

# Child Development and Behavior Branch NICHD



**Report to the NACHHD Council**  
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## TABLE OF CONTENTS

<b>ACRONYMS AND ABBREVIATIONS.....</b>	<b>I</b>
<b>EXECUTIVE SUMMARY .....</b>	<b>1</b>
<b>INTRODUCTION TO THE BRANCH.....</b>	<b>1</b>
HOW THE CDBB BUILDS SCIENTIFIC INITIATIVES.....	2
<b>BRANCH RESEARCH PROGRAMS.....</b>	<b>3</b>
SOCIAL AND AFFECTIVE PROCESSES IN CHILD AND FAMILY DEVELOPMENT PROGRAM .....	3
<i>Program Initiatives</i> .....	3
<i>Program Growth</i> .....	5
<i>Program Impact</i> .....	5
<i>Strategic Planning/Future Program Directions</i> .....	5
DEVELOPMENTAL COGNITIVE PSYCHOLOGY, BEHAVIORAL NEUROSCIENCE, AND PSYCHOBIOLOGY PROGRAM .....	6
<i>Program Initiatives</i> .....	6
<i>Program Growth</i> .....	7
<i>Program Impact</i> .....	8
<i>Strategic Planning/Future Program Directions</i> .....	8
BEHAVIORAL PEDIATRICS AND HEALTH PROMOTION PROGRAM .....	9
<i>Program Initiatives</i> .....	9
<i>Program Growth</i> .....	12
<i>Program Impact</i> .....	12
<i>Strategic Planning/Future Program Directions</i> .....	13
HUMAN LEARNING AND LEARNING DISABILITIES (LDS) PROGRAM .....	13
<i>Program Initiatives</i> .....	14
<i>Program Growth</i> .....	15
<i>Program Impact</i> .....	15
<i>Strategic Planning/Future Program Directions</i> .....	18
LANGUAGE, BILINGUAL, AND BILITERACY DEVELOPMENT AND DISORDERS AND ADULT, FAMILY, AND ADOLESCENT LITERACY PROGRAM .....	18
<i>Program Initiatives</i> .....	19
<i>Program Growth</i> .....	22
<i>Program Impact</i> .....	23
<i>Strategic Planning/Future Program Directions</i> .....	23
EARLY LEARNING AND SCHOOL READINESS PROGRAM.....	24
<i>Program Initiatives</i> .....	25
<i>Program Growth</i> .....	26
<i>Program Impact</i> .....	27
<i>Strategic Planning/Future Program Directions</i> .....	27

MATHEMATICS AND SCIENCE COGNITION AND LEARNING DEVELOPMENT AND DISORDERS PROGRAM .....	27
<i>Program Initiatives</i> .....	28
<i>Program Growth</i> .....	32
<i>Program Impact</i> .....	32
<i>Strategic Planning/Future Program Directions</i> .....	32
<b>OVERVIEW OF BRANCH FUNDING TRENDS: 2000-2004 .....</b>	<b>32</b>
<b>FIGURES AND TABLES .....</b>	<b>FIGURES AND TABLES-1</b>
<b>APPENDIX A: BRANCH SOLICITATIONS .....</b>	<b>A-1</b>
<b>APPENDIX B: BRANCH PUBLICATIONS .....</b>	<b>A-4</b>
<b>APPENDIX C: BRANCH PERSONNEL .....</b>	<b>A-9</b>

## ACRONYMS AND ABBREVIATIONS

<b>Acronym/ Abbreviation</b>	<b>Full Description</b>
AAAS	American Association for the Advancement of Science
ACF	Administration for Children and Families
ADHD	Attention Deficit/Hyperactivity Disorder
ALRWG	Adult Literacy Reading Research Working Group
ASHA	American Speech-Language-Hearing Association
ASPE	Office for the Assistant Secretary for Planning and Evaluation
BCC	Behavior Change Consortium
CANWG	Child Abuse and Neglect Working Group
CDBB	Child Development and Behavior Branch
CDC	Centers for Disease Control and Prevention
COSE	Committee on Science Education
DELLS	Development of English Literacy in Spanish-Speakers
DHHS	U.S. Department of Health and Human Services
DOJ	U.S. Department of Justice
DRDC	Data Research and Development Center
DTI	Diffusion Tensor Imaging
ED	U.S. Department of Education
ELLs	English-Language Learners
ERIC	Education Resources and Information Center
FIRST	First Independent Research Support and Transition
fMRI	Functional Magnetic Resonance Imaging
IAA	Inter-agency Agreement
IERI	Inter-agency Education Research Initiative
IES	Institute of Educational Sciences
IRA	International Reading Association
ISRC	Inter-agency School Readiness Consortium
LDRC	Learning Disabilities Research Center
LDs	Learning Disabilities
MCHB	Maternal and Child Health Bureau
MRI	Magnetic Resonance Imaging
MRSI	Magnetic Resonance Spectroscopy Imaging
NACHHD	National Advisory Child Health and Human Development
NCI	National Cancer Institute
NELP	National Early Literacy Panel
NHLBI	National Heart, Lung, and Blood Institute
NIA	National Institute on Aging
NIAAA	National Institute on Alcohol Abuse and Alcoholism
NICHHD	National Institute of Child Health and Human Development
NIDA	National Institute on Drug Abuse
NIDDK	National Institute of Diabetes and Digestive and Kidney Diseases
NIFL	National Institute for Literacy

<b>Acronym/ Abbreviation</b>	<b>Full Description</b>
NIH	National Institutes of Health
NIJ	National Institute of Justice
NIMH	National Institute of Mental Health
NINDS	National Institute of Neurological Disorders and Stroke
NINR	National Institute of Nursing Research
NLP	National Literacy Panel on Language-Minority Children and Youth
NSF	National Science Foundation
OBSSR	Office of Behavioral and Social Science Research
ODS	Office of Dietary Supplements
OELA	Office of English Language Acquisition
OERI	Office of Educational Research and Improvement
OSEP	Office of Special Education Programs
OSERS	Office of Special Education and Rehabilitation Services
OVAE	Office of Vocational and Adult Education
PA or PAR	Program Announcement
RDs	Reading Disabilities
RFA	Request for Applications
SBIR	Small Business Innovative Research
SEED	Science and Ecology of Early Development
SRCD	Society for Research on Child Development
STTR	Small Business Technology Transfer

## **EXECUTIVE SUMMARY**

The Child Development and Behavior Branch (CDBB), within the Center for Research for Mothers and Children, has grown in the past four years from supporting five programs to supporting seven, with a concomitant increase in the number of grants of more than 50 percent, and a corresponding increase of more than 87 percent in overall funding. During this time, the CDBB has continued to fund high-quality research on all aspects of child development and human behavior, to vigorously identify gaps in research knowledge, and to develop new initiatives to close these gaps. This report describes how the Branch goes about identifying and addressing gaps and the areas of science managed within each program and provides an overview of major initiatives accomplished or under way. The CDBB continues to emphasize interdisciplinary research, both in the design and implementation of studies, and in training the next generation of developmental scientists. Moreover, the Branch strives to increase research support for new and innovative methodologies to measure the development of complex cognitive, linguistic, social, perceptual, biological, genetic, environmental, and educational variables relevant to human maturation across the life span.

## **INTRODUCTION TO THE BRANCH**

The CDBB develops scientific initiatives and supports research and research training relevant to the psychological, psychobiological, language, behavioral, and educational development of children. A central theme that characterizes all Branch scientific programs is this: physical and behavioral development are most comprehensively and accurately described and studied as variable processes in which individual differences in cognitive, social, affective, language, and neurobiological maturation, environment and life experiences, and genetics interact in complex ways to influence child development.

During the past four years, the CDBB has developed new initiatives to better understand how inherited, dispositional, environmental, and experiential conditions are integrated in development to mold, moderate, and predict human learning and behavior. New programmatic initiatives in early childhood and school readiness, mathematics development and learning disabilities, adolescent literacy, and adult and family literacy exemplify this focus. Critical to both sustained and new initiatives is an emphasis on the development of dynamic research methods and approaches that assess and describe complex behavioral and biological interactions as they unfold over time.

To better serve its scientific constituencies and accomplish its scientific missions, the Branch has developed new research programs and reorganized selected existing research programs to increase scientific coverage, focus, coherence, and relevance. The additions and changes are described in the text of this report. The Branch continues to successfully recruit accomplished and experienced scientists to direct each of its research programs. Brief biographical sketches of

Branch staff are provided in Appendix C. A list of Branch program directors' publications since 2000 is provided in Appendix B.

### **HOW THE CDBB BUILDS SCIENTIFIC INITIATIVES**

The scientific program directors in the CDBB communicate continuously with scientific colleagues, grantees, and prospective grantees, while attending scientific and professional meetings to stay abreast of new findings in their areas of scientific expertise and responsibility. Branch staff place equal importance on providing scientific leadership to identify research gaps, and on working closely with the scientific community to develop initiatives that will close such gaps.

Once a research need is identified through reviews of the literature, discussions at conferences and meetings, and/or recommendations from congress, CDBB staff discuss the need for new research with scientists who possess expertise in the topic(s) of interest, and with counterparts at various federal or non-federal (private foundation) funding agencies. Staff then propose a workshop or major symposium within the National Institute of Child Health and Human Development (NICHD) planning system and plan the event, usually with co-sponsors, which typically include not only other federal agencies, but also foundations and scientific and professional associations. A meeting agenda is developed to provide a framework for a comprehensive review of the current state of the science. Through plenary and breakout group discussions, participants formulate a consensus on what is currently known and not known; from this consensus, they forge a research agenda that reflects the most significant research gaps and proposes scientific strategies to develop new knowledge. To ensure that the information is clearly relevant to the clinical and practitioner communities, the Branch may hold a second meeting before it moves forward with the research agenda. This scientific-clinical collaboration proactively reduces communication, methodological, and conceptual barriers that may impede the critical transition and scale-up of research findings.

Following the meeting, a summary document is posted on the NICHD and/or co-sponsors' Web site to allow rapid dissemination of presentation content and discussion results. In addition, the proceedings may be submitted to a peer-reviewed journal or published in an edited book to increase the dissemination and visibility of the information; in these cases, the program officer typically serves as an editor or co-editor. In the Branch's experience, these publications highlight the importance of different topic areas and stimulate critical new research in previously understudied areas. If needed, this research forms the basis of a solicitation that seeks to build critically needed scientific knowledge in the targeted area. The solicitations are often grounded in trans-agency collaboration, with other agencies contributing funds and expertise to the endeavor.

After peer review and the presentation of a funding plan to the Institute's advisory council for approval, program staff collaborate with principal investigators to develop informal research networks, which provide consistent communication and collaboration across sites. One important aspect of this approach is that investigators budget within their grants for travel to attend annual investigator meetings in the Washington D.C., area; at these meetings, researchers

share designs and seek to determine whether a core set of common measures might be adopted to allow greater comparability across projects and potential pooling of data to address common questions. This collaborative process has proven to be exceptionally helpful. For example, datasets from different sites can be combined to ensure that researchers have adequate statistical power to pursue unanticipated research questions that emerge from the ongoing research findings. In addition, network researchers plan joint symposia and presentations at which collective research findings can be presented to key professional societies. The remainder of this report outlines the CDBB's research programs and describes the component initiatives, progress, impact, and future directions for each program.

## **BRANCH RESEARCH PROGRAMS**

### **SOCIAL AND AFFECTIVE PROCESSES IN CHILD AND FAMILY DEVELOPMENT PROGRAM**

This Program, previously known as the Cognitive, Social, and Affective Development, Child Maltreatment, and Violence Program, supports research and research training relevant to normative cognitive, social, affective, and personality development from the newborn period through adolescence. The Program also focuses on the impact of specific aspects of physical and social environments on the health and psychological development of infants, children, and adolescents. Investigations of socio-cultural, familial, individual, and biological influences on development are of interest, as are studies of child developmental processes in high-risk settings (e.g., in violent or abusive environments, or in families experiencing stressors such as poverty, unemployment, or parental depression).

#### **Program Initiatives**

##### *RESEARCH ON CHILD NEGLECT*

In 1999, the National Institutes of Health (NIH) established the Child Abuse and Neglect Working Group (CANWG) and issued a multi-agency request for applications (RFA) titled *Research on Child Neglect* (OD-99-006). The initiative was supported by the NICHD (CDBB), the Office of Behavioral and Social Sciences Research (OBSSR), the National Institute on Alcohol Abuse and Alcoholism (NIAAA), the National Institute of Dental and Craniofacial Research, the National Institute on Drug Abuse (NIDA), the National Institute of Mental Health (NIMH), and the National Institute of Neurological Disorders and Stroke (NINDS) at the NIH; the Children's Bureau at the Administration for Children and Families (ACF) at the U.S. Department of Health and Human Services (DHHS); the National Institute of Justice (NIJ) and the Office of Juvenile Justice and Delinquency Programs at the U.S. Department of Justice (DOJ); and the Office of Special Education Programs (OSEP) at the U.S. Department of Education (ED). As a result of this RFA, the CDBB funded seven grants on child neglect that addressed public policy and child neglect, the impact of child neglect on adaptation to school, the impact of neglect on adolescent development, causes and assessment of child neglect, and the impact of neglect on adult outcomes. In 2000, the sponsoring agencies established the Federal Child Neglect Consortium, which consisted of grants funded under the RFA and the sponsoring agencies; additional projects were subsequently funded and added to the Consortium, including



three CDBB projects on the prevention of child neglect and the community context of rural and urban child neglect. The Consortium holds annual investigator meetings to report its findings. In 2001, as a follow-up to this initiative, the Branch, in collaboration with the CANWG, issued a program announcement (PA/PAR), *Research on Child Neglect* (PA-01-060). The CANWG also issued a PA in 1999, *Career Development Awards for Child Abuse and Neglect Research* (PA-99-133); to date, the Branch has funded 13 awards under these initiatives.

#### *DEFINITION AND CLASSIFICATION OF CHILD ABUSE AND NEGLECT*

In fall 1999, the Branch, in collaboration with the Children's Bureau at the ACF and the NIH CANWG, sponsored *Defining and Classifying Child Abuse and Neglect*, a meeting to assess the state of the science in this area and to plan a research agenda. A second meeting, held in the winter of 2000, focused on general measurement and methodology needs and brought together researchers from the various scientific and clinical fields essential to moving the research forward. The Program's director is currently editing a book on this topic as a follow-up to these two multidisciplinary meetings. CDBB staff and meeting sponsors are planning a third meeting, which will focus on specific measurement and methodology requirements and will outline specific approaches to advance this field.

#### *RESEARCH ON YOUTH VIOLENCE*

In the fall of 1999, the NIH convened a panel of experts to evaluate the state of NIH research on youth violence; the CDBB was one of several co-sponsors of this meeting. In 2000, based on the recommendations from this meeting, the NICHD, in collaboration with the OBSSR, the NIAAA, NIDA, and the NIMH, issued an RFA titled *Research on the Development of Interventions for Youth Violence* (RFA OD-00-005). To date, the CDBB has funded five projects under this initiative. The grantees of this initiative, together with the sponsoring Institutes, have established a Youth Violence Consortium, which holds annual investigator meetings to share findings and research directions.

#### *CHILDREN EXPOSED TO VIOLENCE*

In 2002, the CDBB organized the *Children Exposed to Violence* workshop; partner agencies included NIDA, the NIMH, the Fogarty International Center, and the OBSSR at the NIH; the Office of the Assistant Secretary for Planning and Evaluation (ASPE), the Centers for Disease Control and Prevention (CDC), and the Substance Abuse and Mental Health Services Administration within DHHS; the NIJ at the DOJ; and OSEP at ED. The goal of this workshop was to assess the state of the science and research needs related to children exposed to domestic violence, community violence, and war/terrorism. A summary document of the workshop is available at [http://www.nichd.nih.gov/crmc/cdb/Workshop\\_on\\_ChildrenViolence.pdf](http://www.nichd.nih.gov/crmc/cdb/Workshop_on_ChildrenViolence.pdf). Based on this meeting, the NICHD developed a three-year, multi-agency PA (PAR-03-096) that was published in 2003; awards were made in 2004. In addition, the Branch coordinated two special issues of the journal *Clinical Child and Family Psychology Review* to highlight research on children exposed to violence; the issues were co-edited by the Branch's Dr. Margaret Feerick and were published in 2003. Dr. Feerick is also editing a book on this topic that describes some current Branch projects on children and violence.

#### *RESEARCH ON EMOTION DEVELOPMENT*

In 2003, the CDBB supported a PA, *Basic and Translational Research on Emotion* (PA-03-169), along with the NIMH, NIDA, NINDS, the NIAAA, the National Institute on Aging (NIA), and the National Cancer Institute (NCI). This PA underscored both the NICHD's and the Branch's research commitment to basic and applied research on emotion development and regulation. This area is closely linked to child maltreatment and violence and is crucial to understanding those areas; through this collaborative PA and through investigator-initiated research applications, the Branch seeks to build the NICHD's foundational investment in research on normative development and in the translation of such fundamental research to both the facilitation of typical development and intervention with children at risk.

#### **Program Growth**

The Cognitive, Social, and Affective Development, Child Maltreatment, and Violence Program was the largest Program within the Branch, and the newly titled Program remains so. In 2000, the Program administered 87 grants with a total budget of \$18,032,000. By the end of fiscal year 2003, the Program administered 113 grants, with a total budget of \$34,427,000, reflecting increases of 29.9 percent and 90.9 percent, respectively (see Figure 1 and Table 1 for more details).

#### **Program Impact**

This Program now has a significant portfolio on child maltreatment and violence, areas that previously received little research attention and little funding. The relatively new focus on these areas has enhanced interest and increased the amount, quality, and rigor of such research. A better understanding of the effects of maltreatment and violence will enable researchers to develop and test interventions for these situations, which are increasingly recognized as crucially important to the American family and to the well-being of all children.

Programmatic attention also focuses on training the next generation of interdisciplinary scientists so that they can continue to address important questions in this area. The efforts of the director of this CDBB Program in co-chairing the CANWG, and in organizing and developing sponsorship for conferences, writing solicitations and PAs, and editing books and journals helps to highlight both current research and important areas in need of further investigation.

#### **Strategic Planning/Future Program Directions**

As indicated, the Branch reorganized this Program, formerly the Cognitive, Social, and Affective Development, Child Maltreatment, and Violence Program, based on the overall growth of the research and on feedback from National Advisory Child Health and Human Development (NACHHD) Council members and senior developmental scientists. The new Program, the Social and Affective Processes in Child and Family Development Program, ensures a greater focus and enhances communication with the scientific community. The new Program includes research on social, emotional, and personality development; child abuse, neglect, and violence; and the impact of family and marriage relationships on child development. Grants previously administered under the prior Program that related to basic cognitive development were transferred to the Developmental Psychobiology and Cognitive Neuroscience Program to achieve a stronger integration between basic cognitive development, cognitive science, and developmental neuroscience.

