TOXIC? THE NATURE AND EFFECTS OF MOTHERS' EXPOSURE TO

PEDIATRIC ENVIRONMENTAL HEALTH INFORMATION IN THE MEDIA

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ABSTRACT

TOXIC? THE NATURE AND EFFECTS OF MOTHERS' EXPOSURE TO PEDIATRIC ENVIRONMENTAL HEALTH INFORMATION IN THE MEDIA

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Protecting children from environmental threats like lead poisoning and pesticides is becoming a greater public health priority. Research dedicated to prenatal and pediatric environmental health (PPEH) coupled with the green movement and increasingly intensive parenting has created a new, dynamic environment in which information can play a critical role in determining protective behaviors. New and expecting mothers particularly vulnerable to toxic chemicals in the environment are exposed to health information from a variety of sources, including the mass media. Despite several decades of environmental and health communication research, the nature and effects of environmental health information available to mothers have received limited research attention.

This dissertation launches a new exploration into environmental health communication by asking three overarching research questions: (1) how prevalent is PPEH information in the media, (2) is mothers' exposure to such information linked to key outcomes – namely, protective behaviors, behavioral intentions, knowledge, descriptive norms, and perceived threat, and (3) are the effects of such exposure contingent on the relative volume of media coverage PPEH topics receive? To address these questions, four studies were conducted. Study 1, an elicitation survey, determines where mothers routinely come across, or *scan*, PPEH information and how they conceptualize toxic threats. Study 2, a content analysis of popular media sources (i.e., the Associated Press (AP), parenting magazines, and parenting websites), focuses on the first research question. Study 3, a cross-sectional survey, addresses the second question, while Study 4 combines data from Studies 2 and 3 to address the third. While Studies 1 and 2 examine multiple PPEH issues, the latter two studies focus in on three chemical toxins: arsenic, bisphenol A (BPA), and pesticides.

Results show that PPEH information is prevalent on parenting websites and exists to a lesser extent in AP stories and parenting magazines. Perhaps more importantly, there is evidence that mothers scan this information and that scanning is associated with certain positive outcomes. The observed differences between the effects of media scanning at different levels of coverage volume were in a direction not entirely consistent with study hypotheses. Implications of these findings for communication research and practice are discussed.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Health experts contend that American children are currently facing a "new pediatric morbidity" (Landrigan et al., 1998). Patterns of childhood illness have shifted dramatically in the past century, away from infectious diseases like poliomyelitis, dysentery, and tuberculosis toward a new class of chronic and disabling conditions. Rates of childhood asthma, leukemia, brain cancer, attention deficit hyperactivity disorder, and neurodevelopmental dysfunction have increased in recent decades, and the potential influence of environmental toxicants has attracted considerable attention.

The sequence of life stages from conception through fetal development, infancy, and adolescence, known as childhood, is a critical window during the human lifespan of vulnerability to environmental toxins. Epidemiologic studies suggest a causal relationship between childhood exposure to environmental toxins and a variety of negative health consequences on the fetus, infant, and child, including preterm birth, sudden infant death syndrome (SIDS), asthma, cognitive deficits, and cancer (Wigle et al., 2008). As many as 2 in 3 cases of cancer are estimated to be linked to some type of environmental factor, including tobacco smoke and toxic substances in the air, water, and soil (Kerrigan & Kelly, 2010).

What makes children particularly vulnerable to these hazards? When it comes to environmental exposures, "children are not little adults" (Freeman, 2007, p. 316). First, babies and children live in different environments than adults. They spend a majority of their time in one location (e.g., the nursery) and breathe air at levels closer to the floor where chemicals and particles heavier than air tend to concentrate. Second, babies and children have smaller bodies. They consume more oxygen and thus more air pollutants than adults when adjusting for body mass. They also consume more food per pound of body weight than adults and thus may ingest larger concentrations of water- and food-borne toxicants like pesticides. Because they have a larger ratio of surface area to body mass, children also tend to absorb more environmental toxins through their skin, pound for pound, than adults. Finally, cognitive and behavioral differences put babies at greater risk of exposure. For instance, developing children pass through a stage of intense oral exploratory behavior. In other words, they put everything in their mouths. Because they are in the process of acquiring knowledge about risks in their environments – often through trial and error – preventive and protective interventions are left in the hands of policymakers, manufacturers, and parents.

As modern industrial society advances, there is a growing sense of public *chemophobia*, or general fear of presumably toxic substances in the environment. Humans have always been "intuitive toxicologists" (Kraus, Malmfors, & Slovic, 2000). Call it maternal instinct, but some mothers even sense the potential danger associated with prenatal and pediatric exposures to chemicals:

> "For most of my life, I hardly considered which pesticides were in my food, or what those pesticides might be doing to the planet (never mind the field workers who essentially bathe in them)... Once my son, Harry, was born, my whole worldview shifted. Looking at his tiny, 6-pound body, watching him struggle to latch on and be nourished by my breast milk, it was suddenly obvious how important it was to think about what I was eating—and later, what he was. Maybe my body can handle the relatively small amounts of pesticide residue allowed by law in our food, but can his? And what are those chemicals doing to the world I'm leaving him?"
>
> - Debbie Koenig, Parents.com (November 25, 2012)

The central problem is that these new environmental risks to human health are not so readily perceptible (Beck, 1992), meaning we often cannot see, smell, taste, or in any physiological way detect their presence. Instead, we rely on policymakers and manufacturers to properly regulate and mitigate public health threats. During the 2012 presidential election, *Parents Magazine* surveyed mothers to find out which issues they cared about most and expected the candidates to address. Among the top five responses, “moms wanted a president who [could] protect families from environmental hazards” (Mahoney, 2012, p. 140).

Tens of thousands of industrial chemicals are available for use today in the United States, but the E.P.A. has only mandated safety testing for a small percentage. So, while causal evidence is strong in some cases (i.e., tobacco smoke), the link between fetal and childhood exposure to a number of toxins and adverse health consequences is largely understudied (Wigle et al., 2008). To address these gaps, the U.S. public health agenda has started to prioritize prenatal and pediatric environmental health (American Academy of Pediatrics Council on Environmental Health, 2012; Trasande & Liu, 2011). In 1997, President Clinton issued an executive order entitled “Protection of Children from Environmental Health Risks and Safety Risks” to direct all federal agencies to identify, assess, and address these risks (Executive Order No. 13045, 1997). Later in 2000, Congress authorized the planning and implementation of the National Children’s Study, the largest long-term research study of the effects of environmental influences on children’s health and development ever conducted in the United States (Eunice Kennedy Shriver National Institute of Child Health & Human Development, 2012). Between 2000 and 2010, the study has received over $600 million in funds from the National Institutes of Health and a consortium of federal partners, including the Environmental Protection Agency (E.P.A.) and the Centers for Disease Control and Prevention (C.D.C.).

As part of this investment, the E.P.A.'s Toxicity and Exposure Assessment for Children's Health (TEACH) provides publicly available summaries of 20 "chemicals of concern," including arsenic, benzene, bisphenol A, and phthalates among others (Environmental Protection Agency, 2011). Of course, there are a number of additional chemicals in the environment that (may) pose a threat and are also continually monitored by scientists and federal agencies. These toxins include asbestos, carbon monoxide, diesel, and styrene to name a few (see Table 1.1 for a more comprehensive list).

Table 1.1 Environmental chemicals concerning for prenatal and pediatric health

E.P.A.'s TEACH Summaries	Additional Chemicals
2, 4-D (2,4-dichlorophenoxyacetic acid); arsenic; atrazine (2-chloro-4-(ethylamino)-6-(isopropylamino)-s-triazine); benzene; BaP (benzo(a)pyrene); BPA (bisphenol A); dichlorvos or DDVP (2,2-dichlorovinyl dimethyl phosphate); formaldehyde; lead[a]; manganese; DEET (N,N-diethyl-meta-toluamide); mercury (elemental & inorganic, methylmercury, ethylmercury); nitrates/nitrites; permethrin/resmethrin (pyrethroids); phthalates; PCBs (polychlorinated biphenyls); PBDEs (polybrominated diphenyl ethers); TCE (trichloroethylene); PVC (polyvinyl chloride)	1,4 dioxane; asbestos; aluminum (aluminium); ammonia (azane); BPS (bisphenol S); cadmium; carbon monoxide; chlorine; chromium (trivalent (III); hexavalent (IV)); DDE (dichlorodiphenyl-dichloroethylene); DDT (dichloro-diphenyltrichloroethane); diesel; dioxin; EtO (ethylene oxide); nitrogen oxide; ozone; parabens; PAHs (polycyclic aromatic hydrocarbons); perchlorates; PCDFs (polychlorinated dibenzofurans); PFCs (polyfluoroalkyl chemicals); (poly)styrene; sulfur dioxide; toluene (toluol)

Note. Common umbrella terms for these hazards include toxins, toxic chemicals, household chemicals, environmental hazards, particulate matter, air pollution, water contaminants/pollutants, carcinogens, home health, volatile organic compounds (VOCs), genetically modified organisms (GMOs), pesticides, herbicides, insecticides, rodenticides, flame retardants, and heavy metals.
[a] The E.P.A. emphasizes lead as a health hazard to children and highlights it separately from the TEACH Summaries.

When our innate senses and regulation fall short, we are forced to rely on external sources of information – particularly the mass media – to increase our awareness of toxic environmental threats, to formulate risk perceptions, and to guide our protective behaviors (Adam, Allan, & Carter, 1999). For some time, the media have been a primary source of risk information (Slovic, 1987). Even more, a steady stream of evidence from new scientific studies resulting from increased investment in this field will likely populate the public information environment, making pediatric environmental health a growing and important area of focus for communication researchers. So, what role does the media play in the lives of new parents today? Is mass media "toxic" – either in its content or in its effects?

Given the rise in intensive mothering and the ability of certain media to reflect and even shape cultural shifts in parenting across generations (Hays, 1996; Quirke, 2006), it seems likely that news coverage of unsafe products and emerging scientific evidence is, in part, driving new parents to take even greater precautions with young children. Among some observed changes, a survey conducted by Babycenter.com – a popular parenting website – reported that more than half of mothers resolved to purchase more nutritious foods in 2013 (i.e., containing less high fructose corn syrup and artificial dyes). This was particularly true among moms ages 30 or younger (Sauerwein, 2013). Another recent trend in household chemical purging during pregnancy further suggests that parents are aware of environmental health issues and adjusting their behavior accordingly (Dell'Antonia, 2012).

Despite several decades of environmental and health communication research, the nature and effects of environmental health information available to mothers, to my knowledge, have received very little research attention. Most research on the effects of exposure to health news coverage has focused broadly on cancer prevention (e.g., Hornik, Parvanta, Mello, Freres, & Schwartz, in press; Slater, Hayes, Reineke, Long & Bettinghaus, 2009; Stryker, Moriarty, & Jensen, 2008), on a single toxic threat to society as a whole (e.g., bisphenol A; P. R. Brewer & Ley, 2011), or more narrowly on a single parent behavior (e.g., breastfeeding; Foss & Southwell, 2006). In fact, environmental health in general has been relatively overlooked by health promotion research and practice (Howze, Baldwin, & Kegler, 2004).

The central goal of this dissertation is to begin bridging the divide between environmental health and communication. This dissertation launches a new exploration into environmental health communication by asking three overarching research questions: (1) how prevalent is PPEH information in the media, (2) is mothers' exposure to such information linked to key outcomes – namely, protective behaviors, behavioral intentions, knowledge, descriptive norms, and perceived threat, and (3) are the effects of such exposure contingent on the relative volume of media coverage PPEH topics receive?

To address these questions, four studies were conducted. Because of the relative lack of environmental health communication research, particularly examining mothers' media exposure to PPEH information, an elicitation survey was warranted prior to the development of any further dissertation studies. Study 1, an elicitation survey, determines where mothers routinely come across, or *scan*, PPEH information and how they conceptualize toxic threats. Study 2, a content analysis of popular media sources (i.e., the Associated Press (AP), parenting magazines, and parenting websites), focuses on the first research question. Results show that PPEH information is prevalent on parenting websites and exists to a lesser extent in AP stories and parenting magazines.

Study 3, a cross-sectional survey, addresses the second question and focuses on three chemical toxins: arsenic, bisphenol A (BPA), and pesticides. The study provides evidence that mothers scan this information and perhaps more importantly, that scanning is associated with positive outcomes, specifically protective behaviors, intentions, descriptive norms, and perceived threat. Finally, Study 4 combines data from Studies 2 and 3 to address the third question and strengthen causal claims. The observed differences between the effects of media scanning at different levels of coverage volume were in a direction not entirely consistent with study hypotheses. Possible explanations and implications of these findings are discussed. Collectively, the studies presented in this dissertation lay a strong foundation for future research on prenatal and pediatric environmental health information – an underexplored and increasingly important area of study.

CHAPTER ONE

Theoretical foundations for studying PPEH information in the media and its effects

Overview

In the first chapter of this dissertation, the state of research on environmental health and the media is reviewed, and existing evidence from a variety of content analyses regarding the characteristics of such coverage is presented. Mothers' exposure to and use of information in the media is also discussed. Finally, a theoretical case is made for why certain effects are likely given mothers' exposure to PPEH information in the media.

Environmental health and the media

The mass media play a central role in providing environmental health information to the general public (Adam et al., 1999; Slovic, 1987). In essence, the media "sets the stage for the public's response" to risks (McCluskey & Swinnen, 2011). Scientists, however, are critical of the media's ability to effectively inform and educate non-experts about such complex issues. A 2009 survey of more than 2,500 scientists conducted by the Pew Research Center for the People and the Press (2009), in conjunction with the American Association for the Advancement of Science, reported that roughly three-quarters (76%) of scientists believe the media's oversimplification of research findings is a major problem. In a separate study released the same year, toxicologists expressed related concerns over what they perceive to be the media's tendency to both overstate and present unbalanced explanations of chemical risks to the public (Statistical Assessment Service (STATS), 2009).

In the end, accusations and mere speculation about the nature and potential effects of media coverage are unhelpful. Expert perceptions of the media like these require further exploration and systematic analysis to expose actual tendencies and trends in coverage. A review of the literature reveals that, to date, there have been no comprehensive content analyses of media coverage focusing on pediatric environmental health. Most research in the domain of pediatric health has examined media depictions of either breast and formula feeding (e.g., Foss, 2010; Foss & Southwell, 2006; Frerichs, Andsager, Campo, Aquilino, & Stewart Dyer, 2006; Gage et al., 2013; Stang, Hoss, & Story, 2010), food advertising in parent magazines (e.g., Manganello, Clegg Smith, Sudakow, & Summers, 2012), or a single environmental health threat (e.g., lead poisoning; Bellows, 1998). Other content analytic research has been conducted related to the topical focus of this dissertation on news coverage of environmental health risks (e.g., Licther & Rothman, 1999) and environmental cancer, but focused more broadly on the general population (e.g., Jensen, Moriarty, Hurley, & Stryker, 2010).

To better organize and initiate a formal inquiry into the uncharted domain of PPEH, the following section provides an in-depth review of studies that examine the volume and topical focus of related media coverage, as well as how media content depicts attributions of responsibility and offers advice about what actions might be taken to mitigate environmental/health risks.

Volume and topical focus of media coverage

A journalist for *The New York Times* recently noted that "it seems surprising to read a newspaper column about chemical safety... It's not the kind of thing… the news media cover much" (Kristof, 2012). Unfortunately, communication research has yet to provide consistent evidence of the volume and topical focus of media coverage related to environmental health. Earlier findings suggest that the prevalence of news coverage linking the environment to cancer is relatively high. For example, between 1977 and 1980, Freimuth and colleagues (1984) demonstrated that environmental factors were the most frequently mentioned risk factor in newspaper coverage of cancer, with environmental carcinogens (e.g., pesticides) receiving three times more coverage than lifestyle causes of cancer (e.g., diet and exercise).

More recent work paints a different picture of the information environment. Although causes of cancer remain one of the more prominent topics in cancer-related news (Slater, Long, Bettinghaus, & Reineke, 2008), a later analysis by Jensen et al. (2010) comparing coverage in 2003 to Freimuth's earlier findings showed that lifestyle had become the most frequently mentioned risk factor, receiving twice the amount of coverage as environmental risk factors. Another study on issue dynamics in Swedish public television news (Djerf-Pierre, 2012) found that coverage of chemicals, such as biocides, toxic waste, hazardous chemicals, and metals, has declined over the past 50 years to 1% of total news coverage after peaking at 14% during the 1960s – the era of Rachel Carson and DDT.

Two additional content analyses focusing on how news media portray breast cancer (Atkin, Smith, Ferguson, & McFeters, 2008; Brown, Zavestoski, McCormick, Mandelbaum, & Luebke, 2001) partially support Jensen's results. Paying special attention to coverage of the risks of controllable environmental exposures (i.e., contaminants, hormone replacement therapy, second-hand smoke, pesticides) and preventive behavior (i.e., diet, exercise), they found very few news items addressed risks of exposure to contaminants (chemicals, pesticides, second-hand smoke) and even fewer stories made reference to avoiding environmental contaminants. However, Brown and colleagues (2001) did show that women's magazines, in particular, had a higher percentage of breast cancer articles referencing environmental factors, suggesting some differences in coverage volume across platforms.

One of the more extensive content analyses of environmental cancer risks conducted by Lichter and Rothman (1999) examined print and broadcast news stories from 1972 to 1992 considered to be 'most visible' (evening newscasts and front page stories from major national news outlets) and tells a slightly different story. Rather than a significant decline in the volume of chemical coverage over time, they observed discontinuities in the amount of environmental cancer news that reflected shifts in scientific research and policymaking. Though topics tended to shift along with volume, they found the media paid more attention to man-made chemicals (i.e., industrial solvents, chemical wastes, plastics manufacturing) than any other category of carcinogen. Food additives, pollution, pesticides, radiation and hormone treatments also received heavy coverage – significantly more coverage than diet, sunlight, and asbestos, which scientists regard as more severe cancer threats. These findings were partially supported by Major and Atwood (2004), who analyzed environmental news stories published between 1997 and 1998 in Pennsylvania daily newspapers. The authors cited the journalistic appeal of toxic chemicals and demonstrated how these topics receive more frequent coverage than forest fires, energy issues, and air pollution. While individual toxic chemicals may become the "carcinogen-of-the-week" (Russell, 1999), other chronic issues like air pollution, in general, tend to fall by the wayside in favor of less familiar hazards.

Attributions of responsibility and advice in the media

Environmental hazards may be regulated by policymakers, managed by industries and manufacturers, and/or mitigated at the individual level. It may be that the way the mass media cover hazard stories, and in particular to whom those stories attribute responsibility, will influence whether parents think they should act personally or demand policy changes from the political system to mitigate environmental health risks to children. What is known about attributions of responsibility in news related to environmental health? First, studies have shown that the media discuss responsibility for hazard *mitigation* more frequently than *causal* responsibility (E. Singer & Endreny, 1994; Woodruff, Dorfman, Berends, & Agron, 2003).

Such attributions of responsibility may be overtly stated (e.g., "Toxic suds in Johnson & Johnson's baby shampoo" (The Associated Press, 2011)) or inferred from the type of frame (episodic vs. thematic) employed in the story (Iyengar, 1991). Bellows (1998) examined news frames of childhood lead poisoning from 1993 to 1994 and determined that parental responsibility for lead abatement and screening is rarely stated explicitly. Rather, consistent with other examinations of attribution framing in pediatric health news (e.g., Lawrence, 2002; Madden & Chamberlain, 2004; Woodruff et al., 2003), episodic frames (e.g., event or instance oriented reports) are more common rather than thematic frames (e.g., reports placing an issue in general and abstract context). Despite the lack of explicit statements, focusing on individual experiences may still lead audiences to infer parental responsibility and the necessity for personal behavior change to mitigate risk.

Attribution of responsibility to policymakers and manufacturers, however, has not been entirely absent from coverage. In a content analysis of childhood nutrition coverage from 1998 to 2000 in California newspapers, Woodruff and colleagues (2003) found that when stories attribute blame to stakeholders, the culprit is most commonly a “corrupt” or “inept” government. Three times more stories pointed to government as a contributing factor than to parents. Lichter and Rothman (1999) also argue that in recent years journalists have tended to emphasize the “system” rather than individual responsibility in environmental cancer news.

If parents are implicated as responsible for reducing environmental health risks, do the media also provide advice about which protective behaviors parents can adopt? In their study examining childhood nutrition, Woodruff et al. (2003) noted that the largest single topic in news articles was advice for parents. Bellows (1998) also found that stories about lead poisoning often included extensive “how-to” descriptions of preventive measures. The extent of available advice may impact whether mothers perceive themselves to have control over pediatric environmental health risk mitigation.

In sum, there is mixed evidence regarding the amount of media attention received by environmental health risks. What makes the evaluation of this body of research particularly difficult are the various ways in which environmental risks are defined across studies. Some include lifestyle choices (i.e., smoking) whereas others focus on man-made chemicals and/or individual toxins. What we can say with some certainty is that very few studies have given consideration to how environmental health risks to pregnant women and children specifically – the most vulnerable populations – are communicated by the mass media.

Mothers' exposure to PPEH information in the media

New mothers are arguably awash in a "glut of information" about parenting (Carter, 2007). The transition to parenthood is known to increase attention to information about issues that may affect a child's well-being, including potential health threats (P. C. Stern, Dietz, & Kalof, 1993). Such information is often acquired from mass media sources, particularly the Internet (Bernhardt & Felter, 2004; Plantin & Daneback, 2009; M. J. Stern, Cotten, & Drentea, 2012). New mothers have even rated the mass media as more important sources for parenting information and advice than their own mothers (Madge & O'Connor, 2006).

A recent industry-based survey of 1,000 mothers conducted by TheMotherhood.com and the public relations agency Fleishman-Hillard reported that mothers trust food and mom blogs more than government sources, medical sites, and brands for researching food information (Food Safety News, 2012). Using pesticides as an example, 34% cited blogs as their most trusted source while medical sites and physicians were trusted 20% and 15%, respectively. For seeking information on genetically modified organisms, or GMOs, 39% rated food and mom blogs as their top source followed by offline peers (31%), the government (24%), and medical sites (18%).

Qualitative studies suggest that a majority of mothers use the information they acquire from the media to positively affect the health of those around them (see M. J. Stern et al., 2011; Warner & Procaccino, 2007), while time series analyses make a compelling case for the link between news coverage and secular trends in aspirin administration to children (Soumerai, Ross-Degnan, & Kahn, 2002) and breastfeeding (Foss & Southwell, 2006). What is missing from this body of research is an examination of (1) the extent to which mothers routinely encounter PPEH information in the media and (2) the association between media exposure and mothers' perceptions and behaviors at the disaggregated level.

Mothers' media exposure, in conjunction with variations in the dimensions of coverage (i.e., volume, topical focus), may have important implications for the adoption of critical perceptions and subsequent protective behaviors. Research on media effects suggests that psychological and behavioral outcomes can be expected as a result of frequent or routine exposure to information in the media. The following section discusses the theory supporting these potential media effects, relying predominantly on the priming and behavior change literatures to further justify the studies executed herein.

Effects of frequent exposure to information in the media

Theoretical mechanism of effect: Priming

Rooted in cognitive theory, priming is based on the notion of mental networks. The concept was first used to explore how information stored in memory was structured, retrieved, and represented (see Anderson, 1983). In mental network models, concepts stored in memory (nodes) are interconnected and assumed to have individual activation thresholds. If this activation threshold is exceeded in response to a stimulus, a node will fire and consequently, become more accessible in the mind for a short period of time (Roskos-Ewoldsen, Roskos-Ewoldsen, & Carpentier, 2002, 2009). The priming literature tells us that media coverage can serve as an external stimulus or prime that when encountered, has the ability to make certain issues more accessible in the mind (McCombs, 2005; Roskos-Ewoldsen et al., 2002). Issues made more accessible are more likely to be used when forming relevant judgments (Price & Tewksbury, 1997).

Priming research asserts that the effects of a prime are a function of both the recency (i.e., duration between prime and access) and intensity (i.e., frequency and duration of a prime) of exposure to media content (Higgins, 1996; Higgins, Bargh, & Lombardi, 1985). In the health communication arena, experimental research on priming is becoming more common, although the focus tends to be almost exclusively on the recency of exposure (Cappella, Lerman, Romantan, & Baruh, 2005; Yzer, Capella, Fishbein, Hornik, & Ahern, 2003; Zhao et al., 2006).

The theoretical justification for why priming frequency – or repeated exposure to mediated health information – matters is well-established (see Hornik, 2002; Hornik & Niederdeppe, 2008). Though research in health communication may not explicitly reference priming frequency as the mechanism of effect, many studies inherently rely on it as a basic assumption. Both time series (e.g.,Yanovitzky & Blitz, 2000) and survey-based studies (e.g., Lee & Niederdeppe, 2011; Niederdeppe, Fowler, Goldstein, & Pribble, 2010) postulate that the frequency of (or opportunities for) exposure to health messages may impact the relative salience of issues in one's mind by communicating new information, reinforcing existing thoughts, and serving as cues to action (Hornik et al., in press). In turn, the proportion of people convinced to adopt a healthy behavior following media coverage of an issue.

Admittedly, this is an oversimplified explanation of the persuasion process. It makes a giant leap to behavior change without adequately acknowledging the more proximate determinants of behavior, which are more likely to be primed in the process. In the next section, special attention is given to theoretical explanations for the potential effects of repeated exposure to information during routine media use on knowledge, descriptive norms, perceived threat, and ultimately behavioral intention and behavior. Reasons for why certain behavioral determinants – namely attitudes, injunctive norms, self-efficacy – are less likely to be influenced by frequent media exposure are also offered. Finally, the operationalization of exposure to information in the media is discussed.

Behavioral determinants

Knowledge. It has been argued that knowledge is a necessary, though not sufficient, condition for the adoption of a behavior (e.g., Fisher & Fisher, 1992). Before a mother can reduce her child's exposure to pesticides, for example, she must know through which exposure pathways (air, food, water, soil) her child is likely exposed. As stated earlier, the mass media play a central role in providing environmental health information to the general public (Adam et al., 1999; Slovic, 1987). As the amount of information available in the social environment increases – due in part to increasing media coverage – knowledge acquisition is likely to increase as well (Viswanath and Finnegan, 2002). Knowledge-gap issues aside, research to date suggests that frequent exposure to health information in the media is positively associated with knowledge related to prescription drugs (Peyrot, Alperstein, Van Doren, & Poli, 1998), nutrition (Charlton, Brewitt, & Bourne, 2004), human papillomavirus (Dell, Chen, Ahmad, & Stewart, 2000), and cancer (Jensen, Bernat, Wilson, & Goonewardene, 2011; Shim, Kelly & Hornik, 2006) to name a few.

Stryker and colleagues (2008) recently found evidence of media priming effects on cancer prevention knowledge. First, a content analysis was conducted to compare the prevalence of news coverage of specific cancer prevention behaviors (i.e., diet, exercise, smoking, sun exposure, and alcohol use). Then, cross-sectional data from the National Cancer Institute's Health Information National Trends Survey (HINTS) was analyzed to estimate the relationship between general health news attention and knowledge of the specific cancer prevention behaviors. Finally, a qualitative comparison was made between the media and survey data to look for patterns in the prevalence with which specific behaviors were discussed in the media that might explain the observed associations between self-reported attention and knowledge. Results from the content analysis showed that diet and smoking received the greatest amount of media coverage, which qualitatively conformed to the results of the survey data in which only diet and smoking knowledge were significantly associated with media attention. The authors concluded that attention to health news – which frequently covered diet and smoking in the context of cancer prevention – positively impacted related knowledge (and not the reverse).

Descriptive norms. Social norms are standards of behavior transmitted through social interactions and have a long history in the study of human behavior (e.g., Asch, 1951; Deutsch & Gerard, 1955). There is general agreement that two types of social norms – subjective and descriptive – can strongly influence individuals' behaviors. Subjective norms, also known as injunctive norms, are governed by beliefs about whether important others want you to perform the behavior, whereas descriptive norms are governed by beliefs about which behaviors are widely adopted or popular (Cialdini, Reno, & Kallgren, 1990). Theory has suggested that increased exposure to information about a behavior in the media may impact normative perceptions that the behavior is widely adopted and then influence subsequent behavioral uptake (see Hornik et al., in press). There is some empirical evidence to support this claim. An analysis of responses to the National Survey of Parents and Youth (Jacobsohn, 2007) found that perceived descriptive norms, or prevalence, of marijuana use among youth mediated the relationship between exposure to the National Youth Anti-Drug Media Campaign and pro-drug outcomes. Another study found similar results in the context of cigarette smoking (Gunther, Bolt, Borzekowski, Liebhart, & Dillard, 2006).

Perceived threat. The social amplification of risk framework (Kasperson et al., 1988) purports that hazards interact with psychological, social, institutional, and cultural processes in ways that may amplify public responses to risk. Amplification occurs at two stages, first in the transfer of information, and then in the response mechanisms of society. The news media can play an important role in sending risk signals to the public, increasing perceived threat, and inciting behavioral responses. This theory is consistent with the Health Belief Model (Janz & Becker, 1984; Rosenstock, 1974), in which behavior change is based on an individual's perceived likelihood of good or bad outcomes resulting from engagement in a particular behavior. The formal model consists of the several key belief components that are considered to directly affect behavior (Champion & Skinner, 2008), including perceived likelihood, or the probability of experiencing a health problem, and perceived severity of the consequences of experiencing said problem. Together, these components form what traditional risk scholars would deem threat. An important characteristic of the HBM is that all of its components, including threat, are based on cognitive perceptions rather than actual realities (which may or may not be consistent). In the words of Rosenstock (1974), "it is the world of the *perceiver* that determines what he will do and not the physical environment."

Prior research has provided some evidence of increased perceived threat of toxic chemicals following exposure to new information (Feng, Keller, Wang, & Wang, 2010). After encountering product recalls, participants in the study tended to overestimate probability judgments of higher blood lead levels from exposure to lead-painted toys. The authors argue that the result was likely due to priming the availability heuristic, which states that the frequency and probability of an event is judged by the extent to which occurrences of that event are easily "available" in memory. In other words, extensive media coverage during recall crises brings adverse examples readily to mind, creating the perception that they are more prevalent. Consistent with early risk perception theory (Slovic, 1987), the same study also showed that communication about risks to children has an even greater impact on threat perceptions than communication about risks to other populations.

Behavior and behavioral intentions. Repeated exposure to health topics in media content may have a significant cumulative impact on behavioral choices, even outside the context of motivated information seeking (Hornik & Niederdeppe, 2008; Shim et al., 2006). The study of such media priming effects in the health behavior domain is facilitated by the application of an established theory of behavior change: the integrative model of behavioral prediction (IM: Fishbein, 2000, 2010; Fishbein & Ajzen, 2010). The IM is a comprehensive model for predicting behavior change based on constructs compiled from well-established health behavior theories, including the theory of reasoned action (Fishbein & Ajzen, 1975), the theory of planned behavior (Ajzen, 1991), the health belief model (Janz & Becker, 1984), and social cognitive theory (Bandura, 1986).

The IM posits that intention is the single best predictor of any volitional behavior. The model further suggests that the three primary determinants of behavioral intentions are attitudes toward a behavior ("Reducing my child's exposure to chemicals in the environment is healthy"), perceived normative pressure to perform the behavior ("Moms like me reduce their children's exposure to chemicals in the environment"), and self-efficacy to conduct the behavior ("Reducing my child's exposure to chemicals in the environment is under my control"). Each determinant is governed by a set of related underlying beliefs and various background variables such as demographics, perceived threat, and media exposure. While priming effects are more likely to involve more proximate outcomes (i.e., determinants of behavior), it is also possible that media exposure has detectable and direct effects on behavior.

Attitudes, injunctive norms, and self-efficacy. In health communication research, most studies are designed to assess the effects of exposure to media coverage about *behaviors* on related *behaviors* in a particular population. For instance, research has examined the effects of coming across information about mammograms in the media on subsequent mammography uptake (Hornik et al., in press). In this dissertation, a different approach to operationalizing the key constructs is adopted. The design is more akin to agenda-setting, news reception, and diffusion research, which suggest that *issue awareness* tends to be greater during periods of elevated news coverage (e.g., McCombs & Shaw, 1972; Price & Czilli, 1996; E. M. Rogers, 2000). Accordingly, the focus is not on media coverage of protective behavior (e.g., purchasing organic produce, mitigating chemical exposure), but rather on the *chemical issues* (e.g., arsenic, BPA, pesticides) covered more generally.

It is argued that the volume of media coverage an issue receives is as important as the frequency of exposure an individual has to the media. In the case of PPEH-related issues, a chemical covered more frequently in newspapers, magazines, and so forth will account for a greater proportion of information encountered during a mother's routine exposure to media. Ultimately, it is the combination of both coverage composition and frequent exposure to such coverage that determines the dose of information received. This suggests that if a chemical like arsenic is covered less frequently, it will account for a smaller proportion of information encountered in the media and ultimately, a weaker dose of persuasive communication.

In applying this theoretical approach to develop the conceptual model of effects, attitudes, injunctive norms, and perceived self-efficacy are relatively incompatible as predictors. There is theoretical justification for the prediction that coverage volume primes knowledge, descriptive norms, perceived threat, and behavior. As the information environment is flooded with more coverage of a particular hazard, knowledge and threat rise. The cultural norms of intensive mothering may also be kindled as pediatric health threats become more commonly discussed and collective perceptions of what mothers are doing to protect their children may turn to hot-topic hazards. It is less clear how self-efficacy, for example, might be affected by sheer coverage volume in the absence of some specific content characteristic (e.g., advice on how to reduce a child's exposure to chemicals in the environment); but, perhaps future research could find justification. For now, these three behavioral predictors remain outside the scope of this dissertation.

Media exposure. Research has categorized information exposure into two types of mass media engagement at different ends of a continuum. At one end, information seeking is characterized by an active and motivated pursuit of specific information (Lambert & Loiselle, 2007), as occurs when an individual uses a specific website to find the results of a chemical risk assessment or advice on purchasing green cleaning supplies. Information scanning, on the other hand, is a less purposive, more incidental behavior that occurs during an individual's routine encounters with informative sources: for instance, while reading a magazine during a regular visit to the pediatrician or watching the nightly news (Hornik & Niederdeppe, 2008; Niederdeppe et al., 2007).

In short, the critical difference between seeking and scanning is an individual's level of activeness in looking for information, and presumably his or her pre-existing motivation to obtain specific information. This difference is what makes scanning such an appealing measure of media exposure, particularly for studies that may be limited to cross-sectional survey data like this dissertation. Information seeking conflates exposure and motivation, whereas measures of information scanning provide better estimates of information encountered through exposure to routinely used sources.

To date, scanning studies have demonstrated that self-reported routine exposure to mass media coverage of specific cancer prevention and screening behaviors (e.g., fruit and vegetable consumption, mammography) is associated not only with knowledge (Shim et al., 2006), but also individuals' specific current health behaviors and predictive of their future behaviors, even after adjustment for potential confounding influences and baseline behavior (Hornik et al., in press; Kelly et al., 2010).

CHAPTER TWO

Model of effects and research overview

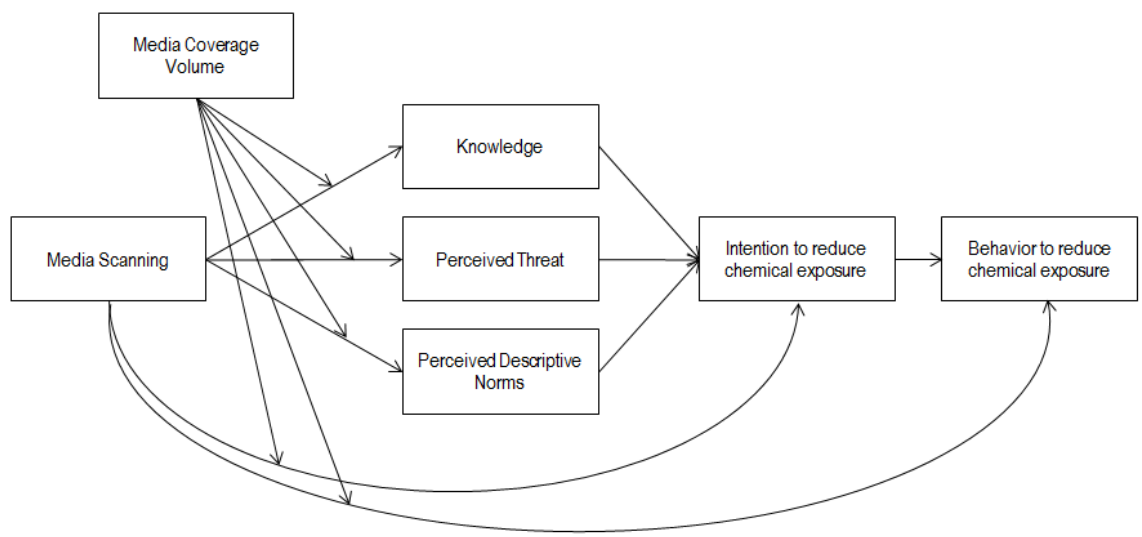
Overview

Taken together, these branches of research build theoretical support for the study of PPEH information in the media and its potential effects. The insight provided by prior work in related areas is particularly useful, given the relative lack of empirical research on PPEH communication. In this chapter, the proposed model of effects is presented, followed by brief summaries of each of the four studies in this dissertation.

Conceptual model of effects

Figure 2.1 presents the proposed model of effects. Scanning of PPEH information in the media is located to the far left of the model, the potential proximate outcomes – or behavioral determinants – are toward the center, and the potential distal outcome – behavior – is located to the far right. A single possible moderator – media coverage volume – is located in the upper left-hand corner of the model. How each of the four dissertation studies was designed to address a particular component of this conceptual model presented will be described in the next section. As explained in Chapter 1, a number of behavioral determinants are absent from the proposed model of effects. Although the data collected in the studies could be used to explore a variety of additional relationships between media scanning, coverage characteristics (i.e., attributions of responsibility, presence of advice), perceptions and behaviors (i.e., perceived responsibility, self-efficacy), such endeavors are beyond the scope of this dissertation and reserved for future work.

Figure 2.1 Conceptual model of effects



Note. The direction of all hypothesized relationships presented in the conceptual model is positive.

Overview of research studies

As noted in the Introduction, this dissertation launches a new exploration into environmental health communication by asking three overarching research questions: (1) how prevalent is PPEH information in the media, (2) is mothers' exposure to such information linked to key outcomes – namely, protective behaviors, behavioral intentions, knowledge, descriptive norms, and perceived threat, and (3) are the effects of such exposure contingent on the relative volume of media coverage PPEH topics receive?

Because of the relative lack of environmental health communication research, particularly examining mothers' media exposure to PPEH information, an elicitation survey was warranted before any of the primary research questions could be addressed.

Study 1 begins here and sets out to determine where mothers come across PPEH information such as from doctors, friends/family, or the mass media and how they conceptualize toxic threats, broadly or as specific individual risks. Results from the online elicitation survey, which sampled pregnant women and mothers with children 6 and under in the United States and was fielded in January 2013, would serve to inform the development of both the content sampling frame and coding procedure for Study 2 as well as measures intended for use in Study 3's full-scale cross-sectional survey. Study 1 is detailed in Chapter Three.

Study 2, a content analysis of popular media sources (i.e., the Associated Press (AP) wires, parenting magazines, and parenting websites), focuses on the first research question, examining content available between September 2012 and March 2013. Study 2 has two primary objectives: (1) to estimate the prevalence of media coverage received by pediatric environmental health threats, and (2) to examine how certain PPEH risks are characterized. Results from the content analysis would serve to further guide the focus and development of Study 3's survey measures and topical focus, as well as inform *a priori* expectations about the directions of the hypothesized media effects in Study 4. Study 2 is detailed in Chapter Four.

Study 3, a cross-sectional survey, addresses the second overarching research question and in doing so, focuses on three chemical toxins: arsenic, bisphenol A (BPA), and pesticides. In March 2013, the online survey was fielded to a fresh sample of pregnant women and mothers with children 6 and under in the U.S. The purpose of Study 3 was to move beyond inferences from content analysis to provide empirical support for the direct relationships between mothers' scanning of PPEH information in the media and key outcomes, including behavior, intention, knowledge, descriptive norms, and perceived threat. Study 3 is detailed in Chapter Five.

Finally, Study 4 is the central study of this dissertation, as it combines data from both the content analysis and the cross-sectional survey to address the third overarching research question: are the effects of scanning contingent on media coverage volume? The purpose of Study 4 is to strengthen causal claims related to priming effects and reduce the threat of reverse causation that often plagues cross-sectional data analyses. Mixed effects regression is used to assess whether media coverage volume moderates the relationships between media scanning and key outcomes. Instead of comparing the strength of associations before and after exposure, as is typically done in media priming studies, this study compares the strength of associations observed across the three chemical topics highlighted above. Study 4 is detailed in Chapter Six.

CHAPTER THREE

Study 1: Eliciting mothers' thoughts and behaviors related to information engagement and pediatric environmental health

Overview

This chapter describes the structure and results of an elicitation survey which serves to inform the latter two studies of this dissertation and has three corresponding objectives. In order to define an appropriate sampling frame for the content analysis in Study 2, it must first be determined *from which sources* mothers receive their information about potentially harmful chemicals in the environment. In other words, to which sources (e.g., doctors, friends, mass media) do mothers report frequent exposure – both actively sought and routinely encountered – to these issues?

The second objective of this study is to assess how mothers conceptualize threats to prenatal and pediatric environmental health. Not only is PPEH a relatively novel and burgeoning area of interest among researchers, medical practitioners and parents, the categorization of threats and associated scientific jargon is complex and dense. Before asking mothers to respond to closed-ended survey questions related to their risk perceptions, attitudes, and so forth in Study 3's cross-sectional survey, it is of utmost importance to first acquire a basic understanding of *how mothers conceptualize* or think about these issues. One final goal of Study 1 is to pre-test survey measures of information exposure and PPEH-related behaviors in preparation for Study 3.

In the next section, a series of research questions is put forth, followed by a review of the methods and measures employed. The chapter concludes with a presentation and discussion of results.

Research questions

The objectives described above are to be met by addressing five research questions. First and foremost:

RQ1a: From which sources do new and expecting mothers report acquiring information about chemicals in the environment that may be harmful to children's health?

Prior research has shown that mothers frequently turn to the internet for parenting information (e.g., Bernhardt & Felter, 2004). But, do moms also encounter PPEH information through more traditional media sources? The proposed content analysis of media sources requires a better understanding of which sources mothers recall as primary providers of this type of information. As such, a more specific question to be addressed is:

RQ1b: Do mothers cite newspapers and television/radio as sources of information about chemicals in the environmental as frequently as magazines and the Internet?

If yes, the sampling frame for the content analysis should include major U.S. newspapers, as well as the Associated Press domestic wire service. If not, an analysis of magazine and website content should provide a sufficiently representative sample of the information environment accessed by mothers.

The development of Study 3's cross-sectional survey depends on three lines of inquiry related to chemical salience, concern, and related behavior. The first question to be addressed is:

RQ2a: Do mothers freely recall specific names of chemicals in the environment that may be harmful to children's health?

In other words, when prompted to freely recall chemicals of concern, are specific chemical names (e.g., BPA, chlorine) or categories of chemical hazards (e.g., plastics, household cleaning supplies) more salient? If the former scenario is true, it would be appropriate to write future survey questions using specific chemical names. If the latter scenario is true, it may be more appropriate to craft questions that speak to more general categories of chemicals.

An additional consideration for survey item development is level of concern about specific chemicals and chemical types. The purpose of Study 2 is to focus on issues most likely to 'strike a chord' with mothers; thus, I ask:

RQ2b: Which chemicals/types of chemicals in the environment are most concerning to mothers?

Finally, understanding how mothers conceptualize protective behaviors in relation to chemicals will shape behavioral questions on the cross-sectional survey. Do they freely recall very specific behaviors that reduce exposure to specific chemicals (e.g., buying BPA-free baby bottles) or instead refer to more general behaviors that reduce exposure to multiple threats (e.g., eating organic food)? In short, I ask:

RQ2c: Do mothers report engaging in specific or general protective behaviors, if any, to reduce their child's exposure to chemicals in the environment?

Method

Participants and procedures

Participants were recruited through Survey Sampling International, which both maintains an online panel of individuals who have opted-in to participate in surveys and also uses partner organizations to recruit additional study participants (SSI; Survey Sampling International, Shelton, CT). These panels include a large number of individuals (more than one million) who while varying widely in their characteristics cannot be considered a representative sample of the U.S. population. The survey was available in English, only. Female panelists were sent a recruiting email in early January 2013 linking to the survey. To be eligible for the study, women must have been pregnant and/or have had at least one child age 6 or under at the time of the survey. Data was collected using a 19-item online questionnaire programmed with Qualtrics software (Qualtrics, Provo, UT). The study was approved by the university's institutional review board.

Measures

The variables of interest were: (a) participant's concern over chemicals in the environment and their child's health, (b) their protective behaviors to limit their child's exposure to those chemicals, (c) their assessment of media performance in keeping parents informed of these issues, and (d) their information seeking and scanning behaviors about the relationship between children’s health and chemicals in the environment.

Concerning chemicals. Maternal concerns over chemicals in the environment were measured using three survey items. First, mothers were told that “a variety of chemicals and toxins can sometimes be found in our environment - in the food we eat, the water we drink, the air we breathe and the products we use.” Then they were asked to respond to the following open-ended item: “Thinking about your child's health now and in the future, which chemicals of concern (if any) come to mind? There are no right or wrong answers; we are merely interested in what might come to mind.” Ten lines were provided for open-ended responses.

The second item measured concerns about their child’s exposure to 12 specific chemicals (e.g., arsenic, asbestos, lead, PBDEs, rBGH) using a closed-ended format. Half of the chemicals in this item were taken from the E.P.A.’s TEACH Summary. More specifically, participants were asked, “Below is a list of specific individual chemicals in the environment that may be harmful to children’s health. Thinking about your child's health now and in the future, please specify how concerned you are about your child’s exposure to each chemical.” Response options ranged from 0 (*not at all concerned*) to 3 (*very concerned*) and included an additional ‘I do not recognize this chemical’ option (see Appendix A for full elicitation survey). To better assess comparability with the responses generated by open-ended concern measure, this item was recoded into a dichotomous measure at its midpoint: the two lowest response options (*not at all concerned* and *not really concerned*) were recoded as 0 (*not concerned*); and, the two highest responses (*concerned* and *very concerned*) were recoded as 1 (*concerned*).

The third item measured concerns about their child's exposure to a variety of more general types of chemical hazards (e.g., plastics, secondhand tobacco smoke, personal care products). Specifically, participants were asked, "Below is a list of products or types of chemicals in the environment that may be harmful to children's health. Thinking about your child's health now and in the future, please specify how concerned you are about your child's exposure to each type of product or chemical." Response options ranged from 0 (*not at all concerned*) to 3 (*very concerned*). The same recoding procedure applied to the specific chemical measure (detailed above) was also used to dichotomize this measure for analysis.

Protective behaviors. First, mothers received the following introductory statement: "Some people try to do things to reduce a child's exposure to chemicals in the environment. Other people don't feel they can do anything that will affect their child's exposure to chemicals." Then, they were asked, "Have you personally done anything specific to limit your child's exposure to chemicals in his/her environment?" Ten lines were provided for open-ended responses.

