Studying Media Effects on Children and Youth: Improving Methods and Measures, Workshop Summary

Program Committee for a Workshop on Improving Research on Interactive Media and Children's Health, Alexandra Beatty, Rapporteur, National Research Council

ISBN: 0-309-66324-5, 36 pages, 8 1/2 x 11, (2006)

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Workshop Summary

Alexandra Beatty, Rapporteur

Program Committee for a Workshop on Improving Research on Interactive Media and Children's Health

Board on Children, Youth, and Families
Division of Behavioral and Social Sciences and Education
Institute of Medicine

NATIONAL RESEARCH COUNCIL
INSTITUTE OF MEDICINE
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THE NATIONAL ACADEMIES PRESS
Washington, D.C.
www.nap.edu

THE NATIONAL ACADEMIES PRESS 500 Fifth Street, N.W. Washington, DC 20001

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This study was supported by Contract No. 04-1101-310 between the National Academy of Sciences and the Henry J. Kaiser Family Foundation. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the organizations or agencies that provided support for the project.

International Standard Book Number ISBN 0-309-10275-8

Additional copies of this report are available from National Academies Press, 500 Fifth Street, N.W., Lockbox 285, Washington, DC 20055; (800) 624-6242 or (202) 334-3313 (in the Washington metropolitan area); Internet, http://www.nap.edu

Printed in the United States of America

Suggested citation: National Research Council and Institute of Medicine. (2006). *Studying Media Effects on Children and Youth: Improving Methods and Measures.* Alexandra Beatty, Rapporteur. Program Committee for a Workshop on Improving Research on Interactive Media and Children's Health. Board on Children, Youth, and Families, Division of Behavioral and Social Sciences and Education and Institute of Medicine. Washington, DC: The National Academies Press.

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Preface

Concerns about the theory, quality, and rigor of methods and measures in studies of the impact of media technologies on child health and development have emerged in recent Academy studies. A 2006 study of the impact of food marketing on the diets and health of children and youth (Institute of Medicine, 2006) and an earlier 2004 study on underage drinking (National Research Council and Institute of Medicine, 2004) both called attention to the pervasive nature of media in the social environments of today's children and youth and the limited capacity of research studies to understand its nature, intensity, duration, or effects.

In response to these concerns, members of the Board on Children, Youth, and Families of the National Research Council and Institute of Medicine sought to organize a planning discussion to explore the strengths and limitations of the methods and measures of interactions between media influences and child and adolescent health and development. Board member Ellen Wartella framed a set of key questions that ultimately led to a collaboration with the Kaiser Family Foundation in organizing a planning meeting to examine these issues and to identify strategies that could inform the design and implementation of future surveys and studies. A program committee chaired by Aletha Huston met by phone to plan the agenda for the meeting and to identify speakers and other participants.

The program committee commissioned two papers to guide the discussions: Elizabeth Vandewater from the University of Texas prepared an overview of the types of measures currently employed in selected media studies, and Michael Oakes from the University of Minnesota presented an analysis from the perspective of a social epidemiologist on the merits of selected study designs and assessment measures. Both papers are available online, along with slides from presentations by other speakers (www.bocyf.org).

This workshop summary has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the Report Review Committee of the National Research Council. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the charge. The review comments and draft manuscript remain confidential to protect the integrity of the process. We thank the following individuals for their review of this report: Judy S. DeLoache, Department of Psychology, University of Virginia; Susan McHale, Department of Human Development and Family Studies, Pennsylvania State University; W. James Potter, Department of Communication, University of California at Santa Barbara; Richard Scheines, Department of Philosophy, Carnegie Mellon University; and Ellen Wartella, Office of the Executive Vice Chancellor and Provost, University of California, Riverside.

Although the reviewers listed above provided many constructive comments and suggestions, they were not asked to endorse the content of the report nor did they see the final draft of the report before its release. The review of this report was overseen by Gary

Sandefur, College of Letters and Science, University of Wisconsin-Madison. Appointed by the National Research Council, he was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the author(s) and the institution.

Aletha C. Huston
Chair
Program Committee for a Workshop on
Improving Research on Interactive Media
and Children's Health

Chapter 1
Introduction

The presence and intensity of media influences—television, radio, music, computers, films, videos, and the Internet—are increasingly recognized as an important part of the social ecology of children and youth, and these influences have become more visible and volatile in recent decades. Research that explores the level and effects of media influences calls for measurements of the quantity and character of exposure to a variety of potentially overlapping media sources, an analysis of the content of the media output, and examination of the social context and relationships that are associated with the media experience.

Additional effort is needed to develop theories that can identify underlying processes and mechanisms that link media influences to outcomes. Outcomes in turn call for tools that can measure, evaluate, and help explain how certain media experiences influence, and are influenced by, health and behavioral factors as well as cognitive and developmental processes. Methodologies from a variety of disciplines—communications, economics, neuroscience, pediatrics, and psychology, to name a few—have been applied to these questions, and a strong body of research and valuable findings has emerged. Nevertheless, the field is relatively young and many methodological and theoretical questions remain, even as new digital technologies continue to pose unique challenges to researchers.

While current media studies focus on the social environment of the millennium generation, there is nothing new in adults being worried about corrupting influences on young people. Early Greek philosophers argued about the relative merits of a focus on rhetoric in the education of their youth at the expense of reason and understanding. When novels were first published during the eighteenth century, many people were concerned that readers, especially the young, would be corrupted by the licentious and immoral behavior described, as well as by the indolent lifestyle they perceived novel readers to follow. By the twentieth century, the potential causes for concern had proliferated dramatically. Today, media experiences seem to expand by the month, and while much of the concern about their influence on young people may represent older worries in new forms, the media ecology of today's children and youth also presents a new frontier that offers unique challenges for research studies.