**DEVELOPMENTAL COGNITIVE PSYCHOLOGY, BEHAVIORAL NEUROSCIENCE,  
AND PSYCHOBIOLOGY PROGRAM**

This Program, formerly the Developmental Psychobiology and Cognitive Neuroscience Program, develops and supports research to identify linkages among the developing brain, behavior, and genes. Of particular interest are studies that focus on developmental pathways leading to normal and atypical brain development and behaviors, and on the identification of underlying mechanisms at the molecular, genetic, cellular, and network levels relevant to developing brain and behavior. In addition, the Program supports research that identifies biological and behavioral indices of individual differences that are predictive of performance in sensory, motor, linguistic, cognitive, and social behavior at different points in development. This Program also supports research training in developmental psychobiology, behavioral genetics, and developmental cognitive neuroscience. Areas of emphasis include both human and animal model studies assessing neuroanatomical, neurofunctional, electrophysiological, and neurochemical correlates of attention and attention deficits, perception, sensation, sensori-motor function, memory, learning, problem solving, and socio-emotional behavior. Research that examines the influence of genetic-environmental interaction on temperament, learning, cognition, and social and group behavior in the developing organism is encouraged, as well as research that investigates the effects of hormonal influences on behavioral development. Other areas of research interests for this Program are the development of gender-specific behaviors; the role of hormones in social, emotional, and cognitive development; and the interaction among hormones and stress-related behaviors during development.

**Program Initiatives**

*PEDIATRIC MAGNETIC RESONANCE IMAGING (MRI) STUDY OF NORMAL BRAIN DEVELOPMENT*

One major focus of the Developmental Cognitive Psychology, Behavioral Neuroscience, and Psychobiology Program is normal brain development. The Pediatric MRI Study of Normal Brain Development addresses this focus. This study is a contracted network of six university research sites in the United States and a data processing center in Montreal, Canada. The overall goal of the initiative, developed as a result of a series of workshops, became the focus of a trans-Institute request for proposals. The goal of the network is to produce a public-access database of structural MRI, diffusion tensor imaging (DTI), and magnetic resonance spectroscopy imaging (MRSI) data for a sample of children ranging in age from birth to 18 years; demographic, cognitive, and behavioral assessment data are included for each child. The data are longitudinal, composed of several scans and assessments collected for each child over time; the sample of children has been meticulously ascertained and is representative of the 2000 U.S. Census population distributions. Eventually, growth curve analyses will be produced showing typical growth of the total brain and of major brain regions across the ages represented in the sample. This project has already generated the largest sample of pediatric anatomical MRI scans obtained through a standardized imaging protocol to date. The final results and database are expected in summer 2008. A public access Web site describing the project and the network sites involved is available at <http://www.brain-child.org/>.

#### *NIH PEDIATRIC NEUROIMAGING INTEREST GROUP*

This CDBB Program was instrumental in establishing the NIH Pediatric Neuroimaging Interest Group, which holds monthly meetings with administrators and researchers interested in neuroimaging research with children. The Group organized a workshop held in May 2004, *Pediatric Functional Neuroimaging: A Trans-NIH Workshop*. A summary document is in preparation and will be widely distributed.

#### *THE HUMAN BRAIN PROJECT*

In 1993, the CDBB was a co-leader in developing the Human Brain Project; the Branch continues as a participant in this trans-NIH initiative. The broad-based initiative, led by the NIMH, supports research on and development of advanced neuroimaging technologies and neuroinformatics infrastructure through cooperative efforts among neuroscientists and information scientists (i.e., computer scientists, engineers, physicists, and mathematicians). The goal of this initiative is to produce new digital capabilities that provide an Internet-based information management system in the form of interoperable databases and associated data management tools. The CDBB participates in this effort by funding research in pediatric and developmental cognitive neuroscience.

#### *EXPLORATORY/DEVELOPMENTAL GRANTS IN SOCIAL NEUROSCIENCE*

In partnership with the NIMH, the CDBB developed this initiative to establish a newly emerging area of interdisciplinary research at the junction of social/personality/affective psychology with neuroscience. Recognizing that the development of a new field, especially one that spans interdisciplinary boundaries, takes time, the initiative was meant to foster new collaborations and to develop pilot work. To date, several developmentally focused projects have been funded through this initiative.

#### *RESEARCH ON ETHICAL ISSUES IN HUMAN STUDIES*

More than half of the initiatives supported by this Program involve human subjects, and most often, they involve children. Because of the rapid advances and the complexity of the research enterprise, more empirical work is needed to guide researchers and Institutional Review Board members in promoting optimal protections for research participants, especially children and their parents. The CDBB participated in developing a trans-NIH initiative to stimulate research on the ethical issues involving child and parent informed consent and the research participant understanding and appreciation of research goals, risks, and benefits.

### **Program Growth**

In 2000, the Developmental Cognitive Psychology, Behavioral Neuroscience, and Psychobiology Program supported 47 grants with a funding total of \$8,823,000. By the end of fiscal year 2003, the Program supported 77 projects (74 grants and three contracts), representing an increase of 63.8 percent (including both grants and contracts). Table 1 provides Program totals and Figure 2 graphically depicts the increase in the number of grants managed within the Program. By the end of fiscal year 2003, the total funding had reached \$17,949,000, an increase of 103.4 percent.

## **Program Impact**

This CDBB Program is a leader in the support of neuroimaging research aimed at understanding normal brain development and brain-behavior interactions as they develop from infancy through young adulthood. For instance, the Pediatric MRI Study of Normal Brain Development completed its first wave of longitudinal data collection in 2003, and the second wave started in 2004; the database currently has anatomical MRI scans and behavioral assessments for 467 children between the ages of birth and 18 years. The sample not only meets extensive, exclusionary health-related criteria, but also is demographically representative of the 2000 U.S. Census in terms of race, parental education, and income levels. The database also contains DTI data for 155 of the study participants; this addition has created a unique database of both anatomical MRI and DTI on the same children, a resource previously unheard of in the field. A goal of the Pediatric MRI Study is to ultimately offer other pediatric neuroimaging researchers a database of carefully selected controls for their studies. Even before completion of the first wave of data, more than 25 researchers have requested the imaging and assessment protocols from this study to incorporate the data into studies they are proposing for NIH funding.

Other Branch-supported neuroimaging research, focused on normal brain-behavior development, has collected functional MRI (fMRI) data on 355 children, ages six to 19 years, taken while they completed language tasks. The results indicate a clear correlation of increasing leftward lateralization in Broca's and Wernicke's areas with increasing semantic language skills and with other language demands that increase with age. Another project supported through this program is collecting  $^{31}\text{P}$  and  $^1\text{H}$  MRSI scans on a representative sample of 96 children ages six to 18 years. The data from this project will yield a normative database of molecular and metabolic features for multiple brain regions. Both this MRSI database and the language development database will be valuable resources for future studies.

## **Strategic Planning/Future Program Directions**

The tremendous growth of the CDBB portfolio made it apparent to Branch staff that they needed to reorganize some of the Branch programs. After conferring with experts in the fields of cognitive development, Branch staff decided to transfer all basic cognitive development research grants from the Cognitive, Social, and Affective Development, Child Maltreatment, and Violence Program (allowing it to become the Social and Affective Processes in Child and Family Development Program), into the Developmental Psychobiology and Cognitive Neuroscience Program. With these additional grants, the latter was renamed the Developmental Cognitive Psychology, Behavioral Neuroscience, and Psychobiology Program. This newly designated Program retains a focus on grants exclusively within the domain of cognitive development, but it will also seek to improve collaborations among cognitive development researchers and researchers investigating brain function. Thus, the reorganization will enable interdisciplinary interactions among cognitive developmentalists, pediatric neuroimagers, developmental cognitive neuroscientists, and those who examine the developmental behavioral effects of neuroendocrines within one portfolio.

## **BEHAVIORAL PEDIATRICS AND HEALTH PROMOTION PROGRAM**

This Program supports research and research training in behavioral and developmental pediatrics, examining the role of behavior in health, growth, and development from before birth to young adulthood. Emphasis is placed on health promotion and disease prevention in pediatric and young adult populations. Developmental and behavioral aspects of health promotion, including physical and mental health, as well as contextual influences (i.e., peers, family, organizations, society, and the environment) are of interest.

Health promotion and disease prevention interests include examining the following areas:

- The biological, behavioral, and psychological mechanisms relevant to overweight and obesity;
- Acute, recurrent, and chronic diseases;
- The effects of prematurity and *in utero* toxic exposures on children, adolescents, and young adults;
- The effects of inadequate sleep on growth, health, and behavior;
- Eating disorders;
- Pain, stress, and coping with these conditions;
- Chronic fatigue syndrome; and
- Adherence to medical and therapeutic behavioral regimens.

A high priority is placed on research aimed at two major areas:

- Identifying risk and protective factors involved in health risk behaviors (e.g., sexual behavior in middle childhood; tobacco, alcohol, and other drug use; antisocial behavior; gang participation, violence, homicide, and suicide; and youth gambling); and
- Identifying protective influences (i.e., positive youth development, the influence of religiosity and spirituality, and school and family connectedness).

The Program also supports research on the surveillance, etiology, prevention, and treatment of injuries from a behavioral and developmental framework. Research training programs and career awards are valued components of this research Program.

### **Program Initiatives**

Collaboration is an essential part of this research Program. The CDBB has sought to actively work with NIH Institutes, as well as with other federal agencies to encourage research in sleep disorders in children, emergency medical services for children, physical activity and obesity, HIV in international populations of women and children, international tobacco research, precursors of sexual behavior in middle childhood, chronic fatigue syndrome, maintenance of long-term behavioral change, and chronic kidney disease in children.

#### *RISK BEHAVIORS*

The study of precursors and resilience factors associated with health risk behaviors was the focus of an RFA issued in 1999, titled *Prevention of Health Risk Behaviors in Middle Childhood* (HD-99-014). The CDBB funded two R01 grants under this RFA: one focused on reducing sexual risk behaviors by improving parent-child communication through a community organization; the

second incorporated classroom curriculum, service learning, and techniques to enhance parent-child communication to prevent early sexual risk behaviors. A third R01 was funded in fiscal year 2000 to study the protective influence of sports on girls' high-risk sexual behaviors. In fiscal year 2002, the CDBB issued *The Identification and Prevention of Middle Childhood Precursors of Risky Sexual Behavior* (PA-02-101), which led to the funding of two projects: an assessment of the efficacy of a middle school-based intervention to prevent early sexual behavior; and a longitudinal cohort-sequential study of contextual/risk factors, protective resources, and health behaviors of school-aged children.

#### *BEHAVIOR CHANGE*

To better understand mechanisms and processes involved in changing behavior, the CDBB supported *Innovative Approaches to Disease Prevention through Behavior Change* (RFA-OD-98-002), which led to the creation of the Behavior Change Consortium (BCC). This Consortium was composed of research investigators, NIH program staff, and representatives from co-sponsoring private foundations. The BCC met biannually, developed an active Web site (<http://www1.od.nih.gov/behaviorchange/>), and formed work groups that dealt with conceptual mediators, methodology and data analysis, motivational interviewing, nutrition, physical activity, representativeness and translation, recruitment and retention, tobacco dependence, trans-behavioral outcomes, and treatment fidelity/adherence. In fiscal year 2003, the OBSSR, the Office of Disease Prevention, the NCI, the National Eye Institute, the NIA, the NIAAA, the NICHD, NIDA, the NIMH, the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), and the National Institute of Nursing Research (NINR) issued a follow-up RFA, *Maintenance of Long-Term Behavioral Change* (OB-03-003). The NICHD and NINR co-fund the resource center for the newly established Health Maintenance Consortium, which consists of 17 research projects. These projects investigate the maintenance of behavior change relevant to physical activity, diet, HIV infection, smoking, drug use, alcohol use, cancer surveillance, cardiovascular risk, and weight loss. Specifically, the resource center is examining effective strategies for achieving sustainable health promotion and for understanding theories and methodologies related to the processes of behavior change.

#### *SLEEP AND SLEEP DISORDERS*

The effects of sleep restriction have important implications for academic achievement, injury prevention, and mental health functioning in adolescents. In fiscal year 2001, the NICHD participated in the *Sleep and Sleep Disorders in Children* (HL-01-006) RFA, which was designed to improve the understanding of fundamental biological mechanisms through which sleep deprivation and sleep disorders affect the cardiopulmonary, hematological, immunological, mental, and behavioral health of children ages four to 18 years. The NICHD co-funded an R01 focused on understanding circadian phase preference and the effects of restricted nocturnal sleep on adolescents.

#### *INJURY PREVENTION*

In fiscal year 2001, a collaborative initiative, *Research on Emergency Medical Services for Children* (PA-01-044), was developed and supported by a trans-agency working group. This group included the NICHD, NIDA, the NIMH, the NINR, and the National Heart, Lung, and Blood Institute (NHLBI) at the NIH; the Agency for Health Research and Quality; the National Institute of Occupational Safety and Health; and the Maternal and Child Health Bureau (MCHB).

The initiative was designed to reduce childhood morbidity and mortality by improving the quality and quantity of research related to emergency medical services for children. This PA has stimulated research in the field and will be re-issued, with additional support from the NIAAA and the National Institute of Biomedical Imaging and Bioengineering, in 2004.

#### *HEALTH PROMOTION/DISEASE PREVENTION*

Obesity is occurring in epidemic proportions in the United States. In fiscal year 2001, the trans-NIH *Physical Activity and Obesity across Chronic Diseases* PA (PA-01-017) was developed to explore obesity prevention and the neuroendocrinology of obesity. The PA invites studies to examine the relationship between physical activity and obesity, to improve the methodology of assessing physical activity and energy balance, and to test intervention approaches that incorporated physical activity for obesity prevention or for treatment related to chronic diseases.

In fiscal year 2002, the CDBB funded two grants with international components focused on disease prevention or intervention. In response to the *Partnerships for HIV/AIDS Research in African Populations* (HD-02-00) RFA, the CDBB funded an R24 that linked an American investigator with an investigator from Ghana to enhance training and research activities in nutrition and HIV in Ghana. Another trans-NIH RFA, *International Tobacco and Health Research and Capacity-Building Program* (TW-02-005), enabled the NICHD to co-fund a randomized trial of two tobacco prevention programs in a multi-ethnic sample of South African students in fifth through seventh grades. Also in fiscal year 2002, *Pathophysiology and Treatment of Chronic Fatigue Syndrome* (PA-02-034) was developed by the Office of Research on Women's Health in collaboration with the NICHD, the Office of Dietary Supplements (ODS), the OBSSR, the NIAAA, the NINR, NHLBI, the National Center for Complementary and Alternative Medicine, the National Institute of Allergy and Infectious Diseases, the National Institute of Arthritis and Musculoskeletal and Skin Diseases, and the National Institute of Environmental Health Sciences. This PA led to the co-funding by the NICHD of a grant to prospectively study the relationship between infectious mononucleosis and the onset and course of chronic fatigue syndrome in adolescents.

In fiscal year 2003, in response to congressional language, the NICHD allocated funds for the *Prospective Study of Chronic Kidney Disease in Children* (DK-03-012). This collaborative effort, led by the NIDDK, included support from NINDS, NHLBI, and the NICHD and resulted in the funding of cooperative agreements, including two research centers and a data-coordinating center for a large, prospective, epidemiological study of children with chronic kidney disease. The study seeks to determine the risk factors for decline in renal function; the incidence of, and risk factors for, impaired neurocognitive development and function; the prevalence of risk factors for cardiovascular disease; and the long-term effects of growth failure and its treatment. In addition, the NICHD is currently participating in the RFA *Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) to Develop New Therapies for Type 1 Diabetes and Its Complications* (DK-03-020) and in a PA, *Improving Care for Dying Children and Their Families* (PA-04-057).

In fiscal year 2004, the CDBB issued *Understanding Mechanisms of Health Risk Behavior Change in Children and Adolescents* (PA-04-121) in collaboration with the NCI, NHLBI, the NIAAA, NIDA, the NINR, the OBSSR, and the ODS. Of particular interest are research studies



of the processes and factors that influence the following health risk behaviors: substance abuse, inadequate exercise and poor dietary practices as they relate to being overweight or obese, and intentional and unintentional injuries.

#### *CONFERENCES AND TELECONFERENCES*

Through the Behavioral Pediatrics and Health Promotion Program, the CDBB has contributed to the support of several conferences during the reporting period: *Otitis Media and Language Learning Sequelae*; *Preventing Suicide: A Scientific Consensus Process*; the American Psychosomatic Society Meeting; and *Adolescent Brain Development: Vulnerabilities/Opportunities*.

In addition, the Program organized and conducted two teleconferences to explore the current state of knowledge regarding the effects of in-school advertising and marketing on students' academic, social, and behavioral development. The impetus for this preliminary exploration was the prominent role that marketing plays in American society and the current influx of marketing into the classroom and school environment. The teleconference participants concluded that insufficient evidence existed with respect to the effects on children's health, learning, and behavior. A convergence of empirical evidence with replicable results is needed before policy recommendations can be made.

#### **Program Growth**

In 2000, the Behavioral Pediatrics and Health Promotion Program administered 49 grants with a funding total of \$11,392,000. By the end of fiscal year 2003, this program contained 65 grants, representing an increase of 32.6 percent. By the end of fiscal year 2003, the total funding reached \$14,758,000, an increase of 29.6 percent (see Figure 3 and Table 1 for more details).

#### **Program Impact**

This Program has, as its central focus, understanding behavior and behavior change as they relate to health in children and adolescents. The Branch issued or co-sponsored numerous solicitations that called for studies investigating biological and psychosocial influences on health-related behavior, and gave special consideration to influential individual and contextual factors. This Program recognizes that specific health-risk behaviors may vary across the developmental spectrum of childhood and young adulthood and are potential contributors to the leading causes of morbidity and mortality (e.g., unintentional injuries, homicides, and suicides). Precursors of adult diseases, such as cancer, heart disease, and obesity, originate in childhood behaviors such as smoking, improper diet, and inadequate physical activity.

An extension of biobehavioral research that enhances knowledge about health risk behaviors and promotes the development of effective interventions to attenuate or prevent risky behaviors and their consequences is the study of factors responsible for the maintenance of behavior change (as called for in the RFA *Maintenance of Long-Term Behavioral Change*). Another complementary line of research focuses on factors that influence adherence to medical regimens. Studies that enhance knowledge of family dynamics, behavioral choices that lead to adherence or non-adherence and barriers to adherence, and cultural beliefs about illness, medication, and other treatment regimens will improve the quality of life for children, adolescents, and their families. The focus on behavior, in concert with development, uniquely positions this Program to

encourage the exploration of health-compromising and health-promoting behaviors in the 21st century.

The impact of this research Program will also be expressed in the number and caliber of researchers trained in the institutional training (T32) programs it supports. These training programs cover the areas of health behavior in minority populations, health services research, health behavior in at-risk youth, childhood treatment outcomes, and child behavioral health.

### **Strategic Planning/Future Program Directions**

Revised and updated versions of the trans-agency PAs on *Research on Emergency Medical Services for Children* and *Pathophysiology and Treatment of Chronic Fatigue Syndrome* are currently in development. In addition, research gaps have been identified in the influence of the media on the health and behavior of children and adolescents, the influence of religiosity/spirituality on health risk behaviors of youth, and injury prevention in children with deficits of attention. The Branch is planning a meeting for 2005 that will develop the Program's strategic plan for the next five years.

