐ No

If yes, please describe: _____

_____

11. Would you have worked with individuals from this (these) disciplines if you had not been involved in the APRC program? ☐ Yes ☐ No

If yes, please explain why: _____

_____

Now, I would like to ask you a few questions about what you gained from participating in the APRC Program.

12. Did your collaboration on the APRC result in any of the following? (*Check all that apply.*)

☐ Development of a new technology, diagnostic tool, or other methodology *(Please describe:* _____ _____)

☐ Opportunity to join/become active in new professional arenas not known to me before (*Please describe:* _____)

☐ Filing for a patent of a product developed under APRC

☐ Publication that is co-authored with other APRC investigators (*Please specify:* _____ _____)

☐ Submission of a conference abstract or preparation of conference paper or poster session materials (*Please specify:* _____)

☐ Development of new research hypotheses that are/will soon be pursued by another research effort *(Please describe:* _____)

☐ Development of trust and collegiality with other APRC investigators

☐ Development of research proposal to continue APRC research *(Please describe type of research and status of application:* _____)

☐ Participation with other non-APRC collaborators *(Please describe type of collaboration and funding source:* _____)

☐ Ability to access new information/data sets and informational tools

☐ Recognition for work performed or award received *(Please specify:* _____)

☐ Other (*Please describe any other major outcomes of your work:* _____ _____)

*****[Skip to Question 15 if respondent reported significant results.]*****

13. If your APRC project was not as successful as you had hoped it would be, please describe why not.

_____

_____

14. What do you think were the major impediments to generating concrete outputs, such as publications, new grant applications, etc., from the APRC project?

_____

_____

15. Besides what we have just discussed, have you continued to collaborate with your APRC partners in other ways since completing the research? ☐ Yes ☐ No

If yes, please describe: _____

_____

If you have not continued to collaborate, please explain why not: _____

_____

Now, I would like to ask you a few questions about your overall assessment of the APRC experience.

16. Do you think you could have accomplished this work without APRC funding? ☐ Yes ☐ No

Please explain: _____

_____

17. On a scale of 1 to 5, please tell me how strongly you agree or disagree with the following statements:

(a) There was no funding source available, outside of the APRC program, for this research.

1 2 3 4 5

Strongly Disagree Strongly Agree

(b) The research we conducted under APRC helped to launch important follow-up research.

1 2 3 4 5

Strongly Disagree Strongly Agree

(c) The APRC award provided an introduction to new professional contacts.

1 2 3 4 5

Strongly Disagree Strongly Agree

(d) Scientists from different disciplines were able to bring their expertise to bear on common problems in productive new ways under the APRC program.

1 2 3 4 5

Strongly Disagree (*When a score of 1 is given, probe for more information.)* Strongly Agree

(e) Under the APRC program, we were able to forge new collaborative ties that would not have been formed otherwise.

1 2 3 4 5

Strongly Disagree Strongly Agree

(f) The APRC collaboration strengthened the capabilities of each of the collaborators in their other research endeavors.

1 2 3 4 5

Strongly Disagree Strongly Agree

(g) The research we conducted under APRC helped us to develop new insights and paradigms.

1 2 3 4 5

Strongly Disagree Strongly Agree

(h) Participation in the APRC increased our awareness of other funding mechanisms to support our work.

1 2 3 4 5

Strongly Disagree Strongly Agree

(i) The APRC award provided us with the opportunity to receive training in new research techniques, the use of new instrumentation, or new technology.

1 2 3 4 5

Strongly Disagree Strongly Agree

(j) The APRC experience has encouraged me to spend more time collaborating with researchers outside my own discipline for the purpose of integrating their ideas into my own work.

1 2 3 4 5

Strongly Disagree Strongly Agree

(k) The APRC experience has encouraged me to spend more time reading journals and attending conferences outside my major field to pursue new approaches to my work.