A child born in the 1930s might have spent as much as several hours a week listening to the radio; reading comic books, newspapers, or magazines; or watching a film at a local theatre. Since television was first introduced in the 1950s, the number of hours young people spend interacting in some way with media, as well as the range and capabilities of the many devices and activities that could be considered media experiences, have increased to an extent far beyond the imagining of today's grandparents when they were young. Children today use electronic media from two to five hours daily, and infants—even in utero—are regularly exposed to a variety of media

stimuli. This pervasive experience has raised many questions about how media exposure, content, and context influence young people's health, development, and behavior.

Researchers are increasingly concerned not only with how much time children spend with the media in general, but also with how they apportion their exposure over different sources and types of media. Furthermore, interest is growing in examining how the experience with media exposure, content, and context has changed over the decades in response to new media features and technologies as well as reflecting other social and economic trends. As an increasingly pervasive and vibrant part of the social ecology of children and youth, media influences have drawn the attention of parents, practitioners, and policy makers who seek to curb risky exposures as well as to identify ways to promote positive media practices that can foster healthy development.

These questions are extremely complicated to investigate. Recognizing the importance of this research, the Board on Children, Youth, and Families, under the auspices of the National Research Council and the Institute of Medicine, and with the sponsorship of the Henry J. Kaiser Family Foundation, held a workshop in March 2006. Its purpose was twofold: to examine the quality of the measures used in studies of the effects of media on children's health and development and to identify gaps in both research and practice. The goal was for a variety of experts to consider steps and strategies that could move this research forward and improve its utility for helping parents, practitioners, and policy makers guide young people in navigating a media-rich environment.

The specific charge to the Program Committee for a Workshop on Improving Research on Interactive Media and Children's Health, which planned the workshop, was to consider:

1. The nature of key research literatures that examine different types of media exposure among children and youth; as well as the types of behaviors and interactions associated with media use (including television, video games, computers, cell phones, and the Internet);
2. The strengths and limitations of different types of measures used in studies of media, children, and youth; and
3. Opportunities and strategies for developing one or more studies in this field that can inform the development of research, policy, and practice guidelines regarding media use, content, controls, and guidance for children and youth.

The committee met once by phone and collaborated via electronic mail to develop strategies for describing how media research is conducted and the methodological issues it poses. This planning effort prompted the development of two background papers and a subsequent day-long discussion that included sessions on the state of the art in current measures of media exposure; the research designs, tools, and frameworks used in social epidemiological and prevention research; and the role of theory in explaining relationships among media exposure and outcomes. In this way the committee was able to represent a variety of perspectives, even though the available time would not allow for comprehensive coverage of any of the issues.

This report provides a summary of that discussion, supplemented with information from two papers prepared for the workshop, which are available at

<http://www.bocyf.org/030206.html>. It begins with an examination of the potential impact of media exposure, followed by a description of the basic research questions and the methods currently used to study them. Methodological questions and challenges and theoretical approaches are described; they are discussed from the perspective of other kinds of epidemiological research. The report closes with a discussion of future directions for the field.

Chapter 2
Media Consumption as a Public Health Issue

A range of attitudes and beliefs are evident in public discourse about the effects of media exposure. Parents are especially concerned with how media exposure and content may influence the healthy development of their children. Yet efforts to restrict the content of media influences have raised important questions about the types of features or interactions that warrant attention, the extent to which media choices should be restricted for certain age groups, and the need for policy interventions as well as parental and professional guidance. Early proposals for parental warning labels on CDs with explicit lyrics, for example, have been part of an extensive and frequently spirited public debate about puritanism, censorship, and the First Amendment to the U.S. Constitution. At present, only limited and frequently conflicting data are available to examine the effects of music lyrics on health and development or the role that they play in the formation of youth identity, social networks, and parent-child relationships. Claims and counterclaims about possible benefits and detrimental effects of different kinds of media exposure appear regularly in the popular press, but often without strong grounding in peer-reviewed research.

Survey data from the Kaiser Family Foundation indicate that many parents are concerned about the amount of sex and violence that their children see on television. But many parents do not understand the available ratings systems for TV and other media, and only 6 percent of parents of young children are aware that the American Academy of Pediatrics has recommended that children under age 2 not watch television or videos at all (Kaiser Family Foundation, 2004). The amount of television to which young people are exposed suggests that, despite their concern, parents are not effectively limiting their consumption.

Recent data provide a general overview of children's current media consumption (see Box 1); sources and methods for collecting these data are addressed in detail in Chapters 3 and 4.

With these data as a backdrop, the workshop began with a conversation about why research on media exposure is important, led by Ellen Wartella and Dan Anderson. Both called attention first to the growing proliferation of media experiences. The ubiquitousness of televisions in homes and public spaces and the large number of daily activities that adults now conduct online are only part of the story. The advent of digital technology in particular has expanded the possibilities for the use of different media technologies simultaneously (the multitasking phenomenon) and in new settings. Computers now allow kids (and adults) to move rapidly between the Internet and a word processing program, frequently with music in the background, as well as detours to play an electronic game or to engage with e-mail or instant messaging functions. All this can be done with earphones on, or with music or television (or both) on in the background, interspersed with cell phone calls, and so forth. Cell phones can be used to transmit digital photographs, and new MP3 players allow users to download video clips, movies,

and television shows to be watched anywhere, any time. Many media experiences, such as giant screens with surround sound, for example, are far more intense than ever before. And software for babies—even devices alleged to promote the development of fetuses in the womb—are bringing new forms of sensory intensity to young nervous systems that are highly malleable and vulnerable to significant developmental changes.

What impact might all this have on people and their behavior? Anderson noted that multiple claims are made of negative effects on social behavior, health, education, and cognition (e.g., increases in aggression and obesity, interference with reading, increase in problems with attention), as well as positive effects and opportunities in the same areas (e.g., teaching or modeling prosocial behavior, providing a vehicle for public health messages that reduce obesity, teaching reading and other skills, enhancing attention skills). Some, he explained, view media in general as a toxin, exposure to which should be controlled in the same way that environmental pollutants are permitted in small doses. The problem with this approach is that it does not address the significant variation in media content and the context in which exposure takes place, nor does it account for variations in the findings about the effects of exposure.