Information seeking and scanning. Respondents reported from where and how often they actively sought and routinely scanned for information about the relationship between children's health and chemicals in the environment. All items were modified from measures previously validated by Kelly, Niederdeppe, and Hornik (2009) and Kelly et al. (2010) in the context of cancer prevention and screening information. Briefly, the question sequence began by distinguishing between seeking and scanning ("Some people are actively looking for information about chemicals in the environment that may be harmful to children's health while others just happen to hear or come across such information. Some people don't come across information about these potentially harmful chemicals at all."). First, two dichotomous measures were used to assess both exposure behaviors (e.g., thinking about the past four months, did you [actively look for/hear or come across] information about the relationship between children's health and chemicals in the environment?"). Respondents who answered "yes" received two follow-up questions about each behavior – one open-ended and one closed-ended question. First, mothers were asked, "Thinking about the past four months, where did you [actively look for/hear or come across] information about the relationship between children's health and chemicals in the environment?" Ten lines were provided for free recall to each question.

Then, mothers were asked specific closed-ended questions about seeking and scanning. The sequence began with seeking: "How many times did you actively look for information about the relationship between children's health and chemicals in the environment during the past four months from each of the following sources?: (1) television and radio; (2) newspapers (online and print); (3) books; (4) magazines (print only); (5) internet (search engines only); (6) websites (excluding search engines and newspaper websites); (7) doctors or other medical professionals; (8) family, friends, or co-workers." Response options were 0 (*not at all*), 1 (*1 or 2 times*), 2 (*3 times or more*), and 3 (*I don't recall*).[1] If respondents reported any seeking from magazines and/or websites, they received a follow-up question about specific print (*Parents Magazine, Parenting Magazine*) and/or online sources (Babycenter.com, Parents.com) of particular

[1] After the data had been collected, it became apparent that interpreting what respondents were thinking when selecting 'Do not recall' would be impossible. The choice could indicate that they used the source, but could not recall how often; or, it could indicate that they did not recall using the source at all. Recoding the values of these responses could either under- or over-estimate scanning depending on the interpretation. To address this ambiguity without introducing some unknown bias, all *I don't recall* responses were coded as missing for the analysis – for both the seeking and scanning closed-ended items. This measurement issue is addressed further in the discussion section below.

relevance to this study. Response options were identical to the full seeking item. A foil – or non-existent – source (i.e., *Baby Health Magazine, Babyhealth.com*) was also included in each of these follow-up measures to assess recall accuracy.

Finally, participants were asked about scanning behaviors in a nearly identical sequence. There were only two differences between the seeking and scanning items. First, the closed-ended scanning item asked, "How many times did you <u>hear or come across information</u> about the relationship between children's health and chemicals in the environment during the past four months from each of the following sources when you were <u>not actively looking for it</u>?" Second, search engines were excluded from the list of source options since they can only be used for active seeking.

Additional characteristics. Gender, pregnancy status, number of children, and their ages were obtained from screening items in the questionnaire. Mothers' age, race-ethnicity, education, and income were obtained from SSI-provided background profiles. Prior work has shown that difficult knowledge questions followed by media exposure measures can lead to lower reports of actual media attention and interest (for treatment of this issue in political communication, see Lasorsa, 2003). Adding a buffer item between these two types of measures that serves as an excuse for poor knowledge has been shown to reduce order effects and minimize underestimations of media exposure. Accordingly, a buffer item – PPEH information sufficiency – was added that stated, "Some media sources do a good job in keeping parents informed about these types of health issues. Others do not do such a good job." Mothers were then asked, "Thinking about the news media you've come across, would you say they do a poor, fair, good or excellent job of keeping parents informed about environmental health issues and potentially harmful toxins?" Response options ranged from 0 (*poor*) to 3 (*excellent*).

Analytic procedure

Analyses were restricted to the 63 eligible respondents who completed the questionnaire. First, all open-ended responses were coded. Given the small number of open-ended items in the questionnaire and the simplicity of the responses given, a single coder was considered sufficient. The codebook in Appendix B outlines the procedure for coding the four open-ended response items: (1) chemicals of concern, (2) protective behaviors, (3) information seeking, and (4) information scanning. Descriptive statistics were used to calculate and informally compare frequencies, percentages, and means.

Results

Ninety-one percent of participants who began the survey followed it to completion (N = 64). Of those who completed the survey, one participant was neither pregnant nor had any children age 6 or below and was thus ineligible for inclusion in subsequent analyses. On average, eligible participants had 1.78 children age 6 and under (*SD* = 1.14), while a small number (n = 5) reported being pregnant at the time of the survey. Approximately 52% were White, 21% Hispanic, 10% African-American, 8% Asian and 2% "other" (8% did not provide their race/ethnicity). The average age of participants was 31.52 years (*SD* = 8.03). Close to one third of the sample had a bachelor's degree or higher (31%), while a majority of the sample (69.5%) had a household income less than $50,000 (see Table 3.1 for sample characteristics). The average rating of PPEH information sufficiency in the media was 1.42 (*SD* = 0.78).

Table 3.1 Sample characteristics

	N	%	Mean (SD)
No. children 6 and under	63		1.78 (1.14)
Pregnant	63	7.9	
Age	62		31.52 (8.03)
Race/ethnicity	58		
White (not Hispanic)		52.4	
Hispanic		20.6	
African American		9.5	
Asian		7.9	
Other		1.6	
Education	62		
Some high school		6.3	
High school		36.5	
Some college		25.4	
College and above		30.1	
Income	59		
Less than $20,000		27.0	
$20,000 - $49,999		38.0	
$50,000 - $99,999		17.4	
$100,000 - $149,999		11.9	
PPEH information sufficiency in media	62		1.42 (0.78)

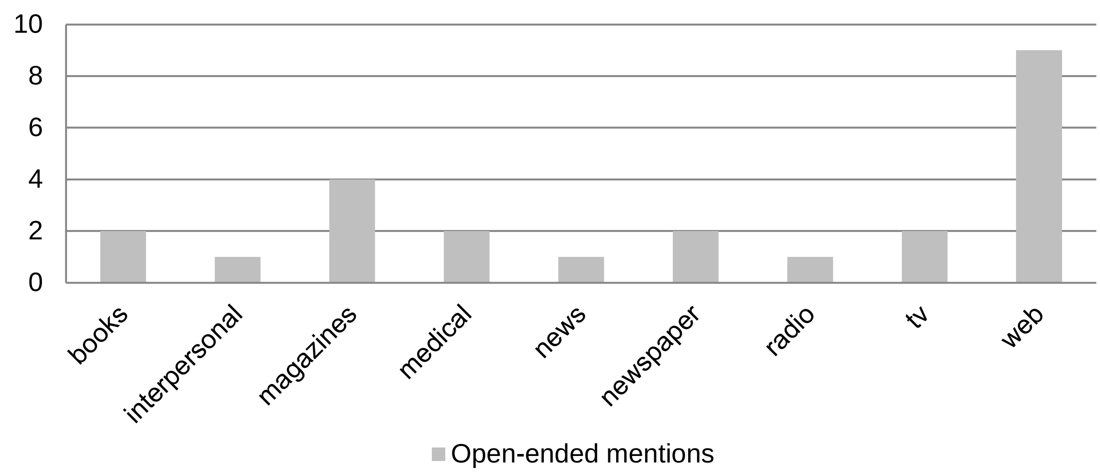
Note. Cases (N) and percentages represent non-missing data and are unweighted.

Information seeking and scanning

The first objective of this study was to determine from which sources new and expecting mothers acquire PPEH information; so to address RQ1a and RQ1b, reported information seeking and scanning were assessed. Approximately 24% of respondents reported actively seeking this type of information during the past four months. Of those

15 seeking mothers, ten (66%) provided a valid response to the open-ended seeking survey item. The internet (n = 9) and magazines (n = 4) were the most frequently reported sources (see Figure 3.1).

Figure 3.1 Sources of PPEH information seeking recalled (n = 10)



The closed-ended seeking items capturing frequency of engagement to individual sources provided similar insights. The most *frequently* used sources for active seeking – used three or more times by the greatest proportion of the sample – were internet search engines, websites, and interpersonal sources (see Table 3.2). The most *commonly* used sources – used at least once by the greatest proportion of the sample – were internet search engines, websites, doctors, and books. About one-fifth of mothers reported seeking at least once in the past four months from Babycenter.com (22.6%) and Parents.com (19%). Reported use of the non-existent website, Babyhealth.com, was equivalent to Babycenter.com, raising concerns about mothers' ability to accurately recall website use. Of those seeking in magazines (n = 13), all reported using *Parents* and

Parenting. Reported frequency of use of the non-existent magazine, *Baby Health Magazine,* was lower than use of both *Parents* and *Parenting.* Finally, the specific sources mentioned in the open-ended question closely matched those provided in the closed-ended item. In other words, no additional sources (e.g., pamphlets) were freely and frequently recalled; therefore, the closed-ended seeking measure will remain as written in Study 3.

Next, routine scanning was assessed. One-third of the sample (n = 21) reported coming across PPEH information when they were not actively looking for it. This item was significantly and positively correlated with PPEH information seeking ($r = 0.58$, $p < .001$), suggesting that the two information engagement behaviors are moderately associated. Among those mothers who scan, half (n = 11) provided a valid response to the open-ended survey item. Figure 3.2 shows the most commonly recalled sources scanned were television (n = 4) and general news (n = 3). Only two sources were freely recalled that were not included in the predetermined closed-ended item: Facebook and product labels. How this will be addressed in the cross-sectional survey is described in the Discussion section that follows.

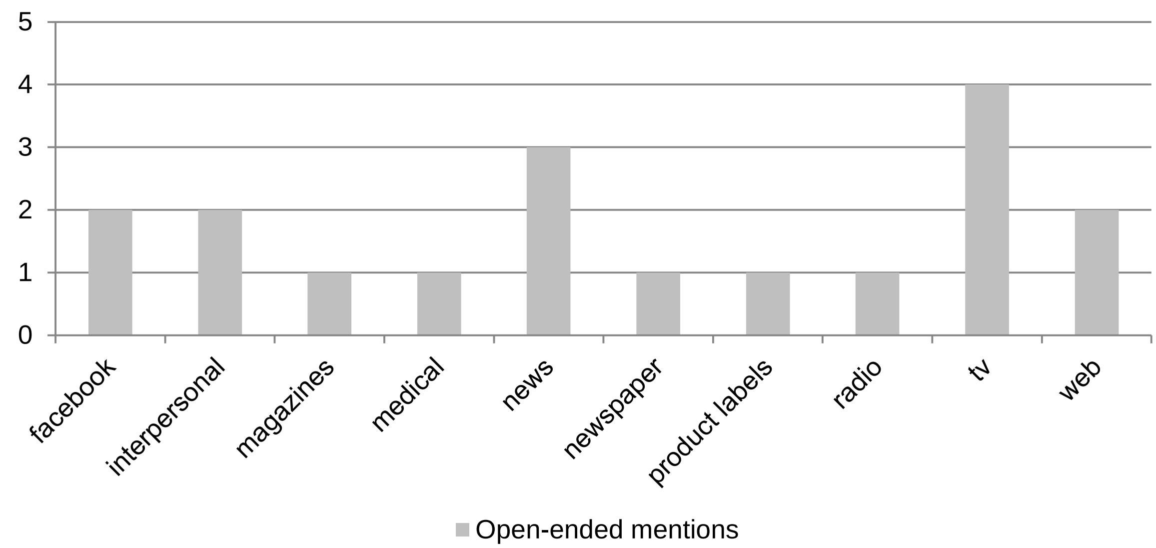
Table 3.2 Frequency of PPEH information engagement – by source – in the preceding four months (closed-ended)

	Seeking				*Scanning*			
Source	N	Never (%)	1 or 2 times (%)	3 or more (%)	N	Never (%)	1 or 2 times (%)	3 or more (%)
Doctor or other medical professional	63	76.2	14.3	9.5	63	66.7	17.5	15.9
Interpersonal sources	62	77.4	9.7	12.9	63	65.1	22.2	12.7
Newspapers (online and print)	63	77.8	14.3	7.9	63	71.4	19.0	9.5
Television and radio	63	77.8	14.3	7.9	62	67.7	14.5	17.7
Books	63	76.2	17.5	6.3	62	72.6	19.4	8.1
Magazines (print only)	63	79.4	9.5	11.1	63	69.8	17.5	12.7
Parents Magazine	63	79.4	9.5	11.1	63	71.4	12.7	15.9
Parenting Magazine	63	79.4	9.5	11.1	63	71.4	12.7	15.9
Baby Health Magazine (foil)	62	83.9	9.7	6.4	63	74.6	20.6	4.8
Internet (search engines only)[a]	63	76.2	4.8	19.0	--	--	--	--
Websites (excluding search engines and newspaper websites)	63	76.2	7.9	15.9	63	66.7	7.9	25.4
Parents.com	62	77.4	9.7	12.9	63	68.3	14.3	17.5
Babycenter.com	63	81.0	11.1	7.9	63	69.8	19.0	11.1
Babyhealth.com (foil)	63	81.0	14.2	4.8	63	73.0	19.0	7.9

Note. 'Do not recall' responses were coded as missing. Cases (N) and percentages represent non-missing data.

[a] Response item for seeking measure only.

Figure 3.2 Sources of PPEH information scanning recalled (n = 11)



In the closed-ended scanning item, it seems mothers most *frequently* came across PPEH information – with three or more encounters reported – on websites and television/radio (see Table 3.2). The most *commonly* scanned sources – with at least one incidental exposure reported – were websites again and doctors. As for print media, magazine scanning was both more frequent (12.7% vs. 9.5%) and more common (30.2% vs. 28.6%) than newspaper scanning – though only marginally. Roughly one-third of the sample reported scanning PPEH information on Parents.com and Babycenter.com. A slightly smaller proportion reported scanning the non-existent website (27%), again raising concerns about mothers' ability to accurately recall website use. The reported frequency of scanning the non-existent website was, however, substantially lower than the real websites, particularly Parents.com. As for specific magazine titles, the frequency of scanning *Parenting* and the non-existent magazine were equivalent; although, scanning the non-existent magazine was overall less common.

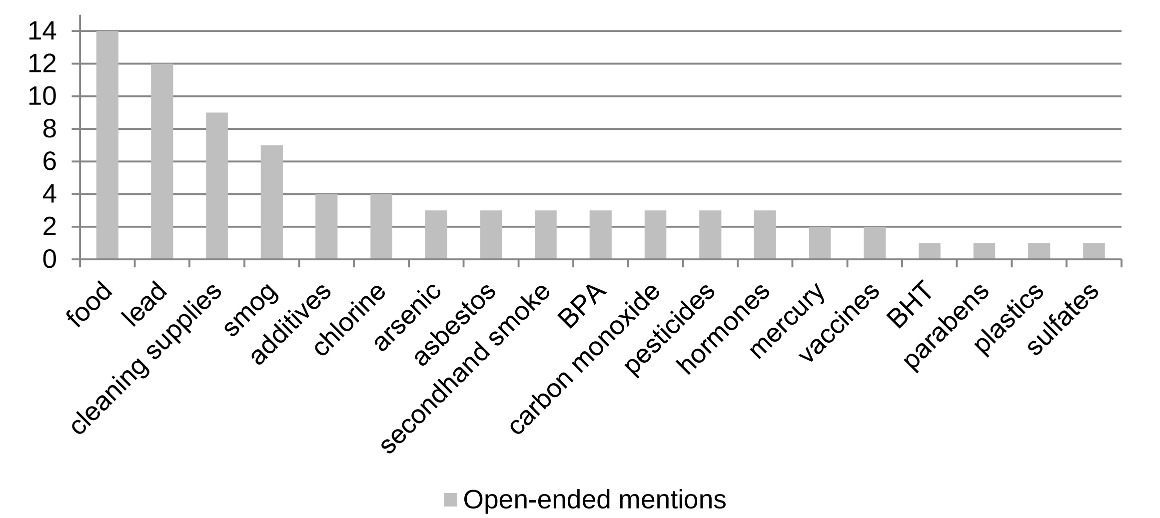
There was some concern over whether the open- and closed-ended items for seeking and scanning were generating similar information. In other words, were respondents providing consistent reports of their information engagement behaviors across question formats? Asking mothers to freely recall sources proved challenging, as many more reported seeking and scanning across different sources in the closed-ended items than in the open-ended items. As a result, the responses did not correlate significantly across question formats.

Chemicals of concern

More than half of the respondents (n = 35) provided a valid response to the open-ended survey item about concerning chemicals. On average, respondents freely recalled 1.33 chemicals of concern. The most commonly mentioned chemical threats were those found in food (i.e., respondent mentioned the exposure pathway generally (n = 14)), as well as lead (n = 12), and cleaning supplies (not including specific mentions of chlorine bleach (n = 9); see Figure 3.3). Only four specific chemicals deemed particularly concerning to children's health by the E.P.A. (out of a possible 21) were freely recalled by mothers: arsenic, bisphenol A (BPA), lead, and mercury.

Nevertheless, a few key exposure pathways known to contain some of the E.P.A.'s concerning chemicals were freely recalled, including smog (which may expose children to benzene and formaldehyde), cigarette smoke (which may expose children to benzene, formaldehyde and benzo(a)pyrene), pesticides (which may expose children to 2,4-D, DEET, dichlorvos and atrazine), and vaccines (which in the past have contained methylmercury). This suggests that mothers may be concerned about significant chemical exposures, even though they may not (be able to) recall specific chemical names.

Figure 3.3 Type and frequency of concerning chemicals reported (open-ended; n = 35)



In the closed-ended survey item, each chemical listed was recognized by at least half of the respondents; though not surprisingly, some were less familiar than others (i.e., phthalates, 2-4D, PBDEs and parabens). Similar to the open-ended responses, lead, mercury, chlorine, arsenic, and asbestos were among the most recognized chemical hazards. Among specific chemicals, the greatest proportion of mothers expressed concern over lead (76.2%), mercury, and chlorine (both 66.7%). Among products and types of chemicals, the greatest proportion of mothers expressed concern over secondhand smoke (81.0%), pesticides, and heavy metals (both 77.8%; see Table 3.3).[2]

[2] A recognition response option was not included in the survey for the list of products/types of chemicals since it was assumed that response options listed were all relatively familiar hazards with identifiable names.

Table 3.3 Chemicals of concern (closed-ended; n = 63)

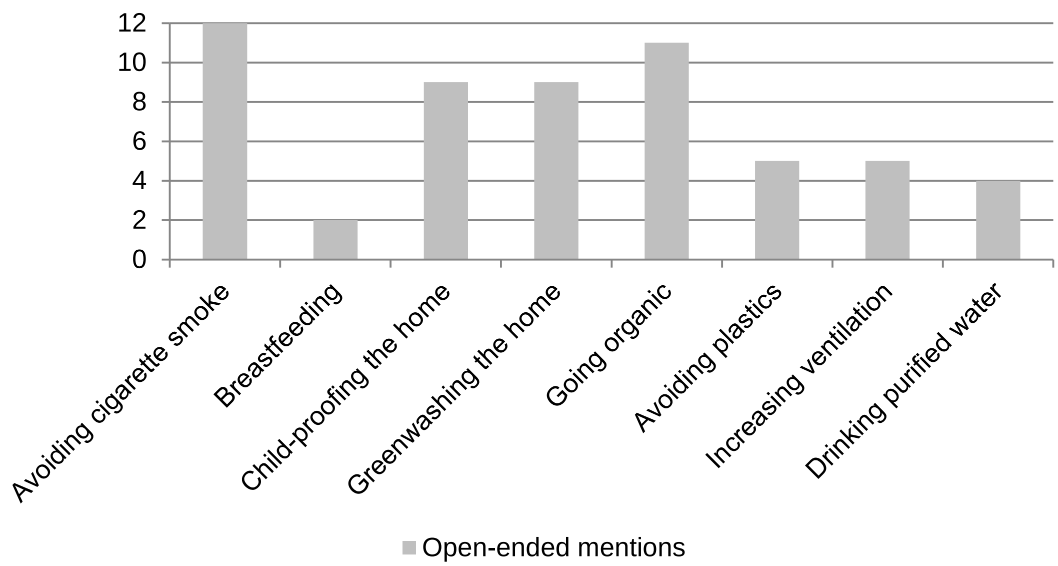
	Concerned (%)	Do not recognize (%)
Specific Chemicals		
Lead	76.2	7.9
Mercury	66.7	6.3
Chlorine	66.7	6.3
Asbestos	61.9	17.5
Arsenic	60.3	14.3
BPA (bisphenol A)	57.1	27.0
Formaldehyde	54.0	19.0
rBGH (bovine growth hormone)	50.8	30.2
PBDEs (polybrominated diphenyl ethers)	42.9	41.3
Parabens	39.7	41.3
Phthalates	38.1	42.9
2, 4-D (2,4-dichlorophenoxyacetic acid)	38.1	42.9
Product/Type of Chemical		
Secondhand tobacco smoke	81.0	--
Pesticides	77.8	--
Heavy metals in food or water supply	77.8	--
Indoor air pollutants	71.4	--
Household cleaning products	71.4	--
Smog/particulate matter (PM)	65.1	--
Flame retardants	63.5	--
Food additives/dyes	63.5	--
Plastics (e.g., toys, food packaging, bottles)	60.3	--
Personal care products (e.g., shampoos)	47.6	--

Note. Only the items assessing specific chemicals included a ‘Do not recognize’ response, which was coded as missing. Percentages represent all data (missing and non-missing) to facilitate comparisons across responses.

Protective behaviors

Approximately half the sample (51%) provided a valid response to the open-ended survey item about specific protective behaviors to limit children’s exposure to chemicals in the environment. Figure 3.4 shows that the most commonly mentioned protective behaviors were avoiding cigarette smoke (n = 12) and purchasing/eating organic products (n = 11).

Figure 3.4 Type and frequency of protective behaviors reported in the preceding four months (open-ended; n = 32)



Discussion

The purpose of this study was to gain insight into the relatively underexplored territory of maternal thoughts and behaviors related to prenatal and pediatric environmental health. The elicitation survey was developed with the primary intent of informing and shaping the next two studies of this dissertation. Here, findings reported above are reviewed and the implications for the content sampling frame in Study 2, as well as the survey sample and survey measures in Study 3, are discussed.

Study 2 - Content sampling frame

First, it was necessary to determine from which sources new and expecting mothers acquire information about chemicals in the environment that may be harmful to children's health (RQ1a). More specifically, it was unknown whether mothers would cite newspapers and television/radio as sources of information about chemicals in the environmental as frequently as magazines and the Internet (RQ1b). As a reminder, the central focus of this dissertation is routine exposure to information (scanning) and only considers active seeking as a potential confounder of the effects of such exposure on behavior; therefore, the most important insights are to be drawn from the survey items assessing scanning.

There is clear empirical justification for the inclusion of websites in the sampling frame for Study 2. As expected, websites were consistently rated among the most sought and scanned sources of PPEH information. Both website and magazine scanning were more frequent and more common than newspaper scanning – providing some support for excluding newspapers from the sampling frame. It should be noted, however, that scanning PPEH information on television and in 'news' in general were reported often in both the open- and closed-ended scanning items. Because of the limited sample size and small differences in reported use across these sources, it is difficult to know whether the observed differences in source use are statistically significant.

Consequently, a conservative approach will be taken in constructing the sampling frame. Using a purposive sampling approach, the most popular parenting websites (Parents.com and Babycenter.com) and magazines (*Parents* and *Parenting*) will serve as representative resources for the analysis. In addition to these websites and magazines, the

Associated Press wire will also be included in Study 2. Prior research has shown that the AP wire provides a reasonably representative sample of the national news environment, including newspapers, radio, and television (see Fan, 1988; Fan & Holway, 1994; Fan & Tims, 1989; Yanovitzky & Stryker, 2001).

Study 3 - Survey sampling

First and foremost, the observed levels of seeking and scanning in the sample were modest (24% and 33%, respectively). Observed rates of SSB by source were even lower. From an empirical perspective, this tells us that exposure to this type of information is limited to a small segment of the population – perhaps smaller than initially anticipated. Even so, it is possible that those few exposed mothers are still significantly affected by such exposure, justifying further investigation. While this sample from SSI may not be entirely representative of the sample to be drawn for the cross-sectional survey in Study 3, it is reasonable to assume that they are likely to be similar. The small proportion of mothers who sought information on this topic – and in particular, the limited number reporting routine scanning – has important implications for the design of Study 3. Low self-reported exposure rates may threaten the study's power to detect effects. By casting such a wide net in sampling participants, variance in exposure is likely to be low which could inhibit meaningful and reliable observations.

There are two possible approaches to addressing this concern. First, a significantly larger sample could be drawn in Study 3. While this approach would provide more generalizable results at the population level, the high cost would be impractical. On the other hand, quota sampling could be employed to oversample routine scanners of PPEH information. This approach would both maximize the number of mothers who are scanning in the sample and provide a comparison group (i.e., non-scanners) for observing associations between media engagement, perceptions, and behaviors. Oversampling seekers would be unnecessary given that seeking is only to be used as a potential confounding variable. The challenge to this type of non-probability approach is that it requires certain assumptions about the distribution of key survey variables in the population. Beyond the results of the elicitation survey, little is known about the actual percentages of PPEH information scanners in the population. Insofar as trying to make a claim that this online sample is better than a convenience sample drawn from, say, local pediatricians offices, a concerted attempt to determine the actual distribution of scanners in the population is worthwhile.

Thirty-three percent of respondents to the elicitation survey were reportedly scanners. To confirm this estimation, Study 3 will begin by surveying 200 participants. A revised screening item with a more expansive definition of scanning will be moved to the beginning of the survey to determine the distribution of the dichotomous variable (yes/no) in the population. Once it is apparent how many scanners are responding to the survey, appropriate quotas for each stratum can be set. Post-survey weights may then be applied (if necessary) to adjust for oversampling and correct the proportion of the scanning subgroup back to its representative proportion of the actual population.

Using G*Power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009), it appears a final sample size of at least 779 should permit detection of a small correlation ($r = 0.1$; see J. Cohen, 1977) with a two-tailed test and 80% power.

Study 3 - Survey measurement

The results of the elicitation survey also help to refine Study 3's survey measures in terms of (a) chemical concerns, (b) specificity of information engagement items, and (c) time frame.

Chemical concerns. One of the primary objectives of this study was to assess how mothers conceptualize threats to prenatal and pediatric environmental health threats (RQ2a & RQ2b). Overall, certain chemicals were more familiar/easily recalled than others (i.e., arsenic, asbestos, mercury, lead). In the open-ended item assessing concerning chemicals, mothers tended to provide more general responses (i.e., food, cleaning supplies, air pollution) than specific chemical names. This suggests that broader terms may be more effective when referencing chemical threats (i.e., pesticides vs. 2, 4-D) in Study 3 and is consistent with C.D.C. recommendations for effective environmental risk communication with parents (Agency for Toxic Substances & Disease Registry, 2011). The same can be said of items measuring protective behaviors to reduce exposure to concerning chemicals: responses freely recalled were also general in nature.

While the results from the elicitation survey do not make a strong case for which chemicals should be the focus of assessments in Study 3, mothers' expressed concerns will help refine the development of the content analysis codebook (e.g., excluding the most obscure chemicals) and will thus indirectly influence the survey in Study 3. For inclusion in the final survey, the (type of) chemical or exposure pathway (e.g., cigarette smoke) must:

1) Be (or contain at least one chemical) listed on the E.P.A.'s TEACH Summary of the most concerning chemical threats to children;

2) Have been recognized by a majority of mothers in the elicitation survey;

3) Have been considered concerning by a majority of mothers in the elicitation survey;

4) Be associated with multiple, non-idiosyncratic behaviors that the average mother could perform to reduce prenatal and/or pediatric exposure and that could be effectively measured in a population survey;

5) And finally, receive at least some coverage related to PPEH across the analyzed websites, magazines and the AP wire during the study period (September 2012 – February 2013). While a small amount of coverage will allow for interesting comparisons, concern over a chemical receiving no coverage at all would be irrelevant to this dissertation.

Specificity of information engagement items. The results of this study also demand that several adjustments be made to the measures of both seeking and scanning (SSB). First, examples of potential sources of information will be provided in the dichotomous SSB items to help respondents more deeply consider their own information engagement and increase the likelihood that they provide valid responses. The new items will ask: "did you [actively look for/hear or come across] information about the relationship between children's health and chemicals in the environment from doctors, other people, or the mass media? (yes/no)." To further increase the likelihood of valid responses to these items, all respondents will be given the opportunity to respond to the source-specific SSB questions. In other words, the existing skip patterns that prevented mothers from answering the source-specific SSB questions if they answered “no” to the dichotomous measure will be removed.

One problem arose while analyzing this data: how should the *I don’t recall* responses be handled? To resolve this ambiguity for Study 3, *I don’t recall* will be removed from the response options in the SSB items. Instead, the following statement will be added: “If you are not sure, please make your best guess.” By asking respondents to code their own thoughts rather than giving them a ‘free pass,’ the loss of key data points will be avoided by not having to recode the responses as missing.

The fact that some mothers reported using Facebook as an information source in the open-ended scanning items of the elicitation survey presented an additional concern. It is possible that mothers are thinking of Facebook or Twitter when responding to the source-specific items assessing website seeking and scanning. To reduce this risk, the source-specific items in Study 3 will be revised to ask respondents to “[exclude] search engines, social networks like Facebook, and newspaper websites” from their frequency of website seeking and scanning

A final concern was raised over mothers’ high recall of non-existent media sources. One possible explanation is that the names of the foils (i.e., Babyhealth.com, *Baby Health Magazine*) were too similar to the actual sources and thus misleading. To address this issue in Study 3, the survey will use different, more distinct foils (e.g., Mychildren.com, *My Child Magazine*). A cursory search of source names confirmed that these titles were not similar to any popular parenting sources in the current media environment.

Another equally likely explanation is that mothers felt compelled by a social desirability bias to be perceived as a ‘good mom,’ reporting exposure to all possible sources listed. This issue will be addressed in two ways. First and most simply, a measure of social desirability will be included in the survey and in subsequent analyses as a covariate. Second, a more stringent standard will be set for these title-specific engagement items. Questions will be re-written in such a way as to give moms an opportunity to respond in a socially desirable way without necessarily having to count their answers as actual exposure in the analyses. This will be achieved by changing the response options to 0 (*not at all*), 1 (*maybe once or twice*), 2 (*1 to 2 times*), and 3 (*3 times or more*). All *maybe once or twice* responses will be recoded as missing.

Time frame. Given the time elapsed between the two survey studies and the amount of content analysis data collected (September 2012 – February 2013), the time frame for all survey items can be changed from four (4) to six (6) months. Extending the time frame should allow for greater reports of information engagement and protective behaviors, as well as more stable estimates of the information environment and its relationship to key outcomes.

CHAPTER FOUR

Study 2: Characterizing pediatric environmental health information in the mass media

Overview

This chapter describes the structure and results of Study 2 – a systematic content analysis of prenatal and pediatric environmental health information covered in the mass media and consumed by new and expecting mothers. The two primary objectives of this study are (1) to estimate the prevalence of media coverage received by pediatric environmental health threats and (2) to examine how certain PPEH risks are characterized. Importantly, the results of this study will serve to further guide the focus and development of survey measures in Study 3, as well as inform *a priori* expectations about the directions of the hypothesized media effects in Studies 3 and 4.

In the next section, a series of research questions are put forth, followed by a review of the content analytic methods employed. The chapter concludes with a presentation and discussion of results.

Research questions

Based on a review of the literature, it appears that there have yet to be any formal studies investigating mass media coverage of prenatal and pediatric environmental health. Because media outlets serve as gatekeepers of information, essentially telling audiences what issues to think about (B. C. Cohen, 1963), the first question to be addressed is:

RQ1: How prevalent will information about chemical threats to PPEH be in the media?

More specifically, it will be important to determine the amount of attention the mass media pays to specific chemicals considered most threatening to PPEH by mothers and environmental health experts, particularly those featured in the E.P.A.'s TEACH Summaries (Environmental Protection Agency, 2011). Accordingly, the second research question posed is:

RQ2: How much media coverage do the most concerning individual chemical threats to PPEH receive?

Based on findings from prior research on environmental health news (i.e., Lichter & Rothman, 1999), it could be expected that coverage will tend to favor novel or unfamiliar risks that are considered less concerning by experts. Knowledge of mothers' responses to the survey questions in Study 1 could also lead to an *a priori* expectation that certain chemicals might be receiving more media coverage than others – particularly, lead, mercury, and secondhand tobacco smoke. That said, such an expectation could be misguided, and thus the search terms used in this study include a wide range of potential PPEH topics (see Methods for detailed explanation of search term development). On a descriptive level, a systematic tally of prominent chemical topics in the media is useful for pediatric health communicators, researchers, and to a certain extent, moms. For the purposes of this dissertation, the tally serves an additional and important purpose – informing the scope of Study 3's topic-specific behavior and perception measures.

The next set of research questions address the second objective of this study – to determine the content characteristics of PPEH-related media coverage – and should provide valuable insight into which determinants of behavior – normative and/or control perceptions – are likely to be primed by media exposure. The focus of the next two research questions is determined by the answers to the first two research questions. That is to say, the three chemical issues that will become the focus of Study 3's survey (based on the results of the present study, specifically RQ2) will also be the focus of these two deeper content-related questions.

First, environmental hazards may be regulated by policymakers, managed by industries and manufacturers, and/or mitigated at the individual level. Research on priming (e.g., Iyengar, 1989) suggests that overt attributions of responsibility in the media may prime certain normative perceptions about a behavior. Scholars have suggested that motherhood is becoming increasingly medicalized, intensive, and scientific (e.g., Armstrong, 2008; Hays, 1996; Litt, 2000), so it is possible that social expectations of intensive mothering are conveyed and primed by the media. In other words, media coverage may routinely communicate and drive injunctive norms (which behaviors are socially approved or disapproved) and/or descriptive norms (which behaviors are popular or typically performed) (Cialdini, 2003). Because perceptions of personal responsibility may factor into behavioral prediction, it is important to determine the following:

RQ3: Is responsibility for causing or mitigating chemical exposure risks addressed in media coverage? If so, to whom is responsibility attributed: individuals (i.e., mothers), manufacturers, or policymakers?

In addition to communicating to mothers what they should do and why (e.g., reduce exposure to BPA because it is popular and/or increases the likelihood they will be perceived as 'good' mothers), the media may also help them sort out what they *can* do.

Some qualitative content-analytic work has examined expert child-rearing advice in media sources targeting parents, such as Rutherford's (2009) study of the depiction of parental authority and child autonomy in *Parents Magazine* and Clarke's (2013) examination of advice to mothers in *Chatelaine* about children's mental health issues; but questions still remain related to advice in the context of PPEH risks.

Because risk information directly communicates threat, these types of messages have the potential to cause unbridled fear – a withdrawal emotion – and decrease motivation to process valuable risk information (Nabi, 1999). Research suggests that messages containing a threat should also include recommendations for increasing self-efficacy to address the threat (Witte, 1992, 1998). By coupling efficacy information with risk information, message developers can increase the likelihood that the receiver will adopt danger control processes, or desired behavioral outcomes, rather than avoiding the threat by focusing on fear control processes (Stephenson & Witte, 2001).

If media coverage mostly attributes responsibility to policymakers and manufacturers, mothers may be likely to perceive themselves as unable to control these risks themselves. On the other hand, if mothers believe they are responsible for mitigating environmental health risks, the inclusion of constructive efficacy information (e.g., advice on how to purchase non-toxic products, where to seek additional information) in media coverage may be particularly important. The final research question to be addressed is:

RQ4: To what extent does media coverage of chemical threats to PPEH include advice, or recommendations for increasing self-efficacy?

Methods

Study population

To address the above series of research questions, Study 2 content analyzes media coverage of prenatal and pediatric environmental health during a six-month period (September 2012 – February 2013) across three media platforms: the Associated Press (AP) domestic wire services, parenting magazines and parenting websites. Specific content sources were selected on the basis of what is *consumed* by and *available* to new and expecting mothers – two key factors in generating an externally valid sampling frame (Jordan & Manganello, 2009).

Key insights for defining the study population parameters based on *consumption* rates were drawn from the survey results in Study 1. As anticipated, there was clear empirical justification for the inclusion of websites, which were consistently rated among the most sought and scanned sources of PPEH information. Magazine scanning was also relatively common. While the open-ended responses in Study 1 suggested somewhat higher recall of scanned exposure to PPEH information on television and in the news more generally, no definitive conclusions could be drawn about the relative rate of newspaper exposure due to the small number of responses. So rather than examining say, the top 50 newspapers, the more appropriate and conservative approach to defining the sampling frame was to include content from the Associated Press since it has been shown to reflect the broader news environment (i.e., newspapers, radio, and television).

To further narrow the scope of the study population, publicly available statistics reporting the *availability* of key sources were consulted. Parenting magazines with the highest circulation rates – *Parenting* and *Parents* – were included in the study population, as well as content published on the two most heavily trafficked parenting websites – Babycenter.com and Parents.com (see Table 4.1 for circulation rates and traffic statistics). Finally, Lexis-Nexis® was used to identify relevant stories from the Associated Press (AP) domestic wire services, including state and local wires.

Table 4.1 Traffic and circulation rates for popular parenting websites and magazines

Website	Total Circulation[a]	Magazine	Total Visitors[c]
Parenting	2,231,783	Babycenter.com	52,884,163
Parents	2,213,162	Parents.com	26,530,989
American Baby[b]	2,000,000	Whattoexpect.com	13,145,736
Fit Pregnancy	503,577	Parenting.com	8,457,345
Pregnancy & Newborn	236,250	Thebump.com	6,281,407
Pregnancy	130,000	Mothering.com	5,180,419
		Pregnancy.org	1,263,800
		Fitpregnancy.com	849,812

[a] Total circulation consists of a publication’s paid subscriptions, single copy purchases, and non-paid circulation for six months ending December 31, 2011. Source: Audit Bureau of Circulations (ABC).
[b] Title not listed in ABC Report. Estimated annual circulation from the magazine's publisher, Meredith Corporation, which also publishes *Parents.*
[c] Total unique visitors from February 2011-February 2012. Source: Compete.com (2012).

Sampling procedure

As mentioned, the central challenge with any content analysis is capturing a sample of the population that is “valid and representative of what is available in the media landscape and/or what is consumed by audiences of interest” (Jordan & Manganello, 2009, p. 54). For the purposes of this study, both probability and purposive sampling techniques are combined to draw a strong, externally valid sample of websites, magazines, and news stories to which parents are likely to be exposed.

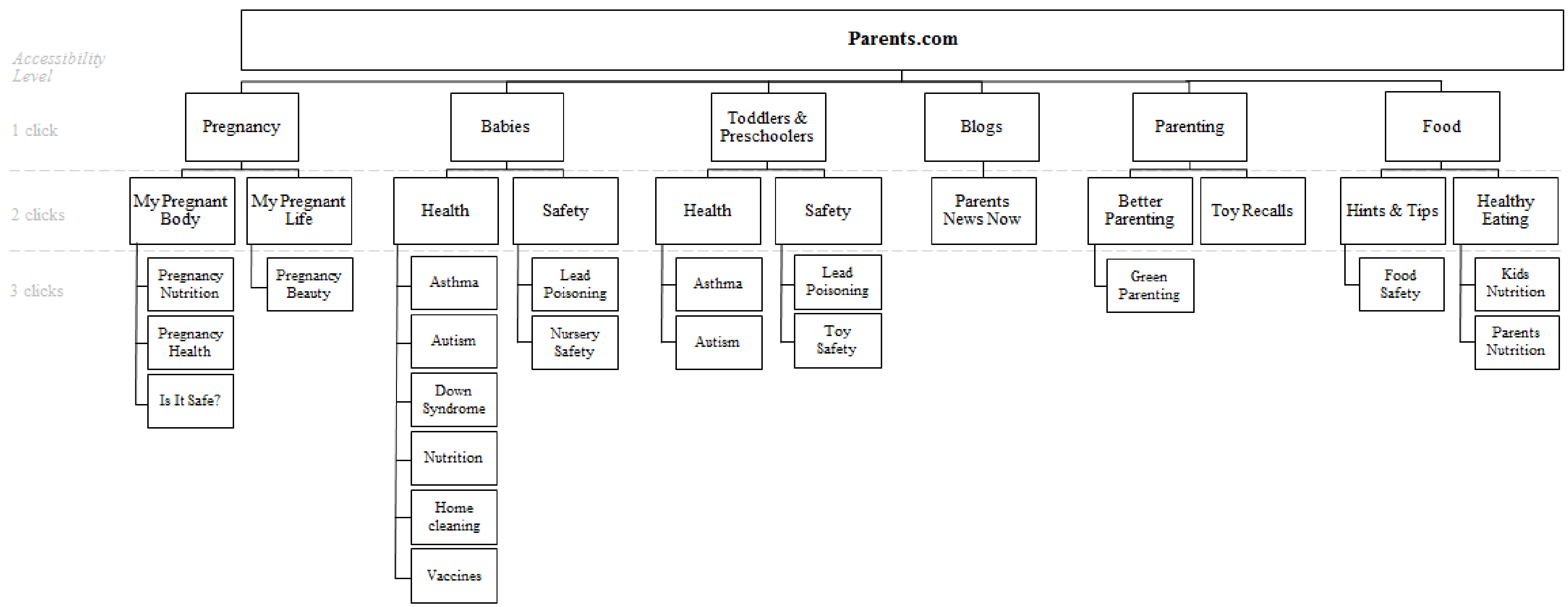
Websites. A traditional approach to content analysis was applied to analyzing web-based content (Herring, 2010; McMillan, 2000). The sheer size of the Internet necessitates an approach that purposively samples the most popular sources of information based on website traffic data (Weare & Lin, 2000). Because websites are structured as a "hierarchy of information, connected via hyperlinks to an infinite number of other sites," the structure of website content is much more complex and vast than printed magazines or digitally archived newspaper articles (Okazaki & Rivas, 2002, p. 383). The only consistent unit of analysis across websites is the homepage, or first page a visitor encounters upon entering a site. To focus exclusively on the content featured on a homepage, however, would not be reflective of actual patterns of media exposure because it excludes content easily retrieved by visitors with just a few quick clicks (Weare & Lin, 2000). Of course, collecting all navigable information on a complex and massive website would be a daunting task.

A sophisticated program was developed with the assistance of the Annenberg IT staff to automatically and selectively harvest and index individual web pages from Babycenter.com and Parents.com in real time. The entire program was developed in C# language and designed to repeatedly fetch HTML pages for a given set of web addresses (e.g., http://www.babycenter.com/is-it-safe-during-pregnancy). The two websites differed in their structure and presentation of online content; thus, a map was developed for each site to inform programmers which HTML pages were to be extracted (see to Appendix C for full mapping of HTML pages scraped in this study). These pre-specified sections were identified as areas where PPEH information was likely to be posted.

In order to capture PPEH information incidentally encountered during routine use of these websites, the program took a novel approach in that it was designed to extract content using a 'three-click' rule. That is, only content accessible to visitors through three clicks – or three levels down from the homepage – was targeted in the sampling procedure. The full process could be compared to identifying nutrient-rich areas in a garden and scraping off just those layers of topsoil while leaving the rest behind. Figure 4.1 offers a snapshot of the three-click hierarchy based on the site mapping of Parents.com. The intention of the three-click rule was to create a snapshot of what a casual website browser might encounter if she was not actively searching for PPEH information, but merely came across the content in a more incidental way.

The initial section mapping took a top-down approach in which each site's interface and main menus were manually reviewed to identify areas where relevant content was likely to be posted. It seemed possible given the enormity of each site that this approach could potentially miss relevant content. So, after the top-down mapping was complete, a bottom-up approach was taken to ensure no relevant areas were overlooked. This was achieved by using key terms in the search bars provided on the homepage of each website to search the entire site for relevant content. Articles retrieved were examined for relevancy. If a site location was found that had not previously been identified and was reachable through three clicks from the homepage, the corresponding web address was added to the map for harvesting. This verification process resulted in only two additional HTML pages mapped for Babycenter.com.

Figure 4.1 Example of website content sampling procedure using three-click hierarchy - Parents.com



In order to keep pace with frequent site updates, each HTML page was scraped once every 24 hours to extract relevant information, such as headlines, article content, embedded hyperlinks, and accompanying imagery. A check was performed at the start of each month to ensure that the original HTML page maps remained valid. Programming purposefully restricted content extraction to featured slideshows and articles linked under prominent headlines (e.g., “Articles,” “Expert Answers,” “News, “Polls” and “Don’t Miss”). If the content extracted was in the form of a slideshow (connected content spread out across separate HTML pages), it was coded as a single page since slideshows tend to be viewed as a cohesive unit. Overall, coding ensured that extraneous content populating each web page (i.e., banner advertisements) would not dilute the extracted data. Content not generated by the news and editorial teams of the websites (i.e., community message board posts) was also filtered out during this process. Communication between parents in these forums can provide valuable social support and has been studied (for review, see Plantin & Daneback, 2009); however, it is beyond the scope of this investigation for practical reasons.

To maintain the manageability of the data, it was important to properly handle duplicated content. It was anticipated that two types of duplicates would be encountered during content extraction: static articles and repurposed articles. Static articles were those that appeared in the same location on the website for multiple days and were extracted during more than one 24-hour cycle. Repurposed articles were those that contained identical content, but appeared in different site locations on the same day. The same article about phthalates in baby shampoo, for instance, might appear under the section for “Baby Bathing” as well as “Expert Answers” on Babycenter.com – essentially two different HTML pages. To handle the issue of duplicates, the C# program was designed to (a) tally the number of days a static article appeared on the same HTML page and (b) extract repurposed articles from different HTML pages as individual units of analysis. This way, it was easier to tell whether the same content lived on the site for multiple days or whether the same content might be encountered in different locations on the site during the same day. Also, if a particular piece of content was removed from a site and then re-posted on a later date – albeit a very rare occurrence – a new line of data was created in the database to distinguish it from the first publication period and to capture the duration of its subsequent appearance.

All extracted content was saved to a Microsoft SQL Server, a database management software product, following each extraction. Each month, saved data was exported to Microsoft Access, a separate database management system, to facilitate file sharing, as well as more user-friendly and in-depth data analysis. Content was scraped for a total of 186 days during the course of the study. On 12 of those days, Parents.com made no new updates to its site.[3] Babycenter.com performed daily content updates throughout the duration of the scraping process. In retrospect, the relatively small number of days without updates validated the decision to extract content every 24 hours.

Once online data collection was complete, distinct search terms were developed and implemented in Microsoft Access to electronically filter the content to coverage of specific PPEH topics. The full list of topics is provided in Table 4.2 (see Appendix D for search terms). After filtering by search terms for each PPEH topic, the resulting content for each topic was imported into a Microsoft Excel-based coding sheet. HTML pages

[3] Days in 2012 with no content updates on Parents.com: October 7 & 22; December 7, 11, & 24. Days in 2013 with no content updates on Parents.com: January 6, 12, & 21; February 3, 10, 16 & 23.

retrieved were then hand coded by two independent coders to determine relevance (see Codebook #1 in Appendix E for set criteria) and then checked for reliability (e.g., Cohen's *kappa*; J. Cohen, 1960).

