REPORT from the NIDA Prevention Research Review Work Group

May 2009

NIDA NATIONAL INSTITUTE ON DRUG ABUSE

NATIONAL INSTITUTES OF HEALTH

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April 8, 2009

Nora D. Volkow, M.D., Director
National Institute on Drug Abuse
6001 Executive Boulevard
Bethesda, MD 20892

Dear Dr. Volkow:

I am pleased to transmit the draft report and recommendations of the Prevention Research Work Group that was created at your request by the National Advisory Council on Drug Abuse at its meeting on May 14, 2008. The report and recommendations reflect the unanimous view of the Work Group members. We take full responsibility for the contents. We look forward to meet with you and/or members of your staff to discuss our conclusions and recommendations, though we hope the report makes our views and thinking clear on its own.

The Work Group is impressed with the devotion and achievements of the NIDA PRB staff and prevention activities at NIDA. During the last decade prevention research at NIDA has significantly advanced the nation's ability to prevent and reduce drug use. The report details a series of recommendations that we believe are advisable to enhance NIDA's prevention research portfolio and program and to further meet the public health goal to prevent drug abuse and addiction. It is notable that The Work Group's findings and recommendations also align strongly with the recent 2009 report from the Institute of Medicine and National Research Council on *Preventing Mental, Emotional, and Behavioral Disorders Among Young People: Progress and Possibilities.*

The members of the Work Group and I would like to thank Denise Pintello, Ph.D., M.S.W. for her support throughout the process. She helped immensely by monitoring the Work Group's progress and, along with Robert Katt, who played a major role in editing the draft report. Thank you for this opportunity to support NIDA's mission.

Sincerely,

Mark T. Greenberg

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National Institute on Drug Abuse

Review of the Prevention Research Portfolio

Prevention Research Review Work Group

May 2009

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EXECUTIVE SUMMARY

Purpose and Context of the Review

The Prevention Research Review Work Group was convened to evaluate the prevention research portfolio and program of the National Institute on Drug Abuse (NIDA). Most of NIDA's prevention research portfolio is administered by the Prevention Research Branch (PRB) in the Division of Epidemiology, Services and Prevention Research (DESPR). The PRB portfolio and plans were the focus of the Work Group's evaluation, and its findings and recommendations were developed in response to the rationale for PRB program emphases during the past 5 years, as well as the 2- and 5-year goals of the PRB Strategic Plan. The Work Group's findings and recommendations also align strongly with the 2009 report from the Institute of Medicine and National Research Council on *Preventing Mental, Emotional, and Behavioral Disorders Among Young People: Progress and Possibilities.*

NIDA's notable accomplishments in prevention research provide the context within which the Work Group framed its findings and recommendations. Overall, the PRB has taken a proactive role in building the field of prevention science, creating a diverse portfolio that encompasses basic research, statistical methodology, efficacy trials, effectiveness research, systems research, and services research. NIDA has funded numerous trials that have shown that school-, family-, and community-based interventions can prevent early drug use and abuse. The research funded by the PRB has demonstrated that drug abuse develops in a complex context of diverse psychological and behavioral problems; thus, the prevention of drug abuse is facilitated by interventions that modify one or more risk factors for these problems. The PRB portfolio is a model for addressing these risk factors comprehensively based on the best informed theoretical research on trajectories leading to substance abuse and comorbid disorders. This is exemplified by the PRB proposal for a Child Wellness Initiative, which was recently submitted in response to the NIH Roadmap. The PRB has also proactively planned for new initiatives that show great promise for substance abuse prevention and that bridge to a shared prevention research agenda with other NIH institutes. PRB and DESPR programs have incorporated key concepts and principles of developmental psychopathology as a discipline from which to improve well-being, promote change, and prevent substance abuse. The Work Group particularly commends NIDA for its support of multi-site prevention trials and longitudinal follow-up studies, which have demonstrated the long-term efficacy of prevention.

Highlights of Major Recommendations

Expand Type 2 Translational Research. To foster innovation and transformation in the next generation of prevention research, the Work Group recommends a set of specific actions that can expand Type 2 translational research. Despite substantial accomplishments in developing and testing prevention interventions, the prevention community still lacks sufficient understanding of why these evidence-based interventions are not being adopted and implemented more widely. The Work Group believes a shift in focus toward increased attention to Type 2 translational research presents the greatest opportunity—and should therefore receive the highest priority—to reduce substance use and abuse while more generally improving public health. Specific actions to expand the portfolio in this direction are presented under headings of (1) emphasizing research on effectiveness of systems and services, (2) focusing on pre-adoption issues of communication and decisionmaking, and (3) supporting innovative and cross-disciplinary training relevant to Type 2 research.

Focus Type 1 Translational Research on Understanding the Basis for Effective Intervention. The Work Group recommends focusing Type 1 translational research in the portfolio on understanding how, for whom, and when prevention interventions have their greatest impact. NIDA should continue to support research into the developmental processes and common causal mechanisms that are related to multiple physical and mental health outcomes including substance use and abuse. Scientific approaches of particular importance include developmental psychopathology, genetics, biological changes in response to intervention, complex systems theory, theories of disruptive innovations, and neuroscience including brain imaging. For HIV research, this recommendation will require recognizing that sexual and drug use behaviors are strongly related to a cluster of risky daily routines. Rather than pursuing only one outcome, the benefits and costs of targeting multiple outcomes simultaneously must be examined. Specific actions to implement this broad recommendation should include: (1) supporting research on biological and genetic factors relevant to prevention, (2) supporting research on how and for whom prevention programs have their protective effects, (3) pursuing development of novel interventions such as physical activity or mindfulness, and (4) supporting research on comprehensive models of problem behavior prevention through fostering nurturing environments in childhood that increase the likelihood of healthy development and decrease the likelihood of substance abuse.

Create a Center for Prevention Trial Research. The Work Group recommends that NIDA create a Center for the Advancement of Prevention Trial Research, as envisioned in the PRB Strategic Plan. Such a center can add value to the existing NIDA prevention portfolio and lead to new areas of investigation.