A more promising approach may be to consider the components of a media diet in terms of the different types, amounts, and effects of media influences, Anderson suggested. In this analysis, certain media influences could be viewed as desserts or stimulants rather than toxic agents. As with food, the overall quantity ingested is important, but equally important are quality and balance. Thus, for example, children may benefit from information, educational programming—and, most likely, entertainment, as well—although the research base for developing precise guidelines as to the recommended levels or proportions of each is insufficient. While the harmful effects of media influences such as violent programming are well established, the basis for making concrete recommendations related to the degree or nature of the violence, maximum safe exposure, and so forth, is similarly absent. The alternative concept of a media diet accommodates recommendations that address such qualitative aspects as the nature, content, and context of media exposure, as well as the quantity, allowing for flexibility in the face of almost overwhelming pressure to consume media.

An extensive research literature is now available that examines the health effects of media use, especially in the areas of violent and sexual behavior and, increasingly, in dietary choices and eating behaviors. The workshop participants focused on these initial areas to review how research studies currently measure important dimensions of media interactions with children and youth.

EFFECTS OF VIOLENT OR SEXUAL PROGRAMMING

Regardless of which metaphor is most useful for public health recommendations, a strong research base is available for some important conclusions about media exposure. Perhaps strongest is the case for the effects of violent programming, which some researchers have suggested is at least as strong as the evidence base regarding links between exposure to tobacco smoke and lung cancer (Oakes, 2006; Anderson et al., 2003). A meta-analysis of the varied research base on this issue has shown that exposure to media violence has demonstrable long- and short-term effects on the likelihood of

aggressive or violent behavior.[1] Exposure can have the effect of glamorizing violence; trivializing its effects, consequences, and moral significance; and desensitizing the viewer or participant to its impact. The short-term effects include changes in behavior (such as reductions in helping behavior or increased willingness to inflict punishment in an experimental setting), thoughts, and emotions; the long-term effects include increased likelihood of engaging in physical assaults or spousal abuse. These casual relationships are disputed by others, however, primarily on the basis of imprecise measurement and confounding variables.

Questions remain as to the potential influences of several variables on the outcome of exposure to media violence. The characteristics of viewers, the precise content of the programming, and mediation by parents or others may all either intensify or mitigate the effects. Moreover, the psychological processes through which these effects occur are not yet fully understood. Nevertheless, the evidence suggests that the effects are pervasive and significant from a public health perspective.

An association has also been demonstrated between media consumption and sexual activity among teenagers (L'Engle, Brown, and Kenneavy, 2006). One recent study has shown that adolescents whose media diet includes more sexual content—and content that presents sexuality in a risk-free light—are also likely to engage in more sexual activity and report a greater degree of openness to sexual activity. Media that portray sexual content together with violence can have a particularly strong effect—specifically in increasing the likelihood that male viewers will behave aggressively or physically assault females who have provoked them (Anderson et al., 2003). Findings such as these clearly indicate the importance of considering the media diet as part of any effort to address adolescent sexuality.

EFFECTS ON OBESITY

The possible links between obesity and food marketing on television are another public health concern that has been investigated, and the results illustrate well some of the difficulties researchers have in tracing media effects, Wartella pointed out. A previous study reviewed 122 studies, covering four decades, of television advertising and children's diets (Institute of Medicine and National Research Council, 2006). The results established a causal connection between advertising and both food preferences and food choices, but they could not confirm a link to adiposity (i.e., fatness). In her remarks, Wartella speculated that a possible explanation for this lack of strong relationship in the obesity studies may reside in the methodological limitations of earlier studies—and that other research designs might yet uncover a causal relationship.

[1] Although the majority of research has addressed violence in television programming, movies, and music videos, some similar findings have been produced with regard to violence in computer and video games.

Box 1
Growing up in a Media Saturated Environment

- The average American home contains:
  - 3.5 Television (82 percent of families have cable access or satellite TV)
  - 1.9 VCRs/DVD players
  - 1.5 Computers (74 percent of families have internet access; 60 percent have instant messaging software)
- Children use electronic media from 2 to 5 hours daily, spending more time with television than in any other activity except sleep.
- 75 percent of children ages 8-18 have a television in their bedroom; 36 percent of children ages 0-6 do.
- 44 percent of children ages 8-18 use a computer every day, and 39 percent play video games every day.

Source: Vandewater and Lee (2006)

Chapter 3
The Current State of Media Research

Research on children's media exposure frequently begins with three basic questions: How much media do children use? What kinds of media messages are they exposed to? What are the effects of this exposure? Elizabeth Vandewater provided an overview of the principal methods used to explore these questions, which, she explained, have proved generally unsatisfying, even before consideration of the complexities of multitasking in a digital era (Vandewater and Lee, 2006).

MEASURING USE

Current methods for measuring the amount of time spent with media include global time estimates, time diaries, media diaries, experience sampling methods, video or direct observation, and electronic monitoring systems.

Global time estimates are obtained by asking subjects to answer such questions as how many hours they spent watching television the previous day or in a typical week, or how frequently they do a particular activity (e.g., on a Likert scale that ranges from "never" to "very frequently"). Such questions are frequently included in large-scale surveys and are an inexpensive, easy way to collect data. However, the simplicity of the design yields imprecision. The respondent is expected within 10-20 seconds to recall all relevant experiences, determine whether they should "count" as a primary activity, and estimate the time spent—and to not shape the answer to fit perceived social expectations.

Time use diaries were first developed by economists interested in the ways Americans spend their paid work time. They differ from global time estimates in that the answer format is open-ended, allowing respondents to record their activities, usually for 24-hour stretches. Questions typically include the principal and secondary activity, duration of the activity, other participants, and location. This method is less frequently used in media research, in part because it is expensive, but it allows for a more accurate and complete picture of the activity being investigated. This technique easily captures routine or daily activities, but it usually misses sporadic activities or those that occur only on days that are not monitored. It also can easily miss activities that are so automatic they escape notice, are considered private, or occur simultaneously with more than one other activity. Television watching that occurs while a meal is being prepared or eaten, for example, may be hidden, as might brief but frequent Internet use, such as using a computer to check the weather, movie reviews, or e-mail.