Table 4.2 PPEH chemical topics examined in Study 2 (n = 14)

Chemical listed in E.P.A.'s TEACH Summary
Arsenic
Lead
Mercury
Bisphenol A (BPA)
Polychlorinated biphenyls (PCBs)
Phthalates
Category/Pathway of Chemical
Pesticides
2, 4-D, atrazine, DEET, dichlorvos and pyrethriods/permethrin/resmethrin
Drinking water quality
atrazine, nitrates/nitrites, trichloroethylene (TCE)
Outdoor air pollution
particulate matter (PM), polyvinyl chloride (PVC), smog, benzene, formaldehyde
Cigarette smoke
Benzene, benzo(a)pyrene (BaP), formaldehyde
Flame retardants
polybrominated diphenyl ethers (PBDEs)
Not listed in or associated with TEACH Summary
Cleaning supplies
Food additives
Other topic

Note. Italicized chemicals = chemicals listed in EPA's TEACH Summaries and associated with the chemical category/pathway listed above. This list was reduced from an original list of over 55 chemicals and chemical categories/pathways either known or commonly speculated to threaten prenatal and pediatric health. The survey results from Study 1, as well as the E.P.A.'s TEACH Summaries and the A.A.P.'s Green Book (2011), informed the development of this refined list. "Other topic" included asbestos, carbon monoxide (excluding references in the context of cigarette smoke), dichlorophenol, PFOA/PTFE/Teflon, perchloroethylene (perc), radon, styrene/styrofoam, paint fumes, and volatile organic compounds (VOCs).

After one practice coding round, inter-coder reliability was established on a random sample of 75 texts (*kappa* = .84). Ninety percent of relevant texts were coded as relevant by the second coder while only 5% of irrelevant texts were coded as relevant by the second coder. At last, the finalized closed terms were run on the universe of texts and the resulting content for each topic was imported into a Microsoft Excel-based coding sheet.

Table 4.3 presents a summary of the precision of the entire scraping and closed search term process in returning relevant content. The terms ‘recall’ and ‘precision’ used here are loosely based on Stryker and colleague’s (2006) definitions in the context of search term validation in electronic databases. Recall is the ability to capture relevant content from a universe of texts with a given search term. Precision is the ability to avoid capturing irrelevant content. It should be noted that a systematic application of search terms was applied to the data set, but only after the data had been purposively scraped from the target webpages. In a sense, the scraping process itself could be loosely equated to what Stryker refers to as the ‘open search term,’ whose goal it is to achieve perfect recall by identifying all relevant texts. The scraping program was designed to capture content likely to be encountered incidentally across a wide range of website subsections; therefore, the relatively low levels of scraping precision and high levels of search term precision presented in Table 4.3 were expected. Among HTML pages with relevant content (n = 2,264), 33% were repurposed articles that contained identical content and appeared on the same day in different website locations (e.g., under ‘Baby Bathing’ *and* ‘Expert Answers’).

Table 4.3 Precision of website scraping and closed search terms

	Parents.com	Babycenter.com
HTML pages scraped	2,074	3,408
HTML pages recalled[a]	989	1,354
Scraping precision	47.7%	39.7%
HTML pages with relevant content	947	1,317
Search term precision	95.8%	97.3%

Note. Scraping precision = the number of HTML pages with recalled with the closed search terms divided by the number of HTML pages scraped. Search term precision = the number of HTML pages HTML pages coded as relevant to this study divided by the number of HTML pages recalled with the closed search terms.
[a] Using validated closed search terms.

Magazines. The sampling procedures for magazines differed from the electronic search used for websites. Sampling methods employed in earlier studies focusing purposively on the most popular parenting magazines (e.g., Foss & Southwell, 2006; Manganello et al., 2012) were adapted to determine the eligibility of magazine articles and advertisements for Study 1. Perhaps most importantly, the time frame used for magazine sampling was one month longer than the other two sources in this study (September 2012 – March 2013). This decision was based on the unique publishing norms in the magazine industry. Magazine cover dates are unlike newspapers and websites in that their dates of publication do not perfectly reflect when information is released for public consumption. It is standard practice for monthly magazines to display a cover date that is a full month into the future from the actual publishing or release date (e.g., an issue dated March 2013 will appear on store shelves in February 2013). This practice allows magazines to maintain a current appearance while accounting for time lags due to shipping and distribution. The cover date is also commonly referred to as the “pull date” and is used to inform newsstands as to when they can pull a magazine off the shelf. Because magazines have a relatively longer shelf life and tend to linger in homes and doctor’s offices, it seemed appropriate to include September 2012 in the sample, even though it was released in August 2012. The final magazine sample included a total of 13 issues: seven issues of *Parents* and six issues of *Parenting.*[4]

Once the issues were collected, each table of contents was reviewed for signifiers of an environmental health article such as the words toxic, environment, chemical, safety, or health. Next, the full text of the article was examined to determine whether it centered on environmental health as indicated by the headline and/or lead paragraph. Articles that contained at least one statement about any PPEH-related toxic threats were eligible for inclusion. Health question and answer articles were also reviewed for relevant content following the same procedure.

In addition, all advertisements in the selected issues were assessed using the same criteria. For the purposes of this study, an advertisement – defined as a “sponsored image or text appearing in the magazine specifically for the purpose of selling a product or promoting a specific behavior” (Foss & Southwell, 2006, p. 4) – was included if it pertained to prenatal or pediatric environmental health. The inclusion of magazine advertisements became necessary for two reasons. First, ads for ‘eco-friendly’ products were noticeably common in these outlets. A preliminary search through smaller-scale parenting magazines put forth by the sample publishers of *Parenting* and *Parents* –

[4] The cover date for one issue of *Parenting* (December/January 2013) spanned two months. Rather than publishing two separate monthly issues, *Parenting* traditionally releases only one issue during this time of year. Although it is only counted once in the sample total of issues (n = 13), content coded in this double issue was tallied twice (e.g., 2 articles discussing pesticides became 4 articles discussing pesticides) to more accurately reflect the availability of the magazine and its contents during two full months of the study.

BabyTalk and *American Baby,* respectively – revealed that relevant advertisements actually outnumbered relevant editorial content. Secondly, time-series analyses have shown that magazine advertisements may influence parents' subsequent health behaviors, even more so than editorial content (Foss & Southwell, 2006). Because many environmental health threats are inextricably linked to consumer products, excluding this type of content from the analysis would have been myopic.

News stories. News media coverage was measured using news from the Associated Press (AP) because it has been shown to be representative of the national news environment, including newspapers, television and radio (Fan, 1988; Fan & Tims, 1989; Yanovitzky & Stryker, 2001). AP stories are used by more than 6,000 broadcast stations and 1,400 daily newspapers in the United States (The Associated Press, 2013; Fan & Holway, 1994). It is also estimated that AP news content is seen by half the world's population on any given day (The Associated Press, 2013). AP content may differ across individual sources for a variety of reasons (i.e., time, space), but the topics themselves being covered tend to be similar (Fink et al., 1978; Rogers, Dearing & Chang, 1991). For the purposes of this study, it is therefore reasonable to assume that the prevalence of PPEH issues in the Associated Press domestic wire services is representative of the prevalence of these issues in most U.S. news media.

Traditionally, content analyses that focus on print news sample articles from a large number of sources (e.g., top 50 newspapers) and/or extend over long periods of time (e.g., the past 25 years). Because Study 1 revealed that mothers rely on news generally rather than newspapers specifically, the focus of this study was limited to just two sources: the AP domestic wire and the AP state and local wire. Moreover, this study required real-time extraction of online content, further limiting the scope of the study to a six-month time frame. In sum, the number of AP articles retrieved in this study would not compare to the thousands of articles retrieved in other larger and longer content analyses of news. For these reasons, the formal development and validation of a complex search term would have been excessive.

Nevertheless, since AP stories tend to be written for general audiences and are thus less likely to be relevant to mothers, revisiting the search term creation process was important. A modified approach to Stryker and colleagues' (2006) search term validation was used to create individual search terms for each of the 14 topics specified above in Table 4.2. Stryker and colleagues (2006) outline three stages for developing and evaluating the validity of complex search phrases to identify topic-specific texts within electronic databases. As mentioned earlier, the objective is to capture a large proportion of relevant texts (high recall) and exclude a large proportion of irrelevant texts (high precision). In Stage I, the researcher must establish the universe of texts (e.g., content published by the AP between September 1, 2012 and February 28, 2013), define story relevance based on the study's research questions (e.g., articles that include PPEH information; see Codebook #1 in Appendix E for full criteria), and specify adequate recall and precision requirements.

Stage II of the search term validation process is comprised of developing and refining search phrases using a random sub-sample of texts. To increase precision, the "closed" search phrases were created and refined by adding exclusion terms through an iterative analysis of another sub-sample of texts retrieved using the open search phrases (see Appendix D for full list of open and closed search terms). Because of the relatively small number and eventual hand coding of all relevant stories, a premium was placed on recall rather than precision. After the creation of the closed search terms, stories retrieved from Lexis-Nexis were then hand coded by two independent coders to determine relevance and then checked for reliability. Content relevancy was then coded in the coding sheet (0 = irrelevant content, no PPEH information present; 1 = relevant content, PPEH information present).

Because the AP wire tends to cover general news rather than niche information targeted at specific populations like pregnant women, it was recognized *a priori* that a significant proportion of stories would mention increased risk to pregnant women and children only briefly within more general stories about environmental health risks. For instance, coverage of a new study about arsenic detected in rice would likely appeal to a mass audience, while still making mention of the increased risk to vulnerable populations. Accordingly, even brief mentions of PPEH risks in stories were considered relevant.

After one practice coding round, inter-coder reliability was established on a random sample of 40 articles pooled across chemical topics (*kappa* = .94). Ninety-six percent of relevant texts were coded as relevant by the second coder while no irrelevant texts were coded as relevant by the second coder. Lastly, the finalized closed terms were run in Lexis-Nexis and sampled articles were coded for relevance. Of the 299 articles retrieved by the search terms, 198 (66.2%) were relevant.

Content coding procedure

This section discusses the coding procedures for website, magazine, and AP content aimed to address the research questions set forth in Study 2. The full codebook features detailed coding instructions, including definitions and examples of these content characteristics from existing print and online articles (see Appendix E). Article source (1 = The Associated Press Wire; 2 = Parents.com; 3 = Babycenter.com; 4 = *Parents Magazine*; 5 = *Parenting Magazine*), month (1 = September 2012; 7 = March 2013) and type (1 = AP news story; 2 = website editorial; 3 = blog; 4 = magazine editorial; 5 = magazine advertisement) were coded for all content sampled. For comparisons across source type, article source was recoded into a three-category variable (1 = *AP*; 2 = websites; 3 = magazines). To address RQ1, the first set of coding procedures identified how much coverage PPEH issues received during the study period across sources. For website and AP sources, this variable was coded and counted electronically. Magazine coverage was hand coded.

To address RQ2, the second set of coding procedures identified which of the 14 chemical topics examined in this study were covered most often. Twelve of the topics coded included at least one chemical cited in the E.P.A.'s TEACH Summaries. In Study 1, we learned that mothers were particularly concerned about food additives and cleaning supplies – two topics not considered by the E.P.A. to be of particular concern. That being said, it seemed prudent to include these two topics in the content analysis for exploratory purposes. For all sources, this variable was hand coded. A final category labeled "other" captured additional PPEH topics (e.g., PFOAs, carbon monoxide).

To address RQ3, content across all three source types was hand coded for the absence or presence of both responsibility for the problem and responsibility for the solution, as well as the locus for each attribution (i.e., parents/caregivers, manufacturers, and/or policymakers). Finally, answering RQ4 involved coding the absence or presence of efficacy information. Again, these content characteristics were only coded for the three chemical topics chosen for inclusion in Study 3. Intercoder reliability was established on a random sample of 40 relevant texts; across all variables, *kappa* ranged from 0.72 to 1.00. The remaining texts were divided evenly between the two coders for content coding.

Analytic procedure

To address RQ1, a period prevalence rate was calculated based on the number of relevant media content units identified across each source over the six-month period. In this study, the period prevalence rate (a term often used in epidemiology) provides an estimate of the amount of PPEH information available during a specified period of time. Descriptive analyses – primarily basic frequency analyses and χ^2 analyses – were also performed to address RQ2, RQ3, and RQ4. All analyses were performed using the statistical software package SPSS Statistics 20 (IBM Corp, 2012).

Results

Prevalence of PPEH information in the media

Between September 1, 2013, and February 28, 2013, the sampling procedure yielded 2,606 hits. Of these, 2,550 (97.9%) were determined to be relevant.[5] The period prevalence rate can be loosely interpreted as the amount of PPEH information available to mothers across the five media sources during the six-month period. Here, that figure is 510 pieces of PPEH information, given five sources in the universe of texts and 2,550 relevant content units. On average, this would equate to roughly 2.83 pieces of PPEH information available in the mass media for mothers per day. These estimates should not be interpreted as a measure of individual exposure to PPEH information in these sources (such measures will be better assessed in Study 3), but rather as what is available in the information environment. Here, the likelihood of exposure to any given piece of PPEH information in the media is ignored, as are encounters with such information that are mediated through medical professionals and interpersonal sources, resulting in an underestimate of total information availability.

Fifty-two percent of PPEH information was published by Babycenter.com, 37% by Parents.com, 8% by the AP Wire, 2% by *Parenting Magazine*, and 2% by *Parents Magazine*. Of articles published by on parenting websites, only 3% were blogs (versus editorials). As for relevant content published in magazines, 72% were advertisements (versus editorials). As noted above, the two parenting websites account for a significant

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[5] This figure could be characterized as 'inflated' for two reasons. First, every magazine article sampled (n = 92) was determined to be relevant as this was a pre-condition in the sampling procedure itself. Second, web-based content was likely to be relevant given that it (a) focused exclusively on pregnant women and young children living in the United States and (b) underwent an extensive sampling process that filtered out a significant portion of content unrelated to PPEH before coding even began. By comparison, only 65.8% (n = 194) of stories from the Associated Press were determined to be relevant.

portion of overall coverage, an unsurprising observation given greater space constraints in magazines and news sources.

Topical focus of PPEH information in the media

News stories. Table 4.4 shows the percentage of AP news stories by chemical topic, and examples of PPEH information for the most common topics are provided in Table 4.5. The most common topics were outdoor air pollution, cigarette smoke, pesticides and mercury. Indoor air quality and cleaning supplies were never mentioned.

Table 4.4 Percentage of PPEH information in Associated Press news stories by chemical topic (N = 198)

Chemical topic	N	%
Arsenic	3	2
Lead	6	3
Mercury	15	8
Bisphenol A (BPA)	7	4
Indoor air quality	0	0
PCBs	4	2
Pesticides	17	9
Phthalates	1	1
Cleaning supplies	0	0
Food additives	12	6
Drinking water quality	3	2
Outdoor air pollution	48	25
Cigarette smoke	23	12
Flame retardants	1	1
Other topic	54	28

Note. "Other topic" included asbestos, carbon monoxide (excluding references in the context of cigarette smoke), dichlorophenol, PFOA/PTFE/Teflon, perchloroethylene (perc), radon, styrene/styrofoam, paint fumes, and volatile organic compounds (VOCs).

Many articles cited research studies that showed a link between exposure to chemicals and adverse health effects in pregnant women and children, as well as the role of regulation in protecting public health. Because data collection took place during the 2012 presidential election, a number of stories summarized candidates' political platforms (i.e., environmental regulation, public health objectives).

Table 4.5 Examples of most common topic-specific PPEH information in Associated Press news stories

"Environmental Protection Agency Administrator Lisa Jackson said the new standard will save thousands of lives each year and reduce the burden of illness in communities across the country, as people "benefit from the simple fact of being able to breathe **cleaner air** [emphasis added]." As a mother of two sons who have battled asthma, Jackson said she was pleased that "more mothers like me will be able to rest a little easier knowing their children, and their children's children, will have cleaner air to breathe for decades to come."
(*The Associated Press*, December 14, 2012)
"The nine graphic warnings proposed by the FDA include color images of a man exhaling cigarette smoke through a tracheotomy hole in his throat, and a plume of **cigarette smoke** [emphasis added] enveloping an infant receiving a mother's kiss. These are accompanied by language that says smoking causes cancer and can harm fetuses."
(*The Associated Press*, October 9, 2012)
"Organic produce had a 30 percent lower risk of containing detectable **pesticide** [emphasis added] levels. In two studies of children, urine testing showed lower pesticide levels in those on organic diets... Still, some studies have suggested that even small pesticide exposures might be risky for some children, and the Organic Trade Association said the Stanford work confirms that organics can help consumers lower their exposure."
(*The Associated Press*, September 4, 2012)
"**Mercury** [emphasis added] concentrations accumulate in fish and go up the food chain, posing the greatest risk of nerve damage to pregnant women, women of childbearing age and young children."
(*The Associated Press*, January 10, 2013)

Magazines. Table 4.6 shows the percentage of PPEH information in parenting magazines by chemical topic. The overall topical focus of information did not vary significantly across the two magazine titles: χ^2 (10, n = 92) = 11.15, p = .346. The most common topics in both titles were cleaning supplies and food additives. Nearly all of these hits were found in advertisements marketing "all-natural" cleaning products and food. Only 7% of food additive hits (n = 3) came from editorial content. The proportion of editorial mentions of the risks associated with cleaning products was also low (14%). Most of the hits related to phthalates (75%) also came from advertisements promoting "phthalate-free" personal care products. Five out of 7 (71%) total hits for indoor air quality were also from advertisements for air filters and testing kits. Lead, PCBs, drinking water quality, and flame retardants were not mentioned in either magazine during the study period.

Only one chemical topic – pesticides – received featured editorial coverage, meaning the topic was discussed in detail over several pages of the magazine. An editorial dedicated to pesticides in *Parenting Magazine* reported news from the American Academy of Pediatrics on the resurrection of the organic produce debate in light of new research findings. A similar feature editorial communicating the PPEH risks of pesticide exposure in *Parents Magazine* focused on the threat of unintentional human exposure to the chemicals during attempts to keep one's home and garden pest-free. Examples of PPEH information conveyed by these editorials are provided in Table 4.7.

Table 4.6 Percentage of PPEH information in *Parenting Magazine* and *Parents Magazine* by chemical topic (N = 92)

	Parenting		*Parents*		Total
Chemical topic	N	%	N	%	%
Arsenic	0	0	2	4	2
Lead	0	0	0	0	0
Mercury	0	0	1	2	1
Bisphenol A (BPA)	3	7	1	2	4
Indoor air quality	5	12	2	4	8
PCBs	0	0	0	0	0
Pesticides	2	5	3	6	5
Phthalates	3	7	6	12	10
Cleaning supplies	8	19	5	10	14
Food additives	19	45	23	46	46
Drinking water quality	0	0	0	0	0
Outdoor air pollution	0	0	1	2	1
Cigarette smoke	2	5	3	6	5
Flame retardants	0	0	0	0	0
Other topic	0	0	3	6	3
Total N	42		50		

χ^2 (10, n = 92) = 11.15, p = .346
Note. "Other topic" included asbestos, carbon monoxide (excluding references in the context of cigarette smoke), dichlorophenol, PFOA/PTFE/Teflon, perchloroethylene (perc), radon, styrene/styrofoam, paint fumes, and volatile organic compounds (VOCs).

Table 4.7 Examples of editorials dedicated to pesticides in *Parenting Magazine* and *Parents Magazine*

"There is convincing evidence, however, that eating organic foods reduces exposure to pesticides, and experts unanimously agree that avoiding pesticides as much as possible is best for the still developing brains of children."

(*Parenting Magazine*, February 2013)

"You make a conscious effort to keep your child away from harmful substances – medications have a childproof top, the laundry detergent and drain cleaner are kept well out of reach. But if a mouse scurries across your kitchen floor, you might not think twice about turning to chemicals for help. And yet pesticides… contain a wide range of chemicals that may pose serious health risks to you and your family."

(*Parents Magazine*, March 2013)

Websites. Table 4.8 shows the percentage of PPEH information on parenting websites by chemical topic, and examples of PPEH information for the most common topics are provided in Table 4.9. The overall topical focus of information varied significantly across the two websites: χ^2 (14, n = 2,264) = 302.01 p < .001. Nearly every chemical topic included in the analysis received at least some coverage across these two sites, with the exception of PCBs and flame retardants. The most common topics were cigarette smoke, food additives, and mercury.

Table 4.8 Percentage of PPEH information on Babycenter.com and Parents.com by chemical topic (N = 2,264)

	Babycenter.com		Parents.com		Total
Chemical topic	N	%	N	%	%
Arsenic	30	2	7	1	2
Lead	49	4	84	9	6
Mercury	138	10	184	19	14
Bisphenol A (BPA)	110	8	48	5	7
Indoor air quality	11	1	24	3	2
PCBs	13	1	0	0	1
Pesticides	156	12	86	9	11
Phthalates	60	5	19	2	3
Cleaning supplies	24	2	77	8	4
Food additives	217	16	144	15	16
Drinking water quality	88	7	4	0	4
Outdoor air pollution	47	4	7	1	2
Cigarette smoke	295	22	143	15	19
Flame retardants	19	1	0	0	1
Other topic	60	5	120	13	8
Total N	1,317		947		

χ^2 (14, n = 2,264) = 302.01, p < .001
Note. "Other topic" included asbestos, carbon monoxide (excluding references in the context of cigarette smoke), dichlorophenol, PFOA/PTFE/Teflon, perchloroethylene (perc), radon, styrene/styrofoam, paint fumes, and volatile organic compounds (VOCs).

A majority of the information provided about smoking focused on the risks of prenatal exposure (e.g., preterm birth, poor reading skills, obesity), as well as secondhand smoke's link to childhood asthma and meningitis. Most articles about food additives discussed the new U.S. Department of Agriculture (U.S.D.A.) guidelines regarding trans fat and whether aspartame is safe for pregnant women. Information about mercury tended to focus on safe eating during pregnancy (i.e., reducing consumption of certain types of fish) and the vaccine-autism debate.

Table 4.9 Examples of most common topic-specific PPEH information on Babycenter.com and Parents.com

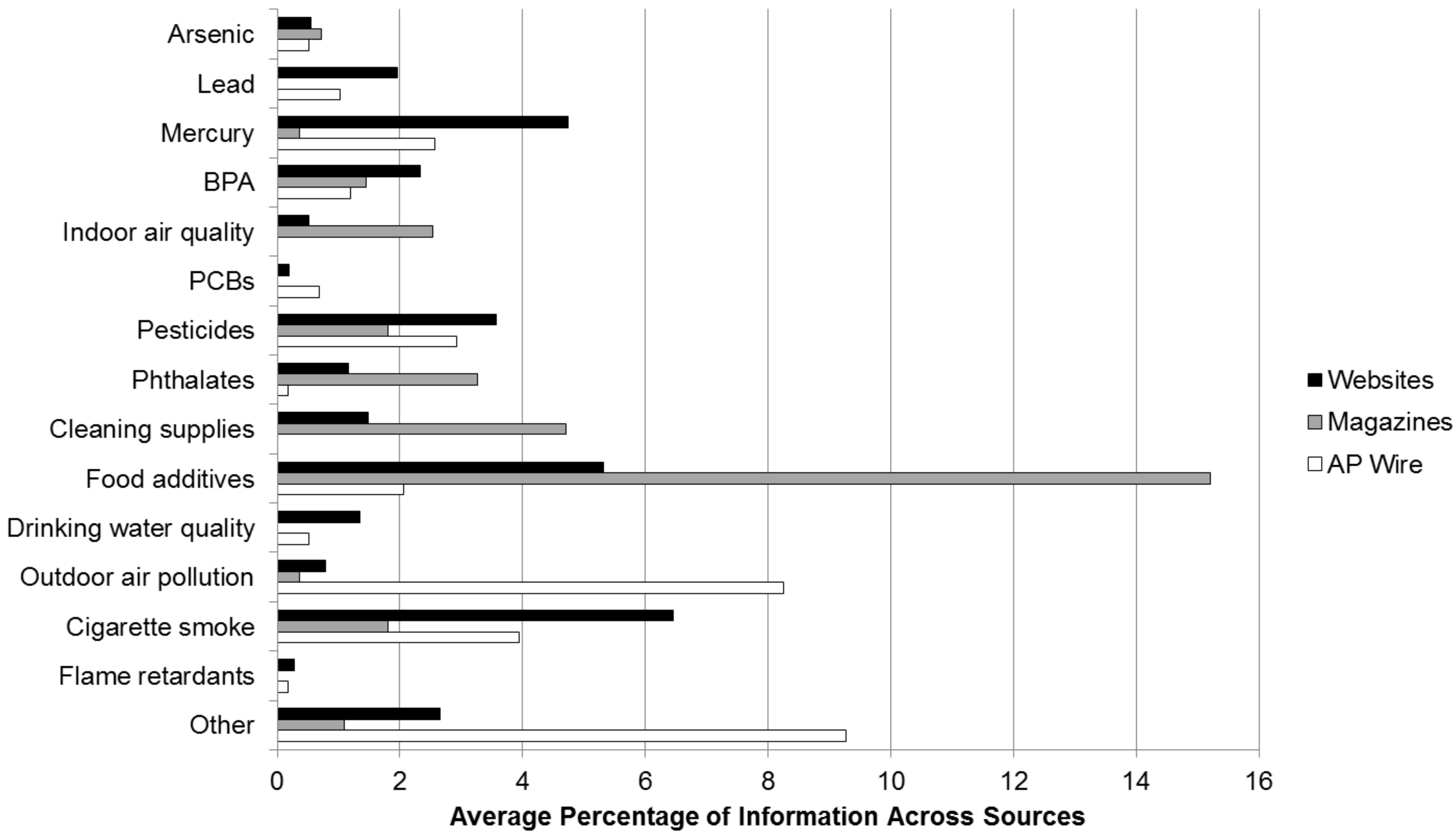
"“Quitting is as important for your family's health as buckling your child into his car seat,” says Susanne Tanski, MD, a smoking researcher and assistant professor of pediatrics at Dartmouth Medical School, in Hanover, New Hampshire. “You wouldn't dream of not strapping him in, even though the odds of being in an accident are actually very low. The odds of getting lung damage from **secondhand smoke** [emphasis added] are much higher.”"
(Parents.com, September 14, 2012)
“Diet sodas often contain both caffeine and an **artificial sweetener** [emphasis added]. The non-nutritive sweeteners used in these drinks are considered safe, especially if you're drinking them in moderation. If you like these drinks, you can allow yourself a can or two a day, but make sure you're also drinking water, milk, and 100 percent fruit juice for hydration and nutrition.”
(Babycenter.com, October 4, 2012)
“Incidentally, the MMR vaccine never contained thimerosal, the **mercury**-based [emphasis added] preservative that some people believed might be linked with autism. Six studies have now examined the relationship between thimerosal and autism and have concluded that thimerosal-containing vaccines do not cause autism either. In any case, thimerosal has been removed from all childhood vaccines except the flu vaccine, so it's no longer a concern.”
(Babycenter.com, February 19, 2013)

Summary of results

A primary objective of this study was to determine which chemical topics are most prevalent in mothers' information environment. Upon analyzing the content sampled from each source, the total frequency of PPEH information available on parenting websites (n = 2,264) far outnumbered both magazines (n = 92) and the Associated Press (n = 194). To merely count the total number of articles in estimating prevalence would be to assume that website content is somehow more readily available or influential to mothers. These would be strong assumptions given the lack of empirical support of exposure rates.

In order to remove this potential bias in reporting, the data were standardized. First, the appearance of each chemical topic by source was calculated (e.g., BPA information in magazines = 4). Then, the total number of relevant PPEH articles per source type was calculated (e.g., PPEH information in magazines = 92). The appearance of each chemical topic by source was then divided by the total number of relevant PPEH articles per source type (e.g., 4/92). This approach resulted in the percent of information dedicated to each chemical topic within each type of source (e.g., 4.35% of PPEH information in magazines was dedicated to BPA). Finally, percent coverage of each chemical topic was averaged across the three source types (e.g., 4.35/3). This approach could be loosely compared to standardizing multiple measures prior to creating a scale.

Figure 4.2 Total average percentage of PPEH information across media sources, by chemical topic (N = 2,550)



χ^2 (28, n = 2,250) = 489.61, p < .001

Note. "Other topic" included asbestos, carbon monoxide (excluding references in the context of cigarette smoke), dichlorophenol, PFOA/PTFE/Teflon, perchloroethylene (perc), radon, styrene/styrofoam, paint fumes, and volatile organic compounds (VOCs).

Figure 4.2 shows the total average percentage of information related to each chemical topic across media sources. Overall, chemical topic prevalence varied significantly across the three source types: χ^2 (28, n = 2,550) = 489.61, $p < .001$. In total, information related to food additives was most prevalent, clearly attributable to the large proportion of magazine content dedicated to the topic. Cigarette smoke, pesticides, and mercury were also prevalent chemical topics. The least prevalent topics were flame retardants, PCBs, drinking water quality, and arsenic.

Selecting chemical topics for Study 3

In addition to the empirical value of performing the first systematic assessment of PPEH information in the mass media, a second objective of this study was to determine which three chemical topics to focus on in Study 3. A set of five criteria for selecting the chemical topics were introduced in Chapter 3. These criteria are restated here with accompanying explanations for how the list of 15 topics examined in the first half of this study was narrowed down to three in light of these results. For inclusion in the final cross-sectional survey, the (type of) chemical or exposure pathway must:

1) Be (or contain at least one chemical) listed on the E.P.A.'s TEACH Summary of the most concerning chemical threats to children;

As mentioned earlier, cleaning supplies, food additives, and other topics were included in the content analysis since they were cited by a substantial number of mothers in the elicitation survey as concerning. Nevertheless, they are not on the E.P.A.'s agenda in any shape or form and are therefore excluded from further consideration.

2) Have been recognized by a large majority of mothers in the elicitation survey;

In Study 1, phthalates were not recognized by 43% of the sample and are therefore excluded from further consideration.

3) Have been considered concerning by a large majority of mothers in the elicitation survey;

Each of the 11 remaining chemical topics was considered concerning by a majority of mothers in the elicitation survey, so this criterion did not exclude any of the possibilities.

4) Be associated with multiple, non-idiosyncratic behaviors that the average mother could perform to reduce prenatal and/or pediatric exposure and that could be effectively measured in a population survey;

Several chemicals pose challenges to individual behavior change and effective behavior measurement, including outdoor air pollution, cigarette smoke, mercury, and lead. First, the most effective method for improving the quality of the outdoor air one breathes on a daily basis is to move to a community with better air quality – a very difficult behavior to change. Other behaviors to reduce outdoor air pollution exposure are relatively idiosyncratic, meaning they would not be relevant to most mothers. These include driving a hybrid car or limiting outdoor physical activity during periods of poor air quality.[6] Because smoking is heavily regulated and the percentage of smokers in the sample was

[6] Study 3 would assess behaviors performed between September 2012 and February 2013. Since periods of poor air quality are often correlated with high temperatures and most of the study would take place during winter months, the assessment of staying indoors would be relatively fruitless.

expected to be low,[7] it was likely that an attempt to measure behaviors to reduce exposure to cigarette smoke would be unsuccessful. While certain behaviors for reducing exposure to lead and mercury are simple to execute (i.e., drinking filtered water, limiting consumption of swordfish), a number of the most effective behaviors are idiosyncratic (i.e., remediating lead paint in homes built before 1970, avoiding mercury fillings in dental cavities). Such behaviors would not be well-suited for assessment in a general, heterogeneous sample. Furthermore, mercury has been the subject of much debate in the autism-vaccine controversy. That topic would undoubtedly introduce a myriad of complications to measurement and inference. For these reasons, outdoor air pollution, cigarette smoke, mercury, and lead were all excluded from further consideration.

5) And finally, receive at least some coverage related to PPEH across the analyzed websites, magazines, and the AP wire during the study period (September 2012 – February 2013). While a small amount of coverage will allow for interesting comparisons, if concern over a chemical received no coverage at all, it would be irrelevant to this dissertation.

Four of the remaining 7 chemical topics under consideration did not receive any coverage in at least one of the sources analyzed: flame retardants, indoor air quality, PCBs, and drinking water quality. Applying the exclusion criteria therefore leaves arsenic, bisphenol A, and pesticides as the most promising chemical topics for further examination.[8]

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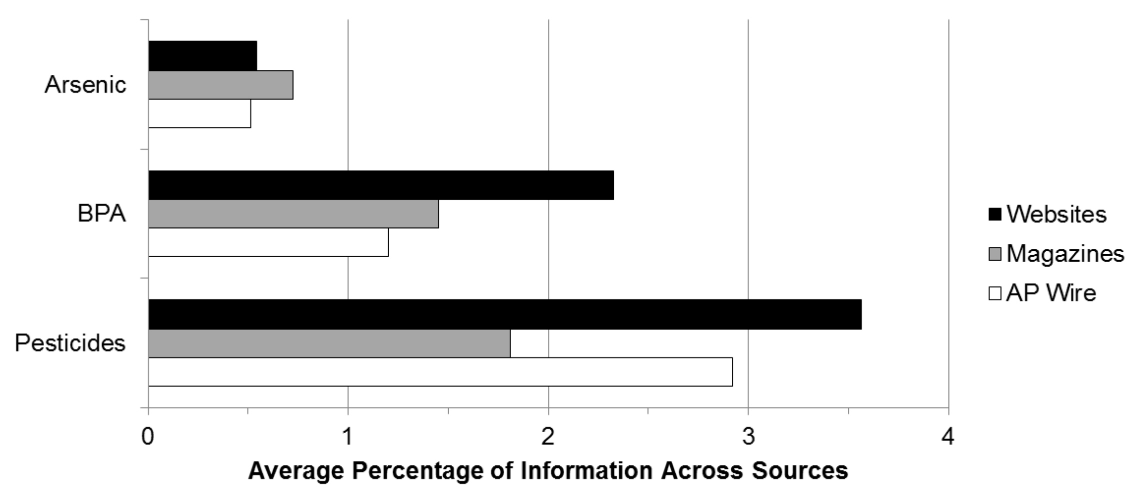
[7] A 2008 survey by the CDC showed that of women who smoked three months before pregnancy (23% of women surveyed), 45% quit during pregnancy. Among women who quit smoking during pregnancy, 50% relapsed within six months after delivery (Centers for Disease Control and Prevention, 2012).

[8] It should be noted that, among other applications, arsenic can technically be categorized as a type of pesticide. To address possible issues with coding, mentions of arsenic in the context of pesticides were coded under pesticides (see Codebook #2 in Appendix E for more detail). In the end, such mentions were rare (n = 2).

Examining arsenic, bisphenol A and pesticide information

Topical focus. Figure 4.3 presents the average percentage of information related to arsenic, BPA, and pesticides across media sources. In total, information about arsenic was least prevalent, information about BPA was moderately prevalent, and information about pesticides was most prevalent. For these three chemicals, topical focus did not vary significantly across the three source types: χ^2 (4, n = 475) = 2.53, p = .639. It is worth noting that while magazines covered the three topics in the same order as did the websites and AP, the absolute differences across topics in magazines was very small (n = 2 versus n = 4 versus n = 5), offering little power to detect any significant differences.

Figure 4.3 Total average percentage of information about arsenic, bisphenol A, and pesticides across media sources (N = 475)



χ^2 (4, n = 475) = 2.53, p = .639

Behaviors and pathways. Once the three chemical topics for inclusion in Study 3 were selected, the content collected underwent a qualitative reexamination to determine which exposure pathways, as well as which types of behaviors, were discussed in the context of these three chemicals. The focus of coverage received by each of these three chemical topics appeared to vary slightly by source. This was unsurprising given the different audiences and journalistic objectives of the three source types analyzed. AP news stories about arsenic stories reported on the Food and Drug Administration's consideration of new standards for the levels of arsenic in rice, while stories about BPA tended to focus on sales receipts as a newly detected pathway for exposure. A number of stories about pesticides reported on large legal settlements involving local communities whose water supplies were contaminated with atrazine by chemical manufacturers (i.e., Syngenta).

In parenting magazines, one small editorial discussed the risk of arsenic exposure in the context of rice. Another larger editorial piece in the November 2013 issue of *Parents Magazine* featured interviews with the presidential candidates about their political platforms, in which air pollution, mercury, arsenic and pesticides were all briefly mentioned. All four mentions of BPA in magazines were found in editorials recommending different products (i.e., toys, baby bottles) to parents, in which "BPA-free" was highlighted as a desirable characteristic.

Finally, many of the website postings about arsenic focused on the risk of arsenic exposure in the context of drinking water, rice, and apple juice. Content related to BPA commonly mentioned exposure to the chemical through bottle feeding, canned formula, food packaging and plastic toys. Information about pesticides centered on the benefits of eating organic food and how to create a healthier "green" home. How these characteristics impact the development of Study 3 survey measures is presented in the Discussion section of this chapter.

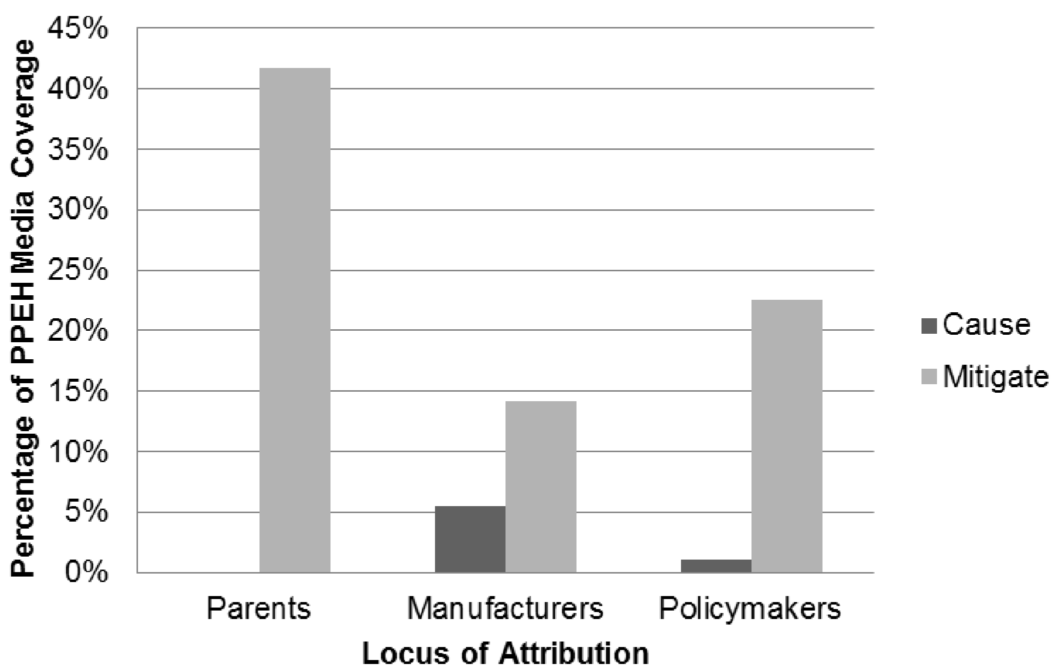
Attributions of responsibility. To address RQ3, this section takes a closer look at attributions of responsibility for chemical exposure in mediated information about arsenic, BPA, and pesticides. Of the 475 content units analyzed on these three topics, roughly one quarter (n = 72) did not attribute responsibility to any party for either causing or mitigating chemical exposure risks. Information with no attributions typically focused on defining the chemical(s), describing new research findings, and/or explaining the consequences of exposure. Close to half (48.4%) contained one attribution of responsibility, while the remaining 27.8% contained two distinct attributions. Examples of attributions for each chemical topic are provided in Table 4.10.

Table 4.10 Examples of attributions of responsibility in PPEH information in the media

"The Food and Drug Administration may consider new standards for the levels of **arsenic** [emphasis added] in rice as consumer groups are calling for federal guidance on how much of the carcinogen can be present in food." (*The Associated Press*, September 19, 2012)
"While the government and the chemical industry assert that the levels of **BPA** [emphasis added] found in humans are very low and that the product is safe, many medical experts, scientists, and environmental experts disagree and believe that the evidence is now strong enough that parents should consider steps to reduce infants' exposure to BPA when possible. In fact, dozens of state and national environmental health organizations… have called for a moratorium on the use of bisphenol A (BPA) in baby bottles and other food and beverage containers." (Babycenter.com, December 14, 2012)
"A recent study found that 38% of conventional produce has traces of **pesticides** [emphasis added], while just 7% of organic produce does. This is a big deal, as a 2010 study found a close correlation between the amount of a certain pesticides present in children's urine and the severity of their ADHD. And prenatal exposure to pesticides has been shown to harm children's brain formation and lead to lower IQs. If buying all organic foods seems like a tall order for your grocery budget, you can pick and choose produce–some types are more likely than others to have pesticide residue." (Parents.com, October 12, 2012)

Most of the media content about arsenic, BPA, and pesticides analyzed focused on reducing exposure rather than citing blame. Of the 475 total content units, responsibility was most commonly credited to parents (41.7%), followed by policymakers (23.6%), and then manufacturers (19.6%; see Figure 4.4). All attributions to parents held them responsible for mitigating exposure to arsenic, BPA and pesticides, while not a single piece of content blamed parents for causing such exposures. A few causal attributions named manufacturers (5.5%) and policymakers (1.1%), although most attributions to each party focused on mitigating exposure.

Figure 4.4 Overall locus of attributions by type (N = 475)



Among content units that provided an attribution of responsibility, there was evidence that the locus of attribution varied significantly across source type: χ^2 (4, n = 403) = 63.57, $p < .001$ (see Table 4.11). PPEH information from the Associated Press was most likely to focus on policymakers, whereas parenting websites and magazines – perhaps not surprisingly – were most likely to focus on parent responsibility related to these issues. The locus of attribution also varied significantly across chemical topic: χ^2 (4, n = 403) = 30.20, p < .001 (see Table 4.12). Content related to pesticides more commonly focused on parent responsibility whereas content related to arsenic and BPA focused more on the responsibility of policymakers.

Table 4.11 Differences in the locus of attribution by source type (N = 403)

	Locus of attribution					
	Parents		Manufacturers		Policymakers	
Source type	N	%	N	%	N	%
Associated Press	0	0.0	10	38.5	16	61.5
Websites	194	52.4	83	22.4	93	25.1
Magazines	4	57.1	0	0.0	3	42.9

χ^2 (4, n = 403) = 63.57, p < .001

Table 4.12 Differences in the locus of attribution by chemical topic (N = 403)

	Locus of attribution					
	Parents		Manufacturers		Policymakers	
Chemical topic	N	%	N	%	N	%
Arsenic	19	46.3	1	2.4	21	51.2
Bisphenol A (BPA)	50	38.5	20	15.4	60	46.2
Pesticides	129	55.6	72	31.0	31	13.4

χ^2 (4, n = 403) = 30.20, p < .001

Advice. To address RQ4, this section takes a closer look at advice given to parents in the media about how to mitigate exposure to arsenic, BPA, and pesticides. Of the 475 content units analyzed on these three topics, sixty-six percent (n = 312) offered advice to parents. Of the 403 units that attributed responsibility, more than three quarters (77.2%) offered advice to parents. Table 4.13 provides examples of advice given in relation to arsenic, BPA, and pesticide exposure reduction.

Table 4.13 Examples of PPEH advice given to parents in the mass media

"Consumer Reports, however, suggests limiting infants to no more than 1 serving a day of infant rice cereal. They also encourage diets with lower **arsenic** [emphasis added] grain options, including wheat cereals, oatmeal, and corn grits. Daily rice drinks for children under age 5 are not recommended. Until more information is known, it's probably wise to heed the advice of both the FDA and Consumer Reports. Continue to feed your child—and yourself—a varied diet with foods from all the basic food groups. Also, mix up the foods you choose from each food group—that way you'll consume different combinations of nutrients, and at the same time, limit your exposure to chemicals that may prove to be harmful."
(Parents.com, September 20, 2012)
"If this is your second child, it's best to invest in new bottles for him, says Erika Landau, M.D., a pediatrician in New York City and coauthor of The Essential Guide to Baby's First Year. The older, used ones might not meet current safety or environmental standards. Also, they may release **bisphenol A (BPA)** [emphasis added], a chemical associated with toxic effects on the brain and reproductive organs, because they've probably been warmed countless times and may have scratches. If you do decide to reuse your first child's bottles, be sure they're free of BPA, Dr. Landau says. Most major brands were made with BPA until a few years ago, when bottle manufacturers virtually phased out the chemical. If an older bottle has a recycling code of 7 and isn't labeled BPA-free, or if it has no code at all, chuck it."
(Parents.com, September 11, 2012)
"You may know of the Environmental Working Group's Dirty Dozen, a list of produce with the highest **pesticide** levels [emphasis added]. This year the EWG added two items and call it the Dirty Dozen Plus. The Clean 15 get the group's okay for going conventional. Consider splurging on organic: apples, celery, sweet bell peppers, peaches, strawberries, nectarines (imported), grapes, spinach, lettuce, cucumbers, blueberries (domestic), potatoes, green beans, kale… Save money with conventional: onions, sweet corn, pineapples…"
(*Parents Magazine*, October 2012)

Among content units attributing responsibility to some entity, there was evidence that the presence of advice to parents varied significantly across source type: χ^2 (2, n = 403) = 34.29, p < .001 (see Table 4.14). PPEH information from the Associated Press was least likely to provide advice, whereas parenting websites and magazines – again, perhaps not surprisingly – were more likely to provide advice related to these issues. The presence of advice also varied significantly across chemical topic: χ^2 (2, n = 403) = 53.49, p < .001 (see Table 4.15). Advice was present in a greater percentage of content related to arsenic and pesticides than to BPA. Close to half (43.8%) of BPA-related content related offered no parenting advice whatsoever.

Table 4.14 Differences in the presence of advice by source type (N = 403)

	Advice for parents			
	No advice present		Advice present	
Source type	N	%	N	%
Associated Press	18	69.2	8	30.8
Websites	72	19.5	298	80.5
Magazines	2	28.6	5	71.4

χ^2 (2, n = 403) = 34.29, p < .001

Table 4.15 Differences in the presence of advice by chemical topic (N = 403)

	Advice for parents			
	No advice present		Advice present	
Chemical topic	N	%	N	%
Arsenic	11	26.8	30	73.2
Bisphenol A (BPA)	57	43.8	73	56.2
Pesticides	24	10.3	208	89.7

χ^2 (2, n = 403) = 53.49, p < .001

Discussion

Study 2 involved a systematic content analysis of prenatal and pediatric environmental health information covered in the mass media and consumed by new and expecting mothers. The study had two primary objectives: (1) to estimate the prevalence of PPEH information in the media, and (2) to examine how certain PPEH risks are characterized. Importantly, the results of this study will serve to further guide the focus and development of survey measures in Study 3, as well as inform *a priori* expectations about the directions of the hypothesized media effects therein. Here, the findings reported above addressing RQ1 – RQ4 are summarized, followed by a discussion of the study's strengths, limitations, and implications.

Prevalence of PPEH information in the media (RQ1)

Results showed that during the study period, roughly three pieces of PPEH information were made available to mothers across these sources daily. The period prevalence rate was based on the fact that there were just over 2,500 relevant articles across five sources between September 2, 2012, and February 28, 2013. This finding suggests that the mass media do in fact communicate PPEH information. Of course, what we do not know from this work is how the prevalence of PPEH information affects an average mother's exposure to such information. Also, we cannot compare PPEH exposure to other types of non-environmental health information mothers encounter (e.g., sudden infant death syndrome). The field might benefit from future research studies that examine the relative prevalence of these issues. Overall, the amount of PPEH information available to mothers was most prevalent on parenting websites, followed by stories from the Associated Press and then parenting magazines. So even if the prevalence of news coverage of environmental health risks has decreased over the years as demonstrated by prior research (Freimuth et al., 1984; Jensen et al., 2010), this may not correspond to a parallel decrease in exposure, particularly among new and expecting mothers, who have alternative sources which present this type of information.