Expand NIDA's Leadership Role in Prevention Research. NIDA is well positioned to expand its leadership role in advancing the scientific understanding of how to promote protective factors for these interlocking problem behaviors, including substance abuse, at multiple levels (healthy environments, communities, families, and personal strengths) across the life span, while buffering known risk factors for substance abuse and its associated negative outcomes. Thus, the Work Group recommends that NIDA, under the expertise of the PRB, expand its leadership in prevention research by pursuing research agendas like that of the Child Wellness Initiative and a Center for the Advancement of Prevention Trial Research. Important elements of such leadership will be to strengthen and expand the infrastructure for coordination and transdisciplinary work that crosses the boundaries between NIDA divisions, NIH institutes, and other governmental agencies. NIDA should extend the use of structural mechanisms to facilitate cross-unit collaboration within the Institute. It should continue to pursue partnering opportunities with other NIH institutes and centers and with implementing agencies in the Department of Health and Human Services, other Federal departments, and at the state and community level. Partnering with implementing agencies is essential to developing prevention interventions that are effective with the populations that are naturally served by these agencies, ensuring that preventive interventions are designed in ways that they can be readily implemented through natural service delivery systems, while facilitating the translation from experimental efficacy trials to effective preventive services.

Enhance Innovative and Cross-Disciplinary Training. The Work Group commends the PRB for its strong support of minority research training and support for early-career investigators. Although highly successful, the investments in training have been relatively limited. NIDA should expand its training investment in areas that will help link prevention science to complementary fields (genetics, statistical methods, ecological research, implementation science, marketing, and health communications) that will expand the evidence base for both Type 1 and Type 2 translation. In addition, the need is urgent for

culturally competent prevention research in racial and ethnic minority communities; researchers from racial and ethnic minority groups are particularly well situated to address this need.

Promote Innovative Prevention Research Tools and Methodologies. The Work Group recommends that NIDA continue and expand its focus on novel statistical methods and research designs, as well as new measurement and intervention technologies. Methods development should focus on tools designed to: (a) improve assessment of risk and outcome; (b) handle information-rich sources including genome wide association, ecological momentary assessments, neuroimaging, and other areas of neuroscience; (c) exploit advances in underlying technologies such as web-based data collection and dissemination and mobile embedded sensing, and (d) devise new methods to deal with the complexity of multilevel intervention models.

INTRODUCTION AND BACKGROUND

In September 2008, the Director of the National Institute on Drug Abuse (NIDA), Nora D. Volkow, M.D., convened the Prevention Research Review Work Group to evaluate NIDA's prevention research portfolio and program and to advise the Institute on prevention research that relates to the public health problems of drug abuse and addiction. The Work Group membership, listed in Appendix A, included members of the National Advisory Council on Drug Abuse and exemplary leaders from the drug addiction field.

Prevention Research at NIDA

Definition of Prevention Research

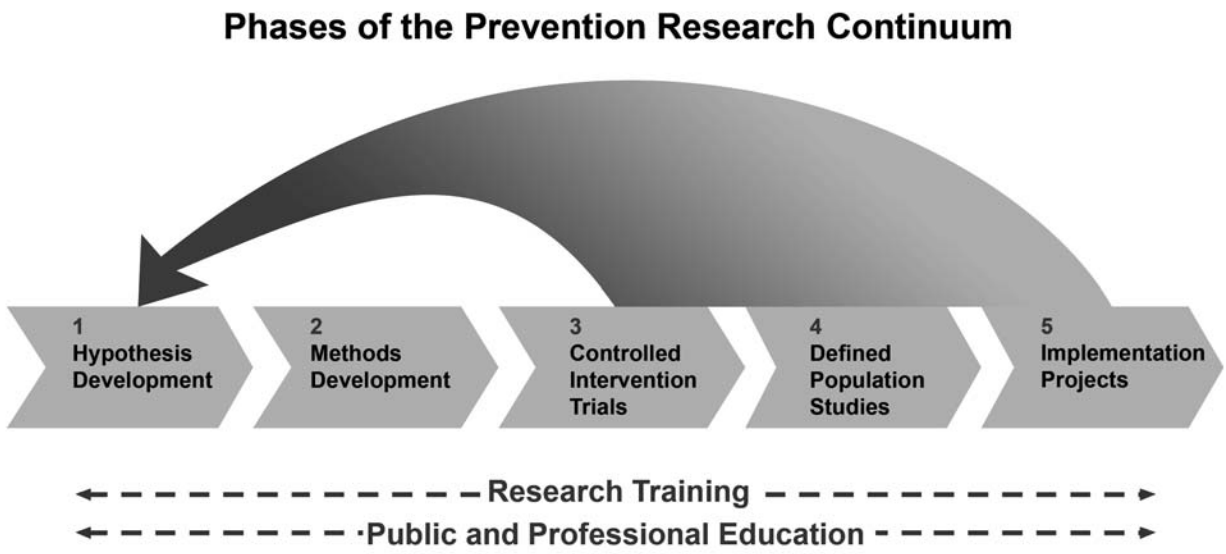
In 2006 and 2007, the National Institutes of Health (NIH) Prevention Research Coordinating Committee revised the 1984 NIH definition of prevention research. After reaching consensus on the new definition, the Coordinating Committee sent the revised definition to the appropriate Institute and Center directors for comment and approval. The following definition was approved and adopted in 2007:[1]

> Prevention research encompasses research designed to yield results directly applicable to identifying and assessing risk, and to developing interventions for preventing or ameliorating high-risk behaviors and exposures, the occurrence of disease/disorder/injury, or the progression of detectable but asymptomatic disease. Prevention research also includes research studies to develop and evaluate disease prevention and health promotion recommendations and public health programs.
>
> The definition includes the following categories of research:
>
> - Identification of modifiable risk and protective factors for diseases/disorders/injuries;
> - Studies on assessment of risk, including genetic susceptibility;
> - Development of methods for screening and identification of markers for those at risk for onset or progression of asymptomatic diseases/disorders, or at risk for high risk behaviors/injuries;
> - Development and evaluation of interventions to promote health for groups of individuals without recognized signs or symptoms of the target condition;
> - Translation of proven effective prevention interventions into practice;
> - Effectiveness studies that examine factors related to the organization, management, financing, and adoption of prevention services and practices; and
> - Methodological and statistical procedures for assessing risk and measuring the effects of preventive interventions.

Preventing Drug Abuse Disorders

The most effective way to halt the manifestation of diseases and disorders is through prevention. Prevention of drug abuse differs from most other diseases and disorders in that, at the initiation stage, there is choice involved. Moreover, the risk factors for drug abuse and a number of other behaviorally

[1] The definition, including the categories of research covered by it, can be found at the website of the NIH Office of Disease Prevention: http://odp.od.nih.gov/research.aspx.



related diseases and disorders are the same; how and why those risk factors express themselves as a particular disease or disorder is not well understood. Research has clearly shown that universal approaches to drug abuse prevention are effective, even for higher risk subpopulations embedded within the full population. Selective and indicated approaches are also effective for groups and individuals identified with specific risk factors. Once a disease or disorder is diagnosable, the approach changes from prevention to treatment and many more resources must be expended to care for affected individuals.

