



FY 2004 – 2008 NIH Director’s Pioneer Award Process Evaluation – Comprehensive Report

FINAL REPORT

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Summary

The National Institutes of Health (NIH) Director's Pioneer Award (NDPA) was initiated in Fiscal Year (FY) 2004 to support individual investigators who display the creativity and talent to pursue high-risk, potentially high-impact ideas in the biomedical and behavioral sciences. Created to complement the more traditional grant programs of the NIH, the NDPA aims to fund exceptionally creative researchers who have the skills to take productive risks and to make significant contributions to medical research. Through the novel DP1 grant mechanism specifically designed for the NDPA,¹ the program provides awardees with up to \$2.5 million in direct costs over 5 years.

Because the NDPA program was created as a pilot, the NIH commissioned the Science and Technology Policy Institute (STPI)² to conduct annual process evaluations in order to track the selection process and inform future years of program implementation. This comprehensive report summarizes the process evaluations of the first 5 years of the NDPA program, highlighting important changes in the program's design and implementation and describing program participants' perceptions. Also included are STPI's overall assessments of the NDPA program and key recommendations.

Three main sources of data were used for the annual process evaluations: (1) NIH administrative data including funding data; (2) interviews with NIH liaisons and external evaluators; and (3) surveys of all candidates considered for an award.

Program Design and Implementation

Because the NDPA was conceived as a novel way of funding research, its design reflects efforts to distinguish it from prevailing models of NIH funding. At the time of its inception,

About NDPA Awardees

Since FY 2004, five cohorts of awards have been made for a total of 63 individual awards. There was a broad range of projects and PIs. Names of all awardees are available at the NIH Roadmap for Medical Research site (available at <http://nihroadmap.nih.gov/highrisk/fundedresearch.asp>). Descriptions of their research are in Appendix B.

Examples of ongoing research include:

- Discovering the principles that govern the maintenance of pluripotency in embryonic stem cells
- Understanding the social determinants of autism
- Utilizing cohorts of hunters to monitor emerging infectious diseases
- Enhancing cellular ability to detect and degrade misfolded proteins

The NDPA awardees are a diverse group of individuals. They include:

- A theoretical physicist turned computational neuroscientist
- A scientist who considered a career as a ballet dancer
- A plant geneticist drawn towards science through experiences as a scuba diver
- A self-taught applied physicist

¹ The DP1 mechanism was developed specifically for the NDPA program. The unique features of this mechanism include independent review by external evaluators who are not required to meet in study sections, as well as a candidate interview phase.

² STPI is a federally funded research and development center (FFRDC) chartered by an act of Congress in 1991. STPI assists the Office of Science and Technology Policy in the White House and the federal science and technology agencies by providing objective, high-quality analytic support. More information on STPI can be found at: <http://www.ida.org/stpi/index.html>.

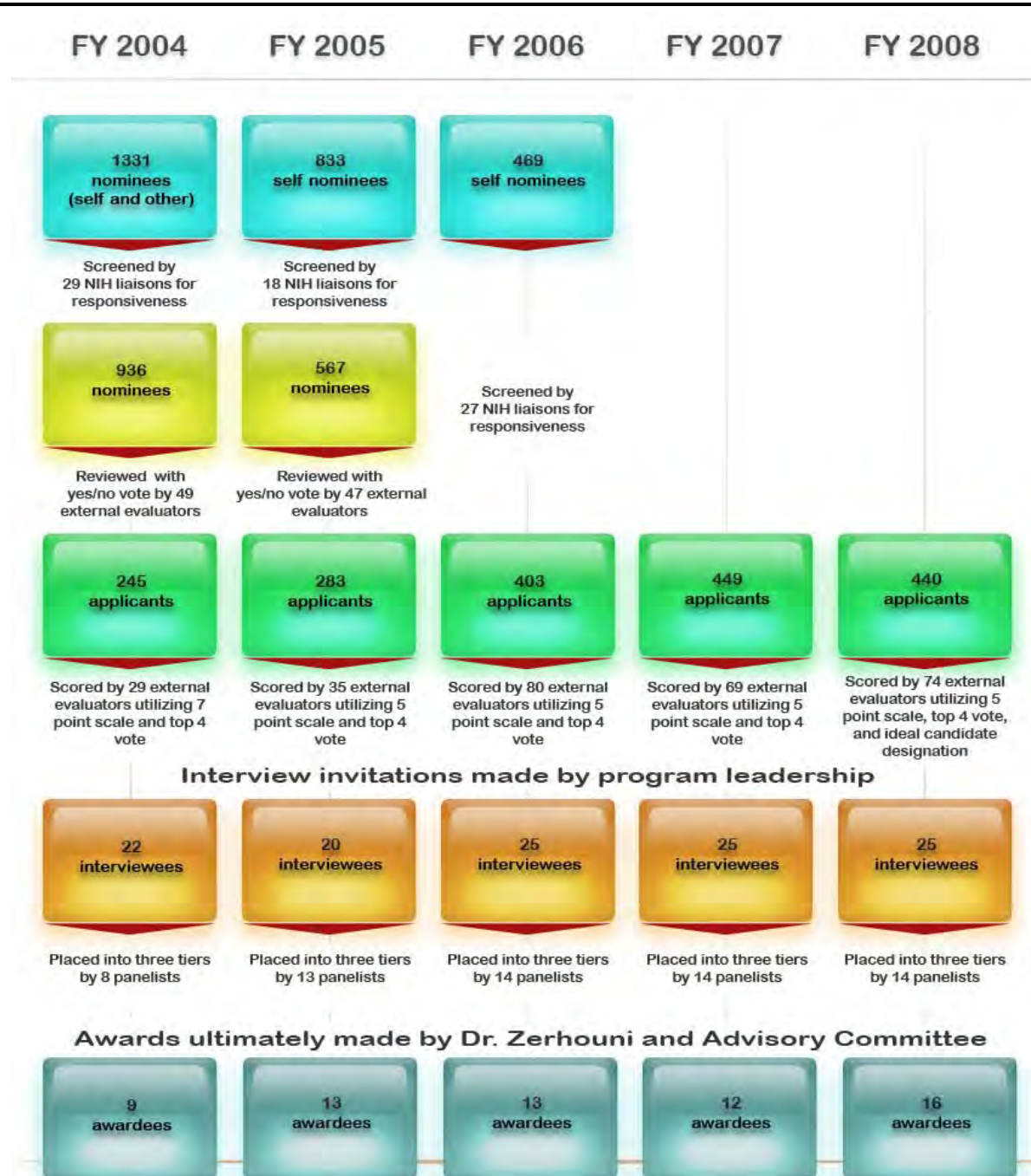
unique characteristics of the NDPA included the brevity of its application materials, the interview component, reliance on independent external evaluators instead of traditional study sections, and central management by the Office of the Director (OD) of NIH.

The NDPA selection process includes several phases of review. In the first year of program implementation, nominated candidates were first screened by NIH liaisons for responsiveness, and then given a “yes” or “no” vote by external reviewers. Candidates who received a “yes” were invited to submit complete applications, which were then scored by a different set of external reviewers. NDPA program leadership invited high-scoring applicants to the NIH campus to be interviewed by an expert panel, who then ranked interviewees into three tiers. Final selection of awardees was made by the NIH Director and Advisory Committee to the Director (ACD). Beginning in FY 2006, the number of phases in the selection process decreased; initial rounds of review were eliminated to take into account the declining number of candidates applying to the program (see Exhibit S-1).

In addition to the number of phases of review, several other aspects of NDPA program design have evolved since its inception to incorporate lessons learned from its early years of implementation. Starting in FY 2005, the language of the Program Notices and Requests for Applications (RFAs) was altered to target women, minorities, and early- to mid-career investigators and to more explicitly describe the meaning of “pioneering” as “highly innovative approaches that have the potential to produce an unusually high impact.” The term “award” was also clarified as “a grant for conducting research, rather than a reward for past achievements.”

In creating the NDPA, the NIH sought to identify pioneers and not projects. Thus, in FY 2004, the review criteria emphasized the merits of the individual candidate: (1) innovation/ creativity; (2) intrinsic motivation/enthusiasm/intellectual energy; and (3) potential for or actual scientific leadership/evidence of, or potential for, effective communication/educator skills. Beginning in FY 2005, the leadership criterion was dropped completely (in response to external evaluators’ concerns that it was subjective and difficult to apply consistently), and the other criteria were melded into a single “investigator” criterion. Two new criteria regarding the scientific problem to be addressed and the suitability of the proposed project for the NDPA mechanism were added (see Exhibit S-2). Application instructions were also made more specific, requiring candidates to specifically address the new review criteria in their submitted essays and to commit at least 51% of their effort to activities supported by the NDPA if awarded. These changes, intended to make the review criteria easier to operationalize, shifted the focus of the selection process away from purely the merits of the individual investigator toward a combination of the individual and the scientific idea.

Exhibit S-1.
NDPA Process and Participation, FY 2004–FY 2008



Source: STPI Analysis of FY 2004–FY 2008 NDPA Process.

Exhibit S-2.
Evolution of NDPA Review Criteria

FY 2005 Criteria*

Innovation/creativity: Does the applicant display evidence of scientific creativity? Does she/he initiate new areas of, approaches to, scientific research? Is the applicant truly visionary in his/her thinking? Does the applicant think in complex, multidisciplinary or interdisciplinary ways?

Scientific problem to be addressed: Biomedical significance/importance; if successful, likelihood of high impact on biomedical problem; creativity/innovativeness

Intrinsic motivation/enthusiasm/intellectual energy: Is the applicant willing to take scientific risks and show persistence in the face of adversity? Is the applicant comfortable with uncertainty (i.e., able to see gray areas as opportunities for new insights)? Is the applicant able to move into new areas that present an opportunity to solve a problem or expand knowledge base? Is the applicant intellectually independent and tenacious? Is the applicant able to make scientific leaps and change the current paradigms of medical research?

Investigator: Evidence for claim of innovativeness/creativity (innovation density – “the extent of innovative activities relative to the applicant’s career stage”); demonstrated ability to devote 51% or more effort on NDPA project

Potential for or actual scientific leadership; evidence of, or potential for, effective communication/educator skills: Does the applicant have the ability to communicate the impact of her/his work? Has the applicant shown the ability (or potential) to bring together diverse teams of scientists; to inspire with his or her scientific vision and lead others; to serve as a mentor or role model?

Suitability for NDPA mechanism: Evidence that proposed project is of sufficient risk/impact to make it more suitable for NDPA than for traditional NIH grant mechanism; distinctness from other research by investigator

Source: STPI Analysis of FY 2004–FY 2008 NDPA Process.

**Criteria in FY 2006–FY 2008 were nearly identical to those in FY 2005, with minor wording changes.*

Program Participation

Candidates and Awardees: Although the number of candidates applying for the NDPA declined steeply after FY 2004, between FY 2006 and FY 2008 the total number of candidates reached a steady state of roughly 450 individuals. Over all 5 years, 2,877 individuals applied to the program, with some applying in multiple years, resulting in a total of 3,520 individual candidacies. A large number of candidates applied to the program multiple times, with more than one-sixth of all candidates applying in 2 or more years and nine candidates applying in all 5 years.

Women made up approximately a quarter of the candidate pool in all 5 years, and there was no significant difference between the gender distribution of the total candidate pool and that of the awardee pool over all 5 years. Based on available data, the proportion of minority candidates applying to the program increased from 10% in FY 2004 to roughly 20% in all subsequent years (during which the language of the RFAs was more specific for demographic targeting). The race distribution of the interviewees and awardees was significantly different from that of the total candidate pool, as more minority candidates were invited to interview and were awarded than would be expected based on the initial candidate pool.

The majority of NDPA candidates were PhD holders, with approximately one-fifth holding MDs only and one-sixth holding MD/PhDs. The degree distribution of the interviewees and awardees was significantly different from that of the total candidate pool, as only 8% of interviewees and 3% of awardees hold MDs only.

As part of the application process, candidates were asked to place their research into one of several research area designations.³ There was no significant difference between the research area distribution of the awardees and that of the total candidate pool. The most common field of research for both candidates and awardees was Molecular, Cellular, [and Chemical] Biology,⁴

³ From FY 2004 to FY 2007, there were seven research area categories. Three new categories were added in FY 2008. See Table 2.1 for more detail regarding these categories.

⁴ Brackets reflect changes in research category names over the years. In FY 2006 and FY 2007, the Molecular and Cellular Biology category was changed to Molecular, Cellular, and Chemical Biology; while in FY 2008, Chemical Biology was made a discrete category.

Participant Characteristics at a Glance

- 17% of all NDPA candidates applied in 2 or more years. Nine candidates applied in all 5 years
- Women comprised 25% of both the candidate and awardee pools across all 5 years
- Of the candidates for whom race information was available, 78% were white, 17% were Asian, 3% were Hispanic or Latino, 1% were Black or African American, and less than 1% were Native Hawaiian, other Pacific Islander, American Indian, or Alaska Native
- 68% of all NDPA candidates were PhD holders, 13% held MD/PhDs and 18% held MDs only
- 30% of all candidates and awardees categorized their research in the field of Molecular, Cellular, and Chemical Biology.
- 86% of all NDPA candidates were from universities or university-affiliated medical institutes
- 50% of all NDPA candidates were senior investigators (with more than 20 years of experience)
- 13 of the 63 NDPA recipients did not have NIH funding in the 5 years prior to their award

accounting for about one-third of all candidates and awardees. The large majority (86%) of all NDPA candidates were from universities or university-affiliated medical institutes. More than a quarter of the candidates and almost half of the awardees were from the following institutions: Harvard University; Stanford University; Johns Hopkins University; Columbia University; University of Pennsylvania; University of Washington; University of California, San Francisco; University of California, Los Angeles; University of Michigan; and Yale University.

Senior investigators (those with more than 20 years of experience) made up roughly half of the total candidate pool in all 5 years of the program, and the proportion of early-career investigators (fewer than 10 years of experience) decreased over the years as the proportion of mid-career investigators (between 10 and 20 years of experience) increased. The candidate pool was significantly more senior than the interviewees and awardees, 70% of whom were early- and mid-career investigators. Roughly a quarter of all candidates and a fifth of the awardees had not received funding from the NIH in the 5 years prior to their NDPA application.

External Evaluators: A total of 255 external evaluators participated in at least one year of NDPA review, and many participated in multiple years, for a total of 375 individual participation counts. In FY 2004, external evaluators were recruited in a shorter period of time, and the resulting evaluator pool was predominately white, male, and senior. Given the critical role of evaluators in identifying pioneers and some criticism from the scientific community about the lack of diversity among the FY 2004 awardees, the NDPA leadership made a targeted effort in subsequent years to attract a more diverse pool of evaluators. In later years of the program, more women and younger investigators participated as external evaluators.

Across all 5 years, the research area distribution of the external evaluators was generally matched to that of the candidate pool. Like the candidate pool, the external evaluators were primarily drawn from universities or university-affiliated medical institutes.

Though it was impossible to assess the ability of the evaluators to identify pioneering research, it was clear from publicly available information that the evaluators are an accomplished group – more than two-thirds have won major awards in their fields or have received prestigious fellowships or honors.

Scoring Trends

Scoring of Applications: In all 5 years of the NDPA program, external evaluators were asked to assign applications a score in each of the three review criteria as well as an overall score. Evaluators were also asked to designate exactly four applications with a “top 4” vote, and in FY 2008 only, any number of “ideal candidate” designations. In contrast to the traditional NIH study section process, evaluators were asked to score applications remotely and without need for consensus. Each application was reviewed by two evaluators within, and one outside of, the candidate’s research area.

The NIH designed the NDPA selection criteria to be broad in order to allow flexibility of interpretation by each evaluator. Thus it is not surprising that there was a high degree of variability in scoring. As expected, however, the level of agreement between external evaluator scores was higher for interviewees and awardees than for the total candidate pool. There was also a high correlation between the individual scores for each criterion and the “Overall Score” given to each application by evaluators. Candidates in the Molecular, Cellular, [and Chemical] Biology research category scored the highest, while candidates in Clinical [and Translational] Research and Behavioral and Social Sciences received the lowest scores.⁵

The “top 4” and “ideal candidate” designations were introduced to inform the interview selection process. These designations did not have uniform support from evaluators, some of whom would have preferred more flexibility in the usage of the “top 4” vote and more guidelines in the usage of the “ideal candidate” designation. All of the interviewees and awardees in all years had at least one “top 4” vote and at least one “ideal candidate” designation. In general, the “top 4” vote was a better indicator for an interview invitation than high overall scores. However, in FY 2008, the “ideal candidate” vote was a better indicator of receiving an interview than the “top 4” vote.

Scoring of Interviews: The interview phase of NDPA distinguishes it from more traditional NIH programs and has remained largely unchanged over the years. During this phase, panelists (external evaluators who participated in the candidate interview phase) listened to the interviewee presentations, were given time to ask questions and then to discuss each interviewee. In all years, panelists placed interviewees into “tiers” – top, middle, and bottom tiers. Candidates in the top tier were absolutely recommended by the panel for funding, those in

Scoring Trends at a Glance

- There was a high correlation between the individual scores for each review criterion and the “Overall Score” given to applications.
- The variance in overall scores for interviewees was much smaller than that for the total applicant pool in all 5 years.
- Women received slightly higher average overall scores than men.
- Applicants in the research areas of Molecular, Cellular, [and Chemical] Biology and Instrumentation and Engineering scored higher than average.
- Applicants in the research area of Behavior and Social Sciences received the lowest scores.
- All interviewees and awardees from FY 2005 to FY 2008 received at least one “top 4” vote.
- Over all years, women received more “top 4” votes per applicant than men.
- Applicants in the research areas of Chemical Biology and Neuroscience received the most “ideal candidate” votes per person while those in Behavior and Social Sciences and Physical and Integrative Systems received the fewest.
- Of the 98 candidates in FY 2008 who received at least one “ideal candidate” vote, only 10 were not also given “top 4” votes. (The “ideal candidate” vote was added in FY 2008.)
- In general, the “top 4” vote was a better indicator of an interview invitation than high overall scores. However, in FY 2008, the “ideal candidate” vote was a better indicator of receiving an interview than the “top 4” vote.

⁵ “Clinical research” and “clinical and translational research” are considered different in nature by the scientific community. However, as part of the NDPA submission and review processes, the two research areas were grouped together and, as such, are treated similarly in this report.

the middle were suggested for funding if money was available, and those in the bottom tier were not recommended for funding.

There is little documentation for the final phase of the NDPA selection process, though it is known that the NIH Director and the Advisory Committee to the Director, with input from the NDPA leadership, made final decisions on the award winners in all years. The probability of receiving an award was not entirely based on the tiering decisions made by the interview panelists. From FY 2005 to FY 2008, additional funds were secured through other NIH Institutes and Centers (ICs) in order to increase the total number of awards given. Before final decisions were made, the co-chairs of the NDPA Oversight Committee discussed all candidates with IC Directors identified to be interested in supporting NDPA awardees. Although ICs co-funded many top-tier awardees, some of the ICs chose to support research of interest to their missions despite panelist recommendations, resulting in three individuals from the bottom tier being awarded in FY 2005 and FY 2006.

Perceptions Regarding the NDPA Program

The perceptions of candidates and external evaluators regarding the NDPA program were gauged via surveys of candidates and interviews with evaluators.

Application Materials: Nearly three-quarters of surveyed candidates expressed that they were given adequate opportunity to display their qualifications in the application. Similarly, the majority (73%) of external evaluators interviewed were satisfied with the application materials and their brevity. Surveyed candidates felt that the 3- to 5-page essay was the most important application component, while the letters of reference and statement of current support were rated the least important components. While many external evaluators questioned the utility of the recommendation letters in the review process, some evaluators found them useful, though they wished for more standardization of letter content.

Review Criteria: Based on survey responses, the majority of the interviewees and awardees, and about three-quarters of the candidates completely or somewhat agreed that the review criteria were adequate for selecting scientists of exceptional creativity who take innovative approaches. A large majority (91%) of the evaluators who were interviewed believed that the review criteria were generally adequate to identify a pioneer. In interviews, NDPA program leadership and consultants to the High Risk Working Group (HRWG) expressed mixed views regarding the shift in review criteria from purely person-based in FY 2004 to a combination of person- and project-based in subsequent years. Some considered the shift a natural evolution of the program, stating that it was difficult to evaluate a person without the context of a project, or that the program had always intended to fund a combination of the person and the project. Others, however, perceived a clear shift and indicated that emphasizing the project leads to a more conservative outlook in the review process. Some consultants to the HRWG felt that this shift was a violation of the intent of the NDPA program.

In each of the 5 years, all external evaluators and liaisons were trained to ensure that review criteria and purpose were well-understood and uniformly applied. Over three-quarters of external evaluators interviewed in FY 2005–FY 2008 believed that the training was adequate. Despite the effort to clarify the selection criteria after FY 2004, the external evaluators in FY 2005–FY 2008 were divided in their review methods and relative weighing of the selection criteria. Evaluators were also split on the relevance of career stages and existing grant support of the candidates as well as on the importance of the expected 51% effort commitment.

Scoring: Regarding the effectiveness of the 5-point scale and “top-4” vote system, the majority of external evaluators who were interviewed in FY 2005–FY 2008 believed that this scoring system was adequate.⁶ While most external evaluators interviewed reported that they used the new “ideal candidate” designation introduced in FY 2008, roughly a third of them expressed that they did not understand or feel comfortable using the designation. Over all 5 years, nearly half of interviewed evaluators felt comfortable reviewing applications outside their research areas. Panelists and candidates alike expressed general satisfaction and enthusiasm regarding the interview round of the NDPA selection process.

Feedback and Transparency: Many comments from surveyed candidates expressed concerns over the lack of feedback on their applications, with 36% of unsuccessful candidates surveyed citing the lack of feedback as their reason for not reapplying. The perception of bias was also cited by many candidates (35%) as a reason for not reapplying. Regarding the co-funding of some awardees by NIH ICs, some panelists expressed concerns about the possibility that their recommendations were not being directly followed, and that IC involvement was leading to the funding of individuals who were not, in the minds of the panelists, deserving of the award.

Success of the Program: Regarding the distinctiveness of NDPA as a discrete NIH funding mechanism, more than two-thirds of surveyed candidates and 83% of awardees believed that it was very unlikely or somewhat unlikely that their proposed NDPA projects would be supported by other funding mechanisms. More than 90% of external evaluators interviewed indicated that the NDPA process was different from those of more traditional NIH grant programs and was conducive to allowing investigators to submit more innovative and creative applications. Moreover, nearly three-quarters of evaluators interviewed in FY 2007 and FY 2008 believe that the program is adding value to the NIH portfolio.

Regarding the ability of the NDPA program to attract and to fund potentially pioneering candidates, two-fifths of the external evaluators interviewed indicated that the majority of applications were similar to those submitted to more traditional NIH grant programs. The majority of the members and consultants to the HRWG interviewed expressed that the program was primarily funding excellent researchers rather than pioneers. Several experts commented that there are two commonly held images of a pioneer. The first is someone who continually attempts to answer truly big questions, uses risky approaches, fails often, and is generally outside of the normal paradigm of NIH-funded science (the “tinkerer in the garage”). The second is the cream of the crop of his/her field – having gone to the best institutions, worked with the best mentors, received large amounts of research support, and conducted top-quality research without necessarily having failed or taken risks. In interviews, program leaders and reviewers expressed a general consensus that the program is attracting pioneers of the second type as opposed to the first type.

Culture Change at the NIH and Beyond: The NDPA was designed in response to community perceptions that the NIH was too conservative in its funding. Thus the NDPA program was envisioned as a mechanism to bring about a culture change at the NIH that would create an environment more receptive to “creative” and “innovative” people and ideas. Although there is debate as to the degree to which the NDPA program has succeeded in this goal, the NIH still holds the program to be the flagship of its High Risk Research Initiative, an exemplar of the goals driving the NIH Roadmap for Medical Research. An important indication of the NDPA’s influence on NIH

⁶ Data from FY 2004 is excluded from the scoring analysis because of the different scoring scale used (5-point scale in 2005–2008 rather than the 7-point scale used in 2004).

culture is the number of new programs aimed at funding innovative research that were established since the inception of the NDPA program. These programs include new NIH grants, such as the New Innovator Award, the EUREKA, and the T-R01, as well as non-NIH grants such as the Department of Defense's National Security Science and Engineering Faculty Fellowships and the Juvenile Diabetes Research Foundation's Scholar Award. Contacts from several of these novel programs have cited the direct influence of NDPA in their program design.

Overall Assessment of the NDPA and Recommendations

Over the last 5 years, STPI has conducted annual process evaluations of the NDPA selection process. Overall, it appears that the NIH has succeeded in maintaining the spirit and goals of the program with minor operational changes. Keeping in this spirit of improving program operations, STPI proposes four recommendations:

- **Maintain the flexibility in review criteria and guidelines.** Such flexibility will ensure the program continues to attract diverse applications and allows external evaluators and NIH leadership to interpret the criteria based on their experiences and intuition. This flexibility has worked to bring well-known researchers into the group of external evaluators, who have indicated that reviewing NDPA proposals is interesting and challenging. In addition, most prefer the latitude to score proposals without having to follow specific definitions of terms such as "pioneering" and to provide lengthy justifications.
- **Explore additional ways to seek out non-traditional scientists who may not apply for NIH grants.** Program managers devoted to the scientific and technological aspects of the program may enhance the NDPA's ability to attract pioneering researchers and ideas. The use of pro-active program managers is a hallmark of other government programs that are viewed as successful in funding risky research, and the NIH might examine the management of those programs to extract effective strategies. Other government programs (e.g., Office of Naval Research) have successfully sought out and funded high-risk research. A study of these programs might provide best practices for the NDPA. Appointing a well-known pioneer to lead the program could enhance the profile of the program.
- **Consider increasing the number of awards.** While the small number of awards contributes to the award's prestige, the NDPA program leaders as well as many panelists have acknowledged that many interviewees are often as qualified as awardees.

While the success and broader impact of the NDPA program will be further examined as part of an ongoing outcome evaluation, based on the findings of this process evaluation, it appears that the NDPA program processes are working as designed and are adding value to the NIH's portfolio of research activities.

The face of biomedical research is changing. To keep pace, we must cross the traditional disciplinary boundaries of science and medicine to bring forward new conceptual frameworks and methodologies that will speed scientific discovery and improve health.

Dr. Elias A. Zerhouni
Director, National Institutes of Health
January 20, 2004

1. Introduction

The National Institutes of Health (NIH) Director's Pioneer Award (NDPA) was initiated in fiscal year (FY) 2004 to support scientists who display the creativity and talent to pursue high-risk, potentially high-impact ideas in the biomedical sciences. Through the DP1 grant mechanism,¹ the NDPA provides individual investigators with up to \$500,000 in direct costs each year for 5 years. The program aims to fund researchers who have the skills to take productive risks and to make significant contributions to medical research.² This "people-based" program was conceived by the High-Risk Research Working Group (HRWG) and its consultants,³ and was originally called the NIH Director's Innovator Award. The term "pioneer" was specifically incorporated by then-NIH Director, Elias Zerhouni, "to distinguish between those who are truly forging new ground and those who are simply solving existing problems in a clever way" and to identify "people who would break new ground with new ideas and approaches, to give them the time and resources to test far-ranging ideas." Appendix A provides a more detailed history of the development of the NDPA program.

Since FY 2004, 2,877 individuals have applied to the program, some applying in multiple years, for a total of 3,520 candidacies. Five cohorts of awards have been made for a total of 63 individual awards. Each year, the NIH announces new NDPA awardees at a symposium,⁴ where awardees from previous years also present their research to their peers. Awarded research projects fell into a broad range of scientific disciplines, which are further described in Chapter 3. A complete list of the FY 2004–FY 2008 awardees and descriptions of their NDPA-funded projects are given in Appendix B.

1.1 Purpose of Evaluation

Because the NDPA program was designed as a pilot program and was significantly different from prevailing models of NIH funding, changes were made over the years to incorporate lessons learned. The changes have been both process-related (i.e., changes in the number of phases, rating system and submission interface) and conceptual (i.e., changes in selection criteria and program emphasis). Following the first round of awards, the NIH Office of the Director (OD) commissioned the Science and Technology Policy Institute (STPI) to perform an independent process evaluation of the NDPA program to formally track changes in the program's implementation and selection process and to inform future years of program planning.⁵

The process evaluation was designed around three domains of inquiry: (1) assessing the NDPA award selection process, (2) determining if the NDPA program was implemented as designed, and

¹ The DP1 mechanism was developed specifically for the NDPA program. The unique features of this mechanism include independent review by external evaluators who are not required to meet in study sections, as well as a candidate interview phase.

² The NIH Director's Pioneer Award Program press release, January 20, 2004, available online at <http://www.nih.gov/news/pr/jan2004/od-20.htm>.

³ The HRWG was co-chaired by Steven Straus and Ellie Ehrenfeld. The HRWG convened a group of consultants to suggest means of funding high-risk, innovative ideas and approaches in biomedical research.

⁴ See <http://www.nihroadmap.nih.gov/pioneer/Symposium2009/index.aspx>.

⁵ STPI is a federally funded research and development center (FFRDC) chartered by an act of Congress in 1991. STPI assists the Office of Science and Technology Policy in the White House and the federal science and technology agencies by providing objective, high-quality analytic support. More information on STPI can be found at: <http://www.ida.org/stpi/index.html>.

(3) determining if the selection process was consistent with program goals. This report offers a comprehensive view of the first 5 years of the NDPA program and summarizes lessons learned from the previous years of program implementation.⁶

1.2 Methodology

Multiple methods were used in this evaluation. See Appendix C for a more detailed description of the methodology and data sources. Sources of candidate data included responses to a survey of the candidates (Appendix D), NIH’s program documents, the IMPAC II database,⁷ websites, and NDPA program leadership. Sources of evaluator data included interviews with the evaluators themselves (Appendix E), internal program documents, and websites. Program data were collected via the survey of candidates, interviews with a purposive sample of evaluators,⁸ and interviews with the program leadership. Contextual information was obtained via a review of the literature as well as through interviews with outside experts, members of and consultants to the HRWG, and directors of other innovative programs at NIH and other institutes (e.g., Howard Hughes Medical Institute).⁹

Two conceptual models guided this process evaluation: first, a process “flow” outlining the NDPA process in each individual year; second, a stakeholder map highlighting individuals involved at each phase. Based on the process flow and stakeholder maps, the following set of high-level study questions was developed:

- **Program Design and Implementation**
 - *Program Structure and Evolution:* What was the overall structure of the selection process in each individual year? How and why did the NDPA program evolve from the preceding year?
 - *Selection Criteria:* How were the characteristics of pioneering research defined and operationalized as selection criteria? How did the selection criteria evolve over the first 5 years?

Terminology

Candidates: investigators nominated (self and by others) for the NDPA

Applicants: candidates who submitted full applications and whose applications were reviewed by external evaluators

Evaluators: extramural (non-NIH) reviewers of the NDPA candidates

Panelists: external evaluators involved in the interview phase

Liaisons: NIH staff involved in the administrative review

⁶ Previous reports included annual data reports and a 3-year comprehensive report.

⁷ IMPAC II is the NIH database that holds funding and application information of all its programs.

⁸ Interview requests were sent to a broad spectrum of evaluators so that the total pool of evaluators interviewed would be diverse in terms of demographics and scientific background. If an evaluator declined to be interviewed, another evaluator with similar characteristics was contacted to maintain the diversity.

⁹ See Appendix C for a list of all interviews with NIH staff and with members of and consultants to the NIH HRWG.

- **Program Participation**
 - *Candidate Characteristics:* What were the characteristics of the nominees/applicants who applied to the program?
 - *Evaluator Characteristics:* What were the characteristics of the internal and external evaluators?
 - *Characteristics of Successful Candidates:* What were the characteristics of the candidates who were successful in advancing at each phase and who won the award?
- **Scoring Trends**
 - *Scoring:* How was the scoring system applied by external evaluators in each phase of the selection process?
 - *Trends of Interest:* What were the trends in scoring by phase and other attributes of interest? What was the relationship between scoring trends and success of candidates in each phase of the selection process?
- **Perceptions Regarding NDPA Program**
 - *Transparency of the Process:* To what extent did the candidates and evaluators understand the selection process?
 - *Adequacy of the Information:* To what extent was the information available to the evaluators adequate to select the best applications?
 - *Success of the Program:* To what extent did the program as implemented attract and select exceptionally creative scientists who proposed pioneering biomedical research?
 - *Distinctiveness of the Program:* Is the NDPA as a unique program (as opposed to modifications to more traditional NIH programs) necessary to attract and select exceptionally creative scientists who propose pioneering biomedical research?

In this report, the preceding questions are addressed in detail. The following chapters describe the NDPA program's design and implementation over the first 5 years (Chapter 2), discuss participant characteristics (Chapter 3), highlight important scoring trends (Chapter 4), present perceptions of the value and success of the program (Chapter 5), and provide an overall assessment of the program along with key recommendations (Chapter 6).

2. Program Design and Implementation

To convince the scientific community that the NIH was serious about funding research in a new and innovative way, NIH leadership believed that the NDPA program would have to look different from preexisting models of NIH funding. As a result, the NIH chose to minimize the role of existing NIH bodies and processes and to instead focus on new process components. Several of the unique characteristics of the NDPA program at the time of its inception were as follows:

- The program was run centrally, out of the Office of the Director (OD) of NIH– the first ever grants program to be administered by that office.
- The NIH Director was personally involved in the selection of awardees, with the Advisory Committee to the Director serving as a secondary review body.
- The application length was short relative to other NIH programs, with no requirement of detailed project plans or discussion of preliminary data. Abbreviated candidacy forms were used throughout.
- Independent extramural evaluators were convened to evaluate applications, as opposed to routing applications to standing study sections or to convening one or more special emphasis panels.
- A multi-phase process with a phase-specific scoring system was used instead of assigning priority scores.
- Extramural review was conducted electronically with no face-to-face interaction between evaluators until the final interview phase.
- The program was designed to be a “people-based” program, focusing on the merits of individual researchers.

The NDPA design and implementation have evolved since the program’s inception in FY 2004 (as displayed in Exhibit 2.1, and in more detail in Exhibits 2.2 through 2.7) to incorporate lessons learned over the first 5 years of program implementation.¹⁰ The following sections summarize the key process modifications over the years.

2.1 Definition of “Pioneering”

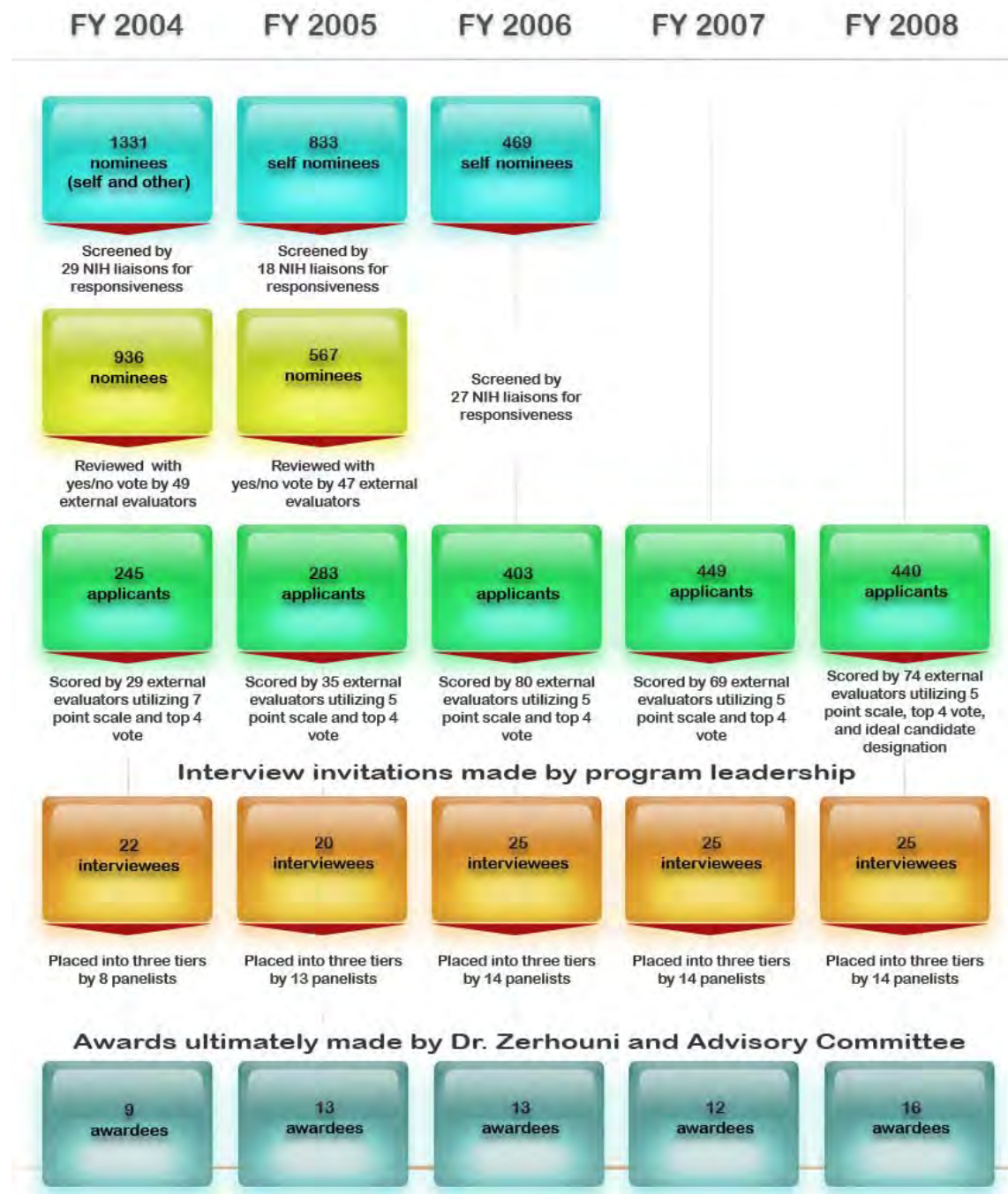
In FY 2004, the Program Announcement (PA) did not define the term “pioneering,” though it was explicitly described in the Request for Applications (RFA) of subsequent years as “highly innovative approaches that have the potential to produce an unusually high impact.” NDPA leadership tried to afford as much flexibility in the application, review, and selection processes as possible,¹¹ leaving the terms “high risk,” “exceptionally creative,” and “highly innovative,” and “pioneering” open to interpretation. This intentional flexibility served several purposes: to open the program to all investigators who believed they embodied the program goals, with the hopes of attracting a diverse pool of candidates; to allow for candidates to propose truly extraordinary and unusual ideas; and to allow expert evaluators to evaluate applications based on their personal intuition of “pioneeringness.”¹²

¹⁰ FY 2004–2006 NIH Director’s Pioneer Award Process Evaluation – Comprehensive Report, Science and Technology Policy Institute, January 2008.