Topical focus of PPEH information in the media (RQ2)

Based on findings from prior research on environmental health news (i.e., Lichter & Rothman, 1999), it was initially expected that coverage would tend to favor novel or unfamiliar risks considered less concerning by experts. Conversely, knowledge of mothers' responses to the survey questions in Study 1 suggested that certain well-established chemical threats might be receiving more media coverage than others – particularly, lead, mercury, and secondhand tobacco smoke (assuming concern and coverage are associated). Taking all sources together, results showed that food additives, cigarette smoke, pesticides, and mercury were the most prevalent topics in the media during the study period. The least prevalent topics were flame retardants, PCBs, drinking water quality, and arsenic.

While it was surprising that the newest man-made threats (i.e., phthalates, PCBs and flame retardants) did not receive significant coverage, what was perhaps more surprising was the relatively small amount of media attention received by lead. Almost none of the content in parenting magazines or the AP wire discussed lead threats to children. Even websites paid relatively little attention to the issue (only 6% of PPEH information sampled from Babycenter.com and Parents.com addressed lead). Although childhood lead poisoning rates have declined over the years, it remains a serious public health concern. Just recently, the E.P.A. launched a communication campaign to educate parents of the dangers of lead paint and safe home renovation. It could be argued that the lack of lead-related coverage is not a major concern since the populations most at-risk of poisoning (i.e., low income minorities) are less likely to use the internet for health information. Even more, the results of Study 1 showed that mothers are concerned about lead, suggesting perhaps they do not need the media to incite their worries. Lead is already a well-established threat. Of course, this is mere speculation.

Attributions of responsibility (RQ3)

Almost all PPEH information in the media included some attribution of responsibility and most attributions were directed at parents – contrary to earlier findings from a study on lead poisoning (Bellows, 1998) – and largely about their responsibility for reducing exposure. These findings lend credence to the possibility that social expectations of intensive mothering are conveyed and primed by the media. Very little information blamed anyone for causing chemical exposure risks, not even manufacturers – consistent with other studies in this area (i.e., E. Singer & Endreny, 1994; Woodruff et al. 2003). Such findings could also have important implications for activism and policy support in this area.

Advice to parents (RQ4)

Results showed that most PPEH information in the media related to arsenic and pesticides provided parents with advice about how to reduce their child(ren)'s exposure to such threats. However, there were significant differences across sources. Unlike Woodruff and colleagues' (2003) study of newspaper coverage of childhood nutrition, which found that the largest single topic in news articles was advice for parents, only 1 in 3 AP stories analyzed herein contained parent advice.

Compared to content about arsenic and pesticides, content related to BPA exposure was less likely to provide parents with any advice. The inclusion of such constructive efficacy information may help mothers cope with being implicated as the most responsible party for protecting PPEH, learn about what they can do, and ultimately engage in danger control processes (i.e., protective behaviors). Therefore, its absence in certain sources and for certain chemicals may have negative consequences.

Strengths and limitations

Sources. There were both strengths and limitations to relying on the range of sources analyzed in this study. First, the inclusion of multiple sources better represented the broader media environment to which new mothers are exposed (Stryker, 2008). Not only is the AP wire used by over 85% of U.S. newspapers, it also provides a reasonably representative sample of the national news environment, including radio and television (see Fan, 1988; Fan & Holway, 1994; Fan & Tims, 1989). Because coverage of various health topics in print and television network news has been shown to be correlated with topics on the AP wire (see Niederdeppe, 2006; Romantan, 2004; Yanovitzky & Blitz, 2000), the inclusion of AP stories offered a practical snapshot of general media attention to pediatric environmental health information. Including magazines and internet sources targeting parents also increased the external validity of the sample while offering an interesting point of comparison to the AP wires. Traditionally, magazines targeted at parents have offered a wealth of relevant health information to this population (Foss, 2010; Foss & Southwell, 2006; Frerichs et al., 2006; Stang et al., 2010). In the digital age, much of this content has migrated online, to which mothers regularly turn for pediatric health information (Bernhardt & Felter, 2004; Plantin & Daneback, 2009; M. J. Stern et al., 2011).

One concern is whether it is appropriate to compare the prevalence of coverage across these different types of sources. Websites have an advantage in that they can archive posts over long periods of time, creating a vast and ever-expanding network of links, articles, and information. Parenting magazines, on the other hand, are subject to strict space constraints (also recall that most PPEH information in magazines was actually conveyed by advertisements). Finally, the AP wire appeals to a general audience and thus a smaller proportion of the information sampled was likely to be relevant to this study. Given that information from the AP is widely available across television, newspapers, online news and radio, it is possible that moms scanned this information just as often if not more frequently than information from parenting websites and magazines. Unfortunately, it is difficult to know which AP stories, if any, were picked up and published across multiple sources; therefore, an effort to scale the AP stories' availability against web-based stories would be based on pure speculation and was not attempted.

Second, the sampling process online was not designed to capture parents' comments on posted articles since they were considered beyond the scope of this research study. Given that mothers did not report frequently scanning PPEH information from interpersonal sources (i.e., other mothers), excluding this type of content here seemed justified. Admittedly, the comments were intriguing and often more polarized than editorial content on the sites. Posts like this could potentially interact with online PPEH information and have interesting effects on maternal perceptions and behaviors. For example, a Babycenter.com user wrote:

> "A town nearby has just admitted that their water (from a municipal treatment facility) contains high levels of a carcinogen ... they are on a "boil alert" because of it. They have known about the contamination for months and "were waiting for the E.P.A. to tell them how to handle the situation." … This news is what scares people. If I were drinking, cooking with, and bathing my newborn in water containing ANY carcinogen, I would be guilt-ridden forever! It's so hard to *trust* others when it comes to my own health (and that of my family's) for just this reason. People (including gov't entities) do NOT look out for others' best interests, unfortunately. These days, there's so much "red tape" running through EVERYthing that simple decisions (telling the truth for others' safety) take the backseat to a hierarchy of rules and regs…"
>
> – Virtualgina, Babycenter.com, January 10, 2013

Future quantitative content analyses of these sources may consider taking a closer look at these sections and comments.

Finally, Study 2 included a wide range of platforms, but it was limited in that it did not analyze every potentially relevant source. A range of sources exist that focus more frequently and intensely on prenatal and pediatric health (e.g., FitPregnancy) or on environmental health (e.g., EnvironmentalWorkingGroup.Org). Content from these sources could provide an even denser and richer sampling of risk information in this area; however, it was unlikely that a large enough segment of the parenting population would be routinely exposed to these sources, making the most popular websites and magazines a top priority in this study. Because the chosen magazines and websites are leaders in the world of parenting information, it is at least likely that they are generally reflective of other sources not examined here.

Time frame. The time frame (September 1, 2012 – February 28, 2013) may also pose a threat to the validity of this study. Selecting a six-month period served a practical purpose, but that decision came with certain assumptions about the nature of content and the timing of exposure effects. From a methodological perspective, examining six months' worth of content helped create a more manageable and valid sample. Because websites are asynchronous and constantly revised, they pose a unique challenge for content analysis – a challenge McMillan (2000) equates to applying a "microscope" to a "moving target." Articles may be posted one day and revised or taken down the next. For this study, it would be impossible to retroactively harvest valid data from the target websites; so to reduce unknown bias in the sample, it was necessary to harvest online content frequently and in real time. To maintain consistency, the time frame was kept the same for all sources.

While the sample is likely to provide an accurate picture of the most recent issues addressed in the media, one could argue that it is not representative of a longer time period of coverage, when certain issues received relatively more or less media attention. Why does this matter? Mothers may not only be influenced by what they see over the past few months, but also by earlier or longer-term exposure to media coverage. For instance, BPA received considerable media attention in July 2012 when the FDA banned the chemical from baby bottles and sippy cups (Tavernise, 2012). A cursory analysis of the six-month period prior to this study (March 1, 2012 – August 31, 2012) showed 13 AP news stories about BPA in the context of PPEH. Comparing this to the 7 stories captured in this study could provide evidence of a shift in the prevalence of a certain chemical topic in parents' information environment. Nevertheless, it is possible that the effects of earlier coverage may still impact mothers' choices down the road. In Studies 3 and 4, certain relationships may or may not be detected because of this time lag.

Though Study 2 was conducted over a relatively shorter period of time than most time series and content analyses, the design was justified in several ways. Primarily, the importance of including website content outweighs the risks associated with a shorter time frame. In addition, the uptake of relevant behaviors in this population could occur reasonably quickly after media exposure for two reasons. First, compared to other pediatric health behaviors like vaccination, many of the protective behaviors to reduce exposure to chemicals do not require long periods of time to enact. For example, getting your child vaccinated requires scheduling appointments, taking time out of work, and so forth, whereas heating food in glass rather than in plastic containers can be accomplished at your child's next meal. Second, pregnancy and childhood – the window of extreme vulnerability to toxins – is relatively short compared to adulthood. These types of behavioral changes need to happen quickly and it is likely that parents recognize the urgency to some degree.

Implications

The results of Study 2 provide valuable insights that are relevant in terms of their (1) implications for subsequent dissertation analyses and (2) broader significance for the study of PPEH information in the mass media and its potential effects.

In conjunction with the elicitation survey results, assessing the relative rates of topical focus in PPEH media coverage here helped determine which chemical topics would be best suited for further exploration and testing in Study 3. Arsenic, BPA, and pesticides each met the pre-specified criteria for inclusion in the cross-sectional survey. Most importantly, each topic received different rates of total coverage during the study's time frame (arsenic = low coverage, BPA = moderate coverage, pesticides = high coverage); but the frequency of information about these three topics did not vary significantly across source type (refer to Figure 4.3). This finding provides empirical justification for creating indices of seeking and scanning PPEH information in the media by combining source types (e.g., websites, magazines, newspapers).

The behavior measures in Study 3 are to be based on the E.P.A. and A.A.P.'s official recommendations for ways parents can effectively reduce prenatal and pediatric exposure to these three chemicals. To increase the validity of these measures, however, there should be some confirmation that the media communicate information about these types of behaviors. The qualitative assessment of PPEH information in this study provided additional insight and empirical support for the inclusion of certain behaviors (i.e., drinking filtered water, reducing consumption of rice, using BPA-free plastic food containers, purchasing organic food) in those measures.

More broadly, this study serves as the first quantitative content analysis to examine multiple chemical topics across a variety of mass media sources. As patterns of childhood illness shift dramatically away from infectious diseases like poliomyelitis, dysentery, and tuberculosis toward a new class of chronic and disabling conditions, the role of environmental toxicants will likely garner more attention from researchers, policymakers, parents, and the mass media. In the very least, this study provides a baseline of PPEH information across a variety of media sources to which new and expecting mothers are likely exposed. On a descriptive level, a systematic tally of prominent chemical topics in the media is useful for pediatric health communicators, researchers, and to a certain extent, moms. For instance, unlike media sources that target parents (e.g., Babycenter.com), information from the Associated Press neither implicates parents as responsible for chemical risk mitigation nor provides any advice. If mothers receive most of their information from sources populated with AP news, then individual behavior changes may be less likely. Understanding what mothers may encounter while navigating the vast information environment can also help public health practitioners plan more effective interventions and evaluate the success of their own campaigns.

CHAPTER FIVE

Study 3: Exploring the relationships between exposure to pediatric environmental health information, perceptions, and behavior

Overview

While the technique of content analysis can be used to make inferences about media effects (Holsti, 1969; Krippendorff, 1980), the purpose of Study 3 is to provide initial empirical support for some of these assumed relationships. The objective is to observe actual cross-sectional associations and gain a deeper understanding of the potential mechanisms of effects between mothers' exposure to prenatal and pediatric environmental health information in the media, their perceptions and their actual protective behaviors. Importantly, the results of both Studies 1 and 2 guided the focus of survey measures detailed in this chapter as well as informed *a priori* expectations about the directions of the hypothesized relationships discussed herein.

The issues surrounding prenatal and pediatric environmental health are complex to say the least. The E.P.A.'s TEACH Summaries only scratch the surface of potential pediatric chemical exposures. In order to effectively explore media effects on perceptions and protective behaviors, it was essential to develop a cross-sectional survey that would be accessible to mothers while still addressing an important range of PPEH topics. To balance these aims, the survey focused on three equally concerning chemicals from the E.P.A.'s TEACH Summaries that mothers both recognized and found concerning (as per the results of Study 1), that could be reasonably addressed by the average mother, and that received media attention during the study period (as per the results of Study 2). In the end, BPA, arsenic, and pesticides were chosen as the focus of the current study.

In the next two sections, Study 3's research questions and central hypotheses are reviewed. These hypotheses were introduced in Chapter 2 and are further elaborated here. Ultimately, if Study 3 finds evidence of reported media exposure to PPEH information and for its association with key outcomes, a follow-up study examining the effects of scanning contingent on media coverage volume will be warranted.

Research questions

As we have seen, there have been very few efforts to capture mothers' protective behaviors, concerns, or exposure to information related to PPEH risks. One of the primary goals of Study 3 was to break ground in this domain by exploring these issues – introduced earlier on in Study 1 – using a larger sample and a more comprehensive survey instrument. Study 3 asks:

RQ1: To what extent do mothers (intend to) engage in protective behaviors to reduce their child's exposure to PPEH risks?

RQ2: Which PPEH issues concern the greatest proportion of new and expecting mothers?

RQ3: To what extent do mothers seek and scan general PPEH information, and from which sources?

Prior evidence suggests that measures of seeking and scanning capture distinct information exposure behaviors (Kelly et al., 2009); nevertheless, it seemed prudent to provide additional evidence of measurement validity, particularly face validity and discriminant validity. One would expect some degree of correspondence between these two constructs, but the measures of scanned exposure across sources should be more highly correlated with one another than with measures of sought exposure across sources:

Ha. Scanning general PPEH information will be correlated positively with sought exposure, but the associations between scanned and sought exposure will be weaker than correlations within each of the scanned information sources.

An additional objective in Study 3 was to improve upon the exposure measures used in Study 1 to assess mothers' engagement with specific parenting media sources (i.e., websites and magazines):

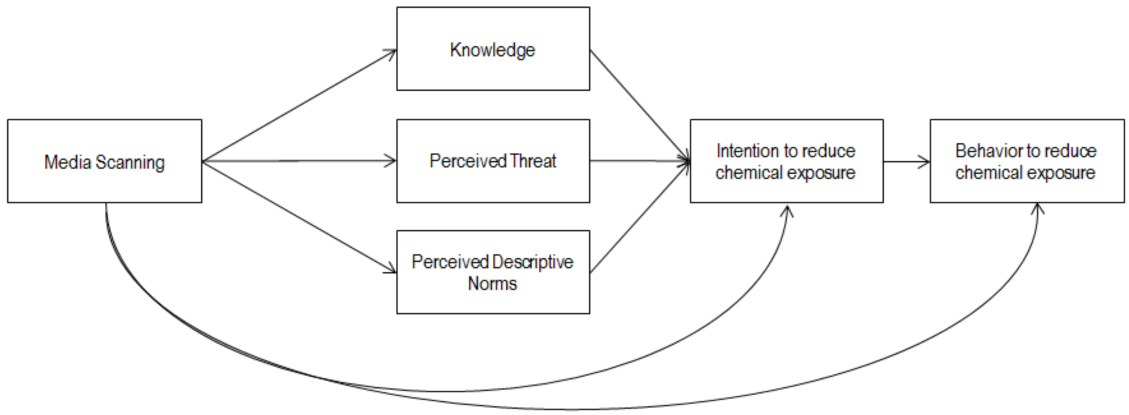
RQ4: Will the adjustments made to the parenting website and magazine survey measures result in more accurate recall of exposure among respondents?

Central hypotheses

The conceptual model of effects specified several main effect hypotheses (see Figure 5.1).

Exposure to information in the media can serve as an external stimulus or prime that when encountered has the ability to make certain issues or attributes of those issues more accessible in the mind (McCombs, 2005; Roskos-Ewoldsen et al., 2002). Issues and attributes made more accessible are more likely to be used when forming relevant judgments (Price & Tewksbury, 1997). The effects of primes are in part a function of their frequency, such that the more a prime is encountered, the more likely it is to impact cognitive accessibility.

Figure 5.1 Conceptual model – direct effects



The health communication literature purports that repeated exposure to information during routine media use – even outside the context motivated information seeking – may have a significant cumulative impact on behavioral choices (Hornik & Niederdeppe, 2008). Hornik and colleagues' (in press) suggest that the effects of frequent information exposure during routine media use may reflect any or all of three mechanisms: (1) reminding, (2) knowledge acquisition, or (3) normative reinforcement.

Scanning content related to a health topic or behavior may serve as a simple reminder, or cue to action (Janz & Becker, 1984; Rosenstock, 1974), to engage in a particular behavior. In other words, scanning may have a direct effect on behavior and behavioral intention. Thus, it is hypothesized that mothers who report greater scanning of general PPEH information in the media will be more likely to report behaviors (and behavioral intentions) to reduce their children's exposure to chemicals:

H1: Scanning information about PPEH will be positively associated with behaviors to reduce exposure to arsenic, BPA, and pesticides (see Figure 5A).

H2: Scanning information about PPEH will be positively associated with behavioral intentions to reduce exposure to arsenic, BPA, and pesticides (see Figure 5B).

Repeated exposure and attention to information in the media have also been shown to generate knowledge about various health topics, such as cancer (Jensen et al., 2011; Stryker et al., 2008), prescription drugs (Peyrot et al., 1998), and nutrition (Charlton et al., 2004). It is hypothesized that mothers who reporter greater scanning of general PPEH information in the media will learn about PPEH issues and be more likely to correctly identify exposure pathways and corresponding behaviors that reduce chemical threats to children's health:

H3: Scanning information about PPEH will be positively associated with knowledge about arsenic-, BPA-, and pesticide-reduction behaviors (see Figure 5C).

It is equally likely that scanned exposure reinforces descriptive norms. If information about a behavior is regularly encountered across prominent sources, exposure may impact normative perceptions that the behavior is widely adopted or popular (e.g., Hornik et al., in press; Jacobsohn, 2007). By extension, it is posited that mothers who report greater scanning of general PPEH information in the media will also report greater perceptions of descriptive social norms related to protective behaviors:

H4: Scanning information about PPEH will be positively associated with perceived descriptive norms toward reducing exposure to arsenic, BPA, and pesticides (see Figure 5D).

This study introduces an additional potential mechanism of scanning's effects: perceived threat. Several theories of behavioral prediction – most notably, the health belief model (Janz & Becker, 1984; Rosenstock, 1974) and protection motivation theory (R. W. Rogers, 1983) – position perceived threat as a prominent determinant of behavior. Consistent with the social amplification of risk framework (Kasperson et al., 1988), it is conceivable that routine exposure to risk information in the media may increase perceptions of risk likelihood and severity. By extension, it is hypothesized that mothers who report greater scanning of general PPEH information in the media will have greater risk perceptions of potentially hazardous chemicals:

H5: Scanning information about PPEH will be positively associated with perceived threat of arsenic, BPA, and pesticides (see Figure 5E).

To address the threat of spuriousness, a supplemental set of hypotheses will test whether each of these associations holds after adjusting for a series of 20 potential confounders including demographics, information scanning from non-media sources (i.e., doctors, friends and family), active information seeking, and other psychosocial variables (*H6 – H10)*. For a complete list of covariates, see Table 5.1.

Figure 5.2 Central hypotheses: Expected effects

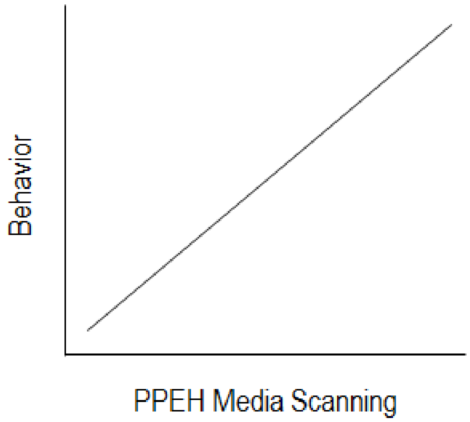


Figure 5A. H1: Direct effects of PPEH media scanning on exposure reduction behaviors.

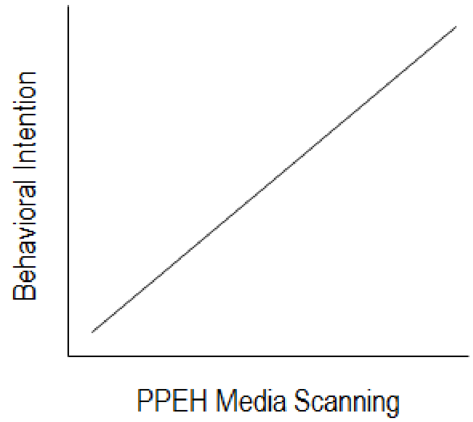


Figure 5B. H2: Direct effects of PPEH media scanning on exposure reduction behavioral intentions.

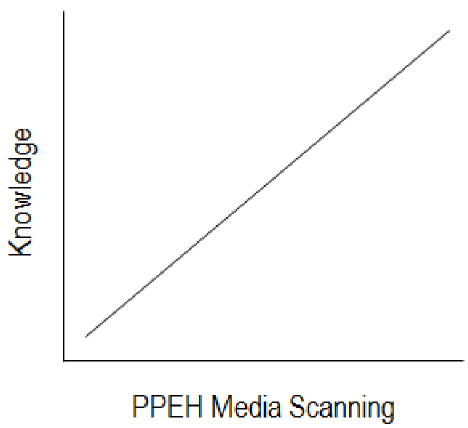


Figure 5C. H3: Direct effects of PPEH media scanning on knowledge.

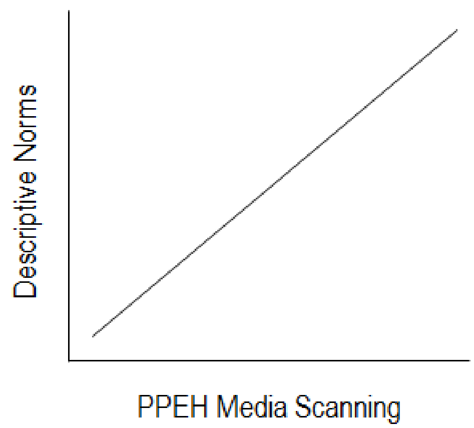


Figure 5D. H4: Direct effects of PPEH media scanning on descriptive norms.

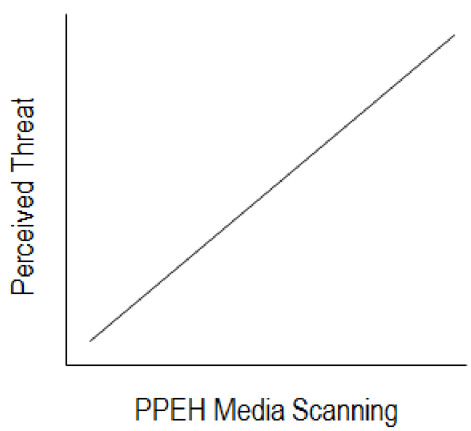


Figure 5E. H5: Direct effects of PPEH media scanning on perceived threat.

Table 5.1 Covariates

Number of children age 6 and under	Child's health status
Pregnancy status	Authoritarian parenting style
Mother's age	Authoritative parenting style
Race/ethnicity	Permissive parenting style
Education	Social desirability
Income	Media trust
Home ownership status	PPEH information sufficiency in the media
Political orientation	Scanning from doctors
Breastfeeding status	Scanning from interpersonal sources
Smoking status	Seeking

Methods

Participants and procedures

As in Study 1, participants were recruited for Study 3 through Survey Sampling International, which both maintains an online panel of individuals who have opted-in to participate in surveys and also uses partner organizations to recruit additional study participants (SSI; Survey Sampling International, Shelton, CT). These panels include a large number of individuals (more than one million) who while varying widely in their characteristics cannot be considered a representative sample of the U.S. population. Female panelists were sent a recruiting email in March 2013 linking to the survey. To be eligible for the study, women must have been pregnant and/or have had at least one child age 6 or under at the time of the survey. Data was collected using an online questionnaire programmed with Qualtrics software (Qualtrics, Provo, UT). The study procedure was approved by the university's institutional review board.

In order to determine the appropriate sample makeup and size *a priori*, the survey was first launched with a small group of eligible respondents (n = 234). A preliminary analysis was conducted on data obtained from this small group to observe the distribution of PPEH information scanning and its point-biserial correlations with protective behavior measures. Results showed that the proportion of PPEH information scanning from the media in the sample was reasonable (69.1%) and well distributed (skewed slightly to the right); therefore, it would not be necessary to oversample scanners. A simple power analysis (G*Power 3.1; Faul et al., 2009) indicated that a final sample size of at least 779 would permit detection of a small correlation ($r = 0.1$; see J. Cohen, 1977) with a two-tailed test and 80% power. The correlations between scanning and behavior ranged from small (.1 cutoff) to large (.5 cutoff), suggesting that the estimated sample size from the power analysis was an appropriate target.

Measures

The primary variables of interest in this study included: (a) behaviors, knowledge and behavioral intentions to reduce exposure to three chemicals in the environment; (b) key behavioral determinants (i.e., attitudes, perceived norms, self-efficacy, perceived threat, perceived responsibility); (c) PPEH information seeking and scanning behaviors; and (e) a series of additional covariates. Based on Study 1 and 2 results, most of the items in this survey focused specifically on three chemical topics: bisphenol A (BPA), arsenic, and pesticides.[9]

General chemical concern. Participants were introduced to the survey with a general question assessing their concern regarding chemicals in the environment. First,

[9] As noted in the preceding chapter, among other applications, arsenic can technically be categorized as a type of pesticide. To address possible issues with measurement, all definitions, questions and response items in the questionnaire carefully avoided any mention of pesticides in the context of arsenic and vice versa. In addition, items assessing behaviors to reduce arsenic exposure were asked before questions about pesticide-related behaviors so mothers would not respond to the pesticide questions with arsenic in mind.

mothers were told that “a variety of chemicals and toxins can sometimes be found in our environment - in the food we eat, the water we drink, the air we breathe and the products we use.” Then, they were asked: Thinking about your child's health now and in the future, please specify how concerned you are about your child’s exposure to each chemical or chemical source listed below. Respondents were presented a list of seven chemicals (i.e., arsenic, BPA, lead, mercury, cigarette smoke, pesticides, and outdoor air pollution), which was generated based on the criteria set in Studies 1 and 2 (e.g., is recognizable, moderately concerning to mothers, and receives some media coverage). Response options ranged from 0 (*not at all concerned*) to 3 (*very concerned*) and included an additional ‘I do not recognize this’ option (see Appendix F). Items were recoded into dichotomous indicators of concern: the two lowest response options (*not at all concerned* and *not really concerned*) were recoded as 0 (*not concerned*); and, the two highest responses (*concerned* and *very concerned*) were recoded as 1 (*concerned*).

Behavior, knowledge and behavioral intention. First, a basic definition of each of the three chemicals and their primary exposure pathways was provided in the survey. For instance, “Bisphenol A, or BPA, is a chemical used to make certain types of plastics and resins. These plastics may be found in many products such as refillable beverage containers, protective linings in food cans, compact disks and plastic dinnerware.” (see Table 5.2). This expository text (kept to 40 words or less) was carefully adapted from educational resources made publicly available by the National Science Foundation (N.S.F.) and the American Academy of Pediatrics (A.A.P.). There was some concern that providing a definition of the chemical and its exposure pathways might actually teach mothers about the types of behaviors they should be performing and in turn, bias their survey responses. To address this, the explanatory statement at the beginning of each behavior question purposefully gave no indication as to which activities were recommended or effective for reducing exposure to each chemical.

Following the introductory text, respondents were asked how often they engaged in a series of behaviors during the past six months “in order to reduce [their] child’s exposure to [BPA/arsenic/pesticides]?” A list of five representative examples of specific activities that reduce exposure to the chemical in question was derived from the E.P.A.’s TEACH Summaries (Environmental Protection Agency, 2011), as well as the A.A.P’s medical reference manual entitled *Pediatric Environmental Health* (American Academy of Pediatrics, 2011). Unfortunately, not all protective activities have the same relative impact on chemical exposure reduction. Because the relative potential for children’s exposure to a chemical varies depending on the exposure pathway (e.g., drinking water vs. diet), careful attention was paid to the selection of activities included in each measure. An effort was made to include activities that, according to the E.P.A. and A.A.P., involved pathways with higher relative potential for children’s exposure. For instance, activities to reduce BPA exposure included “avoiding heating food and beverages in plastic containers/cling wrap” and “purchasing products labeled BPA-free,” which are commonly recommended as most effective. Less effective reduction methods (e.g., limiting exposure to printed receipts) were excluded from each of the measures. Response options ranged from 0 (*never*) to 3 (*always*). Three chemical-specific behavior scales were created by averaging all five activity items for arsenic, BPA, and pesticides, respectively (range = 0 –3). All three were well scaled (α = .75, .77, and .77, respectively; see Results for distributions).

Assessing knowledge and behavior in the same survey proved a complex task. There was some concern that asking mothers about their knowledge of which behaviors were effective and then asking them to report their actual behaviors might bias responses. As a result, a decision was made to craft a measure that captured both knowledge and behavior concurrently without making mothers acutely aware of the assessment. The questions were carefully crafted to ask mothers to report their degree of engagement in behaviors "in order to reduce [their] child's exposure to [BPA/arsenic/pesticides]?" Five of the activities in the measure – detailed above – were behaviors recommended for chemical exposure reduction. Two additional 'test' activities completely irrelevant to reducing exposure to the chemical in question were randomly included within the list. In the case of BPA, an example of a test activity is "limiting consumption of rice and/or rice products" – an activity that has no bearing on BPA exposure reduction. The assumption here was that mothers would be able to make a fairly subtle distinction between doing something (e.g., washing plastics by hand) and doing something for a particular reason (e.g., washing plastics by hand to reduce exposure to BPA). To strengthen the validity of this assumption, extreme activities like limiting exposure to cigarette smoke were strategically avoided for the 'test' activities because it seemed mothers would feel compelled to respond – despite the subtle chemical-specific question wording – that they always engaged in these types of behaviors.

These test activities helped reduce the risk of a mother simply reporting engagement in all of the listed behaviors so as to be perceived as a 'good mom.' Perhaps more importantly, their inclusion enables an assessment of whether a respondent is knowledgeable about how to effectively reduce exposure to each chemical. If a mother reported engaging in a test activity (*sometimes, often,* or *always*) to reduce her child's exposure to a particular chemical, her response was recoded as 0 (*incorrect*). If a mother reported never engaging in said test activity, her response was coded as 1 (*correct*). A knowledge scale was created by averaging correct responses to the two test activities (range = 0 – 1), with a higher score indicating greater knowledge. The inter-item correlations for arsenic and pesticide knowledge were significant (r =.70, $p < .001$, M = .17, SD =.34 for arsenic; r = .58, $p < .001$, M = .19, SD =.35 for pesticides). The correlation among the BPA knowledge items was also significant, but moderate in strength by comparison (r = .30, $p < .001$, M = .27, SD = .33).

Table 5.2 Behavior measure (example: bisphenol A (BPA))

Bisphenol A, or BPA, is a chemical used to make certain types of plastics and resins. These plastics are found in many products such as refillable beverage containers, protective linings in food cans, compact disks and plastic dinnerware.

Thinking about the past six (6) months, how often did you engage in any of the following behaviors in order to reduce your child's exposure to BPA? Please read and consider each response option carefully.

	Never	Sometimes	Often	Always
Avoided heating food and beverages in plastic containers/cling wrap	☐	☐	☐	☐
Purchased products labeled BPA-free	☐	☐	☐	☐
Washed plastics by hand instead of in the dishwasher	☐	☐	☐	☐
Used alternatives to plastic for food packaging, such as glass, when possible	☐	☐	☐	☐
Limited consumption of canned goods, including baby formula	☐	☐	☐	☐
Limited consumption of rice and/or rice products (rice milk, crackers, cereals)	☐	☐	☐	☐
Drank bottled or filtered water instead of tap water	☐	☐	☐	☐

Next, behavioral intentions were assessed by asking how often mothers intend to engage activities during the next six months "in order to reduce [their] child's exposure to [BPA/arsenic/pesticides]?" (see Table 5.3). Since knowledge was already captured in the preceding behavior items, this list of activities was limited to the five E.P.A.- and A.A.P.-recommended activities for each chemical. To maintain the validity of responses to the knowledge items, the survey was programmed so that respondents could not return to previous questions to change their answers. Response options again ranged from 0 (*never*) to 3 (*always*). Three intention scales were created by averaging all five activity items for arsenic, BPA, and pesticides (range = 0 – 3). The three were well scaled (α = .98, .85 and .98 respectively; see Results for distributions).

Table 5.3 Behavioral intention measure (example: bisphenol A (BPA))

Thinking about the next six (6) months, how often do you intend to engage in the following behaviors in order to reduce your child's exposure to BPA?

	Never	Sometimes	Often	Always
Avoid heating food and beverages in plastic containers/cling wrap	☐	☐	☐	☐
Purchase products labeled BPA-free	☐	☐	☐	☐
Wash plastics by hand instead of in the dishwasher	☐	☐	☐	☐
Use alternatives to plastic for food packaging, such as glass, when possible	☐	☐	☐	☐
Limit consumption of canned goods, including baby formula	☐	☐	☐	☐

There was some concern over how one particular subgroup – women who were both pregnant *and* had at least one child age 6 or under – would interpret these items.

For instance, if she were answering a question about reducing arsenic exposure (e.g., by drinking filtered water), she might respond by assessing (a) her behavior as a parent giving filtered water to her young child or (b) her behavior as a pregnant woman drinking filtered water herself for her fetus. Technically, these are two different behaviors that may be difficult to assess concurrently. To reduce threats to measurement validity, women who met these specific criteria were given the following special instructions before answering these items: You mentioned that you are currently pregnant and have at least one child age 6 or under. When responding to the next series of questions, please think about your behaviors as a pregnant woman. In other words, please report how often you engage in certain behaviors for your unborn baby's health, rather than for your other child or children. It was presumed that asking this subgroup to answer questions about their behaviors during pregnancy would increase the likelihood of observing protective tendencies since unborn children are technically in the most vulnerable state.

Key behavioral determinants. Measures assessing attitudes, perceived norms and perceived control were based on instruments recommended by Fishbein and Ajzen (2010). Attitudes toward reducing exposure to each of the three chemicals was assessed by four 7-point items. Respondents indicated whether their engagement in behaviors to reduce their child's exposure to each of the chemicals in the next six months would be (1) bad/good (*extremely bad* = 1 to *extremely good* = 7), (2) harmful/beneficial (*very harmful* = 1 to *very beneficial* = 7), (3) foolish/wise (*very foolish* = 1 to *very wise* = 7), and (4) unhealthy/healthy (*very unhealthy* = 1 to *very healthy* = 7). An attitude scale was created by averaging the four items (α = .97, *M* = 5.75, *SD* = 1.29 for BPA; α = .98, *M* = 5.84, *SD* = 1.34 for arsenic; α = .98, *M* = 5.96, *SD* = 1.29 for pesticides).

Perceived normative pressure was assessed by two 5-point items. Respondents indicated whether most mothers like themselves will engage in behaviors to reduce their children's exposure to each of the three chemicals in the next six months (descriptive norms). Response options for both items ranged from 1 (*strongly disagree*) to 5 (*strongly agree*): $M = 3.96$, $SD = .90$ for BPA; $M = 3.93$, $SD = .92$ for arsenic; $M = 4.04$, $SD = .85$ for pesticides. Respondents also indicated whether most people important to them think they should engage in behaviors to reduce their child's exposure to each of the three chemicals in the next six months. Again, response options for both items ranged from 1 (*strongly disagree*) to 5 (*strongly agree*): $M = 3.96$, $SD = .90$ for BPA; $M = 3.69$, $SD = 1.03$ for arsenic; $M = 3.78$, $SD = .97$ for pesticides. The two items were averaged to create a perceived normative pressure scale ($r = .54$, $p < .001$, $M = 3.77$, $SD = .86$ for BPA; $r = .55$, $p < .001$, $M = 3.81$, $SD = .86$ for arsenic; $r = .53$, $p < .001$, $M = 3.91$, $SD = .80$ for pesticides).

Respondents' self-efficacy was measured by one item. Respondents indicated whether reducing their child's exposure to each of the three chemicals in the next six months was under their control. Response options ranged from 1 (*not at all*) to 7 (*completely*; $M = 5.51$, $SD = 1.29$ for BPA; $M = 5.52$, $SD = 1.13$ for arsenic; $M = 5.67$, $SD = 1.26$ for pesticides).

Perceived threat was measured by two 7-point items assessing the two primary dimensions of risk: likelihood and severity. First, respondents were asked to indicate how likely it is that their child would be exposed to each of the three chemicals in the next 6 months, if no protective actions were taken. Conditioning the threat question on not taking action in this way prevents an underestimation of the association between risk perception and behavior, particularly in cross-sectional surveys (N. T. Brewer et al., 2007). Response options ranged from 1 (*very unlikely*) to 7 (*very likely*). Then, respondents were asked how much exposure to each chemical negatively affects a child's health, with response options ranging from 1 (*very little*) to 7 (*very much*). A threat perception scale was created by weighting the likelihood item by the severity item: (likelihood × severity) / 7. The mean of the threat perception scale was 3.28 (*SD* = 1.99) for BPA, 3.61 (*SD* = 2.11) for arsenic, and 4.18 (*SD* = 2.02) for pesticides.

Perceived responsibility for reducing children's exposure to each of the three chemicals was assessed by three 5-point items, assessing individual, industry and government responsibility. The items were adapted from (Leikas, Lindeman, Roininen, & Lahteenmaki, 2009) to fit the purposes of this study. Respondents indicated whether they agreed they were personally responsible for reducing their child's exposure to each chemical in the next six months, whether companies and manufacturers were responsible, and whether government regulatory agencies like the E.P.A. were responsible. Response options ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). The nine perceived responsibility measures were well distributed (see Appendix G).

PPEH information seeking and scanning. Respondents reported from where and how often they actively sought and routinely scanned information about the relationship between children's health and chemicals in the environment. As in Study 1, all items were adapted from previously validated measures (see Kelly, Niederdeppe, and Hornik, 2009; Kelly et al., 2010). Briefly, the question sequence began by distinguishing between seeking and scanning: "Some people are actively looking for information about chemicals in the environment that may be harmful to children's health while others just happen to hear or come across such information. Some people don't come across information about these potentially harmful chemicals at all."

First, respondents were asked whether or not they engaged in any PPEH information seeking in the past six months. Two important adjustments were made to this item based on insights from Study 1. Examples of potential sources of information (e.g., mass media, doctors, other people) were provided in the question wording to help respondents more deeply consider their own information engagement. In addition, the skip pattern following this question was removed, allowing all respondents the opportunity to respond to the following source-specific seeking question. Both revisions were intended to increase the likelihood of valid responses.

All respondents received a follow-up question assessing the frequency of general PPEH information seeking from individual sources: "How many times did you actively look for information about the relationship between children's health and chemicals in the environment during the past six months from each of the following sources?: (1) books; (2) newspapers (online and print); (3) television and radio; (4) magazines (print only); (5) internet (search engines only); (6) websites (excluding search engines and newspaper websites); (7) doctors or other medical professionals; (8) family, friends, or co-workers" (see Table 5.4 for full measure). In Study 1's elicitation survey, some mothers reported using Facebook as an information source in the open-ended seeking question. This led to a concern that Facebook might be included in responses to the item assessing website seeking. To reduce this risk, mothers were instructed to exclude social networks like Facebook in addition to search engines and newspaper websites from their response to the website seeking item.

Unlike the behavior items that were recoded into scales, it can be argued that the items capturing seeking (and perhaps more importantly, scanning) are not indicators of a common cause. In other words, the seeking (and scanning) items do not necessarily need to intercorrelate in order to have meaningful effects on behavior and/or its determinants, making them more suitable for combining into an index than a scale. Response options for the seeking items ranged from 0 (*not at all*) to 2 (*3 times or more*). Five items (2 through 6 above) were summed to create a PPEH-related media seeking index (range = 0 – 10). The measure was slightly skewed to the right (*Mdn* = 3.0). An index of total seeking for use as a control variable in the central hypothesized analyses was also created by summing all 8 items (range = 0 – 16). The measure was well distributed (*Mdn* = 4.5; see Results for full summary of item and index distributions).

Table 5.4 PPEH information seeking measure

How many times did you actively look for information about the relationship between children's health and chemicals in the environment in the past six (6) months from each of the following sources? If you are not sure, please make your best guess.

	Not at all	1 or 2 times	3 times or more
Books	□	□	□
Newspapers (online and print)	□	□	□
Television and radio	□	□	□
Magazines (print only)	□	□	□
Internet (search engines only)	□	□	□
Websites (excluding search engines, social networks like Facebook, and newspaper websites)	□	□	□
Doctor or other medical professional	□	□	□
Family, friends, or co-workers	□	□	□

If respondents reported any seeking from magazines (item 4) or websites (item 6), they received a follow-up question about seeking from the two specific magazines (*Parents Magazine, Parenting* Magazine) or websites (Parents.com, Babycenter.com) content analyzed in Study 2. A foil – or non-existent – source was also included in the follow-up measures to assess recall accuracy. A concern was raised over mothers' high recall of these non-existent media sources in Study 1. One possible explanation for high recall was that the names of the foils (i.e., *Baby Health Magazine*, Babyhealth.com) were too similar to actual magazines and websites and thus misleading. To address this issue, more distinct foils were used in this study (e.g., *My Children Magazine*, Mychildren.com). Another equally likely explanation was that mothers felt compelled by a social desirability bias to be perceived as 'good moms,' reporting exposure to all possible sources listed. It was conceivable that they did not have (or did not recall) any exposure to the information and/or sources listed, but still wanted to respond in a favorable way.

This issue is addressed in two ways. First and most simply, a measure of social desirability is included in the survey and in subsequent analyses as a covariate (a detailed explanation of this measure is provided in the *Additional covariates* section below). Second, a more stringent standard was set for these title-specific engagement items. The questions were rewritten to give moms an opportunity to respond in a socially desirable way without necessarily having to count their answers as actual exposure. This was achieved by changing the response options for the follow-up magazine and website questions to 0 (*not at all*), 1 (*1 to 2 times*), 3 (*3 times or more*) and 9 (*maybe, but I'm not sure*), which was recoded as 0 for analysis. Respondents skipped out of these questions were also recoded as 0 for each item. Separate magazine- and website-specific seeking indices were created by summing the two non-foil items (range = 0 – 4). The two measures were skewed to the right (*Mdn* = 0.0 for both magazines and websites; see Results for distributions).

Respondents were then asked about PPEH information scanning. There were two important differences between the seeking and scanning measures. First, the scanning item asked: "How many times did you hear or come across information about the relationship between children's health and chemicals in the environment during the past six months from each of the following sources when you were not actively looking for it?" (see Table 5.5 for full measure). Second, search engines were excluded from the list of sources since they are only used for active seeking. Response options ranged from 0 (*not at all*) to 2 (*3 times or more*). Four items (2 through 5) were summed to create a PPEH-related media scanning index (range = 0 – 8). The measure was slightly skewed to the right (*Mdn* = 2.0; see Results for distributions).

Similar to the seeking measures, respondents who reported any scanning from magazines (item 4) or websites (item 6) received a follow-up question about scanning from the two specific magazines (*Parents Magazine, Parenting Magazine*) or websites (Parents.com, Babycenter.com) content analyzed in Study 2. Response options included 0 (*not at all*), 1 (*1 to 2 times*), 3 (*3 times or more*) and 9 (*maybe, but I'm not sure*), which was recoded as 0. Respondents skipped out of these questions were also recoded as 0 for each item. Separate magazine- and website-specific scanning indices were created by summing the two non-foil items (range = 0 – 4). The two measures were slightly skewed to the right (*Mdn* = 0.0 for both magazines and websites; see Results for distributions).

Table 5.5 PPEH information scanning measure

How many times did you hear or come across information about the relationship between children's health and chemicals in the environment in the past six (6) months from each of the following sources when you were not actively looking for it? If you are not sure, please make your best guess.

	Not at all	1 or 2 times	3 times or more
Books	□	□	□
Newspapers (online and print)	□	□	□
Television and radio	□	□	□
Magazines (print only)	□	□	□
Websites (excluding search engines, social networks like Facebook, and newspaper websites)	□	□	□
Doctor or other medical professional	□	□	□
Family, friends, or co-workers	□	□	□

Additional covariates. A series of potential covariates was measured and included in multivariate models to reduce the likelihood of alternative explanations for observed associations among focal variables. As part of its service, the survey company that administered the study provided respondents' age, race-ethnicity, education, and household income. Gender, pregnancy status, and number of children were obtained from screening items in the questionnaire. Measures of political orientation, home ownership, smoking status, and a modified version of child's health status were borrowed from the C.D.C.'s annual survey of health risks, the Behavioral Risk Factor Surveillance System (B.R.F.S.S.; Centers for Disease Control and Prevention, 2011) and included in this survey. Because BRFSS does not assess breastfeeding practices, a single item asking mothers whether they currently breastfeed or feed their child their breast milk was borrowed from the C.D.C.'s U.S. National Immunization Survey (N.I.S.; Schwartz et al., 2000). Respondents pregnant with their first child were asked whether they intended to breastfeed their unborn child (see Results for descriptive statistics for all covariates).

To assess and adjust for maternal parenting styles, the Parenting Styles and Dimensions Questionnaire (PSDQ; Robinson, Mandleco, Olsen, & Hart, 2001) was selected for inclusion after an extensive review of the family measurement literature. Commonly used in studies of parent behavior, the PSDQ has been shown to be associated with actual child health outcomes, including childhood obesity (Clark, Goyder, Bissell, Blank, & Peters, 2007; Wake, Nicholson, Hardy, & Smith, 2007). According to one of the scales developers, Clyde Robinson (personal communication, January 23, 2013), the 32-item ‘short version’ of the PSDQ could be reduced even further for the purposes of this study. A total of nine items that appeared to be most suitable for the population age 0-6 and for the protective behaviors examined in this study were selected from the three latent constructs assessed by the PSDQ: Authoritative Parenting Style, Authoritarian Parenting Style, and Permissive Parenting Style. Mothers were asked: Rate how often you exhibit this behavior with your child(ren) ages 6 and under. Respondents currently pregnant with their first child were instructed to imagine how often they intend to exhibit these behaviors once the child is born. Response options ranged from 0 (*never*) to 4 (*always*) for each of the nine items.

Authoritative parenting, which is characterized as responsive and demanding, was assessed with three items (out of a possible 15). One item from each of the three authoritative dimensions (i.e., connection, regulation, autonomy granting) was presented to respondents: (a) *I am responsive to my child’s feelings and needs*, (b) *I emphasize the reasons for rules*, and (c) *I take into account my child’s preferences in making plans for* *the family*. To obtain the authoritative parenting score, scores on these three items were averaged (Cronbach's $\alpha = .61$).

Authoritarian parenting, characterized as unresponsive and demanding, was assessed using three items (out of a possible 12). One item from each of the three authoritarian dimensions (i.e., physical coercion, verbal hostility, non-reasoning/punitive) was presented to respondents: (a) *When my child asks why he/she has to conform, I state: because I said so, or I am your parent and I want you to,* (b) *I scold and criticize to make my child improve*, and (c) *I use physical punishment as a way of disciplining my child*. Scores were averaged to obtain the authoritarian parenting score (Cronbach's $\alpha = .77$).

Finally, permissive parenting, characterized as undemanding and responsive (or indulgent), was assessed using three items (out of a possible 5) from the single permissive parenting dimension: (a) *I find it difficult to discipline my child*, (b) *I give into my child when the child causes a commotion about something*, and (c) *I spoil my child*. Scores were averaged to obtain the permissive parenting score (Cronbach's $\alpha = .75$). The measures of authoritarian and permissive parenting were moderately correlated ($r = .584$, $p < .001$); however, the correlations between authoritative and authoritarian, and authoritative and permissive, were not strong ($r = .068$* and .156***, respectively).