1 2 3 4 5

Strongly Disagree Strongly Agree

18. What do you consider the major benefits of your experience in working on the APRC program?

19. What recommendations would you make to improve the APRC program in the future? *(Probe for changes in administration of the program, requirements for funding, changes in how to communicate effectively with other collaborations and with DCB staff.)*

Thank you for taking the time to respond to this survey.

Feasibility Study To Evaluate the *Activities To Promote Research Collaborations* Program

Appendix C: APRC Interview Guide—Comparison Group

CSR Incorporated
Consulting Services & Research

APPENDIX C. APRC INTERVIEW GUIDE—COMPARISON GROUP

RESEARCHERS WHO DID NOT RECEIVE APRC FUNDING
INTERVIEW GUIDE

I would like to start by asking you a few questions about your early experiences in applying for the APRC funding.

1. **How did you become aware of the APRC program?**

   ☐ Heard about it from a colleague within my own discipline (*Identify institution* _____).
   ☐ Heard about it from a researcher in a discipline outside my own research area (*Identify institution/ discipline* _____)
   ☐ Read about it in an NIH Guide Notice.
   ☐ Heard about it from a DCB staff member.
   ☐ Other (*Please specify:* _____).

2. **Did you contact your Program Director or another DCB staff member to discuss the APRC application prior to applying for the award?** ☐ Yes ☐ No

   If yes, did you find their advice helpful? Why or why not? _____

   _____

3. **Do you know of other investigators or colleagues who were aware of the APRC but who did not apply for the award?** ☐ Yes ☐ No

4. **Before submitting your application for an APRC award, had you ever been a member of an organized research consortium?** ☐ Yes ☐ No

Now, I would like to ask you a few questions about your experience after you had completed your application for APRC funding.

5. **Were you surprised to learn that your APRC supplement had not been funded?** ☐ Yes ☐ No

   Please describe your reaction: _____

   _____

   _____

6. **What kind of feedback did you receive from DCB?**

   _____

   _____

7. **After you learned that you had not received the APRC funding, did you go on to pursue the proposed project?** ☐ Yes ☐ No

   If yes, please describe how you were able to find other support for this project: _____

   _____

8. **Did you go on to engage in other consortia or collaborations with the same investigators?** ☐ Yes ☐ No

9. **Did you pursue other opportunities to collaborate with researchers who were from a different discipline?** ☐ Yes ☐ No

   If yes, please describe the circumstances: _____

   _____

10. **Did the process of preparing/developing the APRC application and initiating contacts with potential collaborators help you to network or provide the momentum to pursue other collaborative research efforts?**

    ☐ Yes *(Please explain:* _____)

    ☐ No (*Please explain why not:* _____)

11. **Would you consider applying for an APRC supplement in the future?** ☐ Yes ☐ No

    Please explain: _____

    _____

12. **What recommendations would you make to improve the APRC application process in the future?** *(Probe for changes in administration of the program, requirements for funding, changes in how to communicate effectively with other collaborations and with DCB staff.)*

    _____

    _____

    _____

    _____

    _____

Thank you for taking the time to respond to this survey.

Feasibility Study To Evaluate the *Activities To Promote Research Collaborations* Program

Appendix D: IMPACII/PMA Data Retrieval Process Recommendations

CSR Incorporated
Consulting Services & Research

APPENDIX D. IMPACII/PMA DATA RETRIEVAL PROCESS RECOMMENDATIONS

CSR has explored the IMPACII/PMA database to determine what elements are relevant to the evaluation of the APRC program, as well as the most efficient process of retrieval of these data. For the feasibility study, we recommend the following actions.