¹¹ Jeremy M. Berg, Director of the National Institute of General Medical Sciences (NIGMS), and Judith H. Greenberg, Director, Division of Genetics and Developmental Biology at NIGMS, constitute the “NDPA program leadership.”

¹² Interview with Jeremy Berg.

Exhibit 2.1.
NDPA Process and Participation, FY 2004–FY 2008



Source: STPI Analysis of FY 2004–FY 2008 NDPA Process.

Exhibit 2.2.

NDPA Process Changes in Detail: Candidate Recruitment Emphasis

<i>Aspect of NDPA</i>	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008
Emphasis given in Notice or RFA	“Investigators at early stages of their career as well as those who are established will be eligible”	“Investigators at all career levels are eligible. Those at early to middle stages of their careers, women, and members of groups underrepresented in biomedical research are especially encouraged to apply.”	“Investigators at all career levels are eligible. Those at early to middle stages of their careers, women, and members of groups underrepresented in biomedical research are especially encouraged to apply.”	“Investigators at all career levels are eligible. Those at early to middle stages of their careers, women, and members of groups underrepresented in biomedical research are especially encouraged to apply.”	“Women and members of groups underrepresented in biomedical or behavioral research are especially encouraged to apply. Investigators at all career levels who are currently engaged in research are eligible to apply.”
Definition of “pioneering” and “award” given in RFA	Not specifically defined	The term “pioneering” is used to describe highly innovative approaches that have the potential to produce an unusually high impact, and the term “award” is used to mean a grant for conducting research, rather than a reward for past achievements	The term “pioneering” is used to describe highly innovative approaches that have the potential to produce an unusually high impact, and the term “award” is used to mean a grant for conducting research, rather than a reward for past achievements	The term “pioneering” is used to describe highly innovative approaches that have the potential to produce an unusually high impact, and the term “award” is used to mean a grant for conducting research, rather than a reward for past achievements.	The term “pioneering” is used to describe highly innovative approaches that have the potential to produce an unusually high impact, and the term “award” is used to mean a grant for conducting research, rather than a reward for past achievements.

Exhibit 2.3.

NDPA Process Changes in Detail: Selection Process – Phase Mechanics and Candidate/Evaluator Participation

<i>Aspect of NDPA</i>	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008
<i>Process</i>	5 Phases	5 Phases	4 Phases	3 Phases	3 Phases
<i>Phase 1 (Nominees)</i>	Phase 1: 1,331 nomination packages (self nominees and individuals nominated by someone else) – screened for responsiveness by 29 NIH liaisons.	Phase 1: 833 nominations (all self nominees) were submitted and screened for responsiveness by 18 NIH liaisons.	Phase 1: 469 nominations (all self nominees) were submitted and screened for responsiveness by 27 NIH liaisons.	No nomination phase(s)	No nomination phase(s)
<i>Phase 2 (Responsive Nominees)</i>	Phase 2: 936 responsive nomination packages were reviewed by a first group of 49 external evaluators (yes/no vote)	Phase 2: 567 nominees were deemed responsive and were reviewed by 47 external evaluators (yes/no vote)	No initial (yes/no) screening by external evaluators in FY 2006		
<i>Phase 3 (Applicants)</i>	Phase 3: 245 individuals invited to submit a full application package to be reviewed by a second group of 29 external evaluators – scored on a 7-point scale	Phase 3: 283 individuals invited to submit a full application package to be reviewed by a second group of 37 external evaluators – scored on a 5-point scale; “top 4” votes assigned	Phase 2: 406 responsive individuals were reviewed by a group of 80 external evaluators – scored on a 5-point scale; “top 4” votes assigned	Phase 1: 449 individuals submitted a full application and were reviewed by a group of 69 external evaluators – scored on a 5-point scale; “top 4” votes assigned	Phase 1: 440 individuals submitted a full application and were reviewed by a group of 74 external evaluators – scored on a 5-point scale; “top 4” votes and “ideal candidate” designations assigned
<i>Phase 4 (Interviewees)</i>	Phase 4: 22 of the applicants were invited to the NIH for an interview with a panel of 8 experts	Phase 4: 20 of the applicants were invited to the NIH for an interview with a panel of 13 experts	Phase 3: 25 of the applicants were invited to the NIH for an interview with a panel of 14 experts	Phase 2: 25 individuals invited for an interview on July 9-11th, 2007 with a panel of 14 experts	Phase 2: 25 individuals invited for an interview on July 9-11th, 2008 with a panel of 14 experts
<i>Phase 5 (Awardees)</i>	Phase 5: 9 awards were made on September 29, 2004	Phase 5: 13 awards were made on September 29, 2005	Phase 4: 13 awards were made on September 19, 2006	Phase 3: 12 awards made on September 19, 2007	Phase 3: 16 awards made on September 22, 2008

**Exhibit 2.4.
NDPA Process Changes in Detail: Counts of Review**

<i>Aspect of NDPA</i>	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008
Total Counts of External Review per Candidate	6 total counts of review per application (3 external evaluators – Phase 2; 3 external evaluators – Phase 3)	5 total counts of review per application (2 external evaluators – Phase 2; 3 external evaluators – Phase 3)	3 total counts of review per application (3 external evaluators – Phase 2)	3 total counts of review per application (3 external evaluators – Phase 1)	3 total counts of review per application (3 external evaluators – Phase 1)

**Exhibit 2.5.
NDPA Process Changes in Detail: Selection Criteria**

<i>Aspect of NDPA</i>	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008
Criterion 1	<p>Innovation/creativity— Examples: Does the applicant display evidence of scientific creativity? Does she/he initiate new areas of, approaches to, scientific research? Is the applicant truly visionary in his/her thinking? Does the applicant think in complex, multidisciplinary or interdisciplinary ways?</p>	<p>Scientific problem to be addressed: Biomedical significance/importance; if successful, likelihood of high impact on biomedical problem; creativity/innovativeness</p>	<p>The scientific problem to be addressed: The biomedical significance/importance of the problem, the likelihood that, if successful, the project will have a significant impact on a biomedical problem, and the innovativeness of the project.</p>	<p>The scientific problem to be addressed: The biomedical or behavioral significance/importance of the problem, the likelihood that, if successful, the project will have a significant impact on this problem, and the innovativeness of the project.</p>	<p>The scientific problem to be addressed: The biomedical or behavioral significance/importance of the problem; the likelihood that, if successful, the project will have a significant impact on this problem; and the innovativeness of the project.</p>
Criterion 2	<p>Intrinsic motivation/enthusiasm/intellectual energy—Examples: Is the applicant willing to take scientific risks and show persistence in the face of adversity? Is the applicant comfortable with uncertainty (i.e., able to see gray areas as opportunities for new insights)? Is the applicant able to move into new areas that present an opportunity to solve a problem or expand knowledge base? Is the applicant intellectually independent and tenacious? Is the applicant able to make scientific leaps and change the current paradigms of medical research?</p>	<p>Investigator: Evidence for claim of innovativeness/creativity (innovation density – “the extent of innovative activities relative to the applicant’s career stage”); demonstrated ability to devote 51% or more effort on NDPA project</p>	<p>The investigator: Evidence for the investigator’s claim of innovativeness/creativity (innovation density), and the demonstrated ability of the investigator to devote 51% or more effort on NDPA project</p>	<p>The investigator: Evidence for the investigator’s claim of innovativeness/creativity (innovation density), and the demonstrated ability of the investigator to devote 51% or more effort on NDPA project</p>	<p>The investigator: Evidence for the investigator’s claim of innovativeness/creativity (innovation density) and the demonstrated ability of the investigator to devote at least 51% of his/her effort to activities supported by the Pioneer Award</p>

<i>Aspect of NDPA (continued)</i>	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008
Criterion 3	<p>Potential for or actual scientific leadership; evidence of, or potential for, effective communication/educator skills—Examples: Does the applicant have the ability to communicate the impact of her/his work? Has the applicant shown the ability (or potential) to bring together diverse teams of scientists; to inspire with his or her scientific vision and lead others; to serve as a mentor or role model?</p>	<p>Suitability for NDPA mechanism: Evidence that proposed project is of sufficient risk/impact to make it more suitable for NDPA than for traditional NIH grant mechanism; distinctness from other research by investigator</p>	<p>The suitability for NDPA mechanism: Evidence that the proposed project is of sufficient risk/impact to make it more suitable for the NDPA than for the traditional NIH grant mechanism and that it is distinct from other research previously or currently conducted by the investigator</p>	<p>The suitability for NDPA mechanism: Evidence that the proposed project is of sufficient risk/impact to make it more suitable for the NDPA than for the traditional NIH grant mechanism and that it is distinct from other research previously or currently conducted by the investigator</p>	<p>The suitability for Pioneer Award mechanism: Evidence that the proposed project is of sufficient risk/impact to make it more suitable for a Pioneer Award than for the traditional NIH grant mechanism and that it is distinct from other research previously</p>

Exhibit 2.6.
NDPA Process Changes in Detail: Application Materials

<i>Aspect of NDPA</i>	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008
<i>Application Material</i>	Submitted in Phases	Submitted in Phases	Submitted up front	Submitted up front	Submitted up front
<i>Essay on innovative vision (3–5 pages)</i>	Submitted at Application Phase	Submitted at Nomination Phase	Submitted at Initial Phase	Submitted at Initial Phase	Submitted at Initial Phase
<i>Biographical sketch (2 pages)</i>	Submitted at Nomination Phase	Submitted at Nomination Phase	Submitted at Initial Phase	Submitted at Initial Phase	Submitted at Initial Phase
<i>List of current research support</i>	<i>Not submitted in FY 2004</i>	Submitted at Nomination Phase	Submitted at Initial Phase	Submitted at Initial Phase	Submitted at Initial Phase
<i>Letters of reference (3)</i>	Submitted at Application Phase	Submitted at Application Phase	Submitted at Initial Phase	Submitted at Initial Phase	Submitted at Initial Phase
<i>Most significant accomplishment</i>	Submitted at Application Phase	Submitted at Application Phase	Submitted at Initial Phase – the applicant’s single most significant publication or achievement	Submitted at Initial Phase – one-page description of the applicant’s single most significant research accomplishment	Submitted at Initial Phase – one-page description of the applicant’s single most significant research accomplishment.
<i>Abstract describing project goals (300 words)</i>	<i>Not submitted in FY 2004</i>	<i>Not submitted in FY 2005 – self-nominees only</i>	Submitted at Initial Phase	Submitted at Initial Phase	Submitted at Initial Phase
<i>Level of effort commitment (a statement that, if chosen, the applicant will commit a minimum of 51% of his/her research efforts to Pioneer Award activities)</i>	<i>Not submitted in FY 2004</i>	<i>Not submitted in FY 2005</i>	<i>Not submitted in FY 2006</i>	<i>Submitted at Initial Phase</i>	<i>Submitted at Initial Phase</i>
<i>Nomination letter (either self or other nomination)</i>	Submitted at Nomination Phase	<i>Not submitted in FY 2005 – self-nominees only</i>	<i>Not submitted in FY 2006 – self-nominees only</i>	<i>Not submitted in FY 2007 – self-nominees only</i>	<i>Not submitted in 2008 – self-nominees only</i>

Exhibit 2.7.
NDPA Process Changes in Detail: Research Areas of Candidates

<i>Aspect of NDPA</i>	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008
Research Areas	Behavioral and Social Science	Behavioral and Social Science	Behavioral and Social Science	Behavioral and Social Science	Behavioral and Social Science
	Clinical Research	Clinical Research	Clinical and Translational Research	Clinical and Translational Research	Clinical and Translational Research
	Instrumentation and Engineering	Instrumentation and Engineering	Instrumentation and Engineering	Instrumentation and Engineering	Instrumentation and Engineering
	Molecular and Cellular Biology	Molecular and Cellular Biology	Molecular, Cellular, and Chemical Biology	Molecular, Cellular, and Chemical Biology	Molecular and Cellular Biology
					Chemical Biology
	Pathogenesis and Epidemiology	Pathogenesis and Epidemiology	Pathogenesis and Epidemiology	Pathogenesis and Epidemiology	Epidemiology
	Physiological and Integrative Systems	Physiological and Integrative Systems	Physiological and Integrative Systems	Physiological and Integrative Systems	Physiology and Integrative Systems
	Quantitative and Mathematical Biology	Quantitative and Mathematical Biology	Quantitative and Mathematical Biology	Quantitative and Mathematical Biology	Quantitative and Computational Biology
					Neuroscience
					Immunology

Note: Areas in bold remained unchanged from FY 2004 to FY 2008.

2.2 Changes in Review Criteria and Guidelines

In FY 2004, the first year of program implementation, the review criteria emphasized the merit of the individual scientist—*innovation/creativity; intrinsic motivation/enthusiasm/intellectual energy; and potential for or actual scientific leadership/evidence of, or potential for, effective communication/educator skills*. In FY 2005, the leadership criterion was eliminated completely, and the other criteria were melded into a single “investigator” criterion. Two new criteria were also added in FY 2005, resulting in the following three criteria:¹³

1. **Scientific problem to be addressed:** Biomedical significance/importance; if successful, likelihood of high impact on biomedical problem; creativity/innovativeness
2. **Investigator:** Evidence for claim of innovativeness/creativity (innovation density – “the extent of innovative activities relative to the applicant’s career stage”); demonstrated ability to devote 51% or more effort¹⁴ on NDPA project
3. **Suitability for NDPA mechanism:** Evidence that proposed project is of sufficient risk/impact to make it more suitable for NDPA than for traditional NIH grant mechanism; distinctness from other research by investigator¹⁵

These changes¹⁶ were intended to make the criteria easier to operationalize – as external evaluator feedback from FY 2004 indicated that certain criteria (e.g., leadership), were subjective and difficult to apply consistently.

The program was originally conceived on the premise that great ideas stem from a creative individual rather than a work plan. This was a novel programmatic approach for the NIH, and the initial review criteria were designed to reflect these goals. The changes in review criteria shifted the emphasis of the review process away from purely the individual investigator and toward a combination of the individual and the proposed project.

2.3 Changes for Demographic Targeting

Beginning in FY 2005, a greater effort was made to draw in a more diverse pool of candidates. Several process changes from the FY 2004 announcement were made in the FY 2005 notice.¹⁷

¹³ In the original program notice (available at <http://www.grants1.nih.gov/grants/guide/notice-files/NOT-OD-05-021.html>), three slightly different criteria were given:

- Innovation/creativity, and the potential for future innovation. Evaluators will assess “innovation density” – the extent of innovative activities relative to the applicant's career stage.
- Motivation/enthusiasm/intellectual energy to pursue a challenging problem.
- Relevance of the research and impact on the scientific field and on the NIH mission.

The criteria given on the website and in the instructions to both the candidates and the evaluators match those stated above.

¹⁴ The 51% effort commitment is defined as 51% of research time devoted to NDPA-supported activities.

¹⁵ Evaluation Criteria for 2005 NIH Director’s Pioneer Award and Instructions to the Evaluators Presentation, NDPA internal documents.

¹⁶ Exhibits 2.1 through 2.7 present the changes in the review criteria across years.

¹⁷ See <http://www.grants1.nih.gov/grants/guide/notice-files/NOT-OD-05-021.html>.

2.3.1 Changes in RFA Text

In FY 2004, the program notice stated that “investigators at early stages of their career as well as those who are established will be eligible.” In FY 2005, the language of the notice/RFA was altered to be more precise, emphasizing that “those at early to middle stages of their careers, women, and members of groups underrepresented in biomedical research are especially encouraged to apply.” Guidelines in evaluator training materials in FY 2005–FY 2008 similarly emphasized this change in priority.

2.3.2 Elimination of Peer Nominations

In FY 2004, the NDPA solicitation included a two-pronged nomination process in which a person could self-nominate, or could be nominated by a peer. In FY 2005, responding to feedback that peer nominations led to a perpetuation of the “old boys club,”¹⁸ the NIH eliminated peer nominations.

2.3.3 Changes in External Evaluator Training

Beginning in FY 2005, the external evaluator training process displayed an increased focus on targeting those demographics specified in the new RFA text. New guidelines in the evaluator training materials emphasized consideration of previous funding and career stage of candidates.¹⁹

2.4 Rounds of Review

2.4.1 Administrative Review

According to program leadership,²⁰ the role of the administrative review became less relevant after FY 2006 as the scientific community more fully understood the rules and scope of NDPA.²¹ This, in addition to the decreased number of nominated candidates, led to the nomination phase being eliminated altogether beginning in FY 2007. Thus, for FY 2007 and FY 2008, candidates are equivalent to applicants (see Terminology sidebar at beginning of Chapter 1).

2.4.2 External Review

The first round of external review (Phase 2 in FY 2004 and FY 2005) was eliminated in FY 2006, mainly because of the much lower number of nominations submitted, compared to the first 2 years of the program.

¹⁸ See for example, M. Carnes, S. Geller, E. Fine, J. Sheridan, and J. Handelsman (2005), “NIH Director’s Pioneer Awards: Could the Selection Process Be Biased against Women?” *Journal of Women’s Health*, 14(8): 684–691, and J. Mervis (2004), “Male Sweep of New Award Raises Questions of Bias.” *Science*, 306: 595.

¹⁹ Evaluation Criteria for 2005 NIH Director’s Pioneer Award and Instructions to the Evaluators Presentation. NDPA internal documents.

²⁰ Personal communication with NDPA leadership.

²¹ The Administrative Review ensured that the nomination packages were complete and that the candidates met program eligibility requirements.

2.5 Application Materials

2.5.1 Level of Effort Commitment

In all years, awardees have been expected to commit “the major portion of their effort to activities supported by NDPA.” Beginning in FY 2005, “major portion” was explicitly defined as at least 51% of the investigator’s research time. In FY 2007 and FY 2008, all applicants were required to submit an effort commitment statement in their list of current and pending support that, if chosen, they would commit a minimum of 51% of their research efforts to NDPA activities.

2.5.2 Essay

In FY 2004 candidates were given little instruction about what to include in their essays. Beginning in FY 2005, candidates were required to specifically address the following questions, reflecting the new review criteria:

1. What is the scientific problem that will be addressed, and why is this important?
2. How will the new research direction differ from the individual's past or current work?
3. Why is the planned research uniquely suited to the stated goal of the NDPA program?

2.5.3 Most Significant Accomplishment

In FY 2004–FY 2006, applicants were required to submit their single most significant accomplishment in the form of a publication. In FY 2007 and FY 2008, the requirement was changed to a one-page description of the applicant’s single most significant research accomplishment.

2.5.4 Submission of Application Materials

Beginning in FY 2006, all application materials were submitted up-front during the first phase of review, as opposed to FY 2004 and FY 2005, when the submission of materials was staggered.

Although the NDPA process has changed since its inception, the program appears to have now reached a steady state in terms of its design and implementation.

3. Program Participants

As described in Chapter 2, the design of the NDPA program reflected efforts to attract a diverse group of candidates and external evaluators. This chapter depicts program participation over the first 5 years of the NDPA and summarizes the key characteristics of both candidates and external evaluators.

3.1 Characteristics of Candidates and Awardees

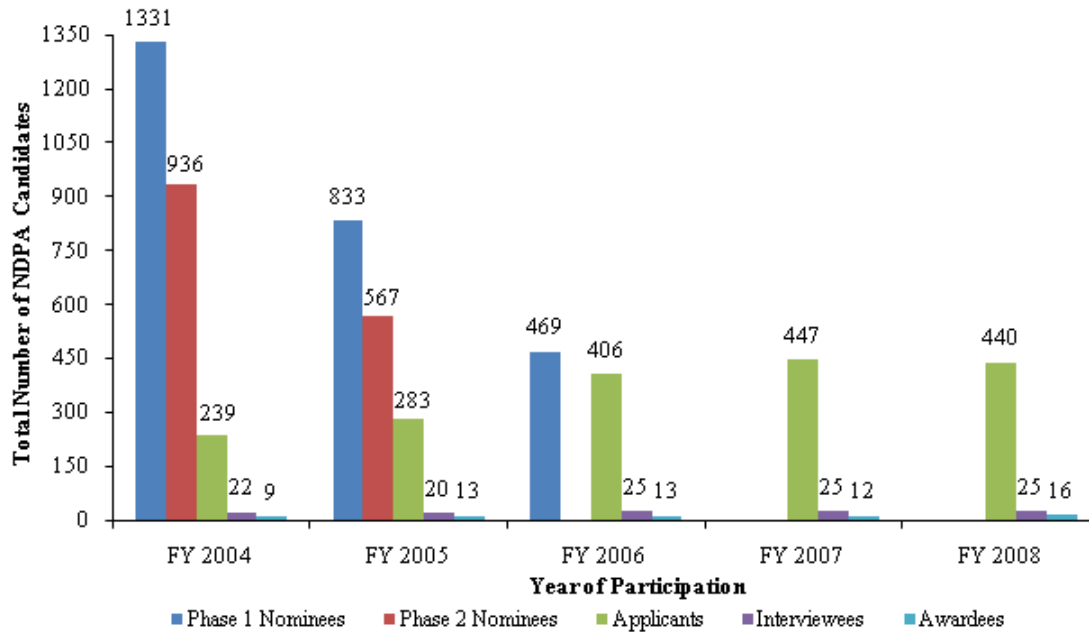
In all years of implementation, the NDPA was intended to attract as many candidates from as diverse a set of backgrounds as possible. Several modifications were made in each year of the program in a continuing attempt to generate more candidate diversity, with the most substantial program changes occurring between FY 2004 and FY 2005. Despite these changes, available data show that the demographic characteristics of the candidates remained largely the same from year to year, with a few notable exceptions. Detailed data on characteristics of the candidates and evaluators are located in Appendices F and G, respectively.

3.1.1 Program Participation

Over the first 5 years, 2,877 individuals applied to the program. Many individuals applied in multiple years, resulting in a total of 3,520 candidacies. Following a decline from 1,331 candidates in FY 2004, the number of candidates applying for the NDPA reached a steady state of roughly 450 per year between FY 2006 and FY 2008. Over the first 3 years of implementation, while the total number of *candidates* dropped, the number of *applicants* (candidates whose applications were reviewed by the external evaluators) increased before leveling off between FY 2006 and FY 2008(Exhibit 3.1).²²

²²The nomination phase(s) was eliminated in FY 2007.

Exhibit 3.1.**Number of NDPA Candidates, FY 2004–FY 2008**



Source: STPI Analysis of FY 200–FY 2008 NDPA Administrative Data.

3.1.2 Repeat Applicants

Many candidates applied to NDPA multiple times throughout the 5 years.

- The percentage of repeat candidates in a given year increased from 22% in FY 2005 to 38% in FY 2007, and dropped to 34% in FY 2008 (Exhibit 3.2).
- Four hundred and eighty candidates (17%) applied in 2 or more years, and 9 candidates applied in all 5 years of the program (Appendix F, Exhibits F.1 and F.2).
- Over all years, 46 interviewees (41%) and 17 awardees (27%) applied in at least 2 years of the program (Appendix F, Exhibits F.1 and F.2).
- Of the total interviewee pool, four individuals participated in the interview process in 2 different years, two of whom eventually won an award.
- The likelihood of receiving an award increased slightly for repeat applicants (Appendix F, Exhibit F.1).²³

²³ The NDPA process is significantly different from that of more traditional funding mechanisms such as the R01. For example, repeat applicants for the NDPA must submit complete applications in every year, rather than supply amendments to their initial applications as R01 applicants do. Thus it is difficult to compare the NDPA to the R01 in terms of likelihood of success based on repeat applications.

Exhibit 3.2.
Repeat Participation of FY 2004–FY 2008 NDPA Candidates

Fiscal Year	Number of Unique Candidates (% of Total Candidates)	Number of Repeat Candidates (% of Total Candidates)
2004	1331 (100%)	N/A
2005	649 (78%)	184 (22%)
2006	331 (71%)	138 (29%)
2007	276 (62%)	171 (38%)
2008	290 (66%)	150 (34%)

Source: STPI Analysis of FY 2004–FY 2008 NDPA Administrative Data.

3.1.3 Gender Distribution

Across all years, women have comprised approximately one-quarter of the total candidate pool (Appendix F, Exhibit F.3).

- Since FY 2005, the percentage of women applying to the NDPA has been roughly 25%, ranging from 22% to 27%.
- In the first 5 years of implementation, there were 32 (27%) female interviewees and 18 (29%) female awardees.
- The percentage of NDPAs awarded to females (29%) in 5 years of implementation is slightly higher than the percentage of R01s awarded to females (23%) from FY 2000 to FY 2005 (Appendix F, Exhibits F.3 and F.4).
- There was no significant difference between the total number of female interviewees and the expected number based on the total candidate pool.²⁴
- If the selection process were completely random, the median expected number of female awardees based on a binomial distribution would be 15. Though there were no female awardees in FY 2004, the actual number of female NDPA awardees over all 5 years (18) is not significantly different from what would be expected,²⁵ given the initial male/female ratio of NDPA candidates (Appendix F, Exhibit F.5).

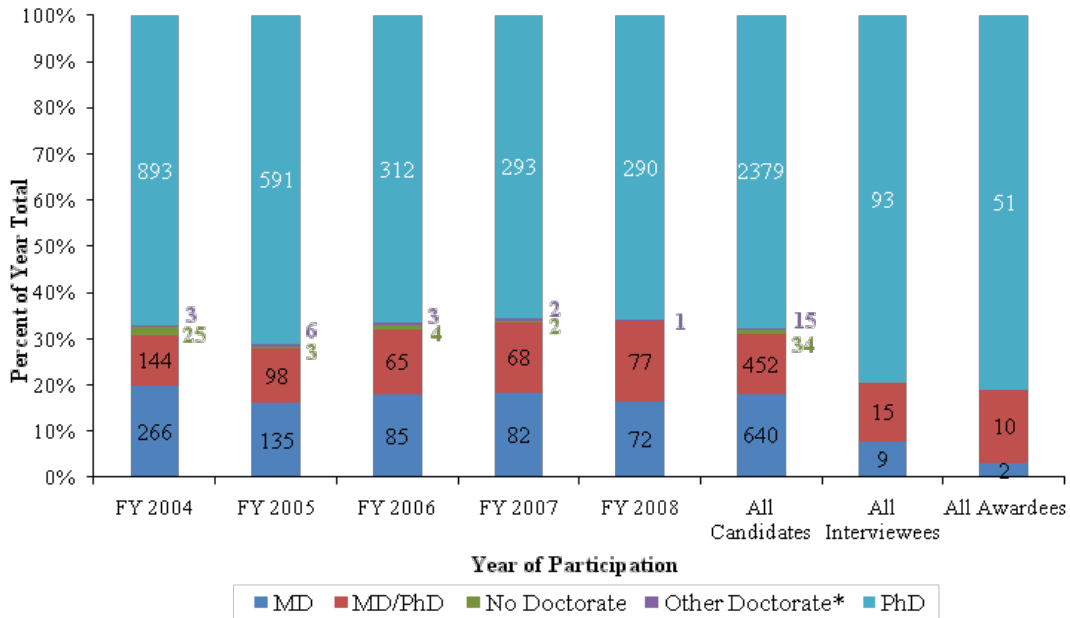
²⁴ Chi-square test, $\chi^2 = 0.56$, $df = 1$, $p = 0.5$.

²⁵ Chi-square test, $\chi^2 = 0.60$, $df = 1$, $p = 0.4$.

3.1.4 Degree Distribution

The majority of all NDPA candidates (68%) have PhDs, while 18% have MDs and 13% have both (Exhibit 3.3).²⁶ The degree distributions of the interviewees and awardees are significantly different from that of the total candidate pool,²⁷ as 8% of interviewees and 3% of awardees hold MDs only.

Exhibit 3.3.
Degree Distribution of NDPA Candidates, FY 2004–FY 2008



*“Other doctorate” includes DVM, DDS, PharmD, etc.; “PhD” includes DSc.

Source: STPI Analysis of FY 2004–FY 2008 NDPA Administrative and IMPAC II Data.

²⁶ The remaining 4% hold one of the following degrees: BA/BS, DMD, DVM, EdD., JD, or PharmD. Degrees of candidates and seniority were coded using information from the submitted biographical sketches and personal websites. STPI considered the number of years elapsed since the nominee obtained his or her MD or PhD (and for candidates with both MD and PhD or multiple PhD degrees, the year the earlier degree was obtained was used to calculate seniority). Information was not available for some of the nominees – they were coded as “N/A.” (Seniority data are most incomplete for the FY 2006 cohort, as the application materials were not available and all seniority had to be coded based on personal websites.)

²⁷ For interviewees: chi-square test, $\chi^2 = 11.2$, $df = 4$, $p = 0.024$. For awardees: chi-square test, $\chi^2 = 10.8$, $df = 4$, $p = 0.029$.

3.1.5 Seniority Distribution

Seniority data were available for 3,475 (99%) of the 3,520 NDPA candidates in the first 5 years of the program. The average seniority (years since first doctorate) of the candidates has stayed roughly the same over the first 5 years (19.8 years in FY 2004, 20.8 years in FY 2005, 21.6 years in FY 2006 and FY 2007, and 21.1 in FY 2008) (Appendix F, Exhibit F.6).

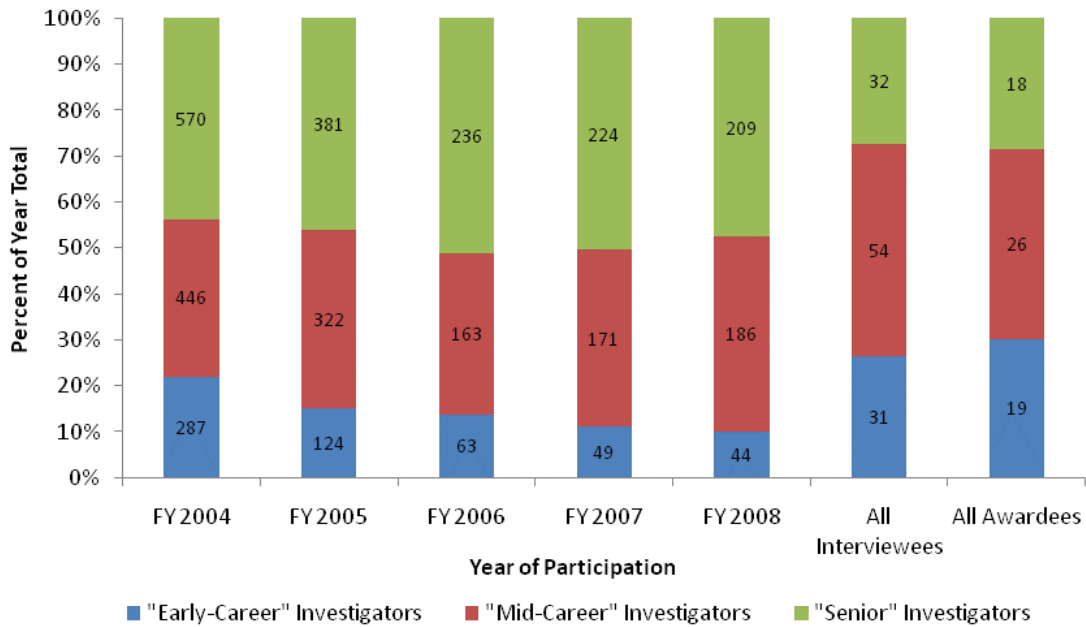
- Over the years, the number of “early-career” investigators (those with fewer than 10 years since their first doctorate) declined from 287 (22% of total candidate pool for whom seniority data were available) in FY 2004 to roughly 45 (10% of the total candidate pool for whom seniority data were available) in FY 2007 and FY 2008 (Exhibit 3.4).
- Conversely, the proportion of “mid-career” investigators (those with between 10 and 20 years since their first doctorate) increased from 34% in FY 2004 to 42% in FY 2008.
- “Senior” investigators (those with greater than 20 years since their first doctorate) comprised roughly 50% of candidates in all years of the program.

The seniority distributions of the interviewees and awardees are somewhat different from that of the candidate pool.

- In all years, the average seniority of the awardees was less than that of the candidates, with differences between the group ranging from 2 years (FY 2004) to 7 years (FY 2007) (Appendix F, Exhibit F.6).
- There was a significant difference between the seniority distribution of the total candidate pool and that of the interviewees and awardees,²⁸ with the candidate pool being more senior (Exhibit 3.4).
- In all years, female candidates averaged 18.6 years since receiving their first doctorate, while male candidates averaged 21.3 years (Appendix F, Exhibit F.7).

²⁸ For interviewees: chi-square test, $\chi^2 = 19.2$, $df = 2$, $p = 6.88E - 05$. For awardees: chi-square test, $\chi^2 = 12.1$, $df = 2$, $p = 0.002$.

Exhibit 3.4.
Seniority (Years since First Doctorate) of NDPA Candidates, FY 2004–FY 2008



Note: "Early-Career" ≤ 10 years of experience, "Mid-Career" between 10 and 20 years of experience, and "Senior" ≥ 20 years of experience. Numbers and percentages in Exhibit F.7, Appendix F, exclude candidates with no doctorate, and are based on available data only; therefore, the column totals do not sum exactly to the year totals.

Source: STPI Analysis of FY 2004–FY 2008 NDPA Administrative and IMPAC II Data.

3.1.6 Race/Ethnicity

Of the 3,520 total candidates, race information was available for 2,654 (75%) (Appendix F, Exhibit F.8):²⁹

- Of the 2,654 candidates for whom race information was available, 78% were White, 17% were Asian, 3% were Hispanic or Latino, 1% were Black or African American, and less than 1% were Native Hawaiian or other Pacific Islander or American Indian or Alaska Native.
- Of the candidates for whom race information was available, the proportion of minority candidates applying to the program between 2005 and 2008 was roughly 22%, ranging from 18% in FY 2004 to 26% in FY 2008.
- Over all years, interviewees were 73% White, 14% Asian, 3% Black or African American, and 3% Hispanic or Latino, while awardees were 65% White, 17% Asian, and 6% Black or African American.

²⁹ Race categories are those stored in the NIH IMPAC II database. IMPAC II is the NIH database that holds funding and application information of all its programs. Because race/ethnicity data of NDPA candidates from NIH sources was not complete, candidates were asked an optional survey question about their race/ethnicity as part of the candidate survey (see Appendix D).

- There was a significant difference between the race distribution of the total candidate pool and that of the interviewees and awardees,³⁰ as more minority candidates were invited to interview and were awarded than would be expected based on the initial candidate pool.

3.1.7 Research Areas

As part of the application process, candidates were asked to place their research in one of several categories that have evolved slightly over the years (see Exhibit 2.1). All of the candidates chose one of these categories. However, in FY 2004, candidates were able to designate an “other” category instead of one of the seven categories. In FY 2005, candidates were required to select a primary field of research, but could also designate a secondary “other” category to add more detail.³¹

Overall, Molecular, Cellular, [and Chemical]³² Biology was the most common field of research in all years, accounting for roughly one-third of all candidates and awardees (Appendix F, Exhibit F.9).

There was no significant difference between the distribution of the awardees and that of the total candidate pool.³³

3.1.8 Affiliation

Overall, the majority (86%) of NDPA candidates were drawn from universities or university-affiliated medical institutes. More than one-quarter of all candidates and almost half of the awardees were drawn from 10 institutions: Harvard University, Stanford University, Johns Hopkins University, Columbia University, University of Pennsylvania, University of Washington, University of California San Francisco, University of California Los Angeles, University of Michigan, and Yale University (Exhibit 3.5; Appendix F, Exhibits F.10 and F.11).

³⁰ For interviewees: chi-square test, $\chi^2 = 22.69$, $df = 6$, $p = 0.001$. For awardees: chi-square test, $\chi^2 = 21.57$, $df = 6$, $p = 0.002$.

³¹ The specific descriptions given in the “other” categories were coded by STPI staff. Most of these descriptions could be grouped into one of the original seven research categories given. Other common categories specified included Neuroscience, Biophysics/Bioengineering, Genomics/Bioinformatics, and Biochemistry.

³² Brackets denote that category name changed over the years of program implementation.

³³ Chi-square test, $\chi^2 = 17.4$, $df = 10$, $p = 0.073$.

Exhibit 3.5.**Geographic Distribution of NDPA Awardees, FY 2004–FY 2008**



Note: Sizes of red markers are scaled to reflect relative number of awardees at marked locations. One awardee from FY 2005, who is at the University of Cambridge in the United Kingdom, is not shown. Candidates at foreign institutions were no longer eligible for the NDPA after FY 2005.

Source: STPI Mapping of FY 2004–FY 2008 NDPA Administrative Data.

3.1.9 Funding Sources – IMPAC II Data³⁴

As discussed in Chapter 2, Section 2.3, the NDPA selection criteria and guidelines were modified in FY 2005 to give more consideration to career stage and previous funding of candidates. Analysis based on the NIH IMPAC II database revealed that every year, 75% to 80% of NDPA applicants and awardees had received funding from the NIH in the 5 years prior to submitting their NDPA application (Appendix F, Exhibit F.12).³⁵

- Applicants over all 5 years held an average of \$2.2 million per person in NIH funding over the 5 years prior to their NDPA application, while interviewees and awardees held \$2.0 million and \$2.1 million, respectively (Exhibit 3.6).
- Applicants in all 5 years held a total of 83 different grant mechanisms over the 5 years prior to their NDPA application, though the majority of grants were R01s (68%), followed by R21s (5%).
- Awardees held 23 different award mechanisms; R01s represented 72% of all awards held by NDPA awardees.

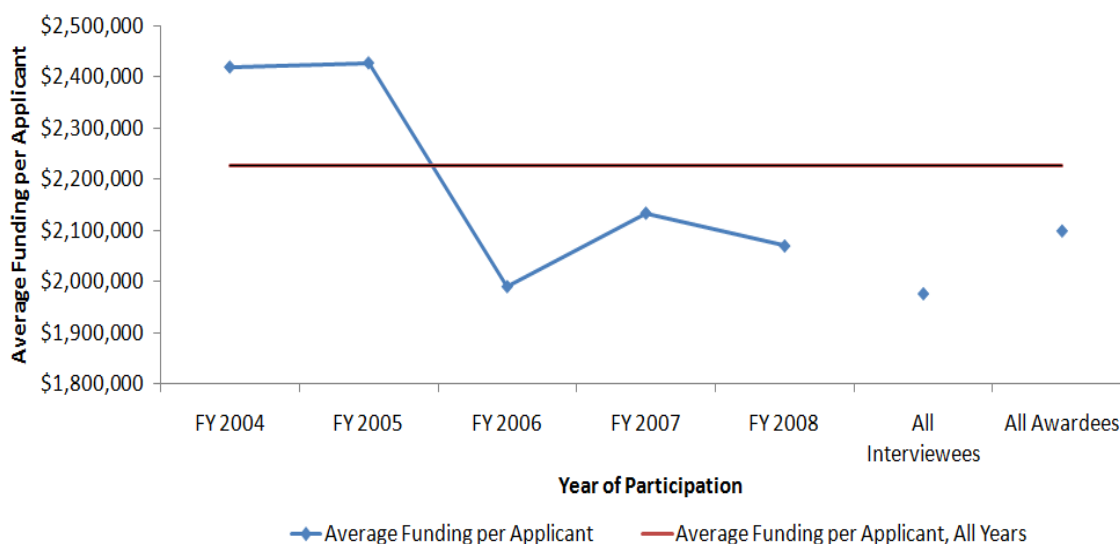
³⁴ IMPAC II is the NIH database that holds funding and application information of all its programs.