While it would be advantageous from an analytic perspective to combine these three parenting measures into a single overall scale (i.e., to reduce degrees of freedom in the analytic models), neither the pattern of correlations among the scales observed here nor the parenting measurement literature suggest that such an approach would be appropriate. The literature argues that the three constructs are theoretically distinct, a claim that finds empirical support here.

Several items assessed respondents' exposure to and reactions to PPEH information, both generally and in mass media specifically. First, respondents' exposure to PPEH information on product packaging was captured with a single item: How often do you read information about ingredients and/or certifications (e.g., USDA organic, all natural, non-toxic) printed on the different products you purchase? Response options ranged from 0 (*never*) to 4 (*always*).[10]

Next, a measure of PPEH information sufficiency in the media served a dual purpose in this survey. As mentioned in Study 1, prior work has shown that difficult knowledge questions followed by media exposure measures can lead to lower reports of actual media attention and interest (see Lasorsa, 2003). Adding a buffer item between these two types of measures that serves as an excuse for poor knowledge has been shown to reduce order effects and minimize underestimations of media exposure. Accordingly, a buffer item – PPEH information sufficiency – was added to the survey and included as a covariate in analyses. The item stated: Some media sources do a good job in keeping parents informed about these types of health issues. Others do not do such a good job.

So mothers would transparently report about the same sources they had been thinking about throughout the survey, this item was adjusted slightly to mirror other media exposure measures in the survey. Rather than stating "Thinking about the media sources you are most familiar with…," the question read "Thinking about the <u>media sources you come across</u> that provide information about children's health…" Mothers were then asked: Would you say they do a poor, fair, good or excellent job keeping

[10] It is likely that recalling exposure to PPEH information on product packaging is caused by media scanning. Preliminary analyses showed the two items were significantly correlated ($r = .405$, $p < .001$). Unfortunately, it is impossible to establish causal order between the two variables using cross-sectional data. To prevent diluting the observed effects of scanning in subsequent analyses, this particular covariate was excluded from models testing the hypothesized relationships.

parents informed about the relationship between children's health and chemicals in the environment?" Response options ranged from 0 (*poor*) to 3 (*excellent*).

Finally, a modified version of Gaziano and McGrath's (1986) measure of trust and confidence in media sources used in prior work (i.e., Tsfati & Cappella, 2003) was also included in the survey. Respondents were asked to give their opinions related to the various components of media skepticism (i.e., fair, accurate, tell the whole story, can be trusted, help society solve its problems). Answers were coded 0 (*least trusting*) to 4 (*most trusting*) and were averaged to obtain a media trust score (Cronbach's α = .90).

Lastly, to assess and adjust for biases in self-reported behaviors and perceptions, a validated 13-item scale of social desirability (Form C; Crowne & Marlow, 1960; Reynolds, 1982) was captured. The scale consists of 13 true/false statements (e.g., I am always courteous, even to people who are disagreeable). Five items (3, 5, 8, 9, and 13) were reverse coded so that a higher score signified a greater social desirability bias. Responses were summed to create a scale ranging from 0 to 13, with a high score indicating a high tendency to provide socially desirable responses. The complete wording of all survey measures can be found in Appendix F.

Analytic procedure

First, a comparison between those who did and did not complete the survey was performed using SSI profile data to determine whether any significant differences existed between the two groups. Analyses were then restricted to the 822 eligible respondents who completed the questionnaire. Basic frequency analyses were performed to assess sample characteristics, as well as address the study's four research questions.

To evaluate discriminant validity (*Ha*), correlations of each scanned source with each sought source were computed (excluding internet search engines – a source exclusive to the seeking measure). Correlations across each of the sources were averaged and confidence intervals were computed using the formula: CI = average correlation + or – SE* (.975 quartile of the t distribution with n-1 degrees of freedom). This approach helped determine whether the mean correlation for each of the scanned exposure measures with other scanned exposure measures was significantly higher than the mean correlation for sought exposure for each source. Standard errors and confidence intervals were used to determine whether the mean correlations were significantly different from one another (for the full matrix of correlations, see Appendix G).

To test the first set of aforementioned hypotheses (*H1-H5*), zero-order correlations were used to estimate bivariate associations between central hypothesized constructs (Model 1). Multivariate linear regression (Model 2) was used to examine the associations between constructs, adjusting for a series of potential confounders (*H6-H10*).

A large number of analyses would need to be performed to test these central hypotheses (5 outcomes × 2 models × 3 chemicals = 30 tests), increasing the risk of chance significant results. To address this concern, *a priori* standards were set for evaluating the legitimacy of significant results and mitigating Type I errors. After running all 30 models, the results were compiled into a single table and examined to determine whether one of two patterns emerged (see Appendix H for table). The first possible pattern that would increase confidence in the legitimacy of the results would be if at least two of the coefficients for a single independent variable (e.g., media scanning) were significant across all three chemical-specific models predicting the same outcome (e.g., behavior). Such a pattern would suggest that overall the predictor had a strong impact on one of the key outcomes. The second possible pattern that would increase confidence in the results would be if the coefficients for a single independent variable (e.g., media scanning) were significant across at least three chemical-specific outcomes (e.g., BPA-related behavior, BPA-related intentions, BPA-related knowledge; or, arsenic-related behavior, arsenic-related descriptive norms, and arsenic-related perceived threat). Such a pattern would suggest that the predictor had a strong impact on multiple key outcomes related to a single chemical. By limiting the claims of significant results to only those that follow these two specific patterns, the likelihood of Type I error is reduced without limiting the interpretation of potentially differential results across chemicals and outcomes.

Analyses were performed using the statistical software package SPSS Statistics 20 (IBM Corp, 2012) and significance was set at $p \leq 0.05$ for all statistical tests. Cases with missing values on any of the independent, dependent, or confounding variables were dropped using listwise deletion since no more than 10% of cases were missing in any analysis.

Results

Descriptive analyses: Demographic characteristics and covariates

A total of 911 SSI panelists began the survey, of which 847 (93%) met the study's eligibility requirements (i.e., female who has children under 6 and/or is currently pregnant). Of those eligible respondents, 822 (97%) completed the survey and were included in subsequent analyses.

Table 5.6 presents a series of comparisons between two groups of eligible respondents: those who did and did not complete the survey. Comparisons were based on background characteristics made available by the survey provider for all eligible participants who started the online survey. Respondents who completed the survey were slightly younger (*M* = 30.3 vs. 33.7, respectively) and more educated. No other significant differences were observed between the two groups.

Table 5.6 Demographic comparisons based on survey completion (n = 846)

	Survey Complete	Survey Incomplete
n	822	24
Mother's age, years (M)	30.3*	33.7
Race/ethnicity (%)[a]		
White (not Hispanic)	64.4	66.7
Hispanic	14.9	9.5
African American	9.6	14.3
Asian	0.0	8.1
Other	3.1	9.5
Education (%)[b]		
Some high school	3.7***	20.8
High school	19.5	16.7
Some college	26.5	25.0
College and above	50.3	37.5
Income (%)[c]		
Less than $20,000	17.4	26.1
$20,000 - $49,999	37.9	30.4
$50,000 - $99,999	33.3	26.1
$100,000 and above	11.4	17.4

* $p < .05$, *** $p < .001$.
Note. Age comparison based on ANOVA; all other comparisons based on crosstabulation (χ^2).
[a] 72 missing on race/ethnicity.
[b] 13 missing cases on education.
[c] 40 missing cases on income.

Among those who completed the survey, most (60.5%) had one child age 6 or under, while 30.8% reported being pregnant at the time of the survey. Roughly 20% of the sample (n = 120) reported both a current pregnancy and having at least one child age 6 and under. Approximately 64% were White, 15% Hispanic, 10% African-American, 8% Asian and 3% "other" (9.4% did not provide their race/ethnicity). The average age of participants was 30.29 years (*SD* = 7.55). Half of the sample had a bachelor's degree or higher (50.3%), while a majority of the sample (55.3%) had a household income of less than $50,000. Additional characteristics of the final sample are detailed in Table 5.7.

Table 5.7 Sample characteristics

	N	%	Mean (SD)
Children 6 and under	822		
0		10.1	
1		60.5	
2		23.7	
3 or more		5.7	
Pregnant (yes)	822	30.8	
Mother's age, years	822		30.29 (7.55)
Race/ethnicity	753		
White (not Hispanic)		64.4	
Hispanic		14.9	
African American		9.6	
Asian		8.1	
Other		3.1	
Education	809		
Some high school		3.7	
High school		19.5	
Some college		26.5	
College and above		50.3	
Income	783		
Less than $20,000		17.4	
$20,000 - $49,999		37.9	
$50,000 - $99,999		33.3	
$100,000 and above		11.4	
Homeowner (yes)	818	48.2	
Political orientation	816		
Liberal		29.6	
Moderate		65.4	
Conservative		41.2	
Breastfeeding (yes)	819	36.1	
Smoker (yes)	818	25.3	

Note. Cases (N) and percentages represent non-missing data and are unweighted.

Table 5.7 (continued) Sample characteristics

	N	%	Mean (SD)
Child's health status	821		
Good		12.3	
Very good		43.4	
Excellent		43.5	
Parenting style	822		
Authoritarian			4.11 (0.69)
Authoritative			2.25 (1.02)
Permissive			5.57 (0.96)
PPEH information exposure on product packaging	820		
Rarely		9.3	
Sometimes		37.4	
Often		34.9	
Always		16.3	
Media trust	820		2.08 (0.83)
PPEH information sufficiency in media	822		
Fair		34.4	
Good		40.4	
Excellent		13.5	
Social desirability	818		7.01 (2.81)

Note. Cases (N) and percentages represent non-missing data and are unweighted.

Behaviors, concerns and exposure to PPEH information: Descriptive analyses

RQ1 – Protective behaviors. Study 3's first research question asked to what extent mothers (intend to) engage in protective behaviors to reduce their child's exposure to PPEH risks. Table 5.8 shows the distributions for each of five recommended activities measured for reducing exposure to BPA, arsenic, and pesticides.

The most common behavior to reduce BPA exposure was purchasing BPA-free products (89.7% reported engaging in the behavior at least *sometimes* during the past 6 months). The most frequent behavior to reduce BPA exposure was washing plastics by hand instead of in the dishwasher (39.1% reported *always* engaging in the behavior during the past 6 months). The least frequent/common behavior to reduce BPA exposure was limiting consumption of canned goods, including baby formula (25.9% reported *never* engaging in the behavior during the past six months).

The most common behavior to reduce arsenic exposure was washing hands after soil exposure (92.9% reported engaging in the behavior at least *sometimes* during the past six months). This was also the most frequent behavior (60.7% reported *always* engaging in the behavior during the past six months). The least frequent/common behavior to reduce arsenic exposure was limiting the consumption of rice and/or rice products (36.4% reported *never* engaging in the behavior during the past six months).

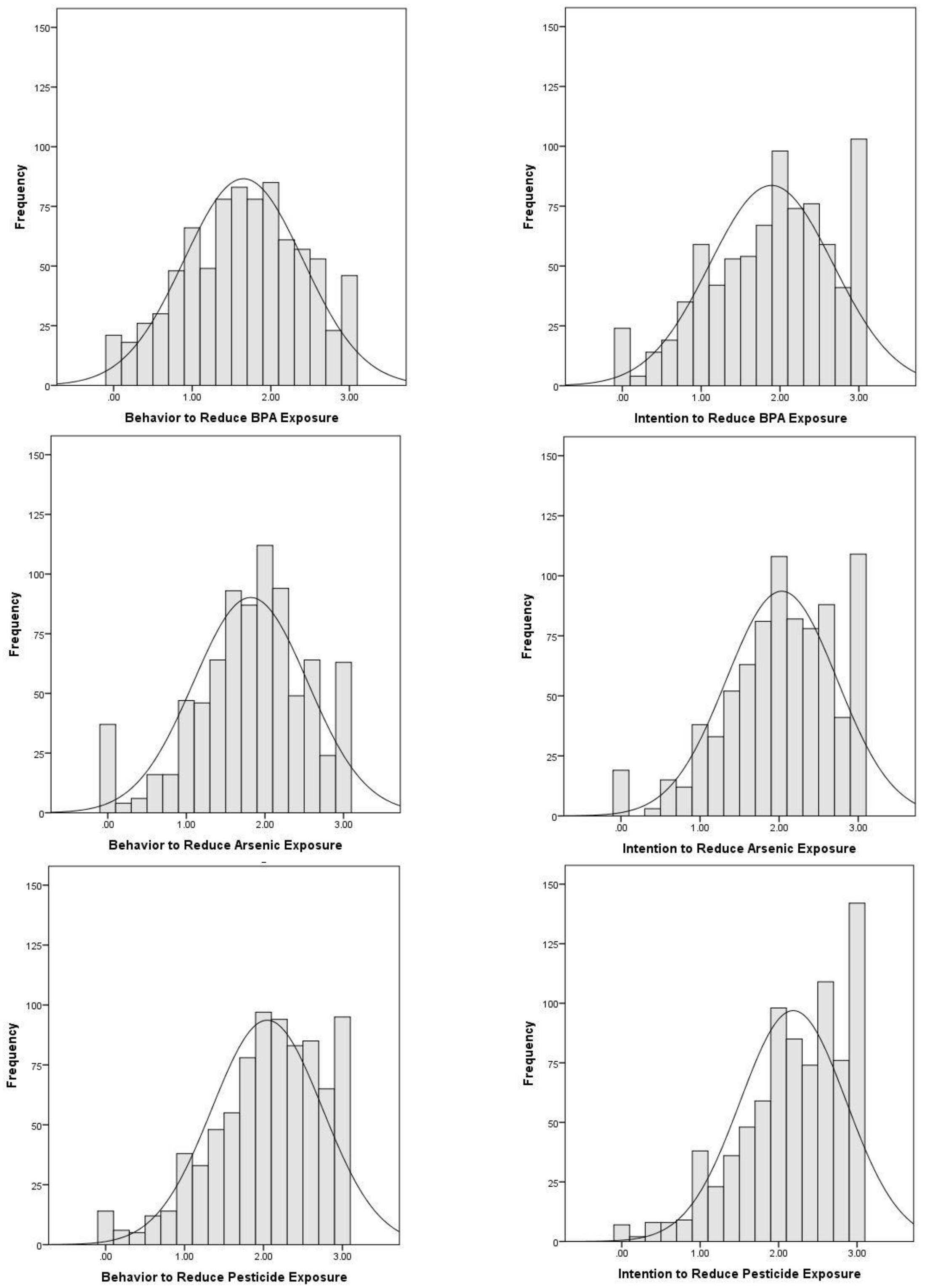
The most common behavior to reduce pesticide exposure was thoroughly washing fruits and vegetables before eating (97.3% reported engaging in the behavior at least *sometimes* during the past six months). This was also the most frequent behavior (67.5% reported *always* engaging in the behavior). Relatively speaking, the least frequent/common behavior to reduce pesticide exposure was purchasing organic fruits and vegetables (16.3% reported *never* engaging in the behavior).

Table 5.9 shows the distribution for each of the combined behavior and behavioral intention scales. Based on their relative distributions, it appears mothers have been making the greatest effort to reduce exposure to pesticides during the past six months (M = 2.05, SD = .70), followed by arsenic (M = 1.82, SD = .73), and BPA (M = 1.65, SD = .76). The pattern is consistent for behavioral intentions to reduce exposure in the next six months (M = 2.19, SD = .68 for pesticides; M = 2.03, SD = .70 for arsenic; and M = 1.89, SD = .78 for BPA).

Table 5.8 Protective behaviors and intentions to reduce exposure to three focal chemicals: Item distributions by percent (n = 822)

	Behavior (% past 6 months)				Intentions (% next 6 months)			
	Never	Sometimes	Often	Always	Never	Sometimes	Often	Always
BPA								
Avoid heating food and beverages in plastic	16.2	29.0	24.5	30.4	9.2	23.5	30.7	36.6
Purchase products labeled BPA-free	11.3	22.4	31.3	35.0	7.9	18.0	30.9	43.2
Wash plastics by hand	16.7	21.7	22.6	39.1	10.8	21.3	23.4	44.5
Use alternatives to plastic for food packaging	19.3	34.2	28.2	18.2	10.1	28.6	33.1	28.2
Limit consumption of canned goods	25.9	29.8	24.7	19.6	17.6	27.3	31.9	23.2
Arsenic								
Drink bottled or filtered water	14.1	19.3	25.9	40.6	10.1	19.1	24.3	46.5
Limit consumption of rice	36.4	30.4	18.2	15.0	26.3	28.0	25.7	20.1
Limit consumption of apple juice	30.3	24.8	24.3	20.6	19.1	24.0	28.6	28.3
Limit exposure to cigarette smoke	7.7	11.1	22.5	58.8	4.3	8.3	19.5	68.0
Wash hands after soil exposure	7.1	10.3	21.9	60.7	4.3	8.3	18.4	69.1
Pesticides								
Limit pesticide use at home	8.8	17.2	29.1	45.0	5.8	16.1	27.3	50.9
Limit use of insect repellents (DEET)	10.3	17.2	27.0	45.5	6.4	16.5	25.4	51.6
Purchase organic fruits and vegetables	16.3	34.3	30.4	19.0	11.1	28.7	34.4	25.8
Thoroughly wash fruits and vegetables	2.7	10.7	19.1	67.5	1.3	7.4	20.3	70.9
Drink bottled or filtered water	12.0	19.5	22.9	45.6	9.6	18.6	21.7	50.1

Table 5.9 Protective behaviors and intentions to reduce exposure to three focal chemicals: Scale distributions (n = 822)



RQ2 – PPEH concerns. Study 3's second research question asked which PPEH issues concern the greatest proportion of new and expecting mothers. A majority of mothers (more than 50%) expressed concerns related to all PPEH issues listed (see Table 5.10). The largest proportions of mothers expressed concern over cigarette smoke (84.7%), pesticides (83.9%), outdoor air pollution (76.6%), and lead (74.3%).[11] The least familiar PPEH issue among mothers surveyed in Study 3 was BPA, with roughly 1 in 10 respondents (11.4%) reporting that they did not recognize the chemical.

Table 5.10 General chemical concern (n = 822)

	Concerned (%)	Do not recognize (%)
Arsenic	66.2	4.9
BPA (bisphenol A)	69.5	11.4
Lead	74.3	2.4
Mercury	69.9	2.9
Cigarette smoke	84.7	2.2
Pesticides	83.9	2.3
Outdoor air pollution	76.6	1.9

RQ3 – Exposure to PPEH information. Study 3's third research question asked to what extent mothers seek and scan general PPEH information, and from which sources. Table 5.11 shows the distributions for seeking and scanning across medical, interpersonal, and various media sources.

According to the dichotomous measure of seeking, close to half (45.1%) of respondents reported actively seeking information during the past six months about chemicals in the environment that may be harmful to children's health. The most

[11] These results are relatively consistent with findings from Study 1, which showed widespread concerns related to cigarette smoke (81.0%), pesticides (77.8%) and lead (76.2%).

commonly used sources – those used at least once by the largest proportion of mothers – for active PPEH information seeking were internet search engines (61.9%), websites (56.7%), interpersonal sources (56.1%), and medical professionals (54.4%). The pattern of most frequently used sources – those used three or more times by the largest proportion of mothers – for active seeking was the same: internet search engines (28.2%), websites (21.8%), interpersonal sources (19%), and medical professionals (18.0%). It should be reiterated that every respondent was asked whether she actively sought information (yes/no) *and* the extent to which she sought from a variety of sources (8 items ranging from *not at all* to *3 times or more* combined into an index of total seeking). Although the measures did not produce identical percentages of seekers (45.1% vs. 26.2%, respectively), they were significantly and positively correlated ($r = .65$, $p < .001$).

According to the dichotomous measure of scanning, just over half (56.2%) of respondents reported coming across PPEH information during the past six months. The most commonly scanned sources were interpersonal sources (62.0%), websites (60.8%), medical professionals, and television/radio (both 52.9%). Mothers most frequently came across PPEH information from websites (21.0%), interpersonal sources (17.9%), and medical professionals (16.3%). Again, all respondents were asked whether they routinely came across information (yes/no) *and* the extent to which they scanned from a variety of sources (7 items combined into an index of total scanning). Although the measures did not produce identical percentages of scanners (56.2% vs. 19.5%, respectively), they were also significantly and positively correlated ($r = .39$, $p < .001$).

Table 5.11 PPEH information seeking and scanning – by source – in the past 6 months: Item distributions by percent (n = 822)

	Seeking			*Scanning*		
Source	Not at all	1 or 2 times	3 times or more	Not at all	1 or 2 times	3 times or more
Doctor/medical professional	45.6	36.4	18.0	47.1	36.6	16.3
Interpersonal sources	43.9	37.1	19.0	38.0	44.2	17.9
Books	62.8	24.9	12.3	65.0	24.6	10.5
Newspapers (online and print)	62.2	26.3	11.6	59.4	29.6	11.1
Television and radio	56.1	29.6	14.4	47.1	38.3	14.6
Magazines (print only)	60.0	29.8	10.2	55.1	33.9	10.9
Parents Magazine	71.4	19.3	9.2	70.4	18.6	10.9
Parenting Magazine	72.9	18.2	8.9	72.4	17.5	10.1
My Children Magazine (foil)	81.9	12.3	5.8	80.4	12.3	7.3
Internet (search engines only)[a]	38.1	33.7	28.2	--	--	--
Websites (excluding search engines and newspaper websites)	43.3	34.9	21.8	39.2	39.8	21.0
Parents.com	66.5	20.0	13.5	68.1	21.8	10.1
Babycenter.com	67.2	19.0	13.9	68.1	19.8	12.0
Mychildren.com (foil)	81.5	11.1	7.4	80.9	11.8	7.3

[a] Response item for seeking measure only.

Table 5.12 shows the distributions of the indices representing seeking and scanning from media sources (i.e., newspapers, television/radio, magazines, internet search engines, and websites). About 2 out of 3 mothers reported active seeking from media sources, while 3 out of 4 reported scanning PPEH information from the media in the past 6 months. Both media seeking and scanning indices were skewed to the right (*Mdn* = 3.0 and 2.0, respectively).

Table 5.12 PPEH information seeking and scanning from the media in the past 6 months: Index distributions by percent (n = 822)

	Seeking	Scanning
0	29.2	25.5
1	7.8	14.5
2	10.0	15.1
3	9.7	10.3
4	8.0	16.2
5	11.6	6.6
6	7.9	3.9
7	5.5	2.9
8	3.4	5.0
9	2.7	
10	4.3	

Table 5.13 shows the distributions of the indices representing seeking and scanning from the specific websites and magazines content analyzed in Study 2: *Parents Magazine, Parenting Magazine,* Parents.com, and Babycenter.com. Seeking PPEH information from these two websites was the most common information engagement behavior (39.9% reported seeking from one of the websites at least once in the past 6 months). Scanning these websites was also relatively common (38.8%). A majority of mothers (> 60%) reported that they never sought or scanned PPEH information from any of these four sources.

Table 5.13 PPEH information seeking and scanning from parenting magazines and parenting websites in the past 6 months: Index distributions by percent (n = 822)

	Seeking		*Scanning*	
	Magazines	Websites	Magazines	Websites
0	69.3	60.1	67.4	61.2
1	5.6	9.4	7.5	11.3
2	14.1	15.9	12.9	15.2
3	3.8	6.0	3.8	5.0
4	7.2	8.6	8.4	7.3

Note. Magazines = *Parents* and *Parenting.* Websites = Babycenter.com and Parents.com.

Ha – Discriminant validity. Study 3's preliminary hypothesis (*Ha*) aimed to show only a limited degree of correspondence between the constructs of PPEH information seeking and scanning. In other words, it sought to provide evidence of discriminant validity. Table 5.14 shows the hypothesis was only partially supported. The mean correlation between general PPEH information seeking and scanning across all sources is positive (mean $r = 0.49$, 95% CI [0.55, 0.60]) and significant (all correlations $p < 0.001$). The mean intra-scan correlation is higher (mean $r = 0.55$. 95% CI [0.52, 0.57]), but not significantly, as the confidence intervals overlap. Refer to Appendix G for full correlation matrix.

Furthermore, the separate indices created representing media seeking and media scanning are highly correlated ($r = .78$, $p < .001$). The total seeking index intended for use as a covariate (including doctor and interpersonal seeking, as well as media seeking) is also highly correlated with the index for media scanning ($r = .77$, $p < .001$). Based on these high correlations and the lack of discriminant validity between the measures, it is improbable that their distinct effects on the outcomes of interest in this study will be detectable. Based on evidence from prior work in the domain of cancer-related information seeking and scanning (i.e., Niederdeppe, Frosch, & Hornik, 2008), it is also probable that seeking is an effect of scanning, mediating the relationship between routine exposure and behavior. This too would make it increasingly difficult to find simultaneous relationships of seeking and scanning in the proposed models using cross-sectional data. Thus to reduce the likelihood of Type I error, a decision was made to exclude seeking as a covariate in this study and revisit the issue of seeking's potential effects in future research using longitudinal data.

Table 5.14 Mean correlations for PPEH information seeking and scanning

Comparison	Mean correlation (r)	Standard deviation of r	95% CI	*n* of correlations
Intra-scan correlations[a]	0.55	.05	0.52 – 0.57	21
Intra-seek correlations[b]	0.58	.05	0.46 – 0.51	21
Scanning with seeking across all sources[c]	0.49	.06	0.55 – 0.60	21

[a] Intra-scan correlations describe pair-wise correlations between scanned exposure measures (e.g., scanning from television with scanning from radio; scanning from radio with scanning from websites).
[b] Intra-seek correlations describe pair-wise correlations between sought exposure measures (e.g., seeking from television with seeking from radio; seeking from radio with seeking from websites).
[c] Scanning with seeking across all sources refers to correlations between each scanned exposure measure and each sought exposure measure (excluding internet search engines; e.g., scanning from television with seeking from websites).

RQ4 – Parenting website and magazine exposure measures. Study 3's fourth and final research question asked whether the adjustments made to the parenting website and magazine survey measures resulted in more accurate exposure recall among respondents. Table 5.11 above showed the distribution of seeking and scanning across specific parenting media sources content analyzed in Study 2: *Parents Magazine, Parenting Magazine,* Parents.com, and Babycenter.com. In Study 3, about 1 in 3 mothers reported seeking PPEH information at least once in the past six months from Parents.com (33.5%) and Babycenter.com (32.8%). Magazine seeking was less common: 28.6% sought from *Parents Magazine* while 27.1% sought from *Parenting Magazine*. Only about 1 in 5 mothers (18.5%) reported seeking from the foil website, Mychildren.com, and the foil magazine, *My Children Magazine* (18.1%). In addition, the frequency of reported seeking from the foil sources was lower than the real sources, suggesting that mothers were better able to distinguish between the real and fake sources in this study.

Reported patterns of scanning PPEH information across parenting media sources were similar. About 1 in 3 mothers reported scanning PPEH information at least once in the past six months from Parents.com and Babycenter.com (both 31.9%). Magazine scanning was also less common: 29.6% scanned *Parents Magazine* while 27.6% scanned *Parenting Magazine*. Only about 1 in 5 mothers (19.6%) reported scanning the foil website, Mychildren.com, and the foil magazine, *My Children Magazine* (19.1%). Again, the frequency of reported scanning from the foil sources was also lower than the real sources.

Comparing the results from Study 3 with Study 1, it appears that revising the parenting website and magazine exposure measures to account for potential social desirability biases, as well as using more obscure foils, successfully increased accurate recall among respondents. Table 5.15 shows the comparison of measures across the two studies. The sum of the proportions of mothers in Study 3 who reported scanning *not at all* and *maybe, but not sure* are greater than those reporting *not at all* in Study 1. This further suggests that the revised measures either (a) improved mothers' ability to discriminate between real and fake source titles or (b) gave them an appropriate opportunity to respond in a socially desirable way.

Table 5.15 Comparison of parenting website and magazine scanning measures

	Study 1	*Study 3*	
Source	% Not at all	% Not at all	% Maybe, but not sure
Parents Magazine	71.4	59.8	10.6
Parenting Magazine	71.4	61.9	10.5
Foil Magazine[a]	74.6	72.7	7.7
Parents.com	68.3	55.5	12.7
Babycenter.com	69.8	55.4	12.8
Foil Website[b]	73.0	69.6	11.3

Notes. Study 1 n = 63; Study 3 n = 822.
[a] Study 1 = *Baby Health Magazine.* Study 3 = *My Child Magazine.*
[b] Study 1 = Babyhealth.com. Study 3 = Mychild.com.

Addressing central hypotheses

H1 – Protective behaviors. H1 predicted that scanning information about PPEH in the media would be positively associated with behaviors to reduce exposure to arsenic BPA, and pesticides. H1 was supported: there was a positive and significant association with protective behaviors to reduce exposure to each of the three chemicals, even after adjusting for potential confounders (see Tables 5.16, 5.17, and 5.18).

Significant patterns of effects on behavior were also observed across chemicals for a series of covariates, including scanning PPEH information from interpersonal sources and doctors, having fewer than two children under 6 years old, exhibiting an authoritative parenting style, having greater trust in the media, and exhibiting a social desirability bias (see Appendix H for summary table of models).

Table 5.16 Bivariate and multiple linear regressions of arsenic-related protective behavior on media scanning

	Model 1			Model 2		
	B	SE	β	B	SE	β
Intercept	1.557***	.036		.678**	.211	
Media scanning	.101***	.010	.322	.038*	.016	.120
Interpersonal scanning				.052	.047	.051
Doctor scanning				.128**	.047	.128
Children under 7 (>=2)				-.174**	.054	-.109
Pregnant (yes)				-.010	.063	-.007
Mother's age				.002	.003	.022
Race/ethnicity (White)				-.038	.052	-.025
Education (>=college)				-.024	.063	-.013
Income (>=$50,000)				-.002	.055	-.002
Homeowner (yes)				-.100	.054	-.069
Political orientation				-.004	.011	-.013
Breastfeeding				.116	.059	.076
Smoker (yes)				-.050	.058	-.030
Child health (excellent)				.111*	.051	.075
Authoritarian parenting				.014	.030	.020
Authoritative parenting				.107**	.038	.100
Permissive parenting				.005	.032	.006
Media trust				.062*	.031	.072
Information sufficiency				.055	.033	.065
Social desirability				.033***	.009	.128
R^2	.15			.24		
N	822			762		

* $p < .05$, ** $p < .01$, *** $p < .001$.
Note. Model 1 = bivariate association of scanning and behavior. Model 2 = association of scanning and behavior, adjusting for all covariates.

Table 5.17 Bivariate and multiple linear regressions of BPA-related protective behavior on media scanning

	Model 1			Model 2		
	B	SE	β	B	SE	β
Intercept	1.323***	.036		.267	.215	
Media scanning	.128***	.011	.392	.065***	.016	.200
Interpersonal scanning				.100*	.048	.096
Doctor scanning				.066	.048	.063
Children under 7 (>=2)				-.114*	.055	-.069
Pregnant (yes)				-.021	.064	-.013
Mother's age				.003	.004	.029
Race/ethnicity (White)				-.034	.053	-.022
Education (>=college)				.021	.064	.011
Income (>=$50,000)				.084	.056	.055
Homeowner (yes)				-.036	.055	-.024
Political orientation				-.001	.011	-.004
Breastfeeding				.168**	.060	.106
Smoker (yes)				-.039	.059	-.022
Child health (excellent)				.046	.052	.030
Authoritarian parenting				-.007	.031	-.010
Authoritative parenting				.112**	.038	.101
Permissive parenting				.020	.033	.025
Media trust				.070*	.031	.078
Information sufficiency				.065	.033	.074
Social desirability				.031***	.009	.115
R^2	.15			.24		
N	822			762		

* $p < .05$, ** $p < .01$, *** $p < .001$.

Note. Model 1 = bivariate association of scanning and behavior. Model 2 = association of scanning and behavior, adjusting for all covariates.

Table 5.18 Bivariate and multiple linear regressions of pesticide-related protective behavior on media scanning

	Model 1			Model 2		
	B	SE	β	B	SE	β
Intercept	1.807***	.035		.522**	.202	
Media scanning	.094***	.010	.309	.037*	.015	.121
Interpersonal scanning				.107*	.045	.110
Doctor scanning				.108*	.045	.113
Children under 7 (>=2)				-.105*	.051	-.069
Pregnant (yes)				.001	.060	.001
Mother's age				.006	.003	.059
Race/ethnicity (White)				-.027	.049	-.018
Education (>=college)				-.039	.060	-.023
Income (>=$50,000)				.033	.052	.024
Homeowner (yes)				-.082	.052	-.058
Political orientation				.003	.011	.009
Breastfeeding				.053	.057	.036
Smoker (yes)				-.073	.055	-.046
Child health (excellent)				.092	.049	.065
Authoritarian parenting				-.016	.029	-.024
Authoritative parenting				.232***	.036	.225
Permissive parenting				-.027	.031	-.036
Media trust				.051	.029	.062
Information sufficiency				.014	.031	.017
Social desirability				.025**	.009	.101
R^2	.10			.23		
N	822			762		

* *p* < .05, ** *p* < .01, *** *p* < .001.
Note. Model 1 = bivariate association of scanning and behavior. Model 2 = association of scanning and behavior, adjusting for all covariates.

H2 – Behavioral intentions. H2 predicted that scanning information about PPEH in the media would be positively associated with behavioral intentions to reduce exposure to arsenic, BPA, and pesticides. H2 was partially supported. Media scanning was not associated with arsenic-related behavioral intentions (see Table 5.19); however, there was a positive and significant association with behavioral intentions to reduce exposure to BPA and pesticides, even after adjusting for potential confounders (see Tables 5.20 and 5.21, respectively).

Significant patterns of effects on intentions were also observed across chemicals for a series of covariates, including scanning PPEH information from doctors, having fewer than two children under 7 years old, exhibiting an authoritative parenting style, having greater trust in the media, and exhibiting a social desirability bias (see Appendix H for summary table of models).

H3 – Knowledge. H3 predicted that scanning information about PPEH in the media would be positively associated with knowledge about arsenic, BPA, and pesticides. H3 was not supported: there was a significant *negative* association with knowledge about arsenic and pesticides that held even after adjusting for potential confounders (see Tables 5.22 and 5.24, respectively). While there was a negative and significant bivariate association between media scanning and BPA-related knowledge, it did not hold after adjusting for potential confounders (see Table 5.23). Significant patterns of effects on knowledge were also observed across chemicals for a series of covariates, including scanning PPEH information from doctors, having fewer than two children under 7 years old, exhibiting an authoritative parenting style, having greater trust in the media, and exhibiting a social desirability bias (see Appendix H for summary table of models).

Table 5.19 Bivariate and multiple linear regressions of arsenic-related protective behavioral intention on media scanning

	Model 1			Model 2		
	B	SE	β	B	SE	β
Intercept	1.817	.035		.551	.204	
Media scanning	.084***	.010	.277	.014	.015	.045
Interpersonal scanning				.065	.046	.067
Doctor scanning				.168***	.046	.174
Children under 7 (>=2)				-.159**	.052	-.103
Pregnant (yes)				-.040	.061	-.026
Mother's age				.004	.003	.047
Race/ethnicity (White)				-.026	.050	-.018
Education (>=college)				-.008	.061	-.005
Income (>=$50,000)				-.006	.053	-.004
Homeowner (yes)				-.082	.052	-.058
Political orientation				-.001	.011	-.003
Breastfeeding				.069	.057	.047
Smoker (yes)				.010	.056	.006
Child health (excellent)				.082	.049	.057
Authoritarian parenting				-.016	.029	-.023
Authoritative parenting				.214***	.036	.206
Permissive parenting				-.017	.031	-.023
Media trust				.069*	.030	.082
Information sufficiency				.045	.032	.056
Social desirability				.029**	.009	.114
R^2	.08			.22		
N	822			762		

* $p < .05$, ** $p < .01$, *** $p < .001$.
Note. Model 1 = bivariate association of scanning and behavioral intention. Model 2 = association of scanning and behavioral intention, adjusting for all covariates.

Table 5.20 Bivariate and multiple linear regressions of BPA-related protective behavioral intention on media scanning

	Model 1			Model 2		
	B	SE	β	B	SE	β
Intercept	1.600	.039		.535	.225	
Media scanning	.113***	.011	.334	.043*	.017	.128
Interpersonal scanning				.082	.051	.076
Doctor scanning				.135**	.051	.126
Children under 7 (>=2)				-.115*	.057	-.067
Pregnant (yes)				.019	.067	.011
Mother's age				.003	.004	.030
Race/ethnicity (White)				-.122*	.055	-.076
Education (>=college)				.011	.067	.006
Income (>=$50,000)				.057	.058	.036
Homeowner (yes)				-.081	.057	-.051
Political orientation				-.006	.012	-.017
Breastfeeding				.150*	.063	.092
Smoker (yes)				-.049	.062	-.027
Child health (excellent)				.079	.054	.050
Authoritarian parenting				-.046	.032	-.061
Authoritative parenting				.186***	.040	.162
Permissive parenting				-.002	.034	-.003
Media trust				.110***	.033	.118
Information sufficiency				.005	.035	.006
Social desirability				.023*	.010	.083
R^2	.11			.23		
N	822			762		

* $p < .05$, ** $p < .01$, *** $p < .001$.

Note. Model 1 = bivariate association of scanning and behavioral intention. Model 2 = association of scanning and behavioral intention, adjusting for all covariates.

Table 5.21 Bivariate and multiple linear regressions of pesticide-related protective behavioral intention on media scanning

	Model 1			Model 2		
	B	SE	β	B	SE	β
Intercept	1.993	.034		.546	.193	
Media scanning	.075***	.010	.258	.029*	.014	.101
Interpersonal scanning				.069	.043	.074
Doctor scanning				.114**	.043	.123
Children under 7 (>=2)				-.053	.049	-.036
Pregnant (yes)				-.027	.058	-.019
Mother's age				.007*	.003	.080
Race/ethnicity (White)				-.088	.047	-.063
Education (>=college)				-.007	.057	-.004
Income (>=$50,000)				-.002	.050	-.001
Homeowner (yes)				-.093	.049	-.069
Political orientation				.009	.010	.028
Breastfeeding				.058	.054	.041
Smoker (yes)				.007	.053	.005
Child health (excellent)				.083	.046	.061
Authoritarian parenting				-.043	.027	-.064
Authoritative parenting				.297***	.034	.298
Permissive parenting				-.051	.030	-.071
Media trust				.073**	.028	.090
Information sufficiency				-.010	.030	-.012
Social desirability				.018*	.008	.074
R^2	.07			.24		
N	822			762		

* $p < .05$, ** $p < .01$, *** $p < .001$.

Note. Model 1 = bivariate association of scanning and behavioral intention. Model 2 = association of scanning and behavioral intention, adjusting for all covariates.

Table 5.22 Bivariate and multiple linear regressions of arsenic-related knowledge on media scanning

	Model 1			Model 2		
	B	SE	β	B	SE	β
Intercept	.266	.017		.413	.105	
Media scanning	-.039***	.005	-.259	-.019*	.008	-.126
Interpersonal scanning				-.013	.024	-.027
Doctor scanning				-.073**	.024	-.157
Children under 7 (>=2)				.064*	.027	.085
Pregnant (yes)				-.009	.031	-.012
Mother's age				-.003*	.002	-.076
Race/ethnicity (White)				.003	.026	.005
Education (>=college)				.007	.031	.008
Income (>=$50,000)				-.018	.027	-.027
Homeowner (yes)				.047	.027	.069
Political orientation				.002	.006	.012
Breastfeeding				-.006	.029	-.008
Smoker (yes)				.018	.029	.023
Child health (excellent)				.031	.025	.044
Authoritarian parenting				.011	.015	.034
Authoritative parenting				.002	.019	.004
Permissive parenting				-.019	.016	-.053
Media trust				.003	.015	.008
Information sufficiency				-.024	.016	-.060
Social desirability				-.007	.004	-.059
R^2	.07			.12		
N	822			762		

* *p* < .05, ** *p* < .01, *** *p* < .001.

Note. Model 1 = bivariate association of scanning and knowledge. Model 2 = association of scanning and knowledge, adjusting for all covariates.

Table 5.23 Bivariate and multiple linear regressions of BPA-related knowledge on media scanning

	Model 1			Model 2		
	B	SE	β	B	SE	β
Intercept	.385	.017		.504	.098	
Media scanning	-.043***	.005	-.299	-.007	.007	-.049
Interpersonal scanning				-.018	.022	-.039
Doctor scanning				-.112***	.022	-.245
Children under 7 (>=2)				.018	.025	.025
Pregnant (yes)				.024	.029	.033
Mother's age				.000	.002	.009
Race/ethnicity (White)				.030	.024	.044
Education (>=college)				.016	.029	.020
Income (>=$50,000)				-.006	.025	-.009
Homeowner (yes)				.034	.025	.051
Political orientation				.004	.005	.028
Breastfeeding				-.081**	.027	-.116
Smoker (yes)				-.026	.027	-.034
Child health (excellent)				.006	.024	.009
Authoritarian parenting				-.010	.014	-.030
Authoritative parenting				.012	.017	.025
Permissive parenting				-.015	.015	-.043
Media trust				-.005	.014	-.012
Information sufficiency				-.022	.015	-.057
Social desirability				-.017***	.004	-.138
R^2	.09			.20		
N	822			762		

* $p < .05$, ** $p < .01$, *** $p < .001$.

Note. Model 1 = bivariate association of scanning and knowledge. Model 2 = association of scanning and knowledge, adjusting for all covariates.

Table 5.24 Bivariate and multiple linear regressions of pesticide-related knowledge on media scanning

	Model 1			Model 2		
	B	SE	β	B	SE	β
Intercept	.305	.017		.474	.105	
Media scanning	-.044***	.005	-.293	-.019*	.008	-.129
Interpersonal scanning				-.057*	.024	-.119
Doctor scanning				-.044	.024	-.092
Children under 7 (>=2)				.033	.027	.043
Pregnant (yes)				-.016	.031	-.021
Mother's age				-.002	.002	-.037
Race/ethnicity (White)				.016	.026	.022
Education (>=college)				-.002	.031	-.003
Income (>=$50,000)				-.044	.027	-.063
Homeowner (yes)				.047	.027	.067
Political orientation				.004	.006	.027
Breastfeeding				-.015	.029	-.021
Smoker (yes)				.056	.029	.070
Child health (excellent)				.049	.025	.070
Authoritarian parenting				.014	.015	.042
Authoritative parenting				-.002	.019	-.004
Permissive parenting				-.025	.016	-.069
Media trust				-.004	.015	-.009
Information sufficiency				-.030	.016	-.074
Social desirability				-.010*	.004	-.084
R^2	.09			.15		
N	822			762		

* $p < .05$, ** $p < .01$, *** $p < .001$.
Note. Model 1 = bivariate association of scanning and knowledge. Model 2 = association of scanning and knowledge, adjusting for all covariates.

Why might the relationship between media scanning and knowledge be in the opposite direction than hypothesized? Recall from the Measures section that the means for these items (ranging from 0 to 1) were low: $M = .17$, $SD = .34$ for arsenic, $M = .27$, $SD = .33$ for BPA, and $M = .19$, $SD = .35$ for pesticides. Very few mothers answered both test items correctly (12.5% for arsenic, 9.9% for BPA, and 12.4% for pesticides; see Appendix G for full distributions). These figures could be interpreted as indicators of low knowledge; but, it is equally plausible that what they actually show is respondents' failure to recognize the nuance in the way the behavior question was worded. One of the original purposes for subtly combining the knowledge and behavior items was to reduce the risk of mothers' simply reporting engagement in all of the listed activities so as to be perceived as a 'good mom'; but, did that tactic actually work?

To look for potential patterns in how mothers responded, principal components factor analysis was performed to assess unidimensionality. This would help determine whether all 7 activities (5 assessing legitimate behaviors to reduce exposure to a specific chemical and 2 test activities) within each of the three behavior measures were indicators of the same underlying construct (i.e., being a protective mother), or whether they adequately captured mothers' knowledge separate from behavior.

Results for each chemical showed only one factor extracted, suggesting the 7 items were in fact capturing one underlying construct (see Figure 5.3). Bivariate correlations between the scales created for knowledge and behavior by chemical provide further evidence ($r = -.612$ for arsenic, $r = -.503$ for BPA, and $r = -.521$ for pesticides, all ps $< .001$). The signficant negative associations would suggest that as knowledge increases, proper behavior decreases and vice versa – a clearly illogical presumption and more indicative of errors in measurement. Because the knowledge measures did not perform as well as originally intended, further analyses using knowledge as an outcome were dropped from this study and from Study 4.

Figure 5.3 Scree plots: Principal components factor analysis results for behavior/knowledge items

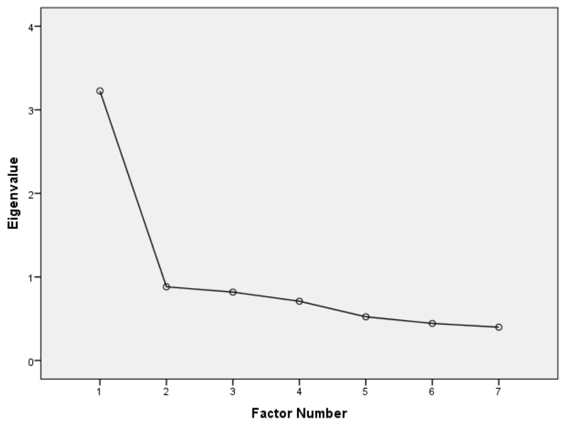


Figure 5F. BPA-related items

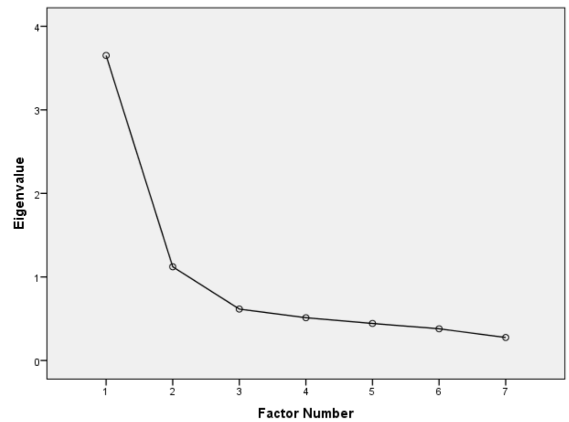


Figure 5G. Arsenic-related items

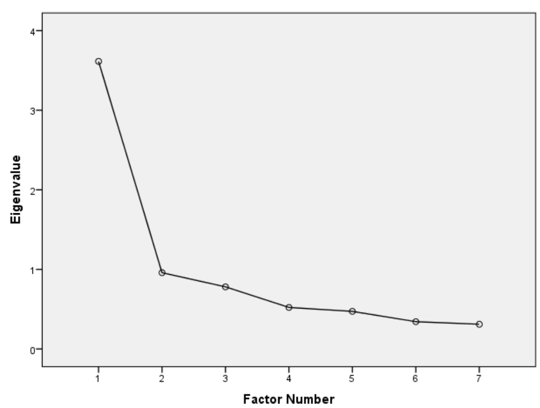


Figure 5H. Pesticide-related items

H4 – Perceived descriptive norms. H4 predicted that scanning information about PPEH in the media would be positively associated with perceived descriptive norms toward reducing exposure to arsenic, BPA, and pesticides. Significant associations with media scanning were not observed for either arsenic- or pesticide-related descriptive norms (see Tables 5.25 and 5.27, respectively); however, H4 was partially supported. There was a positive and significant association with perceived descriptive norms toward reducing exposure to BPA, even after adjusting for potential confounders (see Table 5.26). Because media scanning was consistently predictive of key BPA-related constructs (i.e., showed significant associations with at least three outcomes), this association was determined to be beyond chance.