Media diaries are targeted time use diaries, focused on a single activity. Participants are asked to highlight the shows they watched on a program grid or to record whether the TV was on, who was watching, what channel, etc., by hour of the day. This method is less burdensome than a diary of all daily activities and thus allows data to be collected over longer time periods. It also allows for the collection of supplementary information, such as the participants' reasons for doing the activity at a particular time.

Media diaries do not generally allow for the collection of data regarding context, such as other activities done at the same time.

Experience sampling methods provide a look at typical activities by sampling at random times of the day, often by paging participants and asking them to fill in particular information in a booklet of self-report forms. This method can capture internal aspects of the experience (motivation, mood, cognition), as well as external information (location, context, etc.). It is somewhat less burdensome than other methods, but it is useful only with participants who can write coherently about their experiences (i.e., not most children under 10—a key target for media research). It also does not allow researchers to determine the total amount of time spent on activities of interest.

Direct observation (or video observation) is an ethnographic technique for investigating social phenomena in natural settings. It provides very accurate and rich information about such issues as television viewing habits, but it is extremely time- and labor-intensive and consequently expensive—which limits the sampling that is possible. Moreover, although observation eliminates bias in answering questions, the presence of the observer or camera may have significant influence on participants' media choices and behaviors.

Electronic monitoring is a commercial method designed to collect the data that are used to generate ratings for television programming. Two somewhat different technologies for this purpose are owned by two companies, Nielson and Arbitron, which have occasionally made them available to researchers for a fee. In the Nielson method, each viewer in the household is assigned a button on a device supplied by the company and is asked to push it when they begin and end a viewing session. Thus all programming played on that channel before the button is pushed off is counted as "viewed" by that family member, although he or she may have wandered off or begun a different activity. The Arbitron company uses a device called the Portable People Meter, which can detect codes that are embedded in video and audio programming and thus record the viewing and listening patterns of the people carrying them. Both these methods produce the same kind of data that a media diary yields; that is, they do not provide information about the context in which the media use occurs or its relation to other activities in which the participant engages.

Having called attention to the limitations of each of these methods of measuring the quantity of media consumption, Vandewater raised the question of how much precision is really needed to answer important questions about media exposure. The reliability and validity of these measures vary. Diary estimates, for example, are highly correlated with observational measures (.80 to .85), whereas global time estimates show only moderate correlation with observational data (.20) or diary data (.40). However, despite the variation, the big picture result from all of these sources is that the average level of television viewing for adolescents is 2.5 to 3 hours per day. This figure may be sufficiently precise for many purposes, while a much greater degree of detail may be needed for predictive research, or for exploring error variance. What is of greater concern is the introduction of imprecise measures as an independent variable in another study, such as the effect of parenting restrictions on media habits. In such cases, low reliability of the media measures can bias the estimate of the main effect.

Dimitri Christakis commented that no more studies demonstrating how much TV children watch are needed. Instead, he argued, the focus should be on studies that

illuminate how and what they watch and that suggest opportunities to improve viewing and other media habits.

A related question for Vandewater is what, precisely, is meant by a "user" of a given type of media—and this question is critical to the validity of a measurement. The influence a given media stimulus may have is clearly dependent on the degree of attention the user is paying to it and the context in which it is being used, which are more difficult to measure than the amount of time a device is in use, for example.

MEASURING EXPOSURE TO CONTENT

The content of media exposure may be at least as important as the quantity of exposure, but existing research methods lack precision in measuring or capturing important dimensions of content, and many measures have serious validity problems. Moreover, they do not capture incidental messages, such as those contained in advertisements, movie trailers, or product placements, Vandewater explained.

Asking viewers is the most direct way to determine at least the general nature of what is being consumed. Children might be asked to list their favorite shows or to include the names of the programs they watch in diaries or other records of their viewing. Coding the content of television programs or video games is also possible, although current coding schemes have yielded only general programming information in designated categories, such as educational (e.g., children's programming on public broadcasting), drama, comedy, etc. Some efforts have been made to code the content and to capture more specificity of sample episodes of popular children's programs. This method allows for greater precision, but it does not readily allow researchers to connect particular viewing experiences to particular children, which would be necessary to examine possible effects.

Sandra Calvert described some work she has done on coding content on the Internet using categories similar to those used to code television programming (Calvert, Alvy, and Strong, 2006). However, site content, links, and advertising change frequently on the Internet; moreover, each of the links on an Internet site can be considered an independent part of the site and thus needs to be sampled and scored as well. As a result, the results are not stable. Other participants mentioned recent efforts to analyze the content of computer games and to describe the ways in which users interact with them. Participants agreed that, given the increasing time children and adolescents spend on these activities, more information and consistent classification codes are necessary for describing the content of and modes of interaction with different sources of electronic and interactive media technologies.

MEASURING DEVELOPMENTAL EFFECTS ON YOUNG CHILDREN

In addition to the public health effects of media as described in Chapter 2, the meeting participants discussed research on the potential effects of media exposure on very young children, who are the fastest growing segment of media audiences. Dimitri Christakis and Judy DeLoache provided close looks at significant potential risks and benefits of media exposure to babies and young children. Christakis began with the observation that young children have only recently become heavy consumers of media

and that, consequently, comparatively little research has been done on effects for this age group (Christakis, 2006; Zimmerman and Christakis, 2005). Yet the developmental significance of the first three years of life has been well documented (National Research Council and Institute of Medicine, 2000), and exposure during these years has been increasing dramatically. Moreover, because young children are still sleeping 12 or more hours a day, even a modest amount of exposure can occupy a significant percentage of their waking hours. Television exposure in the early years is also highly predictive of later viewing patterns—and once established, viewing patterns are very difficult to change.