³⁵ Not all of the candidates in FY 2004 and FY 2005 were entered into IMPAC II; the analysis therefore only considered applicants.

- Eleven of the 63 awardees held R21s over the 5 years prior to receiving the NDPA.
- The NDPA applicants in FY 2004 and FY 2005 who had received NIH funding held an average of \$400,000 more in NIH funding per person (over the 5 years prior to their NDPA application) than applicants in subsequent years.
- Thirteen (21%) of the 63 awardees did not have NIH funding in the 5 years prior to their award.

Exhibit 3.6.

Average Amount of NIH Funding per Previously Funded NDPA Applicant in the 5 Years Prior to their NDPA Application



Note: Excludes candidates with no NIH funding; Funding calculated using direct costs.

Source: STPI Analysis of FY 2004–FY 2008 NDPA IMPAC II Data.

3.1.10 Funding Sources – Survey Data

As data regarding private funding sources are not publicly accessible, the NDPA candidates' funding portfolios were further explored in the surveys of the candidates. Candidates were asked whether their NDPA application was their first NIH submission, and to categorize their total funding portfolio over the 5 years prior to their NDPA application. More than half of the respondents reported that they received the majority of their funding from the NIH. Other common sources of funding reported by survey respondents included: hospitals, universities, or other non-profit organizations, followed by foundations, other U.S. government sources, and for-profit companies (Appendix G, Exhibit G.3).

3.2 Characteristics of Evaluators

3.2.1 NIH Liaisons

A total of 53 NIH staff members, or “liaisons,” were involved in the administrative review of candidates in FY 2004–2006 for a total of 73 participation counts.³⁶ The administrative review phase was removed entirely in FY 2007 (see Chapter 2, Exhibit 2.1). Overall, liaisons were drawn from 21 of the 27 NIH Institutes and Centers and the Office of the Director.

3.2.2 External Evaluators

A total of 255 external evaluators – including 52 panelists who ranked interviewees and made funding recommendations – have participated in at least one year of review, though many have participated in multiple years for a total of 375 individual participation counts. Though the total number of candidates has declined over the years, more evaluators have been recruited in each subsequent year, and repeat evaluators have become more common (Appendix H, Exhibits H.1 and H.2).

In FY 2004, evaluators were recruited in a shorter period of time, and the resulting evaluator pool was predominately white, male, and senior (Appendix H, Exhibits H.3, H.4, H.6). Given the critical role of evaluators in identifying pioneers, the NDPA leadership made a targeted effort in subsequent years to attract a more diverse pool of evaluators. These efforts were successful in terms of attracting more women and younger investigators to serve as evaluators (Appendix H, Exhibits H.3 and H.4).

Overall, across all 5 years, the external evaluators were:

- Mostly men (63% male, 37% female), though the proportion of women evaluators increased from FY 2004 to FY 2005 (Appendix H, Exhibit H.3)
- Relatively senior (the majority obtained degrees more than 25 years ago) (Exhibit H.4)
- Predominantly White (83% White, 9% Asian, 4% Black or African American, and 4% Hispanic or Latino) (Appendix H, Exhibit H.6)
- Generally matched to the research area distribution of the candidate pool (Appendix H, Exhibit H.5)³⁷

By design, the evaluators recruited to participate in the NDPA selection process were well-known researchers and leaders in their fields. Though it is impossible to judge the ability of the evaluators to identify pioneering research, it is clear from an analysis of curricula vitae and personal websites that the evaluators are an accomplished group. Information obtained for 221 of the 255 (87%) external evaluators reveal several accomplishments worth noting (Appendix H, Exhibit H.7):

- Ninety-two evaluators are members of the National Academy of Sciences (NAS)
- Seventy-seven are, or have been, Howard Hughes Medical Investigators (HHMI) at some point in their career

³⁶ The administrative review ensured that the nomination packages were complete and that the candidates met program eligibility requirements.

³⁷ The NDPA review process required each application to be scored by two external evaluators within the applicant’s research area and one outside the applicant’s research area.

- Seven are Nobel Laureates, winning awards in Physiology or Medicine, Physics, and Chemistry
- Fifteen were NDPA awardees themselves prior to serving as evaluators
- Evaluators are well-cited scientists, as revealed by their relatively high average h -index.³⁸

³⁸ J. E. Hirsch (2005), "An index to quantify an individual's scientific research output," in *Proceedings of the National Academy of Sciences* 102 (46): 16569–16572. (available at <http://www.pnas.org/content/102/46/16569>).

The h -index is defined as follows: A scientist has an index of h if his/her published papers Np have at least h citations each, and the other papers ($Np - h$) have no more than h citations each. The h -index has received a number of strong criticisms, but has also been increasingly used by bibliometricians since its introduction. The mean h -index of the FY 2004 group of external evaluators is 49; for the FY 2008 evaluators, 41. For comparison, the mean h -index of recent inductees into the National Academies of Science in the biological and biomedical fields was 57.

4. Scoring Trends

The NDPA scoring system is distinct from those of more traditional NIH programs. Thus, an important part of the process evaluation was to understand the implementation of this scoring system throughout the different phases of the selection process and to identify trends of interest over the first 5 years of the program.

4.1 Scoring of Applications

In the first phase of application scoring (Phase 3 of FY 2004 and FY 2005, Phase 2 of FY 2006, and Phase 1 of FY 2007 and FY 2008),³⁹ external evaluators were asked to score applications on each of the three review criteria between 1 and 5,⁴⁰ as well as to give an overall score on that same scale. Evaluators were also asked to designate exactly four applications with a “top 4” vote and, in FY 2008 only, to provide any number of “ideal candidate” designations. Evaluators were asked to score applications externally and without discussion with other evaluators, in contrast to the traditional methodology of NIH study sections where applications are discussed. Each application was reviewed by two evaluators within, and one outside, the applicant’s research area.

4.1.1 Overall Score Trends

There was a high correlation between the individual scores for each review criterion and the overall score given to each application by evaluators (Appendix I, Exhibit I.1). Therefore, unless otherwise noted, all scoring analyses below were conducted utilizing overall scores. Trends in average overall scores include:⁴¹

- The average overall score of the total applicant pool was around 3.18, ranging from a low of 3.06 in FY 2005 to a high of 3.31 in FY 2008 (Appendix I, Exhibit I.2).
- In all years, the variance in scores for interviewees was much smaller than that for the total applicant pool (Appendix I, Exhibit I.3). Overall scores received by applicants followed a normal distribution, with scores of 2, 3, and 4 making up 74% of all scores. In contrast, 91% of all overall scores received by interviewees were 4 or above, and 99% were 3 or above (Exhibit 4.1; Appendix D, Exhibit D.4).
- Female applicants received slightly higher average overall scores than male applicants, 3.21 for women vs. 3.18 for men between FY 2005 and FY 2008 (Appendix I, Exhibit I.5).
- While the average overall score of all applicants increased between FY 2005 and FY 2008, early- and mid-career investigators experienced the greatest increase over those years (Appendix I, Exhibit I.6).
- From FY 2005 to FY 2008, early- and mid-career investigators received higher average overall scores than senior investigators (3.21 for early-career, 3.25 for mid-career, and 3.15 for senior investigators).

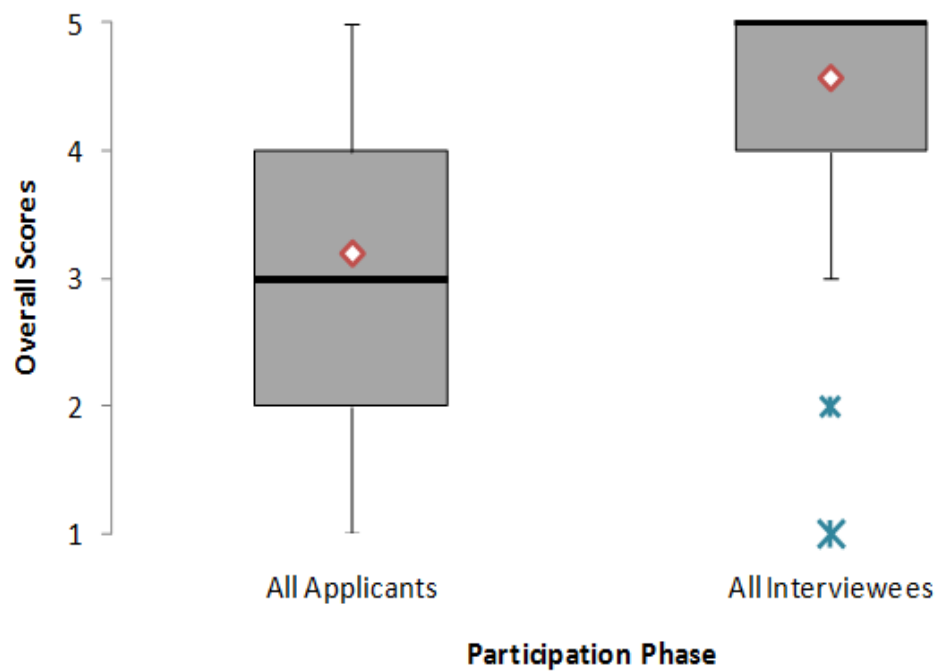
³⁹ See Exhibits 2.2 through 2.7 in Chapter 2 for details regarding process changes.

⁴⁰ In contrast to the 5-point scale used in all subsequent years, the scoring scale in FY 2004 ranged from 1 to 7.

⁴¹ Each candidate received three scores (since each application was reviewed by three evaluators), thus the number of scores used in these analyses equals the number of candidates times three. Unless otherwise noted, data are summarized for FY 2005–FY 2008 only, due to the different scoring scale used in FY 2004.

- Applicants in the research areas of Molecular, Cellular, [and Chemical] Biology and Instrumentation and Engineering received higher average overall scores than all applicants, while the average overall scores for applicants from every other research area fell below that of all applicants. Applicants in the Behavioral and Social Sciences category received the lowest overall scores (Appendix I, Exhibit I.7).
- For both Clinical [and Translational] Research and Behavioral and Social Sciences, the average scores in the Scientific Problem to be Addressed and Investigator criteria are much higher than the those given for the Suitability criterion (Exhibit 4.2).

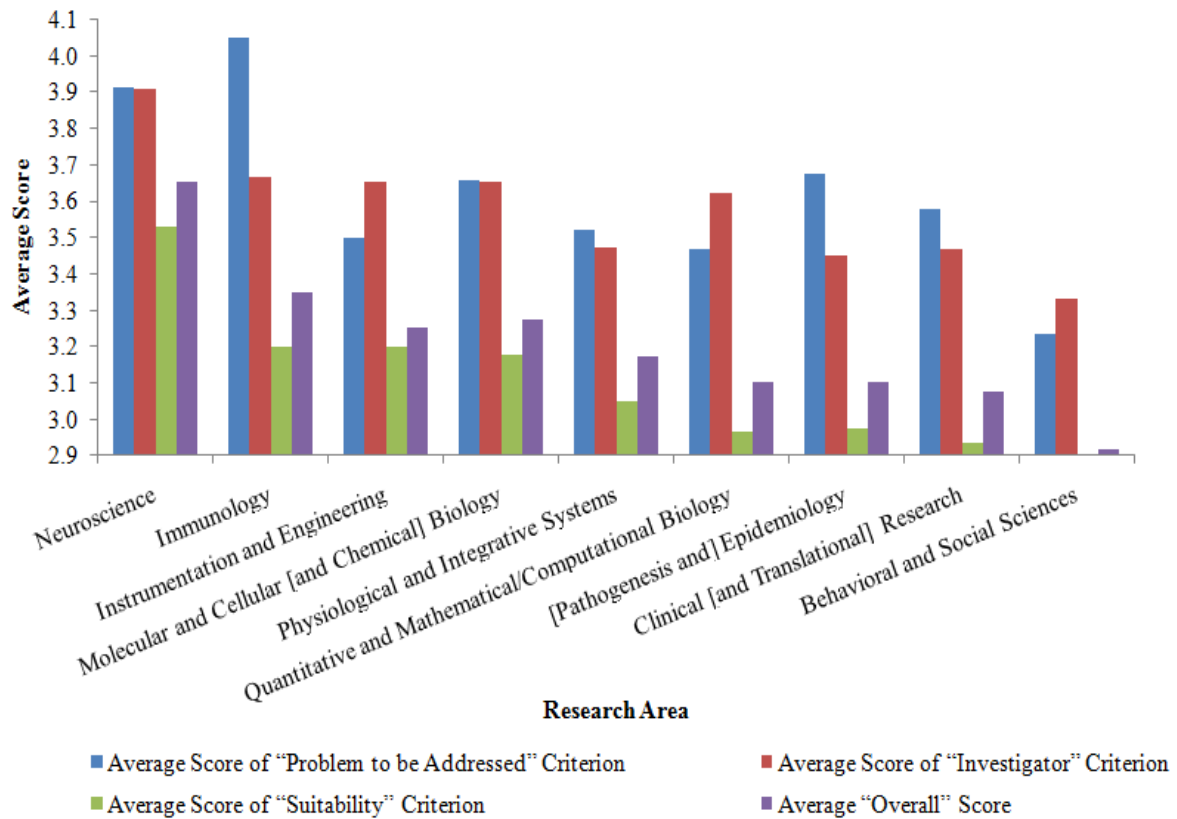
Exhibit 4.1.
Spread in Scores of NDPA Applicants and Interviewees, FY 2005–FY 2008



***Note:** FY 2004 Scores are not included in this analysis because of the different scoring scale in that year (7-point scale, versus 5-point in subsequent years). Heavier black lines represent median scores, open red diamonds are mean scores, and blue asterisks are outliers (for All Interviewees, there were three scores of 1 and one score of 2). Analysis of FY 2005 scoring data along with comments shows that one evaluator mistakenly reversed the scoring scale, and this contributed to the markedly higher variance of interviewee scores in that year.*

***Source:** STPI Analysis of FY 2005–FY 2008 NDPA External Evaluator Scoring Trends.*

Exhibit 4.2.**Average Score of Each Criterion by Applicant Research Area, FY 2005–FY 2008**



Note: Bracketed portions of research area designations indicate that the designation changed over the period of analysis. Similar research areas from different years were grouped together for the NDPA submission and review processes, and, as such, are treated similarly in this report. Immunology and Neuroscience research areas reflect FY 2008 scores only. FY 2004 scores are not included in this analysis because of the significantly different review criteria and scoring scale in that year.

Source: STPI Analysis of FY 2005–FY 2008 NDPA External Evaluator Scoring Trends.

4.1.2 "Top 4" Vote Trends

Top 4 voting trends for FY 2005–2008 are summarized below:⁴²

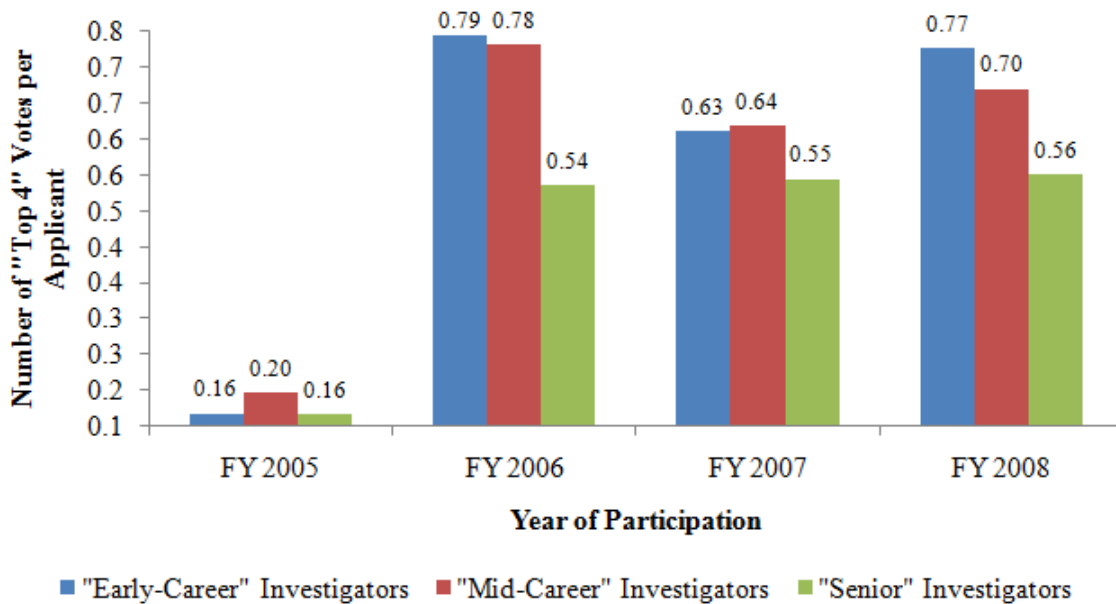
- Of the 1,815 applicants reviewed between FY 2005 and FY 2008, 806 (44%) received at least one top 4 vote from the external evaluators (Appendix I, Exhibit I.8).
 - All of the 117 interviewees had at least one top 4 vote. Seventeen (15%) had only one, 68 (58%) had only two, and 32 (27%) had three top 4 votes.
 - All of the 63 awardees had at least one top 4 vote. Seven (11%) had only one, 35 (56%) had only two, and 21 (33%) had three top 4 votes.

⁴² Unless otherwise noted, data are summarized for FY 2005–FY 2008 only, due to the much smaller number of evaluators in FY 2004. With a higher ratio of evaluators to applicants, the number of top 4 votes per applicant increased.

- Over all years, women received more top 4 votes per applicant than men (Appendix I, Exhibit I.9).
- Between FY 2006 and FY 2008, early- and mid-career investigators received more top 4 votes per applicant than senior investigators (Exhibit 4.3).
- In all years, applicants from the areas of Quantitative and Computational/Mathematical Biology and Instrumentation and Engineering received the most top 4 votes per applicant, while applicants from the areas of Clinical [and Translational] Research and Behavioral and Social Sciences received the fewest (Appendix I, Exhibit I.10).

The spread in the number of applications reviewed by FY 2004 external evaluators was wider (ranging from 11 to 43 applications per evaluator) than in later years. This created some concern among program staff – for instance, the top 4 choices of an evaluator who reviewed 11 applications may not have been of the same caliber as the top 4 choices of another evaluator who reviewed 43 applications. This discrepancy was eliminated in future years by ensuring that all evaluators reviewed approximately the same number of applications (Appendix I, Exhibit I.2).

Exhibit 4.3.**Number of “Top 4” Votes per Applicant Based on Seniority, FY 2005–FY 2008**



Note: The fluctuation in number of top 4 votes per applicant in different years is at least partly due to changes in the evaluator-to-applicant ratio. For example, in FY 2006, there were a greater number of evaluators reviewing a smaller number of applications, so more top 4 votes were given overall. Thus, the comparison of top 4 votes received based on seniority is a more important aspect of this graph than comparison between years. Because of the extremely small evaluator-to-applicant ratio in FY 2004, data from that year were excluded from this analysis. “Early-Career” ≤ 10 years since first doctorate, “Mid-Career” between 10 and 20 years, and “Senior” ≥ 20 years. Analysis excludes candidates with no doctorate and is based on available data only.

Source: STPI Analysis of FY 2005–FY 2008 NDPA External Evaluator Scoring Trends.

4.1.3 Ideal Candidate

Starting in FY 2008, external evaluators also had the ability to designate any number of applicants as “ideal candidates.” The ideal candidate vote was added for two reasons: (1) to respond to concerns from evaluators that picking exactly four candidates to receive the top 4 vote was difficult as there could be more or less than four candidates suitable for this designation; and (2) to allow external evaluators to flag truly exceptional applications or ideas – the reason behind the creation of the program.⁴³ However, as will be discussed further in Section 5.3.1, many evaluators did not fully understand and/or use this scoring feature, and it did not seem to have the effect that program leadership intended. Thus, the future of this scoring feature is uncertain. Major findings regarding the ideal candidate vote for FY 2008 are summarized below:

- The 73 external evaluators involved in the scoring phase gave a total of 119 ideal candidate votes.
- Twenty-one evaluators (29%) did not give any ideal candidate votes, while 52 (71%) gave at least one. Of the evaluators that gave at least one ideal candidate vote, 24 gave one, 10

⁴³ Interview with Jeremy Berg, July 2009.

gave two, 7 gave three, 4 gave four, 4 gave five, and 3 gave six ideal candidate votes to the applications they reviewed. Each evaluator in FY 2008 reviewed a total of 17 to 22 applications.

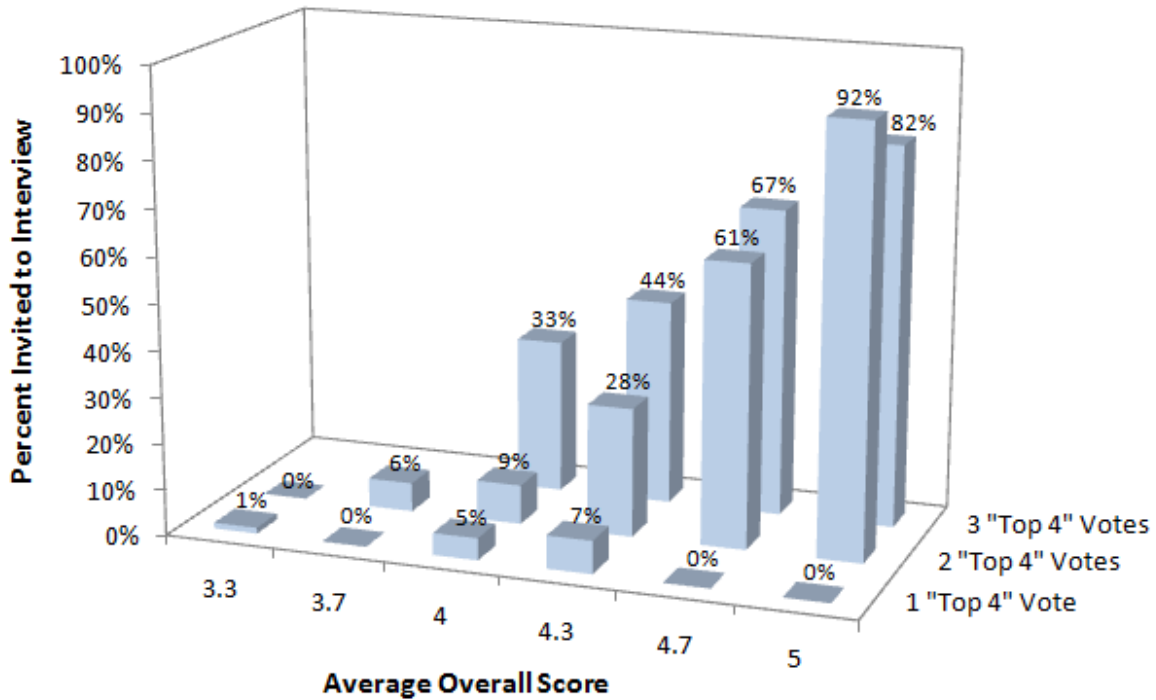
- Of the 440 applications reviewed in FY 2008, 98 (22%) received at least one ideal candidate vote: 80 (18%) had one, 15 (3%) had two, and 3 (1%) had three ideal candidate votes.
 - All of the 25 interviewees had at least one ideal candidate vote: 12 (48%) had one, 10 (40%) had two, and 3 (12%) had three ideal candidate votes.
 - All of the 16 awardees had at least one ideal candidate vote: 8 (50%) had one, 7 (44%) had two, and 1 (6%) had three ideal candidate votes.
- Of the 98 candidates who received at least 1 ideal candidate vote, 10 did not also receive top 4 votes.
- Women received more ideal candidate votes per applicant than men, with 0.34 votes per female applicant versus 0.25 votes per male applicant.
- Early- and mid-career investigators received more ideal candidate votes than senior investigators, with 0.39 and 0.32 votes per applicant for early- and mid-career investigators, respectively, versus 0.20 votes per applicant for senior investigators.
- Applicants from the areas of Chemical Biology and Neuroscience received the most ideal candidate votes per applicant (0.41 and 0.39 votes per applicant, respectively), while applicants from Behavioral and Social Sciences and Physical and Integrative Systems received the fewest (0.14 and 0.04 votes per applicant, respectively). For all research areas combined, the number of ideal candidate votes per applicant was 0.27.

4.1.4 Relationship between Scores and Probability of Interview

Each year, once all scores and votes were submitted, the NDPA Oversight Committee co-chairs selected 22–25 applicants deemed to be the most pioneering to be invited to the NIH to present their ideas to a panel composed of external experts.⁴⁴ The selection of interviewees cannot be predicted solely from average overall scores and top 4 designations. In each year there were individuals not asked to interview who had higher scores and more top 4 designations than some of the interviewees (and awardees). Conversely, there were some individuals asked to interview with lower scores and only one top 4 designation (Exhibit 4.4). Program leadership acknowledged this discrepancy and indicated that they further reviewed the top scoring applications in detail with regard to existing funding, other potential funding (e.g., interviews were not given to candidates who received Howard Hughes Medical Institute fellowships while in consideration for the NDPA), as well as other factors related to increasing both demographic and scientific diversity in the interview round.

⁴⁴ The number of panelists ranged from 8 in FY 2004 to 14 in FY 2008.

Exhibit 4.4.
Likelihood of Receiving Interview Based on Combination of Average Overall Score and Number of “Top 4” Votes



1 Top 4 Vote			2 Top 4 Votes			3 Top 4 Votes		
Average Overall Score	Total Number of Applicants	Number Invited to Interview	Average Overall Score	Total Number of Applicants	Number Invited to Interview	Average Overall Score	Total Number of Applicants	Number Invited to Interview
3.3	79	1	3.3	10	0	3.3	0	0
3.7	87	0	3.7	16	1	3.7	0	0
4.0	105	5	4.0	47	4	4.0	3	1
4.3	42	3	4.3	61	17	4.3	9	4
4.7	6	0	4.7	36	22	4.7	15	10
5.0	1	0	5.0	13	12	5.0	17	14

Note: “Likelihood” is calculated as the percentage of applicants invited to interview based on top 4 and overall score combinations. Data from FY 2004 is excluded because of the different scoring scale used (5-point scale vs. 7-point scale used in later years). Only 94 out of 95 interviewees from FY 2005 through FY 2008 are included in this analysis because one interviewee (an awardee) had two top 4 votes and an average overall score of 2.5 due to a scoring error by an external evaluator.

Source: STPI Analysis of FY 2005–FY 2008 NDPA External Evaluator Scoring Trends.

In general, the top 4 vote is a better indicator for an interview invitation than good overall scores (Appendix I, Exhibits I.11 and I.12).⁴⁵ However, in FY 2008, the ideal candidate vote was a better indicator of receiving an interview than the top 4 vote (Appendix I, Exhibits I.12 and I.13).

4.1.5 Consistency of Review

The NIH designed the NDPA selection criteria to be broad in order to allow flexibility for interpretation by each evaluator. It is not surprising, then, that there was a high degree of variability in scoring of applications (as discussed in Section 4.1.1). As will be elaborated on in Section 5.2.2, liaisons and evaluators used diverse approaches in operationalizing the review criteria.

Comments given by evaluators also portray the broad diversity in scoring. For example, one applicant was given overall scores of 5 and 1, and received the following two comments, respectively:

- “This is the most original proposal I saw, and it is by a PI who has a history of constant innovation. Though the idea seems very novel to me, [he/she] is in an excellent position to make great progress.”
- “While [his/her] earlier work appears very innovative, this project cannot accomplish what is proposed.”

Another applicant with overall scores of 5, 5, and 2 received the following comments:

- “Exciting proposal and very novel. This goes against current dogma for cancer treatment and if it works, it could be a major advance.”
- “This is very much high risk science, but with a potential for very high gain. It is unlikely to be funded through other mechanisms. [His/her] letters of recommendation are exceptionally strong, and clearly indicate that this is an ideal proposal for a Pioneer award.”
- “An old story that in this case may represent a unique animal model with little generalizability. Not really where [this research field] is likely to go.”

In FY 2007 and FY 2008 there were 146 and 169 applicants, respectively, who received at least one overall score of 5 and were not invited to interview. Conversely, in FY 2005, an interviewee received one overall score of 2,⁴⁶ and in FY 2007, an interviewee received one overall score of 1.

4.2 Scoring of Interviews

The interview phase of NDPA distinguishes it from more traditional NIH programs and has remained largely unchanged over the years. Since FY 2004, a total of 117 applicants have been invited to the NIH to present their ideas to the external expert review panel. Of these 117 applicants, 63 (54%) individuals went on to win NDPA awards. In the Interview Phase (Phase 4 in FY 2004 and FY 2005, Phase 3 in FY 2006, and Phase 2 in FY 2007 and FY 2008), panelists listened to 15-minute interviewee presentations and were given time to ask the interviewees questions.

⁴⁵ Likelihood of interview was calculated based on “good” score being an overall score of 6 or 7 for FY 2004, or 4 or 5 for FY 2005–FY 2008.

⁴⁶ In FY 2005, an interviewee and an awardee also received overall scores of 1, but these appear to be due to a scoring error by an external evaluator.

Then the interviewees were asked to leave the room while the panelists discussed each presentation. Panelists placed the interviewees into three “tiers” – top, middle, and bottom. Interviewees in the top tier were recommended by the panel for funding, those in the middle were suggested for funding if money was available, and those in the bottom tier were not recommended for funding.

There was little documentation of the final phase of the NDPA selection process, though it is known that the NIH Director and the Advisory Committee to the Director (ACD), with input from NDPA leadership, made final decisions on the award winners in all years. The likelihood of receiving an award was not entirely based on the tiering decisions made by the interview panelists. As discussed in Section 4.1.4, program leadership also considered more subjective factors (i.e., existing funding, other potential funding sources, etc.) in the final phases of the selection process. As highlighted in Appendix I, Exhibit I.14, across all years, awards were given to 36 of 42 (86%) interviewees in the top tier, 24 of the 34 (71%) middle-tier interviewees, and three of the 41 (7%) bottom-tier interviewees. The selection of the awardees was more likely to follow the tiered structure in later years; in FY 2007 and FY 2008, all top-tier and no bottom-tier interviewees received an award.

In FY 2004, all funding for NDPA awards was provided through the NIH Roadmap Initiative. In FY 2005–FY 2008, additional funds were secured through NIH Institutes and Centers (ICs) other than the Office of the Director (OD) in order to increase the total number of awards given. Before final decisions were made, the co-chairs of the NDPA Oversight Committee discussed all candidates with IC Directors who expressed interest in supporting NDPA awardees. Perhaps because some of these ICs specified their particular research interests, three individuals from the bottom tier were selected as awardees. As illustrated in Exhibit 4.5, 16 of the 36 (44%) awardees from the top tier, 16 of the 24 (67%) awardees from the middle tier, and 3 of the 3 (100%) awardees from the bottom tier are co-funded by NIH ICs other than the OD. Of the awarded funds through FY 2008, the OD accounted for \$70.9 million (82.3%), while 18 other ICs contributed the \$15.3 million to varying degrees (Appendix I, Exhibit I.15).

Exhibit 4.5.
NDPA Interviewees and Awardees by Interview Tiers

Tier	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	Total
Top						
Middle						
Bottom						
Total						

Legend: Blue = Non-Funded Interviewees, Red = Solely OD-Funded Awardees, Green = IC Co-funded Awardees
Source: STPI Analysis of NDPA internal files and IMPAC II funding data.

5. Perceptions about the Program

This chapter summarizes the key perceptions regarding the NDPA program, drawing on data collected from surveys of candidates (Appendix D) and interviews (Appendix E) with NDPA stakeholders (including external evaluators, program leadership, and members of, and consultants to, the HRWG).⁴⁷

While the surveying of perceptions is common in many program evaluations, it is especially important in a program like the NDPA for two reasons. First, because the NDPA program was formed partly in response to the scientific community's strong belief that the traditional NIH grant mechanisms (and particularly their review processes) had become overly conservative, the implicit goal of the NDPA is to be perceived as tolerant of innovative, high-risk proposals. Second, unlike traditional NIH grant mechanisms, the NDPA allows for extensive flexibility in external evaluator interpretation of the selection criteria, without requiring documentation of how scoring decisions were made. Thus, it is of interest to understand more clearly how the review criteria were operationalized.

The following sections discuss perceptions regarding two main topics: (1) the NDPA selection process (perceptions of application materials, criteria, scoring, the interview stage, and feedback and transparency); and (2) the success of the NDPA program (perceptions of its ability to attract potentially pioneering candidates and applications, success of the selection process, distinctiveness as a funding mechanism, and effect on NIH culture). Corresponding data tables are located in Appendices G and J.⁴⁸

5.1 Application

The NDPA application is short compared to more traditional NIH programs, requiring a three- to five-page essay in which applicants need not include detailed project aims or discussion of preliminary data. Instead, applicants are asked to address their innovative vision for, and the significance of, the scientific problem to be addressed, as well as their qualifications for undertaking pioneering research. Applicants were also asked to have three letters of recommendation from peers submitted on their behalf, an unusual requirement for NIH grants.⁴⁹

5.1.1 Length

Over all years, the majority (73%) of those who responded to the candidate survey completely or somewhat agreed that they were given adequate opportunity to display their qualifications in the application (ranging from 66% in FY 2005 to 78% in FY 2008) (Appendix G, Exhibit G.12). Surveyed candidates from FY 2006 to FY 2008 were asked to rate the importance of each of the application materials on a scale from 1 to 6, with 1 being least important and 6 being most important. Across

⁴⁷ Total survey response rate for FY 2004 to FY 2008 was 61%. More details, including annual breakdowns of survey response rates, are given in Appendix G, Exhibit G.1. Survey questions are given in Appendix D.

⁴⁸ No individual question in the surveys and interviews was mandatory, and thus some individuals did not respond to certain questions. In this chapter, all percentages reported for each question were calculated using the actual number of respondents to the question as the denominator. The complete values, including non-respondents, are given in Appendices G and J. Responses from external evaluators as well as panelists (external evaluators who participated in the candidate interview phase) are included in the interview data in Appendix J.

⁴⁹ Detailed application requirements are shown in Chapter 2, Exhibit 2.6.

all years, the three- to five-page essay received the highest average importance rating, 5.4 out of 6 (Appendix G, Exhibit G.17). One candidate commented that the “short application process was wonderful as it makes me think carefully about what ideas I would want to convey effectively to the readers.”

The majority (73%) of the evaluators interviewed expressed satisfaction with the application materials, and some commented on the utility of certain features (Appendix I, Exhibit I.5). One evaluator commented that “the application format was appropriate in that it kept things short and it helped bring out the vision that the investigator had rather than the experimental detail which in this kind of case isn’t very useful.” Another evaluator applauded the decision to eliminate preliminary data from the application, stating that NIH was “emphasizing something that hasn’t been emphasized in the past, that great things can come from great ideas, you don’t need to have preliminary data to try to answer a great question. I’m hoping that will spill over to the rest of NIH.”

5.1.2 Letters of Recommendation

Out of all the application materials,⁵⁰ surveyed candidates gave letters of reference the second lowest importance rating (4.0 out of 6) (Appendix G, Exhibit G.17). A few surveyed candidates (6%) cited letters of reference as a reason for not reapplying in future years, commenting that they did not want to trouble their colleagues/senior investigators to write them (Appendix G, Exhibit G.7).

In interviews, external evaluators expressed mixed opinions on the utility of the letters in the review process. In FY 2007, 2 of 22 evaluators interviewed thought that the letters were the most important component, and in FY 2008, 8 of 42 (19%) external evaluators thought that the letters were the most important component (Appendix J, Exhibit J.5). One evaluator who had participated in multiple years summarized his views as follows: “The [application] materials were all relevant except for the letters of reference...these were really useless. Basically people had their buddies write them glowing letters – I didn’t end up giving much weight to these recommendations. At this stage in an investigator’s career, they shouldn’t need letters of reference – they should be proven based on their ideas, past performance, and future potential.” Another evaluator indicated that the letters were not conducive to picking pioneers, stating that the “people who are the most creative are going to tick off the scientific community and will not be able to get the best recommendations.”

On the other hand, some evaluators who thought these letters were important would have liked more standardization. For example, one evaluator commented that “the letters of reference became very important at the interview phase – it would have been nice to have had a bit more standardization in the types of information provided.”

5.2 Criteria

In FY 2004, the review criteria focused on the merits of the individual, emphasizing (1) innovation/creativity; (2) intrinsic motivation/enthusiasm/intellectual energy; and (3) potential

⁵⁰ The perceived order of importance (from most important to least important) of application materials, based on importance ratings given by surveyed candidates from FY 2006 to FY 2008 on a 6-point scale, is as follows: 3–5 page essay, biographical sketch, most significant accomplishment, 300-word abstract, letters of reference, and current support.

for or actual scientific leadership/evidence of, or potential for, effective communication/educator skills. Beginning in FY 2005, the criteria were modified and stated as: (1) the scientific problem to be addressed, (2) the investigator, and (3) the suitability for the NDPA mechanism.

In surveys, the majority of interviewees (84%) and awardees (94%), and nearly three-quarters of candidates (73%) completely or somewhat agreed that the criteria were adequate for selecting scientists of exceptional creativity who take innovative approaches (Appendix G, Exhibit G.11).⁵¹

In all, the majority of the external evaluators who were interviewed (91%) believed that the criteria were generally adequate to identify a pioneer (Appendix J, Exhibit J.2).

5.2.1 Perceptions Regarding the Modifications to Review Criteria

Program leadership and consultants to the HRWG expressed mixed views regarding the shift in review criteria from purely “person-based” in FY 2004 to a combination of person- and project-based in subsequent years. Some consider the shift a natural evolution of the program, stating that it is difficult to evaluate a person without the context of a project, or that the program always aimed to fund a combination of the person and the project. Others, however, perceived a clear shift and indicated that emphasizing the project in the review criteria leads to a more conservative outlook in the review process. Some consultants to the HRWG felt that this shift was a violation of the original intent of the NDPA program design.

5.2.2 Operationalization of Review Criteria

In each of the 5 years, all external evaluators and liaisons participated in a 15-minute conference call to learn about program goals and review criteria. Of the FY 2005–FY 2008 external evaluators who were interviewed, more than three-quarters (79%) believed that the evaluator training was adequate (Appendix J, Exhibit J.14).