Significant patterns of effects on descriptive norms were also seen across chemicals for a few covariates, including exhibiting an authoritative parenting style, having greater trust in the media, and exhibiting a social desirability bias (see Appendix H for summary table of models).

H5 - Perceived threat. H5 predicted that scanning information about PPEH in the media would be positively associated with perceived threat of arsenic, BPA, and pesticides to children's health. H5 was supported: there was a positive and significant association with perceived threat of each of the three chemicals, even after adjusting for potential confounders (see Tables 5.28, 5.29 and 5.30).

Significant patterns of effects on perceived threat were also seen across chemicals for a few covariates, including breastfeeding, exhibiting an authoritative parenting style, and having greater trust in the media (see Appendix H for summary table of models).

Table 5.25 Bivariate and multiple linear regressions of arsenic-related descriptive norms on media scanning

	Model 1			Model 2		
	B	SE	β	B	SE	β
Intercept	3.733	.047		2.176	.273	
Media scanning	.076***	.014	.192	-.002	.020	-.005
Interpersonal scanning				.079	.061	.062
Doctor scanning				.143*	.061	.114
Children under 7 (>=2)				-.042	.069	-.021
Pregnant (yes)				.056	.082	.028
Mother's age				.004	.004	.029
Race/ethnicity (White)				-.140*	.067	-.074
Education (>=college)				-.166*	.081	-.075
Income (>=$50,000)				-.025	.071	-.013
Homeowner (yes)				.032	.070	.018
Political orientation				-.017	.014	-.041
Breastfeeding				-.048	.076	-.025
Smoker (yes)				-.041	.075	-.020
Child health (excellent)				.140*	.066	.076
Authoritarian parenting				-.048	.039	-.053
Authoritative parenting				.277***	.049	.206
Permissive parenting				.053	.042	.055
Media trust				.085*	.040	.078
Information sufficiency				.060	.042	.056
Social desirability				.042***	.012	.127
R^2	.04			.17		
N	822			762		

* $p < .05$, ** $p < .01$, *** $p < .001$.
Note. Model 1 = bivariate association of scanning and descriptive norms. Model 2 = association of scanning and descriptive norms, adjusting for all covariates.

Table 5.26 Bivariate and multiple linear regressions of BPA-related descriptive norms on media scanning

	Model 1			Model 2		
	B	SE	β	B	SE	β
Intercept	1.323	.036		.267	.215	
Media scanning	.128***	.011	.392	.065***	.016	.200
Interpersonal scanning				.100*	.048	.096
Doctor scanning				.066	.048	.063
Children under 7 (>=2)				-.114*	.055	-.069
Pregnant (yes)				-.021	.064	-.013
Mother's age				.003	.004	.029
Race/ethnicity (White)				-.034	.053	-.022
Education (>=college)				.021	.064	.011
Income (>=$50,000)				.084	.056	.055
Homeowner (yes)				-.036	.055	-.024
Political orientation				-.001	.011	-.004
Breastfeeding				.168**	.060	.106
Smoker (yes)				-.039	.059	-.022
Child health (excellent)				.046	.052	.030
Authoritarian parenting				-.007	.031	-.010
Authoritative parenting				.112**	.038	.101
Permissive parenting				.020	.033	.025
Media trust				.070*	.031	.078
Information sufficiency				.065	.033	.074
Social desirability				.031***	.009	.115
R^2	.05			.16		
N	822			762		

* $p < .05$, ** $p < .01$, *** $p < .001$.
Note. Model 1 = bivariate association of scanning and descriptive norms. Model 2 = association of scanning and descriptive norms, adjusting for all covariates.

Table 5.27 Bivariate and multiple linear regressions of pesticide-related descriptive norms on media scanning

	Model 1			Model 2		
	B	SE	β	B	SE	β
Intercept	3.814	.043		2.218	.255	
Media scanning	.089***	.013	.240	.031	.019	.085
Interpersonal scanning				.096	.057	.082
Doctor scanning				.066	.057	.056
Children under 7 (>=2)				.022	.065	.012
Pregnant (yes)				-.047	.076	-.025
Mother's age				.006	.004	.052
Race/ethnicity (White)				-.082	.062	-.046
Education (>=college)				-.063	.076	-.031
Income (>=$50,000)				-.076	.066	-.044
Homeowner (yes)				.012	.065	.007
Political orientation				-.015	.014	-.039
Breastfeeding				-.033	.071	-.018
Smoker (yes)				-.042	.070	-.021
Child health (excellent)				.099	.061	.058
Authoritarian parenting				-.027	.036	-.032
Authoritative parenting				.302***	.045	.241
Permissive parenting				.037	.039	.041
Media trust				.094*	.037	.093
Information sufficiency				.017	.039	.017
Social desirability				.017	.011	.055
R^2	.06			.16		
N	822			762		

* $p < .05$, ** $p < .01$, *** $p < .001$.
Note. Model 1 = bivariate association of scanning and descriptive norms. Model 2 = association of scanning and descriptive norms, adjusting for all covariates.

Table 5.28 Bivariate and multiple linear regressions of arsenic-related perceived threat on media scanning

	Model 1			Model 2		
	B	SE	β	B	SE	β
Intercept	2.902	.105		-.008	.627	
Media scanning	.274***	.030	.301	.101*	.047	.111
Interpersonal scanning				.309*	.141	.106
Doctor scanning				.090	.141	.031
Children under 7 (>=2)				-.156	.159	-.034
Pregnant (yes)				.075	.188	.016
Mother's age				.013	.010	.047
Race/ethnicity (White)				-.346*	.153	-.080
Education (>=college)				-.017	.186	-.003
Income (>=$50,000)				-.132	.162	-.031
Homeowner (yes)				-.061	.160	-.014
Political orientation				-.021	.033	-.022
Breastfeeding				.324	.175	.074
Smoker (yes)				.224	.172	.046
Child health (excellent)				.193	.151	.045
Authoritarian parenting				.115	.089	.056
Authoritative parenting				.385***	.112	.124
Permissive parenting				.105	.096	.047
Media trust				.318***	.091	.127
Information sufficiency				-.103	.097	-.042
Social desirability				.029	.027	.039
R^2	.09			.17		
N	822			762		

* $p < .05$, ** $p < .01$, *** $p < .001$.
Note. Model 1 = bivariate association of scanning and perceived threat. Model 2 = association of scanning and perceived threat, adjusting for all covariates.

Table 5.29 Bivariate and multiple linear regressions of BPA-related perceived threat on media scanning

	Model 1			Model 2		
	B	SE	β	B	SE	β
Intercept	2.616	.100		-.224	.596	
Media scanning	.257***	.029	.297	.143**	.045	.166
Interpersonal scanning				.078	.134	.028
Doctor scanning				.058	.134	.021
Children under 7 (>=2)				-.020	.151	-.005
Pregnant (yes)				-.084	.178	-.019
Mother's age				.008	.010	.030
Race/ethnicity (White)				-.127	.146	-.031
Education (>=college)				-.066	.177	-.014
Income (>=$50,000)				.083	.154	.021
Homeowner (yes)				.045	.152	.011
Political orientation				-.061	.032	-.068
Breastfeeding				.424*	.167	.102
Smoker (yes)				.175	.163	.038
Child health (excellent)				-.192	.143	-.048
Authoritarian parenting				.128	.084	.066
Authoritative parenting				.400***	.106	.136
Permissive parenting				.017	.091	.008
Media trust				.323***	.086	.136
Information sufficiency				.083	.092	.036
Social desirability				.033	.025	.046
R^2	.09			.17		
N	822			762		

* $p < .05$, ** $p < .01$, *** $p < .001$.

Note. Model 1 = bivariate association of scanning and perceived threat. Model 2 = association of scanning and perceived threat, adjusting for all covariates.

Table 5.30 Bivariate and multiple linear regressions of pesticide-related perceived threat on media scanning

	Model 1			Model 2		
	B	SE	β	B	SE	β
Intercept	3.577	.101		.657	.606	
Media scanning	.236***	.029	.271	.168***	.045	.194
Interpersonal scanning				.179	.136	.065
Doctor scanning				-.076	.136	-.028
Children under 7 (>=2)				-.079	.154	-.018
Pregnant (yes)				-.132	.181	-.030
Mother's age				.016	.010	.059
Race/ethnicity (White)				-.177	.148	-.043
Education (>=college)				.372*	.180	.077
Income (>=$50,000)				-.207	.157	-.051
Homeowner (yes)				.019	.155	.005
Political orientation				-.014	.032	-.016
Breastfeeding				.400*	.170	.095
Smoker (yes)				.068	.166	.015
Child health (excellent)				.111	.146	.028
Authoritarian parenting				.004	.086	.002
Authoritative parenting				.494***	.108	.168
Permissive parenting				.005	.093	.002
Media trust				.211*	.088	.089
Information sufficiency				-.016	.094	-.007
Social desirability				-.014	.026	-.020
R^2	.07			.15		
N	822			762		

* $p < .05$, ** $p < .01$, *** $p < .001$.
Note. Model 1 = bivariate association of scanning and perceived threat. Model 2 = association of scanning and perceived threat, adjusting for all covariates.

Summary of findings. If significant associations remained after adjusting for potential confounders and a consistent pattern was observed among the results, an effects claim could be made with increased confidence. Based on this qualitative standard, analyses revealed significant main effects for scanning PPEH information in the media on several key outcomes, finding robust support for six and partial support for two of the study's 10 central hypotheses (see Table 5.31).

Table 5.31 Summary of findings from cross-sectional analyses

	Model 1	Model 2	Hypotheses Supported?
Behavior			
Arsenic	.101***	.038*	H1 – Yes
BPA	.128***	.065***	H6 – Yes
Pesticides	.094***	.037*	
Intention			
Arsenic	.084***	.014	H2 – Yes
BPA	.113***	.043*	H7 – Partial
Pesticides	.075***	.029*	
Knowledge			
Arsenic	-.039***	-.019*	H3 – No[a]
BPA	-.043***	-.007	H8 – No[a]
Pesticides	-.044***	-.019*	
Descriptive Norms			
Arsenic	.076***	-.002	H4 – Yes
BPA	.128***	.065***	H9 – Partial
Pesticides	.089***	.031	
Perceived threat			
Arsenic	.274***	.101*	H5 – Yes
BPA	.257***	.143**	H10 – Yes
Pesticides	.236***	.168***	

* $p < .05$, ** $p < .01$, *** $p < .001$.
Note. Model 1 = bivariate association of PPEH media scanning and topic-specific outcomes listed. Model 2 = association adjusting for all covariates. A hypothesis was supported (Yes) if a significant association remained significant after adjusting for covariates *and* results were consistent across chemicals within a single outcome. A hypothesis was partially supported (Yes – partial) if a significant association remained *and* results were consistent across outcomes within a single chemical. A hypothesis was not supported (No) if the association was non-significant *and* no consistent patterns across results emerged.
[a] Direction of association not as hypothesized.

For arsenic, media scanning was significantly and positively associated with behavior and perceived threat. For BPA, a consistent pattern of significant positive associations was observed between media scanning and behavior, intention, descriptive norms, and perceived threat. For pesticides, a consistent pattern of significant positive associations was observed between media scanning and behavior, intention, and perceived threat.

Discussion

Chapter 5 used data from an online survey of mothers with children ages 6 and under to explore mothers' protective behaviors, perceptions, and exposure to prenatal and pediatric environmental health information. Three research questions were put forth regarding mothers' PPEH-related behaviors, perceptions, and engagement with sources of PPEH information. Two additional research questions probed the validity of exposure measures employed in the survey. Finally, a series of theory-informed hypotheses were tested concerning the cross-sectional associations of PPEH media scanning and key outcomes, including protective behaviors, behavioral intentions, knowledge, descriptive norms, and perceived threat (*Study 3*).

The most common protective behaviors (highest percent reporting at least *sometimes* performing the behavior in the past six months) included purchasing BPA-free products (BPA), washing hands after soil exposure (arsenic), and washing fruits and vegetables before eating (pesticides). The most frequent protective behaviors (highest percent reporting *always* performing the behavior) were washing plastics by hand instead of in the dishwasher (BPA), washing hands after soil exposure (arsenic), and washing fruits and vegetables before eating (pesticides). Relatively speaking, the least common/frequent behaviors included limiting the consumption of canned goods (BPA), limiting the consumption of rice and/or rice products (arsenic), and purchasing organic fruits and vegetables (pesticides). Overall, mothers appear to have been making the greatest effort to reduce exposure to pesticides during the past six months, followed by arsenic, then BPA, a pattern consistent with their reported behavioral intentions to reduce exposure in the next six months.

When asked which prenatal and pediatric environmental health threats they were most concerned about, mothers' reported cigarette smoke, pesticides and lead – consistent with findings from Study 1. Public health agencies like the C.D.C. and the E.P.A. have invested a great deal of time and resources to inform and educate mothers about the dangers associated with early exposure to cigarette smoke and lead. For instance, warning labels on cigarette packaging have targeted pregnant women since the mid-1980s (e.g., "Smoking By Pregnant Women May Result in Fetal Injury, Premature Birth, And Low Birth Weight.").

While heightened concern associated with cigarette smoke and lead were expected, pesticide-related worries were relatively surprising. This could be a reflection of the steadily growing organic food movement in the United States. Sales of organic products have increased from $1 billion in 1990 to $26.7 billion in 2010, an increase led by organic fruit and vegetable sales (Organic Trade Association, 2011). What is counterintuitive to this speculation is that relative to other behaviors for reducing pesticide exposure, purchasing organic fruits and vegetables was the least common reported by this sample. That being said, all of the behaviors were widely adopted with

84% of mothers having reported purchasing organic at least *sometimes* in the last six months, which is not insignificant. It is also very likely that heightened concern over pesticides reflects the widespread coverage of pesticides in the mass media found in Study 2. For instance, the Environmental Working Group regularly publishes lists (i.e., “Dirty Dozen” and “Clean Fifteen”) to help consumers make informed decisions in the produce department to avoid pesticides (Environmental Working Group, 2013) and their communication efforts were picked up by both parenting magazines and parenting websites during the study period.

While a large proportion (> 88%) of mothers recognized each of the PPEH threats listed in the survey, the least familiar issue was BPA. This was a relatively unsurprising result given that the other issues listed (arsenic, lead, mercury, cigarette smoke, pesticides, and outdoor air pollution) are longer-standing issues and have less scientific names. Again, close to 90% recognized BPA, which is not insignificant and could be attributed to the increasing prominence of packaging labels and/or moderate media coverage of the chemical during the study period.

Close to 2 out of 3 mothers surveyed reported actively seeking PPEH information from the mass media in the past six months. Internet search engines were the most common and frequent sources for seeking followed by websites. These findings suggest that future research might benefit from a closer examination of the rise and fall of PPEH-related search terms using a platform like Google Trends. Tracking which issues mothers want more information about could provide an alternative test of media effects following major headlines or help public health communicators better focus their efforts on actual information demands.

About 3 out of 4 mothers reported scanning PPEH information – a slightly more common behavior than active seeking.[12] Again, websites served as important resources for mothers. As Study 2 showed, parenting websites provide significantly more information about chemical threats than Associated Press news stories and parenting magazines; so, mothers' reports of more web-based scanning is a logical extension of those results. Surprisingly, despite having such widespread circulation and high traffic rates, a majority of the sample never sought or scanned PPEH information from the specific parenting magazine and parenting website titles analyzed in Study 2. Future research could focus more deeply on website exposure to determine where mothers are coming across this type of information if not on Babycenter.com or Parents.com. Also, lack of exposure to (or at least recall of) PPEH information in these sources could be problematic for Study 4, which combines this survey data with inferences from the previous content analysis.

Study 3 found robust support for six of the study's 10 central hypotheses. For all three chemicals, significant bivariate associations were observed between scanning PPEH information in the media and behavior (*H1*), intention (*H2*), descriptive norms (*H4*), and perceived threat (*H5*). Unfortunately, the knowledge measure did not perform as originally intended and results were inconclusive. To rule out alternative explanations, a series of potential confounders were adjusted for in subsequent tests. Significant associations remained between media scanning and behavior (*H6*; all 3 chemicals), intention (*H7*; BPA and pesticides), descriptive norms (*H9*; BPA) and perceived threat (*H10*; all 3 chemicals). Again, knowledge results were inconclusive.

[12] It should be reiterated that discriminant validity testing of the measures for PPEH information seeking and scanning (*Ha*) was unsuccessful, so this small difference is likely non-significant.

Strengths and limitations

Temporal order. Conclusions based on these results are limited by the cross-sectional nature of the data. Despite having included a good number of potential confounders and establishing covariation – an important first step in this line of research – the issue of temporal precedence still threatens valid causal inference. It could be that media scanning drives behaviors, intentions, descriptive norms, and perceived threat. It could also be true that these thoughts and behaviors drive media scanning. That is, a mother who perceives BPA to be a significant threat or takes steps to reduce her child's exposure, for example, may better recall coming across PPEH information in the media. Study 4 will directly address this issue by examining more complex mixed regression models that compare these associations across chemical topics receiving different levels of media coverage as observed in Study 2.

Measurement precision. Self-report recognition measures, such as the scanning items used in this study, are best considered measures of memory, rather than actual past exposure (Southwell, Barmada, Hornik, & Maklan, 2002). Accuracy of recall in a complex media environment, as well as the possibility that the measure confounds exposure with interest or motivation, may be problematic. Self-report measures range in content specificity from low to high, very general to very precise (Romantan, Hornik, Price, Cappella, & Viswanath, 2008). The content specificity of the seeking and scanning measures in this study differed from those in cancer communication research for which the measures were originally developed. Rather than focusing on specific topics (e.g., BPA), the measures mentioned PPEH more broadly, which is comparable to asking about health or cancer prevention information rather than mammography or exercise. Greater specificity would have improved the ability to address effect size problems common to the field; however, the fear was that these issues would be relatively obscure, result in low recall, and thwart meaningful interpretation.

The fact that the seeking and scanning items could not be distinguished statistically from one another was both surprising and disconcerting. Although previous studies have established discriminant validity with similar question wording, the same could not be achieved in this study. This observation serves as a warning to any future studies planning to modify these measures that validity should not be assumed. The initial intent of this study was to include seeking as a covariate in each analysis to help better account for individual motivation to attend to and seek PPEH information. Unfortunately, given the high correlations between the two measures and minimal discrimination, its inclusion would have muddied the results beyond valuable interpretation. For the purposes of this research, a decision to omit seeking and focus on the effects of routine scanned exposure to PPEH information was favored. Routine exposures to non-media sources (i.e., doctor and interpersonal scanning) did remain in all models to help rule out alternative explanations and determine the effects of media exposure above and beyond encounters with other information sources.

Measurement issues also arose with the knowledge items. Knowledge questions could not be placed before behavior questions given the plausibility of a mother learning what behaviors she should be engaging in from mere exposure to the question. Since priority was placed on assessing the effects of media scanning on behavior, integrating the knowledge items into the behavior question (rather than keeping them separate) was the safest alternative. For best results, future research should consider focusing more exclusively on PPEH knowledge acquisition from the media as a precursor to behavior rather than trying to combine both measures into a single survey, never mind a single measure.

Generalizability. Comparative analyses showed that respondents who completed the survey were slightly younger and more educated than those who did not. This is not a major threat, especially given the fact that neither those who completed the survey nor those who did not represent the population with any real precision. Though not representative of the population, the SSI sample is arguably better than a convenience sample from, say, a local obstetrics office. The focus on mothers may seem restrictive, but was chosen for several specific reasons. First, women generally tend to be more sensitive to risks than men (Finucane, Slovic, Mertz, Flynn, & Satterfield, 2000). Multiple studies have shown that women are consistently more concerned about environmental health and chemical risks (Davidson & Freudenburg, 1996; Fischer, Morgan, Fischhoff, Nair, & Lave, 1991; Flynn, Slovic, & Mertz, 1994; Kraus et al., 2000). Even female toxicologists, assumed to have greater rationality and expertise than the average person, were more likely than male toxicologists to judge societal risks as moderate or high (Slovic, Malmfors, Mertz, Neil, & Purchase, 1997). Second, gender differences in risk perception are not only a function of gendered ideology or gender roles, but also situational differences (i.e. exposure to health information) (Gustafson, 1998). Women tend to search for and pay greater attention to health information (e.g., Kelly et al., 2010). Finally, mothers tend to make more purchasing and childcare-related decisions in the household than men and as a result, may be more likely to report performing these relatively ‘new’ and often product-oriented protective behaviors.

CHAPTER SIX

Study 4: Contingent effects of mothers' exposure to pediatric environmental health information on perceptions and behaviors

Overview

While cross-sectional associations are an important starting point for new research agendas such as this, there are clearly limitations to causal inference in Study 3. Obviously correlation alone does not imply causation (Davis, 1985). Since a good number of third-variable explanations were accounted for in the analyses, it could be argued that selective exposure poses a greater threat to establishing causality than spuriousness. This issue of reverse causality – or what Slater (2004) refers to as "the endogeneity of exposure" – is a fundamental challenge to media effects research in field contexts (i.e., outside of the laboratory). Prior knowledge or interest in a topic could account for a greater propensity to attend to and recall related media content (Yanovitzky, Hornik, & Zanutto 2008). Health communication research has shown that individuals who make health a priority are probably more knowledgeable, more likely to adopt healthier behaviors, and more likely to report using more health-related media (Lau, Hartman, & Ware, 1986; Slater & Flora, 1991). Media effects research that relies wholly on cross-sectional data often assume unidirectionality of effects and as such, cannot confidently estimate the true relationships between self-reported media exposure and key outcomes.

So, how could cross-sectional data be used to examine media priming effects and make stronger causal claims? In a recent study exploring media effects on various health behaviors, Stryker and colleagues (2008) attempted to combat such limitations methodologically by considering both *the possibility of exposure* and *self-reported exposure* in their study. As discussed in Chapter 1, they first conducted a content analysis to compare the prevalence of news coverage of specific cancer prevention behaviors (i.e., diet, exercise, smoking, sun exposure, and alcohol use). Then, cross-sectional data from the National Cancer Institute's Health Information National Trends Survey (HINTS) was analyzed to estimate the relationship between general health news attention and knowledge of the specific cancer prevention behaviors.

Finally, a qualitative comparison was made between the media and survey data to look for patterns in the prevalence with which specific behaviors were discussed in the media that might explain the observed associations between self-reported attention and knowledge. Results from the content analysis showed that diet and smoking received the greatest amount of media coverage, which qualitatively conformed to the results of the survey data in which only diet and smoking knowledge were significantly associated with media attention. The authors concluded that attention to health news – which frequently covered diet and smoking in the context of cancer prevention – positively impacted related knowledge (and not the reverse).

The strength of Stryker's methodological approach was the use of both the externally estimated possibility of exposure along with self-reported exposure – an approach adopted by this study. While self-reported attention captures individual-level exposure, it may also be subject to recall and/or social desirability biases. Estimates of exposure from the possibility of exposure derived from aggregate data (e.g., gross ratings points, content analysis) offer an independent measure of the information environment;

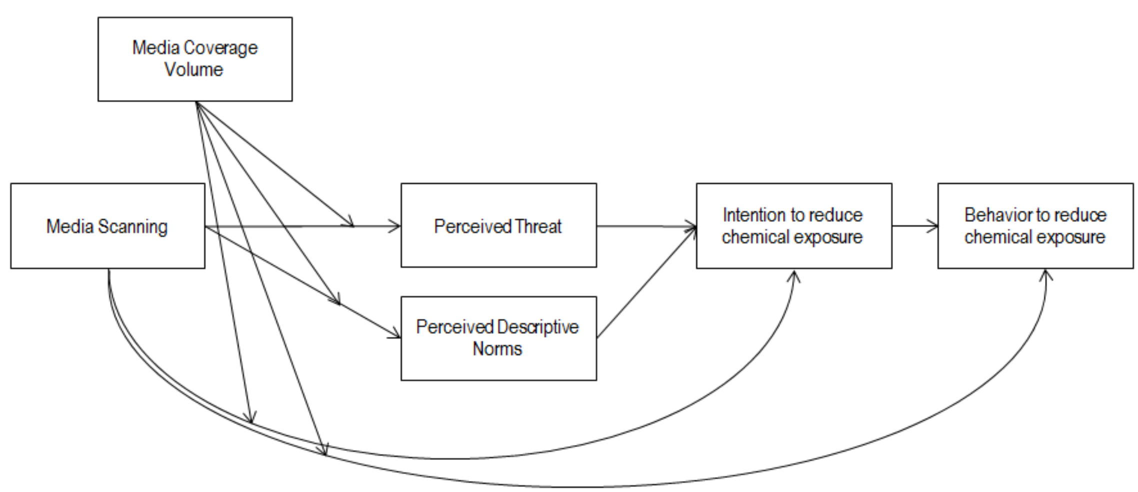
however, they cannot capture individual-level effects and often require strong assumptions about exposure. By combining these two types of exposure measures, their strengths and weaknesses may be better balanced.

Applying Stryker's qualitative approach to the current study, one would hypothesize based on the results of the content analysis that the significance and/or size of the observed associations between media scanning and key outcomes should be ordered such that the least prevalent topic (arsenic) has the weakest associations while the most covered topic (pesticides) has the strongest associations, with the moderately covered topic (BPA) falling somewhere in between. The limitation of this approach, however, is that it does not quantitatively address whether differences between the coefficients are significant. That is to say, Stryker did not perform any calculations to determine whether the coefficients for general health news attention's effects on knowledge were *statistically different* across cancer prevention behaviors.

As advances in multilevel modeling have emerged, communication research has begun to more formally integrate content analysis data into inferential analysis (i.e., Slater et al., 2009) using mixed regression. The current study continues this practice and asks whether the effects of scanning are primed by media coverage volume. Media priming is presumed to strengthen the association between the predictor (in this case, scanning PPEH information in the media) and the outcome variable (e.g., behavioral intentions). Testing priming effects typically focuses on the difference between regression coefficients or correlations representing these relationships measured before and after a prime (for more details, see Cappella, Fishbein, Hornik, Ahern, & Sayeed, 2001; Fishbein & Cappella, 2006; Fishbein & Yzer, 2003). Because only cross-sectional data is available in this study, differences across multiple chemical topics are assessed instead. Using mixed regression also takes account of the repeated measurement of individuals (i.e., mothers were asked about their behaviors, intentions, and so forth for each of the three chemical topics).

In the next two sections, the moderation hypotheses put forth in the conceptual model of effects are further elaborated and tested (with the exception of knowledge; see Figure 6.1 for the conceptual model including contingent effects). Ultimately, if Study 4 finds additional evidence for the hypothesized associations between scanning and key outcomes, contingent on media coverage, then future research might explore whether routine exposure actually predicts certain perceptions and behaviors – using either longitudinal observational survey data or an experimental design.

Figure 6.1 Conceptual model – contingent effects



Hypotheses

The series of moderation hypotheses incorporates a new term capturing the interaction of self-reports of exposure (identical to Study 3's central hypotheses) with a new measure representing the possibility of exposure (i.e., relative volume of media coverage by chemical topic derived from Study 2). The combination of these two distinct exposure measures – both theoretically and analytically – is intended to (a) offset common issues associated with cross-sectional data (i.e., unmeasured third-variable explanations, reverse causation, reliance on a single measure of exposure) and (b) explore how the effects of self-reported scanning of general PPEH information in the media – in conjunction with actual coverage volume – may influence key constructs.

Agenda-setting, news reception, and diffusion research suggest that issue awareness tends to be greater during periods of elevated news coverage (e.g., McCombs & Shaw, 1972; Price & Czilli, 1996; Rogers, 2000). The volume of media coverage an issue receives is as important as the frequency of exposure an individual has to the media. In the case of PPEH-related issues, a chemical covered more frequently in newspapers, magazines and so forth will account for a greater proportion of information encountered during a mother's routine media exposure. Put another way, information about a chemical covered frequently is more likely to be encountered during routine media use than a chemical receiving relatively less media coverage.

Ultimately, it is the combination of both coverage composition and routine exposure to such coverage that determines the dose of information received. A chemical like arsenic covered less frequently will account for a smaller proportion of information encountered in the media and ultimately, a weaker dose. By extension, it is hypothesized that the relative volume of media coverage across chemicals will differentially impact the central hypothesized constructs:

H1: The effect of scanning information about PPEH on protective behavior will be moderated by coverage volume, such that the effect is stronger for chemicals that receive more coverage (see Figure 6A).

H2: The effect of scanning information about PPEH on behavioral intention will be moderated by coverage volume, such that the effect is stronger for chemicals that receive more coverage (see Figure 6B).

H3: The effect of PPEH scanning on descriptive norms will be moderated by coverage volume, such that the effect is stronger for chemicals that receive more coverage (see Figure 6C).

H4: The effect of scanning information about PPEH on perceived threat will be moderated by coverage volume, such that the effect is stronger for chemicals that receive more coverage (see Figure 6D).

In these analyses, the key essential coefficients belong to the terms interacting chemical topic (a proxy for coverage volume) and media scanning. These coefficients represent the most important aspect of this examination: the comparison of scanning effects *across* chemical topics. In short, these coefficients will reveal whether the effects of scanning are smaller/non-significant for arsenic (low coverage) and larger/significant for pesticides (high coverage).

Figure 6.2 Moderation hypotheses: Expected effects

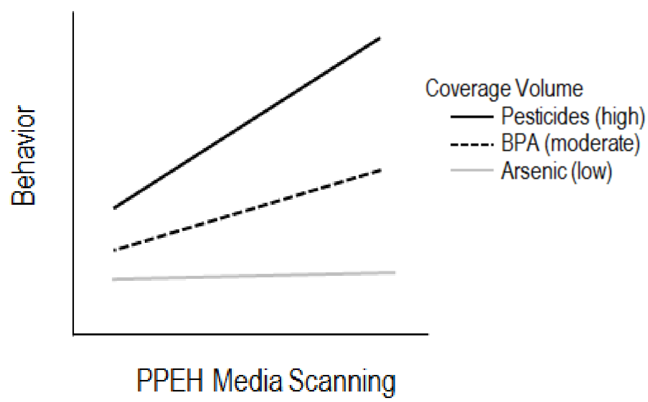


Figure 6A. H1: Moderating effects of coverage on scanning – behavior relationship.

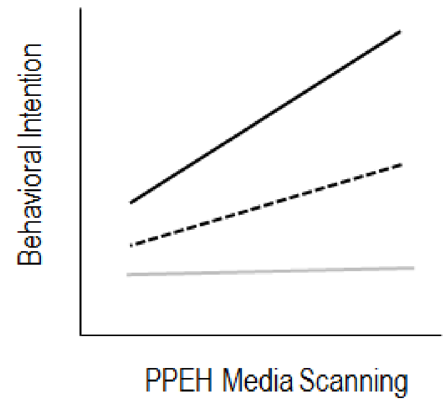


Figure 6B. H2: Moderating effects of coverage on scanning – intention relationship.

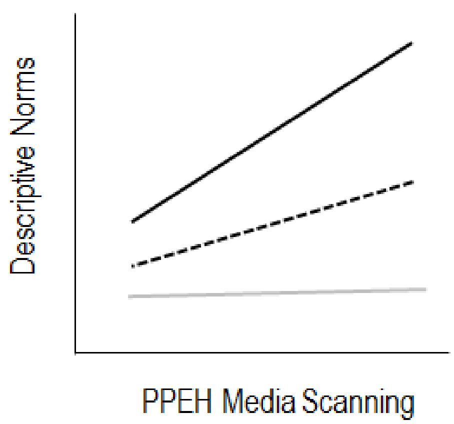


Figure 6C. H3: Moderating effects of coverage on the scanning – descriptive norms relationship.

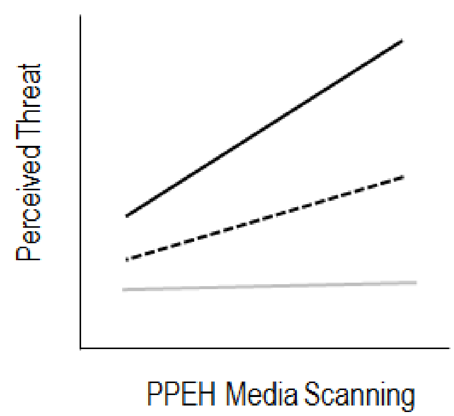


Figure 6D. H4: Moderating effects of coverage on the scanning – perceived threat relationship.

Methods

Participants and procedures

The survey data collected in Study 3 is further analyzed in the present study. Refer to Chapter 5 for details on participants and procedures.

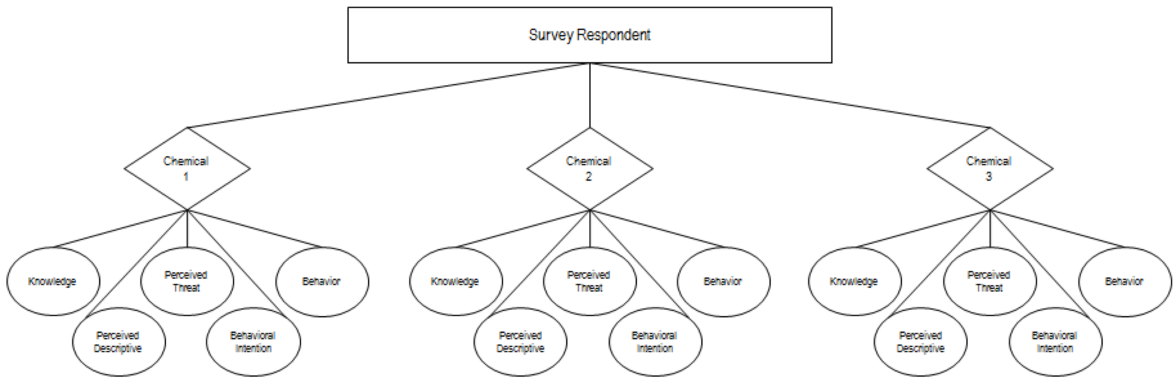
Measures

Again, the same survey measures used in Study 3 are used in the present study. An additional ordinal variable representing media coverage volume (COV) was introduced based on the results of Study 2, with values 2 (high coverage volume: pesticides), 1 (moderate coverage volume: BPA), and 0 (low coverage volume: arsenic).

Analytic procedure

In this study, survey measures repeated for each chemical were clustered within individual respondents (see Figure 6.3). Using a conventional cross-sectional pooled OLS regression for clustered data violates standard OLS regression assumptions and would produce biased results due to ignoring the dependence among observations (Bliese & Hanges, 2004; Kenny & Judd, 1986; Wooldridge, 2002, 2009); therefore, multilevel mixed-effects regression was used. Mixed effects regression can rule out threats associated with clustered data and produces unbiased estimates by estimating fixed and random effects in one model (McCulloch, Searle, & Neuhaus, 2008; Raudenbush & Bryk, 2002; Verbeke & Molenberghs, 2000; Wooldridge, 2002, 2009). The application of mixed effects models here addresses how each person's behaviors, attitudes and so on differ *across chemicals* and how these differences vary across people.

Figure 6.3 Data clustering within survey respondents



Before beginning any analyses, it was necessary to reconfigure the survey data from wide to long form. More specifically, each of the central constructs measured repeatedly in the survey (i.e., behavior toward each chemical, perceived threat of each chemical) needed to be collapsed into a single variable, leaving each respondent with three cases. During this restructure process, the ordinal variable representing media coverage volume (COV) was created based on the results of Study 2, with values 2 (high coverage volume: pesticides), 1 (moderate coverage volume: BPA), and 0 (low coverage volume: arsenic). Scores for all reconfigured cases were ordered to correspond by row to the three chemical topics as coded in the new media coverage volume variable.

The proposed interactive model can be formally expressed by the following equation (linear unobserved effects model: Wooldridge, 2002):

$$y_{ic} = \beta_0 + \beta_1 SCAN_i + \beta_2 COV_c + \beta_4 (SCAN_i \times COV_c) + \gamma Z_i + \alpha_i + \varepsilon_{ic}$$

where y_{ic} is the outcome variable corresponding to topic *c*, with *c* corresponding to the three chemical topics (arsenic, BPA, and pesticides, respectively) reported by individual *i*. $SCAN_i$ represents the respondent's score on the measure of scanning general PPEH information in the media described above (range = 0 – 8). COV_c denotes media coverage volume of chemical topics with values 0 (low coverage volume: arsenic), 1 (moderate coverage volume: BPA), and 2 (high coverage volume: pesticides). The vector Z_i represents a set of 19 potential confounding factors measured, and γ is a vector of coefficients on Z. Unlike a conventional OLS regression model, there are two error components in the present mixed effects model: (1) an individual-specific error term α_i and (2) an idiosyncratic error term ε_{ic}. α_i, often also referred to as a random intercept, represents individual-specific random effects and captures all unobserved, chemical-topic invariant variables (e.g., topic-invariant unobserved heterogeneity like genetic dispositions) affecting the y_{ic}. This is what accounts for dependence among multiple observations for a specific person. Finally, ε_{ic} is an idiosyncratic error component that varies across individuals (i) and chemical topics (c).

The proposed interactive model above assumes that effect of coverage on each outcome is linear, that is to say that the difference between BPA and arsenic is the same as the difference between pesticides and BPA. This is a strong assumption, especially given that actual coverage rates in Study 2 did not differ proportionally. Accordingly, it seemed appropriate to begin this set of analyses with a more conservative approach and assume that the effect of COV is non-linear, expressed in a revised interactive model:

$$y_{ic} = \beta_0 + \beta_1 SCAN_i + \beta_2 BPA_c + \beta_3 PESTICIDES_c + \beta_4 (SCAN_i \times BPA_c) + \beta_5 (SCAN_i \times PESTICIDES_c) + \gamma Z_i + \alpha_i + \varepsilon_{ic}$$

where BPA_c and $PESTICIDES_c$ are dummy variables corresponding to chemical topic coverage.

Analyses were performed using STATA 12 (StataCorp, 2011). For all models, cases with missing values on any of the independent, dependent, or confounding variables were dropped using listwise deletion since no more than 10% of cases were missing in any analysis. Restricted maximum likelihood estimation method (REML) was used to estimate the parameters of the models because the number of units for the chemical topics was small. Likelihood ratio (LR) tests when reported were based on differences in the likelihood of the data (i.e., the -2 log likelihood: -2LL) using maximum likelihood estimation (ML), as LR tests based on REML are not appropriate for comparing models differing only in their fixed effects (Raudenbush & Byrk, 2002; J.D. Singer & Willett, 2003). Potential confounders were grand mean-centered to facilitate interpretation of the intercept. The focal independent variable in each model (i.e., media scanning) was also mean-centered to facilitate interpretation of the simple main effects coefficients of the interacting variables. Statistical significance was set at $p \leq 0.05$ for all statistical tests.

Results

Protective behaviors

The first model tested whether there was any variation in actual protective behavior by chemical by estimating an empty model containing a random intercept with no predictors. Of interest is the variance component for the intercept, which quantifies the variance in protective behavior across individuals. As can be seen in Table 6.1 (model 1), there was significant variance in behavior across individuals, as the variance component for respondent (α_i, the random intercept in the model) was statistically different from zero: .33, 95% CI [.29, .37], likelihood-ratio χ^2 (1) = 780.89, p < .001. The intra-class correlation coefficient (ICC) was 0.595, indicating that about 59.5% of the total variance in reported protective behaviors was accounted for by differences between individuals in how they behave protectively on average. All this evidence supports the use of mixed effects regression to examine the hypothesized effects on behavior.

Model 5 in Table 6.1 was used to test Hypothesis 1, which asserts that increased media scanning translates into increased protective behavior more so for chemicals receiving greater media coverage. The model specifies an interaction between coverage and individual-level media scanning. Because coverage is coded 0 – 2, signifying three ordered levels of coverage volume, two interactions are specified, one for each contrast representing increased levels of media coverage (arsenic < BPA < pesticides). Results from model 5 showed that the variance of the random intercept is statistically different from zero: .24, 95% CI [.21, .27], likelihood-ratio χ^2 (1) = 684.03, p < .001. The intra-class correlation coefficient (ICC) was 0.565, indicating that about 56.5% of the total variance in reported protective behaviors was still accounted for by unobserved differences between individuals in how they behave protectively on average, even after including focal independent variables and potential confounders in the model. This evidence again supports the use of mixed effects regression to examine the hypothesized interactive effects of coverage and scanning on behavior.

Results from model 5 showed the simple main effect of scanning was significant on arsenic-related protective behavior (i.e., the chemical that received low media coverage): $b_{arsenic}$ = .041, 95% CI [.013, .069], p = .005. In other words, for every additional scale unit of media scanning, a mother's protective behavior to reduce exposure to arsenic increases .041 scale units on the behavior measure, holding all other predictors constant. Increased scanning significantly increases a mother's protective behavior to reduce exposure to BPA (i.e., the chemical with moderate media coverage): b_{BPA} = .067, 95% CI [.039, .096], p < .001. Finally, increased scanning also increases a mother's protective behavior to reduce exposure to pesticides (i.e., the chemical with heavy media coverage): $b_{pesticides}$ = .032, 95% CI [.004, .060], p = .027.

An omnibus test of the interaction between scanning and coverage was significant, Wald χ^2 (2) = 15.41, p = .001, indicating that the effect of scanning varies significantly across chemical topics (or levels of media coverage). The pattern of interactions was such that effect of scanning is greater for BPA-related protective behaviors than for arsenic- or pesticide-related behaviors (see Figure 6.4): $b_{BPA} - b_{arsenic}$ = .027, 95% CI [.008, .045], p = .005; $b_{pesticides} - b_{BPA}$ = -.036, 95% CI [-.054, -.017], p < .001. The difference in the effect of scanning on behavior for pesticides versus arsenic (or, high versus low coverage) was not significant: $b_{pesticides} - b_{arsenic}$ = −.009, 95% CI [-.028, .010], p = .343.

Table 6.1 Mixed effects regression models to predict protective behavior

	Behavior				
	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	1.833*** (.023)	1.800*** (.078)	1.78*** (.078)	1.761*** (.079)	1.761*** (.079)
Interpersonal scanning		.145*** (.036)	.086* (.040)	.086* (.040)	.086* (.040)
Doctor scanning		.144*** (.038)	.101* (.040)	.101* (.040)	.101* (.040)
Children under 7 (>=2)		.132** (.045)	.131** (.045)	.131** (.045)	.131** (.045)
Pregnant (yes)		.014 (.053)	.010 (.053)	.010 (.053)	.010 (.053)
Mother's age		.004 (.003)	.004 (.003)	.004 (.003)	.004 (.003)
Race/ethnicity (White)		.042 (.044)	.033 (.043)	.033 (.043)	.033 (.043)
Education (>=college)		.008 (.053)	.014 (.052)	.014 (.052)	.014 (.052)
Income (>=$50,000)		-.039 (.046)	-.038 (.046)	-.038 (.046)	-.038 (.046)
Homeowner (yes)		.073 (.046)	.073 (.045)	.073 (.045)	.073 (.045)
Political orientation		-.004 (.009)	-.001 (.009)	-.001 (.009)	-.001 (.009)
Breastfeeding		-0.124* (.050)	-0.112* (0.05)	-.112* (.050)	-0.112* (.050)
Smoker (yes)		.038 (.049)	.054 (.049)	.054 (.049)	.054 (.049)
Child health (excellent)		-.090* (.042)	-0.083+ (.043)	-.083 (.043)	-0.083+ (.043)
Authoritarian parenting		.004 (.025)	-.003 (.025)	-.003 (.025)	-.003 (.025)
Authoritative parenting		.153*** (.032)	.150*** (.031)	.150*** (.031)	.150*** (.031)
Permissive parenting		.005 (.027)	-.001 (.027)	-.001 (.027)	-.001 (.027)
Media trust		.066** (.026)	.061* (.026)	.061* (.026)	.061* (.026)
Information sufficiency		.062* (.027)	.045 (.027)	.045 (.027)	.045 (.027)
Social desirability		.029*** (.008)	.030*** (.008)	.030*** (.008)	.030*** (.008)
Media scanning			.047*** (.013)	.047*** (.013)	.041** (.014)
Coverage of BPA vs. arsenic (C1)				-.169*** (.022)	-.169*** (.022)
Coverage of pesticides vs. arsenic (C2)				.230*** (.022)	.230*** (.022)
Media scanning × C1					.027** (.009)

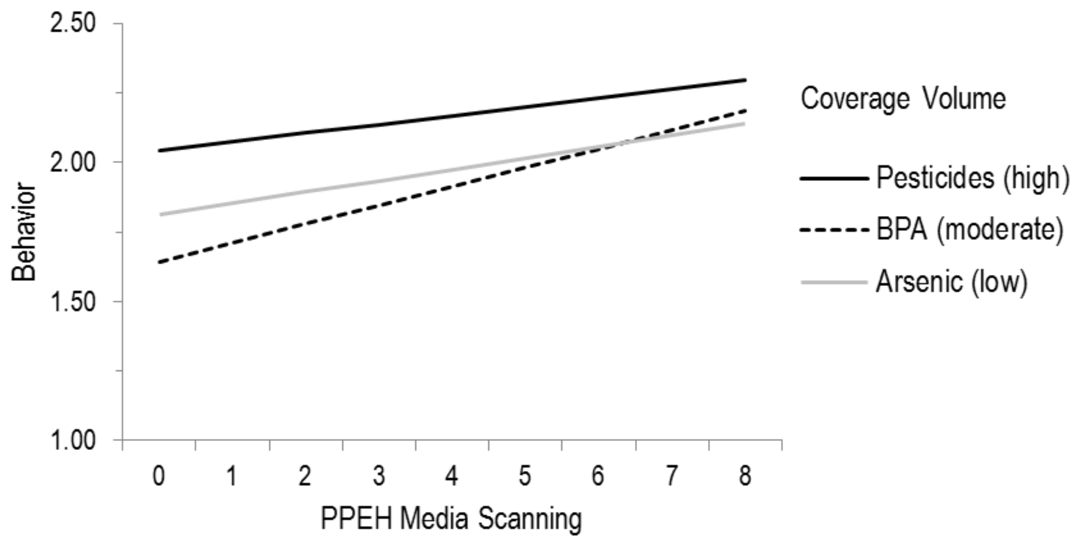
Table 6.1 (continued) Mixed effects regression models to predict protective behavior

Media scanning × C2					-.009 (.009)
Random-Effect Parameters					
Variance (Between-Individuals)	0.33	0.23	0.23	0.24	0.24
Variance (Residual)	0.23	0.23	0.23	0.19	0.19
Pseudo-R^2		0.18	0.19	0.24	0.24
Deviance (–2LL)	4380.32	4142.29	4129.69	3833.74	3818.37
LR χ^2 Test (vs. Model 1)		238.03***	250.63***	546.58***	561.96***
		(*df* = 19)	(*df* = 20)	(*df* = 22)	(*df* = 24)
LR χ^2 Test (vs. Model 2)			12.60***	308.55***	323.92***
			(*df* = 1)	(*df* = 3)	(*df* = 5)
LR χ^2 Test (vs. Model 3)				295.95***	311.33***
				(*df* = 2)	(*df* = 4)
LR χ^2 Test (vs. Model 4)					15.37***
					(*df* = 2)

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Note. N = 2,286 with 762 clusters (= number of respondents). Model 1 = null model. Model 2 = association of behavior and all covariates. Model 3 = association of behavior and media scanning, adjusting for all covariates. Model 4 = association of behavior, media scanning, and media coverage, adjusting for all covariates. Model 5 = interactive effects of media scanning and coverage on behavior, adjusting for all covariates. Cell entries are unstandardized regression coefficients with standard errors in parentheses. Parameters were estimated using the restricted maximum likelihood estimation method. Pseudo-R^2 is defined as the proportional reduction in the total residual variance comparing the null model without covariates with each model of interest (Snijders & Bosker, 2012). Deviance statistics (−2 log likelihood) and the associated likelihood-ratio tests for model comparisons are based on full maximum likelihood estimation methods (Raudenbush & Byrk, 2002; J. D. Singer & Willett, 2003). All continuous predictors were grand mean-centered to facilitate interpretation of the intercepts.