Prevention research has a long and distinguished history of research and dissemination efforts at NIDA. Since funding the Midwest Prevention Project almost 30 years ago, NIDA has funded hundreds of randomized controlled trials of prevention programs, practices, and policies for use in a variety of contexts and with populations defined by developmental status, levels of risk, cultural attributes, and so forth. Many of these interventions have been demonstrated to be effective. In the 2009 NIDA Five-Year Strategic Plan, prevention research is the first of four major goal areas that inform the Institute's strategic directions for the future.

Most of NIDA's prevention research portfolio is administered by the Prevention Research Branch (PRB) within the Division of Epidemiology, Services and Prevention Research (DESPR). Additional research grants coded as having a prevention component are administered across DESPR and other NIDA divisions. Thus, at its first formal meeting, the Work Group was briefed on these other research grants outside of DESPR, but the focus of the evaluation was the research portfolio and program of the PRB.

The Prevention Research Branch

History of the Branch and the NIDA Prevention Portfolio

The PRB traces its origins to the Special Action Office for Drug Abuse Prevention, established within the Executive Office of the President by the 1972 Drug Abuse Office and Treatment Act. In 1975, the programs and responsibilities of this prevention office were transferred to the newly established NIDA, which at that time was under the Alcohol, Drug Abuse and Mental Health Administration and included

both research and services delivery. In NIDA's early years, all extramural behavioral research funded by NIDA, including prevention research, was administered by the Division of Clinical Research.

Legislation in 1981 that granted the states more control over the selection of drug abuse prevention services under the Block Grant Program also recognized the need for effective, comprehensive, evidence-based prevention program options. In response, NIDA began promoting research on multi-component, multilevel, comprehensive prevention approaches. The Midwestern Prevention Project was the first large-scale research evaluation of prevention interventions funded under this initiative.

In 1987, a Prevention Research Branch was created as one of three branches under the Division of Clinical Research. The first permanent Branch Chief of the PRB was named in 1989. In 1991, the PRB was transferred to the newly created Division of Epidemiology and Prevention Research, which has since become today's DESPR. In I992, NIDA was split into a research component and a services component, with the former transferred to the NIH as the current NIDA. The services component became the Substance Abuse and Mental Health Services Administration (SAMHSA).

Between 1991 and 1996 PRB held a series of influential conferences to highlight and promote wider adoption of evidence-based practices. In 1997, the first edition of *Preventing Drug Use among Children and Adolescents: A Research-based Guide* (the NIDA Red Book) solidified the linkages between NIDA-funded prevention research and community practice. The NIDA Red Book, now in a second, revised and expanded edition, continues to be a standard reference guide for practitioners across the United States and in other countries around the world. The PRB has continued to expand and update the Principles of Prevention to incorporate insights from new research.

In 1998, the scope of the prevention research portfolio was expanded to encompass a broader bio-psycho-social perspective on risk factors and protective factors for substance use and abuse. The venues for prevention efforts were broadened from the earlier focus on the school environment to include all the primary environments of children and their families. Another new direction was development of new interventions or tailoring of mainstream interventions to target special populations and groups not adequately reached by established mainstream programs. Studies to better understand what prevention practices and programs work for whom, and under what conditions, became an integral objective of the prevention research portfolio—as illustrated in the 2000 Request for Applications (RFA) on the Next Generation of Prevention Research.

In 2001, the PRB and the Robert Woods Johnson Foundation funded a work group to assess the state of knowledge in prevention and determine the research foci that could maximize the ultimate public health benefits. The 2004 report, *Helping Adolescents at Risk: Prevention of Multiple Problem Behaviors*, focused on four co-occurring youth problems: serious antisocial behavior, drug and alcohol misuse, tobacco smoking, and risky sexual behavior.[2] It focused on the current state of knowledge about multiple problem behaviors associated with development, the evidence for effective public health measures for prevention and treatment, and the social costs of neglecting these behaviors during early development. Beginning in 2004 the PRB has been a partner with SAMHSA on a new approach to State Incentive

[2] Dr. Anthony Biglan, a member of the Prevention Review Research Work Group, directed the Palo Alto Group project.

Grants called the Strategic Prevention Framework (SPF). The PRB has provided technical assistance to the SPF and has funded a science-based evaluation of its state-funded grants.

Current Goals and Objectives of the PRB: The PRB Strategic Plan

From 2003 to the present, the drug abuse and HIV/AIDS prevention research portfolios administered by the PRB have targeted expansion in four areas: (1) developmental focus on emerging adulthood, early childhood, and college students; (2) additional venues or contexts for prevention activities (e.g., foster care system, criminal justice system, military systems); (3) identifiable populations at heightened risk (e.g., youth at risk, victims of disasters); and (4) novel prevention modalities (e.g., physical activity and exercise). Another emphasis area has been inclusion of the practice community in designing and executing prevention research.

The Prevention Research Review Work Group examined and discussed the current PRB research portfolio, which reflects the above areas of emphasis from the past 5 years. The Work Group also reviewed the 2008 PRB Strategic Plan, which includes 2-year and 5-year goals in each of four areas that the branch has targeted for expansion: novel intervention approaches; initiation of a Prevention Trials Network, research training, and HIV/AIDS.

- **Novel intervention approaches** continues the expansion in some of the areas targeted since 2003 and adds some new emphases. For example, this area has goals for expansion and evaluation of the portfolio in emerging intervention areas such as physical activity, mindfulness, and e-technology. An important new area of research noted in discussions with the PRB Chief is health communications research. There are goals for identifying adult subpopulations at heightened risk (e.g., emerging adults, the military, firefighters) for substance use initiation and progression to abuse or for acquisition and transmission of HIV/AIDS.

- The **Center for Advancement of Prevention Trials Research** will provide a platform for communication and collaboration among the over two dozen Community Multi-site Prevention Trials funded by the PRB. This proposed center is intended to foster partnerships between NIDA and multiple service delivery agencies. Under the proposed model, the service agencies would fund the services delivery components of an intervention trial, while PRB would fund the research components. The PRB approach to this network was discussed in detail at the Work Group's second meeting.

- The goals for **research training** include building a science-trained workforce of multi-disciplinary professionals equipped for translational research, attracting interest in issues in prevention science from scientists in complementary disciplines, and fostering new researchers from minority and underrepresented groups.

- The goals for the **HIV/AIDS** portfolio include focusing on those at highest risk for HIV (men who have sex with men and/or women, Latino and Africa-Americans, adolescents) and on strategies for HIV testing and linking to care among social networks. Another goal is to increase the portfolio investigating common pathways and reciprocal relationships among drug use/abuse and risky sexual behaviors; risk behaviors such as mental health disorders and symptoms, obesity, smoking, exercise, and alcohol use/abuse; and new

conceptual approaches to HIV prevention, especially those at the network, family, and community levels.