### **HUMAN LEARNING AND LEARNING DISABILITIES (LDs) PROGRAM**

This Program, the longest-standing program within the CDBB, has a special interest in developing and supporting research and training initiatives to increase knowledge relevant to normal and atypical development of reading and written language throughout the life span, and in the development of prevention, remediation, and instructional approaches and methods to ensure robust acquisition of reading and written language skills at different stages of development. These projects focus on three major programmatic emphases:

- Normal reading development—The Branch supports both longitudinal and cross-sectional studies, especially those that delineate the relative contributions of environmental, experiential, instructional, cognitive, linguistic, genetic, and neurobiological factors to the developmental reading process. In addition, the Program encourages studies that focus on the longitudinal course of reading development, in particular those that seek to identify the interactions among these factors at different stages of reading development.
- Reading disabilities (RDs)—The Branch supports multidisciplinary efforts that integrate genetic, neuroimaging, cognitive/behavioral, and instructional studies to develop and validate classification and definition systems for RDs, identify specific etiologies for well defined types of RDs, map the developmental course of RDs, and determine which treatment approaches are most beneficial for specific types of RDs.
- Development and disorders of written language—The Programmatic interest in written language development and disorders encourages cognitive, behavioral, instructional, and neurobiological studies that focus on normal and atypical development in several areas, including orthographic processing, spelling, written composition, written expression, knowledge transformation, and compositional fluency.

## **Program Initiatives**

While supporting a portfolio of centers and program projects developed within specific initiatives, investigator-initiated research projects, and the reading scale-up projects funded under the Inter-agency Education Research Initiative (IERI), this Program strives to promote synergy and scientific communication by bringing together the researchers it supports on a consistent basis. (See the Mathematics and Science Cognition and Learning Development and Disorders Program section of this report for details about IERI activities.) The development of collaborations among these entities has served as the model for the CDBB “informal networks” approach.

### *LD RESEARCH CENTERS (LDRCs)*

This research center network was initially solicited in 1988 under the *Learning Disabilities: Multidisciplinary Research Centers* (HD-88-03) RFA. The first center grants were awarded in 1989 and 1990, to Yale University, the University of Colorado, Johns Hopkins University, and Harvard University, with co-funding from NINDS. A re-competition of the centers program was conducted in 1995, and again in 2000. Since the LDRC Network began, two centers were discontinued (Harvard and Johns Hopkins), while two centers were added (University of Washington and Georgetown University).

### *NICHD READING RESEARCH NETWORK*

In 1992, a major effort was initiated to develop informal collaborations among the four LDRCs (P50s), the existing investigator-initiated reading research projects (R01s), and program projects (P01s) supported by the Branch. At that time, there were eight R01s devoted to the study of reading development and reading disorders and four P01s focused on the study of dyslexia. In 1992 and again in 1994, the principal investigators of all of the projects were brought together to develop an informal network that would collaborate and share measures and data to better inform definition, classification, and measurement issues in LDs and reading disorders. In 1995, the Reading Research Network scientists were again brought together formally to discuss specific needs in identifying effective reading intervention protocols that could serve to both prevent and remediate reading difficulties in children ages five to 12 years. Two reading-intervention projects (R01s) at Florida State University and the University of Texas-Houston Health Sciences Center were supported in 1996. After five years of research, these same two projects were renewed following successful investigator-initiated applications. The productivity of the LDRCs, the R01 and P01 research projects, and the intervention studies stimulated so much interest in reading research within the scientific community that reading-related R01 applications increased 128 percent between 1996 and 2000. Since 2000, the reading research portfolio has increased an additional 40 percent.

The Reading Research Network has grown from the original 16 P50, P01, and R01 grants that supported reading science at 22 sites, to a Network now composed of 44 sites, studying 41,223 children and adults and more than 1,000 teachers, in 985 public school classrooms. More than 8,000 children are specifically involved in intervention studies to determine which instructional approaches are most beneficial, for which children, and under what conditions. In addition, the Reading Research Network has provided formal training experiences for more than 60 young investigators. Network researchers have made more than 1,200 national and international

presentations and have received more than 80 scientific honors for their scientific contributions to understanding reading development and reading disorders.

*NICHD-INTERNATIONAL READING ASSOCIATION (IRA) CONFERENCE ON READING  
COMPREHENSION OF COMPLEX TEXT*

Within the reading research community, it is critical to build upon converging research evidence that is relevant to beginning reading development, and to extend research efforts to better understand how children comprehend complex texts. The complexity of the interactions among reader, text, teacher, and context requires the application of multiple research methodologies to address specific questions where little knowledge now exists. The *Conference on Reading Comprehension of Complex Text* was held on the NIH campus in February 2004, to develop a research agenda and to discuss research methodologies for its implementation. The purpose of the conference, jointly sponsored by the NICHD and the IRA, was to identify the most significant research questions and areas of research priority, and to match those questions and priority areas to methods or combinations of methods that could be used to address them. Policy considerations that impact reading instruction and training of interdisciplinary researchers were also noted. Participants embraced an approach that transcended individual research projects, while recognizing the importance of supporting the full spectrum of research approaches. The conference facilitated a dialogue across disciplinary and methodological boundaries, which is the first step to forging innovative and collaborative approaches that will build a solid base of convergent evidence and will translate to better classroom practices and improved reading comprehension.

### **Program Growth**

In 2000, the Human Learning and LDs Program had 35 grants and managed grants with a funding total of \$18,502,000. By the end of fiscal year 2003, the Program contained 49 grants, representing an increase of 40 percent. By the end of fiscal year 2003, the total funding had reached \$26,140,000, an increase of 41.3 percent (see Figure 4 and Table 1 for more details).

### **Program Impact**

The Program director has been called upon to present the findings of the supported research initiatives and networks, as well as of the CDBB more generally, to congress and to various committees several times. In addition, the research findings from the Program efforts have directly influenced federal legislation. Specifically, convergent findings from NICHD reading research have explicitly informed the *Reading Excellence Act*<sup>1</sup> (2001) and the *No Child Left Behind Act*<sup>2</sup> (2001), and have played a major role in legislation devoted to family literacy and early screening for reading difficulties, and in the dissemination of reading research findings to states, schools, and teachers.

Congressional testimony based on findings from the NICHD reading research provided since 2000 is cited below:

- *Scientific Initiatives in Early Childhood Programs*. U.S. House of Representatives Subcommittee on Labor-HHS-Education Appropriations; April 2004.

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<sup>1</sup> At [http://www.ed.gov/offices/OESE/REA/reading\\_act.pdf](http://www.ed.gov/offices/OESE/REA/reading_act.pdf)

<sup>2</sup> At <http://www.ed.gov/legislation/ESEA02/107-110.pdf>

- *The Critical Need for Evidence-Based Comprehensive and Effective Early Childhood Programs*. U.S. Senate Health, Education, Labor, and Pensions Committee; July 2003.
- *Learning Disabilities and Early Intervention Strategies*. U.S. House of Representatives Committee on Education and the Workforce, Subcommittee on Education Reform; June 2002.
- *Measuring Success: Using Assessments and Accountability to Raise Student Achievement*. U.S. House of Representatives Committee on Education and the Workforce; March 2001.
- *Education Research and Evaluation and Student Achievement: Quality Counts*. U.S. House of Representatives Committee on Education and the Workforce; May 2000.

Since the last CDBB report to the NACHHD Council, this Program has provided extensive input and consultation to the White House and ED. As a result, new initiatives have been designed to translate convergent evidence on reading development and reading instruction, supported by the Branch and by the Program, into educational practices and federal educational policies. Some of these initiatives include the following:

- **The Reading First<sup>3</sup> Program Initiative (2001)**. The Reading First Program was developed, with extensive input from NICHD reading scientists, by the domestic policy staff at the White House, ED, and Staff from the House Education and Work Force Committee within the U.S. congress. The initiative was built on the following principles: the continued recognition that many of the nation's children, particularly those from disadvantaged environments, continue to struggle in reading; the availability of converging scientific evidence on reading development, reading difficulties, and effective reading instruction; the recognition that the prevention of reading failure is critical to child development, coupled with the availability of data indicating that prevention can be accomplished; and the need to increase the identification and implementation of reading and professional development programs based on scientific research. To accomplish the mission of Reading First, the CDBB Program director provided significant contributions: technical assistance in the scientific sections of the legislation; developing the scientific criteria for the peer review of Reading First applications; and recommendations regarding the design of the Reading First Program Evaluation. The Reading First Program has significantly increased the federal investment in scientifically based reading instruction in the primary grades. Approximately \$1.4 billion per year are provided to eligible states and local districts for a period of six years under this initiative.
- **The Early Reading First<sup>4</sup> Program Initiative (2001)**. The Human Learning and LDs Program also played a major role in the development and implementation of the Early Reading First Initiative, which provides significant support for evidence-based, preschool programs designed to prepare children who are at risk for reading failure for successful entry into school. The initiative provides applicants with an average of \$80 million each year for three years to implement the program.

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<sup>3</sup> *No Child Left Behind Act*, (PL 107-110), Title I, Subpart 3: Reading First. At <http://www.ed.gov/legislation/ESEA02/107-110.pdf>

<sup>4</sup> *No Child Left Behind Act*, (PL 107-110), Title I, Subpart 4: Early Reading First. At <http://www.ed.gov/legislation/ESEA02/107-110.pdf>

- **The Education Sciences Reform Act<sup>5</sup> (2002).** The CDBB Program provided scientific expertise and assistance to ED, the White House, and the U.S. congress in developing the Education Sciences Reform Act, which ensures that educational research funded by the federal government meets the highest standards of scientific quality. This Act also established the Institute of Educational Sciences (IES), which replaced the Office of Educational Research and Improvement (OERI) within ED.
- **The President's Commission on Excellence in Special Education (2002).** The Program director worked closely with the White House domestic policy staff in preparing the Presidential charter for a special commission to identify ways to strengthen America's four decades of commitment to educating children with disabilities. The Program director also served on the Commission. Findings<sup>6</sup> of the Commission were published in July 2002 as *A New Era: Revitalizing Special Education for Children and Their Families*. The report served as the basic foundation for the re-authorization of the Individuals with Disabilities Education Act (now in conference).
- **The Reading First Teacher Network (2003).** The Program director collaborated with ED and the National Council for Accreditation of Teacher Education in designing and implementing a grant program to help teacher educators and future teachers at minority institutions teach reading using scientifically proven instructional strategies. The NICHD and the University of Texas-Austin are currently responsible for training more than 100 faculty from primarily minority-serving institutions over a three-year period. In addition to training education faculties at these institutions, the project involves deans and presidents of institutions to ensure that training is instantiated at the institutions, and that change takes place in the way reading instruction is delivered. The ultimate goal of this effort is to improve the reading abilities of children from preschool through grade 12. The NICHD was instrumental in the development and implementation of this initiative, and ED has provided the financial support.
- **The Striving Readers Initiative (2004).** The CDBB Program director has played a major role in President Bush's *Striving Readers Initiative*, which was designed to develop, implement, and evaluate effective reading interventions for middle and high school students who read significantly below grade level. This \$100 million initiative will complement the Reading First Program and will provide funding to states through competitive grants.
- **The Education Resources and Information Center (ERIC) Re-design Initiative (2004).** The Program director is collaborating with ED in this initiative to develop new scientific standards and criteria for selecting materials to be included in the ERIC database. The mission of ERIC is to provide a comprehensive, easy-to-use, searchable, Internet-based bibliographic and full-text database of education research and information for educators, researchers, and the public. In the past, the materials and information available to the public through ERIC has been of uneven scientific quality, and limited attention was paid to ensuring that the information was trustworthy and based upon converging scientific evidence. The new standards and criteria will ensure that the findings from educational research available through ERIC will be of the highest quality.

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<sup>5</sup> *Education Sciences Reform Act*, (PL 108-185). At [http://www.congress.gov/cgi-bin/cpquery/?&dbname=cp108&&r\\_n=sr185.108&sel=TOC\\_1288864&](http://www.congress.gov/cgi-bin/cpquery/?&dbname=cp108&&r_n=sr185.108&sel=TOC_1288864&)

<sup>6</sup> Available at <http://www.ed.gov/inits/commissionsboards/whspecialeducation/reports/index.html>

## **Strategic Planning/Future Program Directions**

Three meetings were held with the directors of the LDRCs over the past four years at selected conferences, as well as several regional meetings with directors of reading research sites within the NICHD Reading Research Network. Based on the input collected at these meetings, as well as through conversations with research scientists, the CDBB has developed strategic directions for this Program that will primarily be addressed through the recompetition of the LDRCs under a recurring RFA, with potential funding in fiscal year 2006. Several new research directions will be stimulated by the upcoming RFA, including the following:

- There is a need to systematically investigate different approaches to defining responses to treatment and, most importantly, validating classifications of children as non-responders; research must determine whether the magnitude of a student's response to a well defined intervention is attributable to cognitive, instructional, neurobiologic/genetic, and/or behavioral factors or combinations therein.
- Research is needed to develop a better understanding of co-morbidity of LDs with other disorders, such as Attention Deficit/Hyperactivity Disorder (ADHD), and the effects of this co-morbidity on developmental course and treatment outcomes across types of LDs.
- It is critical to expand the LDRC research objectives to address deficits in automaticity and fluency of performance across contingent domains.
- Research must place a significant emphasis on the development of reading comprehension abilities and on better understanding of the specific relationships between the development of word-level reading skills, vocabulary, background knowledge, and fluency and the ability to comprehend complex text genres and formats.
- Research should place a major emphasis on the design and conduct of neuroimaging protocols that allow for the precise study of neural systems involved in phonological development, and on the extension of this work to designing protocols specifically linked to semantic and syntactic development; this new work will be essential for developing neural maps of the reading comprehension process.

## **LANGUAGE, BILINGUAL, AND BILITERACY DEVELOPMENT AND DISORDERS AND ADULT, FAMILY, AND ADOLESCENT LITERACY PROGRAM**

This research Program has a special interest in increasing knowledge of monolingual and bi/multilingual language and literacy development and disorders in children, adolescents, and adults. The Program supports all aspects of research in normative linguistic development, including phonemic, semantic, syntactic, communicative, and metalinguistic development, as well as the factors that characterize, promote, or impede the acquisition of languages in addition to the first or native language. The Program also encourages investigations of the perception and production of spoken, written, and gestural language; sociocultural factors, such as the relation between language and thought, and the measurement/assessment of language abilities and disorders; and neurobiological and genetic aspects of language and literacy development. The Program also supports training in the study of these areas, with an emphasis on the integration and application of theoretical and conceptual principles derived from psycho- and sociolinguistics, cognitive psychology, developmental psychology, developmental neuroscience, reading education, and quantitative and qualitative research methodologies. This Program will

support studies, within a developmental context, that identify and explicate the cognitive, linguistic, social, cultural, socio-environmental, geographic, instructional, and neurobiological factors influencing language and literacy development. These areas are important not only in the preschool and elementary school years, but also remain important throughout the life span. As a result, this Program encourages research in adolescent, adult, and family language and literacy, with a special interest in minority and language-minority populations.

### **Program Initiatives**

In addition to individual grants, the Program includes three research networks that grew out of workshops and research agendas developed in the manner described earlier in this report. All three Program networks are funded through inter-agency partnerships. In addition, various workshops and symposia, which have occurred or are planned, seek to address issues of language and literacy, especially among language-minority populations.

#### *DEVELOPMENT OF ENGLISH LITERACY IN SPANISH SPEAKERS (DELSS) RESEARCH NETWORK*

The DELSS Network, solicited under an RFA (HD-99-012) in 1999, was jointly funded in fiscal year 2000 by the NICHD and the IES, ED. During the five-year funding period, 13 projects under seven grants were supported as a direct result of the RFA; later, two more projects were added. The Network will continue with those new and competing continuation applications funded under the investigator-initiated process.

Although the Network has been in operation for a relatively short time, contributing scientists have been quite productive. For example, collaborating investigators representing the different sites have developed 15 new instruments for measuring the abilities of Spanish-speaking, English-language learners (ELLs) as well as a network-wide demographic data collection instrument. These measures, which are available through the DELSS Web site (<http://www.cal.org/delss>) for research use, include both Spanish and English instruments; they assess cognate and phonological awareness, phonological processing, decoding skills, spelling, morphology, reading comprehension, narrative production, and other abilities.

The Network is currently studying 8,976 children, 344 families, and more than 300 teachers, at 80 sites in 12 states across the United States, Puerto Rico, and Mexico. Now in its fifth year of funding, the Network is publishing longitudinal and cross-sectional findings from the data derived from the newly developed measures. Network findings will have a major impact on both policy and practice in the education of ELLs in the United States.

#### *ADULT LITERACY RESEARCH NETWORK*

In November 2000, the National Institute for Literacy (NIFL) and the National Center for the Study of Adult Learning and Literacy at the Harvard Graduate School of Education formed an Adult Literacy Reading Research Working Group (ALRWG). The CDBB Program director was, and continues to be, a member of that working group. The ALRWG outlined and commissioned a synthesis of extant literature on adult literacy, using criteria similar to that used by the National Reading Panel. Because of the limited amount of experimental research published in the literature, reliable meta-analyses were not possible; however, a review of the available literature was produced. This document, available at



[http://www.nifl.gov/partnershipforreading/adult\\_reading/intro/rrwg.html](http://www.nifl.gov/partnershipforreading/adult_reading/intro/rrwg.html), clearly highlights the need for additional research on adult literacy.

In August 2001, the NICHD, NIFL, the Office of Vocational and Adult Education (OVAE), and the Office of Elementary and Secondary Education at ED convened an expert panel to discuss research needs and future directions in adult and family literacy. A summary document of this panel's discussion is available at [http://www.nichd.nih.gov/crmc/cdb/AFL\\_workshop.htm](http://www.nichd.nih.gov/crmc/cdb/AFL_workshop.htm); this document served as the basis for *Adult Literacy Research Network* (HD-02-004), which consisted of six research project grants (R01) and was jointly funded in fiscal year 2002 by the NICHD, NIFL, and OVAE. Researchers in this Network have designed, developed, and are implementing and testing the effectiveness of adult literacy interventions for low-literate adults, including the role of decoding, vocabulary, fluency, and comprehension instruction in adult literacy, as well as the explicitness of instruction. Over the five-year funding period, these research teams will screen nearly 73,000 adults with low-literacy skills to identify the more than 3,800 research participants needed for these studies. The principal investigators estimate that, in their targeted recruitment planning for these projects, more than 60 percent of those taking part in the studies will be minorities; most studies will have 30 percent to 60 percent African American participants, and between 20 percent to 50 percent Hispanic or Latino participants, many of whom will not be native speakers of English. The investigators are conducting this research at more than 80 sites in 16 different states: Alaska, California, Connecticut, Georgia, Idaho, Kansas, Louisiana, Massachusetts, Maine, Maryland, North Carolina, New Jersey, Oregon, Pennsylvania, Rhode Island, and Washington. All six projects employ experimental designs, and at least four of these use combined quantitative and qualitative research methods. The studies are funded through 2007.