Figure 6.4 Model predicted relationship between PPEH media scanning and protective behavior by media coverage volume (n = 762)



Overall, these results do not support the hypothesis that increased media scanning translates into increased protective behavior more so for chemicals receiving greater media coverage. While media scanning had a significantly larger effect on BPA-related behavior than arsenic-related behavior (moderate vs. low media coverage) as hypothesized, the observation that media scanning had a significantly larger effect on BPA-related behaviors than pesticide-related behaviors (moderate vs. high media coverage) was the very opposite of *a priori* expectations. Additionally, if the evidence supported the coverage volume hypothesis, one would also expect to see the most significant difference emerge between pesticides and arsenic (high vs. low media coverage). Here, no difference was observed.

Behavioral intention

The first model tested whether there was any variation in behavioral intention by chemical by estimating an empty model containing a random intercept with no predictors. Of interest is the variance component for the intercept, which quantifies the variance in intention across individuals. As can be seen in Table 6.2 (model 1), there was significant variance in intention across individuals, as the variance component for respondent (α_i, the random intercept in the model) was statistically different from zero: .35, 95% CI [.31, .40], likelihood-ratio χ^2 (1) = 690.14, p < .001. The intra-class correlation coefficient (ICC) was 0.654, indicating that about 65.4% of the total variance in reported behavioral intentions was accounted for by differences between individuals in their intentions on average. All this evidence supports the use of mixed effects regression to examine the hypothesized effects on behavioral intention.

Model 5 in Table 6.2 was used to test Hypothesis 2, which asserts that increased media scanning translates into increased behavioral intentions more so for chemicals receiving greater media coverage. The model specifies an interaction between coverage and individual-level media scanning. Again, two interactions are specified, one for each contrast representing increased levels of media coverage. Results from model 5 showed that the variance of the random intercept is statistically different from zero: .26, 95% CI [.23, .29], likelihood-ratio χ^2 (1) = 814.04, p < .001. The intra-class correlation coefficient (ICC) was 0.609, indicating that about 60.9% of the total variance in reported behavioral intentions was still accounted for by unobserved differences between individuals in their intentions on average, even after including focal independent variables and potential confounders in the model. This evidence again supports the use of mixed effects regression to examine the hypothesized interactive effects of coverage and scanning on behavioral intentions.

Results from model 5 showed the simple main effect of scanning on arsenic-related protective behavioral intentions (i.e., the chemical that received low media coverage) was not significant: $b_{arsenic}$ = .021, 95% CI [-.008, .050], p = .136. Similarly, there was no significant effect of scanning on pesticide-related intentions (i.e., the chemical with heavy media coverage): $b_{pesticides}$ = .015, 95% CI [-.013, .043], p = .306. By contrast, increased scanning significantly increases a mother's intentions to reduce exposure to BPA (i.e., the chemical with moderate media coverage): b_{BPA} = .050, 95% CI [.022, .078], p = .001. In other words, for every additional scale unit of media scanning, a mother's intention to reduce exposure to BPA increases .050 scale units on the intention measure, holding all other predictors constant.

An omnibus test of the interaction between scanning and coverage was significant, Wald χ^2 (2) = 17.62, p < .001, indicating that the effect of scanning significantly varies across chemical topics (or levels of media coverage). Again, the pattern of interactions was such that effect of scanning was greater for BPA-related intentions than for arsenic- or pesticide-related intentions (see Figure 6.5): $b_{BPA} - b_{arsenic}$ = .029, 95% CI [.011, .046], p = .001; $b_{pesticides} - b_{BPA}$ = -.035, 95% CI [-.053, -.018], p < .001. The difference in the effect of scanning on intention for pesticides versus arsenic (or, high versus low coverage) was not significant: $b_{pesticides} - b_{arsenic}$ = -.007, 95% CI [-.024, .011], p = .453.

Table 6.2 Mixed effects regression models to predict behavioral intention

	Behavioral Intention				
	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	2.040*** (.023)	1.996*** (.079)	1.984*** (.079)	1.978*** (.080)	1.978*** (.080)
Interpersonal scanning		.108** (.037)	.072+ (.040)	.072+ (.040)	.072+ (.040)
Doctor scanning		.166*** (.038)	.139** (.040)	.139** (.040)	.139** (.040)
Children under 7 (>=2)		.109* (.046)	.109* (.045)	.109* (.045)	.109* (.045)
Pregnant (yes)		.054 (.054)	.016 (.054)	.016 (.054)	.016 (.054)
Mother's age		.003+ (.003)	.005+ (.003)	.005+ (.003)	.005+ (.003)
Race/ethnicity (White)		.044 (.044)	.079+ (.044)	.079+ (.044)	.079+ (.044)
Education (>=college)		.053+ (.053)	.001 (.053)	.001 (.053)	.001 (.053)
Income (>=$50,000)		.047 (.047)	-.016 (.046)	-.016 (.046)	-.016 (.046)
Homeowner (yes)		.046+ (.046)	.085+ (.046)	.085+ (.046)	.085+ (.046)
Political orientation		.009 (.009)	.001 (.009)	.001 (.009)	.001 (.009)
Breastfeeding		.050* (.050)	-.092+ (.050)	-.092+ (.050)	-.092+ (.050)
Smoker (yes)		.049 (.049)	.011 (.049)	.011 (.049)	.011 (.049)
Child health (excellent)		.043* (.043)	-0.081+ (0.043)	-.081+ (.043)	-.081+ (.043)
Authoritarian parenting		.025 (.025)	-.035 (.025)	-.035 (.025)	-.035 (.025)
Authoritative parenting		.234*** (.032)	.232*** (.032)	.232*** (.032)	.232*** (.032)
Permissive parenting		-.020 (.027)	-.023 (.027)	-.023 (.027)	-.023 (.027)
Media trust		.087** (.026)	.084** (.026)	.084** (.026)	.084** (.026)
Information sufficiency		.024 (.027)	.014 (.028)	.014 (.028)	.014 (.028)
Social desirability		.023** (.008)	.023** (.008)	.023** (.008)	.023** (.008)
Media scanning			.029* (.013)	.029* (.013)	.021 (.014)
Coverage of BPA vs. arsenic (C1)				-.135*** (.021)	-.135*** (.021)
Coverage of pesticides vs. arsenic (C2)				.154*** (.021)	.154*** (.021)
Media scanning × C1					.029** (.009)

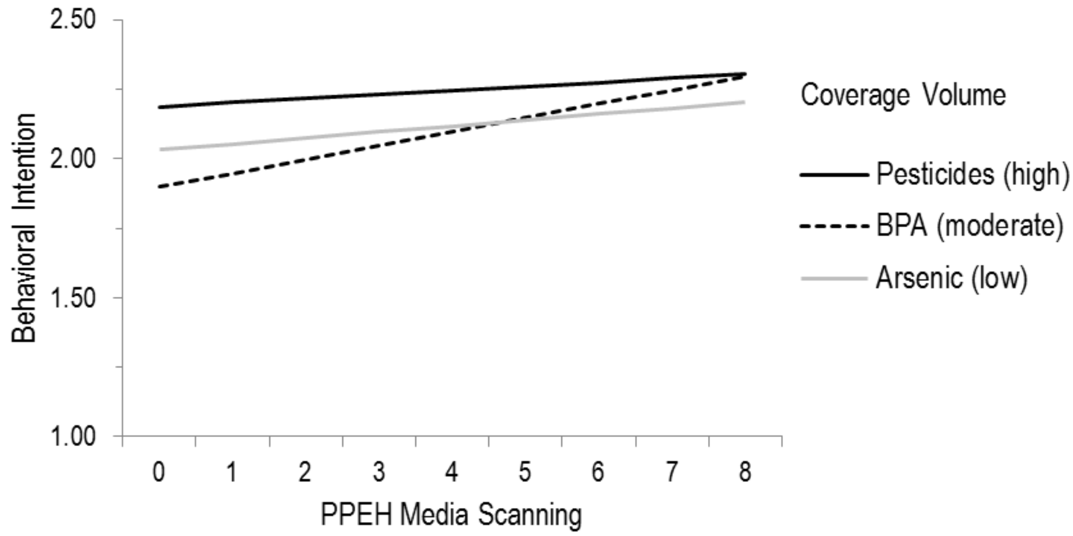
Table 6.2 (continued) Mixed effects regression models to predict behavioral intention

Media scanning × C2					-.007 (.009)
Random-Effect Parameters					
Variance (Between-Individuals)	0.35	0.25	0.25	0.25	0.26
Variance (Residual)	0.19	0.19	0.19	0.17	0.16
Pseudo-R^2		0.19	0.19	0.22	0.22
Deviance (–2LL)	4089.98	3852.92	3848.22	3666.32	3648.76
LR χ^2 Test (vs. Model 1)		237.07*** (*df* = 19)	241.76*** (*df* = 20)	423.66*** (*df* = 22)	441.22*** (*df* = 24)
LR χ^2 Test (vs. Model 2)			4.70* (*df* = 1)	186.59*** (*df* = 3)	204.16*** (*df* = 5)
LR χ^2 Test (vs. Model 3)				181.90*** (*df* = 2)	199.46*** (*df* = 4)
LR χ^2 Test (vs. Model 4)					17.57*** (*df* = 2)

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Note. N = 2,286 with 762 clusters (= number of respondents). Model 1 = null model. Model 2 = association of behavioral intention and all covariates. Model 3 = association of behavioral intention and media scanning, adjusting for all covariates. Model 4 = association of behavioral intention, media scanning, and media coverage, adjusting for all covariates. Model 5 = interactive effects of media scanning and coverage on behavioral intention, adjusting for all covariates. Cell entries are unstandardized regression coefficients with standard errors in parentheses. Parameters were estimated using the restricted maximum likelihood estimation method. Pseudo-R^2 is defined as the proportional reduction in the total residual variance comparing the null model without covariates with each model of interest (Snijders & Bosker, 2012). Deviance statistics (−2 log likelihood) and the associated likelihood-ratio tests for model comparisons are based on full maximum likelihood estimation methods (Raudenbush & Byrk, 2002; J. D. Singer & Willett, 2003). All continuous predictors were grand mean-centered to facilitate interpretation of the intercepts.

Figure 6.5 Model predicted relationship between PPEH media scanning and behavioral intention by media coverage volume (n = 762)



Overall, these results do not support the hypothesis that increased media scanning translates into increased behavioral intentions more so for chemicals receiving greater media coverage. While media scanning had a significantly larger effect on BPA-related intentions than arsenic-related intentions as hypothesized, the observation that media scanning had a significantly larger effect on BPA-related intentions than pesticide-related intentions was again the very opposite of *a priori* expectations. Furthermore, no difference was observed between pesticide- and arsenic-related intentions – the comparison hypothesized to show the greatest difference.

Descriptive norms

The first model tested whether there was any variation in perceived descriptive norms by chemical by estimating an empty model containing a random intercept with no predictors. Of interest is the variance component for the intercept, which quantifies the variance in descriptive norms across individuals. As can be seen in Table 6.3 (model 1), there was significant variance in descriptive norms across individuals, as the variance component for respondent (α_i, the random intercept in the model) was statistically different from zero: .52, 95% CI [.48, .58], likelihood-ratio χ^2 (1) = 951.87, p < .001. The intra-class correlation coefficient (ICC) was 0.646, indicating that about 64.6% of the total variance in reported descriptive norms was accounted for by differences between individuals in their descriptive norms on average. All this evidence supports the use of mixed effects regression to examine the hypothesized effects on perceived descriptive norms.

Model 5 in Table 6.3 was used to test Hypothesis 3. The model specifies an interaction between coverage and individual-level media scanning. Results from model 5 showed that the variance of the random intercept is statistically different from zero: .41, 95% CI [.35, .45], likelihood-ratio χ^2 (1) = 749.36, p < .001. The intra-class correlation coefficient (ICC) was 0.592, indicating that about 59.2% of the total variance in reported descriptive norms was still accounted for by unobserved differences between individuals in their descriptive norms on average, even after including focal independent variables and potential confounders in the model. This evidence again supports the use of mixed effects regression to examine the hypothesized interactive effects of coverage and scanning on descriptive norms.

Results from model 5 showed that none of the simple main effects of scanning were statistically significant predictors of descriptive norms across chemicals: $b_{arsenic}$ = .014, 95% CI [-.008, .050], p = .136; b_{BPA} = .024, 95% CI [-.012, .060], p = .192; $b_{pesticides}$ = .025, 95% CI [-.011, .061], p = .169.

Table 6.3 Mixed effects regression models to predict descriptive norms

	Descriptive Norms				
	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	3.985*** (.028)	3.920*** (.100)	3.912*** (.100)	3.861*** (.101)	3.861*** (.101)
Interpersonal scanning		.109* (.046)	.083 (.051)	.083 (.051)	.083 (.051)
Doctor scanning		.112* (.049)	.093+ (.051)	.093+ (.051)	.093+ (.051)
Children under 7 (>=2)		.021 (.058)	.021 (.058)	.021 (.058)	.021 (.058)
Pregnant (yes)		.008 (.068)	.006 (.068)	.006 (.068)	.006 (.068)
Mother's age		.006 (.004)	.006 (.004)	.006 (.004)	.006 (.004)
Race/ethnicity (White)		.108+ (.056)	.104+ (.056)	.104+ (.056)	.104+ (.056)
Education (>=college)		.100 (.067)	.103 (.067)	.103 (.067)	.103 (.067)
Income (>=$50,000)		.029 (.059)	.029 (.059)	.029 (.059)	.029 (.059)
Homeowner (yes)		-.014 (.058)	-.014 (.058)	-.014 (.058)	-.014 (.058)
Political orientation		-.008 (.012)	-.006 (.012)	-.006 (.012)	-.006 (.012)
Breastfeeding		-.007 (.064)	-.001 (.064)	-.001 (.064)	-.001 (.064)
Smoker (yes)		.045 (.062)	.053 (.062)	.053 (.062)	.053 (.062)
Child health (excellent)		-.102+ (.055)	-.099+ (.055)	-.099+ (.055)	-.099+ (.055)
Authoritarian parenting		-.039 (.032)	-.042 (.032)	-.042 (.032)	-.042 (.032)
Authoritative parenting		.287*** (.040)	.286*** (.040)	.286*** (.040)	.286*** (.040)
Permissive parenting		.035 (.035)	.033 (.035)	.033 (.035)	.033 (.035)
Media trust		.097** (.033)	.095** (.033)	.095** (.033)	.095** (.033)
Information sufficiency		.052 (.035)	.044 (.035)	.044 (.035)	. 044 (.035)
Social desirability		.010** (.010)	.031** (.010)	.031** (.010)	.031** (.010)
Media scanning			.021 (.017)	.021 (.017)	.014 (.018)
Coverage of BPA vs. arsenic (C1)				.038 (.027)	.038 (.027)
Coverage of pesticides vs. arsenic (C2)				.114*** (.027)	.114*** (.027)
Media scanning × C1					.010 (.012)

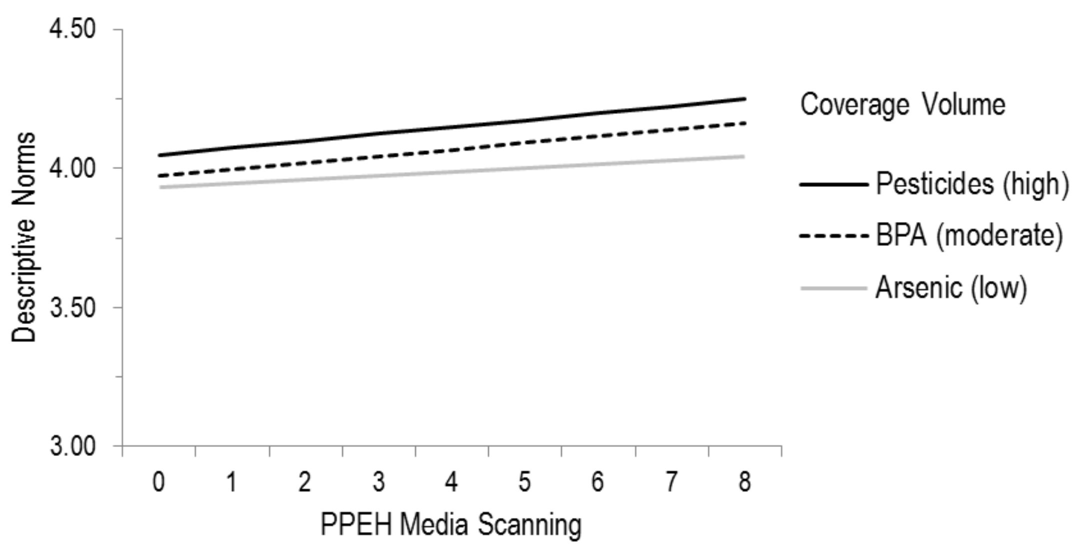
Table 6.3 (continued) Mixed effects regression models to predict descriptive norms

Media scanning × C2					.012 (.012)
Random-Effect Parameters					
Variance (Between-Individuals)	0.52	0.41	0.41	0.41	0.41
Variance (Residual)	0.28	0.28	0.28	0.28	0.28
Pseudo-R^2		0.14	0.14	0.14	0.14
Deviance (–2LL)	5022.11	4850.20	4848.65	4830.32	3648.76
LR χ^2 Test (vs. Model 1)		171.90***	173.45***	191.79***	192.96***
		(*df* = 19)	(*df* = 20)	(*df* = 22)	(*df* = 24)
LR χ^2 Test (vs. Model 2)			1.55	19.88***	21.06***
			(*df* = 1)	(*df* = 3)	(*df* = 5)
LR χ^2 Test (vs. Model 3)				18.34***	19.51***
				(*df* = 2)	(*df* = 4)
LR χ^2 Test (vs. Model 4)					1.17
					(*df* = 2)

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.
Note. N = 2,286 with 762 clusters (= number of respondents). Model 1 = null model. Model 2 = association of descriptive norms and all covariates. Model 3 = association of descriptive norms and media scanning, adjusting for all covariates. Model 4 = association of descriptive norms, media scanning, and media coverage, adjusting for all covariates. Model 5 = interactive effects of media scanning and coverage on descriptive norms, adjusting for all covariates. Cell entries are unstandardized regression coefficients with standard errors in parentheses. Parameters were estimated using the restricted maximum likelihood estimation method. Pseudo-R^2 is defined as the proportional reduction in the total residual variance comparing the null model without covariates with each model of interest (Snijders & Bosker, 2012). Deviance statistics (−2 log likelihood) and the associated likelihood-ratio tests for model comparisons are based on full maximum likelihood estimation methods (Raudenbush & Byrk, 2002; J. D. Singer & Willett, 2003). All continuous predictors were grand mean-centered to facilitate interpretation of the intercepts.

An omnibus test of the interaction between scanning and coverage was not significant, Wald χ^2 (2) = 1.17, p = .557, indicating that the effect of scanning does not vary across chemical topics (or levels of media coverage). Figure 6.6 plots model-predicted descriptive norms by PPEH media scanning and compares the degree of descriptive norms across chemical topics. The pattern of interactions was such that the effects of scanning on all three chemical-related descriptive norms could not be differentiated: $b_{BPA} - b_{arsenic}$ = .010, 95% CI [-.013, .033], p = .380; $b_{pesticides} - b_{BPA}$ = .001, 95% CI [-.021, .024], p = .914; $b_{pesticides} - b_{arsenic}$ = .012, 95% CI [-.011, .034], p = .453. In sum, these results do not support the hypothesis that increased media scanning translates into increased descriptive norms more so for chemicals receiving greater media coverage.

Figure 6.6 Model predicted relationship between PPEH media scanning and descriptive norms by media coverage volume (n = 762)



Perceived threat

The first model tested whether there was any variation in perceived threat by chemical by estimating an empty model containing a random intercept with no predictors. Of interest is the variance component for the intercept, which quantifies the variance in threat perception across individuals. As can be seen in Table 6.4 (model 1), there was significant variance in perceived threat across individuals, as the variance component for respondent (α_i, the random intercept in the model) was statistically different from zero: 2.44, 95% CI [2.15, 2.77], likelihood-ratio χ^2 (1) = 695.17, $p < .001$. The intra-class correlation coefficient (ICC) was 0.566, indicating that about 56.6% of the total variance in reported perceived threat was accounted for by differences between individuals in their perceived threat on average. All this evidence supports the use of mixed effects regression to examine the hypothesized effects on perceived threat.

Model 5 in Table 6.5 was used to test Hypothesis 4, which asserts that increased media scanning translates into greater perceived threat more so for chemicals receiving greater media coverage. Results from model 5 showed that the variance of the random intercept is statistically different from zero: 1.96, 95% CI [1.71, 2.23], likelihood-ratio χ^2 (1) = 622.83, $p < .001$. The intra-class correlation coefficient (ICC) was 0.542, indicating that about 54.2% of the total variance in reported perceived threat was still accounted for by unobserved differences between individuals in their perceived threat on average, even after including focal independent variables and potential confounders in the model. This evidence again supports the use of mixed effects regression to examine the hypothesized interactive effects of coverage and scanning on perceived threat.

Table 6.4 Mixed effects regression models to predict perceived threat

	Perceived Threat				
	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	3.706*** (.063)	3.942*** (.225)	3.888*** (.224)	3.803*** (.227)	3.802*** (.227)
Interpersonal scanning		.362** (.105)	.189** (.115)	.189+ (.115)	.189+ (.115)
Doctor scanning		.153 (.110)	.024 (.114)	.024 (.114)	.024 (.114)
Children under 7 (>=2)		.086 (.130)	.085 (.129)	.085 (.129)	.085 (.129)
Pregnant (yes)		.059 (.154)	.047 (.152)	.047 (.152)	.047 (.152)
Mother's age		.014+ (.008)	.012+ (.008)	.012 (.008)	.012 (.008)
Race/ethnicity (White)		.244+ (.125)	.217+ (.125)	.217+ (.125)	.217+ (.125)
Education (>=college)		-.113 (.152)	-.096 (.151)	-.096 (.151)	-.096 (.151)
Income (>=$50,000)		.083 (.133)	.085 (.132)	.085 (.132)	.085 (.132)
Homeowner (yes)		-.001 (.131)	-.001 (.130)	-.001 (.130)	-.001 (.130)
Political orientation		-.040 (.027)	-.032 (.027)	-.032 (.027)	-.032 (.027)
Breastfeeding		-.416** (.143)	-.383** (.143)	-.383** (.143)	-.383** (.143)
Smoker (yes)		-.204 (.140)	-.156 (.140)	-.156 (.140)	-.156 (.140)
Child health (excellent)		-.059 (.124)	-.038 (.123)	-.038 (.123)	-.038 (.123)
Authoritarian parenting		.103 (.073)	.082 (.072)	.082 (.072)	.082 (.072)
Authoritative parenting		.435*** (.091)	.426*** (.091)	.426*** (.091)	.426*** (.091)
Permissive parenting		.060 (.079)	.042 (.078)	.042 (.078)	.042 (.078)
Media trust		.299*** (.074)	.284*** (.074)	.284*** (.074)	.284*** (.074)
Information sufficiency		.040 (.078)	-.012 (.079)	-.012 (.079)	-.012 (.079)
Social desirability		.013 (.022)	.016 (.022)	.016 (.022)	.016 (.022)
Media scanning			.137*** (.038)	.137*** (.038)	.149*** (.041)
Coverage of BPA vs. arsenic (C1)				-.341*** (.066)	-.341*** (.066)
Coverage of pesticides vs. arsenic (C2)				.595*** (.066)	.595*** (.066)
Media scanning × C1					-.077 (.028)

Table 6.4 (continued) Mixed effects regression models to predict perceived threat

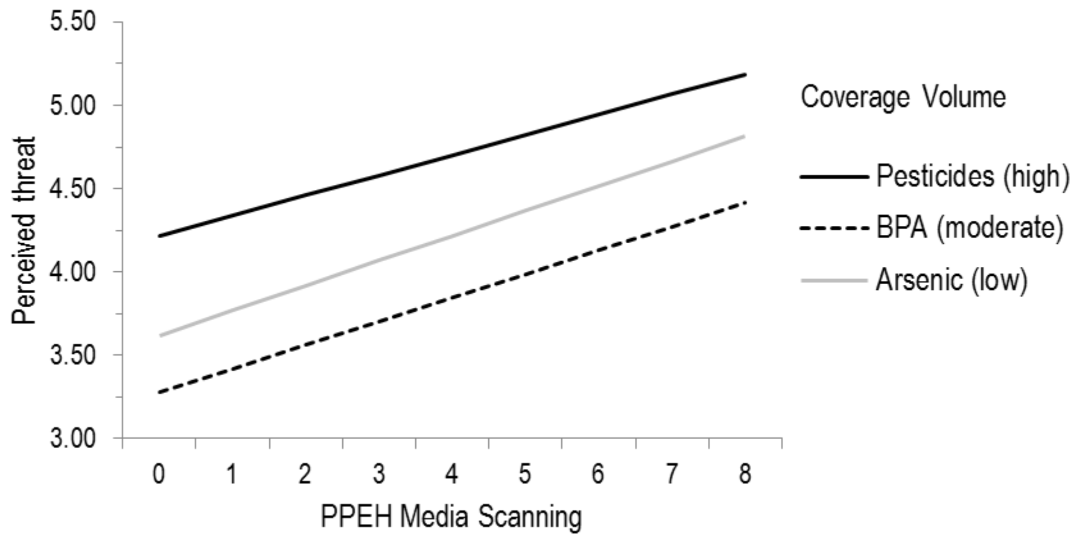
Media scanning × C2					-.028 (.028)
Random-Effect Parameters					
Variance (Between-Individuals)	2.44	1.92	1.88	1.96	1.96
Variance (Residual)	1.87	1.87	1.87	1.65	1.65
Pseudo-R^2		0.12	0.13	0.16	0.16
Deviance (–2LL)	9133.30	8972.36	8959.13	8764.45	8763.42
LR χ^2 Test (vs. Model 1)		160.94***	174.17***	368.85***	369.88***
		(*df* = 19)	(*df* = 20)	(*df* = 22)	(*df* = 24)
LR χ^2 Test (vs. Model 2)			13.23***	207.91***	208.94***
			(*df* = 1)	(*df* = 3)	(*df* = 5)
LR χ^2 Test (vs. Model 3)				194.68***	195.71***
				(*df* = 2)	(*df* = 4)
LR χ^2 Test (vs. Model 4)					1.03
					(*df* = 2)

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.
Note. N = 2,286 with 762 clusters (= number of respondents). Model 1 = null model. Model 2 = association of perceived threat and all covariates. Model 3 = association of perceived threat and media scanning, adjusting for all covariates. Model 4 = association of perceived threat, media scanning, and media coverage, adjusting for all covariates. Model 5 = interactive effects of media scanning and coverage on perceived threat, adjusting for all covariates. Cell entries are unstandardized regression coefficients with standard errors in parentheses. Parameters were estimated using the restricted maximum likelihood estimation method. Pseudo-R^2 is defined as the proportional reduction in the total residual variance comparing the null model without covariates with each model of interest (Snijders & Bosker, 2012). Deviance statistics (−2 log likelihood) and the associated likelihood-ratio tests for model comparisons are based on full maximum likelihood estimation methods (Raudenbush & Byrk, 2002; J. D. Singer & Willett, 2003). All continuous predictors were grand mean-centered to facilitate interpretation of the intercepts.

Model 5 results showed the simple main effect of scanning on perceived threat of arsenic (i.e., the chemical that received low media coverage) was significant: $b_{arsenic}$ = .149, 95% CI [.068, .230], p = .000. That is, for every additional scale unit of media scanning, a mother's perceived threat of arsenic increases .149 scale units on the perceived threat measure, holding all other predictors constant. Similarly, the effects of scanning on perceived threat of BPA and pesticides were also positive and significant: b_{BPA} = .142, 95% CI [.060, .223], p = .001; $b_{pesticides}$ = .121, 95% CI [.040, .203], p = .003.

An omnibus test of the interaction between scanning and coverage was not significant, Wald χ^2 (2) = 1.02, p = .599, indicating that the effect of scanning does not vary across chemical topics (or levels of media coverage). Figure 6.7 plots model-predicted perceived threat by PPEH media scanning and compares the degree of perceived threat across chemical topics. The pattern of interactions was such that the effects of scanning on all three perceptions of chemical threats could not be differentiated: $b_{BPA} - b_{arsenic}$ = -.077, 95% CI [-.063, -.048], p = .796; $b_{pesticides} - b_{BPA}$ = -.020, 95% CI [-.076, .035], p = .472; $b_{pesticides} - b_{arsenic}$ = -.028, 95% CI [-.083, -.028], p = .329. In sum, these results do not support the hypothesis that increased media scanning translates into increased perceived threat more so for chemicals receiving greater media coverage.

Figure 6.7 Model predicted relationship between PPEH media scanning and perceived threat by media coverage volume (n = 762)



Discussion

Chapter 6 used data from Study 2 (a content analysis of relative coverage volume across chemical topics) and Study 3 (an online survey of mothers with children ages 6 and under) to assess contingent effects of scanning prenatal and pediatric environmental health information in the media on key outcomes, including protective behaviors, behavioral intentions, knowledge, descriptive norms, and perceived threat (*Study 4*). A series of theory-informed hypotheses were offered concerning the association between PPEH media scanning and key outcomes, contingent on the volume of coverage in the information environment.

Summary of findings

Although past agenda-setting and priming research suggest that issue awareness tends to be greater during periods of elevated news coverage, mixed effects analyses did not find robust support for any of the study's four moderation hypotheses (see Table 6.5 for summary of findings).

Table 6.5 Summary of findings from moderation analyses of PPEH media scanning effects, contingent on media coverage volume

	Wald χ^2	Interaction Contrasts	Hypotheses Supported?
Behavior	15.41***		H1 – Partial
$b_{BPA} - b_{arsenic}$		.027**	
$b_{pesticides} - b_{BPA}$		-.036***	
$b_{pesticides} - b_{arsenic}$		-.009	
Intention	17.62***		H2 – Partial
$b_{BPA} - b_{arsenic}$		.029**	
$b_{pesticides} - b_{BPA}$		-.035***	
$b_{pesticides} - b_{arsenic}$		-.007	
Descriptive Norms	1.17		H3 – No
$b_{BPA} - b_{arsenic}$		.010	
$b_{pesticides} - b_{BPA}$		.001	
$b_{pesticides} - b_{arsenic}$		.012	
Perceived threat	1.02		H4 – No
$b_{BPA} - b_{arsenic}$		-.077	
$b_{pesticides} - b_{BPA}$		-.020	
$b_{pesticides} - b_{arsenic}$		-.028	

** $p < .01$, *** $p < .001$.
Note. A hypothesis was supported (Yes) if the omnibus test of the interaction was significant *and* the interaction contrasts indicated significant differences in the hypothesized directions (arsenic < BPA < pesticides). A hypothesis was partially supported (Partial) if the omnibus test of the interaction was significant, but the interaction contrasts indicated significant differences in a direction other than those hypothesized. A hypothesis was not supported (No) if the omnibus test of the interaction was non-significant.

Media coverage volume did not moderate the relationship between media scanning and descriptive norms nor between media scanning and perceived threat. For both behavior and intention, the media scanning-coverage interactions were significant;

however, the observed differences between levels of coverage were in a direction not entirely consistent with study hypotheses. That is, the interactive effects were larger for BPA-related behaviors and intentions than for both arsenic- and pesticide-related behaviors and intentions. Because BPA received relatively moderate media coverage during the study's time frame, such an observation was unexpected. Had the results been in the opposite direction than hypothesized (scanning effects greatest for arsenic behaviors, smaller for BPA, and even smaller for pesticides), they could have been explained by some interesting findings in health and political communication. Recent studies have shown that the effect of media attention (or in this case, routine media scanning) is sometimes smaller when coverage volume is high, since less attention is required to come across news stories (e.g., Kwak, 1999; Slater et al., 2009). But, such was not the case.

So, what could account for such a pattern of results? There are five plausible explanations. First, it could be that the media does not impact reactions to specific chemicals, but rather creates a generalized concern with regard to the relationship between children's health and chemical exposure. The data, however, do not strongly support this explanation given that differences across chemicals are in fact observed (i.e., effects of scanning on behavior and intention were significantly greater for BPA).

A second plausible explanation is reverse causation, which is to say behavior drives scanning of PPEH information in the media. Based on the moderation results, this would mean moms taking action to reduce BPA exposure report, recall, and/or engage in more general media scanning, whereas moms taking action against the other two chemicals report, recall, and/or engage in less general media scanning. According to the survey data presented in Study 3, moms care a great deal about reducing exposure to pesticides and arsenic (remember Tables 5.8 and 5.9 showed those behaviors and intentions were more prevalent than reducing and intending to reduce BPA exposure). If reverse causation were the actual culprit, why would it only hold for one of the chemicals – particularly the chemical mothers are relatively less concerned about and less active against? In short, the story told by the data does not support this explanation.

A third explanation could be that there is something about BPA itself that sets it apart from the other two chemicals and accounts for the differential effects of general PPEH scanning on BPA behavior and intention. The moderator variable was intended to represent coverage volume (0 = low coverage volume: arsenic; 1 = moderate coverage volume: BPA; and 2 = high coverage volume: pesticides), but it could potentially represent characteristics other than coverage volume that differ between these three chemicals. In this study's defense, the selection of chemical topics relied on the E.P.A.'s TEACH Summaries to ensure that the chemicals were considered equally "concerning" to children's health, at least among experts. Moreover, the elicitation survey in Study 1 showed that a majority of mothers were concerned about all three issues. That being said, differences most likely remain between the chemicals that could be inadvertently represented by the moderator variable.

For instance, the series of behaviors for reducing arsenic and pesticide exposure measured in this study (e.g., drinking filtered water, limiting exposure to cigarette smoke, washing dirty hands, washing produce) could already be engrained in most mothers' behaviors, having been widely addressed over the years and passed down generation-to-generation as common sense. The data did show that mothers engage in protective behaviors against arsenic and pesticides more often than against BPA. By contrast, behaviors for BPA exposure reduction assessed were relatively novel (e.g., avoiding heating food in plastics, limiting consumption of canned good, washing plastics by hand), offering more opportunity for movement in the population.

Or, perhaps the fact that BPA is relatively less recognizable than the other two chemicals could explain the results. In Study 3, a slightly greater proportion of mothers reported recognizing arsenic and pesticides than BPA (95% and 98% versus 89%, respectively). Scanning general PPEH information in the media could have a greater impact on BPA behaviors and intentions because it has a greater relative impact on *recognition rates* compared to arsenic and pesticides. This would suggest that media coverage relative to baseline matters more than absolute levels of media coverage. Future studies could test this further to see whether the pattern of results holds when substituting a recoded measure of recognition (yes/no) as an alternative outcome.

It is equally plausible that there is something about the media coverage of BPA itself that impacts a specific behavioral determinant and in turn, accounts for its uniquely significant effects on behavior and intention. For instance, media exposure impacts descriptive norms about BPA more so than it does norms about other chemicals: both the cross-sectional results and the simple main effects of scanning on descriptive norms in the mixed models were significant *only* for BPA. Perhaps norms are a stronger predictor of PPEH behaviors and intentions than perceived threat and thus drive the observed effects on intention and behavior. To test this idea, follow-up analyses were conducted regressing each of the three chemical exposure reduction behaviors on descriptive norms (model 1), perceived threat (model 2), and both (model 3).

Table 6.6 Follow-up linear regressions of protective behaviors on descriptive norms and perceived threat

	Behavior					
	Model 1		Model 2		Model 3	
	B (SE)	β	B (SE)	β	B (SE)	β
Arsenic						
Intercept	.604*** (.103)		1.432*** (.048)		.564*** (.101)	
Descriptive norms	.309*** (.025)	.390			.255*** (.026)	.322
Perceived threat			.107*** (.011)	.299	.070*** (.012)	.202
BPA						
Intercept	.289** (.108)		1.168*** (.047)		.180 (.103)	
Descriptive norms	.344*** (.027)	.411			.277*** (.026)	.331
Perceived threat			.148*** (.012)	.391	.115*** (.012)	.302
Pesticide Behavior						
Intercept	.767*** (.109)		1.612*** (.054)		.687*** (.108)	
Descriptive norms	317*** (.026)	.386			.266*** (.027)	.323
Perceived threat			.104*** (.012)	.299	.068*** (.012)	.197

* $p < .05$, ** $p < .01$, *** $p < .001$.

Note. N = 822. Model 1 = bivariate association of descriptive norms and behavior. Model 2 = bivariate association of perceived threat and behavior. Model 3 = association of descriptive norms and behavior, adjusting for perceived threat. Measures of behavioral intention were purposefully omitted from the models since theory suggests it is a potential mediator of these relationships.

As shown in Table 6.6, descriptive norms do in fact appear to drive behavior more than perceived threat (larger βs for norms) for all three exposure reduction behaviors. A future study could explore this further and incorporate additional behavioral determinants measured in Study 3 (i.e., attitudes, self-efficacy) for a more comprehensive model.

The fifth and final plausible explanation for the pattern of results is that there was simply too much noise in the data sets as specified. It could be argued that the composite measures of media scanning and the derivation of coverage volume from the content analysis results were not refined enough to capture subtle differences at the individual level. One way to test this would be to replace the items capturing exposure to PPEH information on websites and in magazines more generally with the parenting magazine and parenting website survey items to create a more refined media scanning index. Given that a majority of mothers reported that they did not scan these specific magazines or websites at all, the disadvantage of this approach would be the highly skewed resulting data.

More content-specific media exposure measures capturing scanning of specific chemical information rather than a measure of general PPEH information exposure may have strengthened the ability to compare effect sizes. Without prior evidence of mothers' awareness of these issues, it was feared that more content-specific measures would perform poorly and have limited variance. Based on the results of this dissertation, it seems reasonable for future research to use more specific exposure measures. As for the coverage volume variable, Study 2 showed no significant differences in chemical topic coverage volume across the three source types. In other words, the proportion of coverage received by each chemical was roughly equivalent across sources. This suggests that the decision to create a combined media scanning measure with websites, magazines, newspapers, television, and radio probably did not bias the results.

While Study 3 helped establish covariation between exposure, perceptions, and behavior while adjusting for potential confounders – an important first step – issues with causal inference remained. This study combined evidence across methods (i.e., content analysis, self-report), which increases confidence in the measurement and results of media effects research (Fishbein & Hornik, 2008). By uniting estimates of exposure from the possibility of exposure with self-reports of exposure, the strengths and weaknesses of each measure taken independently were counterbalanced. Of course, more rounds of data collection – both of media content and survey responses – would strengthen causal claims by examining associations over time. By setting a higher standard for assessment with each new study – one that requires multiple rounds of data collection and sophisticated analysis – our ability to properly examine causation in the context of media effects will continue to improve (Noar, 2006).

CHAPTER SEVEN

Summary and conclusions

Summary of results

A growing body of research dedicated to pediatric environmental health coupled with the broader green movement and increasingly intensive parenting has created a new, dynamic environment in which information can play a critical role in determining protective behaviors. New and expecting mothers, a population particularly vulnerable to toxic chemicals in the environment, are exposed to a great deal of health information from a variety of sources including the mass media. Newspapers report on potential toxins detected in consumer products, while parenting magazines and websites offer advice on how to detoxify the home and why eating organic produce is a healthier choice. Despite several decades of environmental and health communication research, the nature and effects of environmental health information available to mothers have received little research attention.

This dissertation launched a new exploration into environmental health communication to address these gaps and determine whether the mass media is “toxic” – either in its content or in its effects. Three overarching research questions were asked: (1) how prevalent is PPEH information in the media, (2) is mothers’ exposure to such information linked to key outcomes – namely, protective behaviors, behavioral intentions, knowledge, descriptive norms, and perceived threat, and (3) are the effects of such exposure contingent on the relative volume of media coverage PPEH topics receive?

To address these questions, four studies were conducted. Study 1, an elicitation survey, informed the latter studies by determining where mothers routinely come across, or *scan*, PPEH information and how they conceptualize toxic threats. Study 2, a content analysis of popular media sources (i.e., the Associated Press (AP), parenting magazines and parenting websites), focuses on the first research question. Study 3, a cross-sectional survey, addresses the second question, while Study 4 combines data from Studies 2 and 3 to address the third. The latter two studies focus on three chemical threats: arsenic, bisphenol A (BPA), and pesticides. Before considering directions for future research and the implications of study findings, the results of each study are summarized here briefly.

Study 1 found clear empirical justification for the inclusion of websites in the content analysis sampling frame in Study 2. As expected, websites were consistently rated among the most sought and scanned sources of PPEH information. Magazine scanning was also relatively frequent and common compared to other media sources, supporting the inclusion of top parenting magazine titles in the analysis. At first glance, reports of newspaper scanning were relatively low; but, because scanning PPEH information on television and in 'news' in general were reported often in both the open- and closed-ended scanning items, the Associated Press wire, meant to represent such 'news' in general, was ultimately included in the sampling frame.

The results of the elicitation survey also helped refine Study 3's survey measures in terms of (1) chemical concerns, (2) specificity of information engagement items, and (3) time frame. Study 1 found that using broader terms (i.e., pesticides instead of 2, 4-D) may be more effective when referencing chemical threats. Results also demanded several adjustments be made to the measures of both seeking and scanning, including (a) adding examples of potential sources in the dichotomous items, (b) removing the "Do not recall" response options, (c) using more distinct foils (Mychildren.com instead of

Babyhealth.com) to improve accuracy in reporting, and (d) offering mothers the option to respond to items in a socially desirable way. Finally, given the time elapsed between the two survey studies and the amount of content analysis data collected (September 2012 – February 2013), the time frame for all survey items was changed from four (4) to six (6) months, allowing for greater reports of information engagement and protective behaviors, as well as more stable estimates.

Using the sampling frame defined by Study 1, Study 2 had two primary objectives: (1) to estimate the prevalence of PPEH information in the media, and (2) to examine how certain PPEH risks are characterized. Importantly, the results of the content analysis served to further guide the focus and development of survey measures in Study 3, as well as inform *a priori* expectations about the directions of the hypothesized media effects in Study 4. Results showed that during the study period, roughly three pieces of PPEH information were made available to mothers across these sources daily, suggesting that the mass media do in fact communicate PPEH information. So even if the prevalence of news coverage of environmental health risks has decreased over the years as demonstrated by prior research (e.g., Freimuth et al., 1984; Jensen et al., 2010), this may not correspond to a parallel decrease in exposure, particularly among new and expecting mothers, who have alternative sources which present this type of information. Of course without prior years' data, it is impossible to know for sure.

Taking all sources together, results showed that food additives, cigarette smoke, pesticides, and mercury were the most prevalent topics in the media during the study period. Contrary to findings from prior research on environmental health news (i.e., Lichter & Rothman, 1999), the relatively novel and unfamiliar risks – flame retardants and PCBs – were the least prevalent topics covered. What was perhaps more surprising was the relatively small amount of recent media attention given to lead poisoning.

Almost all PPEH information in the media related to arsenic, BPA, and pesticides included some attribution of responsibility and most attributions were directed at parents – contrary to prior evidence of attribution framing in pediatric health news (i.e., Bellows, 1998) – and largely about their responsibility for *reducing* exposure. These findings lend credence to the possibility that social expectations of intensive mothering are conveyed and primed by the media. Very little information blamed anyone for *causing* chemical exposure risks, not even manufacturers – consistent with some prior content analytic work (Woodruff et al., 2003). Results also showed that most PPEH information in the media related to arsenic and pesticides provided parents with advice about how to reduce their child(ren)'s exposure to such threats, while information about BPA was less likely to provide parents with advice. The importance of a future study on PPEH information in the media is elaborated in the next section of this chapter.

Using the measures refined in Study 1, Study 3 made a theoretical case for the hypothesized set of relationships by turning predominantly to research on priming and behavior change. Descriptive analyses revealed that close to 2 out of 3 mothers surveyed reported actively seeking PPEH information from the mass media in the past six months, whereas about 3 out of 4 mothers reported scanning PPEH information. It appeared as though scanning was a slightly more common behavior than active seeking; however, because the measures could not be discriminated, comparisons should be made with caution. Consistent with the literatures on priming and behavior change, most central hypotheses (6 out of 10) were supported. Across all three chemical topics, significant bivariate associations were observed between scanning PPEH information in the media and behavior, intention, descriptive norms, and perceived threat. After adjusting for a series of potential confounders, four BPA-related outcomes were significantly and positively associated with media scanning (all but knowledge). For pesticides, media scanning was positively associated with behavior, intention, and perceived threat. For arsenic, greater media scanning was associated with greater protective behavior and greater perceived threat. Results related to knowledge acquisition for all three chemicals were inconclusive due to poor measure performance. These results provided initial support for the claim that exposure to PPEH information in the media might have important effects on mothers' perceptions and behaviors. However, these cross-sectional associations provide only limited strength for causal claims, particularly given concerns about unmeasured confounders and ambiguous causal direction.

As previously noted, Study 4 was the central study of this dissertation, as it combined the results of all prior studies to test each relationship specified in the model of effects to make stronger causal claims. It was used to push the associations found in Study 3 one step further, and to show that their magnitude was contingent on how much media coverage there was about a given topic during the study period. If topics with more coverage produced higher associations of media scanning with topic-specific outcomes than topics with less coverage, it would have provided some additional evidence that the observed associations reflected exposure to PPEH information in the media and not some other cause. In the end, the evidence did not provide robust support for claims of effects. The relationships between routine exposure to PPEH information in the media and key outcomes were not contingent on the coverage volume of each topic. The effects of scanning on pesticide-related outcomes – the topic with the greatest coverage volume – were not larger or stronger than the effects of exposure to BPA- or arsenic-related information during the study period. There were no significant interaction effects on descriptive norms or on perceived threat. Unexpectedly, the interaction effects were significantly larger for BPA-related behaviors and intentions than for both arsenic- and pesticide-related behaviors and intentions. Despite efforts to focus on three equally threatening chemicals, Study 4 suggests that the issue of BPA exposure stands apart from pesticide and arsenic exposure in the minds of mothers. Something about the chemical itself or the coverage it receives – other than volume – appears to be driving the significant differences observed.

Limitations and directions for future research

Taken together, Studies 1 through 4 provide initial evidence that mothers are concerned about environmental health risks, that they come across PPEH information in the media, and that exposure to such information is linked with greater behavior, intentions, descriptive norms, and perceived threat. That said, several questions were left unanswered. In this section, a number of limitations of this dissertation are discussed and corresponding directions for future research are proposed.

First, this dissertation initiated a new exploration into the domain of maternal exposure to PPEH information. Because of its relative novelty, it seemed prudent to adapt key measures (i.e., information seeking and scanning) from an already well-established body of work in cancer communication. As seen in Study 2, however, discriminant validity between these two measures could not be established. Because quality assessments of media exposures are a critical precursor for accurate effects research (McGuire, 1986; Slater, 2004), refinement and testing of measures that discriminate between scanning and seeking in the context of PPEH information is of utmost importance. Specifically, measures with greater content specificity could help determine whether mothers are able to adequately report exposure to chemical-specific information. If so, such measures could offer better estimates of effect sizes on chemical-specific outcomes.