Christakis's research has shown that children under age 3 watch television an average of 2.2 hours per day, and that 3- to 5-year-olds watch 3.3 hours per day. Yet each hour of daily viewing by children in this age group is associated with measurable detriments to their cognitive development. Benefits have been identified as well, although because much of the research is somewhat dated, it does not reflect changes in viewing patterns, such as the increase in the number of minutes of commercial time per hour, increases in sexual and violent content, and the increasing likelihood that children will watch alone. Television programming and media or screen-based electronic products for very young children are an increasing business—although, as Christakis noted, their quality and content vary. Christakis argued that media exposure is one of the most profound influences on children in the United States and that it intersects with many public health concerns: violence, obesity, tobacco and alcohol use, and risky sexual behaviors. The public health question for him is to find ways to mediate the influences of this exposure on young children, to optimize their exposure in terms of time spent, age of exposure, and content—rather than hoping to eliminate it. Other participants called attention to the importance of social context in heightening or diminishing certain types of media exposures.

DeLoache raised questions about media influences on the development of very young children in terms of the perspective that all media, because they are symbolic representations of some kind, offer more cognitive complexity than does direct experience. Thus, media experiences may have profound impacts on very young children because they do not bring to these experiences the same context and background understanding of basic properties of reality (such as solidity, continuity, and support) that adults and older children have. Her research has focused on five questions about media and early development. Her answer to the first, whether infants can learn from media, is yes. The remaining questions—what and how well they can learn, and what the benefits and risks might be--follow from that conclusion. Her research suggests that certain developmental pathways offer potential risks that could present challenges and opportunities for parental, policy, and practice interventions.

DeLoache observed that the key developmental risks for infants and very young children of exposure to media are (1) *interference* with the acquisition of crucial developmental skills—time spent with media is time taken from such activities as motor skill development and learning through playing with objects; (2) *deprivation of social interaction*—time spent viewing media would decrease infants' opportunity for crucial social interaction with other people; and (3) *interference with learning about reality*—because infants can be confused about the basic nature of media, substantial media viewing could interfere with learning fundamental facts about the nature of reality (e.g.,

the fact that objects cannot pass through other objects or disappear into thin air). A fourth risk, which may not rise to the level of a public health concern, is that products purporting to educate infants may not only waste parents' time and money, but also the existence and advertising of such products may generate unrealistic concerns and goals with respect to their infants' development.

These analyses of media effects on very young children involve both studies of longitudinal data as well as experimental observations. Christakis described research studies in which he and his colleagues used data from the National Longitudinal Survey of Youth 1979 to investigate the effects of frequent television viewing on cognitive development. Measures of cognitive development in children at ages 6 and 7 were regressed on television viewing at younger ages. The conclusion was that modest adverse effects can result from viewing at young ages, when potential confounding variables, such as parental characteristics, were controlled. In contrast, other participants observed that certain educational programs for young children are associated with improvements in their cognitive developments. These differences suggest that media influences may differ by developmental stage as well as across social and cultural groups.

DeLoache described experimental research that has explored the effects of symbolic representations and media exposure on the development of very young children, noting that the potential for both beneficial learning and harm needs to be further investigated (DeLoache, Pirroutsakos, and Uttal, 2003; DeLoache, 2005). The experimental research she described was mainly based on the premise that the best way to determine what infants and toddlers can learn or be taught is to try to teach them, for example, to imitate a series of actions or problem-solving exercises. In addition, simple observations of the length of time that infants look at particular displays can be used to assess what kinds of visual stimuli they prefer. Such research can help identify what kinds of media might have beneficial effects on infant learning and development.

Participants were intrigued with the research on young children, but many commented on how much remains to be understood. Socioeconomic differences and many other contextual factors, for example, have not been thoroughly investigated. At the same time, the mechanisms by which many influences—from early literacy experiences, to family placement, to the nature of their media exposure—affect children are also not yet fully understood. Such mechanisms may include the content or exposure of certain forms of media, the social context and relationships surrounding the child's experience with different types of media, and the displacement effects of media on other behaviors and exposures.

Chapter 4
Methodological Questions, Challenges, and Opportunities

The overview of current research methods generated a variety of ideas about ongoing challenges in media research, at both a practical and a theoretical level. To start, participants pointed out, at a time when new forms of media are proliferating, the field lacks operational definitions both of what constitutes a medium of interest from a public health perspective and of what counts as media exposure. Current distinctions among media are platform-based; that is, they are based on the kind of technology that determines the way they operate. Yet the rapid arrival of new technologies is blurring the uses of electronic devices, now that computers and handheld devices can be used for activities traditionally available only with a television or radio, and so on. Electronic toys and other new gadgets are likely to further complicate the question until the field can develop a functional, comprehensive definition.

The definition of media use is complicated by the fact that different media require different kinds of processing and yield different kinds of interactions. For example, the nature of a child's experience with ambient media (such as music, which may be prevalent in multiple settings) may be substantially different from the experience with media that is confined to certain times of the day or certain locations. Questions of attention, of what else is taking place in the vicinity of the media user, and of new roles that media experiences may play in people's lives are not generally taken into account conceptually or methodologically, yet they may be critical to understanding how this powerful influence really affects people.

On a practical level, the field lacks baseline information about some of the fundamental processes of concern in this kind of research, Anderson and others noted. Such processes may include information retrieval patterns, attention, memory, pattern recognition, and the ways in which children interpret narratives. To understand the ways in which users interact with media, for example, it would be useful to have a clear taxonomy of the technical design features used in many media, such as cuts, zooms, screen sizes, and the like. Similarly, existing descriptive research about eye-tracking patterns and other physiological processes as they relate to media exposure is not sufficient. For example, Anderson noted, thousands of EEG (electroencephalogram) and ERP studies have been done in other clinical and psychological studies, but their potential for improving understanding of media effects has not been fully explored. A far more detailed understanding of how the brain responds to media stimuli, as well as how cognition and behavior are affected in turn, would be possible if a stronger taxonomy to classify media technologies based on their design features was available.