In interviews, external evaluators who participated in FY 2004 expressed general agreement about the scientific criteria and their operationalization; however, they viewed the leadership criterion as the least relevant and their lowest priority.⁵² One external evaluator commented that, “There are lots of good scientists that are terrible leaders,” while another questioned, “How do you evaluate leadership on paper?” The leadership criterion was subsequently eliminated in FY 2005.⁵³

Evaluators in FY 2005–FY 2008 were divided in their methods for deciding whether or not an application was competitive. Specifically, some evaluators looked primarily for a creative, pioneering individual and others looked for an innovative project. When asked how they weighed the criteria, some evaluators (25%) responded that the scientific problem was the most important factor to consider, others focused on the characteristics of the individual investigator (33%), a few thought the suitability criterion was most important (4%), while others weighed all of the criteria equally (31%) (Appendix J, Exhibit J.1). Furthermore, when probed, several evaluators believed that when attempting to identify high risk, or highly innovative, research, their decision was instinctual and that they simply knew it when they saw it.

⁵¹ Categories “Candidates,” “Interviewees,” and “Awardees,” as presented in this chapter, are mutually exclusive.

⁵² FY 2004–2006 NIH Director’s Pioneer Award Process Evaluation – Comprehensive Report, Science and Technology Policy Institute, January 2008.

⁵³ The FY 2004 process evaluation was not completed before NIH posted the RFA for FY 2005. The NDPA leadership presumably made the change based on feedback from the evaluators.

5.2.3 Existing Grant Support/Career Stage Eligibility and 51% Time Requirement

Although one of the NDPA selection criteria focused on evidence of investigator qualifications, the program emphasized that early-stage investigators were eligible. As one member of NDPA program staff stated it, “We’re not looking at the raw quantity of past innovation, we’re looking at the innovation density of the applicants – i.e., what have they done given the amount of time they’ve been researchers?” NDPA leadership was also looking to bring new researchers into the NIH fold, and stated that existing grant support would not be considered beyond assessing whether the applicant would be able to comply with the 51% effort requirement. However, in interviews, the majority (66%) of external evaluators in FY 2005–FY 2008 reported giving at least some consideration to existing grant support (Appendix J, Exhibit J.3).

Evaluators who were interviewed also expressed ambivalence about the requirement that awardees commit 51% of their time to the NDPA-funded project. While many evaluators considered the 51% factor, they suggested that this was the least important criterion in their review. Several evaluators indicated their belief that most creative individuals do not have 51% free time to devote to any given project, and in fact those who did have the time may not be the best candidates to receive the award. Despite flexibility in evaluator consideration of existing grant support and 51% time requirement, NDPA program staff used these factors to further screen interviewees. In some cases, candidates were excluded as late as the final award phase because NDPA staff perceived them to have existing support that would preclude them from being able to spend the needed time on NDPA. For example, if a candidate accepted a Howard Hughes Medical Institute fellowship while in consideration for the NDPA, they were administratively excluded from the competition.⁵⁴

5.3 Scores

As mentioned above, external evaluators were asked to review the NDPA applications and score them (on a 7-point scale in FY 2004 and a 5-point scale in subsequent years) on each of the three review criteria as well as give an overall score. Evaluators were also asked to designate exactly four proposals with a top 4 vote, and, in FY 2008 only, mark any number of proposals with an ideal candidate vote.

⁵⁴ FY 2004–2006 NIH Director’s Pioneer Award Process Evaluation – Comprehensive Report, Science and Technology Policy Institute, January 2008.

5.3.1 Scoring System

The majority (78%) of external evaluators in FY 2005 to FY 2008 reported finding the 5-point scale and top 4 vote system adequate (Appendix J, Exhibit J.12). In FY 2008, the NIH also added the option of designating any number of ideal candidates to the NDPA scoring system. Of the external evaluators interviewed, 44% reported using this designation, although some evaluators interviewed (33%) reported that they did not understand or feel comfortable using the designation (Appendix J, Exhibit J.13).⁵⁵ One evaluator stated, “The whole concept of an ideal candidate escapes me. Is it related to where they are working? Whether they’re a minority?

“I read the grants as if I were reading an article from *Scientific American*. Was I interested in the problem? Was it significant to me... as an educated reader versus an expert?”

Evaluator Comment

I understand that you want to support young scientists, but you don’t want to bias against a senior scientist with brilliant ideas. I don’t think it has any meaning.”

5.3.2 Applications Outside Evaluator Research Areas

At the time of its inception, the NDPA program was unique in its review process in that two of the three evaluators per application were within the same research area as the applicant, while one was not. According to program leadership, the rationale behind this arrangement was that a truly pioneering proposal should be evident even to those who are not experts in the applicant’s area.

Evaluators who were interviewed expressed divided views regarding the effectiveness of having one evaluator outside each candidate’s research area. Over all years, 45% of the evaluators interviewed had no problems with reviewing applications outside their research area, ranging from 40% in FY 2005 to 54% in FY 2006 (Appendix J, Exhibit J.4).

One proponent of the process commented that while s/he thought reading applications outside his/her research area was the hardest part of the review process, s/he understood “why that was done and thought it was brilliant.” This evaluator also commented, “I read the grants as if I were reading an article from *Scientific American*. Was I interested in the problem? Was it significant to me...as an educated reader versus an expert?” Another evaluator stated that the process allowed him/her to pick the most logical and thoughtful proposals without being impeded by the science. This evaluator said, “I think that without knowing the field, if you can follow the logic and you can see clarity in that, the innovation comes through. Innovation without clarity isn’t going to succeed so I think that’s an important part of the process.”

On the other hand, some external evaluators (12%) from outside candidates’ research areas commented in interviews that they were unable to comfortably review the science. As one evaluator said,

Science has become so complicated that unless you work in the very specialized area of the proposal, you won’t know for sure that [the science] is solid. For example, I could be a breast cancer researcher, but if you sent me something on prostate cancer, I would still not be sure if that’s innovative. What you need is someone who’s studied prostate cancer 20 years...

⁵⁵ Since this is a new designation and 36 of the 81 evaluators answered this question, the percentage may or may not be representative of the evaluators who were not interviewed.

Otherwise I can be fooled. [A proposal] can look and smell pioneering, but I will not know that there is no substance if I'm not an expert in that field.

Many external evaluators gave specific suggestions for future years:

- “The process at the early rounds would be better served by having scientific experts participate in the review. The person who lives in the R01 field should say ‘this is great science,’ and then you get someone like me who is good at picking out what’s pioneering say ‘yes, this is pioneering.’ You need to have both of those opinions.”
- “There should be a box to check off ‘I am not an expert in this but here is my educated opinion about what I just read.’ Then the review committee can figure out if they want to request extra reviews from people that are more qualified.”

Many evaluators commented that they should be asked to broadly define primary and secondary areas of expertise or be able to exclude certain fields.

5.4 Interview Round

5.4.1 Views of Panelists

Panelists who were interviewed were generally happy and enthusiastic about the interview round of the NDPA review.⁵⁶ They expressed that the process is exciting and highly effective, and that in general, interviewees and awardees were qualified candidates. One panelist who was involved in multiple years of the process commented that s/he was pleased that the panel “was populated by nurturers...There are a lot of people in science with huge egos, which sometimes helps cut through problems in some study sections, but to have them on a panel like this is disruptive. I was impressed by selection of people on the panel.”

Some panelists, however, have expressed concern about the caliber of the individuals on the panel. One panelist stated that “there were very few pioneers on this committee. If you’re not a pioneer, you can’t identify things that are pioneering.” Another said that “there was some lack of expertise [in the panel]...Sometimes people may have thought that a project was more creative than it was because they didn’t understand the science. Sometimes they thought it was less creative because they didn’t understand the significance of the proposal.”

Of the panelists interviewed, all indicated that they had enough time and materials to prepare for the panel session. The panelists stated that the system to rank interviewees was efficient and successful. All believed that the interview duration (of one hour) was appropriate, that it was enough time to get a feel for the candidates, to ask questions and to reach a consensus. Panelists enjoyed the interview process, and some gave specific suggestions for future years.

For example, panelists requested that briefing books be provided in future years and that these books should have extensive material on each of the interviewees.

Though the interviewees were all given the same information before the interview, panelists indicated that there was a tremendous amount of heterogeneity in the presentations. One panelist recommended that in the future there should be some sort of template for the presentation so that the panelists get the same level of detail from each individual.

⁵⁶ Panelists are external evaluators who participate in the interview phase of the NDPA selection process.

5.4.2 Views of Candidates

In general, applicants have positive views on the interview component of the process. One awardee who completed the candidate survey commented that the interview was “key for me because it allowed me to present my ideas and to answer questions. I just wish that other study sections of NIH could adopt some of these techniques to select grant applications for funding.”

The main point of contention among finalists was whether they had a fair chance to present their ideas and whether the panel members adequately understood their proposed ideas (Appendix G, Exhibit G.15). The opinions of interviewees who were not funded contrast sharply with those who were funded. Surveyed awardees almost uniformly reported satisfaction with the panel’s comprehension of the proposed research and the clarity of the interview instructions. Non-awardees who were surveyed had mixed opinions on the clarity of the invitation instructions, and indicated that the panelists only somewhat understood their ideas or did not understand them at all. One interviewee commented that, “with outstanding researchers in some areas and poor representation in others, the playing field for some researchers in the interview process was not at all level.”

In surveys, interviewees as well as awardees expressed divided opinions over the length of the interview, as more than half (58%) of unfunded interviewees, and almost half (48%) of awardees surveyed across all years believed that the interview duration was too short (Appendix G, Exhibit G.14).

5.4.3 Transparency in Final Selection of Awardees

As mentioned previously, although it is known that the NDPA awardees are ultimately chosen by the NIH Director and the Advisory Committee to the Director, with input from the NDPA leadership, little is understood about the process by which the final funding decisions are made. In FY 2005–FY 2008, additional funds were secured through other NIH Institutes and Centers (ICs) to increase the total number of awards given. Before final decisions were made, the co-chairs of the NDPA Oversight Committee discussed all candidates with IC Directors who expressed interest in supporting NDPA awardees. Although ICs co-funded many top-tier awardees, some of the ICs chose to support research of interest to their missions despite panelist recommendations, resulting in three individuals from the bottom tier being awarded in FY 2005 and FY 2006 (see Chapter 4, Section 4.2.1).

The panelists interviewed did not have a problem with IC contributions of additional funds to NDPA; however, they were unhappy about the possibility that their recommendations were not being directly followed, and that individuals might be funded that were not, in the minds of the panelists, deserving of the award. Some FY 2005–FY 2008 panelists interviewed expressed disappointment that some people whom they strongly recommended should not be funded were pulled in by ICs. One panelist stated that “this defeats the purpose of the award.” When an interviewee was funded despite recommendations otherwise, one panelist was so discouraged by the process that s/he chose not to participate in future years of NDPA review. Other panelists suggested that if the ICs are designating funds for awardees that were not highly recommended by the panel, perhaps these awardees should receive a designation other than “pioneer.” Additionally, as stated by one panelist, “I also think that [the IC-funded “Pioneers”] should go through another round of review – perhaps by the NIH Advisory Committee to the Director – to determine if the science really is innovative and deserving of the IC’s special support. This would be really transparent – and I think the extra layer of scrutiny would be really valuable.”

5.5 Feedback and Transparency

Over the years, both NDPA candidates and evaluators have consistently expressed concerns that NDPA criteria are applied inconsistently and the program might be biased.⁵⁷ The surveys and interviews from FY 2004 through FY 2008 revealed that some candidates suspect evaluators of favoring certain characteristics over others, and that the process was “controlled” in some way (Appendix G, Exhibits G.7 and G.16).

5.5.1 Candidates’ Views

The primary complaint about the program, evident from coded answers to open-ended survey questions, was that without feedback given to the candidates, they had no guidance on what was lacking in their application, and how to improve in future years. Over all years, this complaint was expressed by 45% of survey respondents who made comments regarding program improvement,⁵⁸ ranging from 33% in FY 2005 to 53% in FY 2006 (Appendix G, Exhibit G.16). In addition, 36% of unsuccessful candidates cite lack of feedback as a reason for not reapplying in future years (ranging from 28% in FY 2005 to 41% in FY 2006; Appendix G, Exhibit G.7). As explained by one respondent, “in the absence of feedback, it is impossible (or an ineffective use of my efforts) to know how to improve upon my prior application. As such, I can only assume that I and this project were not of interest to the program.” Another said:

I was discouraged by the complete lack of feedback for the process. Some evaluative information, even if it had been cursory, would have encouraged me to try again. Was the idea too ambitious? Was the idea uninteresting to the evaluators? Did they feel that the system or techniques I was proposing were inappropriate? Without this feedback, I felt it was unlikely that I would succeed in creating a better proposal. I was also hesitant to trouble my colleagues to write letters of recommendation on my behalf for an application that was unlikely to be successful.

Not all candidates requested feedback, however. One candidate who was also initially a consultant to the HRWG commented that it is hard to provide feedback in a program looking to foster innovation and creativity and that this aspect of the program did not bother him.

Survey responses also indicated that there was some perception of bias in the process. In all years, 14% of surveyed candidates who made comments regarding program improvements have perceived some sort of bias in the process (Appendix G, Exhibit G.16), and 35% of unsuccessful candidates who do not plan to reapply cite bias as the primary reason for not reapplying in future years (Appendix G, Exhibit G.7).

5.5.2 External Evaluators Views

Several evaluators in all years (23% of evaluators interviewed between FY 2005 and FY 2008⁵⁹) also expressed concerns on the lack of feedback from the NIH, which they claim would have allowed them to assess inter-evaluator reliability and to understand why candidates they scored highly were not awarded. One evaluator said, “I think that the feedback we got after the process was very poor. I never really learned whether my scores were in the right range...I wish we had more information about the processes afterwards – calibration information, for example. Were

⁵⁷ Based on candidate surveys and evaluator interviews.

⁵⁸ In response to an open-ended question regarding how to improve the NDPA program in future years.

⁵⁹ Tabulation based on comments to question about providing feedback to NIH.

my scores comparable to others?” Another evaluator summarized the frustration expressed by several evaluators by saying:

There were some [candidates] that I rated that I thought were really outstanding but none actually got funded. Then the question is, am I using the right judgment and seeing things through the same lens as everyone else? And how did the proposals that I thought were outstanding get rated by other people and how did they do in the process as a whole. Without feedback, you don't know whether you're doing a good job or not... If you allow us to compare scores and comments, you'll have a better view in the future of whether the criteria are good or not.

5.6 Ability to Attract Potentially Pioneering Candidates and Applications

The first step in *awarding* pioneering investigators and projects is successfully *attracting* a diverse pool of potentially pioneering researchers and ideas. The NDPA program was advertised in a variety of media, but most surveyed candidates (64%) reported first hearing about the program through the NDPA website, departmental flyers or announcements, and/or word of mouth (Appendix G, Exhibit G.9). External evaluators, program management, and consultants to the HRWG were asked about their perception of the success or failure of candidate recruitment for the program. Their responses are summarized in the following sections.

5.6.1 Views of Evaluators

Evaluators interviewed in all years suggested that the initial pool of candidates attracted to the program was highly variable – some applications were different from traditional submissions to NIH grant programs, and others should have been submitted for an R01 or other type of award (Appendix J, Exhibits J.7 and J.8). Evaluators in FY 2005 and FY 2006 were specifically queried about the application caliber compared to that of traditional study sections, and 41% of the evaluators interviewed indicated that the majority of applications were similar to those submitted to more traditional NIH study sections (Appendix J, Exhibit J.8). Panelists who were interviewed noted that the interviewees, on the whole, were of high quality; however, there were several panelists in every year who believed that a fraction of the interviewees should not have been invited to interview.

Below are several evaluator interview comments reflecting on the NDPA applications:

- “Of a typical 20 that you see, there’s usually one that is really good and a couple others that are pretty good and the rest are usually miserable. There is usually a large gap between the really good and the really bad. People are so scared to be innovative in their writing that even the best proposals are pretty conservative.”
- “The applications were well thought through in general. Some marginal but important (not trivial) increments in science – on clear paths – very logical. A bunch of applications go off in tangential direction that you go ‘holy smokes’ – unpredictability.... The unanticipated things in science often end up being the most important. That’s what I think this program is trying to screen for: the tangential thinkers.... They fall into one of three bins and the percents in

“The program will only succeed in achieving transformative research if it convinces transformative thinkers to apply. If the NIH doesn’t set the standard and stick to it, those people will go away and never come back again.”

Evaluator Comment

each category hasn't changed much [over time]. The first bin is self-nominations and people that aren't substantive and not worth the evaluators time.... The next bins are about the same. These are logical steps in the program. They may be a little expanded but they aren't ground breaking, not paradigm shifting. The last bin are the best [applications]. The signal to noise ratio should be going up over time, but that's been stable since the second year, certainly by the third year."

- "The first year it was stunning, the second year was average. [It] wasn't so much the applicants but the nature of the ideas being evaluated. Literally the first year, it was, in some ways, it was fascinating to have the opportunity to learn about these topics and engage with people who were creative smart innovative thinkers. I had much less of that sense [in FY 2008]. I think it was an off year and not inherent in the program.... They weren't as risky and it seemed to me a much less departure from current status quo and established paradigms in terms of how people have approached problems."
- "For the most part, the interviewees did have exciting ideas...though I would say that 10–15% of them should not have made it to the interview round. I was really disappointed to see that there were a few people doing really boring, basic science in an area that has been exhausted – and despite my critique, went on to win an award. I was just left questioning what had happened in early rounds of review – I was concerned that some people made it through that shouldn't have...and there likely were other great candidates that were eliminated."

"I thought there were more pioneers than were funded, but I do think the ones that were funded were pioneers."

Evaluator Comment

5.6.2 Views of Program Leadership and Expert Participants

One of the consultants to the HRWG commented that there are two commonly held images of a pioneer. The first is someone who continually attempts to answer truly big questions, uses risky approaches, fails often, and is generally outside of the normal paradigm of science. The second is one who is the cream of the crop of his/her field. This person has gone to the best institutions, worked with the best mentors, received large amounts of research support, and has conducted top-quality research without necessarily having failed or taken risks. Essentially, this person is at the apex of the scientific hierarchy. The research proposed by this person is top quality, and he/she may be first to venture into a new type of research problem, but is likely just the "first to cross the finish line." In interviews with program leaders and observers, there was a general consensus that the program is attracting pioneers of the second type as opposed to the first type.

Some experts involved in the design of the program were concerned that the program may not be doing enough to attract non-traditional researchers. He commented that "the NIH hasn't gone outside the normal avenues to broadcast the program and hasn't looked for minds outside biomedical research." He noted, for example, that the Office of Naval Research (ONR), for example, has program staff dedicated to going to departments around the country to pull in new researchers.

5.7 Success of the Selection Process

The NDPA program stakeholders who were interviewed or surveyed expressed mixed views on whether the program succeeded in selecting pioneering individuals and ideas.

5.7.1 Views of External Evaluators

External evaluators who were interviewed were divided regarding whether the program was successful in selecting pioneers. About one-third of evaluators interviewed in FY 2005–FY 2008 believed that the program successfully awarded funds to pioneers. Thirty-eight percent believed that it is too early to make that judgment, and 9% believed that the program was unsuccessful (Appendix J, Exhibit J.9). Panelists commented that in general, they were happy with the ultimate selection of awardees; however, a few panelists believed that there were candidates who should not have received an award. Several comments are highlighted below:

- “To me, ‘pioneer’ means someone that is doing something that has never been done before. It seems a little odd to me that a program is trying to ‘pick the un-pickable.’ I do think that some prejudice enters the selection process because each evaluator has his/her own taste and are probably looking for slightly different things.”
- “I feel strongly that the caliber of the awardees over the past few years has declined. I’m not sure if the people that won in 2007 would have been able to make it through to the finals in Year 1.”
- “I think that the most brilliant people that are doing some of the best scientific work aren’t going to be remembered after 20 years...science isn’t about fame, it’s about creeping. How many of them are going to do research that lives on a century after they are gone? None of them. How many of them are going to do something that improves subsets of biology? All of them.”
- “You’d have to define what a pioneer is. I have a different problem with that. I think they are imaginative people who are doing outside of the box, not doing mainstream traditional research that the community might expect them to do and be eligible for funding and its opportunity to do things that they wouldn’t ordinarily be able to do something under traditional funding...but there are no absolutes. They might be able to be funded. It’s a Catch 22, can’t know if they are pioneers if this is their first grant and if they are post docs. You have to judge them on the potential of the imagination they bring forth through the project. “
- “I think it is too early to tell [if the awardees are pioneers]. I would say that most of them are bright young individuals with bright young futures. I think they were each dedicated and its going to be a lifelong endeavor and this is a tremendous boost and for students and post docs it could only help.”
- “It seems we are attracting good scientists. I think the awardees are very pioneering scientists. I was jealous.”
- “I think that if you give out 25 pioneer awards, you’ll be very happy if 3–5 of them are genuinely pioneering. That’ll be an exceptional return on your investment. [For the NDPA,] the average of 2–3 a year would be my guess.”

5.7.2 Views of Program Leadership and Expert Participants

The majority of members and consultants to the HRWG who were interviewed commented that the program was being too conservative in the ultimate selection of awardees. As stated by one respondent,

My impression is that [the selection process has] gotten too conservative. I'm basing this on who has won the award and what their projects were about.... The world is spinning the same way. The impact has been good but not major. I have yet to see paradigm shifting work. I would have expected inklings of that after 5 years. Five years is a long time in terms of how fast things are moving lately.

Another consultant to the HRWG noted that all the awardees to date have been deserving of the award, yet felt that the size of the program was doing a disservice to promoting innovation. "The number of awards could be tripled and still all selected would still be deserving of the award." This individual also felt that the NDPA had not stayed true to the working group's vision of funding creative scientists with innovative ideas, but had moved towards a requirement of potentially "paradigm shifting" projects.

Many experts involved in the design of the program indicated that it was too early to tell the impact of the program but expressed opinions on the implementation of the program versus the way the program was envisioned. One member of the HRWG recommended that NDPA should have a prominent pioneer head the program and be its designated spokesperson. This person would bring distinction to the program and also be given the responsibility of attracting new researchers to NIH, stating that "I could envision NDPA staff giving talks or having a booth at a national mathematics conference, for example, to try to attract mathematicians to apply."

One member of program leadership suggested that a positive aspect of the NDPA has been its ability to fund more technology development than is traditionally funded by the NIH. He stated that development of new technologies has the potential for very high impact, as it has broad applications to numerous fields and can open up existing systems to a higher level of study. Such new technologies are cross-cutting and do not fall directly under the purview of any one IC (which mainly fund changes to existing technology systems, rather than the development of entirely new ones).

The majority of the members and consultants to the HRWG who were interviewed believe that the program was primarily funding excellent researchers rather than pioneers. One individual stated, for example, that the current program relies on the track records of the candidates and such a system is not conducive to funding real risk takers.


5.7.3 Views of Candidates

Some survey respondents (ranging from 10% in FY 2008 to 31% in FY 2005) reported that they believed the NDPA failed to fund innovators and the program outcomes did not reflect the goals of the program (Appendix G, Exhibit G.16).⁶⁰ Several survey respondents also commented that the program is funding conventional ideas and people and that instead of achieving its goal, the program is supporting the "old boys" network.

⁶⁰ It should be noted that candidates were not specifically asked about awardees, and those who left comments spontaneously did not receive any prompting about awardee caliber.

Below are some candidate survey comments regarding the success of the selection process:

- “The titles and descriptions of winners of the Pioneer Award appear to be much more within paradigm than outside.”
- “I have seen Pioneer Awards given to people who had some cool techniques, and proposed to apply it to science or medicine. That's fine, but in my view not *nearly* as fine as someone who has sound reason to challenge an important prevailing paradigm that is the basis for so much. The former has been done many times; but the latter has rarely been funded, and it is the latter that can get science moving once again.”



“Thinking about the proposal and writing it was a good exercise, even if it did not get funded. I would give out more of these awards to increase the chances of getting funded, which would encourage more people to apply and to think outside the normal boundaries of their project.”

Candidate Comment



5.8 NDPA as a Distinct Funding Mechanism

One of the key questions regarding the success of the NDPA mechanism is whether the program was necessary, or if a standard R01 mechanism could have been used to achieve the same goals. As discussed previously, it was not feasible within the constraints of this process evaluation to objectively answer this question. However, as the question was posed to participants in multiple ways, their perceptions regarding this topic are summarized below.

5.8.1 Views of Candidates

Candidates were asked about the likelihood of their proposed NDPA idea being funded by other sources. The majority of surveyed candidates (70%) believed that it was very unlikely or somewhat unlikely that their proposed NDPA projects would be supported by other funders (Appendix G, Exhibit G.4). Awardees were the most likely to believe that they would not be able to secure alternative funding for their proposal (83% of all awardees surveyed, FY 2004–FY 2008).

Below are some candidate survey comments relating to the necessity (or lack thereof) of the NDPA program:

- “An excellent innovation compared with the usually dreary R01 process – keep it up”
- “Innovation should not be a special category at the NIH, open to a few percent of applications. The NDPA represents an acknowledgment of deep failure at the NIH in my view. Why not have a mandate to identify, encourage, and fund transformative research in regular grants.”
- “My sense is that the NDPA is another 'beauty prize' type of award. Certainly, some of the winners were innovative scientists with interesting ideas, but not so different from many other investigators and ideas.”
- “This is a really fantastic new way of funding science. The program allows researchers to conduct innovative research with a freedom that was never possible before. The idea of funding innovative people and giving them great freedom is a very effective way of encouraging quantum advances in science and medicine.”

5.8.2 Views of External Evaluators

The majority of external evaluators interviewed indicated that the NDPA process itself was different from a traditional study section, and was conducive to allowing investigators to submit more innovative and creative applications without the supporting preliminary research (91%; Appendix J, Exhibits J.7 and J.8). Furthermore, 73% of evaluators interviewed in FY 2007 and FY 2008 believe that the program is adding value to the NIH portfolio (Exhibit 5.1). Several, however, commented that because of the ever-increasing conservatism at the NIH, soliciting and funding research that is more creative is difficult, and that NDPA may not be taking a big enough leap.

Exhibit 5.1.
Is the NDPA Program Adding Value to the NIH Portfolio?

Response	FY 2007	FY 2008
NDPA is adding substantial value to the NIH portfolio	13	21
NDPA is adding value to the NIH portfolio, but needs to expand for full impact to be realized	3	11
NDPA funds would be better spent on traditional grant programs	3	5
It is too early to tell if NDPA is adding value to the NIH portfolio	3	6
No response	0	1
Total	22	44

Source: STPI Analysis of FY 2007–2008 NDPA Evaluator interview responses.

Some evaluator interview comments relating to the necessity (or lack thereof) of the NDPA follow:

- “I’m not convinced [that the program is funding projects that would not have been funded by traditional mechanisms] at all. I think that these were at the top and worthwhile, but I’m not sure that they wouldn’t have been able to get funding through traditional sources... if they had chopped their idea into smaller pieces and gotten some preliminary data.”
- “Yes, I think [the NDPA process differed from traditional processes]. Basically, to get funded by conventional R01, they would have needed at least 3 more years of data.”
- “I think if you had the right panel members, then yes, [the NDPA process would allow you to choose applications that might not be funded under a traditional study section]. It’s set up to work; I just don’t think it was executed very well. They could change that by putting pioneers on the panel. And don’t try to do this number of women, this number of nurses, this number of whatever. Just try to find people that have a track record of pioneering that people think are pioneers and let them be the judge.”

- “I raise questions as to the process...something’s amiss. I guess my judgment could be way off in left field but if other people are complaining about lack of feedback, then they must be having the same concerns where they did the evaluations and picked the ones they thought were most important and they didn’t get funded. With the lack of flexibility in the scale, it was very hard to slice them that way. Just even numbers. More flexibility would have been helpful I think. I’m not sure why they didn’t do that because the normal NIH rating system allows you to use 2.2 and 2.3 and whatever. That’s just my take on it.”
- “The [NDPA] is a slightly different procedure than what we’re used to as NIH evaluators...for one thing the applications are fairly concise. We’re asked to evaluate under a different set of conditions than usual NIH grants and what I think is a good idea is that we were invited to review proposals that were somewhat fairly outside the field. That’s a good idea.”

5.9 Culture Change at the NIH: A Preview⁶¹

The NIH leadership and members of and consultants to the HRWG ventured to design a program to combat community perceptions that the NIH was too conservative in its research funding processes. Thus, the NDPA was envisioned to bring about an NIH culture change that would create an environment more receptive to “creative” and “innovative” people and ideas. Although there are diverging opinions as to the degree to which the NDPA program has succeeded in this goal, the NIH still holds the program to be the flagship of its High Risk Research Initiative, an exemplar of the goals driving the NIH Roadmap for Medical Research.

One indication of the NDPA’s influence on NIH culture may be the number of new programs aimed at funding innovative research that were established since the inception of the NDPA program.⁶² These new programs are:

1. New Innovator Award (NIA)
2. Exceptional, Unconventional Research Enabling Knowledge Acceleration (EUREKA)
3. Transformative-R01 (T-R01)
4. Outstanding New Environmental Scientists (ONES)
5. Biobehavioral Research Awards for Innovative New Scientists (BRAINS)
6. Avant-Garde
7. Department of Defense’s National Security Science and Engineering Faculty Fellowships (NSSEFF)
8. Juvenile Diabetes Research Foundation’s Scholar Award (JDRF)

The founders of five of the six programs within NIH were affiliated with NDPA, through co-chairing the program, serving on the NDPA Executive Advisory Committee (EAC), or having been involved with the HRWG. Program contacts from the two non-NIH programs examined stated that their programs were directly influenced by NDPA and that their program processes were designed to mirror that of the NDPA, to the extent possible given their own constraints.

The annual number of awards in each of these 8 programs is small, ranging from 3 awards in the 2008 Avant-Garde program to up to 55 in the 2009 NIA program, with NDPA in the middle of the

⁶¹ A further analysis of these programs, and other measures of culture change at the NIH, will be examined in the outcome evaluation of the NDPA program.

⁶² M.E. Hughes, “Mechanisms of Funding High-Risk, High-Reward Research in the Federal S&T Agencies,” presentation at the Atlanta Conference on Science and Innovation Policy, October, 2009.

ranking at 16 awards. The size of funding ranges from \$250,000 per year for JDRF to \$800,000 per year for the EUREKA program, with NDPA at \$500,000 per year. Approximately half of the programs require a time commitment of about 25 to 50 percent. The other half do not have a minimum time requirement, though expectations state that the Principal Investigators will “devote time commensurate to project needs.”⁶³

Half of the programs have application processes and review criteria that are similar to those of the NDPA, and the remaining half use a modified R01 approach. Half of the programs include an interview round as part of the selection process. Five programs provide feedback to the applicants: EUREKA, TR01, ONES, and BRAINS provide feedback to the highest scored applicants, and NSSEFF program staff provides feedback to those who are invited to submit full applications. As with the NDPA, the NIA and JDRF programs do not provide feedback to applicants.

⁶³ T-R01 program description. The descriptions for EUREKA, NSSEFF, and JRDF are similar.

6. Overall Assessment and Recommendations

The NIH Director's Pioneer Award program was designed to initiate a change from traditional peer-review grant programs at the NIH. The FY 2004 program notice states:

History suggests that leaps in knowledge frequently result from exceptional minds willing and able to explore ideas that were considered risky at their inception, especially in the absence of strong supportive data. Such individuals are more likely to take such risks when they are assured of adequate funds for a sufficient period of time, and with the freedom to set their own research agenda. The NIH Director's Pioneer Award (NDPA) program is being established to identify and fund investigators of exceptionally creative abilities and diligence, for a sufficient term (five years) to allow them to develop and test far-ranging ideas.⁶⁴

Although several changes were made to the program process as lessons were learned from previous years of implementation, the fundamental purpose and intent of the program did not change. The changes that were made were done primarily to clarify program goals, and to facilitate efficiency (as in the case of eliminating review stages to account for the declining number of applications). This chapter summarizes the key tenets of the program, highlights key comments by some applicants and external evaluators, and proposes recommendations to enhance the implementation of the program.

6.1 Defining "Pioneering"

The program notices and RFAs in the inaugural year of the NDPA program included no definition of the term "pioneering." In subsequent years of the program, "pioneering" was described as "highly innovative approaches that have the potential to produce unusually high impact." Beyond this description, NIH did not attempt to operationalize "pioneering," which allowed for a diversity of viewpoints in deciding which applications were, in fact, pioneering. Evaluators liked the flexibility provided them as they often used intuitive "know it when I see it" approaches to identify pioneering ideas.

Conversations with NIH officials revealed the belief in two types of pioneers: the "tinkerer in the garage," and the more traditional academic scientist who is doing standard, high-quality biomedical research, and who, as such, has most likely previously received NIH funding. While both types of pioneers were encouraged to apply for the NDPA, the program was intended to attract more of the first type. As David Armstrong, a member of HRWG commented, "[Ellie Ehrenfeld] and I dreamed of finding the nut tinkering away in a garage." The perception of several of the members of the HRWG who were interviewed as part of this evaluation was that most of the awardees fall into the second category of pioneer (and they openly admitted that it may not be possible for the NIH to attract the first kind of pioneer – that, in fact, this type of pioneer may not exist). Using prior NIH funding as a proxy for the second type of pioneers, approximately four-fifths of NDPA applicants had received NIH funding in the 5 years before applying to the NDPA.

6.2 Transparency and Accountability

As discussed previously, the NIH intentionally did not operationalize the definitions of concepts such as "pioneer," "exceptionally creative," and "highly innovative" to allow for diversity in

⁶⁴ Available at <http://www.grants2.nih.gov/grants/guide/notice-files/NOT-RM-04-007.html>.

applications and to capture the intuitive responses of the evaluators.⁶⁵ According to our interviews with external evaluators, there were no universally agreed-upon characteristics that the evaluators looked for in the applications. While this is in keeping with the original design of the program, instinctive decisions are often difficult to articulate and do not translate well into oral or written feedback or descriptions of how scoring decisions were made.

Over the years, some evaluators and candidates alike expressed concern about the program's lack of transparency, as was presented in Chapter 5. From the unfunded candidates' perspective, concerns centered on how to improve their applications without feedback, and on understanding how the NDPA awardees were more pioneering. From the evaluators' perspective, the concerns focused on how the final selections of interviewees and awardees were made and on why candidates who scored high did not always receive interview invitations or awards. Such concerns may be unavoidable given the very small percentage of NDPA applications that are selected for funding.

Historically, the NIH has provided summary statements to all applicants outlining the panel review in traditional grant processes. Thus, the requests for feedback from NDPA candidates may be due as much to the novelty of not receiving feedback in an NIH grant as to the perceived lack of transparency. Furthermore, it is not clear whether written feedback in a program like NDPA would be useful to candidates. As stated by one consultant to the HRWG, "What will they say? I'm sorry, you weren't or your idea wasn't 'pioneering' enough?" Additionally, after receiving external evaluator scores and comments, NDPA leadership uses not only the scores, but also considers additional factors to select a diverse portfolio of interviewees.

This procedure poses a challenge to program implementation: on the one hand, adding stringent criteria and increasing burdens on program staff and external evaluators for feedback may decrease program flexibility to fund pioneers and their projects. On the other hand, program flexibility and the lack of feedback may have led to some perceptions of conservatism and evaluator bias by a portion of the applicants and external evaluators (about 20% and 10%, respectively).

The concept of accountability extends to scoring of applications by external evaluators as well. As described above, the NDPA selection process allows flexibility in review, and thus relies on independent intuitive judgments on the part of the evaluators. However, this aspect of the program makes it difficult to assess the validity of evaluator reviews. Currently, scoring comments are optional, and evaluators do not need to justify their scores. Some candidates who responded to the survey suggested that the review criteria were not applied towards the stated goals of the pioneer awards, and that the evaluators should be "checked" in their review. Interviews with external evaluators found that they do indeed weigh the review criteria differently from one another.

6.3 Balancing Diversity and Scientific Merit

As a government agency, the NIH aims to foster diversity, both in terms of demographic characteristics and research areas of the candidates. Yet in a program like the NDPA, there is also the fundamental requisite to award the most innovative thinkers. The RFA includes language encouraging participation by members of underrepresented groups, and evaluator training specifically encourages evaluators to consider demographic factors. As discussed in Chapter 3,

⁶⁵ Based on a conversation with Jeremy Berg on June 8, 2009.

there are demographic differences between interviewees/awardees and the candidate pool in terms of career stage, degree, and race/ethnicity (though not in terms of gender). Moreover, some evaluators have stated that they take seniority and previous award history into account in judging applications.

6.3.1 Demographics

There was a persisting perception by some participants that the NDPA selection process is highly political, and that some awardees were likely selected to fill certain quotas. However, the demographic distribution of NDPA applicants and awardees is similar to that of the participants in the R01 grant program. In FY 2004, the selection of interviewees was based solely on scores, resulting in an interviewee pool that was not demographically or scientifically representative of the candidate pool. In later years, a greater effort was made by NDPA leadership to incorporate diversity into the selection of the interviewees.⁶⁶

6.3.2 Research Areas

A recurring concern expressed by participants is that the NDPA program fails to fund projects in the clinical and behavioral research areas. The Institutional Review Board (IRB) process may contribute to the perception that clinical research is a risk-averse field. The impact of this community perception on NDPA may be twofold: (1) NDPA proposals in clinical [and translational] and behavioral research may, inherently, not be as pioneering as basic science or technology proposals, and (2) evaluators may (consciously or subconsciously) be more conservative in their evaluations. One way to counter this perception might be for the NIH to provide examples in the RFA and external evaluator training to describe hypothetical high-risk clinical or behavioral research projects.

6.4 NIH Institutes and Centers Funding of Proposals

After the interview phase, panelists sort interviewees into three tiers (top, middle, and bottom). The NIH Director and Advisory Committee to the Director (ACD) then review the proposals in these three tiers. The final selection of awardees is made by the NIH Director based on recommendations by the ACD. The recommendations are based on a combination of the ranking system submitted by the panel and available funds from the Office of the Director and NIH Institutes and Centers (ICs). In 2005 and 2006, NIH funded most top-tier and middle-tier proposals, but also three bottom-tier proposals. In 2007 and 2008, NIH funded all top-tier proposals and the majority of middle-tier proposals, but no bottom-tier proposals.

Starting in 2005, ICs were able to co-fund proposals, resulting in 31 (57%) of the 54 awards from FY 2005 to FY 2008 being co-funded.

While IC contributions make it possible for NDPA to fund more investigators, there was a strong sentiment among participants, and in particular, panelists, that ICs should not be involved in the decisionmaking process. While only 3 of the 63 awardees have been from the bottom tier (2 in FY 2005 alone), external evaluators believed that this situation should not occur at all.

⁶⁶ FY 2004–2006 NIH Director’s Pioneer Award Process Evaluation – Comprehensive Report, Science and Technology Policy Institute, January 2008.

6.5 Number of Awards

Out of 3,520 NDPA applications between 2004 and 2008, the NIH has funded 63 awards, or about 2 percent. The low percentage of winners makes this a prestigious award, which is further enhanced by the program being part of the NIH Roadmap spearheaded by the NIH Director. The majority of applicants (85%) and external evaluators (over 90%) believe either that awards have been given to pioneers or that it is too early to tell.