#### *ADOLESCENT LITERACY RESEARCH NETWORK*

From March through May 2002, a series of workshops co-sponsored by multiple federal agencies and professional associations were convened to focus on the under-researched area of adolescent literacy. (Summary documents from these workshops are posted at <http://www.nifl.gov/partnershipforreading/publications/adolescent.html>.) Based on the research agenda that was developed at these workshops, the NICHD, OVAE, and the Office of Special Education and Rehabilitation Services (OSERS) at ED published RFA HD-03-012. In fiscal years 2003 and 2004, five research project grants (R01) were funded to form the Adolescent Literacy Research Network. These projects are now under way and will study preadolescent and adolescent students. All projects use some experimental methods, as well as descriptive/qualitative research methodologies. Two projects use extant longitudinal cohorts, while three will examine the brain-behavior linkages in reading and RDs to test the effectiveness of reading interventions. One project specifically seeks to study the relations among expectancy values, motivation, and engagement and literacy achievement; another will examine the impact of varying levels of teacher support in an intensive high school literacy intervention.

#### *INCLUSION OF LANGUAGE-MINORITY POPULATIONS IN NATIONAL STUDIES: CHALLENGES, OPPORTUNITIES, AND BEST PRACTICES—A SYMPOSIUM*

In July 2000, the CDBB, in collaboration with the NICHD's Demographic and Behavioral Sciences Branch, the NIA, and the NIH Center for Research on Minority Health and Health Disparities, held a symposium highlighting the need to capture the growing diversity of the

nation in studies that purport to be nationally representative. Major topics discussed included defining language-minority individuals; identifying barriers to their inclusion and discussing ways to overcome those barriers; identifying challenges and possible solutions to assessment development, sampling, and interviewing; and discussing how technology might be of use in meeting these challenges. A summary document is available at [http://www.nichd.nih.gov/publications/pubs/diverse\\_voices.htm](http://www.nichd.nih.gov/publications/pubs/diverse_voices.htm); executive summaries are also available in Chinese and Spanish. Notably, in August 2000, President Clinton issued Executive Order 13166<sup>7</sup> requiring all federally assisted programs to provide access for persons with limited English proficiency. This order stimulated awareness of the need for scientifically reliable data on the prevalence of English proficiency and information on the steps needed to overcome existing barriers to collecting such information.

#### *LDS IN ELLS SYMPOSIUM*

There is both over- and under-referral of ELLs for special education in various geographic areas within the United States. Those expected to make the distinction between learning difficulties and issues of language proficiency often do not have the information or the measures needed to make such judgments. Given the rapidly increasing ELL population in the United States, having information and measures is crucially important for research and national education. In October 2003, the NICHD, OSERS, and the Office of English Language Acquisition (OELA), with multiple agency and professional association co-sponsors, organized a national symposium on the topic. The summary document for this symposium is available at [http://www.nichd.nih.gov/crmc/cdb/symposium\\_summary.pdf](http://www.nichd.nih.gov/crmc/cdb/symposium_summary.pdf). The symposium highlighted the difficulties of distinguishing between apparent reading and learning difficulties manifested by ELLs, and actual learning difficulties that might be masked by linguistic differences. Participants produced a research agenda that calls for research on the classification and definition of LDs in ELLs. The agenda was noteworthy for taking into account the additional complexity of the cultural and linguistic differences in the nation's heterogeneous population. Organizers of the symposium are editing a thematic issue of the journal *Learning Disabilities Research & Practice*, which will be published in late 2004, to alert the research community of the specific research needs in this important area.

#### *BILINGUAL LANGUAGE DEVELOPMENT WORKSHOP*

Many children in the United States grow up exposed to more than one language. For these children, environmental bilingualism or multilingualism is a fact of life. Despite its prevalence, the consequences of bilingualism (or multilingualism) have not been well described. Language development is crucial to a child's educational success and provides an important foundation for literacy development, yet the topic is relatively under-researched. Therefore, in April 2004, the NICHD, OELA, and OSERS, with support from the American Federation of Teachers, the IRA, and the American Speech-Language-Hearing Association (ASHA), held a workshop to discuss the current status of research on bilingual development and to develop a research agenda for this area of science. A summary document will be published on the Internet, and a thematic issue of the *International Journal of Bilingualism* on the topic is in preparation. Researchers are calling for more cross-disciplinary research and for colleagues to consider the findings and methods used in adult psycholinguistic research and in infant monolingual and cross-linguistic research.

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<sup>7</sup> At <http://www.usdoj.gov/crt/cor/Pubs/eolep.htm>

### RESEARCH DISSEMINATION

An activity that falls within the purview of the director of this Program, as liaison for the National Reading Panel and liaison to NIFL, is research dissemination. Various products have been developed since the last Branch report to the NACHHD Council and have been published and disseminated through the *Partnership for Reading*, a national reading-research dissemination project authorized by the *No Child Left Behind Act*<sup>1</sup>; the *Partnership for Reading* mission is to make scientifically based reading research more accessible to educators, parents, policy makers, and other interested individuals. NIFL is responsible for carrying out this effort. The documents published to date include the following:

- *Put Reading First: Helping Your Child Learn to Read*
- *Put Reading First: The Research Building Blocks for Teaching Children to Read*
- *A Child Becomes a Reader – Kindergarten to Grade 3*
- *A Child Becomes a Reader – Birth to Preschool*
- *Using Research and Reason in Education*
- *La Lectura es lo Primero: Como Ayudar a su Hijo a Aprender a Leer—Una Guia para Padres de Familia—Del Prescolar al Tercer Grado*

Single copies of these publications are available through the NICHD Information Resource Center (1-800-370-2943). Electronic versions of these files are available from the NICHD Web site (<http://www.nichd.nih.gov>) and from the NIFL Web site (<http://www.nifl.gov/nifl/pfr.html>). Large quantities of these publications are available from EDPubs at 1-800-228-8813 (TDD/TTY1-877-576-7734) or at <http://www.edpubs.org/webstore/Content/search.asp>.

Following the model of the National Reading Panel, two additional panels are currently working to synthesize the research literature on literacy instruction: the National Literacy Panel on Language-Minority Children and Youth (NLP), funded by the IES with contributions from the NICHD and OELA; and the National Early Literacy Panel (NELP), funded by NIFL. The Program director serves on the steering committee for the NLP and on an advisory group for adult literacy recommendations for family literacy programs related to the NELP. Under the auspices of the *Partnership for Reading*, NIFL is establishing a new panel, the Commission on Reading Research, which will examine kindergarten through grade 12 reading research that has been published since the National Reading Panel report, to continue the tradition of research syntheses and meta-analyses for the identification of research that can inform practice in America's schools. This panel will begin its work in late 2004, or early 2005.

In addition, the Program director has designed and edited a volume with Vinita Chhabra, the research scientist for the National Reading Panel, aimed at bringing information about evidence-based instructional practice to teachers, school administrators, and the public. This volume, *The Voice of Evidence in Reading Research*, was published by Brookes Publishing, Baltimore, Maryland, in 2004; royalties from the book are being donated to the NIH Children's Inn.

### Program Growth

In 2000, the newly formed Language, Bilingualism, and Biliteracy Development and Disorders Program had 37 grants with a funding total of \$7,263,000. By the end of fiscal year 2003, this Program administered 60 grants, representing an increase of 62.2 percent. By the end of fiscal

year 2003, the total funding had increased to \$13,752,000, an increase of 89.3 percent (see Figure 5 and Table 1 for more details).

### **Program Impact**

Even though language development has long been a topic addressed by NICHD-funded research, research dealing with languages other than English has received little attention from the research community in general. With explicit urging and encouragement from congress, the NICHD initiated a research effort to understand how best to teach Spanish-speaking children to read English; this effort is ongoing. This research focus has expanded beyond Spanish to include other non-English native languages and is now beginning to address bilingual language development and the identification, prevention, and remediation of LDs in ELLs. Branch staff and researchers continue to strive to understand not only how non-native speakers of English can best be assisted to learn to speak, read, and write in English, but also how the CDBB can facilitate their being able to fully participate in the opportunities offered to them by living in the United States. Congress recognized the importance of this work, especially in enabling children whose first language is Spanish to overcome reading and writing difficulties. In addition, the U.S. House Appropriations Committee praised<sup>8</sup> the dissemination of the National Reading Panel Report.

### **Strategic Planning/Future Program Directions**

The CDBB convened a strategic planning group in November 2003, to evaluate the Program's research and to make recommendations for future Program efforts. The group recommended that the state of the science in bilingual language development be examined and gaps and needs be identified; this effort was initiated through the workshop on bilingual language development described above. The group also identified a second area for attention—improving methods for studies of infant language development and replicating infant studies across laboratories. In addition, the group recommended a workshop or symposium to explore designs and methods relevant to identifying group versus individual differences in bilingual or ELL reading. Additional recommendations included examining the feasibility of large longitudinal studies of early language development; reviewing measurement needs; and revisiting conceptualizations of language development, and of the differences between normal and delayed or disordered development. A special focus on supporting new investigators was also recommended.

The DELSS Research Network received its last year of funding in fiscal year 2004; the RFA under which this Network was funded is not being recompeted. Rather, these projects must recompute via the investigator-initiated path. Careful monitoring of the success of these grants and of new projects in this still under-researched area will be crucial to ensuring that the necessary research data are obtained. This research will continue to inform educational policy and practice and to develop additional information on the psychology and neurobiology of literacy development in ELLs.

In conjunction with the continuing work on literacy in ELLs, the Program is supporting efforts to identify and classify LDs within the language-minority population. The Branch is organizing a

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<sup>8</sup> House Appropriations Report 106-645; Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriation Bill, 2001; p. 78-79.

major colloquium to address LDs in Native American populations (i.e., American Indian, Alaska Native, and Native Hawaiian students). In addition, a focus on intervention for language-minority students who are not succeeding in literacy development (both in reading and writing) will be important, including the development and testing of effectiveness of culturally appropriate, research-based interventions. These interventions will not only address specific native-language groups, but also the “multilingual” classroom (i.e., the classroom in which multiple native languages are represented among the ELLs); the makeup of such groups of students makes support via the native language generally infeasible. Research is specifically needed on what approaches are feasible and ultimately effective in providing education to classes that do not share a common native language and are being immersed in English, being taught by teachers who, while they may speak one or two of the native languages represented, surely will not be familiar with all of them. Researchers must determine what specific preparation teachers require and what methods will most effectively enable them to teach these groups of children to speak, read, and write English.

### **EARLY LEARNING AND SCHOOL READINESS PROGRAM**

This Program was developed in 2001, as part of a Presidential emphasis on early childhood programs and development. The Program supports research that attempts to specify the experiences children need from birth to age eight to prepare them to learn, read, and succeed in school. Specifically, the Program seeks to identify early interactions with adults and peers, the early childhood education teaching methods and curricula, and comprehensive early childhood interventions that support learning and development, specifically in domains that prepare children from diverse backgrounds who experience diverse environments in kindergarten and the early grades. The areas of specific research include the development of cognition, emergent literacy, language, numeracy, and mathematics; social and emotional competence; metacognition and self-regulation; motor development; and physical health. One special interest is the development and evaluation of integrative and comprehensive early childhood curricula and programs to support learning and development for diverse populations of children in the areas listed above. Especially important are studies that test complex hypotheses, which will generate a body of knowledge about what early childhood experiences with adults and peers, what pedagogical strategies, and what early childhood curricula or programs are most effective in promoting learning and development in specific areas; for which children; and under what conditions.

The Program also supports cross-sectional and/or longitudinal research designed to specify cause-effect relationships between children’s early experiences and the development of specific abilities and dispositions that lead to achievement, reading ability, social competence, and emotional well-being in kindergarten and the early grades. Research that specifies the mediating processes responsible for observed outcomes in learning and development is another Program focus, and may help explain how these processes and outcomes differ for individual children, families, communities, and early childhood programs with varied characteristics. In addition, the Program seeks to enhance knowledge about the preparation, training, and professional development of persons involved in the care and education of young children, the effectiveness of training strategies in promoting the positive modes of interaction identified by the research

described above, and the causal linkages between adult behavior and school readiness outcomes for young children.

To achieve a larger goal, the Program encourages the integration of basic and applied research that will lead to a coherent base of knowledge to support healthy development and learning for diverse populations of children, in a range of settings that include parental and non-parental home- and center-based care; and contribute to a better understanding of the mechanisms of early learning and development by specifying the processes through which particular environments, interpersonal interactions, pedagogical strategies, and curricula influence learning and behavior at different phases of early development. To address these issues, the Program encourages the study of basic mechanisms of cognitive, language, social, emotional, motor, or physical development, as well as emergent literacy, in the context of applying this knowledge to early childhood tasks, activities, or early childhood curricula and programs. Such activities should be designed to develop specific capabilities and attitudes that lay foundations for school success. New and innovative methods and assessments for measuring child development and learning will be developed as part of this effort.

### **Program Initiatives**

Some of the early initiatives for this area were actually undertaken prior to the establishment of the focused research Program, but are reported here because they formed the basis upon which the Program was established.

#### *WORKSHOP ON EMERGENT AND EARLY LITERACY*

In September 2001, the NICHD in partnership with the National Institute on Deafness and Other Communication Disorders, OSEP, and ASHA, held a workshop to address the current status of knowledge and critical research needs in the earliest stages of literacy—the preschool years. This critical examination of the earliest foundations of literacy built upon the knowledge made available through the report of the National Reading Panel and examined how data from the report might best inform studies of children at the preschool level. The information shared and developed at the workshop, including a research agenda, has been published in a thematic issue about emergent and early literacy in the journal *Learning Disabilities Research & Practice*.

#### *THE SCIENCE AND ECOLOGY OF EARLY DEVELOPMENT (SEED)*

This effort is based upon a collaboration among agencies within the DHHS—the NICHD, the NIMH, the ACF, ASPE, and the CDC—and within ED—the IES, the National Center for Education Statistics, and OSEP—to establish a research agenda on the development of children in low-income families that has scientific integrity and is highly relevant to policy makers. The overarching goal of SEED is to foster research on the multiple contexts of development—family, child-care settings, schools, neighborhoods, communities, and broader cultural contexts—and their impacts on the development trajectories of low-income families.

#### *THE INTER-AGENCY SCHOOL READINESS CONSORTIUM (ISRC)*

This initiative is a joint venture of the NICHD, the NIMH, the ACF, and ASPE within the DHHS, and OSEP, within OSERS at ED. The goal of this \$39.5 million collaborative consortium is to support research on the effectiveness of early childhood curricula, programs, and interventions in promoting the range of cognitive, social, and behavioral skills necessary for

a child's successful entry into school. Among the activities supported by the ISRC are the following:

- **Planning Grants**—In fall 2002, \$2.5 million was provided to develop research capacity in early childhood education. These grants supported 14 research teams with expertise in early childhood and preschool programs as they developed strategies for conducting complex, scientifically rigorous, multi-site effectiveness trials of early interventions. These projects examined the development and identification of comprehensive intervention strategies to address the linguistic, social, communicative, cognitive, and perceptual-motor competencies that promote early learning and school readiness for children from birth to age five.
- **Effectiveness Grants**—In fall 2003, \$7.4 million in initial-year funding was provided to support eight projects that provide scientifically rigorous trials of the effectiveness of integrated, early childhood curricula or programs that promote school readiness. During their five years of support, these grants will identify what types of early programs or interventions are most effective in supporting the early learning and school readiness, for which children, delivered in which settings, by which people. Projects include a diverse set of interventions designed to meet children's developmental needs in multiple domains, delivered through a diverse set of early childhood settings, for children from identified risk groups (e.g., primarily those from poverty, but also ELLs and children with LDs). All studies focus on literacy and social competence outcomes; some also examine oral communication, early mathematics, and behavioral and emotional regulation. The projects also include data analysis plans that consider implementation issues, as well as plans to demonstrate specific, causal relationships between children's experiences and outcomes. Investigators in this informal network will meet regularly and are encouraged to employ common measures when possible.
- **Field Capacity-Building Workshops**—The ISRC is conducting a series of workshops to focus researchers on early childhood development, intervention implementation, and effectiveness, and to inform the Head Start Bureau's efforts on developing a National Reporting System. The first two workshops focused on identifying outcome measures for young children and identifying possible measures for the developing Head Start Reporting System. Future workshops will focus on conceptualizing and measuring aspects of early childhood environments that support school readiness, as well as on fostering relationships between private business and researchers to develop theory- and data-driven approaches that prepare children for school. The ISRC also held meetings for recipients of the planning grants and will conduct twice annual meetings for grantees working on effectiveness studies. In all cases, the participants agree that information coming from these meetings should be shared with researchers, practitioners, and policy makers in a timely fashion.

### **Program Growth**

The Early Learning and School Readiness Program was established in fiscal year 2001 with a single grant that was funded at \$500,000. The Branch funded an RFA the following year and transferred grants relevant to this Program from other Branch research Programs. By the end of fiscal year 2003, this Program contained 16 grants, with total funding at \$5,127,000 (see Figure 6 and Table 1 for more details).

## **Program Impact**

Because this new Program is in its infancy, conceptualizing the scope and range of scientific initiatives to address unmet needs in early childhood has been a major focus; recently, productivity of these efforts is becoming evident. The Program promises to have significant impact on the knowledge base for early child development and on policy for early childhood education and early child care. Because it is housed within the NICHD, the Program is able to encompass the diverse landscape of early childhood in ways that other federal agencies cannot. For example, the Early Learning and School Readiness Program includes projects that examine school readiness within the context of child care settings, Head Start and Early Head Start, and publicly funded pre-kindergarten programs. To achieve such breadth, the CDBB Program is closely intertwined with programs, including research and service-delivery systems, at other agencies, both within the DHHS and ED. The resulting collaboration allows the Program to support research that answers complex questions, in the real-world environments of young children. The Program also maintains an active dialogue with both the public and private sectors to determine research needs and to develop collaborations.

## **Strategic Planning/Future Program Directions**

The Early Learning and School Readiness Program currently supports a range of research projects that focus on school readiness; some fall within the framework of specific solicitations, but others have come from the research community. One immediate plan for the Program is to identify those areas of research not currently represented within the portfolio, but still within the scope of the Program, and then develop strategies for promoting and supporting this work. Another area of great need that the Program is supporting is the development of outcome measures for young children that are appropriate for large-scale utilization. While many aspects of early child development are amenable to assessment, there is a critical need to scale-up strategies that have sound psychometric properties, as well as to support the development of assessments from conceptualization through utilization in the context of large-scale studies. The Program is currently developing two inter-agency initiatives to support this type of work.

The Program is also continuing its work with research, practice, and policy communities to generate research that is readily translated into practice. Through a combination of grant support, conference and workshop presentations, and outreach to professional organizations, the Program is forging relationships to bring translational research to the forefront.

## **MATHEMATICS AND SCIENCE COGNITION AND LEARNING DEVELOPMENT AND DISORDERS PROGRAM**

This Program encourages both basic and intervention research in all aspects of mathematical thinking and problem solving, as well as in scientific reasoning, learning, and discovery for children from infancy and early childhood through the undergraduate years. The Program seeks studies that explore a variety of influences on normal and atypical development in mathematics and science learning and cognition, including genetic and neurobiological substrates, as well as cognitive, linguistic, sociocultural, and instructional factors. An important priority for the Program is the investigation of individual differences that may moderate achievement in math and science, with particular interest in the delineation of skill sets needed to attain proficiency in



these domains, the means to address learning difficulties that emerge in these areas, and the development of effective instructional methods for mitigating such difficulties.