Concerns such as these are linked to broader issues and to research questions in related fields. In order to understand how media exposure might affect children's attention spans, for example, one must begin with a theory of how certain internal

processes and ecological interactions contribute to the development of attention. Without that understanding, it is difficult to identify the effects of rapid scene changes or other specific aspects of media exposure on natural or unusual developmental processes. This kind of investigation is truly interdisciplinary, Anderson pointed out. The lack of a disciplinary "home" for this type of research has contributed to its marginal status in many research centers and the lack of systematic training and the development of rigorous theoretical frameworks, causing its importance to be often overlooked.

A number of participants stressed the point that, although available research methods may be unsatisfying in some respects, existing methods and levels of precision are sufficient to begin to address important questions. For example, differences in the exposure of socioeconomic subgroups to various media—and possible differences in the resulting effects on groups—can be identified using large-scale surveillance studies. The degree of accuracy typical of current studies would be sufficient for exploring potentially significant differences in the overall media diets of different groups, but relatively little has been done in this area.

AN ECOLOGICAL APPROACH TO THE STUDY OF YOUTH AND THE MEDIA

Susan McHale brought the perspective of a researcher in human development and family studies to bear on the analysis of media influences on developmental processes and family interactions. She began with a reference to the theory of the ecology of children's development, a model developed by Uri Bronfenbrenner in the late 1970s. In this "onion" model, the child is seen as nested within successively more distal layers of environmental influences, the impact of each of which is mediated by the impact of the others. In this model, media are placed in the outermost layer, along with cultural attitudes and values, influencing children from some distance. In Bronfenbrenner's view, each of these influences can affect a child's interactions, and the focus of attention should be "molar activities"—those the child chooses in a particular setting and that therefore reflect his or her predilections, opportunities, and constraints.

The ecological approach calls attention to who is participating in an activity, how it is carried out, and why it is undertaken. With regard to television viewing, for example, the important questions are, Who turns on the TV in this kind of family? Who decides what will be watched? What kinds of conversations accompany TV viewing? An ecological perspective is not a theory but a perspective from which processes—or they might be termed mechanisms or mediators—work. Much of the research on children's time use has focused on links between activities and outcomes, but this approach does not directly address the ways in which selected activities produce outcomes. Using an ecological approach, a researcher would dig much deeper into the patterns of social interactions and relationships that influence development. For example, if a family watches television during dinner time, the nature and form of exposure may be affected by the conversation among family members. Conversely, the timing or setting of the dinner event itself may be affected by certain media features or programs.

Daily activities, such as media consumption, are viewed as both the causes and consequences of development. The focus is on the social and psychological processes that link the activities to development and on identifying discrete interactions in these processes that may be influenced by variations in the characteristics that children,

adolescents, or families bring to the activities or the contexts in which they live. By improving understanding of the mediating processes that link activities (media consumption) to outcomes of interest, researchers can assess the strength of hypotheses about the causes of particular outcomes.

Chapter 5
Perspectives from Other Kinds of Epidemiological Research

The field of media research is relatively young and its methods and contributions are not widely understood or appreciated beyond its borders. Social epidemiologist Michael Oakes brought the perspective of an outsider to an analysis of the extant research on the effects of media consumption on children (Oakes, 2006). The discussion began with Mark Becker's point that the prevailing research model for media studies has been based on research methods typical of psychology. He suggested that other statistical or epidemiological models may be more effective for some types of media research analyses—most especially for developing the kinds of causal links that are needed to support policy and public health measures that could influence behavior and improve outcomes for children.

The focus of Oakes's presentation was to compare the research designs, standard measures, and modeling frameworks used in media research with those used in other social epidemiology and prevention studies. He began by stressing the high quality of much of the media research he has reviewed. He was favorably impressed by the volume of compelling studies and reiterated the point that the evidence for links between exposure to violence in the media and aggression is as strong as that for links between cigarette smoking and lung cancer. From his perspective, the measures of media exposure are effective and are likely to improve, although he recommended an intensified focus on the coming challenges of new technologies and changing ways of interacting with media, as well as marketing innovations.

Several gaps in the research base were evident as well. One notable lack was in what Oakes called the study of effect modification by social subgroup. In this category he included examination of media effects by social subgroup and by other social-environmental contexts besides race and class, as well as efforts to investigate the effects of social interactions on individual and group outcomes. While differences between boys and girls and across age categories are frequently explored, unexamined differences related to wealth, region of the country, and other factors related to socialization may have profound influences on how children are affected by media. Other contextual effects insufficiently addressed in media literature include school settings, neighborhoods, family structures, and social and cultural interactions; all these factors may have important influences on the way children process media exposure and may in turn be influenced by media themselves. Other types of social subgroups may be categorized by the preferences of children and youth for certain types of media content or technology (including design features as well as technical source). Significant differences may reside in how light or heavy media users respond to certain program themes or stimuli.

Traditional regression models make it difficult to isolate selected contextual effects, Oakes explained, since media exposure is frequently pervasive. This challenge is similar to studying the effects of smog or water quality on different populations; the level

of exposure cannot be determined with precision. Multilevel regression models are increasingly being used in epidemiology and public health studies to examine contextual influences in a variety of areas. He used John Snow's discovery that removing the handle of a pump reduced the incidence of cholera in the neighborhood (by limiting access to tainted water) to emphasize the importance of exploring all potential factors. This finding led to efforts to disentangle more proximal causes for disease—which in turn led to the breakthrough discovery of germ theory and the effects of bacteria in sewage.

Oakes also found little innovation in media research methodologies in their approaches to inferring cause in observational studies. The axiom that correlation does not imply cause remains true, but the potential of surveys and correlational studies to illuminate cause, even in the absence of an explanatory theory or mechanism, is dismissed too readily, he argued. Other research fields are making significant strides in finding innovative ways to infer causation. Counterfactual causality, originally identified by philosopher David Hume as the "but for" condition—the case in which situation *x* would not be true but for intervention *y*—has been used in contemporary research to account for alternate outcomes that result from differing exposure to particular influences. This line of analysis compares scenarios in which two conditions with similar features produce very different outcomes as a result of the presence or absence of intervening factors.