Some participants have indicated that the small chance of success may serve as a disincentive for participation. Others believe the small number adds to the prestige of the program. For an award to be prestigious, it must be given to only a select few, as is evident from other high-prestige awards — a maximum of three Nobel Prizes can be awarded per category and 20–25 people receive McArthur Fellowships per year. The NDPA program was designed to be prestigious, and was directly linked to the NIH Director to increase its profile. Increasing the number of awards may reduce the prestige of the program. Furthermore, given that some of the participants have already voiced concern about the pioneering nature of the awardees and their projects, increasing the number of awards may run the risk of decreasing the quality of the awardees, thus decreasing the prestige of the award.

6.6 Recommendations

Over the 5 years STPI has conducted annual process evaluations of the NDPA selection process, the NIH has succeeded in maintaining the spirit and goals of the program with minor operational changes. Keeping in the spirit of improving program operations, STPI recommends the following:

- **Maintain the flexibility in review criteria and guidelines.** Such flexibility will ensure the program continues to attract diverse applications and allows external evaluators and NIH leadership to interpret the criteria based on their experiences and intuition. This flexibility has worked to bring well-known researchers into the group of external evaluators, who have indicated that reviewing NDPA proposals is interesting and challenging. In addition, most prefer the latitude to score proposals without having to follow specific definitions of terms such as “pioneering” and to provide lengthy justifications.
- **Explore additional ways to seek out non-traditional scientists who may not apply for NIH grants.** Program managers devoted to the scientific and technological aspects of the program may enhance the NDPA’s ability to attract pioneering researchers and ideas. The use of pro-active program managers is a hallmark of other government programs that are viewed as successful in funding risky research, and the NIH might examine the management of those programs to extract effective strategies. Other government programs (e.g., Office of Naval Research) have successfully sought out and funded high-risk research. A study of these programs might provide best practices for the NDPA. Appointing a well-known pioneer to lead the program could enhance the profile of the program.
- **Consider increasing the number of awards.** While the small number of awards contributes to the award’s prestige, the NDPA program leaders as well as many panelists have acknowledged that many interviewees are often as qualified as awardees.

While the success and broader impact of the NDPA program will be further examined as part of an ongoing outcome evaluation, based on the findings of this process evaluation, it appears that the NDPA program processes are working as designed and are adding value to the NIH’s portfolio of research activities.

Appendix A: Origin of the NDPA

The National Institutes of Health (NIH) Director's Pioneer Award (NDPA) was initiated in fiscal year (FY) 2004 to support individual investigators who display the creativity and talent to pursue high-risk, potentially high-impact ideas in biomedical sciences. The program grew out of concerns that the traditional peer review process is overly conservative and that NIH may require additional means by which to fund high-risk research.^{1,2,3,4} On the premise that great ideas are driven by an individual, and not necessarily by a work plan, the program aimed to find researchers who have the skills and the creativity to take productive risks and to make significant contributions to medical research.⁵ In addition, NIH, wanted "to maximize the diversity of those considered for Pioneer Awards," and to "encourage nominations from women, members of groups that are underrepresented in biomedical research, individuals in the early to middle stages of their careers, and scientists working in fields that have not traditionally been supported by NIH."⁶ NDPA is part of the *Research Teams of the Future* theme of the NIH Roadmap. As part of the theme, it, "is meant to complement NIH's traditional, investigator-initiated grant programs by supporting individual scientists of exceptional creativity who propose pioneering approaches to major contemporary challenges in biomedical research."⁷

The roots of the NDPA program can be traced back to FY 2000, when Drs. Ellie Ehrenfeld (Center for Scientific Review)⁸ and David Armstrong (Center for Scientific Review) assessed the feasibility of a small initiative run by CSR. While no action directly resulted from that effort, in 2002, during the development of the NIH Roadmap, a High Risk Research Working Group (HRWG) was created. Dr. Ehrenfeld and Dr. Stephen Straus (National Center for Complementary and Alternative Medicine) were asked by Dr. Elias Zerhouni, then Director of NIH, to co-chair the HRWG.

In June 2003, the HRWG and its group of consultants (recruited primarily by Dr. Linda Engel) came together to design and propose new funding mechanisms at the NIH to promote high risk and innovative research.⁹ This informal group was composed of 15 individuals:

- Jerry Rubin (Janelia Farm Research Campus)
- Richard Nakamura (National Institute of Mental Health)

¹ Interviews with NIH staff.

² "Proceedings of the 88th Meeting of the Advisory Committee to the Director," National Institutes of Health, May 6, 2004. Available online at <http://www.nih.gov/about/director/acd/minutes/050604acd.htm>.

³ "Risky Business: Can the U.S. government do a better job of betting on long shots in science? NSF and NIH hope the answer is yes," *Science*, October 8, 2004, pp. 220–221.

⁴ Brenner, Sydney, "The Impact of Society on Science," *Science*, November 20, 1998, p. 1411.

⁵ The NIH Director's Pioneer Award Program press release, January 20, 2004. Available online at <http://www.nih.gov/news/pr/jan2004/od-20.htm>.

⁶ See <http://www.nih.gov/news/pr/jan2005/od-10.htm>.

⁷ "NIH Director's Pioneer Award," National Institutes of Health. Available online at <http://nihroadmap.nih.gov/pioneer/>.

⁸ In the May 2004 presentation to CSRAC, Dr. Ehrenfeld stated that the genesis of the program dates back to CSRAC members' suggestions. Minutes of the May 2001 CSRAC meeting, pages 9–11. The 2001–2003 meeting minutes has additional detail on the prehistory. Dr. Ehrenfeld was the head of CSR until September 2003.

⁹ Minutes of the September 2003 CSRAC meeting.

- David Schwartz (National Institute of Environmental Health Sciences)
- Gerry Pollack (University of Washington)
- Roger Brent (University of California, San Francisco)
- Terry Blum (Georgia Institute of Technology)
- Nora Volkow (National Institute on Drug Abuse)
- Teresa Levitin (National Institute on Drug Abuse)
- Jeremy Berg (National Institute of General Medical Sciences)
- David Armstrong (HRWG Co-chair; Center for Scientific Review)
- Linda Engel (National Center for Complementary and Alternative Medicine)
- Ellie Ehrenfeld (HRWG Co-chair; Center for Scientific Review)
- Stephen Straus (National Center for Complementary and Alternative Medicine)
- Lisa Begg (Office of Research on Women's Health)
- Ruth Kirschstein (Office of the Director)

The HRWG, after a series of meetings with internal and external experts, put forth three potential program designs, two of which were project-based and one of which was people-based.¹⁰ The proposed programs were:

- A *grand challenges program* designed to identify a grand challenge of interest to multiple ICs (NIH Institutes and Centers) and fund teams of researchers to meet the challenge;
- An *exceptional projects program* geared toward high-risk projects where individuals submit short applications describing the problem of interest and a proposed approach, which could be funded on a fast-track;
- A *people-based program* designed to fund individuals with creative approaches to important problems in biomedical sciences.

These recommendations were further discussed at the NIH Director's Budget Retreat. Ultimately the people-based program, which was to become the NDPA program, was approved in FY 2004.

A Steering Committee was established to run the program in its first year. Members included:¹¹

- Ellie Ehrenfeld, Center for Scientific Review
- Stephen Straus, National Center for Complementary and Alternative Medicine
- David Armstrong, Center for Scientific Review
- Linda Engel, National Center for Complementary and Alternative Medicine
- Ruth Kirschstein, Office of the Director
- Barbara Spalholtz, National Cancer Institute
- Bettie Graham, National Human Genome Research Institute
- Teresa Levitin, National Institute on Drug Abuse
- Lisa Begg, Office of the Director

To assist in the development of the NDPA criteria, NIH leadership convened a meeting on January 7, 2004 that involved members of the Steering Committee, as well as academic experts on

¹⁰ The background about the genesis for the NDPA was described in the Center for Scientific Review Advisory Committee Meeting, National Institutes of Health, May 17, 2004. Available online at <http://cms.csr.nih.gov/NR/rdonlyres/8C6CA534-FBF3-46A1-A85E-F78C537E2EB0/5577/May1704min.doc>.

¹¹ The NIH staff listed above and the following additional staff contributed to the FY 2004 competition: John Chah, Jim Anderson, and Donald Luecke. Tara Vinson from the Center for Scientific Review was the administrative assistant.

creativity. These experts were Dr. Robert Root-Bernstein (Professor of Physiology, Michigan State University), Dr. Robert Sternberg (Professor of Psychology and Education, Yale University¹²) and Dr. Dean Keith Simonton (Professor of Psychology, University of California, Davis).

Prior to the meeting, the creativity consultants were not told of the NDPA program nor why they were being queried on their work. The consultants were asked to advise on what metrics should be used in assessing creativity and innovation, and produced the following list:¹³

- The ability to initiate new areas of research or new approaches to research
- A willingness to take scientific risks
- Persistence in the face of adversity
- A willingness to grow scientifically and expand into new areas
- The ability to work in the face of uncertainty
- Scientific vision
- The ability to communicate effectively
- Intrinsic motivation, passion, enthusiasm, and intellectual energy
- Scientific creativity
- Potential for scientific leadership
- A willingness to make mistakes
- The ability to attract first-rate researchers to their labs

As is typical for any new program, NIH staff members were designated to create and operate the NDPA program in its first year. According to members of the Steering Committee, due to timing issues, the program had to be implemented quickly, which did not allow time to gather resources.¹⁴ In September 2004, the first Pioneer Awards were made, with nine individuals receiving funding under the DP1 activity code.

¹² Robert Sternberg is now at Tufts University.

¹³ Based on interviews with these consultants and NIH staff.

¹⁴ Based on interviews with NIH leadership and staff.

Appendix B: Research Projects of Awardees

Exhibit B.1.

2004 Awardees and Their Research Projects

<i>2004 Awardees</i>	<i>Institutional Affiliation</i>	<i>Description of NDPA-Funded Research Project</i>
Larry Abbott, Ph.D.	Columbia University	Explore how perception arises not only from the information gathered by our senses but also through the integration of internally generated activity representing memory attention and context.
George Q. Daley, M.D., Ph.D.	Children's Hospital Boston / Harvard Stem Cell Institute	Catalog all of the genes and molecular pathways that enable pluripotency. Use a trial-and-error approach to coax somatic cells to become pluripotent by adding pluripotency genes.
Homme W. Hellinga, Ph.D.	Duke University Medical Center	Develop and test new computational methods for protein design and engineering.
Joseph (Mike) McCune, M.D., Ph.D.	University of California at San Francisco	Explore the reasons behind unexplained differences in individual hosts' control of HIV and the progression to AIDS.
Steven L. McKnight, Ph.D.	UT Southwestern Medical Center	Understand metabolic regulation by measuring levels of hundreds of metabolites in the yeast metabolic cycle.
Chad Mirkin, Ph.D.	Northwestern University	Develop a series of powerful new tools for manipulating biological structures at the nanometer scale.
Rob Phillips, Ph.D.	California Institute of Technology	Explore nanoscale mechanics in biological processes, such as DNA ejection and DNA packing, that occur during the life cycle of bacterial viruses.
Stephen R. Quake, D.Phil.	Stanford University	Develop automated methods for biological large-scale integration using microfluidics.
Sunney Xie, Ph.D.	Harvard University	Visualize how gene expression is controlled, and takes place in a living cell one molecule at a time by developing new techniques to probe single molecules in living bacterial cells with millisecond time resolution and nanometer spatial precision.

Source: NDPA Website: 2004 Pioneer Award Recipients <http://nihroadmap.nih.gov/pioneer/Recipients04.aspx>.

Exhibit B.2.
2005 Awardees and Their Research Projects

<i>2005 Awardees</i>	<i>Institutional Affiliation</i>	<i>Description of NDPA-Funded Research Project</i>
Vicki L. Chandler, Ph.D.	University of Arizona	Explain why particular genes become active or silent and how these mechanisms could be associated with human diseases.
Hollis T. Cline, Ph.D.	Scripps Research Institute	Launch a large-scale project to understand the architecture, development, and plasticity of brain circuits.
Leda Cosmides, Ph.D.	University of California, Santa Barbara	Develop evolutionary and computational approaches to the study of motivation and developmental neuroscience.
Titia de Lange, Ph.D.	The Rockefeller University	Develop a new system for studying the biological response to DNA damage.
Karl Deisseroth, M.D., Ph.D.	Stanford University	Launch a large-scale systematic method of mapping key neural circuit dynamics on the millisecond timescale.
Pehr A.B. Harbury, Ph.D.	Stanford University School of Medicine	Develop an approach called DNA Display as a means of engineering drugs significantly more quickly and cheaply than is currently possible.
Erich D. Jarvis, Ph.D.	Duke University Medical Center	Understand the genetic machinery underlying vocal learning in order to pave the way for repairing vocalization disorders in humans.
Thomas A. Rando, M.D., Ph.D.	Stanford University School of Medicine	Apply knowledge of adult stem cell biology to enhance tissue repair and regeneration due to aging, injury, or disease.
Derek J. Smith, Ph.D.	University of Cambridge (UK), Erasmus Medical Center (The Netherlands)	Further understand pathogen evolution and significantly advance our options to control rapidly evolving pathogens.
Giulio Tononi, M.D., Ph.D.	University of Wisconsin-Madison Medical School	Test the hypothesis that sleep is needed for a process called synaptic homeostasis.
Clare M. Waterman-Storer, Ph.D.*	Scripps Research Institute	Apply fluorescence imaging techniques and analytical methods to correlate the interactions of cellular components with resulting cellular movements.
Nathan D. Wolfe, D.Sc.	University of California, Los Angeles	Work in regions of high biodiversity with subsistence hunters who will assist in establishing a sentinel surveillance system to monitor the entry of novel viruses into the human species.
Junying Yuan, Ph.D.	Harvard Medical School	Explore the possible existence of a novel cellular mechanism that specifically detects and removes misfolded, neurotoxic proteins.

**Clare M. Waterman-Storer, Ph.D., received a Pioneer Award while she was an associate professor in the Department of Cell Biology at The Scripps Research Institute in La Jolla, CA. In 2007, when she joined the intramural program of the National Institutes of Health, she relinquished the award.*

Source: NDPA Website: 2005 Pioneer Award Recipients <http://nihroadmap.nih.gov/pioneer/Recipients05.aspx>.

Exhibit B.3.
2006 Awardees and Their Research Projects

<i>2006 Awardees</i>	<i>Institutional Affiliation</i>	<i>Description of NDPA-Funded Research Project</i>
Kwabena A. Boahen, Ph.D.	Stanford University	Develop <i>Neurogrid</i> , a specialized hardware platform to simulate the inner workings of the brain's cortex in detail – something outside the reach of even the fastest supercomputers.
Arup K. Chakraborty, Ph.D.	Massachusetts Institute of Technology	Understand the principles that govern the emergence of autoimmune diseases.
Lila M. Gierasch, Ph.D.	University of Massachusetts, Amherst	Develop new ways to observe the process of protein folding <i>in vivo</i> in order to provide fundamental knowledge needed to understand diseases associated with protein misfolding.
Rebecca W. Heald, Ph.D.	University of California, Berkeley	Study how cells determine the size of their component organelles, such as the spindle.
Karla Kirkegaard, Ph.D.	Stanford University School of Medicine	Identify dominant drug targets for the RNA genomes of the hepatitis C, polio, West Nile, and Dengue viruses.
Thomas J. Kodadek, Ph.D.	Scripps Research Institute	Develop a chemistry-based approach to monitor and manipulate the immune system.
Cheng Chi Lee, Ph.D.	University of Texas Health Science Center at Houston	Investigate the biological processes of suspended animation that are analogous to severe hypothermia in non-hibernating mammals.
Evgeny A. Nudler, Ph.D.	New York University School of Medicine	Develop conceptually new approaches to treat and prevent infectious diseases.
Gary J. Pielak, Ph.D.	University of North Carolina at Chapel Hill	Study proteins involved in neurodegenerative diseases at the atomic level inside living cells.
David A. Relman, M.D.	Stanford University	Characterize the microbial communities indigenous to humans and understand the roles of these communities in health and disease.
Rosalind A. Segal, M.D., Ph.D.	Dana-Farber Cancer Institute	Use genetic and biochemical studies to identify the way complex sugars maintain neural stem cells in the developing and adult brain.
James L. Sherley, M.D., Ph.D.	Boston Biomedical Research Institute	Enable a new era of cellular medicine by developing routine methods for the production of several types of human adult stem cells with clinical potential.
Younan Xia, Ph.D.	Washington University in St. Louis	Develop new tools for studying complex biological systems by harnessing the power of nanomaterials.

Source: NDPA Website: 2006 Pioneer Award Recipients <http://nihroadmap.nih.gov/pioneer/Recipients06.aspx>.

Exhibit B.4.
2007 Awardees and Their Research Projects

<i>2007 Awardees</i>	<i>Institutional Affiliation</i>	<i>Description of NDPA-Funded Research Project</i>
Lisa Feldman Barrett, Ph.D.	Boston College/Harvard Medical School/Massachusetts General Hospital	Understand how the brain creates emotional experiences
Peter Bearman, Ph.D.	Columbia University	Understand the role of social and environmental factors in autism.
Emery N. Brown, M.D., Ph.D.	Massachusetts General Hospital/Massachusetts Institute of Technology	Use a systems neuroscience approach to study how anesthetic drugs act in the brain to create the state of general anesthesia.
Thomas R. Clandinin, Ph.D.	Stanford University	Define the links between behavioral decisions and specific neurons to achieve an integrated understanding of neural function and brain activity.
James J. Collins, Ph.D.	Boston University	Develop innovative systems biology and synthetic biology approaches to analyze the regulatory networks underlying bacterial responses to antibiotics and drug resistance.
Margaret Gardel, Ph.D.	University of Chicago	Integrate approaches from condensed matter physics and cellular biology to establish new tools and frameworks for studying the physical behaviors of the cytoskeleton.
Takao K. Hensch, Ph.D.	Children's Hospital Boston/Harvard Medical School	Explore the role of noncoding RNAs in brain development and as a potential treatment for adult brain disorders.
Marshall S. Horwitz, M.D., Ph.D.	University of Washington School of Medicine	Track mutations in cell lineages in order to better understand how stem cells contribute to development and cancer.
Rustem F. Ismagilov, Ph.D.	University of Chicago	Develop droplet-based, microfluidic technologies for quantitative studies of protein aggregation diseases and aging, at both the molecular and organismal levels.
Frances E. Jensen, M.D.	Children's Hospital Boston/Harvard Medical School	Examine how seizures in early life alter neuronal networks in the developing brain and cause cognitive disorders such as learning deficits and autism.
Mark J. Schnitzer, Ph.D.	Stanford University	Pursue an understanding of neural dynamics in the fruit fly with a focus on neural circuits involved in sensorimotor decision-making.
Gina Turrigiano, Ph.D.	Brandeis University	Develop a super-resolution cryo-microscopic method for probing the structure of the neuronal synapse.

Source: NDPA Website: 2007 Pioneer Award Recipients <http://nihroadmap.nih.gov/pioneer/Recipients07.aspx>.

**Exhibit B.5.
2008 Awardees and Their Research Projects**

2008 Awardees	Institutional Affiliation	Description of NDPA-Funded Research Project
James K. Chen, Ph.D.	Stanford University	Develop synthetic reagents for manipulating and visualizing embryonic genetic programs with the goal of understanding how tissue formation and regeneration are regulated at the molecular level.
Ricardo Dolmetsch, Ph.D.	Stanford University	Develop methods of using adult human stem cells to generate neurons from people with autism and to study the properties of those cells.
James Eberwine, Ph.D.	University of Pennsylvania	Understand how RNA populations encode a cellular memory that helps to control the development and maintenance of cellular identity.
Joshua M. Epstein, Ph.D.	Brookings Institution/Santa Fe Institute	Model how human behavioral adaptations shape infectious and chronic disease dynamics at multiple scales.
Bruce A. Hay, Ph.D.	California Institute of Technology	Pursue a strategy for preventing malaria in humans by introducing genes that block transmission of the disease into populations of wild mosquitoes.
Ann Hochschild, Ph.D.	Harvard Medical School	Develop bacteria-based genetic systems for the study of prions.
Charles M. Lieber, Ph.D.	Harvard University	Develop active interfaces between nanoelectronic devices, cells, and tissues to create new tools for understanding the behavior of neural networks, with potential applications to medical prosthetics.
Barry London, M.D., Ph.D.	University of Pittsburgh	Develop novel techniques for imaging electrical activity within the heart and interactions between the nervous system and the heart.
Tom Maniatis, Ph.D.	Harvard University	Explore the underlying mechanisms of amyotrophic lateral sclerosis (ALS), a neurodegenerative disease of motor neurons.
Teri W. Odom, Ph.D.	Northwestern University	Develop new types of plasmonic materials for microscopic methods that can resolve subcellular structure in three dimensions and without labels.
Hongkun Park, Ph.D.	Harvard University	Develop new nano- and microelectronic tools that can perturb and record real-time dynamics of <i>in vitro</i> and <i>in vivo</i> neuronal ensembles in a cell-specific fashion.
Aviv Regev, Ph.D.	Massachusetts Institute of Technology/Broad Institute	Reconstruct epigenetic and genetic changes in regulatory networks over time to achieve a unified understanding of how networks process information, adapt to their environment, and malfunction in human disease.

(Continued on the next page.)

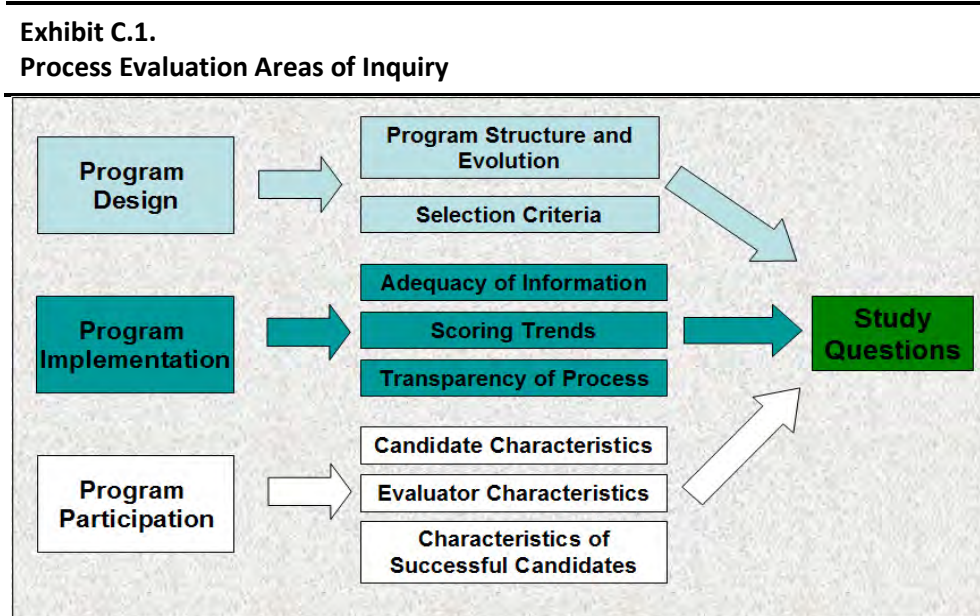
2008 Awardees (continued)	Institutional Affiliation	Description of NDPA-Funded Research Project
Aravinthan D.T. Samuel, Ph.D.	Harvard University	Develop the <i>Drosophila</i> larva as a powerful model system to analyze the neural circuits that mediate sensory perception and decision making during navigational behaviors in complex environments.
Saeed Tavazoie, Ph.D.	Princeton University	Study how regulatory networks are shaped by the complex and dynamic environments of native microbial habitats by exploring how such “internal representations” allow single-cell organisms to carry out cognitive tasks typically associated with metazoan nervous systems.
Alice Y. Ting, Ph.D.	Massachusetts Institute of Technology	Circumvent the problems associated with recombinant protein and transgene expression in cells and tissues to enable the study of endogenous proteins in their native forms and native contexts.
Alexander van Oudenaarden, Ph.D.	Massachusetts Institute of Technology	Explore how stochastic gene expression is controlled during embryonic development and cellular differentiation.

Source: NDPA Website: 2008 Pioneer Award Recipients <http://nihroadmap.nih.gov/pioneer/Recipients08.aspx>.

Appendix C: Methodology

C.1 Process Evaluation Design

The process evaluation was designed to study NDPA’s operations in light of program goals and to provide recommendations for how program activities could be improved. Two conceptual models drove this process evaluation: first, a process “flow” that outlined the NDPA process in each individual year; second, a stakeholder map that highlights individuals involved at each phase. Based on the process flow and stakeholder maps, a set of detailed study questions was developed. The study questions and findings were organized by three categories: Program Design, Program Implementation, and Program Participation as illustrated in Exhibit C.1.



The high-level study questions that guided the process evaluation focused on program design and implementation, scoring trends, program participation, and perceptions regarding the NDPA program. The high level study questions are presented in Section 1.1 of the main report.

To assist and advise in the study design process, the Office of the Director/Office of Behavioral and Social Science Research (OD/OBSSR) convened a six-member NDPA Evaluation Advisory Committee (EAC) to guide the study and its methodology. EAC members were:

- Lawrence Fine: Leader, Clinical Prevention and Translation Scientific Research Group, Division of Epidemiology and Clinical Applications, National Heart Lung and Blood Institute
- Judith Greenberg: Director, Division of Genetics and Developmental Biology, National Institute of General Medical Sciences
- Teresa Levitin: Director, Office of Extramural Affairs, National Institute on Drug Abuse
- James Onken: Chief, Office of Program Analysis and Evaluation, National Institute of General Medical Sciences

- Walter Schaffer: NIH Research Training Officer, Office of Extramural Research, Office of the Director
- Stephane Philogene (Executive Secretary and Evaluation Officer): Office of Behavioral and Social Science Research, Office of the Director

The EAC met last on May 27, 2009; at this meeting, the evaluation team presented the findings of the final NDPA process evaluation for the FY 2004–FY 2008 competition years for the EAC’s approval.

C.2 Data Sources, Collection Methods, and Analysis

Four main data sources were used in each year to conduct the annual process evaluation:

1. Administrative data from the NIH – To gain insights into nominee characteristics, external evaluators’ scores, and comparison mechanisms, data were obtained on candidates’ demographic and other characteristics, scores, and prior funding history from NIH databases.
2. Interviews with NIH liaisons and external evaluators – During the 5 years of the process evaluation, a total of 213 interviews were conducted to gain insights about satisfaction with the process. Interviews were conducted approximately one to 2 years after liaison/evaluator participation. No individual questions were mandatory; thus some participants did not answer certain questions.
3. Surveys of all candidates considered for an award from FY 2004 to FY 2008 – over the years, a total of 1,637 surveys were completed (61% of delivered surveys). The annual breakdown is summarized below in Exhibit C.2. Surveys were administered approximately 1 to 2 years after candidates’ NDPA application. No individual questions on the survey were mandatory; thus some respondents left certain questions blank. Survey questions are given in Appendix D.
4. Interviews with outside experts,¹ members of the High Risk Working Group, and NDPA program Leadership.

Exhibit C.2.
Survey Response Rates by Year FY 2004–FY 2008

Respondent Type	Surveys Delivered	Surveys Completed	Response Rate
FY 2004 Candidate*	677	411	61%
FY 2005 Candidate	705	420	60%
FY 2006 Candidate	456	330	72%
FY 2007 Candidate	438	237	54%
FY 2008 Candidate	429	239	56%
FY 2004 – FY 2008 Candidate Total	2705	1637	61%

*A total of 1,444 surveys were sent in FY 2004; however, 767 surveys were sent to nominators rather than to the candidates themselves and are not included in this table.

Source: STPI Analysis of FY 2004–FY 2008 NDPA Survey Data.

¹ Robert Langer, PhD, Institute Professor, Chemical and Biomedical Engineering, Massachusetts Institute of Technology; Pawan Sinha, Ph.D., Associate Professor of Vision and Computational Neuroscience; Robert Sternberg, Dean of the School of Arts and Sciences, Professor of Psychology, and Adjunct Professor of Education at Tufts University; and Teresa Amabile, Edsel Bryant Ford Professor of Business Administration, Director of Research.

Appendix D: 2008 Candidate Surveys

Surveys from previous years were fundamentally the same as the 2008 version presented here.

OMB No. 0925-0534

Exp. Date 3/31/2011

NDPA Candidate Survey Questionnaires

There are three Candidate Surveys: (1) the General Survey of Candidates (not Interviewees and Awardees), (2) the Survey of Interviewees and, (3) the Survey of Awardees.

1. General Survey of Candidates (not Interviewees and Awardees)

Welcome to the NDPA Candidate Survey. Please provide responses to the following questions to the best of your ability. You may choose not to answer specific questions and it will not affect your ability to submit the survey. After choosing a response, please click "next" to view the next set of questions. If you would like to go back and change a response, you can use the "back" button on the survey or the pull down menu at the bottom of the page. Please do not use your browser's navigation buttons. If you would like to save and come back to the survey, click the "save" button at the bottom of any page. The survey should take 10-15 minutes to complete.

Please consult the NDPA website to review the Request for Applications (RFA), criteria, or processes:

NDPA Website

Please note that participation in this survey is entirely voluntary. Your decision to participate will have no effect on your current or future NIH funding status, and other risks for participation or non-participation are minimal.

Additionally, you may click on underlined words in the survey, which are hyperlinked to the appropriate document.

To begin the survey, scroll down and click "next."

1. Prior to NDPA, had you ever applied for an NIH award or grant as a Principal Investigator (PI) or Co-PI?

{Choose one}

- Yes
- No
- Do not know

Background/Funding History

2. Please provide a rough estimate of the percentage of your total research funding over the past five years represented by each source listed below. (Please make sure that your answers do not add up to more than 100%.)

Hospitals, universities, or other non-profit institutions

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

For-profit companies

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

Foundations (e.g. Howard Hughes Medical Institute, Ford Foundation, etc.)

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

Other US government sources

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

National Institutes of Health (NIH)

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

Other

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

Please list other sponsors below:

{Enter answer in paragraph form}

3. In your opinion, given the innovative nature of your proposed NDPA project, what is the likelihood that it might be supported by other funders?

{Choose one}

- Very likely
- Somewhat likely
- Somewhat unlikely
- Very unlikely

In your opinion, how risky was your proposed idea?

- Very risky
- Somewhat risky
- Not risky

4. Please indicate which of the following statements (if any) are true of the research you proposed to NDPA in 2008:

{Choose all that apply}

- One or more of the fundamental ideas underlying my proposed research were at odds with prevailing wisdom
- My proposed research required use of equipment or techniques that have not been proven or are extraordinarily difficult
- My proposed research required knowledge of fields beyond my previously demonstrated area of expertise
- My research involved a unique and unprecedented combination of perspectives, disciplines, or approaches
- None of these statements is true of my proposed research

5. Do you plan to reapply for an NDPA in future years?

{Choose one}

- Yes
- No

Why not?

{Enter answer in paragraph form}

In future years, to what extent will you make changes to the basic idea you proposed in FY 2008?

{Choose one}

- I will submit a completely different idea
- I will make substantial changes to the basic idea I proposed
- I will make minor changes to the basic idea I proposed
- The basic idea I proposed will remain the same

The Application Process

6. Where did you hear about the NIH Director's Pioneer Award (NDPA)? (Select all that apply)

{Choose all that apply}

- Journal
- Departmental flyer or announcement
- Federal Register
- NDPA website
- Other website (please specify below)
- Word of mouth
- Do not recall

Other:

{Enter answer in paragraph form}

7. As part of the application process, you were asked to classify your research into one or more of seven areas:

- 1. behavioral and social sciences**
- 2. clinical and translational research**
- 3. instrumentation and engineering**
- 4. molecular, cellular, and chemical biology**
- 5. pathogenesis or epidemiology**
- 6. physiological and integrative systems**
- 7. quantitative and mathematical biology**

or select "other." Were these seven areas adequate to choose from?

{Choose one}

- Yes
 No

Which other areas should be offered in future rounds?

{Enter answer in paragraph form}

8. Do you agree that you were given adequate opportunity to display your qualifications in the application phase?

{Choose one}

- Completely agree
 Somewhat agree
 Somewhat disagree
 Completely disagree

Please comment on what additional information you would have preferred to provide or if any information you provided seemed unnecessary.

{Enter answer in paragraph form}

Application materials

9. In your opinion, how important was each of the following application components in allowing you to display your qualifications for the NIH Director's Pioneer Award?

3-5 page essay that addresses your innovative vision

{Choose one}

- (Least Important) 1
 2
 3
 4
 5
 (Most Important) 6

2 page biographical sketch

{Choose one}

- (Least Important) 1
- 2
- 3
- 4
- 5
- (Most Important) 6

List of current research support

{Choose one}

- (Least Important) 1
- 2
- 3
- 4
- 5
- (Most Important) 6

3 letters of reference

{Choose one}

- (Least Important) 1
- 2
- 3
- 4
- 5
- (Most Important) 6

Your most significant accomplishment

{Choose one}

- (Least Important) 1
- 2
- 3
- 4
- 5
- (Most Important) 6

300 word abstract describing project goals

{Choose one}

- (Least Important) 1
- 2
- 3
- 4
- 5
- (Most Important) 6

Criteria for selecting awardees

10. Do you agree that the stated criteria for selecting awardees were adequate and appropriate to select "scientists of exceptional creativity who take innovative approaches to major challenges in biomedical research"?

{Choose one}

- Completely Agree
- Somewhat Agree
- Somewhat Disagree
- Completely Disagree

If the criteria were not appropriate or adequate in your opinion, please propose additional or different criteria.

{Enter answer in paragraph form}

NDPA RFA

11. Was the 2008 NDPA RFA (see link below) clear in describing the kind of person (e.g. "exceptionally creative") or the kind of idea (e.g. "high-impact") the program seeks to fund?

{Choose one}

- Yes, it was clear
- No, it was unclear

If it was unclear, please suggest ways that the directions could be made more clear in the future.

{Enter answer in paragraph form}

12. Did you have any difficulties with the electronic submission forms during the application phase?

{Choose one}

- Yes
- No

If yes, please describe your difficulties:

{Enter answer in paragraph form}

Overall Assessment

13. Please provide any additional comments or feedback related to the NIH Director's Pioneer Award.

{Enter answer in paragraph form}

Demographic Information

Please note: Responses to these questions are entirely voluntary.

Gender

{Choose one}

- Male
- Female

Ethnicity

{Choose one}

- Hispanic or Latino
- Not Hispanic or Latino

Race (Please mark all that apply)

{Choose all that apply}

- American Indian or Alaska Native
- Asian
- Black or African American
- Native Hawaiian or other Pacific Islander
- White

Age (Please select a range)

{Choose one}

- under 20
- 20 - 24
- 25 - 29
- 30 - 34
- 35 - 39
- 40 - 44
- 45 - 49
- 50 - 54
- 55 - 59
- 60 - 64
- 65 - 69
- 70 - 74
- 75 - 79
- 80 - 84
- 85 - 89
- 90+

Thank you for completing the 2008 NDPA Survey. Please click "finish" below to submit your responses.

2. Survey of Interviewees

Welcome to the NDPA Candidate Survey. Please provide responses to the following questions to the best of your ability. You may choose not to answer specific questions and it will not affect your ability to submit the survey. After choosing a response, please click "next" to view the next set of questions. If you would like to go back and change a response, you can use the "back" button on the survey or the pull down menu at the bottom of the page. Please do not use your browser's navigation buttons. If you would like to save and come back to the survey, click the "save" button at the bottom of any page. The survey should take 10-15 minutes to complete.

Please consult the NDPA website to review the Request for Applications (RFA), criteria, or processes:

NDPA Website

Please note that participation in this survey is entirely voluntary. Your decision to participate will have no effect on your current or future NIH funding status, and other risks for participation or non-participation are minimal.

Additionally, you may click on underlined words in the survey, which are hyperlinked to the appropriate document.

To begin the survey, scroll down and click "next."

1. Prior to NDPA, had you ever applied for an NIH award or grant as a Principal Investigator (PI) or Co-PI?

{Choose one}

- Yes
- No
- Do not know

Background/Funding History

2. Please provide a rough estimate of the percentage of your total research funding over the past five years represented by each source listed below. (Please make sure that your answers do not add up to more than 100%.)

Hospitals, universities, or other non-profit institutions

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

For-profit companies

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

Foundations (e.g. Howard Hughes Medical Institute, Ford Foundation, etc.)

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

Other US government sources

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

National Institutes of Health (NIH)

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

Other

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

Please list other sponsors below:

{Enter answer in paragraph form}

3. In your opinion, given the innovative nature of your proposed NDPA project, what is the likelihood that it might be supported by other funders?

{Choose one}

- Very likely
- Somewhat likely
- Somewhat unlikely
- Very unlikely

In your opinion, how risky was your proposed idea?

- Very risky
- Somewhat risky
- Not risky

4. Please indicate which of the following statements (if any) are true of the research you proposed to NDPA in 2008:

{Choose all that apply}

- One or more of the fundamental ideas underlying my proposed research were at odds with prevailing wisdom
- My proposed research required use of equipment or techniques that have not been proven or are extraordinarily difficult
- My proposed research required knowledge of fields beyond my previously demonstrated area of expertise
- My research involved a unique and unprecedented combination of perspectives, disciplines, or approaches
- None of these statements is true of my proposed research

5. Our records indicate that you applied previously for an NDPA award. In 2008, to what extent did you make changes to the basic idea you had proposed in previous year(s)?

{Choose one}

- I submitted a completely different idea
- I made substantial changes to the basic idea I proposed
- I made minor changes to the basic idea I proposed
- The basic idea I proposed remained the same

6. Do you plan to reapply for an NDPA in future years?

{Choose one}

- Yes
- No

Why not?

{Enter answer in paragraph form}

In future years, to what extent will you make changes to the basic idea you proposed in FY 2008?

{Choose one}

- I will submit a completely different idea
- I will make substantial changes to the basic idea I proposed
- I will make minor changes to the basic idea I proposed
- The basic idea I proposed will remain the same

The Application Process

7. Where did you hear about the NIH Director's Pioneer Award (NDPA)? (Select all that apply)

{Choose all that apply}

- Journal
- Departmental flyer or announcement
- Federal Register
- NDPA website
- Other website (please specify below)
- Word of mouth
- Do not recall

Other:

{Enter answer in paragraph form}

8. As part of the application process, you were asked to classify your research into one or more of seven areas:

1. behavioral and social sciences
2. clinical and translational research
3. instrumentation and engineering
4. molecular, cellular, and chemical biology
5. pathogenesis or epidemiology
6. physiological and integrative systems
7. quantitative and mathematical biology

or select "other." Were these seven areas adequate to choose from?

{Choose one}

- Yes
- No

Which other areas should be offered in future rounds?

{Enter answer in paragraph form}

9. Do you agree that you were given adequate opportunity to display your qualifications in the application phase?

{Choose one}

- Completely agree
- Somewhat agree
- Somewhat disagree
- Completely disagree

Please comment on what additional information you would have preferred to provide or if any information you provided seemed unnecessary.