Programmatic emphases within the area of mathematical learning include the following: research on the normal development of mathematical proficiency, including both conceptual and procedural knowledge (i.e., both basic numerical representations and processing); arithmetic comprehension and procedural skills; proficiency with fractions and other types of rational numbers; algebraic problem solving; geometric thinking; concepts of probability and chance; and measurement concepts and skills. Longitudinal studies of the development of mathematical proficiencies, beginning either in the preschool period or in the early grades, are especially welcomed. The Program also encourages studies to delineate the nature and extent of specific LDs in mathematics, including diagnosis, classification, etiology, prevention, and treatment. Subject populations of interest include children with idiopathic math LDs, those with co-morbid math LDs and RDs, and children with neurodevelopmental disorders for whom deficient math performance represents one of the primary cognitive sequelae. Epidemiological longitudinal studies are needed to generate an accurate estimate of the prevalence of specific LDs in mathematics. The effects of poverty on the failure to develop mathematical proficiency and the identification of risk and protective factors within these contexts are of special interest.

The Programmatic emphasis on science cognition and learning seeks to improve understanding of the cognitive and developmental bases of scientific thinking and of the acquisition of scientific concepts. The Branch encourages research on the factors that contribute to conceptual change, as well as studies of inductive and deductive reasoning and the acquisition of scientific concepts, such as experimental control and falsifiability. Related topics of interest include causal thinking and inference, theory-evidence coordination, and reasoning about data. Investigations of developmental changes in naïve or intuitive thinking about the biological and physical worlds are also important to the Program. The Program also supports studies that can inform the design of evidence-based instructional interventions.

### **Program Initiatives**

#### *MATHEMATICAL COGNITION AND SPECIFIC LDs RESEARCH NETWORK*

The Program currently includes one research Network, which is funded through an inter-agency partnership with OSERS. Five grants, one P01 and four R01s, were funded through RFA HD-02-031 in fiscal year 2003 in the amount of \$3.6 million (estimated total of approximately \$18 million over the three- to five-year funding period). Network projects include studies of the neurobiological and genetic substrates of mathematical LDs, a longitudinal analysis of deficits in number estimation competencies, studies of math LD subtypes, and classroom interventions for disabilities in mathematical problem solving. Subject populations include children with idiopathic math LDs, co-morbid math LDs and RDs, ADHD, and several neurodevelopmental disorders (i.e., Turner, Williams, and Fragile X syndromes). In addition to these grants, the Network was expanded to include four previously funded R01s that are focusing on math LD research: a longitudinal study examining developmental changes in math LDs; an investigation of information-processing deficits; math precursor skills in children at risk for developing math LDs; and neuroanatomical features of numerical disorders in children with 22q11.2 deletion (velocardiofacial/DiGeorge) syndrome. This new research Network will permit cross-project communication and collaboration, thereby enhancing the convergence of methods, measures, and

findings that can help build the knowledge base in this area and can lead to improvements in educational practice.

#### *MATHEMATICS AND SCIENCE INITIATIVE*

For the past two years, the Program director has been representing the NICHD as a member of the planning committee for Secretary of Education Rod Paige's Mathematics and Science Initiative. This effort has several objectives, including the development of a major academic research base to enhance knowledge of what improves student learning in mathematics and science in the classroom. The NICHD continues to play a major role in this initiative, by contributing research-based expertise on math and science learning to this national dialogue; nominating some of the Branch's top grantees to serve as speakers at major national summits on math and science; and chairing an Education Research Task Group commissioned by the National Science and Technology Council's Subcommittee on Education and the Workforce, to review and appraise the depth and content of the current federal investment in research on learning and education in science, technology, engineering, and mathematics.

#### *REVIEW AND SYNTHESIS OF RESEARCH ON CHILDREN'S SCIENCE LEARNING*

In November 2002, the National Research Council's Committee on Science Education K-12 (COSE) convened a two-day meeting at The National Academies to discuss research concerning children's science learning. The participants at this meeting, which was funded by the presidents of The National Academies, included experts in science learning and education research and program staff from the National Science Foundation (NSF) and the CDBB. The participants agreed that a need exists for synthesis and integration of disparate bodies of knowledge pertaining to this topic. Attendees concluded that the disparate foci and unevenness of the research across different scientific domains makes an initial comprehensive review and synthesis of the literature both a necessary and critical first step. Thus, COSE (which has since been reorganized under the name "the Board of Science Education") subsequently submitted an application to the NSF for funds to support a review and synthesis of research on children's science learning in kindergarten through grade eight. Although the NSF has agreed to be the primary funder, the NICHD will co-fund this effort through the CDBB. The National Academies are currently assembling a diverse group of expert researchers from multiple disciplines (e.g., developmental psychology, learning theory, cognitive sciences, science education, education policy, social psychology, and anthropology) to address the following questions:

- What does a comprehensive picture of how children acquire scientific ideas look like?
- How can this comprehensive understanding be helpful to advancing goals related to student achievement and equity in opportunities to learn science?
- How can this knowledge help advance the design of science learning assessments?
- What other lines of research need to be pursued to make the understanding of how students learn science more complete?

The work of the committee will be conducted through commissioned papers and workshops; information gathered through these activities will be analyzed and synthesized in a report to be published by The National Academies that is likely to be of interest to educators, researchers, and policy makers.

### *TRANS-NIH HEALTH LITERACY PAs*

The NIH issued two PAs, *Understanding and Promoting Health Literacy* (PAR-04-116 [R01s] and PAR-04-117 [R03s]), in June 2004. The goal of these announcements is to increase scientific understanding of the nature of health literacy and its relationship to healthy behaviors, illness prevention and treatment, chronic disease management, health disparities, and health outcomes, including oral health. The NICHD is a key contributor to these initiatives and focuses especially on the need for research pertaining to children and adolescents. According to *Healthy People 2010*, health literacy is defined as “the degree to which individuals have the capacity to obtain, process, and understand basic health information and the services needed to make appropriate health decisions” (U.S. Department of Health and Human Services, 2000). Although health literacy is known to be an important issue throughout the life course, children and adolescents, as well as adults must acquire sufficient reading and oral-language comprehension skills to satisfactorily process and understand health-related information. A less frequently recognized factor contributing to adequate comprehension of health information concerns the ways in which children’s nascent conceptual knowledge of biological concepts in general, and of health and illness in particular, might influence their interpretation of such information. In other words, understanding developmental changes in children’s everyday or common-sense conceptions and misconceptions of bodily processes, disease, germs, contagion, contamination, etc., is crucial for improving their health literacy and consequent illness-prevention behaviors. Despite some important insights into children’s understanding of health and illness that have been derived from basic behavioral research, much more extensive work is needed to clarify the natural progression of conceptual development and change with respect to biological and health-related knowledge. Further, there is a paucity of rigorously designed, instructional research studies informed by this literature. Clearly, this kind of research is crucial to the formulation of effective, evidence-based approaches to the design and delivery of health education and communication practices.

### *INTER-AGENCY EDUCATION RESEARCH INITIATIVE (IERI)*

From its inception, IERI has emphasized the importance of bringing proven instructional practices to scale; that is, testing their effectiveness in larger and more varied school contexts with diverse student populations. The original 1997 report<sup>9</sup> from the President’s Council of Advisors on Science and Technology recommended that a major program of experimental research be initiated to, among other things, “encompass rigorous, well controlled, peer-reviewed, large-scale empirical studies designed to determine which educational approaches are in fact most effective in practice.” The first IERI solicitation, published in 1999, stated that the initiative would build a knowledge base for improving educational practice by fostering innovative research on basic learning, teaching, and organizational mechanisms, and by developing and studying sustainable and scalable interventions in education. The long-term goal of the IERI is to develop the knowledge and experimental methods that allow the implementation and evaluation of large-scale educational interventions, which, in turn, will inform educational policy and practice.

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<sup>9</sup> Report to the President on the use of technology to strengthen K-12 education in the United States. President's Committee of Advisors on Science and Technology, Panel on Educational Technology, 1997. At <http://www.ostp.gov/PCAST/k-12ed.html>

The most recent inter-agency solicitation, published in December 2002, described the component requirements unique to this initiative:

- Present a foundation of empirical evidence for scaling-up upon which plausible cause and effect assertions can be based;
- Involve interdisciplinary research teams;
- Satisfactorily address issues of training, implementation, and treatment fidelity;
- Demonstrate capability of translating and applying research findings obtained under experimentally controlled conditions to complex and diverse classroom environments; and
- Incorporate the application of technology where appropriate.

Further, the solicitation explicitly defined and operationalized research on scaling-up as the systematic investigation of an effective educational intervention as it is implemented in varied educational contexts.

As a partner in this initiative, the NICHD has supported research projects from each of the IERI solicitations. In 2002, the projects funded included the scaling-up of a reading fluency intervention, a computer-based literacy tutor that monitors student progress and enables teachers to track student progress, and an early literacy intervention program geared toward disadvantaged children. In 2003, projects were funded for the scaling-up of an early reading intervention and for an intervention to improve student achievement through family and community involvement. The NICHD was recognized by congress for its continued leadership and collaboration in these areas.

#### *DEVELOPING A SCIENCE OF SCALING-UP*

Currently, the research community lacks good models for scaling-up educational interventions, a fact that is understandable, given the range, levels, and complexity of factors that can potentially influence successful scalability and sustainability of effective practices across the varied types of contexts already described. To remedy this situation, Dr. Barbara Schneider and Dr. Larry Hedges, supported by an NSF grant as the IERI Data Research and Development Center (DRDC) at the University of Chicago's National Opinion Research Center, are working on the foundations for a "science of scaling-up." (Visit [http://drdc.uchicago.edu/about/drdc\\_ieri.html](http://drdc.uchicago.edu/about/drdc_ieri.html) for more information.) One of their first and most important accomplishments was organizing and managing a conference in Washington D.C., in November 2003, titled *Conceptualizing Scale-Up: Multidisciplinary Perspectives* (<http://drdc.uchicago.edu/csu/index.shtml>). By drawing on concepts, models, and methodologies from other fields, this conference offered important insights into the components needed for effective scaling in the field of education. The DRDC also conducted a scaling-up research needs assessment with the IERI investigators and shared the results at the 2004 meeting of the American Educational Research Association. This presentation was accompanied by other relevant reports from the DRDC as part of a Presidential Invited Symposium that was chaired by the IERI NICHD Program official, titled *Building Capacity to Conduct and Utilize High-Quality Research: Lessons from and for Education Research*. This interactive symposium used experiences of the DRDC to stimulate discussion of the most appropriate mechanisms for, and highlight the challenges of, building capacity in geographically diverse, heterogeneous populations of social scientists.

### **Program Growth**

The Mathematics and Science Cognition and Learning Development and Disorders Program, initiated in the last year of this reporting period, grew out of the Human Learning and LDs Program, which contained a small portfolio of research projects on mathematics learning and math LDs. Given the dearth of research in learning and LDs in both math and science cognition, and the clear need for a major research solicitation on mathematics learning and math LDs (described above), the Branch established a Programmatic focus on cognition, learning, and LDs in both mathematics and science. By the end of fiscal year 2003, this new Program contained 19 grants and had a funding total of \$7,357,000 (see Figure 7 and Table 1 for more details).

### **Program Impact**

Although the Program is relatively new, it has already been recognized and acknowledged by federal legislators. In fiscal year 2004, the U.S. Senate Appropriations Report for the NIH lauded this new Program and recognized the importance of developing strategies based on scientific evidence for diagnosing and treating specific LDs and learning in math and science.

### **Strategic Planning/Future Program Directions**

Although only two years old at this point, this Program is well on its way toward developing a strong portfolio in the areas of mathematics and science cognition and learning. Through targeted activities that could include RFAs, PAs/PARs, and the types of federal inter-agency efforts outlined earlier in this report, the Program plans to cast a comparatively wide net, so as to capture a range of mathematical thinking and scientific reasoning domains for which cutting-edge research approaches in neurocognitive, sociocultural, and instructional influences could provide fundamental contributions to the knowledge base. Further, Program staff will encourage grant applications that also hold promise for informing the design of appropriate educational interventions for children who experience learning difficulties in these areas. Having successfully laid the foundation for this ambitious Program, the primary goal for the next several years will be to continue to attract the best grant applications possible in each of the designated subfields, while simultaneously working to ensure that relevant empirical findings, methodological advances, and theoretical progress can all be brought to bear on educational policy and practice in math and science learning.

## **OVERVIEW OF BRANCH FUNDING TRENDS: 2000-2004**

As shown in Tables 1 and 2 and Figures 8, 9, and 10, the CDBB has grown substantially in the four-year reporting period, from fiscal year 2000 to fiscal year 2003. (Note: fiscal 2004 data were not yet available at the time that this report was prepared.) The Branch went from a total of 256 grants to a total of 398 (an increase of 55.5 percent). At the same time, total funding increased by 90 percent, from \$62,902,000 in fiscal year 2000, to \$119,510,000 in fiscal year 2003. Figures 1 through 7 illustrate the growth of each program from fiscal year 2000 to fiscal year 2003.

When type of funding is considered (Figures 9 and 10), it is clear that even though a variety of types of projects are supported, the vast majority of CDBB support is in research projects; three-fourths of the total number of grants and more than 80 percent of funding support is for research projects. The Branch funds research, training, and the development of products and tools through the Small Business Innovative Research program.

The category of research grants includes the following: small grants (R03), research project grants (R01), program projects (P01), and exploratory grants (R21). The Branch encourages the use of the small grant mechanism (R03) to develop new areas of research and to enable new investigators to work on preliminary data that will serve as a basis to compete for R01s. The vast majority of research projects funded during the reporting period were research project grants (R01), with a total of 303<sup>10</sup>. However, the Branch also supported a large number of smaller grants: 80 small grants, 21 exploratory grants, and 18 Academic Research Enhancement Award grants. The investment in research centers and program projects was smaller, but still substantial: the Branch supported four LDRCs and 12 program projects.

In a discussion of funding, it is also relevant to note that CDBB, as indicated in the descriptions of program initiatives, engages in many trans-NIH and inter-agency partnerships in specific research areas. Although no formal accounting of the co-funding across NIH Institutes is available, by informal estimates the CDBB approximates that it has co-funded grants with at least 10 NIH Institutes or Centers and is responsible for more than \$6 million in co-funding to those Institutes. Likewise, the CDBB has brought in funding to support initiatives led by the Branch's Program officials. The Branch estimates that it is responsible for obtaining more than \$22 million from other Offices, Centers, and Institutes within the NIH and from various Offices and components of ED and the DHHS.

The Branch has also made a substantial investment in research training. During the four-year reporting period, a total of 17 predoctoral fellowships (F31) were awarded to individuals with disabilities or who were members of under-represented minorities; in addition, 56 postdoctoral fellowships (F32) were awarded, and the Branch supported 20 institutional training grants (T32). Career awards were also an important tool for capacity building, especially in the relatively new research areas of child neglect and violence. Overall, the Branch supported 24 career development (K) awards, 13 of which were mentored patient-oriented research career development awards (K23).

The Branch intends to continue to focus relentlessly on not only building new science, but also on the dissemination of research findings in cognitive, social, and affective development; behavioral pediatrics; early childhood development and school readiness; developmental neuroscience; and reading, written language, and mathematics. In this regard, the CDBB will place a particular emphasis on determining the degree to which scientific findings have informed national policies and have been translated into practice in the classroom, the clinic, and the home.

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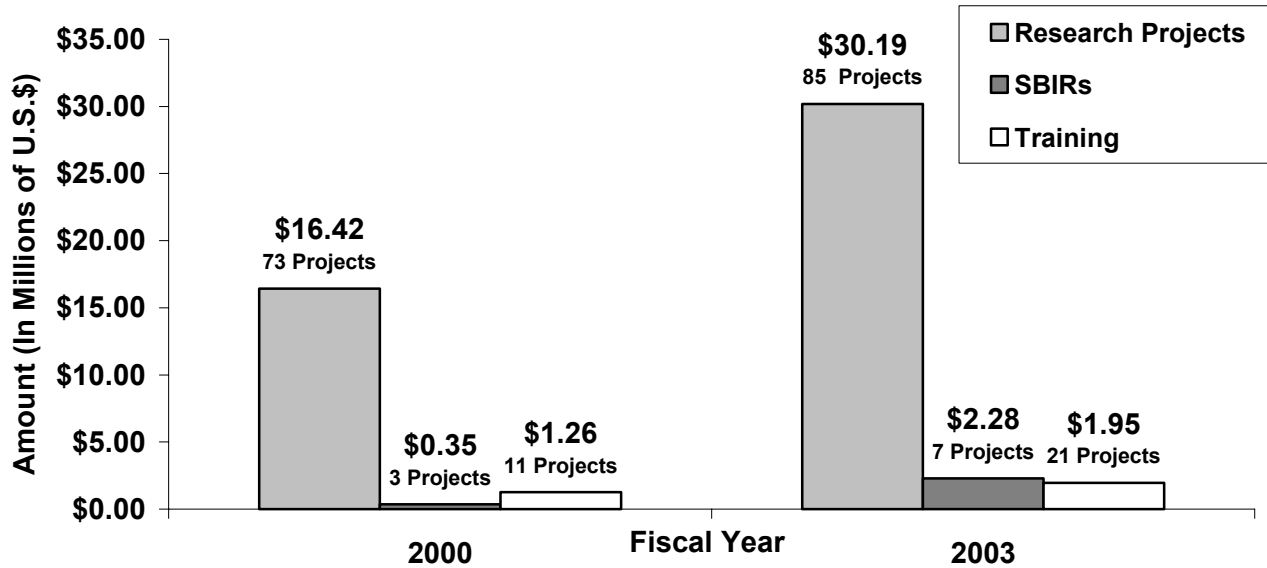
<sup>10</sup> Note that the numbers cited here may not agree with totals from the tables, since the figures cited across the entire period represent the total of all grants that were active at any time during that period.

## FIGURES AND TABLES

(Please note that the dollar values in figures may differ slightly from those noted in text or in tables due to rounding.)

