

June 2017

A Review of The Environmental Protection Agency's Science to Achieve Results Research Program

Science to Achieve Results (STAR), the U.S. Environmental Protection Agency's primary competitive extramural research program, plays an important and distinct role in the nation's research portfolio. The STAR program funds research to address critical gaps in knowledge in areas of science that are relevant to the agency's mission to protect public health and the environment. This report finds that the program has been productive and supported research that has led to many public benefits. EPA should continue to use STAR to respond to the nation's emerging environmental challenges.

The U.S. Environmental Protection Agency (EPA) supports extramural research at academic and nonprofit institutions through a competitive, peer-reviewed grant program known as Science to Achieve Results, or STAR. Established in 1995, the STAR program provides grants for environmental and human health research at universities and non-profit institutions in areas of science that are important to EPA's mission, to protect human health and the environment.

In 2003, a National Research Council committee reviewed STAR and strongly endorsed it as an integral part of EPA's research program, although that review came too early to fully evaluate the impact of STAR research. At the request of EPA, this report assesses the STAR program's scientific merit, public benefits, and overall contributions.

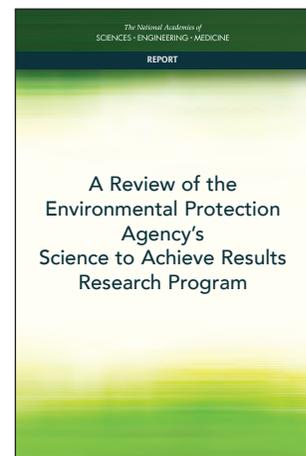
THE SCIENTIFIC MERIT OF THE STAR PROGRAM

Comparing STAR's procedures for priority-setting, funding announcements, and the review and management of grants with those of other extramural research programs, the committee

found no major deficiencies in STAR's operating procedures. The STAR program's RFAs generally have well-described goals and explicit review criteria, and address topics as varied as the mitigation of oil spills and the creation of children's environmental health centers that complement research carried out by EPA's internal research program. The funding announcements are advertised broadly and solicit high quality research proposals. STAR has strong peer-review procedures, and the report's authoring committee was favorably impressed with the diversity

About STAR

STAR is managed by EPA's National Center for Environmental Research and integrated into the overall research program of EPA's Office of Research and Development. STAR research is funded through a request for applications (RFA) process, and its research support consists of grants to individual investigators or multi-institutional teams, and a (recently discontinued) graduate student fellowship program.



Some federal agencies, such as the National Institutes of Health, have made progress in creating databases that mine data from sources such as progress reports and academic literature to link projects to long-term effects and track the career outcomes of graduate fellows. STAR has a website that tracks outputs of STAR grants, which could be a useful tool for evaluations; however, the committee noted that it was out of date.

STAR has made efforts to communicate about the benefits of environmental science research to public audiences, but the efforts have been inconsistent. EPA would benefit from working with other federal agencies that are developing effective new ways to communicate about how research can result in benefits to human health, for example by featuring case studies on websites or blogs.

Finding 3. The STAR program has generated research that has many public benefits. However, these public benefits are not consistently tracked and synthesized.

Recommendation 3. *The STAR program should partner with other federal agency efforts to improve communication of the benefits of its research to the public. In addition, STAR should make whatever changes are necessary to improve the grantee project results website.*

THE STAR FELLOWSHIP PROGRAM

Funding for the STAR fellowship program was eliminated for financial year 2016 to centralize graduate fellowships in the National Science Foundation (NSF). STAR fellowships were the only federal fellowships designed exclusively for students pursuing advanced degrees in environmental sciences and environmental health.

Centralizing graduate fellowships in NSF has already led to a reduction in the support of environmental science students. In 2015, there were 168 NSF fellows in environmental sciences and ecologic research and 51 STAR fellows. In 2017, after the STAR fellowship program

was canceled, the number of NSF fellows in environmental sciences and ecologic research remained essentially unchanged at 176. The need for federally supported fellowship programs in the environmental arena is significant, given projections of considerable human-resources needs in environmental science and engineering policy fields in the United States.

Finding 4. The STAR fellowship program was critical for training future generations of scientists who pursue environmental careers.

Recommendation 4. *The STAR fellowship program should be restored to EPA given the continued and growing need for scientists in environmental research and management.*

RESEARCH FOR ADDRESSING THE EPA'S PRIORITY SCIENTIFIC QUESTIONS

STAR is uniquely positioned to address emerging and persistent environmental issues. While other federal agencies support research in similar disciplines, STAR is the only grant program that applies basic research toward specific environmental problem-solving and decision-making issues. The program's RFAs are developed as an integral part of EPA's strategic research plans and therefore complement internal EPA research, targeting critical gaps in scientific knowledge. Furthermore, STAR funding often supports multidisciplinary research centers to facilitate the collaborations among investigators that are needed to tackle complex environmental issues.

For these reasons, STAR has addressed many different human health and environmental concerns, including those issues related to new technologies, knowledge gaps identified in connection with environmental disasters, and the potential consequences of resource-conservation technologies. Some recent examples are RFAs that cover the health effects of engineered nanoparticles, the environmental effects and mitigation of oil spills after the Deepwater Horizon

CASE STUDY

STAR Research on the Effects of Environmental Contaminants on Children's Health

A growing body of evidence indicates that children are more likely than adults to be vulnerable to the effects of environmental contaminants, because their nervous, immune, and digestive systems are still developing. Evidence also indicates such exposures may be related to increases in the number of children diagnosed with asthma, Attention Deficit/Hyperactivity Disorder (ADHD), autism, and developmental impairment.