{Enter answer in paragraph form}

Application materials

10. In your opinion, how important was each of the following application components in allowing you to display your qualifications for the NIH Director's Pioneer Award?

3-5 page essay that addresses your innovative vision

{Choose one}

- (Least Important) 1
- 2
- 3
- 4
- 5
- (Most Important) 6

2 page biographical sketch

{Choose one}

- (Least Important) 1
- 2
- 3
- 4
- 5
- (Most Important) 6

List of current research support

{Choose one}

- (Least Important) 1
- 2
- 3
- 4
- 5
- (Most Important) 6

3 letters of reference

{Choose one}

- (Least Important) 1
- 2
- 3
- 4
- 5
- (Most Important) 6

Your most significant accomplishment

{Choose one}

- (Least Important) 1
- 2
- 3
- 4
- 5
- (Most Important) 6

300 word abstract describing project goals

{Choose one}

- (Least Important) 1
- 2
- 3
- 4
- 5
- (Most Important) 6

Criteria for selecting awardees

11. Do you agree that the stated criteria for selecting awardees were adequate and appropriate to select "scientists of exceptional creativity who take innovative approaches to major challenges in biomedical research"?

{Choose one}

- Completely Agree
- Somewhat Agree
- Somewhat Disagree
- Completely Disagree

If the criteria were not appropriate or adequate in your opinion, please propose additional or different criteria.

{Enter answer in paragraph form}

NDPA RFA

12. Was the 2008 NDPA RFA (see link below) clear in describing the kind of person (e.g. "exceptionally creative") or the kind of idea (e.g. "high-impact") the program seeks to fund?

{Choose one}

- Yes, it was clear
- No, it was unclear

If it was unclear, please suggest ways that the directions could be made more clear in the future.

{Enter answer in paragraph form}

The Interview Process

13. Were the invitation and instructions clear about the intent, purpose, and content of the interview?

{Choose one}

- Completely Agree
- Somewhat Agree
- Somewhat Disagree
- Completely Disagree

Please feel free to comment on the interview instructions and guidelines:

{Enter answer in paragraph form}

14. Was the duration of the interview appropriate to convey your interest and enthusiasm in the NDPA program and to make your case as a candidate?

{Choose one}

- The interview was too long
- The interview was too short
- The interview was about right

Please comment on the interview process below:

{Enter answer in paragraph form}

15. Do you agree that the interviewers adequately understood your ideas and gave you a fair chance to convey your ideas?

{Choose one}

- Completely Agree
- Somewhat Agree
- Somewhat Disagree
- Completely Disagree

16. Did you have any difficulties with the electronic submission forms during the application phase?

{Choose one}

- Yes
- No

If yes, please describe your difficulties:

{Enter answer in paragraph form}

Overall Assessment

17. Please provide any additional comments or feedback related to the NIH Director's Pioneer Award.

{Enter answer in paragraph form}

Demographic Information

Please note: Responses to these questions are entirely voluntary.

Gender

{Choose one}

- Male
- Female

Ethnicity

{Choose one}

- Hispanic or Latino
- Not Hispanic or Latino

Race (Please mark all that apply)

{Choose all that apply}

- American Indian or Alaska Native
- Asian
- Black or African American
- Native Hawaiian or other Pacific Islander
- White

Age (Please select a range)

{Choose one}

- under 20
- 20 - 24
- 25 - 29
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- 35 - 39
- 40 - 44
- 45 - 49
- 50 - 54
- 55 - 59
- 60 - 64
- 65 - 69
- 70 - 74
- 75 - 79
- 80 - 84
- 85 - 89
- 90+

Thank you for completing the 2008 NDPA Survey. Please click "finish" below to submit your responses.

3. Survey of Awardees

Welcome to the NDPA Candidate Survey. Please provide responses to the following questions to the best of your ability. You may choose not to answer specific questions and it will not affect your ability to submit the survey. After choosing a response, please click "next" to view the next set of questions. If you would like to go back and change a response, you can use the "back" button on the survey or the pull down menu at the bottom of the page. Please do not use your browser's navigation buttons. If you would like to save and come back to the survey, click the "save" button at the bottom of any page. The survey should take 10-15 minutes to complete.

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Additionally, you may click on underlined words in the survey, which are hyperlinked to the appropriate document.

To begin the survey, scroll down and click "next."

1. Prior to NDPA, had you ever applied for an NIH award or grant as a Principal Investigator (PI) or Co-PI?

{Choose one}

- Yes
- No
- Do not know

Background/Funding History

2. Please provide a rough estimate of the percentage of your total research funding over the past five years represented by each source listed below. (Please make sure that your answers do not add up to more than 100%.)

Hospitals, universities, or other non-profit institutions

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

For-profit companies

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

Foundations (e.g. Howard Hughes Medical Institute, Ford Foundation, etc.)

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

Other US government sources

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

National Institutes of Health (NIH)

{Choose one}

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-100%

Other

{Choose one}

- 0%
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- 25-49%
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- 75-100%

Please list other sponsors below:

{Enter answer in paragraph form}

3. In your opinion, given the innovative nature of your proposed NDPA project, what is the likelihood that it might be supported by other funders?

{Choose one}

- Very likely
- Somewhat likely
- Somewhat unlikely
- Very unlikely

In your opinion, how risky was your proposed idea?

- Very risky
- Somewhat risky
- Not risky

4. Please indicate which of the following statements (if any) are true of the research you proposed to NDPA in 2008:

{Choose all that apply}

- One or more of the fundamental ideas underlying my proposed research were at odds with prevailing wisdom
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{Choose one}

- I submitted a completely different idea
- I made substantial changes to the basic idea I proposed
- I made minor changes to the basic idea I proposed
- The basic idea I proposed remained the same

The Application Process

6. Where did you hear about the NIH Director's Pioneer Award (NDPA)? (Select all that apply)

{Choose all that apply}

- Journal
- Departmental flyer or announcement
- Federal Register
- NDPA website
- Other website (please specify below)
- Word of mouth
- Do not recall

Other:

{Enter answer in paragraph form}

7. As part of the application process, you were asked to classify your research into one or more of seven areas:

- 1. behavioral and social sciences**
- 2. clinical and translational research**
- 3. instrumentation and engineering**
- 4. molecular, cellular, and chemical biology**
- 5. pathogenesis or epidemiology**
- 6. physiological and integrative systems**
- 7. quantitative and mathematical biology**

or select "other." Were these seven areas adequate to choose from?

{Choose one}

- Yes
 No

Which other areas should be offered in future rounds?

{Enter answer in paragraph form}

8. Do you agree that you were given adequate opportunity to display your qualifications in the application phase?

{Choose one}

- Completely agree
 Somewhat agree
 Somewhat disagree
 Completely disagree

Please comment on what additional information you would have preferred to provide or if any information you provided seemed unnecessary.

{Enter answer in paragraph form}

Application materials

9. In your opinion, how important was each of the following application components in allowing you to display your qualifications for the NIH Director's Pioneer Award?

3-5 page essay that addresses your innovative vision

{Choose one}

- (Least Important) 1
- 2
- 3
- 4
- 5
- (Most Important) 6

2 page biographical sketch

{Choose one}

- (Least Important) 1
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- 3
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- (Most Important) 6

List of current research support

{Choose one}

- (Least Important) 1
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- (Most Important) 6

3 letters of reference

{Choose one}

- (Least Important) 1
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- 4
- 5
- (Most Important) 6

Your most significant accomplishment

{Choose one}

- (Least Important) 1
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- 3
- 4
- 5
- (Most Important) 6

300 word abstract describing project goals

{Choose one}

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- 2
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- 5
- (Most Important) 6

Criteria for selecting awardees

10. Do you agree that the stated criteria for selecting awardees (see link below), were adequate and appropriate to select "scientists of exceptional creativity who take innovative approaches to major challenges in biomedical research"?

{Choose one}

- Completely Agree
- Somewhat Agree
- Somewhat Disagree
- Completely Disagree

If the criteria were not appropriate or adequate in your opinion, please propose additional or different criteria.

{Enter answer in paragraph form}

NDPA RFA

11. Was the 2008 NDPA RFA clear in describing the kind of person (e.g. "exceptionally creative") or the kind of idea (e.g. "high-impact") the program seeks to fund?

{Choose one}

- Yes, it was clear
- No, it was unclear

If it was unclear, please suggest ways that the directions could be made more clear in the future.

{Enter answer in paragraph form}

The Interview Process

12. Were the invitation and instructions clear about the intent, purpose, and content of the interview?

{Choose one}

- Completely Agree
- Somewhat Agree
- Somewhat Disagree
- Completely Disagree

If not, what did you find particularly problematic or unclear?

{Enter answer in paragraph form}

13. Was the duration of the interview appropriate to convey your interest and enthusiasm in the NDPA program and to make your case as a candidate?

{Choose one}

- The interview was too long
- The interview was too short
- The interview was about right

Please comment on the interview process below:

{Enter answer in paragraph form}

14. Do you agree that the interviewers adequately understood your ideas and gave you a fair chance to convey your ideas?

{Choose one}

- Completely Agree
- Somewhat Agree
- Somewhat Disagree
- Completely Disagree

15. Did you have any difficulties with the electronic submission forms during the application phase?

{Choose one}

- Yes
- No

If yes, please describe your difficulties:

{Enter answer in paragraph form}

Overall Assessment

16. Please provide any additional comments or feedback related to the NIH Director's Pioneer Award.

{Enter answer in paragraph form}

Demographic Information

Please note: Responses to these questions are entirely voluntary.

Gender

{Choose one}

- Male
- Female

Ethnicity

{Choose one}

- Hispanic or Latino
- Not Hispanic or Latino

Race (Please mark all that apply)

{Choose all that apply}

- American Indian or Alaska Native
- Asian
- Black or African American
- Native Hawaiian or other Pacific Islander
- White

Age (Please select a range)

{Choose one}

- under 20
- 20 - 24
- 25 - 29
- 30 - 34
- 35 - 39
- 40 - 44
- 45 - 49
- 50 - 54
- 55 - 59
- 60 - 64
- 65 - 69
- 70 - 74
- 75 - 79
- 80 - 84
- 85 - 89
- 90+

Thank you for completing the 2008 NDPA Survey. Please click "finish" below to submit your responses.

Appendix E: 2008 External Evaluator and Panelist Interview Protocol

Protocols from previous years were fundamentally the same as the 2008 version presented here.

OMB No. 0925-0534
Exp. Date 3/31/2011

NDPA Process Evaluation Interview Protocol

STATEMENT OF INFORMED CONSENT

The Science and Technology Policy Institute (STPI), a federally funded research and development center based in Washington, DC, has been requested by the National Institutes of Health (NIH) to evaluate the process by which recipients of the NIH Director's Pioneer Awards (NDPA) were chosen. The primary objectives of the evaluation are to: (1) assess the NDPA award selection process; (2) examine whether the program was implemented as planned; and (3) determine if the process was conducted in accordance with the overall mission of the NDPA program.

We are employing various data collection techniques to answer these questions; however, we believe that some of the most valuable information will come from those who were involved directly in the evaluation process. These informal interviews are one mechanism that will provide important information concerning the overall NDPA process, and will hopefully highlight aspects of the award process that may need to be revised or improved for future rounds of awards.

Please note that:

- **Your responses will be kept strictly confidential:** If you choose to participate, respondent confidentiality will be protected to the extent provided by law, and STPI will report only aggregate information concerning overall impressions of the process to the NIH.
- **Your participation is entirely voluntary:** You are under no obligation to interview with us, but we strongly encourage you to do so. A successful evaluation of the NDPA awards process depends on a high response rate to gather as much information and as many perspectives as possible. There are no consequences or risks for participating. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled, and you may discontinue the interview at any time without penalty or loss of benefits to which you are otherwise entitled.
- **Whom to contact for additional information:** For additional information about the study you may contact Bhavya Lal, STPI project director. If you have any questions that you would like to address to the NIH Office of the Director, please contact G. Stephane Philogene, Ph.D., the OD Program Officer responsible for this evaluation (e-mail: PhilogeS@OD.NIH.GOV).

Burden Statement. Public reporting burden for this collection of information is estimated to average **30 minutes** per response (.5 hours), including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control

number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to: NIH, Project Clearance Branch, 6705 Rockledge Drive, MSC 7974, Bethesda, MD 20892-7974, ATTN: PRA (0925-0534).

1. External Evaluator Questions

Introductory questions

1. How did you become involved with NDPA as an evaluator?
2. Was your training adequate – were the terms adequately defined and criteria made explicit?
3. Did you have adequate time to review the application packages?

Review Criteria

4. How did you decide if an application was competitive? In FY 2007 the administrative review phase was eliminated - did you come across any applications that were non-responsive? (*For repeat evaluators: did you notice a difference in the quality of applications from previous years i.e., more non-responsive applications?*)
5. What role did existing grant support play in your review? What role did career stage play in your review?
6. How much time did you spend looking up individuals online, or consulting with others during your review?
7. External Evaluators were instructed to use 3 primary criteria to evaluate individuals. For each, what did you identify as the markers - can you please give an example of how you operationalized each of the criteria?

The evaluation Criteria for the 2008 NIH Director's Pioneer Award included:

- Scientific problem to be addressed (Biomedical significance/importance if successful, likelihood of high impact on biomedical problem, Creativity/innovativeness)
 - Investigator (Evidence for claim of innovativeness/creativity (innovation density); Demonstrated ability to devote 51% or more effort on NDPA project)
 - Suitability for NDPA mechanism (Evidence that proposed project is of sufficient risk/impact to make it more suitable for NDPA than for traditional NIH grant mechanism; Distinct from other research by investigator).
8. Which of the criteria was most important to you in your assessment of the application packages?
 9. Do you believe these criteria are adequate to identify a "pioneer?" If not, what other criteria might be used in the future years?
 10. How did you evaluate applications outside of your area of expertise? Were there instances where you were not comfortable with reviewing an application because of the subject area?
 11. During your training, you were given the guidelines to:
 - “Watch for women, minorities, investigators at early to middle career stages”
 - “Eliminate very senior, well-funded investigators who are doing related work or could support project with R01”

How did you interpret and operationalize this guidance?

Application Material

12. How did the information provided to you in the application package help you to evaluate an individual's "pioneeringness?"
13. Was information missing that if there would have helped you make a better decision? Was certain information provided to you better left concealed (name, affiliation, etc.)?

Scoring System

14. Was the five-point scale and the "top 4" designation an adequate system to rate the NDPA applicants? Do you have suggestions for an improved scoring system?

General Characterization

15. How would you characterize the applications you reviewed? Were the ideas outside the realm of convention (conceptually or technically risky? Multidisciplinary? Outside the realm of the investigator's experience?)
16. Have you participated in other traditional NIH study sections? How did this process differ? In your opinion, did the NDPA process allow you to choose applications that might not be funded under a traditional study section?
17. Do you have a sense of how did the applications that you reviewed compare with those applying through other NIH mechanisms, e.g. MERIT, R21s? In your opinion, did NIH truly capture researchers and/or ideas that wouldn't otherwise be in the NIH system? To the best of your knowledge, to what extent is Pioneer adding value to the NIH portfolio?
18. One of the stated goals of the Pioneer Award Program is to bring in unique ideas, approaches, and/or people that are not being funded through NIH traditional peer review system. Based on your review of (applicants/interviewees), and any follow up you have had on the program, do you believe that Pioneer accomplished this goal? What are your thoughts on the awardees - are they pioneers?

General

19. (*Repeat External Evaluators Only*) In your opinion, how did the FY2008 NDPA review compare to that of previous years in terms of clarity, consistency, etc?
20. Do you have any final feedback on the FY2008 NDPA process? Do you have any other recommendations for how the program could be improved?
21. Given your experiences this year, would you consider being involved in the program again? (If they say no) What must change for you to participate in the future?

2. Panelist Questions

Introductory questions

1. How did you become involved with NDPA as a panelist?
2. Was your training adequate – were the terms adequately defined and criteria made explicit?

Review Criteria

3. What were you looking for in a competitive applicant/interviewee?
4. Did grant support or career stage play any role in your review?
5. How much time did you spend looking up individuals online, or consulting with in advance or during the panel review?

Panelist Material

6. How did the information provided to you in the application package help you to evaluate an individual's "pioneeringness?"
7. Did you have adequate time and materials to prepare for the interview?
8. Was information missing that would have helped you prepare for the interview?

General Characterization

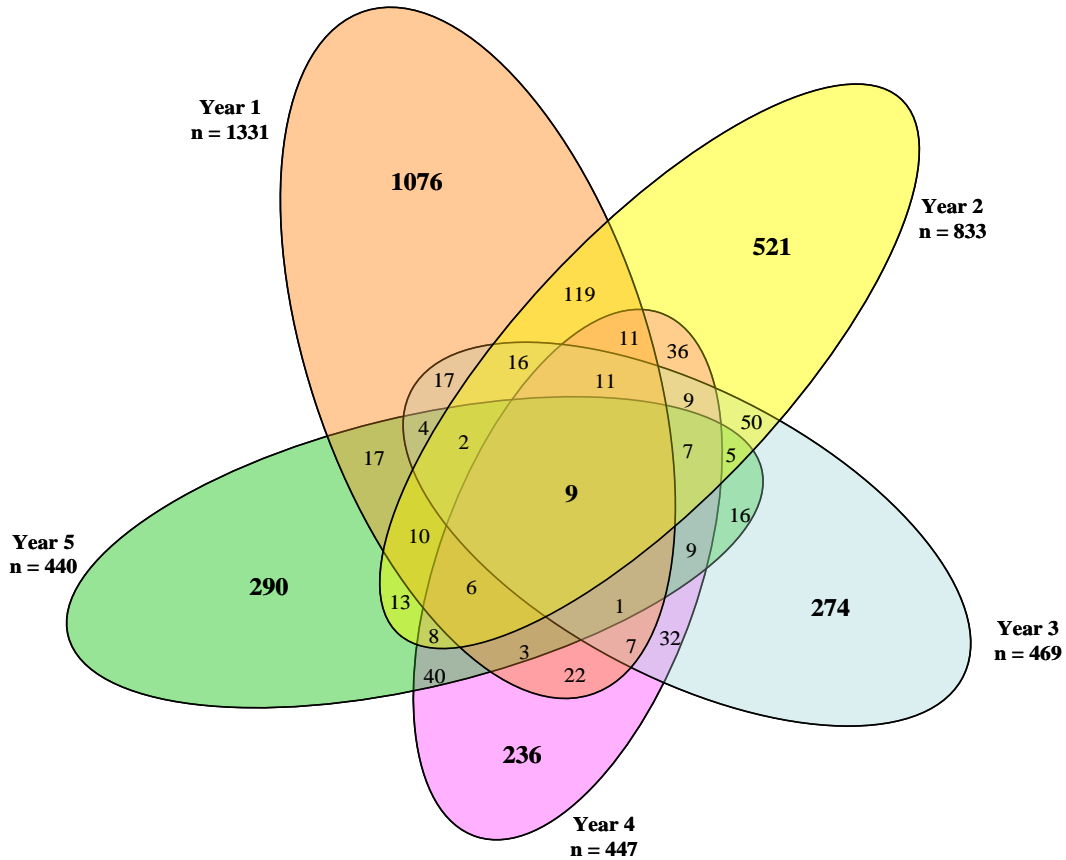
9. What system did you use to rank the interviewees? Did this system differ from the instructions? How?
10. Was the interview length adequate for evaluating the interviewees?
11. Apart from the face-to-face interactions that you had, was there information missing that would have helped you make a better decision?
12. How would you characterize the interviewees? Were their ideas outside the realm of convention (conceptually or technically risky? Multidisciplinary? Outside the realm of the investigator's experience?)
13. Have you participated in other traditional NIH study sections? How did this process differ? In your opinion, did the NDPA process allow you to choose applications that might not be funded under a traditional study section?
14. Do you have a sense of how did the applications that you reviewed compare with those applying through other NIH mechanisms, e.g. MERIT, R21s? In your opinion, did NIH truly capture researchers and/or ideas that wouldn't otherwise be in the NIH system? To the best of your knowledge, to what extent is Pioneer adding value to the NIH portfolio?
15. One of the stated goals of the Pioneer Award Program is to bring in unique ideas, approaches, and/or people that are not being funded through NIH traditional peer review system. Based on your review of (applicants/interviewees), and any follow up you have had on the program, do you believe that Pioneer accomplished this goal? What are your thoughts on the awardees - are they pioneers?

General

16. (Repeat Panelists Only) In your opinion, how did the FY2008 NDPA review compare to that of previous years in terms of clarity, consistency, etc?
17. Do you have any final feedback on the FY2008 NDPA process? Do you have any other recommendations for how the program could be improved?
18. Given your experiences this year, would you consider being involved in the program again? (If they say no) What must change for you to participate in the future?

Appendix F: Characteristics of Candidates

Exhibit F.1.
Candidate Participation in Multiple Years of NDPA



Number of Years of Participation	Number (%) Unique Individual Candidates	Number (%) Unique Interviewees*	Number (%) Unique Awardees	Likelihood of Receiving Award*
1 Year	2397 (83%)	67 (59%)	46 (73%)	1.9%
2 Years	362 (13%)	28 (25%)	12 (19%)	3.3%
3 Years	82 (3%)	10 (9%)	3 (5%)	3.7%
4 Years	27 (1%)	5 (4%)	1 (1.5%)	3.7%
5 Years	9 (0%)	3 (3%)	1 (1.5%)	11%
Total Individual Participants	2877	113	63	

*Four interviewees (including two awardees) have participated in the interview phase in 2 years. The likelihood of receiving award is calculated by dividing the number of unique awardees who participated in a given number of years, by the number of unique individual candidates who participated for that same number of years. For example, the likelihood of receiving an award, given one year of participation, is 46/2397.

Source: STPI Analysis of FY 2004–FY 2008 NDPA Administrative Data.

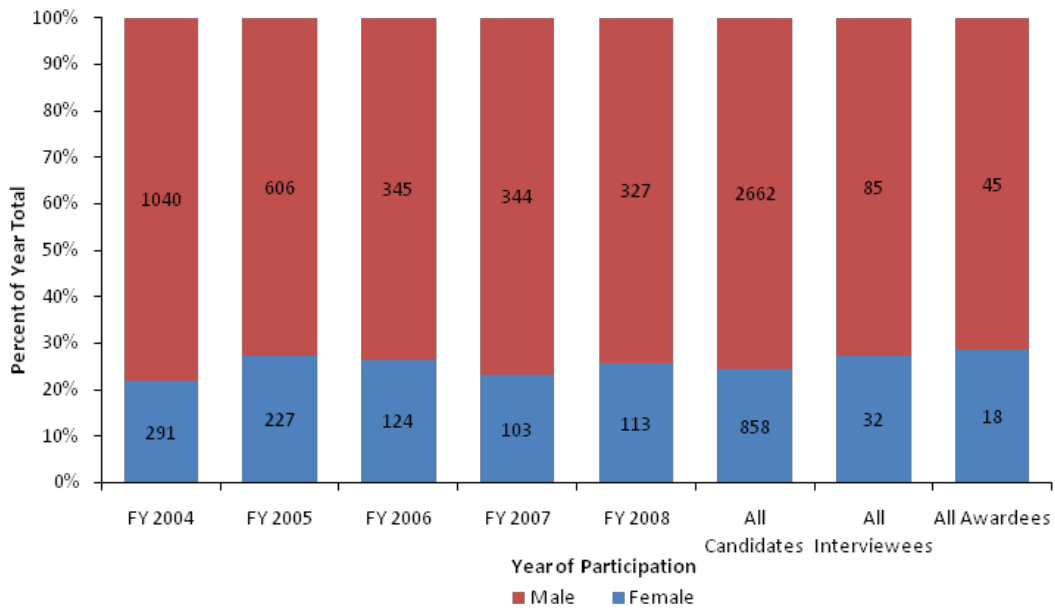
Exhibit F.2.
Participation Details for FY 2004–FY 2008 NDPA Candidates

Years of Participation	Number Unique Individual Participants	Number Unique Interviewees*	Number Unique Awardees
Year 1	1076	12	9
Year 2	521	14	12
Year 3	274	14	11
Year 4	236	13	5
Year 5	290	14	9
Years 1 and 2	119	7	1
Years 1 and 3	17	3	1
Years 1 and 4	22	2	1
Years 1 and 5	17	2	1
Years 2 and 3	50	3	1
Years 2 and 4	36	3	2
Years 2 and 5	13	1	1
Years 3 and 4	32	2	1
Years 3 and 5	16	1	1
Years 4 and 5	40	4	2
Years 1, 2, and 3	16	2	0
Years 1, 2, and 4	11	1	1
Years 1, 2, and 5	10	2	0
Years 1, 3, and 4	7	2	1
Years 1, 3, and 5	4	0	0
Years 1, 4, and 5	3	0	0
Years 2, 3, and 4	9	1	1
Years 2, 3, and 5	5	1	0
Years 2, 4, and 5	8	0	0
Years 3, 4, and 5	9	1	0
Years 1, 2, 3, and 4	11	1	0
Years 1, 2, 3, and 5	2	1	1
Years 1, 2, 4, and 5	6	1	0
Years 1, 3, 4, and 5	1	0	0
Years 2, 3, 4, and 5	7	2	0
Years 1, 2, 3, 4, and 5	9	3	1
Total Individual Participants	2877	113	63

*Four interviewees (including two awardees) have participated in the interview phase in 2 years.

Source: STPI Analysis of FY 2004–FY 2008 NDPA Administrative Data.

Exhibit F.3.
Gender Distribution of NDPA Candidates, FY 2004–FY 2008



Source: STPI Analysis of FY 2004- FY 2008 NDPA Administrative and IMPAC II Data.

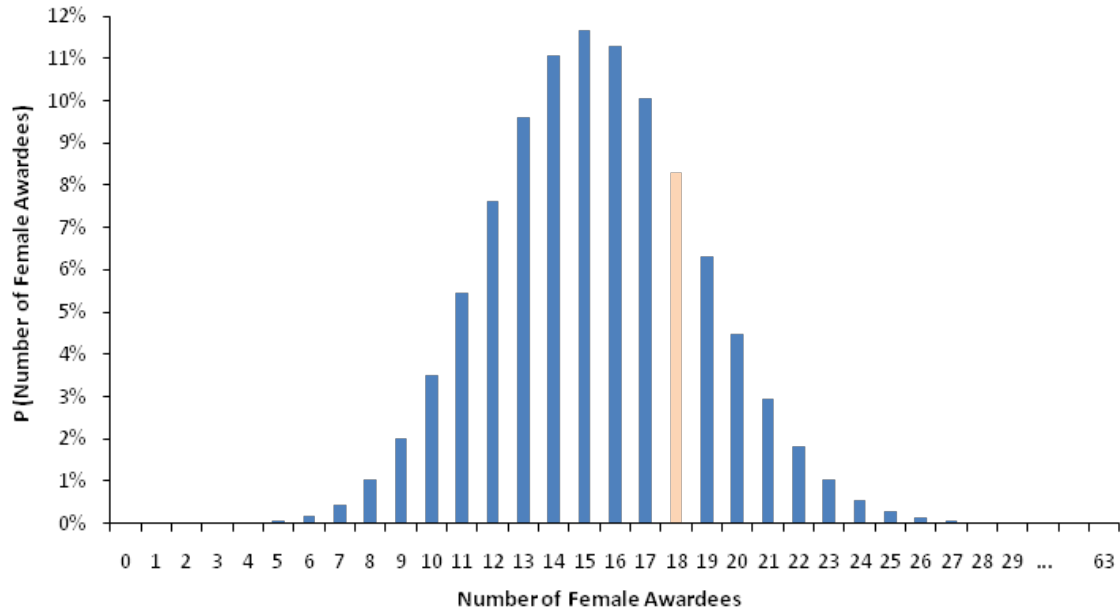
Exhibit F.4.
R01 Funding Distribution Based on Gender

Year	Female				Male			
	Number R01s Awarded*	Percent of Total R01s	Total Dollars Awarded	Percent of Total Dollars	Number R01s Awarded	Percent of Total R01s	Total Dollars Awarded	Percent of Total Dollars
FY 2000	5,237	22%	\$1,568,687,923	23%	18,581	78%	\$5,343,220,926	77%
FY 2001	5,715	23%	\$1,817,906,403	23%	19,619	77%	\$5,992,425,941	77%
FY 2002	6,070	23%	\$2,032,448,314	24%	20,478	77%	\$6,610,272,576	76%
FY 2003	6,543	24%	\$2,277,580,489	24%	21,138	76%	\$7,110,103,865	76%
FY 2004	6,860	24%	\$2,447,580,574	25%	21,470	76%	\$7,435,993,515	75%
Total	30,425	23%	\$10,144,203,703	24%	101,286	77%	\$32,492,016,823	76%

**The statistic includes both new and continuing awards.*

Source: http://grants2.nih.gov/grants/policy/sex_gender/q_a.htm#q9.

Exhibit F.5.**Binomial Distribution of Expected Number of Female NDPA Awardees Given the Percentage of Female Candidates, FY 2004–FY 2008**

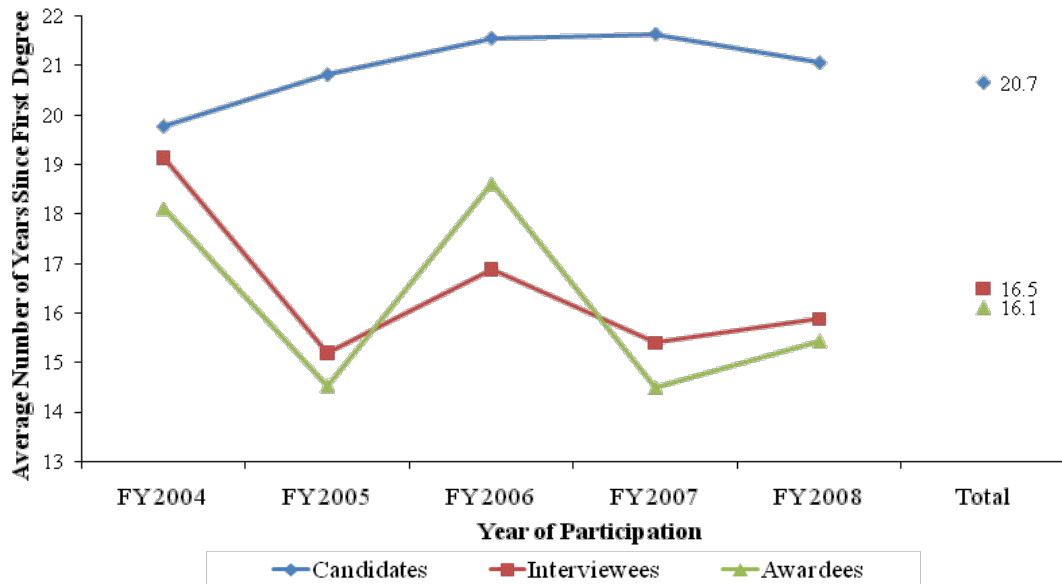


Note: The binomial distribution measures the probability of the number of female awardees given the total five year Male/Female ratio of NDPA candidates.

Source: STPI Analysis of FY 2004–FY 2008 NDPA Administrative and IMPAC II Data.

Exhibit F.6.

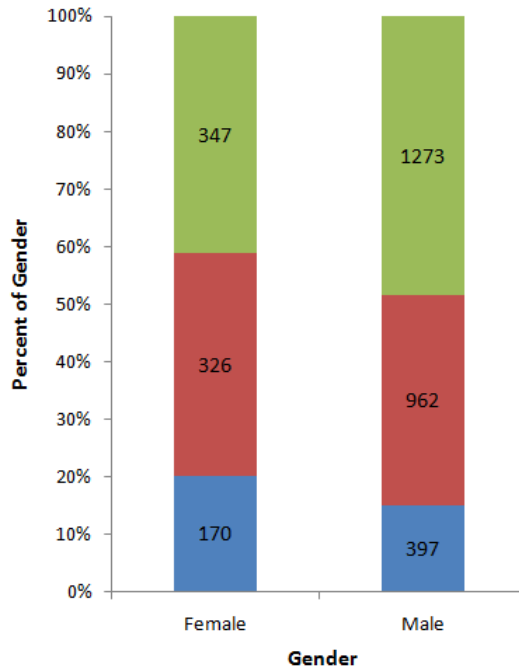
Average Seniority (Years since First Doctorate) of NDPA Candidates, FY 2004–FY 2008



Note: Averages based on available data only. “Early-career:” ≤ 10 years of experience, “mid-career:” between 10 and 20 years of experience, and “senior:” ≥ 20 years of experience.

Source: STPI Analysis of FY 2004–FY 2008 NDPA Administrative and IMPAC II Data.

Exhibit F.7.
Seniority Distribution of NDPA Candidates by Gender, FY 2004–FY 2008



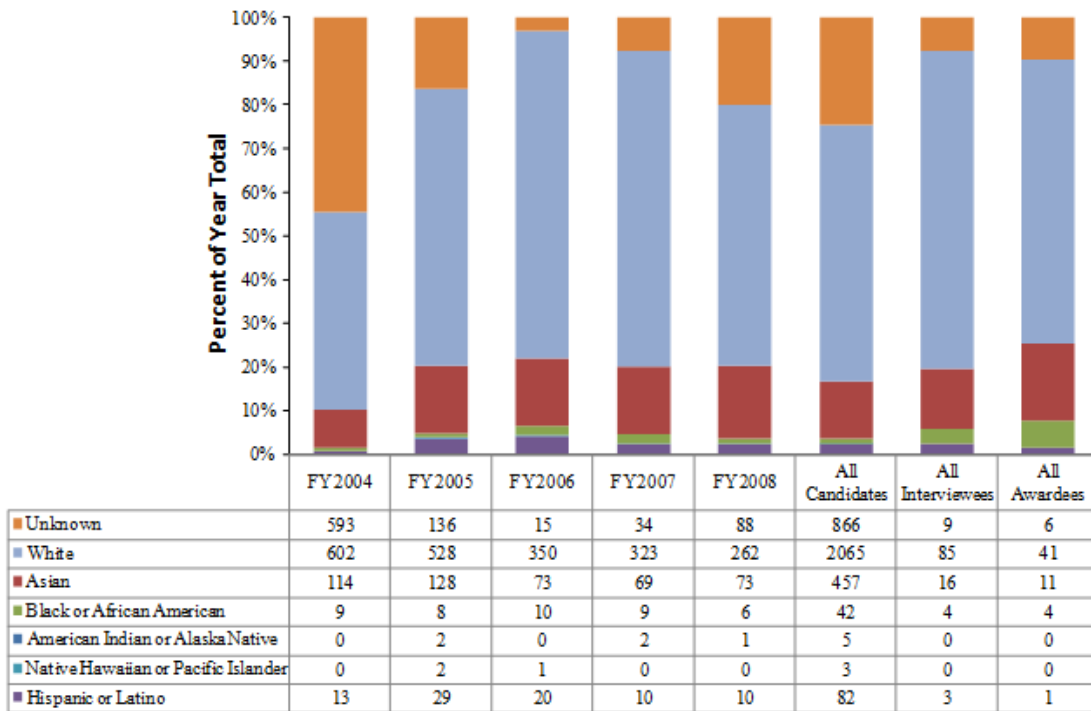
■ "Early-Career" Investigators ■ "Mid-Career" Investigators
 ■ "Senior" Investigators

Note: "Early-Career:" ≤ 10 years since first doctorate, "Mid-Career:" between 10 and 20 years, and "Senior:" ≥ 20 years. Numbers and percentages in this exhibit exclude candidates with no doctorate, and are based on available data only; therefore, the column totals do not sum exactly to the total number of candidates.

Source: STPI Analysis of FY 2004–FY 2008 NDPA Administrative and IMPAC II Data.

Exhibit F.8.

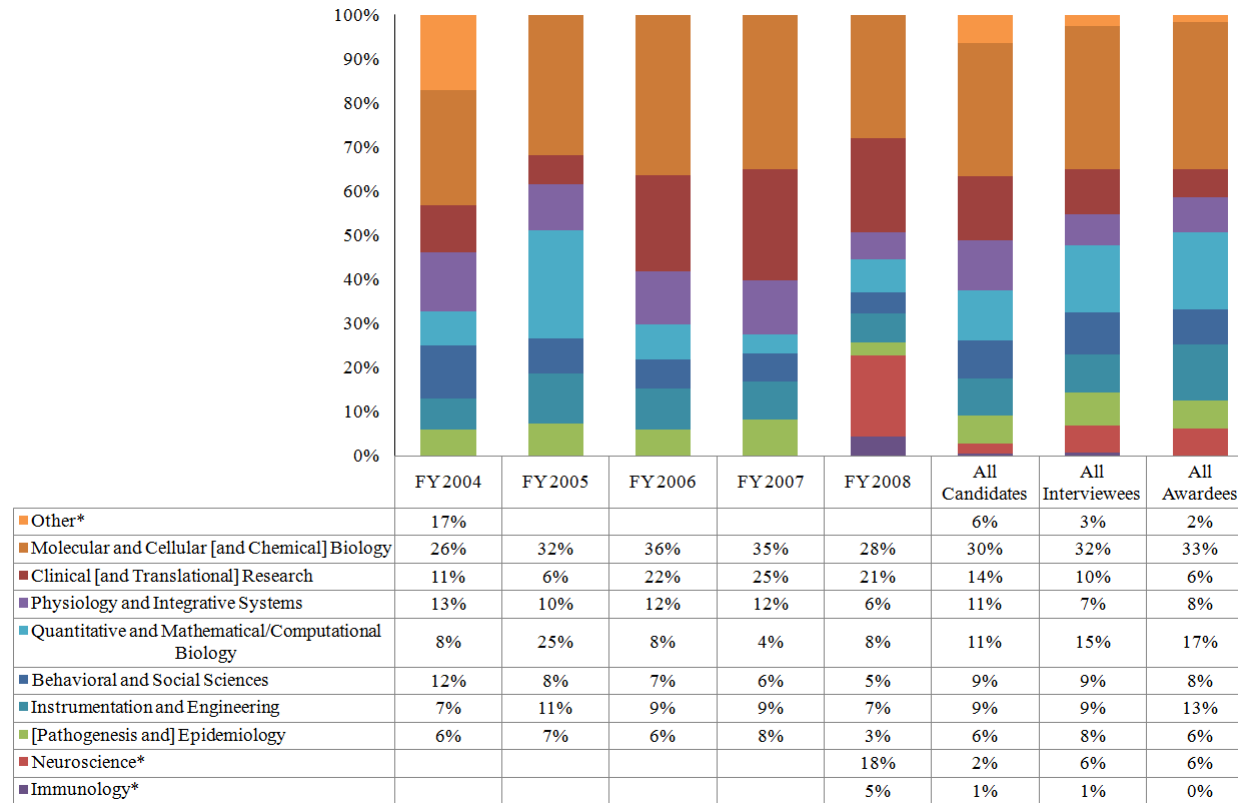
Race/Ethnicity of NDPA Candidates by Year, FY 2004–FY 2008



Note: Race/ethnicity data were available for 2,654 of the 3,520 candidates.