The findings and recommendations presented later in this report take into account the program rationale and emphases reflected in the current PRB portfolio and highlighted in the preceding brief history of the PRB. The Work Group's findings and recommendations were developed in light of, and in response to, the rationales for the emphasis areas and for the particular 2-year and 5-year goals of the PRB Strategic Plan, which was discussed in detail with DESPR and PRB staff.

THE WORK GROUP'S REVIEW PROCESS

The purpose of the Prevention Research Review Work Group was to evaluate NIDA's prevention research portfolio and program. Specifically, NIDA's Director asked the Work Group to produce a written report that includes:

1. A background review of the current prevention research portfolio and program.
2. Identification of strengths and gaps in prevention research conducted by NIDA.
3. Development of a 5-year plan for NIDA's prevention research program with the following emphases:
   - Recommend innovative and transformative approaches to develop the next generation of prevention research;
   - Provide a strategic overview to maximize the research base on translation of prevention research findings and to ensure their application in practice;
   - Review the current NIDA prevention research infrastructure and explore the development of new NIDA prevention research linkages; and
   - Examine the organization and management of the prevention research program and the interactions with other NIDA divisions/centers.

This document is the report of the Prevention Research Review Work Group in response to the above charge. The Work Group convened in two formal meetings. Teleconferences and email exchanges were employed between the two meetings and after the second meeting to continue discussions and develop the final report. The agendas for the two formal meetings are included here as Appendices B and C.

At its initial meeting in September 2008, the Work Group heard presentations from the Director of DESPR and the Chief of the PRB. These were followed by shorter briefings from the three other NIDA divisions, the AIDS Research Program, and the Office of Science Policy and Communications on aspects of those units' work that are coded as prevention research. On the second day, the Work Group had discussions with experts in the field of prevention: a representative from SAMHSA and the current president of the Society for Prevention Research.

At the second meeting in February 2009, the Work Group received follow-up presentations from the PRB Chief and the DESPR Director. Per the Work Group's request, the PRB Chief gave a special briefing on PRB's proposed Center for the Advancement of Prevention Trials Research. The Director of SAMHSA's Center for Substance Abuse Prevention also briefed the Work Group. The bulk of this second meeting was conducted in executive session, as the Work Group discussed and revised a draft report outline prepared by the chair. Subsequent to the second meeting, teleconferences and email exchanges were used to review, revise, and concur upon the content of the report.

NOTABLE ACCOMPLISHMENTS IN PREVENTION RESEARCH AT NIDA

To set the context for the Work Group's finding and recommendations, this section highlights NIDA's substantial accomplishments in prevention research—accomplishments that have been significant for progress in drug abuse prevention in particular but also for evidence-based prevention programs, policies, and practices generally.

1. The PRB has played a unique and long-term role at NIH in supporting the broad field of prevention science and drug abuse prevention in particular. The PRB's broad approach to the problems of substance abuse and HIV/AIDS has created a diverse portfolio that encompasses basic research, efficacy trials, effectiveness research, systems research, and services research, as well as sustaining an important focus on developing the new methods and tools necessary to support and advance these endeavors.

2. Research funded by the PRB has demonstrated that drug abuse develops in the context of diverse psychological and behavioral problems; thus, the prevention of drug abuse is facilitated by interventions that modify risk factors for these other problems. In the process of pursuing this broad developmental agenda, NIDA-funded prevention research has shown efficacy in preventing both drug use and abuse. In addition, this research has affected a broad range of outcomes in addition to drug use including alcohol use and abuse, depression, antisocial behavior, sedentary lifestyle, and academic failure.

3. The PRB portfolio is a model for comprehensively addressing the risk factors for drug abuse and HIV/AIDS acquisition. Because most substance use and abuse—as well as sexual risk behaviors that lead to HIV acquisition–begins in the period between early adolescence and young adulthood, it is imperative that a full understanding of risk factors and protective factors for substance use and abuse and for HIV/AIDS begin with the developmental period before the inception of these behaviors. For example, the PRB has recognized that it would be short-sighted to only support innovative interventions that begin in later childhood. The portfolio has responded to the growing evidence that interventions that begin early in life can have substantial influence on pathways that increase risk for substance abuse, as well as directly affecting later substance use and abuse. In particular, the Work Group commends the PRB for submitting its proposal to the NIH Roadmap to fund research on Child Wellness (the Child Wellness Initiative). This initiative exemplifies the kind of comprehensive approach to prevention that is needed. Although the proposed initiative has not yet been chosen for funding, it reflects a transformational model worthy of further pursuit.

4. Probably more than any other NIH institute or division of NIDA, DESPR has embraced developmental psychopathology as a discipline from which to improve well-being, promote change, and prevent substance abuse. PRB-funded studies have incorporated key concepts and principles including: (a) multilevel analysis of drug abuse causes and consequences, with particular emphasis on molecular and behavioral genetics, as well as the interaction between biological and environmental systems that influence stress neurobiology; (b) concepts of multifinality and equifinality[3] in

[3] "Multifinality" refers to the occurrence of diverse outcomes, in different cases, from the same antecedent condition. "Equifinality" refers to the same outcome resulting via diverse pathways from differing antecedent conditions.

examining risk and protective factors for drug abuse and associated outcomes; and (c) the integration of person-centered and variable-centered approaches, allowing for better characterization of risk in specific subgroups.

5. DESPR's support for innovation in research has been critical to the recent progress in prevention science. NIDA should be especially commended for its support of community multi-site prevention trials and longitudinal follow-up studies, which have produced important new knowledge. Examples include the Seattle Social Development Project, Fast Track, Communities That Care, and PROSPER. In each of these projects, longitudinal follow-up has demonstrated the long-term efficacy of prevention.

6. The PRB should be commended for its strong support for minority research training as well as for the support of early-career investigators. Support for such mechanisms as the Early Career Prevention Network (ECPN) has a high cost-to-yield ratio.

7. The knowledge, scientific guidance, and accessibility of the staff of the PRB is remarkable. The PRB scientific staff is widely acknowledged for its strong knowledge base in prevention science. Further, the PRB is noted for its dedicated outreach to the scientific community and is well recognized for its helpfulness with potential grantees.

8. The PRB has taken a proactive role in building the field of prevention science. There are numerous aspects of this process that should be noted, including the PRB's central role in the creation and support for the Society for Prevention Research and the Early Career Prevention Network. In addition, the PRB has been active in coordinating initiatives both within NIH and with other Federal agencies (see recommendations 8 and 9 in the next section).