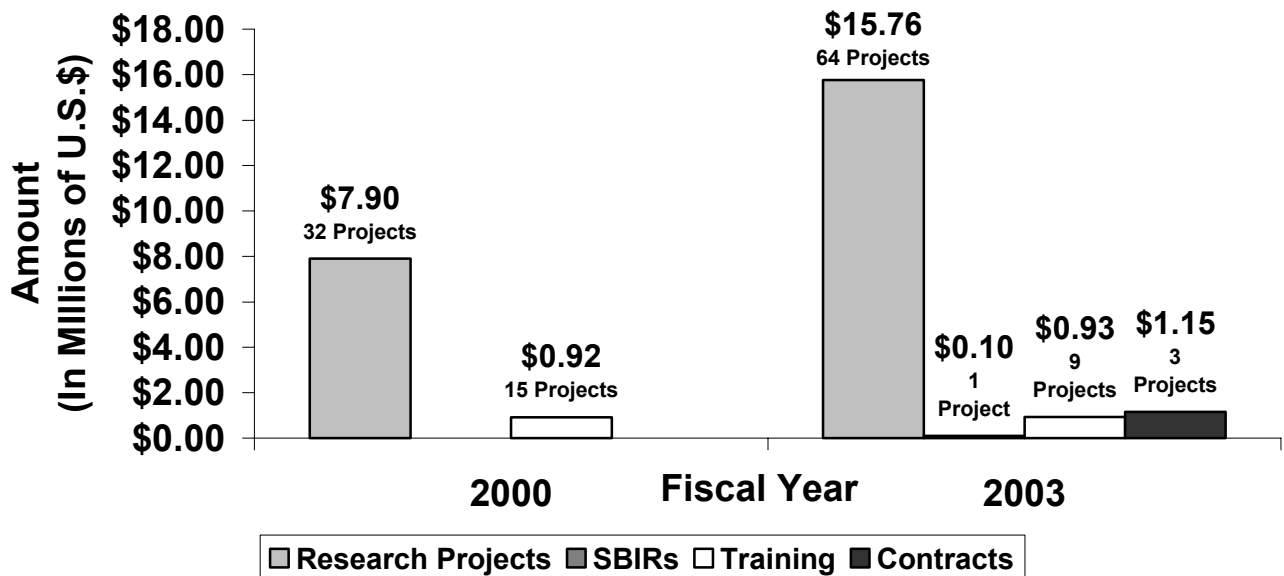
**FIGURE 1: THE SOCIAL AND AFFECTIVE PROCESSES IN CHILD AND FAMILY DEVELOPMENT PROGRAM BY MECHANISM, FISCAL YEARS 2000 AND 2003**

(NOTE: Formerly the Cognitive, Social, and Affective Development and Child Maltreatment Program)

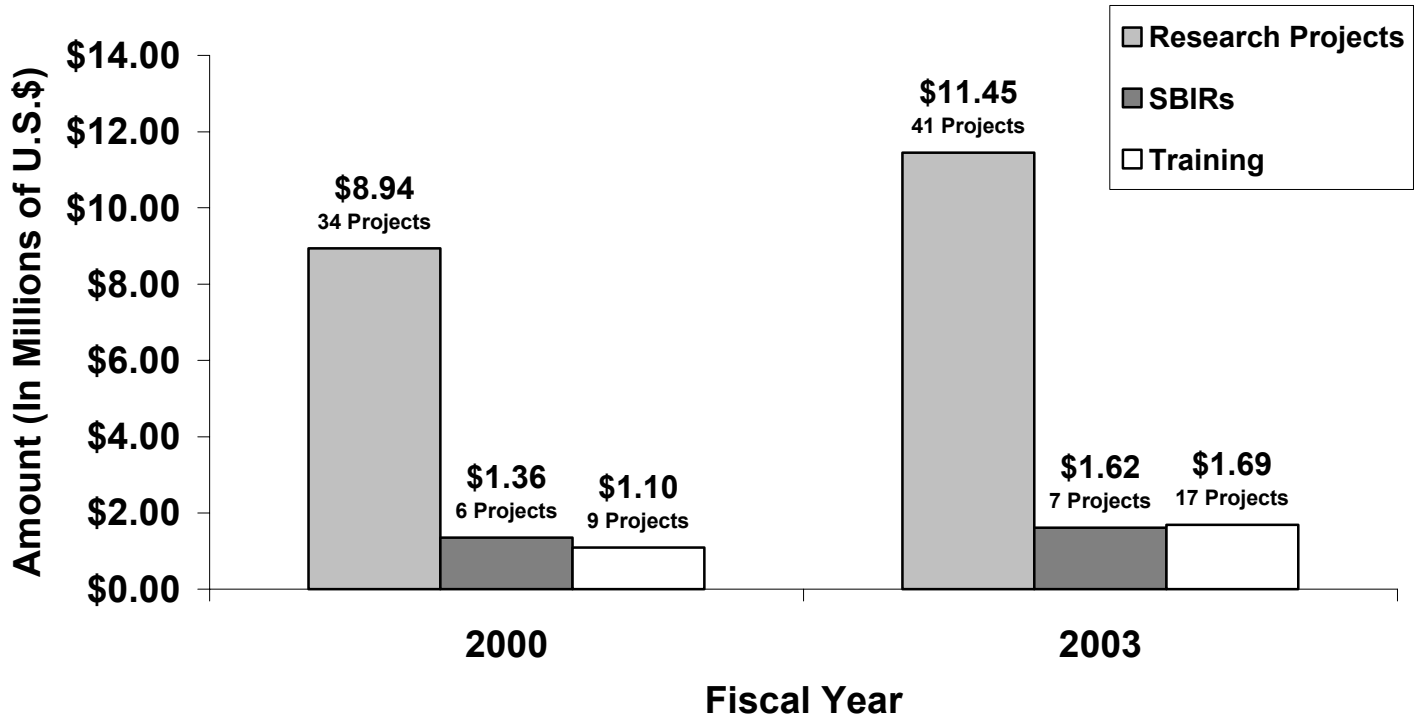


**FIGURE 2: THE DEVELOPMENTAL COGNITIVE PSYCHOLOGY, BEHAVIORAL NEUROSCIENCE, AND PSYCHOBIOLOGY PROGRAM BY MECHANISM, FISCAL YEARS 2000 AND 2003**

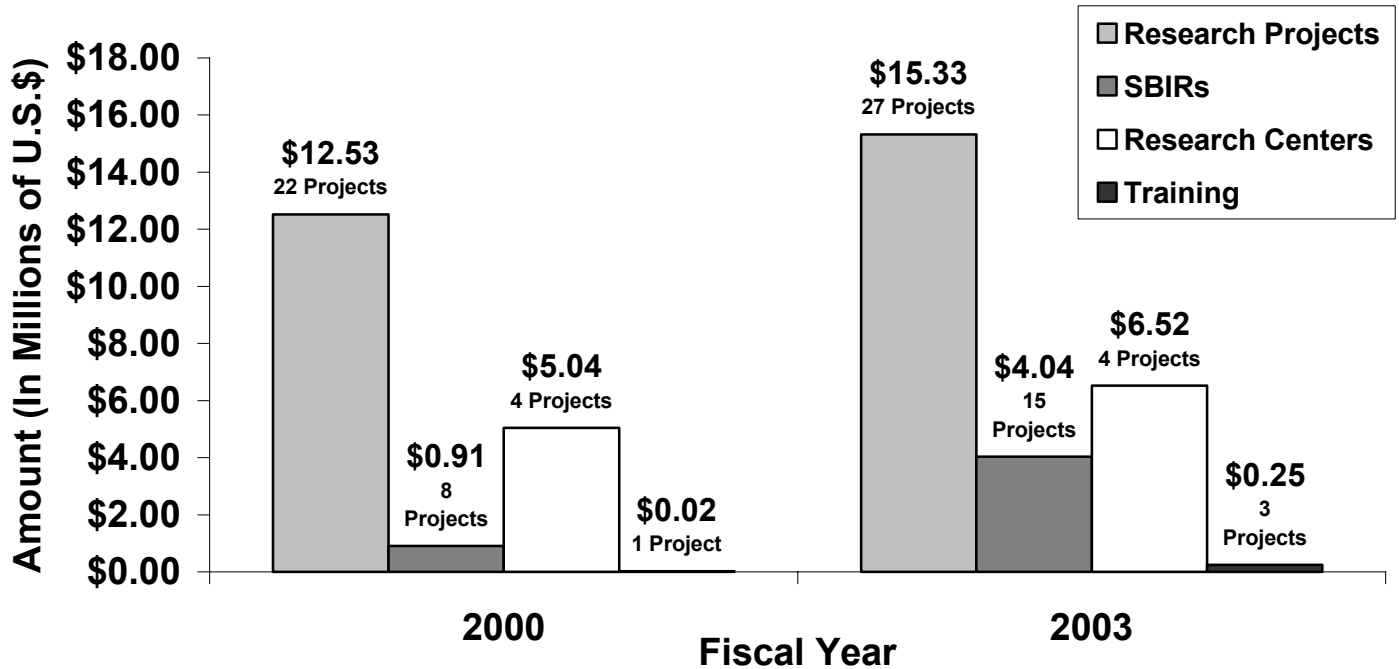
(NOTE: Formerly known as the Developmental Psychobiology and Cognitive Neuroscience Program)



**FIGURE 3: THE BEHAVIORAL PEDIATRICS AND HEALTH PROMOTION PROGRAM BY MECHANISM, FISCAL YEARS 2000 AND 2003**

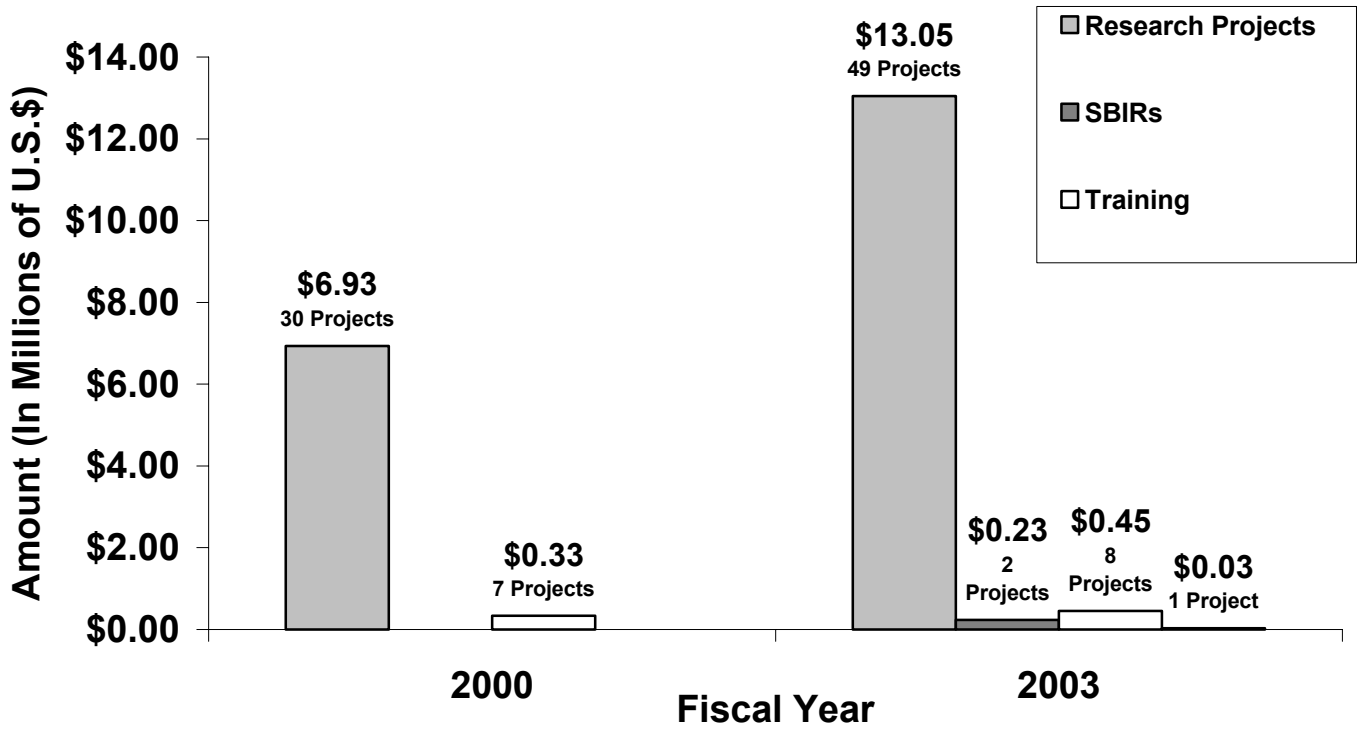


**FIGURE 4: THE HUMAN LEARNING AND LDS PROGRAM BY MECHANISM, FISCAL YEARS 2000 AND 2003**

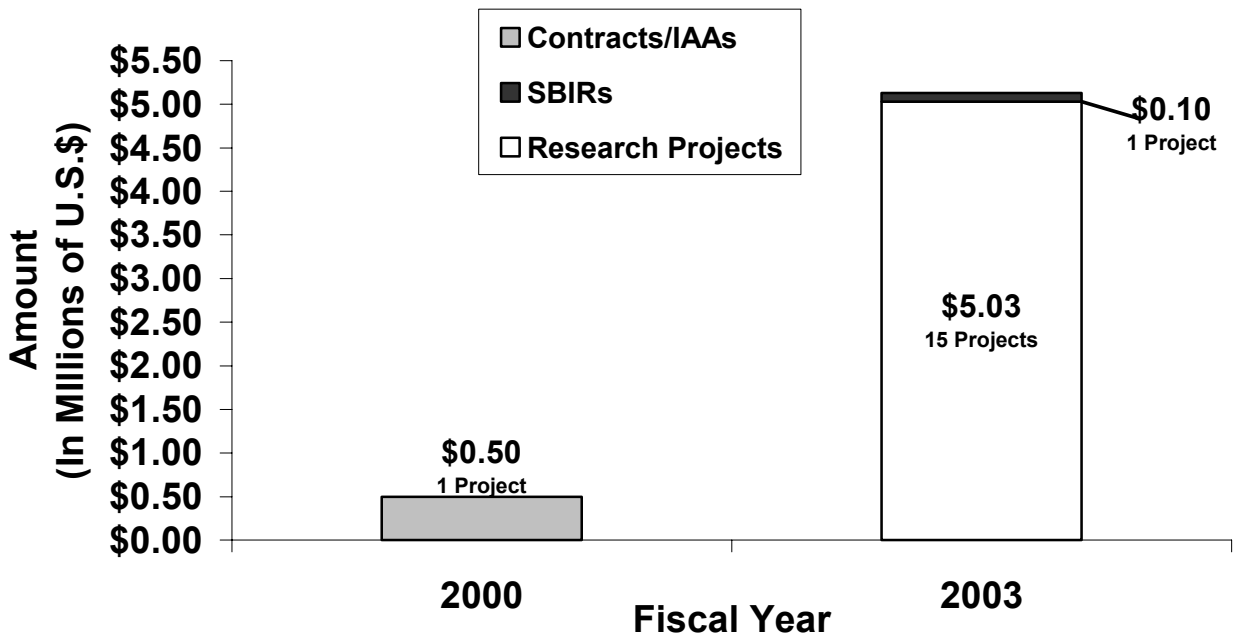




**FIGURE 5: THE LANGUAGE, BILINGUAL, AND BILITERACY DEVELOPMENT AND DISORDERS AND ADULT, FAMILY, AND ADOLESCENT LITERACY PROGRAM BY MECHANISM, FISCAL YEARS 2000 AND 2003**

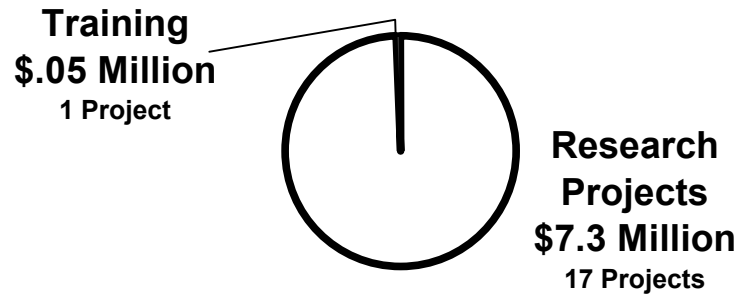


**FIGURE 6: THE EARLY LEARNING AND SCHOOL READINESS PROGRAM BY MECHANISM, FISCAL YEARS 2000 AND 2003**

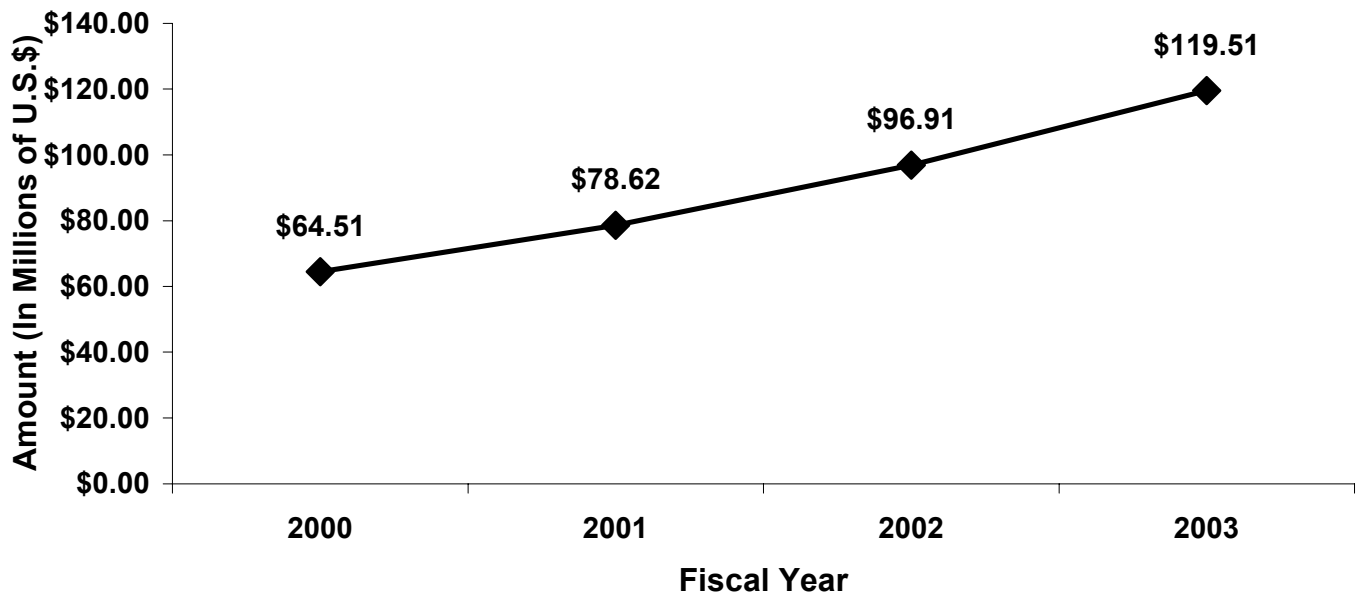


Note: The Early Learning and School Readiness Program did not start until 2001. The funds listed for 2000 above went to a contract for the Early Childhood Longitudinal Study—Kindergarten Cohort; although these contract funds did not come out of Program money at the time, the project is now classified as within the purview of the Program and is, therefore, included here.