This model helps to compensate for the basic challenge of causal inferences—that it is never possible to observe the exposure of one individual to two different sets of influences in the same period of time. A substitute for the unobservable condition—the individual exposed to influences other than those to which he or she was in fact exposed—must be found. Bias creeps in when the substitutes are not good controls because they are not sufficiently similar to the research subjects. Randomized groups of sufficient size provide one means of ensuring that the control group is similar to the targeted group, but in observational studies, in which no intervention is done, there is no opportunity for randomization.

To approximate the benefits of randomization when it is not possible, a variety of new statistical techniques can be used to analyze the data from observational studies to identify causal relationships. One such method, developed by Rosenbaum and Rubin (1983), is called propensity score analysis. This approach begins by developing a statistical model to predict exposure independent of the outcome in question. In a study of the impact of exposure to media on children's diets, for example, logistic regression could be used to estimate the probability—called the propensity score—that a child is exposed to food advertising on TV as a function of parental monitoring and other factors. The probability of exposure, known as the propensity score, is then used as a control variable in an analysis of the relationship between diet and food advertising. Under certain assumptions, it has been shown that the relationship between the outcome (diet) and exposure (advertising) that can still be observed after controlling for other factors using the propensity score can be attributed to food advertising. Like any other statistical method, however, the validity of the inference depends on the assumptions, and propensity score analysis results can be biased if the assumptions are not correct (Rubin, 1997).

Oakes stressed that propensity score analysis is a relatively new approach that may be particularly well suited to the kinds of questions that media researchers tackle.

Not only epidemiologists, but also economists, political scientists, and other researchers who are especially concerned with public policy, have been struggling to find new ways to make inferences about people's behaviors and the choices they make. Instrumental variable analysis—another method of accounting for the unmeasured confounding variable used in econometrics—might also have an application in media research. Another approach is group randomized trials, in which the effects of policies are assessed using random samples of families, schools, neighborhoods, and even towns.

Oakes noted that longitudinal research designs, although they are the prototype for epidemiological research, may not be as helpful in media studies as other approaches. Longitudinal designs, he explained, are very useful for identifying random, unintentional exposures or the natural occurrence and progression of a disease. But when individual choices affect outcomes, the background characteristics and preferences that influence those choices are too difficult to disentangle. Moreover, factors that change over time, such as the nature of media technology or content, and the cumulative effects of ongoing exposure, have changing effects on outcomes, which can affect the findings in a longitudinal study.

The general challenge underlying most epidemiological research, and media research in particular, is that research subjects are not Robinson Crusoe, affected only by the conditions on a small island. Individuals respond to certain stimuli on the basis of their prior experiences as well as current conditions, and they are affected as well by the presence or absence of others. Individuals' choices and experiences are dependent on an infinite number of choices that others have made, as well as infinite other ways in which they are influenced by the individuals and groups that surround them. The more basic question is the perennial one about how social environment influences biological, psychological, and social processes, and vice versa.

Thus, Oakes argued, the most valuable approach may be to use field experiments to investigate the potential impact of interventions. While models that posit causality are needed to support the choices of interventions to evaluate, conclusively resolving the relative contributions of individual versus social factors (nature versus nurture arguments) may not be necessary to achieve public health objectives.

Chapter 6
Where Next?

In her comments, Wartella observed that new researchers are increasingly drawn to study media and their potential effects, and this new generation has brought different perspectives about how to measure, what to measure, and how studies should be designed. The preponderance of existing media research has focused on television viewing, but the research models developed for that purpose may have limited value in studying new, very different kinds of media—and different kinds of questions about their effects. The field is in need, she explained, of some consensus and guidelines about methods and standards of evidence, particularly because of the intense public interest in and press coverage of findings about media exposure. In the current budgetary climate, funding for large-scale research studies on children and media is uncertain, although bills have been proposed to foster studies in this area. In the interim, researchers in this field will need to proceed without extensive public support to develop consensus about research agendas, methods, and designs.

KEY THEMES

Several key themes emerged in the discussions that provided a basis for formulating areas of future interest and attention.

First, current media studies focus predominantly on process measures (exposure, content, and other media features). Although these dimensions are important, the field lacks a deeper understanding of the underlying biological, cognitive, and developmental mechanisms that may affect the experience with the timing, duration, or content of media influences. Limited opportunities exist for media researchers to interact with colleagues from these other fields, and few research studies have emerged that build from truly interdisciplinary work.

Second, linking the study of process measures with theory-driven research will require more attention to experimental and longitudinal research designs. If current measures of media exposure and content are "close enough" to achieve reliability and consistency across study designs, researchers can turn their attention to other, more important questions that can deepen understanding of important social phenomena.

Third, emerging theory and interdisciplinary research designs also need to address the increasing proliferation and complexity of highly versatile media technology. Measures that were initially developed for studies of television viewing must be adapted to capture the new features of cable television, TiVo, iPods, and other digital technologies that emphasize the power of choice, selection, and customizing media preferences.

Fourth, although most media research with children focuses on school-age and adolescent populations, a virtual explosion of media exposure has occurred among very young children. The ubiquity of media exposure and the rapid pace of developmental

changes in infants and toddlers introduce new complexities in understanding the pathways by which media influences may interact with developmental stages.

Fifth, new research designs are emerging that make it possible to infer causal relationships from nonexperimental data. Methods drawn from social epidemiology and environmental studies offer a unique opportunity to strengthen the quality and rigor of current and future media research designs. These methods are especially valuable in examining conditions in which it is not possible to isolate certain media exposures or to establish control conditions because of the pervasiveness of the media environment.