MAJOR FINDINGS AND RECOMMENDATIONS

The first seven of the nine items in this section present major findings and recommendations related to fostering innovation and transformation in the next generation of NIDA-supported prevention research. The final two items contain findings and recommendations on strengthening and expanding the prevention research infrastructure.

As NIDA, and the PRB in particular, seek to foster innovation and transformation in prevention research, a key distinction will be that between Type 1 and Type 2 translational research.

- *Type 1 translational research* applies basic science discoveries to the development and improvement of interventions for the prevention of substance abuse and HIV/AIDS. Research topics in this area address the interface between basic science and prevention intervention. The typical endpoint for Type 1 research is production of promising new models of prevention to reduce risk for substance abuse or HIV/AIDS and to improve health and well-being.
- *Type 2 translational research* investigates factors, models, and processes associated with the adoption, implementation, and sustainability of tested and effective prevention programs, policies, and practices in communities, services settings, and populations.

Foster Innovation and Transformation in the Next Generation of Prevention Research

In view of the success of many randomized experimental trials that demonstrate the efficacy of interventions to prevent substance use and abuse when the interventions are delivered from a research setting, the Work Group believes the time has come to increase the emphasis in the portfolio toward greater support of Type 2 research.

1. **Expand Type 2 Translational Research.** Substantial accomplishments have occurred in developing and testing preventive interventions, especially with children, youth, and families. However, the prevention community does not yet have sufficient understanding of why these prevention interventions are not being adopted and used more widely, and this lack of understanding may threaten the long-term support of these programs by funders and policy-makers. A shift in emphasis is therefore needed, with greater attention to Type 2 translational research, including studies of the adoption, implementation, and sustainability of tested and effective programs, policies, and practices in communities, services settings, and populations. This research would ensure that existing knowledge results in reductions in the incidence and prevalence of drug abuse. Some progress has been made recently, but the Work Group believes this area presents the greatest opportunity—and should therefore receive the highest priority—to reduce substance use and abuse and more generally to improve public health. This recommendation applies to all NIDA-supported research, including HIV prevention and treatment. Specific recommendations for expanding Type 2 translational research are presented in the "Supporting Recommendations" section of this report.

2. **Focus Type 1 Translational Research on Understanding How, for Whom, and When Preventive Interventions Have the Greatest Impact.** To facilitate communication between investigators in prevention science and basic science, NIDA should continue to support research into the developmental processes and common causal mechanisms that are related to multiple physical and mental health outcomes including substance use and abuse. Scientific approaches of particular importance include developmental psychopathology, genetics, biological changes in response to

intervention, complex systems theory, theories of disruptive innovations, and neuroscience including brain imaging. Developmental studies have the potential to detail how genetic and early environmental factors such as maltreatment and poor parenting are transmuted into neurobiological changes associated with increased risk for drug abuse. Supporting developmental process research in the context of prevention trials will provide new knowledge regarding the plasticity of these neural systems in response to interventions, the optimal windows for intervention during 'critical periods of development,' and ways to identify and supplement interventions for potential non-responders. For HIV research, this recommendation will require recognizing that sexual and drug use behaviors are strongly related to a cluster of risky daily routines. Rather than pursuing only one outcome, the benefits and costs of targeting multiple outcomes simultaneously must be examined. Specific recommendations for focusing Type 1 translational research in accordance with this strategy are presented in the "Supporting Recommendations" section of the report.

3. **Create a Center for the Advancement of Prevention Trials Research.** Over the past decade, NIDA has shown great success in fielding multi-site prevention trials that have already yielded important findings. The Work Group supports the Strategic Plan of PRB to create a Center for the Advancement of Prevention Trials Research. This is a new and innovative proposal that could transform research in this area. It can add value to the existing NIDA prevention portfolio and lead to new areas of investigation by identifying common themes and challenges, developing common measures, identifying broad principles for dissemination and implementation, and developing statistical tools and methods to solve problems inherent in conducting multi-site trials.

4. **Expand NIDA's Leadership in Prevention Research.** The scientific study of how best to promote protective factors is a transforming model for prevention. It transcends the scientific silos in which diverse behavioral and physical disorders are studied separately. NIDA is well positioned to expand its leadership role in advancing the scientific understanding of how to promote such protective factors at multiple levels (healthy environments, communities, families, and personal strengths) across the life span, while buffering known risk factors for substance abuse and its associated negative outcomes (HIV, STDs, obesity, academic failure, mental disorders, etc.). For example, the Work Group commends NIDA for proposing a Child Wellness initiative for incorporation in the NIH Roadmap. The research agenda presented in that initiative should be pursued in other program elements and proposed wherever opportunity emerges. The Work Group recognizes that a child wellness initiative will require active partnering with other institutes and Federal agencies and that is precisely what is needed to create the next generation of comprehensive preventive interventions.

5. **Promote Innovative Prevention Research Tools and Methodologies.** To sustain and advance scientific study of both the developmental process at multiple levels of influence and the effects of preventive interventions, the Work Group recommends that NIDA continue and expand its focus on novel statistical methods and research designs, as well as new measurement and intervention technologies. Methods development should focus on tools designed to: (a) improve assessment of risk and outcome; (b) handle information-rich sources including genome wide association, ecological momentary assessments, neuroimaging, and other areas of neuroscience; (c) exploit advances in underlying technologies such as web-based data collection and dissemination and mobile embedded sensing; and (d) evaluate and optimize the cost-benefit ratio of preventive measures. New methods are needed to deal with the complexity of multi-level intervention models and to support studies of high-risk environments and how people select into interventions. Specific recommendations for this major recommendation are presented in the "Supporting Recommendations" section of this report.

6. **Enhance the Investment in Prevention Research Training.** The existing investments in training have been relatively limited but highly successful. There is a critical need to develop the next generation of prevention researchers beyond the training opportunities directly related to the NIH Roadmap's Clinical and Translational Science Awards. The Work Group encourages NIDA to expand this investment in particular areas including linking prevention science to complementary fields (genetics, statistical methods, ecological research, implementation science, marketing, and health communications) that will expand the evidence base for both Type 1 and Type 2 translation. In addition, there is an urgent need for culturally competent prevention research in racial and ethnic minority communities. Researchers from racial and ethnic minority groups are particularly well situated to carry out this important science. Thus, training for prevention scientists who have cultural expertise and are initiating innovative programs of research is imperative.