Between 1998 and 2014, STAR and NIEHS released a series of eight RFAs to fund research at 23 centers. The first eight Children's Centers, established in 1998, set out to study the effects of environmental factors such as pesticides and

air pollution on childhood asthma and children's growth and development. In 2001, four more Children's Centers opened to study the basis of neurodevelopmental and behavioral disorders such as autism. Additional Children's Centers began investigations in 2004 and 2007 on how exposure to mixtures of chemicals affects children's health and which environmental pollutants cause disparities in birth outcomes. These STAR grants have fostered a collaborative network of pediatricians, basic scientists, epidemiologists, and community advocates across the United States, seeking to improve the health and environments of children.

incident, and human and ecologic effects associated with water reuse and conservation practice.

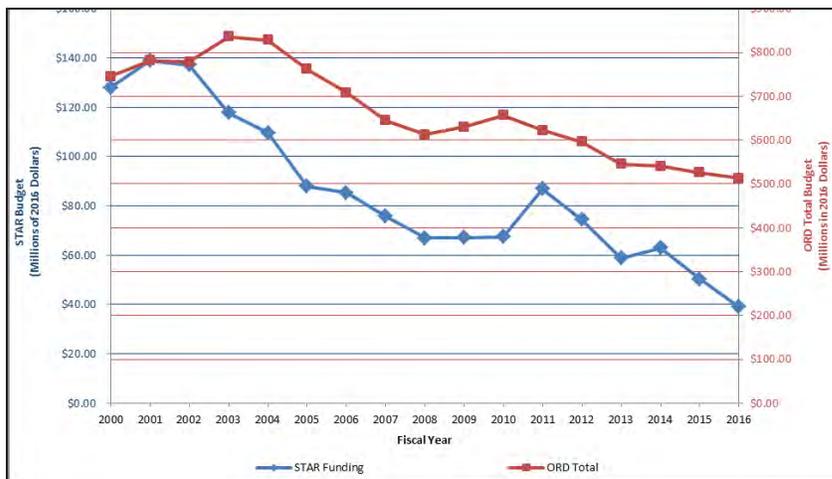
STAR's ability to address important research questions has declined in recent years due to decreases in the program's budget, which has meant that STAR can fund significantly fewer RFAs. In 2003, STAR released 12 individual-investigator grant RFAs and one center RFA. In 2013 and 2014, it released five individual-investigator RFAs and two center RFAs a year. In 2015, STAR released only one individual-investigator RFA.

Finding 5. STAR plays a distinctive role in the nation's overall environmental-research portfolio.

Recommendation 5. *The committee recommends that EPA continue to use STAR to respond to the nation's emerging environmental challenges.*

Declines in STAR Funding

The STAR program's budget has decreased from a peak of around \$138 million (in 2016 dollars) in 2001 and 2002 to \$39 million in 2016. In 2000, the STAR program accounted for 17 percent of the Office of Research and Development (ORD) budget. In the intervening years, the total budget for ORD declined from \$835 million (in 2016 dollars) in 2003 to \$513 million in 2016, and the STAR program now accounts for about 8 percent of the ORD total budget. Source: Johnson, 2016.



COMMITTEE ON REVIEW OF EPA'S SCIENCE TO ACHIEVE RESULTS RESEARCH GRANTS PROGRAM

Mark J. Utell (Chair), University of Rochester School of Medicine and Dentistry; **Praveen K. Amar**, Independent Consultant, Lexington, MA; **Marian R. Chertow**, Yale School of Forestry and Environmental Studies; **Susan E. Cozzens**, Georgia Institute of Technology; **Bart E. Croes**, California Air Resources Board, Sacramento; **Ana V. Diez Roux**, Drexel University Dornsife School of Public Health; **Kimberly A. Gray**, Northwestern University; **Philip K. Hopke**, Clarkson University; **Kimberly L. Jones**, Howard University; **Harold A. Mooney**, Stanford University; **Martin A. Philbert**, University of Michigan School of Public Health; **Joshua M. Sharfstein**, Johns Hopkins Bloomberg School of Public Health; **Mitchell J. Small**, Carnegie Mellon University; **Clifford P. Weisel**, Rutgers University; **Elizabeth Boyle** (Study Director), **Raymond A. Wassel** (Scholar and Director of Environmental Studies), **Mirsada Karalic-Loncarenic** (Manager, Technical Information Center), **Radiyah Rose** (Manager, Editorial Projects); **Orin Luke** (Senior Program Assistant), National Academies of Sciences, Engineering, and Medicine

For More Information . . . This Report Highlights was prepared by the Board on Environmental Studies and Toxicology based on the report *A Review of The Environmental Protection Agency's Science to Achieve Results Research Program*. The study was sponsored by the U.S. Environmental Protection Agency. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authoring committee and do not necessarily reflect those of the sponsor. Copies of the report are available from the National Academies Press, (800) 624-6242; <http://www.nap.edu>.

Division on Earth and Life Studies

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

The nation turns to the National Academies of Sciences, Engineering, and Medicine for independent, objective advice on issues that affect people's lives worldwide.

www.national-academies.org