**FIGURE 7: THE MATHEMATICS AND SCIENCE COGNITION AND LEARNING DEVELOPMENT AND DISORDERS PROGRAM BY MECHANISM, FISCAL YEAR 2003**



**FIGURE 8: TOTAL CDBB FUNDING, FISCAL YEARS 2000 THROUGH 2003**

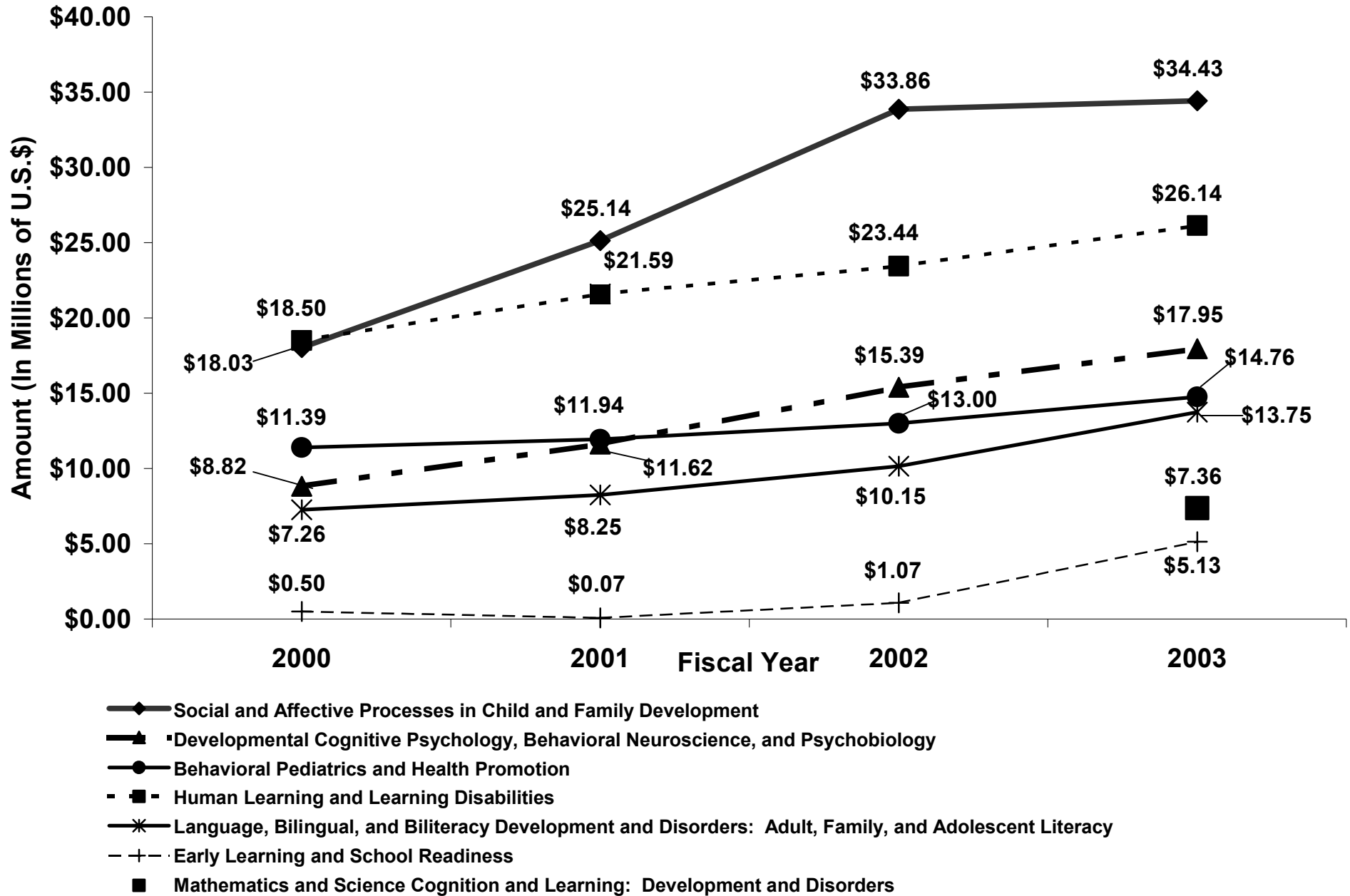


**TABLE 1: CDBB FUNDING BY PROGRAM, FISCAL YEARS 2000 THROUGH 2003**

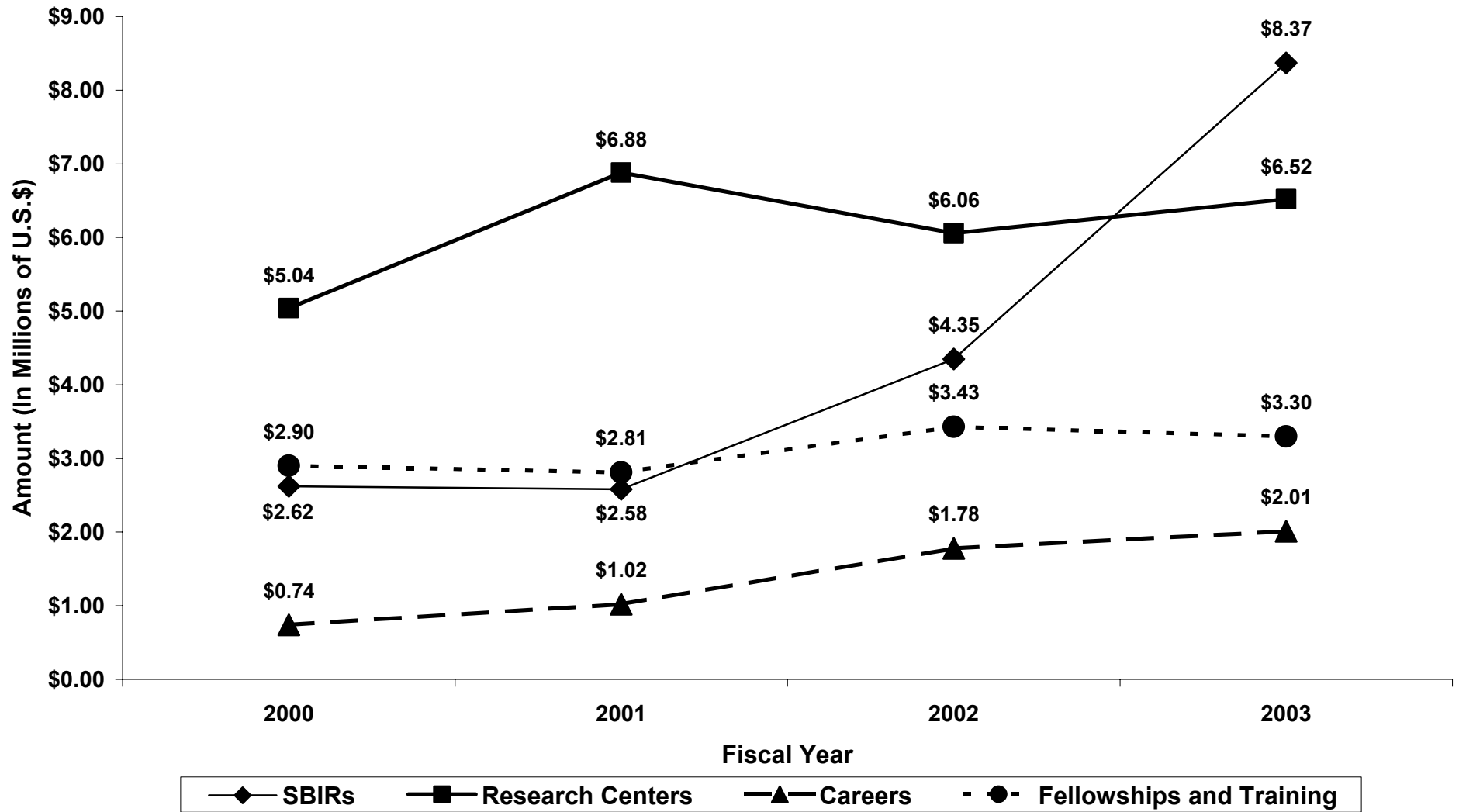
Program	Fiscal Year 2000		Fiscal Year 2001		Fiscal Year 2002		Fiscal Year 2003	
	No.	Amount	No.	Amount	No.	Amount	No.	Amount
Social and Affective Processes in Child and Family Development	87	\$18,032,000	105	\$25,140,000	124	\$33,859,000	113	\$34,427,000
Developmental Cognitive Psychology, Behavioral Neuroscience, and Psychobiology	47	\$8,823,000	55	\$11,619,000	72	\$15,386,000	77	\$17,949,000
Behavioral Pediatrics and Health Promotion	49	\$11,393,000	51	\$11,942,000	60	\$13,004,000	65	\$14,758,000
Human Learning and Learning Disabilities	35	\$18,502,000	34	\$21,592,000	44	\$23,440,000	49	\$26,140,000
Language, Bilingual, and Biliteracy Development and Disorders and Adult, Family, and Adolescent Literacy	37	\$7,263,000	37	\$8,255,000	45	\$10,154,000	60	\$13,752,000
Early Learning and School Readiness <sup>11</sup>	1	\$500,000	1	\$70,700	15	\$1,071,000	16	\$5,127,000
Math and Science Cognition and Learning Development and Disorders	0	\$0	0	\$0	0	\$0	18	\$7,357,000
<b>Totals:</b>	<b>256</b>	<b>\$64,513,000</b>	<b>283</b>	<b>\$78,618,700</b>	<b>360</b>	<b>\$96,914,000</b>	<b>398</b>	<b>\$119,510,000</b>

<sup>11</sup> The Early Learning and School Readiness Program did not start until 2001. The funds listed for 2000 above went to a contract for the Early Childhood Longitudinal Study—Kindergarten Cohort; although these contract funds did not come out of Program money at the time, the project is now classified as within the purview of the Program and is, therefore, included here.

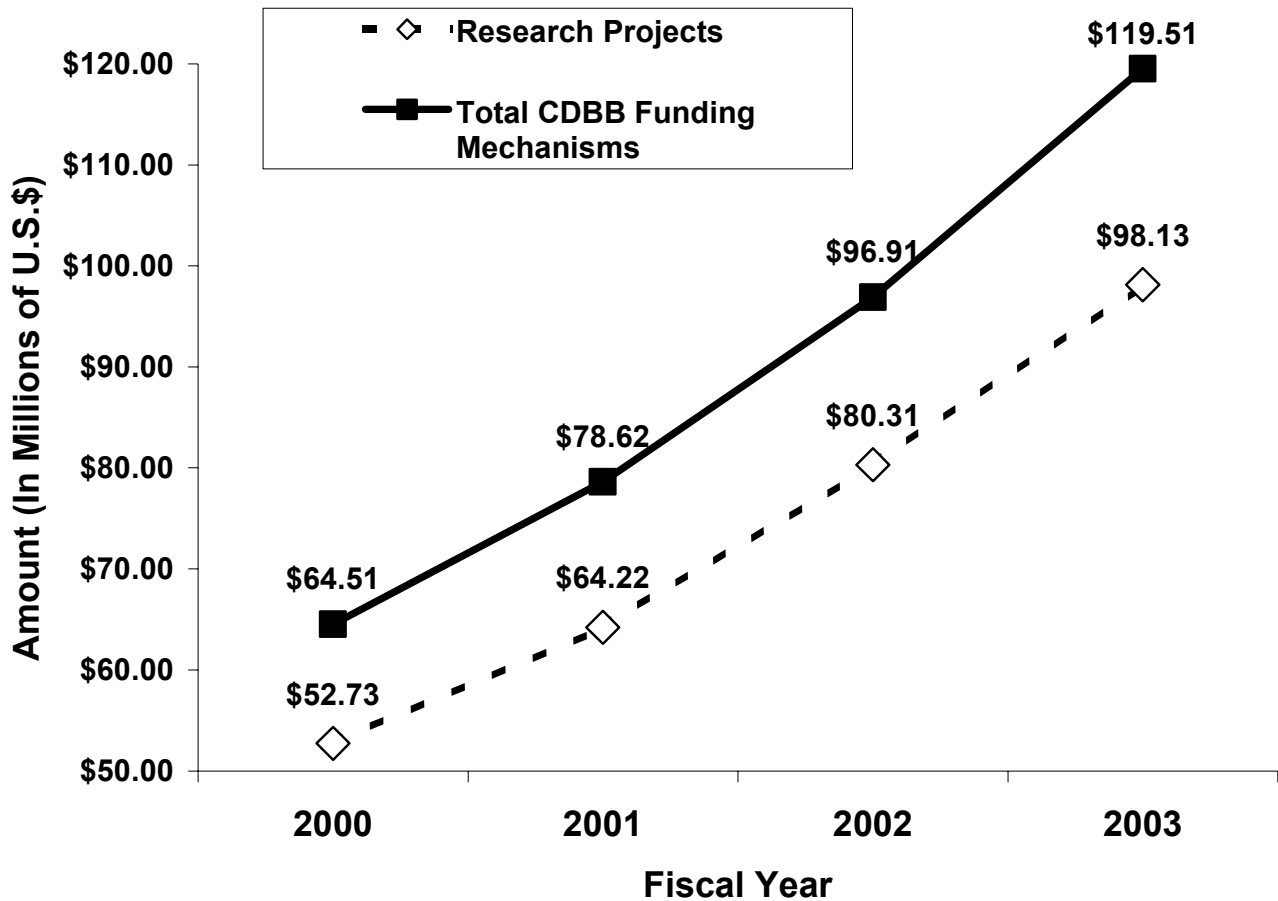
**FIGURE 9: CDBB FUNDING BY PROGRAM, FISCAL YEARS 2000 THROUGH 2003**



**FIGURE 10: CDBB FUNDING BY MECHANISM (EXCLUDING RESEARCH PROJECTS), FISCAL YEARS 2000 THROUGH 2003**



**FIGURE 11: CDBB FUNDING OF RESEARCH PROJECTS AND TOTAL FUNDING OF ALL MECHANISMS, FISCAL YEARS 2000 THROUGH 2003**



(Note: Research Projects include P01, R01, R03, R13, R15, R21, R24, R25, R29, R37, T15, and U01)

**TABLE 2: CDBB FUNDING BY MECHANISM, FISCAL YEARS 2000 THROUGH 2003**

Mechanism	Fiscal Year 2000		Fiscal Year 2001		Fiscal Year 2002		Fiscal Year 2003	
	No.	Amount	No.	Amount	No.	Amount	No.	Amount
Research Projects	191	\$52,725,000	220	\$64,224,000	275	\$80,309,000	298	\$98,129,000
SBIRs	17	\$2,615,000	13	\$2,583,000	17	\$4,351,000	33	\$8,369,000
Research Centers	4	\$5,039,000	4	\$6,877,000	4	\$6,060,000	4	\$6,520,000
Careers	7	\$737,000	10	\$1,026,000	19	\$1,785,000	21	\$2,013,000
Fellowships	24	\$759,000	23	\$835,000	28	\$1,052,000	25	\$986,000
Training	12	\$2,138,000	10	\$1,974,000	12	\$2,376,000	13	\$2,313,000
Contracts/IAs	1	\$500,000	3	\$1,100,000	5	\$981,000	4	\$1,180,000
<b>Totals:</b>	<b>256</b>	<b>\$64,513,000</b>	<b>283</b>	<b>\$78,619,000</b>	<b>360</b>	<b>\$96,914,000</b>	<b>398</b>	<b>\$119,510,000</b>

## APPENDIX A: BRANCH SOLICITATIONS

### **REQUEST FOR APPLICATIONS (RFAs)**

- RFA: HD-00-003: *Learning Disabilities: Multidisciplinary Research Centers*, at <http://grants2.nih.gov/grants/guide/rfa-files/RFA-HD-00-003.html>
- RFA: HD-02-002: *Augmentative and Alternative Communication Strategies for Treatment of Acquired Cognitive-Linguistic Disorders*, at <http://grants2.nih.gov/grants/guide/rfa-files/RFA-HD-02-002.html>
- RFA: HD-02-004: *Research on Adult and Family Literacy*, at <http://grants2.nih.gov/grants/guide/rfa-files/RFA-HD-02-004.html>
- RFA: HD-02-005: *Early Childhood Education and School Readiness Planning Grants*, at <http://grants2.nih.gov/grants/guide/rfa-files/RFA-HD-02-005.html>
- RFA: HD-02-015: *Network on the Neurobiology and Genetics Of Autism: Collaborative Programs of Excellence in Autism Data Coordinating Center*, at <http://grants2.nih.gov/grants/guide/rfa-files/RFA-HD-02-015.html>
- RFA: HD-02-031: *Mathematics Cognition and Specific Learning Disabilities*, at <http://grants2.nih.gov/grants/guide/rfa-files/RFA-HD-02-031.html>
- RFA: HD-03-003: *Effectiveness of Early Childhood Programs, Curricula, and Interventions in Promoting School Readiness*, at <http://grants1.nih.gov/grants/guide/rfa-files/RFA-HD-03-003.html>
- RFA: HD-03-012: *Research in Adolescent Literacy*, at <http://grants2.nih.gov/grants/guide/rfa-files/RFA-HD-03-012.html>

### **PROGRAM ANNOUNCEMENTS (PAS AND PARS)**

- PA-00-105: *Basic and Translational Research in Emotion (R01)*, at <http://grants2.nih.gov/grants/guide/pa-files/PA-00-105.html>
- PA-00-106: *Basic and Translational Research in Emotion: Small Grants*, at <http://grants2.nih.gov/grants/guide/pa-files/PA-00-106.html>
- PA-00-108: *The Science and Ecology of Early Development (SEED)*, at <http://grants.nih.gov/grants/guide/pa-files/PAS-00-108.html>
- PA-01-002: *Age-Related Changes in Reading and Oral Language Comprehension*, at <http://grants.nih.gov/grants/guide/pa-files/PA-01-002.html>
- PA-01-060: *Research on Child Neglect*, at <http://grants2.nih.gov/grants/guide/pa-files/PA-01-060.html>
- PA-02-101: *The Identification and Prevention of Middle Childhood Precursors of Risky Sexual Behavior*, at <http://grants2.nih.gov/grants/guide/pa-files/PA-02-101.html>
- PAR-03-096: *Research on Children Exposed to Violence*, at <http://grants1.nih.gov/grants/guide/pa-files/PAR-03-096.html>
- PA-03-169: *Basic and Translational Research in Emotion*, at <http://grants1.nih.gov/grants/guide/pa-files/PA-03-169.html>

- PA-04-121: *Understanding Mechanisms of Health Risk Behavior Change in Children and Adolescents*, at <http://grants2.nih.gov/grants/guide/pa-files/PA-04-121.html>

### **CO-SPONSORED INITIATIVES**

- RFA: HL-01-006: *Sleep and Sleep Disorders in Children*, at <http://grants2.nih.gov/grants/guide/rfa-files/RFA-HL-01-006.html>
- RFA: DA-02-001: *Neuroimaging Technology Development to Assess Brain and Behavior in Pediatric Populations*, at <http://grants2.nih.gov/grants/guide/rfa-files/RFA-DA-02-001.html>
- RFA: HD-02-003: *Partnerships for HIV/AIDS Research in African Populations*, at <http://grants2.nih.gov/grants/guide/rfa-files/RFA-HD-02-003.html>
- RFA: MH-02-004: *Exploratory/Developmental Grants in Social Neuroscience*, at <http://grants2.nih.gov/grants/guide/rfa-files/RFA-MH-02-004.html>
- RFA: TW-02-005: *International Tobacco and Health Research and Capacity-Building Program*, at <http://grants.nih.gov/grants/guide/rfa-files/RFA-TW-02-005.html>
- RFA: OB-03-003: *Maintenance of Long-term Behavioral Change*, at <http://grants2.nih.gov/grants/guide/rfa-files/RFA-OB-03-003.html>
- RFA: NCER-03-04: *Interagency Education Research Initiative*, at <http://www.ed.gov/about/offices/list/ies/ncer/pgms.html>
- RFA: DK-03-012: *Prospective Study of Chronic Kidney Disease in Children*, at <http://grants2.nih.gov/grants/guide/rfa-files/RFA-DK-03-012.html>
- RFA: DK-03-020: *SBIR and STTR to Develop New Therapies for Type 1 Diabetes and Its Complications*, at <http://grants2.nih.gov/grants/guide/rfa-files/RFA-DK-03-020.html>
- PA 00-046: *Biobehavioral Research for Effective Sleep*, at <http://grants.nih.gov/grants/guide/pa-files/PA-00-046.html>
- PA-00-109: *Self-management Strategies Across Chronic Diseases*, at <http://grants.nih.gov/grants/guide/pa-files/PA-00-109.html>
- PA-01-017: *Physical Activity and Obesity Across Chronic Diseases*, at <http://grants1.nih.gov/grants/guide/pa-files/PA-01-017.html>
- PA-01-044: *Research on Emergency Medical Services for Children*, at <http://grants.nih.gov/grants/guide/pa-files/PA-01-044.html>
- PA-02-034: *Pathophysiology and Treatment of Chronic Fatigue Syndrome*, at <http://grants.nih.gov/grants/guide/pa-files/PA-02-034.html>
- PA-02-072: *Methodology and Measurement in the Behavioral and Social Sciences*, at <http://grants.nih.gov/grants/guide/pa-files/PA-02-072.html>
- PA-02-103: *Research on Ethical Issues in Human Studies*, at <http://grants.nih.gov/grants/guide/pa-files/PA-02-103.html>
- PAR-03-035: *The Human Brain Project (Neuroinformatics): Phase I—Feasibility; Phase II—Refinements, Maintenance, and Integration*, at <http://grants1.nih.gov/grants/guide/pa-files/PAR-03-035.html>
- PA-03-107: *NIH Exploratory/Developmental Research Grant Award (R21)*, at <http://grants1.nih.gov/grants/guide/pa-files/PA-03-107.html>



- PA-03-108: *NIH Small Research Grant Program (R03)*, at <http://grants1.nih.gov/grants/guide/pa-files/PA-03-108.html>
- PA-04-057: *Improving Care for Dying Children and Their Families*, at <http://grants1.nih.gov/grants/guide/pa-files/PA-04-057.html>
- PA-04-113: *The Science and Ecology of Early Development (SEED)*, at <http://grants1.nih.gov/grants/guide/pa-files/PA-04-113.html>
- PA-04-116: *Understanding and Promoting Health Literacy (R01)*, at <http://grants1.nih.gov/grants/guide/pa-files/PA-04-116.html>
- PA-04-117: *Understanding and Promoting Health Literacy (R03)*, at <http://grants1.nih.gov/grants/guide/pa-files/PA-04-117.html>

## APPENDIX B: BRANCH PUBLICATIONS

(CDBB Scientists appear in boldface below.)