7. **Pursue the Recommendations of the IOM Report.** A just-released report on prevention from the National Research Council and the Institute of Medicine (IOM)[4] documents the substantial progress that has been made in prevention research since the IOM's previous report on this topic in 1994. A substantial portion of the research cited in the new report was funded by NIDA. There are multiple points on which this Work Group is strongly aligned with the IOM report's recommendations, including: (1) promoting the broad delivery of evidence-based programs in communities through community partnerships and braided funding between Federal agencies; (2) continuing the course of rigorous research both on specific and general risk factors and on protective factors that weaken or strengthen, respectively, age-appropriate competencies; (3) studying dissemination strategies; (4) creating new research linkages with neuroscience; and (5) focusing on prevention research for children in poverty. In addition, the PRB proposal for a child wellness initiative is consistent with the IOM recommendation for increased research on developmental health and competencies.

Strengthen and Expand Infrastructure Coordination

The study of healthy development should be a high priority across the NIH because of its implications for reducing the risk for multiple mental and behavioral disorders including substance abuse, as well for broad improvement in public health. Drug abuse and HIV prevention cannot be separated from the prevention of other problems, such as antisocial behavior, depression, and academic failure, because these outcomes are all highly comorbid with substance abuse. Evidence suggests that these problems or disorders share a set of risk factors and protective factors. A supportive and nurturing environment that promotes healthy development appears to be generally protective with respect to the entire range of problem outcomes. Innovation in prevention intervention will therefore most likely be driven by transdisciplinary work that crosses the boundaries between NIDA divisions, NIH institutes, and other governmental agencies.

8. **Facilitate Cross-Unit Collaboration within NIDA.** NIDA needs a formal structural and administrative mechanism to promote and facilitate coordination of prevention research between NIDA Divisions. The Work Group notes with approval two recent changes that are likely to promote inter-division coordination: the newly created position of the Director of Program Integration and the co–Program Officer (co-PO) mechanism recently pilot-tested on prevention imaging grants. NIDA should extend the use of promising structural mechanisms to facilitate such collaboration, such as an

[4] National Research Council and Institute of Medicine, *Preventing Mental, Emotional, and Behavioral Disorders Among Young People: Progress and Possibilities*. Washington: The National Academies Press. 2009.

expanded use of multiple Program Officers (multiple POs) and integrated planning through retreats that cross divisions. The goal should be to stimulate and reward interdisciplinary innovation by enabling the investment of resources, including funding and staff, to be credited to multiple programs and divisions. Desirable functional outcomes include formal recognition and incentives for staff efforts and for cross-division cooperation that create and exploit opportunities for innovative transdisciplinary research.

9. **Pursue Cross-Institute and Cross-Agency Partnering to Support Innovations in Prevention.** Major improvement at the societal level in prevention outcomes will require greater coordination of efforts between NIDA and other NIH Institutes and between NIDA and implementing agencies (e.g., SAMHSA, Department of Education, Department of Defense, Department of Justice, Centers for Disease Control and Prevention, Department of Labor). The Work Group commends NIDA for initiating activities in this direction, such as the Blending Research to Practice Initiative with SAMHSA, cross-agency meetings with the Administration for Children and Families, integration with the Center for Substance Abuse Prevention in the SPF State Incentive Grants evaluation, coordination with the Office of Juvenile Justice and Delinquency Prevention for violence prevention, and the recent partnering initiative with the Department of Defense. NIDA should continue to pursue partnering opportunities with other NIH institutes and centers, particularly where shared priorities can foster transdisciplinary research (e.g., NIH Office of Disease Prevention, NIH Prevention Research Coordinating Committee). Partnering with implementing agencies is essential to developing preventive interventions that address all of the risk factors for problematic development, expanding the range of evidence-based prevention approaches, and ensuring that their efficacy is confirmed when translated to practice.

SUPPORTING RECOMMENDATIONS

This section contains Work Group recommendations that support and help implement major recommendations 1, 2, and 5. The summary statement of the major recommendations is repeated here; for the full findings and recommendations, refer to the previous section.

Recommendation 1: Expand Type 2 Translational Research

1.1 **Emphasize Research on Effectiveness of Systems and Services.** To understand obstacles and solutions to bringing evidence-based prevention into wider use, a broad research agenda is needed**.** Specific research topics of value include (but are not limited to): (1) creating effective systems for the large scale implementation of effective prevention programs, which will require greater understanding of—and support to improving—organizational culture, decisionmaking, management of staff turnover, and workforce development; (2) learning from practitioners how to establish programs, policies, and practices that will serve communities' needs; and (3) assessing how variations in service delivery format (web, electronic, cell, etc.) affect uptake and effectiveness.

1.2 **Focus on Pre-Adoption Issues of Communication and Decisionmaking.** An essential domain for Type 2 translational research is the study of how prevention researchers and institutional decision makers communicate about prevention and evidence leading up to adoption and implementation of a program, policy, or practice. A research agenda for this domain should include three perspectives.

- First, what do *institutional decision makers and service providers* consider to be evidence, and how do they evaluate the evidence base for a program, practice, or policy? What sources of evidence are credible, and what aspects of evidence impact their decisions to adopt? How do they see prevention programs and policies relating to their institutional or agency needs? Understanding this perspective will require market research targeted to key decision makers such as school principals, superintendents of schools, judges, community leaders, and legislators.

- Second, from the perspective of *program developers*, how should institutions be assessed with respect to their specific needs for the developers' products and policies? How should programs, practices, and policies be adapted to fit the capacity of a specific institution? This is essentially a market research task to address issues of product design.

- Third, how do prevention *program consumers* decide to become involved in a program, practice, or policy? Do they discriminate between programs or policies that are evidence-based and those that are not? If so, how do they discriminate? What approaches are successful in helping them to access effective prevention programs, practices, or policies? A wide range of approaches to this research could be used, including studies of social networks, social branding, and how communication and social psychological strategies can be used to help prevention consumers make informed decisions about effectiveness.

To carry out this research will require both studies to improve our understanding of how to implement effective programs in practice settings and experimental evaluations of alternative

strategies for affecting practice. Those studies that have moved the field of prevention to the point of influencing programs, policies, and practices have been experiments that have demonstrated a clear impact on substance abuse. Carefully designed and executed experimental studies will be necessary to evaluate strategies for disseminating effective programs, policies, and practices.

1.3 **Support Innovative and Cross-Disciplinary Training.** Successful Type 2 translation requires mastery of the "implementation science" of fielding and evaluating interventions in real-world settings and expertise in the disciplines that inform the design of those interventions. These disciplines include clinical epidemiology and evidence synthesis, communication theory, behavioral science, public policy, financing, organizational theory, system redesign, informatics, and mixed methods/qualitative research. Given this complexity, new models of interdisciplinary training should be developed. Support for this effort can use a variety of funding mechanisms ranging from traditional training grants and K awards to sponsored workshops. To advance this area of scholarship, NIDA should use these and other mechanisms to attract and provide training to a new generation of investigators.