SUGGESTED RESEARCH TOPICS

In the course of the discussions, a number of participants offered suggestions for specific research topics that deserve further exploration, including:

- how children and adolescents watch television and how viewing habits can be improved;
- the potential benefits of media consumption;
- interventions that might dilute negative effects or promote positive ones;
- how family contexts influence the impact of media exposure on children's health outcomes;
- how people choose media experiences;
- documentation of what aspects of contemporary media have negative or positive effects on development, at what ages they have those effects, and what individual or familial characteristics affect risk or opportunity for benefit;
- whether appropriate use of educational video games increases language acquisition and reading in preschool children; and
- whether modeling appropriate eating and sexual practices reduces obesity and risky sexual behaviors.

This brief sampling of the kinds of issues researchers want to explore suggests that the field has much work to do, but several larger themes emerged as well. First, many participants noted that a greater degree of interdisciplinary cooperation, as is common in research on diet and nutrition, would be very useful in media research. Communications, economics, neuroscience, pediatrics, psychology, psychiatry, sociology, all have valuable contributions to make, but not all have been as involved in media research as they could be. Several participants pointed out structural problems, such as lack of funding and a dearth of younger researchers, that have limited both this kind of cooperation and the growth of the field.

Others focused on methodological challenges, such as the kinds of validation studies that are needed and the question of the degree of precision that is needed in measuring exposure. For Vandewater, for example, priorities in the field should be nationally representative samples, longitudinal designs, samples incorporating very young children, the inclusion of family context and interaction measures, a focus on program and game content, and the inclusion of appropriate covariates.

Others focused on practical concerns. For them, ways to influence two key targets—parents and producers of media—should be the guiding goal of media research.

There is a need to incorporate this nearly universal activity into what is already known about children's development. The isolation of media research studies from other fields could be addressed if better links to basic developmental, psychological, or social processes could be established. This would make it easier to offer credible and effective guidance and tools to parents, policy makers, and those who control media content.

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APPENDIX
Workshop Agenda and Participants

AGENDA

Workshop on Media Research Methods and Measures
March 2-3, 2006
National Academy of Sciences Building
Washington, DC

Thursday, March 2

Welcoming remarks and introductions

Aletha Huston, University of Texas
Vicky Rideout, Henry J. Kaiser Family Foundation
Rosemary Chalk, Board on Children, Youth, and Families

Participant Introductions

Session 1: Why Should We Care About Media Research Measures?

Moderator
Aletha Huston

Presenters
Ellen Wartella, University of California at Riverside
Dan Anderson, University of Massachusetts, Amherst

General Discussion

Friday, March 3

Session 2: Assessing the Current Landscape of Media Research Measures

Moderator
Aletha Huston

Presenter
Elizabeth Vanderwater, University of Texas

General discussion

Session 3: Research Design and Measurement Issues: Lessons Learned in Other Fields

Moderator
Mark Becker, University of South Carolina

Presenter
Michael Oakes, University of Minnesota

General discussion

Session 4: The Role of Theory in Explaining Relationships Among Media Exposure and Selected Outcomes

Moderator
Victor Strasburger, University of New Mexico

Presenters
Dimitri Christakis, University of Washington
Judy DeLoache, University of Virginia
Susan McHale, Pennsylvania State University

General Discussion

Session 5: Next Steps and Future Directions

Moderator
Aletha Huston

General Discussion

PARTICIPANTS

Daniel R. Anderson,* Professor, Department of Psychology, University of Massachusetts, Amherst
Mark P. Becker,* Executive Vice President for Academic Affairs and Provost, University of South Carolina, Columbia
Martina Bebin, Robert Wood Johnson Health Policy Fellow, Senate HELP Committee
Jane D. Brown, James L Knight Professor, Department of Journalism and Mass Communication, University of North Carolina, Chapel Hill
Natasha J. Cabrera,* Professor, Department of Human Development, University of Maryland, College Park
Sandra L. Calvert, Professor, Department of Psychology, Georgetown University
Rosemary Chalk, Director, Board on Children, Youth, and Families, The National Academies
Dimitri Christakis, Director, Child Health Institute, University of Washington, Seattle
Judy S. DeLoache,* Professor, Department of Psychology, University of Virginia
Niki Denmark, Department of Human Development, University of Maryland, College Park
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Melissa Ghera, Department of Human Development, University of Maryland, College Park
Lisa Guernsey, Independent Journalist, Alexandria, VA
Christine Hartel, Director, Center for Studies of Behavior and Development, The National Academies, Washington, DC
Lynne Haverkos, National Institute of Child Health and Human Development, Bethesda, MD
James C Hersey, Senior Research Psychologist, Research Triangle Institute, Washington, DC
Sandra L. Hofferth,* Professor, Department of Family Studies, University of Maryland, College Park
Aletha C. Huston,* Associate Director, Center for Population Research, University of Texas, Austin
Sheppard G. Kellam, Senior Research Fellow and Director, Center for Integrating Education and Prevention Research in Schools, American Institutes for Research, Baltimore, MD
Woodie Kessel, Senior Child Health Science Advisor, Office of Disease Prevention and Health Promotion, Washington, DC
Jennifer Kotler, Director, Education & Research, Sesame Workshop, New York
Deborah Linebarger, Annenberg School of Communication, University of Pennsylvania
Valeria O. Lovelace, Media Transformations, Teaneck, NJ

Susan M. McHale,* Professor, Human Development and Family Studies, Pennsylvania State University
Jeff J. McIntyre, Senior Legislative and Federal Affairs Officer, Public Policy Office, American Psychological Association, Washington, DC
Patricia L. Morison, Associate Executive Director, Division of Behavioral and Social Sciences and Education, The National Academies, Washington, DC
Gail M. Mulligan, National Center for Education Statistics, Washington, DC
Michael Oakes, Assistant Professor, Division of Epidemiology, University of Minnesota, Minneapolis
Deborah A. Phillips, Professor and Chair, Department of Psychology, Georgetown University
Vicky Rideout, Vice President, Henry J. Kaiser Family Foundation, Menlo Park, CA
Michael Robb, Department of Psychology, University of California, Riverside
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*Members of the program committee