Source: STPI Analysis of FY 2004–FY 2008 NDPA Administrative, IMPAC II, and Survey Data.

Exhibit F.9.
Research Area Distribution of NDPA Candidates by Year, FY 2004–FY 2008



Note: Bracketed portions of research area designations indicate that the designation changed from year to year. Similar research areas from different years were grouped together for the NDPA submission and review processes, and, as such, are treated similarly in this report. The “Other” designation was a standalone choice only in FY 2004; in FY 2005, candidates could designate a secondary “Other” category, in addition to one of the seven other choices, to add more description (these descriptions are omitted here for the purpose of clarity). The “Other” category was eliminated beginning in FY 2006.

*The Neuroscience and Immunology areas were new designations added in FY 2008.

Source: STPI Analysis of FY 2004–FY 2008 NDPA Administrative Data.

Exhibit F.10.**Top 10 Most Common Institutional Affiliations of FY 2004–FY 2008 NDPA Candidates**

Institutional Affiliation	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	Total Candidates	Total Awardees	% Total Candidates	% Total Awardees
Harvard University	90	64	26	36	47	263	12	7%	19%
Stanford University	40	20	15	12	26	113	10	3%	16%
Johns Hopkins University	31	20	14	13	8	86	1	2%	2%
Columbia University	27	14	12	8	14	75	1	2%	2%
University of Pennsylvania	23	22	9	5	12	71	1	2%	2%
University of Washington	24	23	7	10	6	70	2	2%	3%
University of California San Francisco	20	12	9	11	8	60	1	2%	2%
University of California Los Angeles	23	17	9	4	6	59	0	2%	0%
University of Michigan	30	10	5	6	8	59	0	2%	0%
Yale University	26	10	5	7	6	54	0	2%	0%
Total from Top Ten	334	212	111	112	141	910	28		
Percent of Candidates from Top 10	25%	25%	24%	25%	32%	26%	44%		

Note: Institutional affiliations are generalized and include affiliated hospitals and research centers in addition to the central university. It also should be noted that the affiliations account for the researchers' location at the time of applying for the NDPA. For instance, at the time of the award, one individual was at California Institute of Technology, but moved to Stanford shortly after receiving the award – this individual is listed as affiliated with the California Institute of Technology.

Source: STPI Analysis of FY 2004–FY 2008 NDPA Administrative Data.

Exhibit F.11.**Institutional Affiliations of FY 2004–FY 2008 NDPA Awardees**

Institutional Affiliation	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	All Years	% Total Candidates	% Total Awardees
Harvard University	2	1	1	3	5	12	7.5%	19%
Stanford University		3	3	2	2	10	3.2%	16%
Massachusetts Institute of Technology			2		3	5	1.5%	8%
California Institute of Technology	2				1	3	0.7%	5%
Brandeis University	1			1		2	0.3%	3%
Duke University	1	1				2	1.3%	3%
Northwestern University	1				1	2	0.8%	3%
University of Chicago				2		2	1.2%	3%
University of Texas	1		1			2	0.5%	3%
University of Washington			1	1		2	2.0%	3%
Boston College				1		1	0.2%	2%
Boston University				1		1	0.9%	2%
Brookings Institution					1	1	0.0%	2%
Cold Spring Harbor Laboratory		1				1	0.5%	2%
Columbia University				1		1	2.1%	2%
Johns Hopkins University		1				1	2.4%	2%
New York University			1			1	1.0%	2%
Princeton University					1	1	0.6%	2%
Rockefeller University		1				1	1.0%	2%
Scripps Research Institute		1				1	0.8%	2%
University of Arizona		1				1	0.4%	2%
University of California Berkeley			1			1	1.0%	2%
University of California San Francisco	1					1	1.5%	2%
University of California Santa Barbara		1				1	0.4%	2%
University of Cambridge		1				1	0.1%	2%
University of Massachusetts at Amherst			1			1	0.1%	2%
University of North Carolina			1			1	0.4%	2%
University of Pennsylvania					1	1	2.0%	2%
University of Pittsburgh					1	1	0.4%	2%
University of Texas, Health Science Center at Houston			1			1	0.3%	2%
University of Wisconsin, Madison		1				1	1.1%	2%
Grand Total	9	13	13	12	16	63	35.9%	100%

Note: At the time of the award, one individual was at California Institute of Technology, but moved to Stanford shortly after receiving the award.

Source: STPI analysis of FY 2004–FY 2008 Administrative Data.

Exhibit F.12.**Funding Details of FY 2004–FY 2008 NDPA Applicants and Awardees**

Funding History	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008
<i>All applicants*</i>					
Number (percentage) of <i>applicants</i> who had a minimum of one NIH award as a PI in the 5 years preceding their NDPA application	187 (78%)	226 (80%)	309 (76%)	355 (79%)	352 (80%)
Average number of competing grants won per <i>applicant</i> in the 5 years preceding their NDPA application (of the applicants with a minimum of one NIH award in the last 5 years)	2.5	2.2	2.0	2.1	2.0
Average direct cost of total NIH funding per <i>applicant</i> in the 5 years preceding NDPA (in million dollars) (of the applicants with a minimum of one NIH award in the last 5 years)	\$2.4	\$2.4	\$2.2	\$2.1	\$2.1
<i>Awardees</i>					
Number (percentage) of <i>awardees</i> who had a minimum of one NIH award as a PI in the 5 years preceding their NDPA grant	7 (78%)	11 (85%)	11 (85%)	9 (75%)	12 (75%)
Average number of competing grants won per <i>awardee</i> in the 5 years preceding their NDPA grant (of the awardees with a minimum of one NIH award in the last 5 years)	2.0	2.2	2.5	2.1	1.8
Average direct cost of total NIH funding per <i>awardee</i> in the 5 years preceding NDPA (in million dollars) (of the awardees with a minimum of one other NIH award in the last 5 years)	\$2.8	\$1.7	\$2.0	\$2.2	\$2.1

**Not all of the candidates in FY 2004 and FY 2005 were entered into IMPAC II; the analysis therefore only considered applicants (those whose applications were reviewed by external evaluators).*

Source: STPI Analysis of FY 2004–FY 2008 NDPA Administrative Data and IMPAC II Data.

Appendix G: Candidate Survey Responses

Exhibit G.1.

Previous Application for an NIH Award or Grant as Principal Investigator (PI) or Co-PI

Response	FY 2004		FY 2005		FY 2006		FY 2007		FY 2008		Candidates		Interviewees		Awardees	
Yes	279	87%	336	80%	273	83%	213	90%	207	87%	1308	85%	35	90%	50	96%
No	37	12%	35	8%	14	4%	10	4%	21	9%	117	8%	1	3%	2	4%
Don't Know	4	1%	2	0%	1	0%	N/A	N/A	N/A	N/A	7	0%	0	0%	0	0%
No Response	0	0%	47	11%	42	13%	14	6%	11	5%	114	7%	3	8%	0	0%
Total	320		420		330		237		239		1546		39		52	

Note: Survey respondents were not able to answer "Don't Know" after FY 2006.

Source: STPI Analysis of Survey Data, FY 2004–FY 2008.

Exhibit G.2.

Self-Reported Percentage of Total Funding Received from NIH in Past 5 Years

% NIH Funding	FY 2004		FY 2005		FY 2006		FY 2007		FY 2008		Candidates		Interviewees		Awardees	
0%	36	11%	64	15%	35	11%	29	12%	28	12%	192	12%	4	10%	5	10%
1-24%	24	8%	41	10%	37	11%	21	9%	19	8%	142	9%	6	15%	7	13%
25-49%	71	22%	55	13%	40	12%	40	17%	27	11%	233	15%	7	18%	7	13%
50-74%	65	20%	100	24%	77	23%	66	28%	77	32%	385	25%	10	26%	21	40%
75-100%	124	39%	123	29%	99	30%	74	31%	80	33%	500	32%	11	28%	12	23%
No Response	0	0%	37	9%	42	13%	7	3%	8	3%	94	6%	1	3%	0	0%
Total with some amount of NIH funding	284	89%	319	76%	253	77%	201	85%	203	85%	1260	82%	34	87%	47	90%
Total	320		420		330		237		239		1546		39		52	

Note: The total with some amount of funding was calculated from the total number of respondents; some survey respondents left this question blank.

Source: STPI Analysis of Survey Data, FY 2004–FY 2008.

Exhibit G.3.

Percentage of Candidates with Self-Reported Funding from NIH and Other Sources in Past 5 Years

% Funding	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008
National Institutes of Health	89%	76%	77%	85%	85%
Hospitals, Universities, or other Non-Profit Institutions	47%	47%	41%	44%	52%
Foundations	45%	43%	40%	46%	42%
Other US Government Sources	44%	39%	34%	35%	32%
For-Profit Companies	27%	26%	24%	25%	20%
Other	32%	11%	11%	35%	14%

Note: Since some respondents left this question blank or made more than a single selection, the columns do not sum to 100%.

Source: STPI Analysis of Survey Data, FY 2004–FY 2008.

Exhibit G.4.
Likelihood of NDPA Project Being it Funded by Others

Likelihood of Funding	FY 2004		FY 2005		FY 2006		FY 2007		FY 2008		Applicants		Interviewees		Awardees	
Very Unlikely	4	44%	137	33%	98	30%	93	39%	105	44%	437	35%	14	50%	27	52%
Somewhat Unlikely	4	44%	133	32%	89	27%	62	26%	68	28%	356	29%	4	14%	16	31%
Somewhat Likely	1	11%	74	18%	65	20%	48	20%	40	17%	228	18%	7	25%	6	12%
Very Likely	0	0%	38	9%	40	12%	28	12%	22	9%	128	10%	2	7%	3	6%
No Response	0	0%	38	9%	38	12%	6	3%	4	2%	86	7%	1	4%	0	0%
Total	9		420		330		237		239		1235		28		52	

Source: STPI Analysis of Survey Data, FY 2004–FY 2008.

Exhibit G.5.
Characterization of NDPA Project

Statements about Research	FY 2005		FY 2006		FY 2007		FY 2008		Candidates		Interviewees		Awardees	
My research involved a unique and unprecedented combination of perspectives, disciplines, or approaches	303	72%	246	75%	194	82%	194	81%	937	76%	27	96%	37	86%
One or more of the fundamental ideas underlying my proposed research were at odds with prevailing wisdom	196	47%	156	47%	119	50%	112	47%	583	48%	10	36%	16	37%
My proposed research required knowledge of fields beyond my previously demonstrated area of expertise	158	38%	147	45%	103	43%	119	50%	527	43%	18	64%	32	74%
My proposed research required use of equipment or techniques that have not been proven or are extraordinarily difficult	132	31%	93	28%	80	34%	83	35%	388	32%	14	50%	29	67%
None of these statements is true of my proposed research	8	2%	0	0%	10	4%	3	1%	21	2%	0	0%	0	0%
Total	420		330		237		239		1546		39		52	

Note: Respondents were allowed to make more than a single selection, and percentages were calculated using the total number of survey respondents as the denominator. Therefore the column totals do not sum to the number of survey respondents in that year.

Source: STPI Analysis of Survey Data, FY 2005–FY 2008.

Exhibit G.6.
Plans to Reapply to the NDPA Program in Future Years

Plan to Reapply	FY 2006		FY 2007		FY 2008		Candidates		Interviewees	
Yes	175	55%	112	49%	115	51%	402	52%	14	70%
No	102	32%	110	48%	101	44%	313	40%	4	20%
No Response	41	13%	7	3%	11	5%	59	8%	2	10%
Total	318		229		227		774		20	

Note: This question was only asked of unfunded applicants.

Source: STPI Analysis of Survey Data, FY 2006–FY 2008.

Exhibit G.7.
Reasons for Not Reapplying to the NDPA Program in Future Years

Reason for Not Reapplying	FY 2005	FY 2006	FY 2007	FY 2008
The program fails to fund innovators; the awardees are not pioneers. There are discrepancies between the purpose of the program, and the outcomes.	14%	8%	7%	3%
The selection process is biased in some way (towards or against women, minorities, junior/senior investigators; towards top universities; towards particular research areas; favors PhDs, etc).	32%	49%	31%	20%
The chance of success is too low to warrant the time and effort to reapply; the program is the equivalent of winning the lottery.	17%	14%	23%	9%
I/my idea was not what the NDPA was looking for.	12%	9%	7%	4%
My idea is too high-risk to be funded by this program.	6%	2%	1%	1%
The program is funding the “already well-funded” — established researchers, who are working on extensions of previous projects, and not new ideas. The selection is based more on reputation and academic pedigrees than on innovation.	12%	9%	13%	12%
I did not receive any feedback, and the program lacks transparency. The selection process is arbitrary and not necessarily based on innovation or high-risk, high-reward research.	28%	41%	40%	39%
I do not want to trouble my colleagues/senior investigators to write more letters of reference.	7%	8%	5%	4%
I have received or I have applied for an alternative source of funding.	2%	6%	7%	7%
Other	9%	9%	7%	5%
Total	167	102	110	101

Note: Percentages are calculated using the number of people who answered “No” to the question in Exhibit G.6 as the denominator. Some respondents made comments that fell into more than one coded category; therefore the columns do not sum to the total number of respondents.

Source: STPI Analysis of Survey Data, FY 2005–FY 2008.

Exhibit G.8.
Extent of Changes Expected to NDPA Project in Future Years

Change in Idea	FY 2006		FY 2007		FY 2008		Candidates		Interviewees	
The basic idea I will propose will remain the same	33	19%	25	22%	19	17%	77	19%	1	7%
I will make minor changes to the basic idea I proposed	36	21%	36	32%	45	39%	117	29%	6	43%
I will make substantial changes to the basic idea I proposed	29	17%	33	29%	36	31%	98	24%	5	36%
I will submit a completely different idea	12	7%	18	16%	15	13%	45	11%	2	14%
No Response	65	37%	0	0%	0	0%	65	16%	0	0%
Total	175		112	100%	115	100%	402	100%	14	

Source: STPI Analysis of Survey Data, FY 2006–FY 2008.

Exhibit G.9.
Where Applicants Heard about the NDPA Program

Source*	FY 2004		FY 2005		FY 2006		FY 2007		FY 2008		Candidates	
From Nominator	49	15%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	49	3%
Word of Mouth	41	13%	121	29%	104	32%	73	31%	66	28%	405	26%
NDPA Website	25	8%	96	23%	81	25%	57	24%	55	23%	314	20%
Do Not Recall	65	20%	57	14%	27	8%	32	14%	35	15%	216	14%
Departmental Flyer or Announcement	63	20%	56	13%	56	17%	48	20%	57	24%	280	18%
Journal	23	7%	47	11%	27	8%	33	14%	8	3%	138	9%
Federal Register	14	4%	29	7%	22	7%	18	8%	25	10%	108	7%
Other Website	0	0%	16	4%	17	5%	12	5%	12	5%	57	4%
Other	12	4%	0	0%	0	0%	0	0%	30	13%	42	3%

**Some respondents made more than a single selection, therefore the columns do not sum to the total number of survey respondents in that year. Percentages by statement are calculated using the total number of respondents as the denominator. The nomination phase was eliminated after FY2004.*

Source: STPI Analysis of Survey Data, FY 2004–FY 2008.

Exhibit G.10.
Research Areas Listed in Classifying NDPA Project Were Adequate

Response	FY 2004		FY 2005		FY 2006		FY 2007		FY 2008		Candidates		Interviewees		Awardees	
Yes	179	66%	262	62%	232	70%	171	72%	165	69%	1009	67%	22	76%	31	67%
No	74	27%	114	27%	60	18%	60	25%	65	27%	373	25%	7	24%	15	33%
No Response	17	6%	44	10%	38	12%	6	3%	9	4%	114	8%	0	0%	0	0%
Total	270		420		330		237		239		1496		29		46	

Source: STPI Analysis of Survey Data, FY 2004–FY 2008.

Exhibit G.11.**Criteria for Selecting Scientists of Exceptional Creativity/Innovative Approaches Were Adequate and Appropriate**

Response	FY 2004		FY 2005		FY 2006		FY 2007		FY 2008		Candidates		Interviewees		Awardees	
Completely disagree	15	5%	39	9%	32	10%	26	11%	29	12%	141	9%	3	8%	3	6%
Somewhat disagree	11	3%	86	20%	65	20%	40	17%	36	15%	238	15%	3	8%	0	0%
Somewhat agree	109	34%	165	39%	122	37%	90	38%	97	41%	583	38%	12	31%	12	23%
Completely agree	168	53%	78	19%	69	21%	69	29%	63	26%	447	29%	20	51%	35	67%
No Response	17	5%	52	12%	42	13%	12	5%	14	6%	137	9%	1	3%	2	4%
Total	320	100%	420	100%	330	100%	237	100%	239	100%	1546	100%	39	100%	52	100%

Source: STPI Analysis of Survey Data, FY 2004–FY 2008.

Exhibit G.12.**Opportunity to Display Qualifications in the Application Was Adequate**

Response	FY 2005		FY 2006		FY 2007		FY 2008		Candidates	
Completely disagree	27	6%	15	5%	8	3%	17	7%	67	5%
Somewhat disagree	91	22%	59	18%	44	19%	33	14%	227	19%
Somewhat agree	153	36%	133	40%	90	38%	95	40%	471	38%
Completely agree	95	23%	85	26%	84	35%	83	35%	347	28%
No Response	44	11%	38	12%	11	5%	11	5%	104	8%
Total	420	100%	330	100%	237	100%	239	100%	1226	100%

Source: STPI Analysis of Survey Data, FY 2005–FY 2008.

Exhibit G.13.**Invitation and Instructions about the Interview Were Clear**

Response	FY 2004		FY 2005		FY 2006		FY 2007		FY 2008		Interviewees		Awardees	
Completely disagree	6	30%	0	0%	6	27%	1	6%	0	0%	9	23%	4	8%
Somewhat disagree	0	0%	0	0%	3	14%	1	6%	5	25%	8	21%	1	2%
Somewhat agree	0	0%	4	31%	3	14%	3	19%	5	25%	8	21%	7	13%
Completely agree	13	65%	9	69%	10	45%	11	69%	10	50%	13	33%	40	77%
No Response	1	5%	0	0%	0	0%	0	0%	0	0%	1	3%	0	0%
Total	20	100%	13	100%	22	100%	16	100%	20	100%	39	100%	52	100%

Note: This question was only asked of interviewees and awardees.

Source: STPI Analysis of Survey Data, FY 2004–FY 2008.

Exhibit G.14.
Duration of the Interview Was Appropriate

Response	FY 2004		FY 2005		FY 2006		FY 2007		FY 2008		Interviewees		Awardees	
The interview was too long	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
The interview was about right	12	60%	7	54%	12	55%	5	31%	9	45%	16	41%	27	52%
The interview was too short	7	35%	6	46%	10	45%	11	69%	11	55%	22	56%	25	48%
No Response	1	5%	0	0%	0	0%	0	0%	0	0%	1	3%	0	0%
Total	20	100%	13	100%	22	100%	16	100%	20	100%	39	100%	52	100%

Note: This question was only asked of interviewees and awardees.

Source: STPI Analysis of Survey Data, FY 2004–FY 2008.

Exhibit G.15.
Interviewers Gave Chance to Convey and Adequately Understood Ideas

Response	FY 2004		FY 2005		FY 2006		FY 2007		FY 2008		Interviewees		Awardees	
Completely disagree	9	45%	1	7%	3	14%	3	19%	3	15%	18	46%	1	2%
Somewhat disagree	0	0%	4	27%	6	27%	2	13%	6	30%	12	31%	6	12%
Somewhat agree	0	0%	6	40%	6	27%	7	44%	7	35%	7	18%	19	37%
Completely agree	9	45%	4	27%	7	32%	4	25%	4	20%	1	3%	25	48%
No Response	2	10%	0	0%	0	0%	0	0%	0	0%	1	3%	1	2%
Total	20		15		22		16		20		39		52	

Note: This question was only asked of interviewees and awardees.

Source: STPI Analysis of Survey Data, FY 2004–FY 2008.

Exhibit G.16.

Comments and Suggestions for Future Years of the NDPA Program

Suggestions for Future Years	FY 2005	FY 2006	FY 2007	FY 2008
Feedback is needed; increase program transparency	33%	53%	52%	50%
Improve program implementation to support stated purpose and increase emphasis on high-risk, high-reward, over safe, 'normal science;' those who are truly attempting innovative work cannot be funded through this mechanism	31%	20%	16%	10%
The review process for NDPA is too similar to the traditional review structure, and discourages innovative science; this structure would never fund "Einstein"	14%	24%	15%	8%
NDPA is a great idea in concept and should be continued	13%	22%	10%	11%
Appreciated the short, online application	2%	2%	2%	1%
NDPA is funding the well-funded and well-connected; academic pedigree or being at a prestigious institution gives the investigator an advantage	13%	12%	6%	10%
The number of awards should be increased to maximize the impact of NDPA; maybe smaller grants should be awarded	7%	10%	7%	5%
Increase investment in clinical/translation research	7%	13%	10%	1%
The selection process is biased (towards/against minorities, females, seniority, particular research areas, etc.)	13%	23%	11%	9%
The review focus should be on the idea, not the investigator; the review process should be double-blinded	4%	2%	3%	1%
Program objectives need to be further clarified in the RFA (e.g. what is viewed as "pioneering," whether targeting junior or senior investigators, how research plan should be outlined, etc.)	2%	18%	5%	0%
Letters of reference were a burden; maybe request them at second stage of the application process, or keep them on file for reapplication, and for other NIH grants (i.e. R01)	5%	0%	1%	2%
This program should target new investigators	2%	7%	1%	2%
Other	13%	25%	17%	2%
Total Number of Respondents	167	102	110	101

Note: Some respondents made comments that fit into more than one coded category; percentages by statement are calculated using the total number of survey respondents as the denominator. The "Other" category includes various suggestions that were made in only 2 or fewer years. Suggestions in "Other" included: 51% commitment is unrealistic, Post the winning applications online for future reference, Adopt a multi-tiered format for awarding NDPA, with varying grant size, and Partner with businesses/philanthropists/foundations for an outside review perspective.

Source: STPI Analysis of Survey Data, FY 2005–FY 2008.

Exhibit G.17.

Rank of Importance of Each of the Application Materials

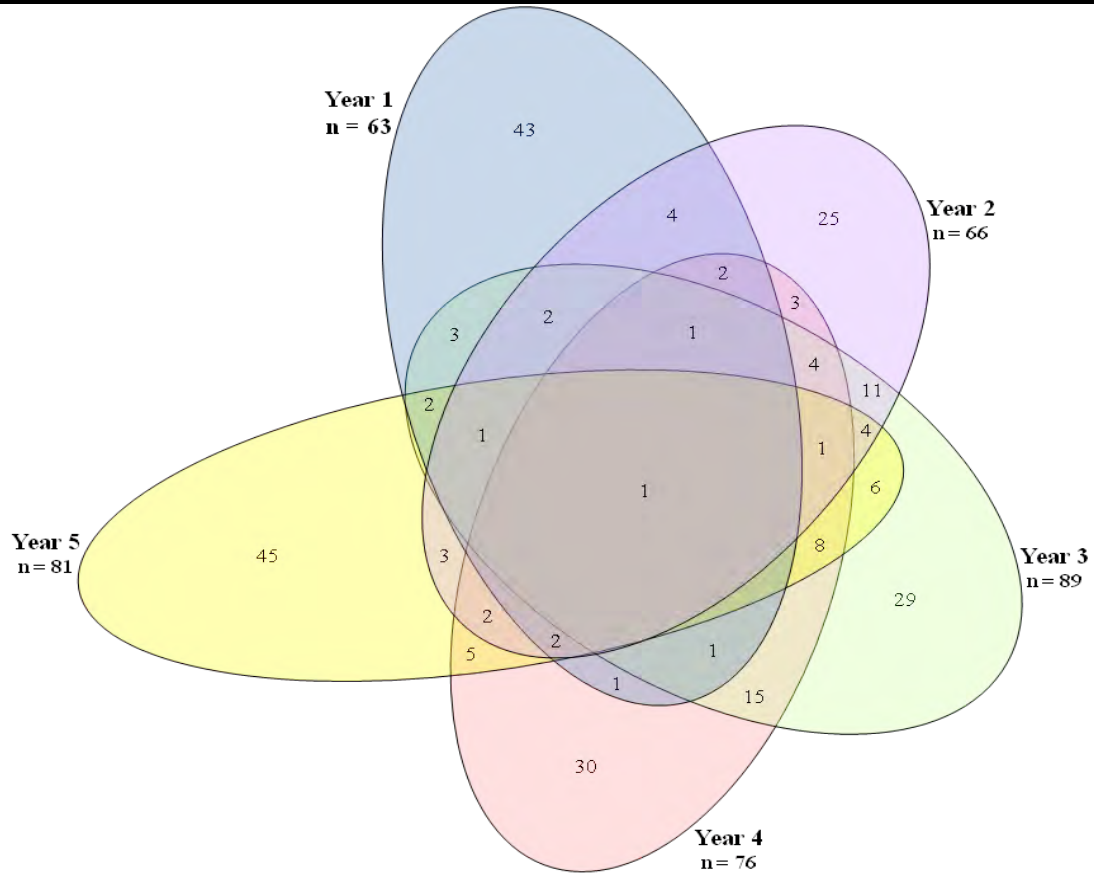
Application Material	Average Ranking on Scale of 1 to 6			
	FY 2006	FY 2007	FY 2008	FY 2006–FY 2008
3-5 Page Essay	5.4	5.4	5.5	5.4
Biographical Sketch	4.3	4.7	4.7	4.6
Current Support	2.7	3.1	3.0	2.9
Letters of Reference	4.5	4.4	3.0	4.0
Most Significant Accomplishment	4.1	4.6	4.5	4.4
300-Word Abstract	4.0	4.3	4.4	4.2
Total Number of Respondents	288	222	223	1101

Note: On a scale of 1 to 6, 1 being least important and 6 being most important.

Source: STPI Analysis of Survey Data, FY 2006–FY 2008.

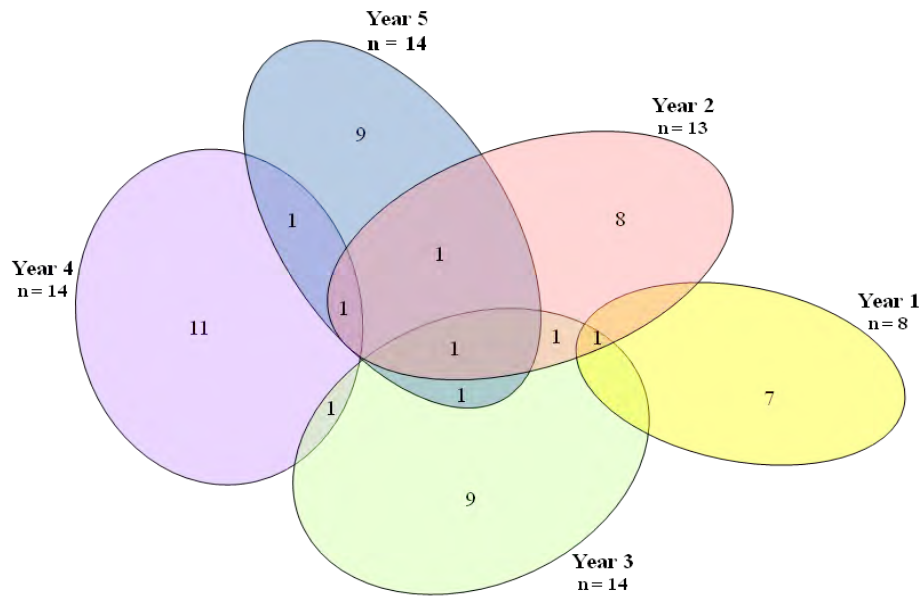
Appendix H: Characteristics of External Evaluators

Exhibit H.1.
FY 2004–FY 2008 Participation by External Evaluators in Multiple Years of Review



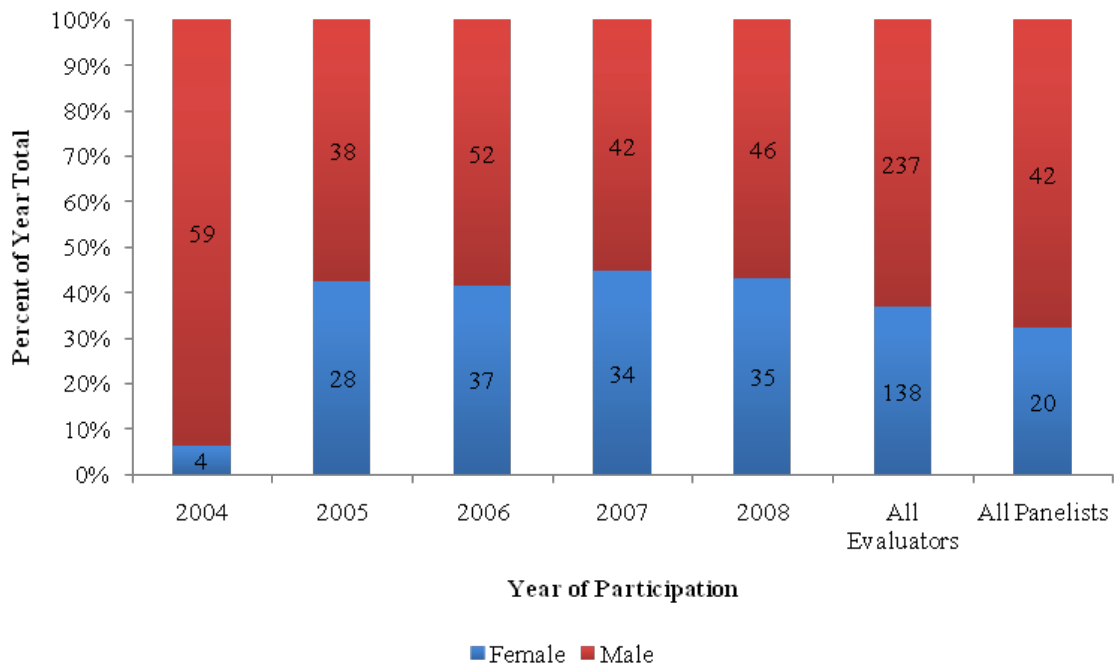
Source: STPI Analysis of FY 2004–FY 2008 NDPA External Evaluator Data.

Exhibit H.2.
FY 2004–FY 2008 Participation by Panelists in Multiple Years of Panel Review



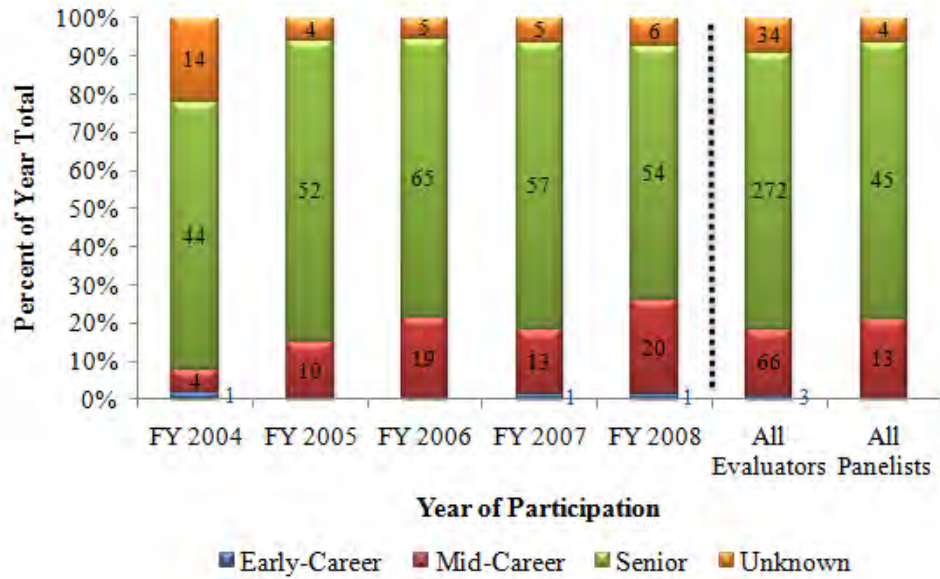
Source: STPI Analysis of FY 2004–FY 2008 NDPA External Evaluator Data.

Exhibit H.3.
Gender Distribution of External Evaluators, FY 2004–FY 2008



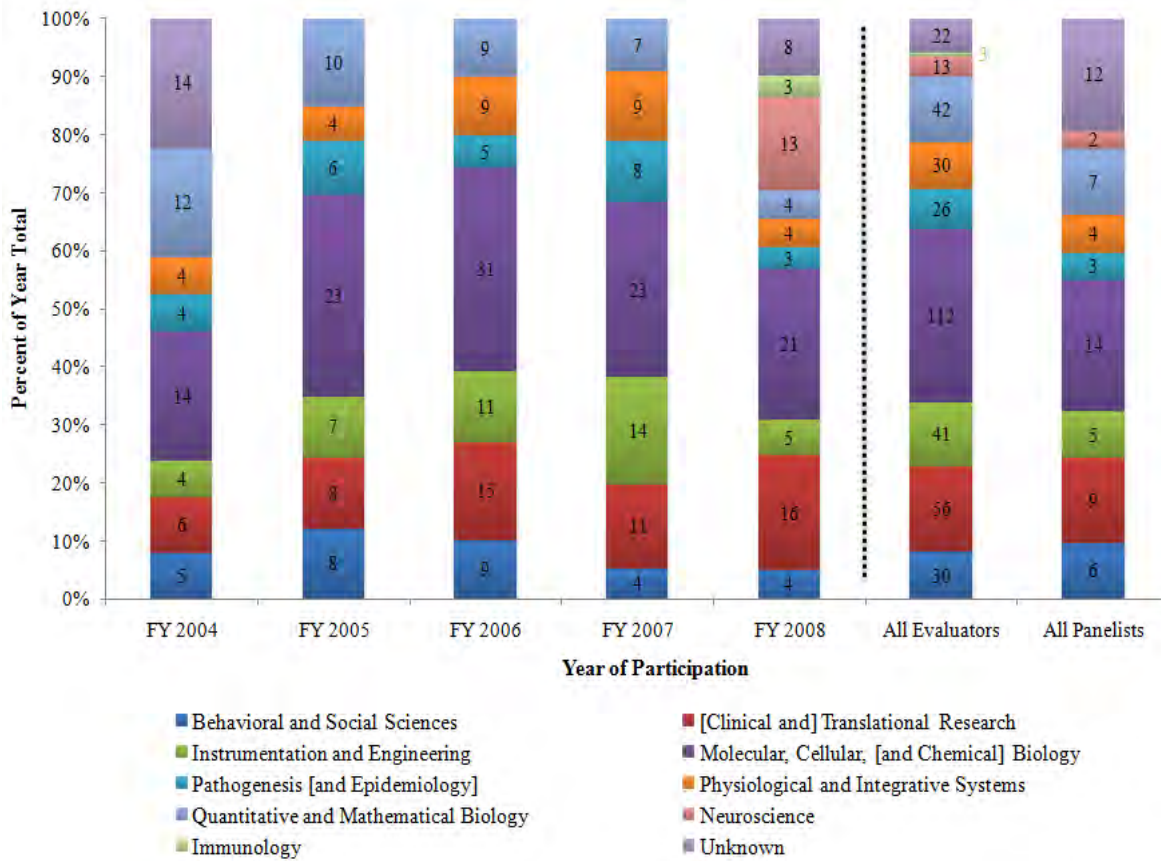
Source: STPI Analysis of FY 2004–FY 2008 NDPA External Evaluator Data.

Exhibit H.4.
Seniority Distribution of External Evaluators, FY 2004–FY 2008



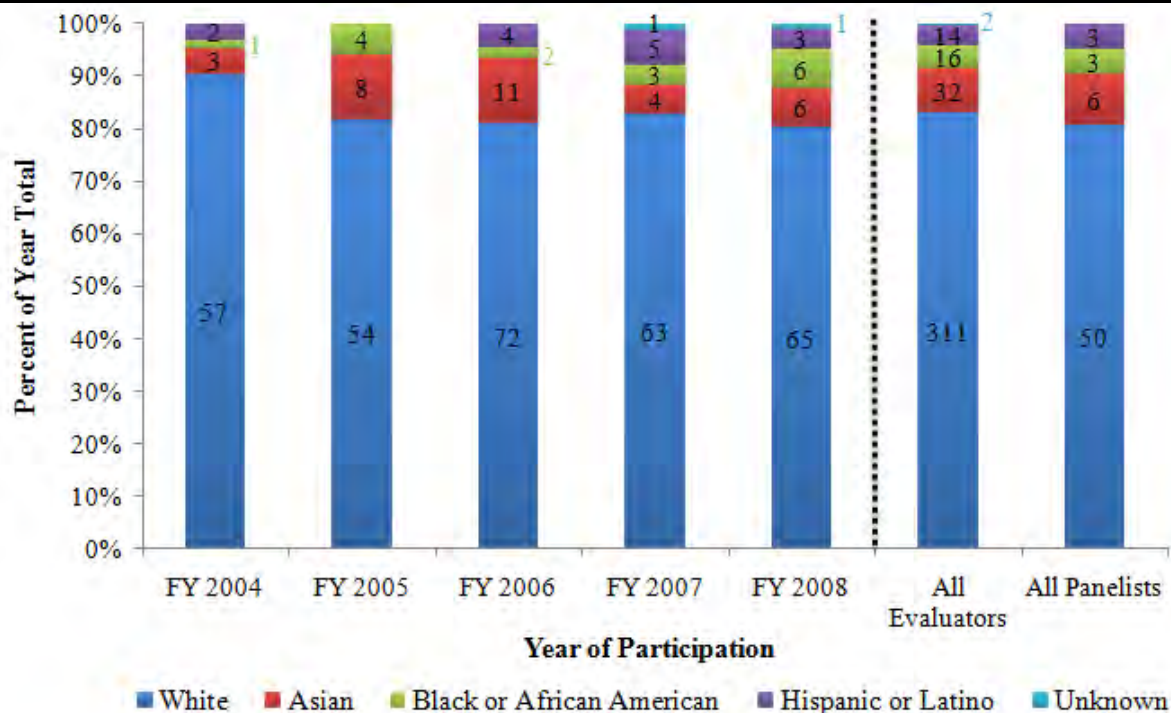
Source: STPI Analysis of FY 2004- FY 2008 NDPA External Evaluator Data.

**Exhibit H.5.
Research Areas of External Evaluators, FY 2004–FY 2008**



Note: Bracketed portions of research area designations indicate that the designation changed from year to year. Similar research areas from different years were grouped together for the NDPA submission and review processes, and, as such, are treated similarly in this report.
Source: STPI Analysis of FY 2004–FY 2008 NDPA External Evaluator Data.

Exhibit H.6.
Race/Ethnicity Distribution of External Evaluators, FY 2004–FY 2008



Source: STPI Analysis of FY 2004–FY 2008 NDPA External Evaluator Data.