Recommendation 2: Focus Type 1 Translational Research on Understanding How, for Whom, and When Prevention Research Interventions Have the Greatest Impact

2.1 **Support Research on Biological and Genetic Factors Relevant to Prevention.** Scientific understanding of the role that biological and genetic factors play in the efficacy of a prevention intervention is still in a nascent state, particularly with regard to human studies. This transdisciplinary field nevertheless has great potential to advance prevention science. For example, prevention strategies may be improved by using brain imaging to test models for human information processing and to evaluate responses to particular messages. Supporting developmental process research in the context of prevention trials will provide new knowledge regarding the plasticity of these neural systems in response to interventions, the optimal windows for intervention during critical periods of development, and ways to identify and supplement interventions for potential nonresponders. Prevention programs may be tailored to specific groups based on a combination of genetic and epidemiological data. NIDA should pursue research along these and similar lines of inquiry as a growth area.

2.2 **Support Research on How and for Whom Prevention Programs Have Their Effects.** Studies on the mediating mechanisms by which prevention programs affect substance use and abuse are critical both for advancing our understanding of the malleability of developmental pathways and for identifying core aspects of the interventions that need to be maintained across later applications of the interventions to maintain their effectiveness. For example, longitudinal research is needed to study the cascading pathways of development, in order to understand how intervention-induced changes in key mediators lead to other changes across developmental periods, which in turn aid in preventing substance abuse. Such research is critical to identify key mediating processes that lead to long-term prevention and that can be effectively targeted by preventive interventions. In addition, studies of the effectiveness of evidence-based programs with new populations can be critical to broadening the public health impact of prevention and to understanding the impact of culture, ethnicity, or local ecological factors on program effectiveness.

2.3 **Pursue Development of Novel Interventions.** The Work Group supports the PRB Strategic Plan in recognizing the potential value of novel interventions (e.g., physical activity, e-technologies, mindfulness). Exploring these areas will include not only developing new intervention models but also applying novel interventions based on such models to the needs of special populations (older adults, minority populations, and others) with particular risk characteristics.

2.4 **Support Research on Comprehensive Models of Prevention.** NIDA has been at the forefront of etiological and intervention research showing what is needed to prevent drug abuse. This research has clarified conditions for the preventive environment to succeed. For example, the environment must nurture an individual's self-regulatory skills and prosocial values and behavior. Such nurturing environments appear to have four features: (1) they minimize biologically and psychologically toxic events; (2) they richly reinforce prosocial behavior; (3) they teach prosocial values and developmentally and culturally appropriate skills; and (4) they promote psychological flexibility in which people pursue value-driven directions while taking an accepting and pragmatic stance toward their own and others' thoughts and feelings.

Nurturing environments have been shown to reduce the risk not only of substance abuse but also of other problems such as antisocial behavior, depression and academic failure. The widespread implementation of preventive interventions requires infrastructure development that goes beyond the wide and effective adoption of evidence-based prevention interventions for drug abuse. It requires strengthening all of the ways through which communities create and maintain nurturing families, schools, workplaces, and neighborhoods. From this perspective, further advances in prevention will require a new generation of studies that develop and test interventions to enhance nurturance comprehensively—in families, schools, neighborhoods, and communities, both universally and as applied to high risk groups. Such interventions have the potential to prevent not just drug abuse but a panoply of psychological behavioral and physical health problems. Recognition of this common ground for preventing multiple wellness and public health problems argues for collaboration among multiple NIH institutes, including NIDA, to fund research on comprehensive preventive interventions, including research that evaluates prevention and promotion via health networks and activities.

Such comprehensive interventions should be mounted in neighborhoods and communities and should be evaluated in rigorous experimental designs. These interventions are likely to combine treatment and prevention, since both types of interventions contribute to the ultimate public health goal of lowering the prevalence of drug abuse. They should develop and test strategies for getting evidence-based programs, policies, and practices implemented effectively. In the initial development of such interventions, innovative designs that permit refining the intervention across a series of communities and with less cost than randomized trials, such as interrupted time series designs, may provide the most appropriate experimental method.

2.5 **Support Development and Widespread Use of Data Monitoring Systems.** NIDA should continue to support the development and dissemination of data systems that can guide communities and states in their prevention efforts. It is now possible to create web-based data systems that give community members precise information about the levels of problem behaviors and prosocial behavior in their communities and the status of risk factors for problematic development outcomes (e.g., dashboard systems). Resources are needed to develop such consumer-friendly systems, and

research is needed to evaluate their contribution to prevention. For those proven to be effective, resources are needed to make them widely accessible and to foster their use by communities.

2.6 **Support Replication of Interventions across Development and with Different Populations.** Although a wide range of preventive interventions have now been tested in careful trials, there are still few interventions that have been independently replicated. There is a need to both replicate effective programs and evaluate their long-term outcomes. Such interventions should be tested in groups that differ in gender, developmental stage, and ethnocultural identity. This research is essential to know which interventions, used with which populations, are likely to improve public health.

Recommendation 5: Promote Innovative Prevention Research Tools and Methodologies

5.1 **Support Research into the Utility and Analysis of Near-Continuous Time Assessments.** New technologies are providing an unprecedented opportunity to measure behavior, environmental risk factors, gene expression, and brain function repeatedly at very short time intervals. These tools produce extremely large amounts of data, which are notoriously difficult to manage and to analyze efficiently. Especially challenging are studies in which two or more sources of high-volume data are to be analyzed. To make the most of these new technologies, research is needed into methods of data analysis that retain the key features of the patterns of change and the relationships between risk factors and outcomes. These new methods will further support the linkage of genetic epidemiology, imaging, and intervention impact.

5.2 **Support Research into Novel Assessments of Risk for Substance Use and Dependence.** Although multiple instruments exist for measuring the use and abuse of drugs, most are designed for use in clinical settings. For the purposes of prevention, it is necessary to develop optimal instruments that assess risk in advance of the onset of drug use and abuse. These instruments should be developed in both short and longer forms. Alternative modalities of administering such tests (e.g., interview, questionnaire, mobile phone, web-based) should be compared; methods to discern the accuracy of respondents' self-reports should be developed and applied, to increase the accuracy of prediction of risk.

5.3 **Develop Methods for the Analysis of Studies of the Efficacy of Type 2 Translational Research and its Adoption.** Improving the effectiveness of programs for prevention depends on being able to measure the impact of interventions as precisely as possible. Widespread implementation of different prevention programs will yield vast quantities of individual-level data of complex structure. New methods are needed to deal with the complexity of multi-level intervention models. Methods that can analyze data in which there is partial non-randomization, such as when agencies or participants self-select into particular prevention programs, should be developed. Approaches that model the complex causal networks from preventive measure to outcomes of reduced substance use and abuse should be a priority. Methods for evaluating the cost-benefit ratio of interventions in these contexts are also needed to maximize cost-effectiveness in implementing Type 2 translational programs.