1. Identify a sample of 9 APRC awardee collaboratives from 2001 funding cycles. These would include the same awardees that we will interview for the survey. *(Note that, since we are selecting fewer than 9 collaborative groups for the survey—in order to interview some principal investigator/collaborating investigator pairs—we will have to select 2-3 additional collaboratives for the database retrieval pilot.)*
2. Search the NCI L Drive APRC folder to identify:
   a. Grant number for the APRC parent grant
   b. PI name
   c. Collaborative investigator name, institution, and other identifying information.
3. Search PMA for each PI and collaborating investigator, for:
   a. Applications submitted to NIH at least 1 year after the initiation of the APRC. We will include in this count the following applications:
      i. Type 1: new
      ii. Type 2: competing continuation
      iii. Suffix A: amended
      iv. Suffix S: supplement

   We will not include *non-competing continuation (type 5)* applications. We will code applications as to whether they are original applications or amended ones, and ensure that we do not count original and amended applications as two separate applications.

   Because the application submission date is only available on the application PDF file (and not all applications have a linked application file), we will use as proxy the Council meeting date. Given the lag time between application submission and Council meeting date, we will select all applications with Council dates at least 18 months after the APRC award.
4. For all post-APRC applications for each PI and collaborating investigator, identify:
   a. Number of post-APRC applications;
   b. Funding status of each post-APRC application; We will count as funded those application grants that have been awarded but are still pending disbursement, i.e. those with status *to be paid* or *pending award*.
   c. IRG score for each post-APRC application (including funded and nonfunded);
   d. Percentile for each post-APRC application (including funded and nonfunded);

e. Whether application is a collaborative; and

f. Whether collaborators on these collaboratives are APRC collaborators.

5. For each PI and collaborating investigator, review all post-APRC applications or summary statement project descriptions to determine whether or not the proposed research is related to work conducted under the APRC.
6. For all post-APRC applications determined to be related to APRC award work, identify:
   a. Funding mechanism (e.g., R01, R21, P01, etc.). (Note that an R21 may be used as a partial proxy for assessing innovation, as these types of grants are, by definition, considered innovative.)
   b. IC with primary assignment;
   c. Funding status. (Note that we will have captured funding status in Step 4 already.)
7. For each PI and collaborating investigator, review all abstracts of publications listed in IMPACII/PMA to determine if the publication relates to work conducted under the APRC. If necessary, we will review the full text of the publication to make this determination.

CSR will time the data retrieval process for each APRC group, from identification of collaborating investigator information to be used to search PMA to reviewing the summary statement project description sections. Based on the different search times for each collaborative, we will compute an average across all 9 groups.

Feasibility Study To Evaluate the *Activities To Promote Research Collaborations* Program

Appendix E: APRC Interview Guide—Revised Version

CSR Incorporated
Consulting Services & Research

APPENDIX E. APRC INTERVIEW GUIDE—REVISED VERSION

ACTIVITIES TO PROMOTE RESEARCH COLLABORATIONS INTERVIEW GUIDE—REVISED VERSION

I would like to start by asking you a few questions about your early experiences with the APRC Program.

1. **How did you become aware of the APRC program?**
   - ☐ Read about it in an NIH Guide Notice.
   - ☐ Heard about it from a DCB staff member.
   - ☐ Other (*Please specify:* _____).

2. **Did you contact your Program Director or another DCB staff member to discuss the APRC application prior to applying for the award?** ☐ Yes ☐ No

   If yes, did you find their advice helpful? Why or why not? _____

   _____

3. **Before submitting your application for an APRC award, had you ever been a member of an organized research consortium?** ☐ Yes ☐ No

Now, I would like to ask you a few questions about your experience during the time that you worked on the APRC program.

4. **Did you receive support or encouragement in applying for this award from your colleagues or your institution?** ☐ Yes ☐ No

   If yes, please describe: _____

   _____

5. **Please describe any problems you had in forming or participating in the APRC consortium.** (*Probe for problems encountered during pre-application and during period of collaboration*.)