Exhibit H.7.
NDPA External Evaluators: Prestigious Awards, Fellowships, or Honors; Leadership Positions at Their Institutions; or Scientific Journal Editors, FY 2004–FY 2008

Category	Number of Evaluators
Department Directors, Chairs, & Chiefs	149
NAS Members	92
HHMI Fellows	77
Scientific Journal Editors	36
NIH MERIT Awardees	22
Alfred P. Sloan Awardees	18
NDPA Awardees	15
Gairdner International Awardees	14
Royal Society of London	9
National Medal of Science Awardees	9
MacArthur Fellows	7
Nobel Laureates	7
Albert Lasker Awardees	5
Fulbright Fellows	4
Pew Scholars	3
Paul Ehrlich and Ludwig Darmstaedter Prize Awardees	3

Note: Awards based on information from evaluator websites; numbers likely an underestimate. An evaluator may fall into more than one category.

Source: STPI Analysis of FY 2004–FY 2008 NDPA External Evaluator Data.

Appendix I: Scoring Data

Exhibit I.1.

Correlations Between Individual Scores for Scientific Problem, Investigator, and Suitability, and Overall Score for a Given Application

	Overall	Scientific Problem	Investigator	Suitability
Overall	1	0.84	0.85	0.9
Scientific Problem	0.84	1	0.76	0.77
Investigator	0.85	0.76	1	0.78
Suitability	0.9	0.77	0.78	1

Note: Scores from FY 2004 are not included in this analysis because of the significantly different review criteria and scoring scale utilized in that year.

Source: STPI Analysis of FY 2005–FY 2008 NDPA External Evaluator Scoring Trends.

Exhibit I.2.

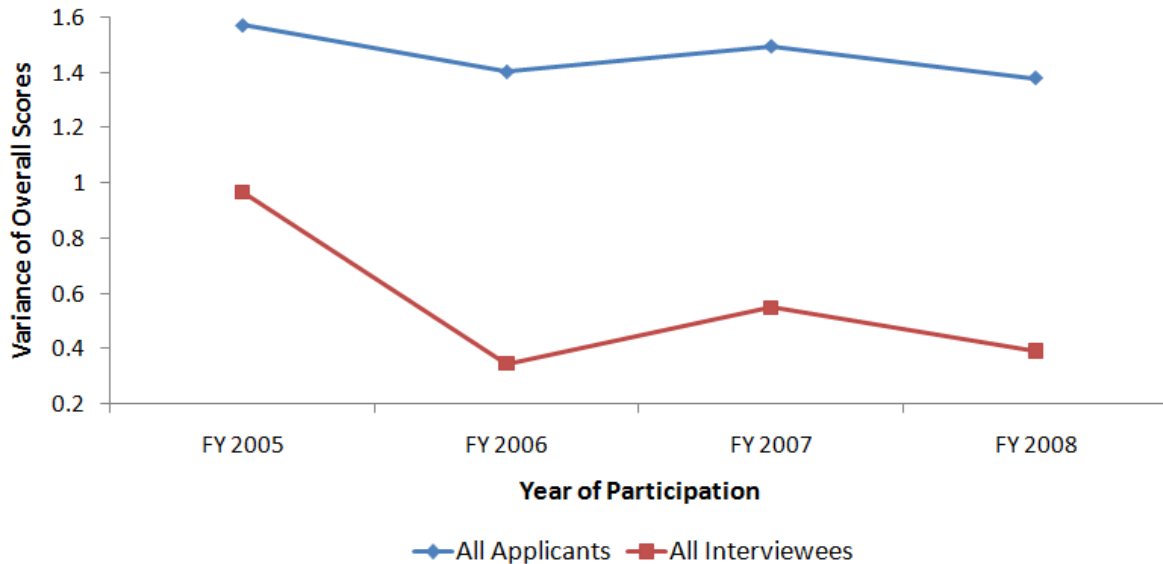
Summary of External Evaluator Scoring

(Phase 3 in FY 2004 and FY 2005, Phase 2 in FY 2006, Phase 1 in FY 2007 and FY 2008)

Year of Participation	Reviews per Evaluator	Average Overall Score for all Applicants	Range of Average Overall Scores by Evaluator
FY 2004	11 to 43	4.37 (\pm 1.73) on 7-point scale	2.8 to 6.3 on 7-point scale
FY 2005	21 to 25	3.06 (\pm 1.25) on 5-point scale	1.9 to 4.2 on 5-point scale
FY 2006	14 to 17	3.21 (\pm 1.18) on 5-point scale	2.3 to 4.5 on 5-point scale
FY 2007	17 to 22	3.15 (\pm 1.22) on 5-point scale	2.4 to 4.5 on 5-point scale
FY 2008	17 to 22	3.31 (\pm 1.17) on 5 point scale	1.8 to 4.3 on 5-point scale

Source: STPI Analysis of FY 2004–FY 2008 NDPA External Evaluator Scoring Trends.

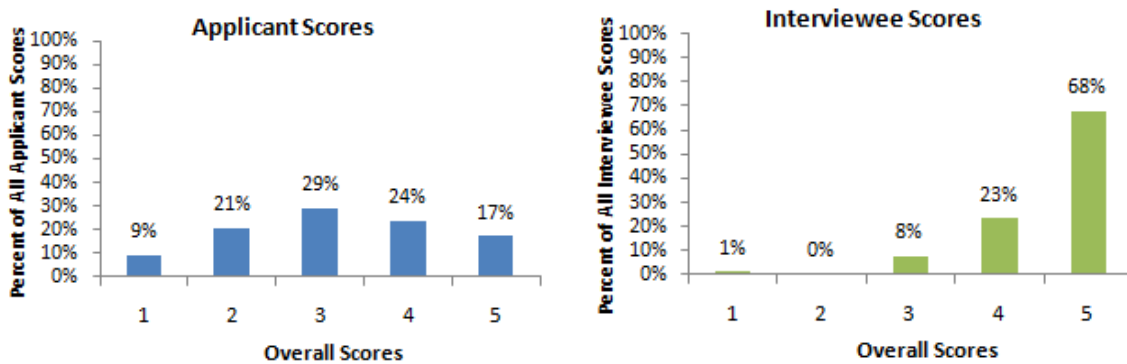
Exhibit I.3.
Variance in NDPA External Evaluator Scoring, FY 2005–FY 2008



Note: FY 2004 scores are not included in this analysis because of the different scoring scale in that year (7-point scale, versus 5-point scale in subsequent years). Analysis of FY 2005 scoring data along with comments shows that some evaluators mistakenly reversed the scoring scale, and this contributed to the markedly higher variance of interviewee scores in that year.

Source: STPI Analysis of FY 2005–FY 2008 NDPA External Evaluator Scoring Trends.

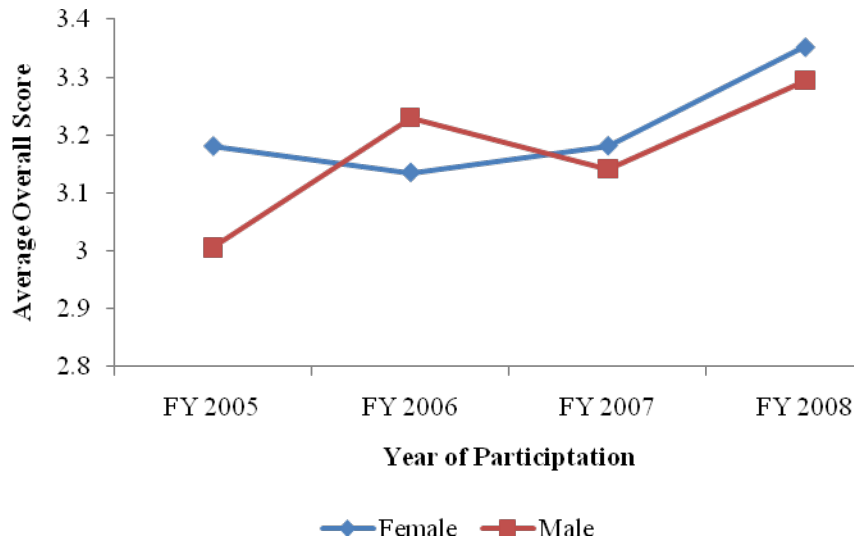
Exhibit I.4.
Score Distributions of Candidates and Interviewees, FY 2005–FY 2008



Note: FY 2004 scores are not included in this analysis because of the different scoring scale in that year (7-point scale, versus 5-point scale in subsequent years). Analysis of FY 2005 scoring data along with comments shows that some evaluators mistakenly reversed the scoring scale, and this contributed to the markedly higher variance of interviewee scores in that year.

Source: STPI Analysis of FY 2005–FY 2008 NDPA External Evaluator Scoring Trends.

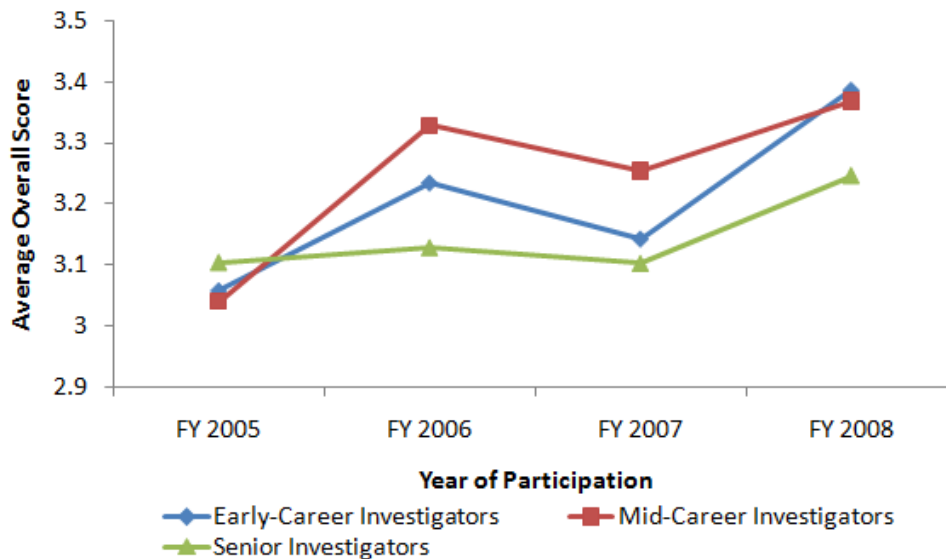
Exhibit I.5.
Average Overall Score of NDPA Applicants by Gender, FY 2005–FY 2008



Note: FY 2004 scores are not included in this analysis because of the different scoring scale in that year (7-point scale, versus 5-point scale in subsequent years).

Source: STPI Analysis of FY 2005–FY 2008 NDPA External Evaluator Scoring Trends.

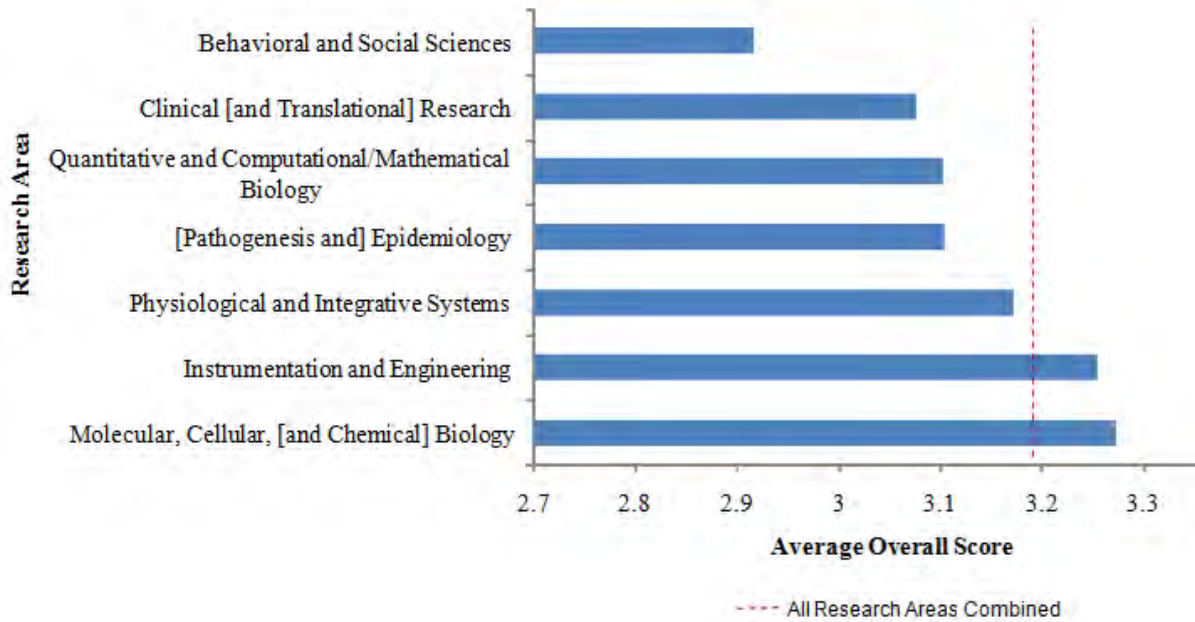
Exhibit I.6.
Average Overall Score of NDPA Applicants by Seniority, FY 2005–FY 2008



Note: FY 2004 scores are not included in this analysis because of the different scoring scale in that year (7-point scale, versus 5-point scale in subsequent years). “Early-Career:” ≤ 10 years since first doctorate, “Mid-Career:” between 10 and 20 years, and “Senior:” ≥ 20 years. Analysis excludes candidates with no doctorate, and is based on available data only.

Source: STPI Analysis of FY 2005–FY 2008 NDPA External Evaluator Scoring Trends.

Exhibit I.7.**Average Overall Scores of NDPA Applicants Based on Research Area, FY 2005–FY 2008**



Note: Bracketed portions of research area designations indicate that the designation changed from year to year. Similar research areas from different years were grouped together for the NDPA submission and review processes, and, as such, are treated similarly in this report. Immunology and Neuroscience research areas are excluded because they were added only in FY 2008. FY 2004 scores are not included in this analysis because of the different scoring scale in that year (7-point scale, versus 5-point scale in subsequent years). Broken red line represents average Overall Score of all research areas combined, which includes scores for research areas not shown here.

Source: STPI Analysis of FY 2005–FY 2008 NDPA External Evaluator Scoring Trends.

Exhibit I.8.

Summary of External Evaluator Scoring

(Phase 3 in FY 2004 and FY 2005, Phase 2 in FY 2006, Phase 1 in FY 2007 and FY 2008)

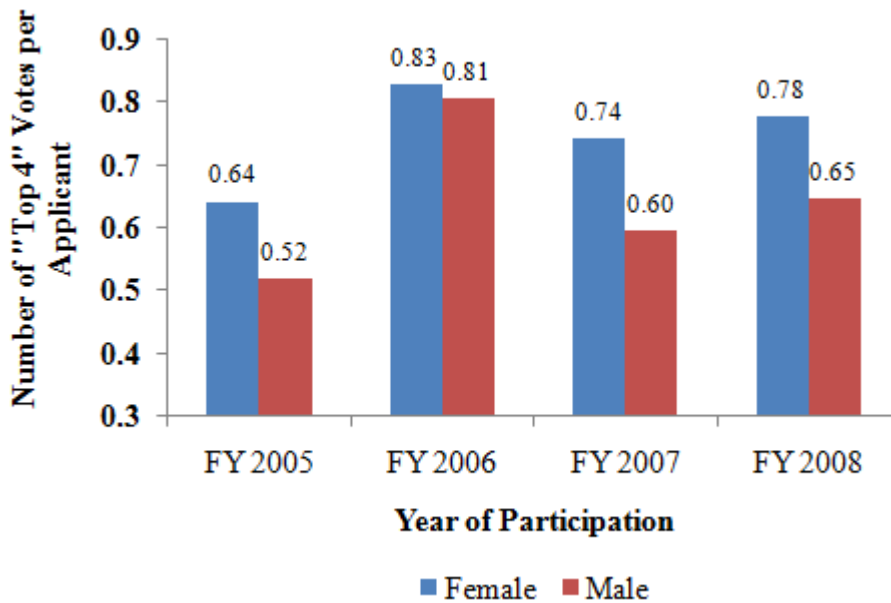
Year of Participation	Applicants with one "top-4" vote	Applicants with two "top-4" votes	Applicants with three "top-4" votes	Percent of Applicants with at Least 1 "top-4" Vote*
FY 2004	61 (8 interviewees; 2 awardees)	18 (11 interviewees; 6 awardees)	3 (3 interviewees; 1 awardee)	33%
FY 2005	101 (4 interviewees; 2 awardees)	18 (13 interviewees; 9 awardees)	3 (3 interviewees; 2 awardees)	43%
FY 2006	120 (0 interviewees; 0 awardees)	69 (12 interviewees; 4 awardees)	17 (13 interviewees; 9 awardees)	51%
FY 2007	139 (1 interviewees; 1 awardee)	54 (22 interviewees; 10 awardees)	6 (2 interviewee; 1 awardee)	45%
FY 2008	130 (4 interviewees; 2 awardees)	49 (10 interviewees; 6 awardees)	18 (11 interviewees; 8 awardees)	45%
Total	551 (17 interviewees, 7 awardees)	208 (68 interviewees, 35 awardees)	47 (32 interviewees, 21 awardees)	44%

**The total number of external evaluators increased after FY 2004, reaching its peak in FY 2006, and the evaluator-to-applicant ratio changed from year to year. Therefore, there were more "top-4" votes given from FY 2006 through FY 2008 than in FY 2004 or FY 2005.*

Source: STPI Analysis of FY 2004–FY 2008 NDPA External Evaluator Scoring Trends.

Exhibit I.9.

Number of "Top 4" Votes per Applicant Based on Gender, FY 2005–FY 2008

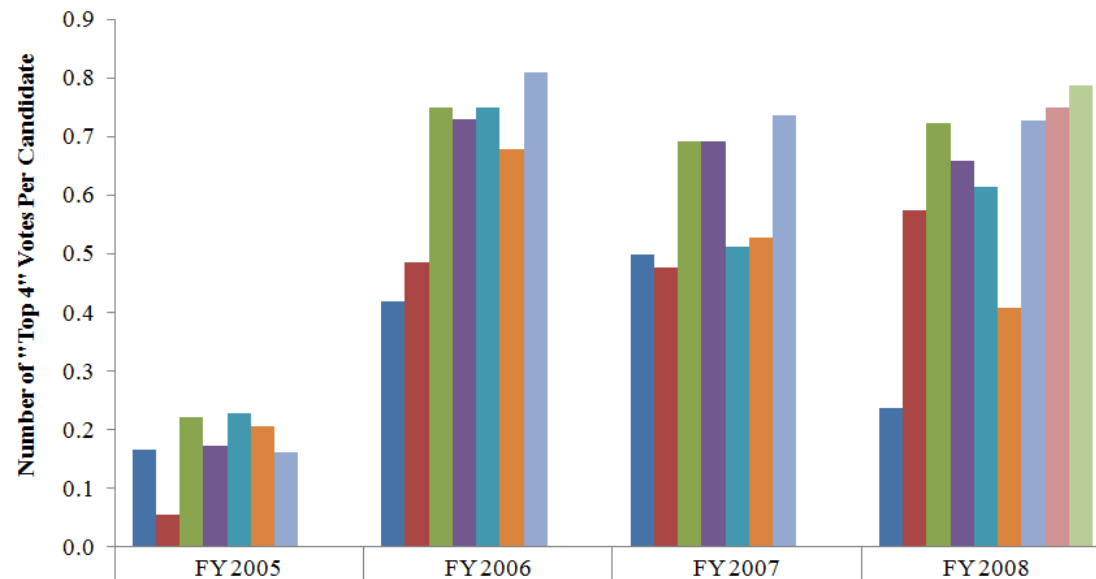


Note: The fluctuation in number of top 4 votes per applicant in different years is at least partly due to changes in the evaluator-to-applicant ratio. For example, in FY 2006, there were a greater number of evaluators reviewing a smaller number of applications, so more top 4 votes were given overall. Thus, the comparison of top 4 votes received based on gender is a more important aspect of this graph than comparison between years. Because of the extremely small evaluator-to-applicant ratio in FY 2004, that data was excluded from this analysis.

Source: STPI Analysis of FY 2005–FY 2008 NDPA External Evaluator Scoring Trends.

Exhibit I.10.

Number of "Top 4" Votes per Candidate by Research Area, FY 2005–FY 2008



	FY 2005	FY 2006	FY 2007	FY 2008
Behavioral and Social Sciences	0.17	0.42	0.50	0.24
Clinical [and Translational] Research	0.06	0.49	0.48	0.57
Instrumentation and Engineering	0.22	0.75	0.69	0.72
Molecular, Cellular, [and Chemical] Biology	0.17	0.73	0.69	0.66
[Pathogenesis and] Epidemiology	0.23	0.75	0.51	0.62
Physiological and Integrative Systems	0.21	0.68	0.53	0.41
Quantitative and Computational/Mathematical Biology	0.16	0.81	0.74	0.73
Immunology*				0.75
Neuroscience*				0.79

Note: The fluctuation in number of top 4 votes per applicant in different years is at least partly due to changes in the evaluator-to-applicant ratio. For example, in FY 2006, there were a greater number of evaluators reviewing a smaller number of applications, so more top 4 votes were given overall. Thus, the comparison of top 4 votes received based on research area is a more important aspect of this graph than comparison between years. Because of the extremely small evaluator-to-applicant ratio in FY 2004, that data was excluded from this analysis.

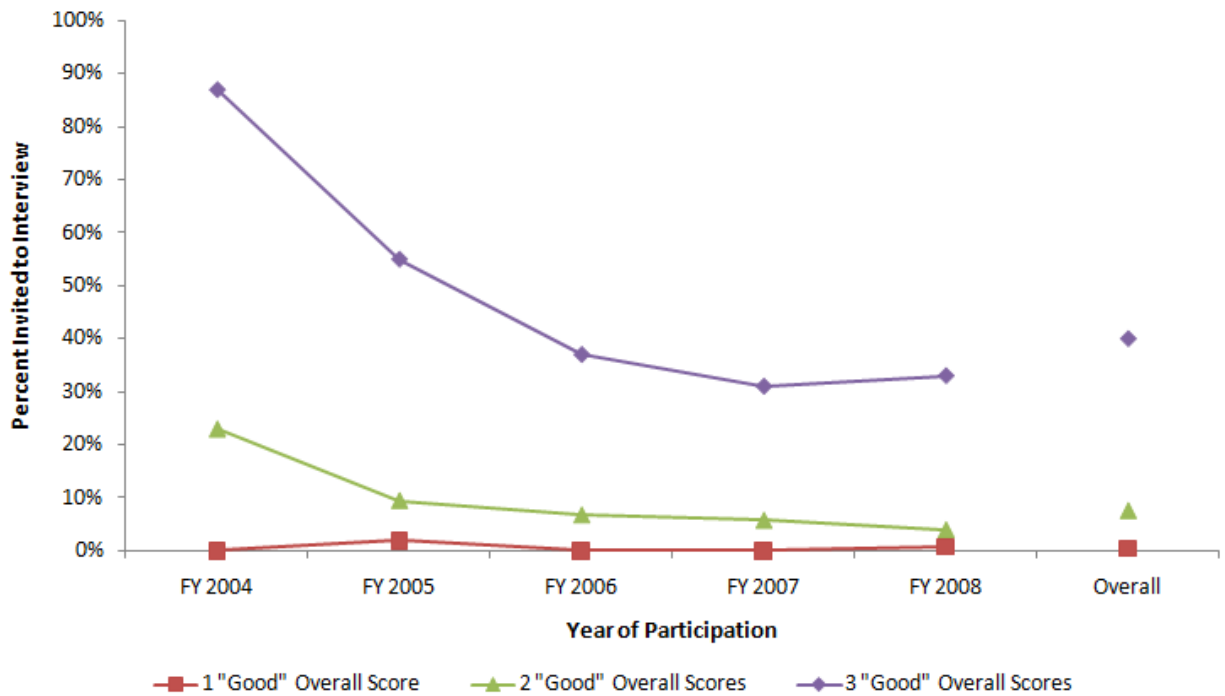
*The Immunology and Neuroscience areas were new designations added in FY 2008.

Source: STPI Analysis of FY 2005–FY 2008 NDPA External Evaluator Scoring Trends.

Exhibit I.11.

Percentage of Applicants Invited to Interview Based on Number of "Good" Overall Scores, FY 2004–FY 2008

Number of "Good" Scores	Percent Invited to Interview FY 2004	Percent Invited to Interview FY 2005	Percent Invited to Interview FY 2006	Percent Invited to Interview FY 2007	Percent Invited to Interview FY 2008	Percent Invited to Interview Overall
0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1	0.0%	1.9%	0.0%	0.0%	0.69%	0.50%
2	23.0%	9.5%	6.8%	5.8%	4.0%	7.6%
3	87.0%	55.0%	37.0%	31.0%	33.0%	40.0%



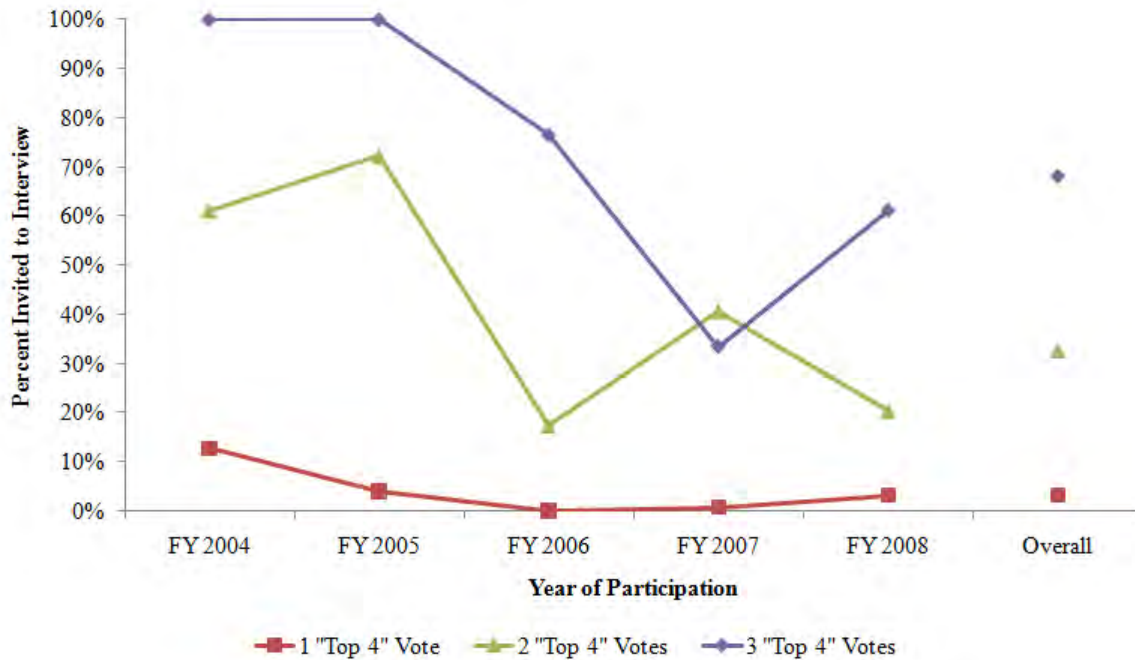
Note: "Good" score is overall score of 6 or 7 for FY 2004, or 4 or 5 for 2005-2008.

Source: STPI Analysis of FY 2004–FY 2008 NDPA External Evaluator Scoring Trends.

Exhibit I.12.

Percentage of Applicants Invited to Interview Based on Number of “Top 4” Votes, FY 2004–FY 2008

Number of “Top 4” Votes	Percent Invited to Interview FY 2004	Percent Invited to Interview FY 2005	Percent Invited to Interview FY 2006	Percent Invited to Interview FY 2007	Percent Invited to Interview FY 2008	Percent Invited to Interview Overall
0	0%	0%	0%	0%	0%	0%
1	13%	3.9%	0%	0.72%	3.1%	3.1%
2	61%	72%	17%	41%	20%	33%
3	100%	100%	76%	33%	61%	68%



Source: STPI Analysis of FY 2004–FY 2008 NDPA External Evaluator Scoring Trends.

Exhibit I.13.

Percentage of Applicants Invited to Interview Based on Number of “Ideal Candidate” Votes, FY 2008

Number of “Ideal Candidate” Votes	Percent Invited to Interview
0	0%
1	15%
2	66%
3	100%

Source: STPI Analysis of FY 2008 NDPA External Evaluator Scoring Trends.

Exhibit I.14.
NDPA Awardees by Panel Designation, FY 2004–FY 2008

Panel Designation	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	All Years
Top Tier	6 of 10	6 of 7	8 of 9	9 of 9	7 of 7	36 of 42
Middle Tier	3 of 5	5 of 6	4 of 7	3 of 5	9 of 11	24 of 34
Bottom Tier	0 of 7	2 of 7	1 of 9	0 of 11	0 of 7	3 of 41

Source: Internal NDPA Documents, FY 2004–FY 2008.

Exhibit I.15.
NDPA Awarded Funds by IC, FY 2004–FY 2008

Institute and Center	Awarded Dollars	Percent of Total NDPA Funds Awarded
OD	\$70,941,910	82.3%
NIDA	\$1,668,253	1.9%
NIA	\$1,495,318	1.7%
NIAID	\$1,476,500	1.7%
NIDDK	\$1,476,500	1.7%
NEI	\$1,370,317	1.6%
NIGMS	\$1,255,841	1.5%
NINDS	\$1,208,765	1.4%
NCI	\$1,000,000	1.2%
NHLBI	\$738,250	0.9%
NIMH	\$718,348	0.8%
NIDCR	\$500,000	0.6%
NIBIB	\$500,000	0.6%
NHGRI	\$488,250	0.6%
FIC	\$488,250	0.6%
NCCAM	\$355,464	0.4%
NICHD	\$268,818	0.3%
NIAAA	\$191,753	0.2%
NINR	\$105,464	0.1%
Grand Total	\$86,248,001	100.0%

Note: NDPA awardees receive up to \$500K per year for 5 years. Starting in FY 2006, yearly funds for FY 2004–FY 2005 awardees were decreased to \$488,250 due to budget cuts; awardees of subsequent years were funded the full \$500K per year. This analysis does not include projected funding data for future years.

Source: STPI Analysis of IMPAC II Funding Data.

Appendix J: External Evaluator Interview Responses¹

Exhibit J.1.

Most Important Criteria in Assessing Application Packages

Response	FY 2005	FY 2006	FY 2007	FY 2008
The scientific problem to be addressed	1	8	2	15
The characteristics of the individual investigator	7	15	5	8
The suitability for the NDPA mechanism	2	1	1	0
The scientific problem and the investigator criteria were equally important	0	0	4	3
All were equally important	8	9	4	12
No response or N/A	2	2	6	6
<i>All interview respondents</i>	<i>20</i>	<i>35</i>	<i>22</i>	<i>44</i>

Note: The responses only reflect the review criteria for FY 2005–FY 2008, as the criteria in FY 2004 were significantly different.

Source: STPI Analysis of FY 2005–2008 NDPA Evaluator interview responses.

Exhibit J.2.

Adequacy of Criteria in Identifying a "Pioneer"

Response	FY 2005	FY 2006	FY 2007	FY 2008
The criteria are adequate and appropriate for identifying a pioneer	12	27	9	21
Generally the criteria are adequate and appropriate for identifying a pioneer	5	4	2	11
Generally the criteria are adequate but the 51% requirement should be dropped	0	2	3	0
The criteria are not adequate or appropriate for identifying a pioneer	2	1	2	4
No response or N/A	1	1	6	8
<i>All interview respondents</i>	<i>20</i>	<i>35</i>	<i>22</i>	<i>44</i>

Source: STPI Analysis of FY 2005–2008 NDPA Evaluator interview responses.

¹ Includes responses from panelists (external evaluators who participated in the candidate interview phase).

Exhibit J.3.**Consideration Given to Existing Grant Support and Career Stage**

Response	FY 2005	FY 2006	FY 2007	FY 2008
I gave career stage and existing grant support significant consideration	6	10	2	11
I gave career stage and existing grant support some consideration	5	9	12	22
I gave career stage and existing grant support no consideration	9	13	7	9
I do not remember if I considered career stage or existing grant support	0	0	1	0
No Response or N/A	0	3	0	2
<i>All interview respondents</i>	<i>20</i>	<i>35</i>	<i>22</i>	<i>44</i>

Source: STPI Analysis of FY 2005–2008 NDPA Evaluator interview responses.

Exhibit J.4.**Evaluation of Applications Outside Areas of Expertise**

Response	FY 2005	FY 2006	FY 2007	FY 2008
Deferred to the reviews of the other evaluators	9	11	1	1
Consulted with a peer or pursued additional source materials	3	5	4	9
Did not have a problem with applications outside of my area – good science is easy to identify	8	19	7	16
I could not distinguish between applications that were supposedly within or outside of my area of expertise	0	0	1	3
I had problems with this aspect and recommend that it is eliminated	0	0	3	10
No response or N/A	0	0	6	5
<i>All interview respondents</i>	<i>20</i>	<i>35</i>	<i>22</i>	<i>44</i>

Source: STPI Analysis of FY 2005–2008 NDPA Evaluator interview responses.

Exhibit J.5.
Adequacy of Information in Application Package in Evaluating "Pioneeringness"

Response	FY 2005	FY 2006	FY 2007	FY 2008
The materials were adequate	11	19	12	22
The materials were adequate but additional components desired	9	9	0	0
The materials were not adequate	0	1	0	0
The essays were the most important component	0	0	4	7
The letters of reference were the most important component	0	0	2	8
I used a combination of the application materials – but some components were not helpful	0	0	3	5
I do not remember if the materials were adequate	0	0	1	0
No response or N/A	0	6	0	2
<i>All interview respondents</i>	<i>20</i>	<i>35</i>	<i>22</i>	<i>44</i>

Source: STPI Analysis of FY 2005–2008 NDPA Evaluator interview responses.

Exhibit J.6.
Characterization of Ideas Expressed in Applications Reviewed

Response	FY 2005	FY 2006	FY 2007	FY 2008
Some outside realm of convention; innovative	8	10	4	6
Risky; technically or conceptually	2	6	0	3
Inter/Multidisciplinary	0	6	0	1
Potentially transformative	0	1	0	0
Extension of problem in area of training, or of an existing project; not necessarily paradigm-shifting	0	3	0	5
Conventional, pedestrian; standard R01-like	4	10	4	6
Mixed	8	17	11	15
Unimpressive, disappointing	3	1	3	12
No Response or N/A	0	1	7	7
<i>All Interview Respondents</i>	<i>20</i>	<i>35</i>	<i>22</i>	<i>44</i>

Note: Some respondents made comments that fit into more than one coded category; thus column totals do not sum to total number of interview respondents.

Source: STPI Analysis of FY 2005–2008 NDPA Evaluator interview responses.

Exhibit J.7.**Difference between NDPA Process and Traditional NIH Study Sections**

Response	FY 2005	FY 2006	FY 2007	FY 2008
The NDPA process is very different and allows different people to get funded	12	25	11	24
The NDPA process is somewhat different	6	9	11	13
Do not see the NDPA process as differing greatly from a traditional study section	1	1	0	5
No response or N/A	1	0	0	2
<i>All interview respondents</i>	<i>20</i>	<i>35</i>	<i>22</i>	<i>44</i>

Source: STPI Analysis of FY 2005–2008 NDPA Evaluator interview responses.

Exhibit J.8.**Difference between NDPA Applications and Traditional NIH Applications**

Response	FY 2005	FY 2006
The applications were very different from traditional NIH applications	10	20
The applications were similar to traditional NIH applications/could have applied to another mechanism	9	12
No response or N/A	1	3
<i>All interview respondents</i>	<i>20</i>	<i>35</i>

Source: STPI Analysis of FY 2005–2008 NDPA Evaluator interview responses.

Exhibit J.9.**Achievement of the Goal of Identifying Unique Ideas, Approaches, and People?**

Response	FY 2005	FY 2006	FY 2007	FY 2008
NDPA is already achieving this goal	5	16	5	13
NDPA is achieving this with only some of the awardees	0	0	0	11
NDPA might be achieving its goal, but it is too early to tell	12	14	11	8
NDPA is not achieving its goal	1	4	1	5
I am not familiar with the awardees, or do not know if NDPA is achieving this goal	0	0	5	7
No response or N/A	2	1	0	0
<i>All interview respondents</i>	<i>20</i>	<i>35</i>	<i>22</i>	<i>44</i>

Source: STPI Analysis of FY 2005–2008 NDPA Evaluator interview responses.

Exhibit J.10.
System Used to Rank Interviewees

Response	FY 2005	FY 2006	FY 2007	FY 2008
Followed the instructions given	6	6	6	6
Used my own system	0	0	0	1
Used a hybrid of my own system and the instructions given	0	2	0	3
Followed some of the instructions	0	0	0	0
No response or N/A	0	2	0	0
<i>All interview respondents</i>	6	10	6	10

Source: STPI Analysis of FY 2005–2008 NDPA Evaluator interview responses.

Exhibit J.11.
Adequacy of Interview Length on Evaluating Interviewees

Response	FY 2005	FY 2006	FY 2007	FY 2008
The interview duration was adequate	6	9	6	7
The interview duration was not adequate	0	1	0	0
No response or N/A	0	0	0	3
<i>All interview respondents</i>	6	10	6	10

Source: STPI Analysis of FY 2005–2008 NDPA Evaluator interview responses.

Exhibit J.12.
Adequacy of 5-Point Scale and “Top 4” Designation in Rating Applicants

Response	FY 2005	FY 2006	FY 2007	FY 2008
The system was adequate	7	12	12	33
The system was mostly adequate though modifications suggested	0	0	3	3
The system was not adequate	5	5	1	1
No response or N/A	8	18	6	7
<i>All interview respondents</i>	20	35	22	44

Source: STPI Analysis of FY 2005–2008 NDPA Evaluator interview responses.

Exhibit J.13.
Usefulness of “Ideal Candidate” Designation in Scoring Applicants

Response	FY 2008
I liked and used the “ideal candidate” designation	16
I liked but did not use the “ideal candidate” designation	6
I did not understand or feel comfortable using the “ideal candidate” designation	6
I did not like the “ideal candidate” designation	6
I do not remember if I liked or used the “ideal candidate” designation	2
No response or N/A	8
<i>All interview respondents</i>	44

Source: STPI Analysis of FY 2008 NDPA Evaluator interview responses.

Exhibit J.14.**Adequacy of Evaluator Training**

Response	FY 2005	FY 2006	FY 2007	FY 2008
The training was adequate	12	27	19	34
The training was somewhat adequate, though additional information desired	5	5	1	7
The training was not adequate	2	1	0	1
I do not remember this training	0	0	2	0
No response or N/A	1	2	0	1
<i>All interview respondents</i>	<i>20</i>	<i>35</i>	<i>22</i>	<i>44</i>

Source: STPI Analysis of FY 2005–2008 NDPA Evaluator interview responses.