- Ball, K., **Berch, D.B.**, Helmers, K.F., et al. (2002). Effects of cognitive training interventions with older adults: A randomized controlled trial. *Journal of the American Medical Association*, 288, 2271-2281.
- Berch, D.B.** & Bender, B.G. (2000). Turner syndrome. In K.O. Yeates, M. D. Ris, & H. G. Taylor (Eds.), *Pediatric neuropsychology: Research, theory, and practice* (pp. 252-274). New York: Guilford Press.
- Berch, D.B.**, & Wagster, M.V. (2004). Future directions in cognitive aging research: Perspectives from the National Institute on Aging. In R. A. Dixon, L. Backman, & L. Nilsson (Eds.), *New Frontiers in Cognitive Aging* (pp. 333-335). New York: Oxford University Press.
- Bryan, J.P., **McCardle, P.**, South-Paul, J., Fogarty, J.P., Legters, L. J., & Perine, P. (2001). Randomized trial of concurrent hepatitis A and B vaccination. *Military Medicine*, 166.
- Capone, G., Kim, P., Javanovich, S., Payne, L., **Freund, L.**, Welch, K., Miller, E., & Trush, M. (2002). Evidence for increased mitochondrial superoxide production in Down syndrome. *Life Science*, 70, 2885-2895.
- Dubowitz, H., Newton, R.R., Litrownik, A.J., Briggs, E.C., Lewis, T., Thompson, R., English, D., Lee, L., & **Feerick, M. M.** (In press). Examination of a conceptual model of child neglect. *Child Maltreatment*.
- Eliez, S., Blasey, C.M., **Freund, L.S.**, Hastie, T., & Reiss, A.L. (2001). Brain anatomy, gender, and IQ in children and adolescents with Fragile X syndrome. *Brain*, 124, 1610-1618.
- Feerick, M.M.** (2002). Research opportunities in child abuse and neglect at the National Institutes of Health. *Section on Child Maltreatment Newsletter, Division 37, American Psychological Association*, 6 (10).
- Feerick, M.M.** (2002). Federal agencies host research agenda-building workshop on children exposed to violence. *Section on Child Maltreatment Newsletter, Division 37, American Psychological Association*, 7 (2).
- Feerick, M., **Boyce, C.**, & Giardino, A. (In press). The National Institutes of Health Child Abuse and Neglect Working Group: Opportunities for federal funding and collaboration. In A. Giardino (Ed.), *Child maltreatment: Volumes 1-2 (A clinical guide and reference)*. St. Louis, MO: GW Medical Publishing.
- Feerick, M.M.**, Bristol-Power, M., & Bynum, D. (2002). The National Institute of Child Health and Human Development research on parenting: Past, present, and future directions. In J. Borkowski, S.L. Ramey, and M. Bristol-Power (Eds.), *Parenting and the child's world: Influences on academic, intellectual, and social-emotional development* (pp. 347-364). Mahwah, New Jersey: Erlbaum.
- Feerick, M.M.**, Haugaard, J.J., & Hien, D.A. (2002). Child maltreatment and adulthood violence: The contribution of attachment and drug abuse. *Child Maltreatment*, 7, 227-241.

- Feerick, M.M.**, & Prinz, R.J. (2003). Next steps in research on children exposed to community violence or war/terrorism. *Clinical Child and Family Psychology Review*, 6, 303-305.
- Feerick, M.M.**, & Prinz, R.J. (2003). Introduction. *Clinical Child and Family Psychology Review*, 6, 147-149.
- Feerick, M.M.** & Prinz, R.J. (2003). Guest Editors. Children exposed to domestic violence: Current status and research directions. *Clinical Child and Family Psychology Review (Special issue)*, 6 (4).
- Feerick, M.M.** & **Snow, K.L.** (In press). The relationships between childhood sexual abuse, social anxiety, and symptoms of post-traumatic stress disorder in women. *Journal of Family Violence*.
- Fleck, D.E., **Berch, D.B.**, Shear, P.K., & Strakowski, S.M. (2001). Directed forgetting in explicit and implicit memory: The role of encoding and retrieval mechanisms. *Psychological Record*, 51, 207-221.
- Fletcher, J.M., **Lyon, G.R.**, Barnes, M., et al. (2003). Classification of learning disabilities: An evidenced-based evaluation. In R. Bradley, L. Danielson, & D. Hallahan (Eds.), *Identification of learning disabilities: Research to practice*. Mahwah, New Jersey: Erlbaum.
- Fletcher, J.M., Morris, R.D., & **Lyon, G.R.** (2003). Classification and definition of learning disabilities: An integrative approach. In H. Lee Swanson (Ed.), *Assessment of learning disabilities* (pp. 30-56). New York: Guilford Press.
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- Haugaard, J.J. & **Feerick, M.M.** (2002). Interventions for maltreated children to reduce their likelihood of engaging in juvenile delinquency. *Children's Services*, 5, 285-297.
- Jackson, .Y, Dietz, W.H., Sanders, C., Kolbe, L.J., Whyte, J.J., Wechsler, H., Schneider, B.S., McNally, L.A., Charles-Azure, J., Vogel-Taylor, M., Starke-Reed, P., Hubbard, V.S., Johnson-Taylor, W.L., Troiano, R.P., Donato, K., Yanovski, S., Kuczmarski, R.J., **Haverkos, L.**, McMurry, K., et al. (2002). Summary of the 2000 Surgeon General's listening session: Toward a national action plan on overweight and obesity. *Obes Res*. 10(12), 1299-1305.
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- Kau, A.S.M., Rieder, E., Meyer, W., **Freund, L.** (2000). Early behavior signs of psychiatric phenotypes in Fragile X syndrome. *American Journal on Mental Retardation*, 105, 266-299.
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- Lyon, G.R.** (In press). Why scientific research must guide educational policies and practices. *Issues in Education: Contributions from Educational Psychology*.

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- Lyon, G.R. & Chhabra, V.** (2004). The science of reading research. *Educational Leadership*, 61, 12-17.
- Lyon, G.R. & Fletcher, J.M.** (2001). Early warning system: How to prevent reading disabilities. *Education Matters*, summer, 22-29.
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- Lyon, G.R. & Fletcher, J.M.** (2001). Early intervention for children at risk for reading failure. *Basic Education*, 46, 12-15.
- Lyon, G.R., Fletcher, J.M., Barnes, M., Fuchs, L., & Chhabra, V.** (In press). Treatment of learning disabilities. In E. Mash & R. Barkley (Eds.), *Child Psychopathology - Second edition*. New York: Guilford Press.
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- McCardle, P.,** Cooper, J., Karp, N., & Houle, G. (2001). Emergent and early literacy: Current status and research directions – introduction. *Learning Disabilities Research and Practice (Special issue)*, 16.
- McCardle, P.,** Scarborough, H.S., & Catts, H.W. (2001). Predicting, explaining, and preventing children's reading difficulties. *Learning Disabilities Research and Practice (Special Issue)*, 16.
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## APPENDIX C: BRANCH PERSONNEL

**Daniel B. Berch, Ph.D.**, is a cognitive and developmental psychologist who received his bachelor's degree in psychology from the University of Michigan, his master's degree in special education from Michigan State University, and his Ph.D. in experimental psychology from the University of New Mexico. He has spent most of his academic career at the University of Cincinnati in the Department of Psychology, where he also served as research coordinator at the University Affiliated Cincinnati Center for Developmental Disorders. He has published articles and book chapters on developmental changes in short-term memory, numerical cognition, mathematical learning disabilities, spatial information processing, sustained attention, and cognitive processing dysfunctions in Turner syndrome. Dr. Berch came to the Washington, D.C., area in 1997 to serve as the Society for Research on Child Development (SRCD)/American Association for the Advancement of Science (AAAS) Executive Branch Science Policy Fellow in the CDBB. He then did a stint at the NIH's Center for Scientific Review, after which time he spent a year at ED as senior research associate in the OERI. He then returned to the NIH, where he subsequently became chief of the Cognitive Aging Section in the Behavioral and Social Research Program at the NIA. Most recently, he came back to the NICHD to direct the new Mathematics and Science Cognition and Learning Program; he also serves as the Institute's representative to Secretary of Education Paige's Mathematics and Science Initiative and as the NICHD team leader for the IERI.

**Vinita Chhabra, M.Ed.**, a research scientist who has worked with the National Reading Panel since its inception, has a background in special education with an emphasis in RDs. Ms. Chhabra has worked in the public school system and as an evaluator at the NICHD-funded Yale Center for the Study of Learning and Attention. She heads dissemination activities for the National Reading Panel and works as an NICHD liaison to NIFL and ED. Ms. Chhabra also assists the NICHD's CDBB with adolescent and family literacy initiatives. She holds a master's degree in education and is completing her doctorate in educational psychology at the University of Virginia. Ms. Chhabra has co-authored articles on LDs and reading research and is co-editor of the recent volume *The Voice of Evidence in Reading Research*, published by Paul Brookes Publishing, 2004.

**Margaret Feerick, Ph.D.**, is a developmental psychologist with a research background in child maltreatment and family violence. Dr. Feerick received her doctorate from Cornell University in developmental psychology, with concentrations in social and personality development and developmental psychopathology. Prior to joining the NICHD, Dr. Feerick held research positions on several federally funded grants, including two projects funded by the NIH, and the National Data Archive on Child Abuse and Neglect, which is funded by the National Center for Child Abuse and Neglect. Dr. Feerick has also been the recipient of several national fellowships and awards, including an Individual National Service Award from the NIH, and an SRCD/AAAS Executive Branch Policy Fellowship. Dr. Feerick worked as director of development and contributions for an independent school in New York City and taught at both the elementary and junior high school levels. As part of the CDBB, Dr. Feerick is responsible for managing a large

research and training program in cognitive, social, and affective development, and in child maltreatment and violence.

Dr. Feerick is working closely with **Valerie Maholmes, Ph.D., C.A.S.**, who is currently a Science Policy Fellow for the SRCD at the NICHD. Dr. Maholmes holds a Ph.D. in educational psychology from Howard University and recently completed a sixth-year degree with advanced study in school psychology, with a concentration in neuropsychological and psychosocial functioning, as well as in the assessment of general cognitive abilities. An intense focus on the psychosocial and environmental factors that influence the learning and development of minority children has been the hallmark of Dr. Maholmes' career. She holds a faculty appointment at the Yale University Child Study Center, where she has held numerous positions, including the director of research and policy for the School Development Program and the Irving B. Harris Assistant Professor of Child Psychiatry—an endowed professorial chair for social policy. Dr. Maholmes has been a member of the New Haven Board of Education, where she has served as vice president/secretary and chair of the curriculum committee for two terms. She also recently finished a term as the president of the Board of Directors for the Arnold Gesell Institute of Human Development. Dr. Maholmes assists Dr. Feerick in completing specific tasks, as they relate to her Fellowship.

**Lisa Freund, Ph.D.**, is a developmental psychologist and cognitive neuroscientist who is known for her neuroimaging studies of children from different clinical populations; she was an NICHD-supported scientist for several years. She has extensive training and experience in the fields of developmental neuroscience, developmental psychology, learning disorders, and behavioral and molecular genetics. Dr. Freund received her Ph.D. from the University of Maryland in applied developmental psychology and was an associate professor of psychiatry at the Johns Hopkins University School of Medicine and Kennedy Krieger Institute. As part of the CDBB, Dr. Freund is responsible for a multifaceted research and training program that promotes basic and applied to gain a deeper understanding of the linkages among genes, the developing brain, and behavior.

**Lynne Haverkos, M.D., M.P.H.**, a board-certified pediatrician and a Fellow of the American Academy of Pediatrics, directs the Behavioral Pediatrics and Health Promotion Program at the CDBB. She received her medical degree from the Medical College of Ohio and her master's in public health from the Graduate School of Public Health in Pittsburgh, Pennsylvania. She completed a fellowship in ambulatory pediatrics at the Children's Hospital of Pittsburgh and developed expertise in adolescent health, anticipatory guidance, obesity, and ADHD as a practicing pediatrician. Her portfolio of grants covers a diverse array of topics including: risk behaviors, injury prevention, infants born at risk, medical adherence, health promotion, and disease prevention. She has participated in a number of interagency committees including the Surgeon General's Obesity and Inactivity Federal Planning Committee, the Surgeon General's Children's Mental Health Federal Planning Committee, the Interagency Committee on Emergency Medical Services for Children Research, the Interagency Coordinating Committee on Fetal Alcohol Syndrome, the trans-NIH Working Group on Chronic Fatigue Syndrome, and the trans-NIH Sleep Research Coordinating Committee. She served as a federal expert to the Science and Program Review Subcommittee of the CDC's Advisory Committee for Injury



Prevention and Control, as an active member of the Behavior Change Consortium and as a representative to the DHHS Interagency Committee on Smoking and Health. She participates actively in the Chronic Kidney Disease in Children Advisory Committee, and the Health Maintenance Consortium. Dr. Haverkos is passionate in her search for understanding the basis of behavior change in children and adolescents and strives to improve children's mental and physical health through research.

**Reid Lyon, Ph.D.**, is a research psychologist and the chief of the CDBB. He is responsible for the overall direction, development, and management of research programs in developmental psychology, cognitive neuroscience, behavioral pediatrics, reading, and human learning and learning disorders. Before joining the NIH on a full-time basis in 1991, Dr. Lyon served on the faculties of the University of Alabama-Birmingham (1977-1980), Northwestern University (in communication science and disorders/neuroscience from 1980-1983), and the University of Vermont (in neurology from 1983-1991). He was a member of the Maternal and Child Health Scientific Peer Review Group at the NICHD from 1987 to 1991, and served as the chairman of the NICHD Scientific Peer Review Panel for the multidisciplinary LDRCs. Prior to joining the NIH, Dr. Lyon's research program was supported, in part, by grants from the NIH and ED. Dr. Lyon received his Ph.D. from the University of New Mexico (1978) with a dual concentration in psychology (developmental neuropsychology) and special education (learning disorders). He completed a fellowship in developmental neuroscience at the University of New Mexico Medical Center. Dr. Lyon has authored, co-authored, and edited more than 100 journal articles, books, and book chapters addressing learning differences and LDs in children. He was a member of the President's Commission on Excellence in Special Education and currently serves as an advisor to President George W. Bush and First Lady Laura Bush on child development and education research and policies.

**Peggy McCardle, Ph.D., M.P.H.**, directs the Language, Bilingual, and Biliteracy Development and Disorders Program at the CDBB. Dr. McCardle holds a bachelor's degree in French, a Ph.D. in linguistics, and a master's degree in public health. She has been a classroom teacher and a speech-language pathologist, and has held university faculty positions at South Carolina State College, the University of Mississippi, the University of Maryland, and the Uniformed Services University of the Health Sciences, and hospital-based clinical positions at Womack Army Community Hospital, Ft. Bragg, North Carolina, and at Walter Reed Army Medical Center, Washington, D.C. Her publications address various aspects of public health and developmental psycholinguistics (e.g., language development, bilingualism, and reading). The research Program for which she is responsible includes three inter-agency funded research networks: the DELSS Research Network; the Adult Literacy Research Network; and the new Adolescent Literacy Research Network. She also serves as the NICHD liaison to the National Reading Panel and to the NIFL, is on the steering committee of the National Literacy Panel for Language Minority Children and Youth, and leads or serves on various inter-agency working groups. She co-edited, with Vinita Chhabra, the book *The Voice of Evidence in Reading Research* (2004), which presents information about reading research and its findings, for educators, administrators, and others concerned with getting research results into the classroom.

**Kyle Snow, Ph.D.**, is the director of the Early Learning and School Readiness Program at the CDBB. In this position, Dr. Snow is responsible for developing initiatives to support research on the processes and contexts of early learning, which includes coordination and/or collaboration with other federal and private sources of research funding to support rigorous research on the most effective ways to prepare children from diverse backgrounds and experiences for school entry and success. Prior to joining the NICHD, Dr. Snow was a research analyst in the education studies division at Westat, a contract research firm located in Rockville, Maryland; in this position, Dr. Snow performed a diverse range of evaluation and research projects related to education and education policy. He has also held a faculty appointment at Wilkes University in Pennsylvania and taught courses at Cornell University, American University, and Seton Hall University. Dr. Snow holds a bachelor's degree in psychology from Castleton State College in Vermont, and a master's and doctorate degree in human development from Cornell University. Dr. Snow's areas of specialization include infant and child development, and the interface between early social and cognitive development. He has published papers in a range of areas and has prepared nearly 20 technical and government reports related to educational programs and educational policy.