   _____

   _____

6. **Please describe the frequency and types of interactions you had with your collaborators on the APRC.**

   Frequency of contacts: _____

   Primary means of communication (e.g., telephone, e-mail, face-to-face meetings): _____

7. **Is the APRC program the first time you have worked with researchers in this (these) field(s)?** ☐ Yes ☐ No

8. **Would you have worked with individuals from this (these) disciplines if you had not been involved in the APRC program?** ☐ Yes ☐ No

   If yes, please explain why: _____

   _____

Now, I would like to ask you a few questions about what you gained from participating in the APRC Program.

9. Did your collaboration on the APRC result in any of the following? (*Check all that apply.*)

- ☐ Development of a new technology, diagnostic tool, or other methodology *(Please describe:* _____ _____)
- ☐ Opportunity to join/become active in new professional arenas not known to me before (*Please describe:* _____)
- ☐ Filing for a patent of a product developed under APRC
- ☐ Publication that is co-authored with other APRC investigators (*Please specify:* _____ _____)
- ☐ Submission of a conference abstract or preparation of conference paper or poster session materials (*Please specify:* _____)
- ☐ Development of new research hypotheses that are/will soon be pursued by another research effort *(Please describe:* _____)
- ☐ Development of research proposal to continue APRC research *(Please describe type of research and status of application:* _____)
- ☐ Participation with other non-APRC collaborators *(Please describe type of collaboration and funding source:* _____)
- ☐ Ability to access new information/data sets and informational tools
- ☐ Recognition for work performed or award received *(Please specify:* _____)
- ☐ Development of trust and collegiality with other APRC investigators
- ☐ Other (*Please describe any other major outcomes of your work:* _____ _____)

*****[Skip to Question 15 if respondent reported significant results.]*****

10. If your APRC project was not as successful as you had hoped it would be, please describe why not.

_____

_____

11. What do you think were the major impediments to generating concrete outputs, such as publications, new grant applications, etc., from the APRC project?

_____

_____

12. Besides what we have just discussed, have you continued to collaborate with your APRC partners in other ways since completing the research? ☐ Yes ☐ No

If yes, please describe: _____

_____

If you have not continued to collaborate, please explain why not: _____

_____

Now, I would like to ask you a few questions about your overall assessment of the APRC experience.

13. Do you think you could have accomplished this work without APRC funding? ☐ Yes ☐ No

Please explain: _____

_____

14. On a scale of 1 to 5, please tell me how strongly you agree or disagree with the following statements:

(a) There was no funding source available, outside of the APRC program, for this research.

1 2 3 4 5

Strongly Disagree Strongly Agree

(b) The research we conducted under APRC helped to launch important follow-up research.

1 2 3 4 5

Strongly Disagree Strongly Agree

(c) The APRC award provided an introduction to new professional contacts.

1 2 3 4 5

Strongly Disagree Strongly Agree

(d) Scientists from different disciplines were able to bring their expertise to bear on common problems in productive new ways under the APRC program.

1 2 3 4 5

Strongly Disagree (*When a score of 1 is given, probe for more information.)* Strongly Agree

(e) Under the APRC program, we were able to forge new collaborative ties that would not have been formed otherwise.

1 2 3 4 5

Strongly Disagree Strongly Agree

(f) The APRC collaboration strengthened my capabilities in other research endeavors.

1 2 3 4 5

Strongly Disagree Strongly Agree

(g) The research we conducted under APRC helped us to develop new insights and paradigms.

1 2 3 4 5

Strongly Disagree Strongly Agree

(i) The APRC award provided us with the opportunity to receive training in new research techniques, the use of new instrumentation, or new technology.

1 2 3 4 5

Strongly Disagree Strongly Agree

(j) The APRC experience has encouraged me to spend more time collaborating with researchers outside my own discipline for the purpose of integrating their ideas into my own work.

1 2 3 4 5

Strongly Disagree Strongly Agree

15. What do you consider the major benefits of your experience in working on the APRC program?

16. What recommendations would you make to improve the APRC program in the future? *(Probe for changes in administration of the program, requirements for funding, changes in how to communicate effectively with other collaborations and with DCB staff.)*

Thank you for taking the time to respond to this survey.