CONCLUSIONS

Prevention research at NIDA has made important contributions to the scientific foundations for understanding the etiology and prevention of substance use and abuse and related behaviors. The Prevention Research Branch had developed a truly exceptional portfolio of high quality research under the outstanding leadership of its Branch Chief and supporting staff.

The Work Group has identified several opportunities to enhance prevention research at NIDA. For optimal success, these opportunities should be coordinated under the expertise of the PRB. One such opportunity is a shift to greater emphasis on Type 2 translational research, including studies of the adoption, implementation, and sustainability of tested and effective programs, policies, and practices in communities, services settings, and populations. The Work Group also identified new and innovative areas of scholarship in Type 1 translational research, including investments in interdisciplinary research that would strengthen the connections between prevention research and relevant disciplines such as neuroscience and genetics. A third major opportunity involves adopting large scale public health research models that examine community-level processes and the joint effects of comprehensive programs and policies that involve both prevention and treatment to reduce community-level rates of substance use and abuse. Fourth, to promote scientific advances and innovation, NIDA should further develop the support and training of early career prevention investigators.

Implementation of the Work Group's recommendations will enhance an already vibrant program in prevention science research. Doing so will position the PRB and NIDA to grasp new research opportunities that will advance the scientific foundation of prevention while translating current knowledge into programs, practices, and policies that can be broadly diffused to improve the public health generally, as well as reducing substance use and abuse.

Appendices

APPENDIX A: PREVENTION RESEARCH REVIEW WORK GROUP

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APPENDIX B: PREVENTION RESEARCH REVIEW WORK GROUP MEETING, SEPTEMBER 2008

National Institute on Drug Abuse
Prevention Research Review Work Group
September 8–9, 2008

3rd Floor NIDA Conference Center
6001 Executive Boulevard
Bethesda, MD

Day 1—September 8, 2008

9:00– 9:15 am	**Welcome and Charge for the Prevention Research Review Work Group** *Nora Volkow, M.D., Director, NIDA*
9:15–9:30 am	**Work Group Introductions, Opening Remarks** *Mark Greenberg, Ph.D., Work Group Chair*
9:30–10:00 am	**Overview of the Prevention Research Portfolio across the Division of Epidemiology, Services and Prevention Research** *Wilson Compton, M.D., Director, DESPR*
10:00–10:30 am	**Prevention Research Branch** *Elizabeth Robertson, Ph.D., Branch Chief*
10:30–11:00 am	**Questions / Discussion**
11:00–11:15 am	**Break**
11:15 am–12:00 pm	***Executive Session*—Work Group Discussion**
12:00–1:30 pm	***Working Lunch***

NIDA RESEARCH RELATED TO THE PREVENTION RESEARCH PORTFOLIO

1:30 – 1:50 pm	**Division of Clinical Neuroscience and Behavioral Research** *Joseph Frascella, Ph.D., Director*
1:50 – 2:10 pm	**Division of Pharmacotherapies & Medical Consequences of Drug Abuse** *Ivan Montoya, Ph.D., Acting Deputy Director*

Day 1—September 8, 2008 (continued)

2:10–2:30 pm	**AIDS Research Program** *Jacques Normand, Ph.D., Director*
2:30–2:50 pm	**Office of Science Policy and Communications** *Cindy Miner, Ph.D., Deputy Director*
2:50–3:10 pm	**Division of Basic Neuroscience & Behavioral Research** *David Shurtleff, Ph.D., Director*
3:10–3:30 pm	***Break***
3:30–5:00 pm	**Work Group Discussion** *Mark Greenberg, Ph.D., Work Group Chair*

Day 2—September 9, 2008

8:30 am–12:00 pm	***EXECUTIVE SESSION***
8:30–9:00 am	**Work Group Discussion** *Mark Greenberg, Ph.D., Work Group Chair*

Prevention Research: Discussions with Experts in the Field

9:00–9:30 am	*Frances Harding, Director, Center for Substance Abuse Prevention, SAMHSA*
9:30–9:45am	**Work Group Discussion**
9:45–10:15 am	*Zili Sloboda, Sc.D., President, Society for Prevention Research*
10:15–10:30 am	***Break***
10:30 am–12:00pm	**Work Group Discussion**
12:00 pm	***ADJOURN***

APPENDIX C: PREVENTION RESEARCH WORK GROUP MEETING, FEBRUARY 2009

National Institute on Drug Abuse
Prevention Research Review Work Group
February2-3, 2009

Congressional Room
Hyatt Regency Bethesda Hotel
Bethesda, MD

Day 1—February 2, 2009

9:00–9:15 am	**Work Group Introductions; Opening Remarks** *Mark Greenberg, Ph.D., Work Group Chair*
9:15 am–5:00 pm	***EXECUTIVE SESSION***
9:15–10:00 am	**Prevention Research—Prevention Clinical Trials Network** *Elizabeth Robertson, Ph.D., Chief, Prevention Research Branch, DESPR*
10:00–10:30 am	**Questions / Discussion** *Work Group Members*
10:30–10:45 am	***Break***
10:45–11:45 am	**Discussion—NIDA's Prevention Research Portfolio** *Wilson Compton, M.D., Director, DESPR*
11:45 am–1:00 pm	***Lunch and Break***
1:00–1:30 pm	**Prevention Research at SAMHSA** *Frances Harding, Director, Center for Substance Abuse Prevention, SAMHSA*
1:30–2:00 pm	**Discussion with Frances Harding** *Work Group Members*
2:00–3:00 pm	**Work Group Discussion** *Mark Greenberg, Ph.D., Work Group Chair*
3:15–4:00 pm	**NIDA's Prevention Research Branch** *Elizabeth Robertson, Ph.D., Chief, Prevention Research Branch, DESPR*
4:00–5:00 pm	**Work Group Discussion** *Mark Greenberg, Ph.D., Work Group Chair*

5:00 pm	***Adjourn—Day 1***

Day 2—February 3, 2009

8:30 am–12:00 pm	***EXECUTIVE SESSION***
8:30–10:00 am	**Prevention Research Review Work Group Report—Potential Content, Framework, Recommendations** *Mark Greenberg, Ph.D., Work Group Chair*
10:00–10:15 am	***Break***
10:15 am–12:00 pm	**Work Group Discussions** *Mark Greenberg, Ph.D., Work Group Chair*
12:00 pm	***Adjourn—Day 2***