Second, the scope of the content analysis – though broader than any previous study in this area – created limitations. While conclusions can be drawn about the relative prevalence of chemical topics, what we still do not know is how the prevalence of PPEH information compares to other types of non-environmental health information mothers encounter (e.g., sudden infant death syndrome). The learning curve associated with having and raising a baby – especially for the first time – is steep. New and expecting mothers must deal with pregnancy, delivery, nutrition, breastfeeding, safe sleep, teething, colic, infections, and toilet training issues to name a few. It is possible that learning about and coping with these new environmental health threats take a back seat to more immediate and more apparent pediatric health concerns. The field would benefit from future research studies that examine the relative prevalence of these types of issues.

Another limitation related to the scope of the content analysis hinges on the sampling frame. Study 3 showed that Internet search engines were the most common and frequent sources for PPEH information seeking, suggesting that communication research and practice might benefit from a closer examination of the ebb and flow of PPEH-related search trends. Study 3 also found that a majority of the sample never sought or scanned PPEH information from the specific parenting website titles analyzed in Study 2, despite their having such widespread circulation and high traffic rates. A future study could focus more deeply eliciting information from mothers about where exactly they come across this type of information online if not from Babycenter.com or Parents.com.

Third, it would be unwise to generalize the results of this dissertation to either information environments or populations outside of the United States. While PPEH demands the attention of policymakers, manufacturers, and parents worldwide, certain issues may be more relevant or pressing than others depending on existing regulatory standards. For instance, the European Union's environmental and health policies are based on the precautionary principle, which demands more comprehensive risk assessments and places a heavier burden on producers, manufacturers, and importers to prove that products do not cause harm (Martuzzi & Tickner, 2004). By contrast, the U.S. enforces less stringent legislation in an effort to fuel innovation and development. As a result, a number of the potentially harmful chemicals and ingredients pregnant women and children encounter in the United States have already been banned in other modern societies. An interesting future study might compare PPEH-related attribution framing in U.S. and European media sources.

Fourth, the primary objective of this dissertation was to examine the relationship between routine exposure to PPEH information in the media and key outcomes (behavior, intention, descriptive norms, and perceived threat) that were likely to be impacted by the sheer *volume* of coverage in the information environment. What this dissertation did not address was how the effects of media scanning on other outcomes measured in the survey, particularly perceived responsibility and self-efficacy, might be contingent on the *characteristics* of such coverage. Results from Study 2 that characterize attributions of responsibility and advice in the media could be used in a similar fashion as coverage volume to analyze media effects on alternative behavioral determinants.

Finally, the ability of this dissertation to make strong causal claims was limited by two factors. First, the studies were fielded during a short period of time – a mere six months. It was argued in Chapter 4 that this limitation was not quite as detrimental given that prenatal and pediatric care occurs during a relatively brief time frame and specific PPEH behaviors can be adopted more immediately than, say, a series of childhood vaccinations. Needless to say, earlier media coverage not analyzed could have impacted the observed results.

Second, the cross-sectional nature of Study 3 precluded any conclusions about the causal direction of the associations found. The objective of Study 4 was to further probe the data from Study 3 by integrating the content analytic work using mixed effects regression. In the end, the directions of the observed relationships in Study 4 were not as hypothesized. The discussion section in Chapter 6 presented several reasons for why this may have been the case. Additional analyses were proposed therein to further explore those possibilities.

So, too, is there an opportunity to tackle the issue of causation using an alternative approach – lagged analysis. A follow-up survey administered in September 2013 (six months later) might test these associations over time using the same survey interface and sample of mothers recruited by SSI in Study 3. Adding a second round to the survey and running simple lagged analyses would provide several key advantages. First, the rationale behind this approach is that the most recent measure of the dependent variable is preconditioned to some extent by prior behavior (Granger, 1969; Ostrom, 1990). The time-series modeling presumably adjusts for this distortion and controlling for the lagged version of the outcome (e.g., behavior, intention) reduces noise in the estimates. By reducing individual heterogeneity, the likelihood of alternative explanations of the associations tested is reduced by adjusting for unobserved variables. Second, lagged analyses can also better elucidate temporal precedence and reduce the threat of reverse causation.

Implications of research findings

Collectively, the studies presented in this dissertation lay a strong foundation for future research on prenatal and pediatric environmental health information, an area of communication research that requires greater consideration as government agencies, manufacturers, the media, and especially parents increasingly turn their attention to combatting environmental threats to children's health.

The results of this dissertation may have important implications for the practice of public health communication. Recall that Study 2 provided evidence not entirely consistent with prior content analytic work. Specifically, PPEH information appears to be somewhat prevalent in the media to which mothers are likely exposed, despite claims that media coverage of environmental health, in general, has dropped in recent years (e.g., Freimuth et al., 1984; Jensen et al., 2010). This finding is more consistent with Brown and colleagues' (2001) study that showed women's magazines had a higher percentage of breast cancer articles referencing environmental factors than other general news sources. In other words, we may need to better acknowledge and consider differences in coverage between general audience sources and sources targeting specific, vulnerable populations. Practitioners may find some comfort in the fact that targeted media sources, especially parenting websites, are providing PPEH information to at-risk populations. That being said, mainstream parenting magazines tended on average to provide less information than parenting websites and AP news stories. Mothers' reports in Study 3 of low exposure to PPEH information in magazines reinforced this claim. Given the magazines' high circulation rates, such insight might encourage practitioners to better target these particular sources. In the meantime, mothers in search of PPEH information may be better served online – a conclusion they may have already drawn on their own given their relatively high reports of internet seeking in Study 3.

Also contrary to prior content analytic work (e.g., Lichter & Rothman, 1999) was Study 2's revelation that novel and unfamiliar risks were covered less frequently than established and familiar PPEH risks. Toxicologists concerned about the media's tendency to overstate chemical risks to the public might find some comfort in this fact. Based on the results, well-studied PPEH risks receive relatively more attention in the media sources analyzed. As discussed in Chapter 4, lead poisoning – a well-established risk that received relatively less coverage – was a glaring exception.

Study 2's findings related to how attributions of responsibility and advice to parents are communicated in the media may also have important implications for efforts to control arsenic, BPA, and pesticide exposure. Attributing most of the responsibility for mitigating exposure to these chemicals to parents may place an unfair burden on one population. The challenge with PPEH risks is that most are undetectable without proper product labeling and consumer warnings, which are the responsibility of manufacturers and policymakers. Frequently attributing responsibility to parents, as was the case for pesticides, may preclude policy support for pesticide control and organic food regulation. Fortunately, advice appeared in more than half of the content analyzed. It was argued that the inclusion of such constructive efficacy information in stories about risk may help mothers cope with being implicated as the most responsible party for protecting PPEH, learn about what they can do, and ultimately engage in danger control processes (i.e., protective behaviors). Less advice about BPA was available to mothers, a gap that could be attributed to the recent increase in regulation of BPA in baby bottles and sippy cups. Nevertheless, prenatal and pediatric exposure to BPA is still possible through other pathways (e.g., canned food, older plastics), leaving room for improvement in the communication of advice to parents by practitioners.

The central contribution of this dissertation was initiating a formal inquiry into the uncharted domain of prenatal and pediatric environmental health communication. The mass media play a central role in providing environmental health information to the general public and set the stage for the public's response to risks. As pregnant women and children represent the most vulnerable populations to environmental health threats, it is critical to understand how much and what kind of information is provided to them by the mass media, as well as how they respond to risks given exposure to such information. In light of the significant associations observed in Studies 3 and 4 between media scanning and key outcomes, further investigation is warranted. Environmental health has not yet achieved the same level of perceived importance in communication research as it has in public health. Hopefully, this dissertation serves to bridge that divide and bring PPEH closer to the forefront of the field of health communication.

APPENDIX A

Study 1 Elicitation Survey (January 2013)

First Page

PID.
[Embed URL so Qualtrics can capture SSI PID.]

CONSENT. Welcome!

The University of Pennsylvania is conducting a research study on what mothers think about the relationship between children's health and chemicals in the environment.

This brief survey should take less than 10 minutes to complete. Your participation is completely voluntary. The information you give will be kept confidential and will not be linked to your name. If you have any questions about the study, you may contact the research coordinator (mello@asc.upenn.edu).

To participate, please click NEXT below.
[Respondents either continue to next page or close the browser if do not wish to participate]

PART 1 – SCREENING

New Page

SEX. What is your sex?

Female 2
Male.. 1

[Forced response]
[If they enter 0, receive debriefing below; otherwise, skip to next question]

New Page

PREG. To your knowledge, are you now pregnant?

Yes.. 1
No 2
Don't know/unsure 3

[Forced response]

CHILD_U6. Do you currently have any children between the ages of 0 and 6? Please do not include a current pregnancy in this response.

Yes.. 1
No 2

[Forced response]
[If CHILD_U6=0 and PREG=0 or 9, receive debriefing below; otherwise skip to CHILD_AGE]

New Page

CHILD_AGE. Please provide the ages in years of each of your children between 0 and 6. For newborns and infants less than 12 months, mark 0. Do not include a current pregnancy in this response.
[open-ended question, programmed so there are five boxes labeled Child 1, age in years; Child 2… Child 5, age in years]

New Page

DEBRIEFING STATEMENT FOR NON-ELIGIBLE PARTICIPANTS

Thank you for your interest our survey. Based on your response to the previous question, you are ineligible for inclusion in the study at this time. To learn more about the relationship between chemicals in the environment and children's health, visit the United States Environmental Protection Agency's website here: http://www.epa.gov/gateway/learn/pestchemtox.html. Thank you again!

Click here to return to SSI: http://dkr1.ssisurveys.com/projects/end?rst=2

PART 2 – ELICITATION SURVEY

New Page

CONCRN_OE. A variety of chemicals and toxins can sometimes be found in our environment - in the food we eat, the water we drink, the air we breathe and the products we use.

Thinking about your child's health now and in the future, which chemicals of concern (if any) come to mind? There are no right or wrong answers; we are merely interested in what might come to mind.

Please write each thought on a separate line.
[Provide 10 separate lines for open-ended response]

New Page

CHEM_CE. Below is a list of specific individual chemicals in the environment that may be harmful to children's health.

Thinking about your child's health now and in the future, please specify how concerned you are about your child's exposure to each chemical.

[randomly ordered]	Not concerned at all	Not really concerned	Concerned	Very concerned	I do not recognize this chemical
Arsenic	0	1	2	3	4
Asbestos	0	1	2	3	4
BPA (bisphenol A)	0	1	2	3	4
Lead	0	1	2	3	4
Mercury	0	1	2	3	4
Chlorine bleach	0	1	2	3	4
Phthalates	0	1	2	3	4
PBDEs (polybrominated diphenyl ethers)	0	1	2	3	4
Parabens	0	1	2	3	4
Formaldehyde	0	1	2	3	4
2, 4-D (2,4-dichlorophenoxyacetic acid)	0	1	2	3	4
rBGH (bovine growth hormone)	0	1	2	3	4

[Forced response]

New Page

TYPE_CE. Below is a list of <u>products or types of chemicals</u> in the environment that may be harmful to children's health.

Thinking about your child's health now and in the future, please specify how concerned you are about your child's exposure to each type of product or chemical.

[randomly ordered]	Not at all concerned	Not really concerned	Concerned	Very concerned
Secondhand tobacco smoke	0	1	2	3
Plastics (e.g., toys, food packaging, bottles)	0	1	2	3
Heavy metals in food or water supply	0	1	2	3
Flame retardants	0	1	2	3
Pesticides	0	1	2	3
Indoor air pollutants	0	1	2	3
Household cleaning products	0	1	2	3
Smog/particulate matter (PM)	0	1	2	3

Personal care products (e.g., shampoos, lotions)	0	1	2	3
Food additives/dyes	0	1	2	3

[Forced response]

New Page

BEH_OE. Some people try to do things to reduce a child's exposure to chemicals in the environment. Other people don't feel they can do anything that will affect their child's exposure to chemicals.

Have you personally done anything specific to limit your child's exposure to chemicals in his/her environment?

Please write each specific thing you've done on a separate line below.
[Provide 10 separate lines for open-ended response]

New Page

BUFFER. Some media sources do a good job in keeping parents informed about these types of health issues. Others do not do such a good job. Thinking about the news media you've come across, would you say they do a poor, fair, good or excellent job of keeping parents informed about environmental health issues and potentially harmful toxins?

Poor 0
Fair.. 1
Good 2
Excellent..................................... 3

New Page

Some people are actively looking for information about chemicals in the environment that may be harmful to children's health while others just happen to hear or come across such information. Some people don't come across information about these potentially harmful chemicals at all.

SEEK. Thinking about the past four months, did you actively look for information about the relationship between children's health and chemicals in the environment?

Yes.. 1
No 2

[Forced response]
[If SEEK=1, ask SEEK_OE; otherwise, skip to SCAN]

New Page

SEEK_OE. Thinking about the past four months, where did you actively look for information about the relationship between children's health and chemicals in the environment? Please list each source of information on a separate line.
[Provide 10 separate lines for open-ended response]

New Page

SCAN. Thinking about the past four months, did you hear or come across information about the relationship between children's health and chemicals in the environment even when you were not actively looking for it?

Yes.. 1
No 2

[Forced response]
[If SCAN=1, ask SCAN_OE]

New Page

SCAN_OE. Thinking about the past four months, where did you hear or come across information about the relationship between children's health and chemicals in the environment even when you were not actively looking for it?

Please list each source of information on a separate line.
[Provide 10 separate lines for open-ended response]

New Page

SEEK_CE. How many times did you actively look for information about the relationship between children's health and chemicals in the environment during the past four months from each of the following sources?

[randomly ordered]	Not at all	1 or 2 times	3 times or more	I don't recall
a. Television and radio	0	1	2	3
b. Newspapers (**online and print**)	0	1	2	3
c. Books	0	1	2	3
d. Magazines (**print only**)	0	1	2	3
e. Internet (**search engines only**)	0	1	2	3
f. Websites (**excluding search engines and newspaper websites**)	0	1	2	3
g. Doctor or other medical professional	0	1	2	3
h. Family, friends, or co-workers	0	1	2	3

[If d =1 or 2, ask SEEK_MAG]
[If f=2 or 3, ask SEEK_WEB]
[Force response]

New Page

SEEK_MAG. You mentioned that you've actively looked for this type of information in magazines.

During the past four months, how many times did you actively look for this type of information in each of the magazines listed below?

[randomly ordered]	Not at all	1 or 2 times	3 times or more	I don't recall
Parents Magazine	0	1	2	3
Parenting Magazine	0	1	2	3
Baby Health Magazine	0	1	2	3

New Page

SEEK_WEB. You mentioned that you've actively looked for this type of information on websites.

During the past four months, how many times did you actively look for this type of information on each of the websites listed below?

[randomly ordered]	Not at all	1 or 2 times	3 times or more	I don't recall
Babycenter.com	0	1	2	3
Parents.com	0	1	2	3
Babyhealth.com	0	1	2	3

[Randomly order]

New Page

SCAN_CE. How many times did you hear or come across information about the relationship between children's health and chemicals in the environment during the past four months from each of the following sources when you were not actively looking for it?

[randomly ordered]	Not at all	1 or 2 times	3 times or more	Don't recall
a. Television and radio	0	1	2	3
b. Newspapers (**online and print**)	0	1	2	3
c. Books	0	1	2	3
d. Magazines (**print only**)	0	1	2	3

e. Websites (**not** including search engines or newspaper websites)	0	1	2	3
f. Doctor (or other medical professional)	0	1	2	3
g. Family, friends, or co-workers	0	1	2	3

[If d =1 or 2, ask SCAN_MAG]
[If f=2 or 3, ask SCAN_WEB]
[Force response]

New Page

SCAN_MAG. You mentioned that you've come across this type of information in magazines.

During the past four months, how many times did you come across this type of information when you were not actively looking for it in each of the magazines listed below?

[randomly ordered]	Not at all	1 or 2 times	3 times or more	I don't recall
Parents Magazine	0	1	2	3
Parenting Magazine	0	1	2	3
Baby Health Magazine	0	1	2	3

New Page

SCAN_WEB. You mentioned that you've come across this type of information on websites.

During the past four months, how many times did you come across this type of information on when you were not actively looking for it on each of the websites listed below?

[randomly ordered]	Not at all	1 or 2 times	3 times or more	I don't recall
Babycenter.com	0	1	2	3
Parents.com	0	1	2	3
Babyhealth.com	0	1	2	3

PART 3 – DEBRIEFING STATEMENT

[Respondents receive this page once they complete the survey]

Thank you for participating in this survey! The aim of this study was to learn more about what mothers think about the relationship between chemicals in the environment and their children's health. To find out more about chemicals in the environment, visit the United States Environmental Protection Agency's website here: http://www.epa.gov/gateway/learn/pestchemtox.html.

If you have any questions about the study, please contact:

Susan Mello
Annenberg School for Communication
University of Pennsylvania
3620 Walnut Street
Philadelphia, PA 19104
mello@asc.upenn.edu

If you have any concerns about the ethical conduct of this study, please contact:

University of Pennsylvania
Office of Regulatory Affairs
Institutional Review Board
3624 Market Street, Suite 301 South
Philadelphia, PA 19104-6006
(215) 898-2614

Redirect participants back to SSI:
http://dkr1.ssisurveys.com/projects/end?rst=1&basic=13515

APPENDIX B

Study 1 Survey Codebook

STUDY 1 CODEBOOK

This document outlines the procedure for coding open-ended response items included in Study 1's elicitation survey. Four coding variables are defined below: (1) chemicals of concern, (2) protective behaviors, (3) information seeking, and (4) information scanning. Terms in parentheses represent each variable's name in the accompanying dataset.

1. Chemicals of concern (CHEM_OE)

Valid response (CHEM_OE_valid)
- 1 if respondent mentioned at least one relevant chemical, toxin or route to exposure in CHEM_OE
- 0 if respondent did not mention at least one relevant chemical, toxin or route to exposure in CHEM_OE

Total number of valid responses to CHEM_OE (CHEM_OE_TOTAL)
- Sum of valid responses given by each respondent to CHEM_OE

Food additives (OE_additives)
- 1 if response contains words ['additive*' OR 'dye*'] AND mentions 'food*' OR a specific food (e.g., milk)
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Arsenic (OE_arsen)
- 1 if response contains the word 'arsenic'
- Add 1 for each response satisfying the above condition
- Otherwise, 0

BHT (OE_BHT)
- 1 if response contains the words 'BHT' or 'butylated hydroxytoluene'
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Bisphenol-A (OE_BPA)
- 1 if response contains the words 'BPA' or 'bisphenol A'
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Carbon monoxide (OE_carbonmon)
- 1 if response contains the words 'carbon monoxide'
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Chlorine (OE_chlorine)
- 1 if response contains words 'bleach' OR 'clorox' OR 'chlorine'

- Add 1 for each response satisfying the above condition
- Otherwise, 0

Household cleaners (OE_cleaners)
- 1 if response contains word 'clean*' OR mentions a specific cleaner (e.g., bleach, ammonia)
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Food, generally (OE_food)
- 1 if response contains the word 'food*' OR mentions a specific food (e.g., meat, milk, vegetables)
- Add 1 for each response satisfying the above condition
- Does not include references to chemicals that may be found in food (e.g., pesticides) unless the response meets at least one of the previous two conditions.
- Otherwise, 0

Hormones (OE_hormones)
- 1 if response contains word 'hormone' or lists specific hormone name (e.g., rBGH)
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Lead (OE_lead)
- 1 if response contains word 'lead'
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Mercury (OE_merc)
- 1 if response contains word 'mercury'
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Pesticides (OE_pestic)
- 1 if response contains word 'pesticide' or lists specific pesticide name (e.g., DDT)
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Plastics (OE_plastic)
- 1 if response contains word 'plastic*'
- Does not include references to chemicals that may be found in plastics (e.g., BPA) unless the response meets the above condition.
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Outdoor air pollution (OE_smog)

- 1 if response contains word ‘pollution’ OR ‘smog’ OR ‘air pollut*’ OR ‘particulate matter’ OR ‘PM’
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Tobacco/Secondhand smoke (OE_tobac)
- 1 if response contains word ‘smok*’ OR ‘tobacco’ OR ‘nicotine’
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Vaccines (OE_vaccin)
- 1 if response contains words ‘vaccine’ or ‘vaccinations’ or lists specific vaccine name (e.g., MMR)
- Add 1 for each response satisfying the above condition
- Otherwise, 0

2. Protective Behaviors to Limit Exposure (BEH_OE)

Valid response (BEH_valid)
- 1 if respondent mentioned at least one relevant behavior in BEH_OE
- 0 if respondent did not mention any relevant behaviors BEH_OE

Avoiding exposure to tobacco smoke (BEH_avoidsmoke)
- 1 if response contains any smoking or tobacco related words (e.g., smoking, cigarettes, second-hand smoke)
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Breastfeeding (BEH_breastfed)
- 1 if response contains any reference to breastfeeding (e.g., breastfe*, no baby formula)
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Childproofing (BEH_childproof)
- 1 if response contains word ‘childproof’ OR any reference to keeping chemicals out of child’s reach
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Greenwashing (BEH_greenwash)
- 1 if response contains words [‘green’ OR ‘free’ OR ‘natural’ OR ‘organic’] AND refers to [‘home’ OR ‘product*’] ANDNOT food
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Organic or all-natural food (BEH_organic)

- 1 if response contains words ['organic' OR 'natural' OR 'homemade'] AND refers to food ANDNOT household products (e.g., cleaners, clothing)
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Avoiding plastics (BEH_plastic)

- 1 if response references behaviors to reduce exposure to plastics (e.g., BPA-free, use glass)
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Improving indoor air quality (BEH_vent)

- 1 if response references behaviors to improve indoor air quality (e.g., opening windows, using air purifier, smoking outside/not indoors, indoor plants)
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Purify water (BEH_water)

- 1 if response contains word 'water' (references behaviors to purify or avoid contaminated water, e.g., using a water filter)
- Add 1 for each response satisfying the above condition
- Otherwise, 0

3. Seeking (SEEK_OE)

Valid response (SEEK_OE_valid)

- 1 if respondent provided at least one valid response (i.e., source of information)
- 0 if respondent did not provide at least one valid response

Books (SEEK_OE_book)

- 1 if response contains words 'book' OR 'pamphlet' OR 'brochure'
- Otherwise, 0

Interpersonal sources (SEEK_OE_interp)

- 1 if response contains reference to family, friends, OR other non-medical and non-media sources
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Magazines (SEEK_OE_mags)

- 1 if response contains word 'magazine*' or title of specific magazine
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Medical professionals (SEEK_OE_med)

- 1 if response contains reference to a medical professional (e.g., doctor, nurse, pediatrician)
- Add 1 for each response satisfying the above condition
- Otherwise, 0

News, generally (SEEK_OE_news)
- 1 if response contains word ‘news’ ANDNOT newspaper, TV or other specific media platform (e.g., website)
- Otherwise, 0

Newspapers (SEEK_OE_newspaper)
- 1 if response contains words ‘newspaper*’ OR ‘paper*’ OR title of specific newspaper
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Radio (SEEK_OE_radio)
- 1 if response contains word ‘radio’ OR title of specific radio station/show
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Television (SEEK_OE_tv)
- 1 if response contains words ‘TV’, ‘television, OR ‘channel’ OR title of specific television show or network
- Add 1 for each response satisfying the above condition
- Otherwise, 0

The internet (SEEK_OE_web)
- 1 if response contains word ‘internet’, ‘.com’, ‘online’, ‘web*’ or ‘e-mail’ OR title of specific website
- Add 1 for each response satisfying the above condition
- Otherwise, 0

4. Scanning (SCAN_OE)

Valid response (SCAN_OE_valid)
- 1 if respondent provided at least one valid response (i.e., source of information)
- 0 if respondent did not provide at least one valid response

Facebook (SCAN_OE_facebook)
- 1 if response contains word ‘facebook’
- Otherwise, 0

Interpersonal sources (SCAN_OE_interp)
- 1 if response contains reference to family, friends, OR other non-medical and non-media sources

- Add 1 for each response satisfying the above condition
- Otherwise, 0

Product labels (SCAN_OE_label)
- 1 if response contains reference to product labeling
- Otherwise, 0

Magazines (SCAN_OE_mags)
- 1 if response contains word ‘magazine*’ or title of specific magazine
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Medical professionals (SCAN_OE_med)
- 1 if response contains reference to a medical professional (e.g., doctor, nurse, pediatrician)
- Add 1 for each response satisfying the above condition
- Otherwise, 0

News, generally (SCAN_OE_news)
- 1 if response contains word ‘news’ ANDNOT newspaper, TV or other specific media platform (e.g., website)
- Otherwise, 0

Newspapers (SCAN_OE_newspaper)
- 1 if response contains words ‘newspaper*’ OR ‘paper*’ OR title of specific newspaper
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Radio (SCAN_OE_radio)
- 1 if response contains word ‘radio’ OR title of specific radio station/show
- Add 1 for each response satisfying the above condition
- Otherwise, 0

Television (SCAN_OE_tv)
- 1 if response contains words ‘TV’, ‘television, OR ‘channel’ OR title of specific television show or network
- Add 1 for each response satisfying the above condition
- Otherwise, 0

The internet (SCAN_OE_web)
- 1 if response contains word ‘internet’, ‘.com’, ‘online’, ‘web*’ or ‘e-mail’ OR title of specific website
- Add 1 for each response satisfying the above condition
- Otherwise, 0

APPENDIX C

Study 2 Content Analysis HTML Site Mapping

Babycenter.com HTML site mapping

Level 1 – website section accessible with single click

Level 2 – website section accessible with two clicks

Level 3 – website section accessible with three clicks

[a] Full indicates that date of harvest, section, subsection(s), headline, date of publication (when available), full -text, and any images were downloaded, saved and coded; excluded were surrounding page content/links, such as 'Related Videos', 'Community,' 'Need help?,' 'Mom Answers', 'Quizzes', 'From Our Community' and 'Polls' (unless otherwise specified above). -- indicates that this HTML page was not extracted.

	HTML page	Extraction[a]	Programming notes
Homepage	http://www.babycenter.com/	Full	Only articles in featured slideshow 'Top Stories'
Pregnancy	http://www.babycenter.com/pregnancy	--	
Health & Safety	http://www.babycenter.com/pregnancy#band2	--	
Is it Safe? Beauty & Style	http://www.babycenter.com/303_beauty-style_3657251.bc	Full	Only articles under 'Expert Answers'
Is it Safe? Home & Work	http://www.babycenter.com/303_home-work_3657260.bc	Full	Only articles under 'Expert Answers' and 'News'
Is it Safe? Health	http://www.babycenter.com/303_health_3657265.bc	Full	Only articles under 'Expert Answers' and 'News'

Is it Safe? Nutrition & Weight	http://www.babycenter.com/302_nutrition-weight_1513070.bc	Full	Only articles under 'Articles', 'Expert Answers', and 'News'
Health Problems in Pregnancy: Quitting Smoking	http://www.babycenter.com/pregnancy-quitting-smoking	Full	Only articles under 'Articles', 'Expert Answers', and 'News'
Beauty & Style During Pregnancy	http://www.babycenter.com/pregnancy-beauty-style	--	
Is it Safe During Pregnancy?	http://www.babycenter.com/is-it-safe-during-pregnancy	Full	Only articles under 'Expert Answers'
News	http://www.babycenter.com/news?phase=15	Full	Only first 14 articles (one full screen's worth) under 'All Pregnancy News' on first page
Baby	http://www.babycenter.com/baby	--	
Breastfeeding	http://www.babycenter.com/breastfeeding	--	
Is it safe?	http://www.babycenter.com/303_is-it-safe_10370311.bc	Full	Only articles under 'Don't Miss', 'Articles', 'Expert Answers', and 'News'
Breast Pumping & Bottle Feeding	http://www.babycenter.com/303_breast-pumping-bottle-feeding_1512887.bc	Full	Only articles under 'Articles', 'Expert Answers', and 'News'
Solids and finger foods	http://www.babycenter.com/302_solids-finger-foods_1518480.bc	--	

Food safety	http://www.babycenter.com/baby-food-safety	Full	Only articles under 'Articles', 'Expert Answers', 'News' and 'Polls'
Formula Feeding	http://www.babycenter.com/baby-formula-feeding	--	
Choosing and Using Baby Formula	http://www.babycenter.com/303_choosing-using-baby-formula_1512875.bc	Full	Only articles under 'Don't Miss', 'Articles', 'Expert Answers', and 'News'
Bottles & Nipples for Formula Feeding	http://www.babycenter.com/303_bottles-nipples-for-formula-feeding_1512873.bc	Full	Only articles under 'Articles', 'Expert Answers', and 'News'
Health & Safety		--	
Baby Allergies & Asthma	http://www.babycenter.com/baby-allergies-asthma	Full	Only articles under 'Don't Miss', 'Articles', 'Expert Answers', and 'News'
Chronic Conditions	http://www.babycenter.com/baby-chronic-conditions	Full	Only articles under 'Articles', 'Expert Answers', and 'News'
Poisoning	http://www.babycenter.com/baby-poisoning-response-and-prevention	Full	Only articles under 'Articles', 'Expert Answers', and 'News'
Baby Vaccine Concerns	http://www.babycenter.com/baby-vaccine-concerns	Full	Only articles under 'Articles', 'Expert Answers', and 'News'

A-to-Z Guide to Illnesses & Injuries	http://www.babycenter.com/baby-illnesses-injuries-guide	--	For own use later (note to self: look at distribution of illnesses - few chronic issues)
Baby Bathing & Body Care	http://www.babycenter.com/baby-bathing-body-care	--	
Baby Bathing Basics	http://www.babycenter.com/baby-bathing-basics	Full	Only articles under 'Don't Miss', 'Articles', and 'Expert Answers'
Safety & Childproofing	http://www.babycenter.com/safety-childproofing	--	
Childproofing for your baby	http://www.babycenter.com/baby-childproofing	Full	Only articles under 'Articles', 'Expert Answers', and 'News'
Safety at Home	http://www.babycenter.com/baby-safety-at-home	Full	Only articles under 'Don't Miss', 'Articles', 'Expert Answers', and 'News'
News	http://www.babycenter.com/news?phase=20	Full	Only first 14 articles (one full screen's worth) under 'All Baby News' on first page
Toddler	http://www.babycenter.com/toddler	--	
Feeding & Nutrition	http://www.babycenter.com/302_feeding-nutrition_1515976.bc	--	
Healthy Eating for Toddlers	http://www.babycenter.com/toddler-healthy-eating	Full	Only articles under 'Don't Miss', 'Articles', 'Expert

			Answers', and 'News'
Health & Safety		--	
Allergies & Asthma	http://www.babycenter.com/toddler-allergies-asthma	Full	Only articles under 'Don't Miss', 'Articles', 'Expert Answers', and 'News'
Chronic Conditions	http://www.babycenter.com/toddler-chronic-conditions	Full	Only articles under 'Articles', 'Expert Answers', and 'News'
Poisoning	http://www.babycenter.com/toddler-poisoning	Full	Only articles under 'Articles' and 'News'
Vaccines for Toddlers	http://www.babycenter.com/toddler-vaccines	Full	Only articles under 'Articles', 'Expert Answers', and 'News'
News	http://www.babycenter.com/news? phase=25	Full	Only first 14 articles (one full screen's worth) under 'All Toddler News' on first page
Preschooler	http://www.babycenter.com/preschoolers	--	
Nutrition & Food	http://www.babycenter.com/302_nutrition-food_1517180.bc	--	
Food Safety	http://www.babycenter.com/preschooler-water-food-safety	Full	Only articles under 'Articles', 'Expert Answers', 'News' and 'Polls'

Nutrition Guide	http://www.babycenter.com/preschooler-nutrition-guide-vitamins	Full	Only articles under 'Don't Miss', 'Articles', 'Expert Answers', 'News' and 'Polls'
Health & Safety	http://www.babycenter.com/preschoolers#band3	--	
Allergies & Asthma	http://www.babycenter.com/preschooler-allergies-asthma	Full	Only articles under 'Don't Miss', 'Articles', 'Expert Answers', 'News' and 'Polls'
Chronic Conditions	http://www.babycenter.com/preschooler-chronic-conditions	Full	Only articles under 'Articles' and 'News'
Poisoning	http://www.babycenter.com/preschooler-poisoning-response-and-prevention	Full	Only articles under 'Articles' and 'News'
Vaccines	http://www.babycenter.com/preschooler-vaccines-immunizations	Full	Only articles under 'Articles', 'Expert Answers', and 'News'
News	http://www.babycenter.com/news?phase=30	Full	Only first 14 articles (one full screen's worth) under 'All Preschooler News' on first page
Blogs	http://blogs.babycenter.com/	Full	Only articles under 'Today's Pick' and 'Recent Posts'

Parents.com HTML site mapping

Level 1 – website section accessible with single click

Level 2 – website section accessible with two clicks

Level 3 – website section accessible with three clicks

[a] Full indicates that date of harvest, section, subsection(s), headline, date of publication (when available), full -text, and any images were downloaded, saved and coded; excluded were surrounding page content/links, such as “Pick a Stage,” “Featured Videos,” 'Featured Blogs,” “More Features,” “Topics in...”, “You May Also Like” and “Ask Our Experts” (unless otherwise specified above).
-- indicates that this HTML page was not extracted.

	HTML page	Extraction[a]	Programming notes
Homepage	http://www.parents.com/	Full	Only articles in featured slideshow and those linked under ‘Latest Headlines’
Pregnancy	http://www.parents.com/pregnancy/my-body/	--	
My Pregnant Body	http://www.babycenter.com/pregnancy#band2	Full	Only articles in featured slideshow and those linked under 'More in My Pregnant Body'
Is it Safe?	http://www.parents.com/pregnancy/my-body/is-it-safe/	Full	Only articles in featured slideshow and those linked under 'More in Is It Safe?'
Pregnancy Nutrition	http://www.parents.com/pregnancy/my-body/nutrition/	Full	Only articles in featured slideshow and those linked

			under 'More in Pregnancy Nutrition'
Pregnancy Health	http://www.parents.com/pregnancy/my-body/pregnancy-health/	Full	Only articles in featured slideshow and those linked under 'More in Pregnancy Health'
My Pregnant Life	http://www.parents.com/pregnancy/my-life/	Full	Only articles in featured slideshow and those linked under 'More in My Pregnant Life'
Pregnancy Beauty	http://www.parents.com/pregnancy/my-life/beauty/	Full	Only articles in featured slideshow and those linked under 'More in Pregnancy Beauty'
Babies	http://www.parents.com/baby/	--	
Health	http://www.parents.com/baby/health/	Full	Only articles in featured slideshow and those linked under 'More in Health'
Asthma	http://www.parents.com/baby/health/asthma/	Full	Only articles in featured slideshow and those linked under 'More in Asthma'
Autism	http://www.parents.com/baby/health/autism/	Full	Only articles in featured slideshow and those linked under 'More in Autism'
Birth defects	http://www.parents.com/baby/health/birth-defects/	Full	Only articles in featured slideshow and those linked under 'More in Down

			Syndrome'
Down Syndrome	http://www.parents.com/baby/health/down-syndrome/	Full	Only articles in featured slideshow and those linked under 'More in Birth Defects'
Home cleaning	http://www.parents.com/baby/health/home-cleaning/	Full	*Only articles in featured slideshow and those linked at top of page
Vaccines	http://www.parents.com/baby/health/vaccinations/	Full	Only articles in featured slideshow and those linked under 'More in Vaccines'
Feeding	http://www.parents.com/baby/feeding/	Full	
Baby Nutrition	http://www.parents.com/baby/feeding/nutrition/	Full	Only articles in featured slideshow and those linked under 'More in Baby Nutrition'
Bottle Feeding	http://www.parents.com/baby/feeding/bottlefeeding/	Full	
Formula	http://www.parents.com/baby/feeding/formula/	Full	
Safety	http://www.parents.com/baby/safety/	Full	Only articles in featured slideshow and those linked under 'More in Safety'
Lead poisoning	http://www.parents.com/baby/safety/lead-poisoning/	Full	Only articles in featured slideshow and those linked under 'More in Lead Poisoning'
Nursery safety	http://www.parents. com/baby/safety/nursery/	Full	Only articles in featured slideshow and those linked under 'More in Nursery Safety'

Kitchen & safety	http://www.parents.com/baby/safety/food/	Full	Only articles in featured slideshow and those linked under 'More in Kitchen and Food Safety'
Toddlers & Preschoolers	http://www.parents.com/toddlers-preschoolers/	--	
Health	http://www.parents.com/toddlers-preschoolers/health/	Full	Only articles in featured slideshow and those linked under 'More in Health'
Asthma	http://www.parents.com/toddlers-preschoolers/health/asthma/	Full	Only articles in featured slideshow and those linked under 'More in Asthma'
Autism	http://www.parents.com/toddlers-preschoolers/health/autism/	Full	Only articles in featured slideshow and those linked under 'More in Autism'
Safety	http://www.parents.com/toddlers-preschoolers/safety/	Full	Only articles in featured slideshow and those linked under 'More in Safety'
Toy safety	http://www.parents.com/toddlers-preschoolers/safety/toy/	Full	Only articles in featured slideshow and those linked under 'More in Toy Safety'
Lead poisoning	http://www.parents.com/toddlers-preschoolers/safety/lead-poisoning/	Full	Only articles in featured slideshow and those linked under 'More in Lead Poisoning'
Food	http://www.parents.com/recipes/	--	
Hints and Tips	http://www.parents.com/recipes/tips/	Full	Only articles in featured slideshow and those linked

			under 'More in Hints & Tips'
Food Safety	http://www.parents.com/recipes/tips/foodsafety/	Full	Only articles in featured slideshow and those linked under 'More in Food Safety'
Healthy Eating	http://www.parents.com/recipes/nutrition/	Full	Only articles in featured slideshow and those linked under 'More in Nutrition'
Kids Nutrition	http://www.parents.com/recipes/nutrition/kids/	Full	Only articles in featured slideshow and those linked under 'More in Kids'
Parents Nutrition	http://www.parents.com/recipes/nutrition/parents/	Full	Only articles in featured slideshow and those linked under 'More in Parents'
Toddler	http://www.babycenter.com/toddler	--	
Feeding & Nutrition	http://www.babycenter.com/302_feeding-nutrition_1515976.bc	--	
Healthy Eating for Toddlers	http://www.babycenter.com/toddler-healthy-eating	Full	Only articles under 'Don't Miss', 'Articles', 'Expert Answers', and 'News'
Health & Safety		--	
Allergies & Asthma	http://www.babycenter.com/toddler-allergies-asthma	Full	Only articles under 'Don't Miss', 'Articles', 'Expert Answers', and 'News'

Chronic Conditions	http://www.babycenter.com/toddler-chronic-conditions	Full	Only articles under 'Articles', 'Expert Answers', and 'News'
Poisoning	http://www.babycenter.com/toddler-poisoning	Full	Only articles under 'Articles' and 'News'
Vaccines for Toddlers	http://www.babycenter.com/toddler-vaccines	Full	Only articles under 'Articles', 'Expert Answers', and 'News'
Blogs	http://www.parents.com/blogs/	--	
Parents News Now	http://www.parents.com/blogs/parents-news-now/author/hrossi/	Full	Only articles featured on main page.
Parenting	http://www.parents.com/parenting/	--	
Better parenting	http://www.parents.com/parenting/better-parenting/	--	
Green parenting	http://www.parents.com/parenting/better-parenting/green/	Full	Only articles in featured slideshow and those linked under 'More in Green Parenting'
Toy Recalls	http://www.parents.com/product-recalls/search/?recallCategory=1&timePeriod=0&searchString=null&sortType=4&page=1	Full	Just the first page articles featuring the most recent recalls

APPENDIX D

Study 2 Content Analysis Search Terms

Website Search Terms

Below are the search terms used to retrieve articles in the Microsoft Access database where the scraped website content was saved. Each search term was applied individually to the database to retrieve relevant content for each chemical topic. Because the websites analyzed target parents, additional search terms signifying prenatal and pediatric health were not necessary.

	Chemical topic	Search terms
1.	Arsenic	arsenic
2.	Lead	lead, lead poisoning, leaded
3.	Mercury	mercury
4.	Bisphenol A	bisphenol A, BPA
5.	Indoor air quality	indoor air, dichlorvos, formaldehyde,
6.	PCBs	PBC, polychlorinated biphenyls
7.	Pesticides	pesticide, atrazine, dichlorvos, pyrethroids, permethrin, resmethrin, DEET
8.	Phthalates	phthalates
9.	Cleaning supplies	cleaning suppl, green clean, bleach, chlorine
10.	Food additives	food additive, bovine growth hormone, rBGH, rBST, organic food, preservatives, high fructose corn syrup, trans fat, aspartame
11.	Drinking water	atrazine, water filter, filtered water, water contaminat, tap water
12.	Outdoor air pollution	smog, particulate, air pollution polyvinyl chloride, benzene, formaldehyde
13.	Cigarette smoke	cigarette smoke, secondhand smoke, smoker, smoking
14.	Flame retardants	PBDE, flame retardant, polybrominated diphenyls
15.	Other	asbestos, carbon monoxide, dichlorophenol, paint fumes, PFOA, PTFE, Teflon, radon, volatile organic compound, VOCs, styrene

Lexis-Nexis Search Terms

Below are the search terms used to retrieve articles in Lexis-Nexis from the AP domestic wire, as well as its state and local wire services. Each open search term included the keywords specified below as related to prenatal and pediatric environmental health, *plus* one chemical issue specified in the left-hand column of the table below. The closed search term again included the string of PPEH keywords, *plus* the closed search term specified in the right-hand column of the table below. After each closed search term, an exclusion criteria filtering out obituaries and letters to the editor was also set.

Prenatal and pediatric environmental health
(prenatal or pregnan! or birth! or pediatric! or baby or babies or newborn! or infant! or child! or mother! or matern! ANDNOT “child care”) AND (harmful! or risk! or hazard! or danger! or toxi! or carcinogen! or poison! or health! or asthma or cancer or obes! or "birth defect!" or autism or ADHD) AND

Chemicals/Pathways

	Open search term	Closed search term
1.	arsenic	arsenic
2.	lead	(lead w/50 poisoning or lead w/15 contaminat!)
3.	mercury	mercury ANDNOT (“mercury news” or “solar system”)
4.	(bisphenol A or BPA)	("bisphenol A" or BPA or “vinyl chloride” andnot "Business Professionals of America")
5.	“indoor air”	(“indoor air” or “ambient air” or “formaldehyde w/15 air” or “dichlorvos w/15 air”) ANDNOT (“carbon monoxide” or smoking)
6.	(polychlorinated biphenyls or PCBS)	(polychlorinated biphenyls or PCBs)
7.	(pesticide! or herbicide! or insecticide! or rodenticide!)	(pesticide! or herbicide! or insecticide! or rodenticide! or atrazine or DEET or dichlorvos or pyrethriods) ANDNOT (atrazine w/15 water or dichlorvos w/15 air)

8.	phthalate!	phthalate!
9.	clean! suppl!	(“clean! suppl!” or clean! w/15 organic or green! w/15 clean! or chlorine or bleach) ANDNOT (“Green Bay” or “green! w/15 energy”)
10.	(“food additive!” or organic w/15 food)	(“food additive!” or organic w/15 food or all-natural w/15 food or preservative! w/15 food or dye w/15 food or aspartame or “bovine growth hormone” or rBST or rBGH or “high fructose corn syrup” or “trans fat”)
11.	(contamina! w/15 water or “filter! water” or “water filter!” or “tap water”)	(contamina! w/15 water or “filter! water” or “water filter!” or “tap water” or trichloroethylene or TCE or benzene w/15 water or atrazine w/15 water or nitrate! w/15 water or nitrite! w/15 water)
12.	air w/15 pollut!	(air w/15 pollut! or “particulate matter” or “particle pollution” or “clean air” or smog) ANDNOT China or Greece or “Mexico City”
13.	(“cigarette smoke” or “secondhand smoke”)	(“cigarette smoke” or “secondhand smoke”) ANDNOT Koop
14.	(PBDEs or "polybrominated diphenyl ethers" or “flame retardant!”)	(PBDEs or "polybrominated diphenyl ethers" or “flame retardant!”) ANDNOT “South Korea”
15.	(asbestos or “volatile organic compound!” or VOCs or “carbon monoxide” or PFOA or PTFE or Teflon or radon or dichlorophenol or styrene)	(asbestos or “volatile organic compound!” or VOCs or “carbon monoxide” or PFOA or PTFE or Teflon or radon or dichlorophenol or styrene)

Exclusions

AND NOT (“letters to the editor” or obituaries)

APPENDIX E

Study 2 Content Analysis Codebooks

CODEBOOK #1: Identifying Relevant Media Content

CODEBOOK #1 outlines the criteria for selecting relevant media content to be included in Study 2 – namely, content that contain information about the relationship between children's health and chemicals in the environment, or PPEH information. I briefly define PPEH information, and then detail the relevance criteria in the pages that follow. Where possible, I include excerpts from actual media sources to illustrate relevant (or irrelevant) content. In the coding sheet, select the appropriate option for a given piece of content (1 = "Yes, PPEH information present"; 0 = "No, PPEH information not present").

PPEH Information

In a single unit of media content (e.g., online slideshow, article, news story, magazine advertisement), there is either an implicit or explicit mention of a chemical present in the environment and its potential negative impact on the health of an unborn child, a newborn, an infant or a young child.

The central criteria for relevance are as follows:

1. Content contains one or more statements that refer to <u>a chemical (or category of chemicals) that may be present in the environment of pregnant women and/or young children</u>. Consider the following examples:

    a. The content may report new evidence of a chemical's presence recently detected in the environment (e.g., air, water, soil, consumer products, food):

    "Many name-brand rice and rice products contain varying levels of carcinogenic **arsenic**, according to the results of separate sets of tests announced today by the U.S. Food and Drug Administration… In the wake of the new reports, some American pediatricians said they would alter their advice for parents feeding their children." – *The Chicago Tribune*

    b. The content may report changes in the regulation of a chemical in the environment:

    "The Food and Drug Administration said Tuesday that baby bottles and children's drinking cups could no longer contain **bisphenol A, or BPA**, an estrogen-mimicking industrial chemical used in some plastic bottles and food packaging." – *The New York Times*

c. The content may provide general information about the potential presence of a chemical in the environment, or instructions for how to limit exposure:

“Because your baby grows so rapidly during pregnancy, this is a particularly vulnerable period. Fortunately, there are a number of things you can do to help protect your developing baby's health… Hydrate healthily: Get to know what's on tap. Visit the Environmental Working Group's Drinking Water Database and enter your zip code to learn what, if any, contaminants of concern may be in your water. This guide will also help you identify an appropriate filter should you need one. Unless you've tested for **lead**, let the tap water run for several minutes in the morning to flush the lead out.” – *BabyCenter.com*

AND

2. An article contains one or more statements that suggest at <u>adverse consequences to prenatal or pediatric health associated with exposure to said chemical</u>. Consider some examples:

a. The content may *explicitly* state that exposure to said chemical may have negative consequences for PPEH, for instance, by listing specific outcomes, diseases or complications:

“Infants who drink water that exceeds the nitrate standard could become seriously ill and die, according the U.S. Environmental Protection Agency.” – *The Associated Press*

“In 2010, the F.D.A. said that it had “some concern about the potential effects of BPA on the **brain, behavior and prostate gland of fetuses, infants and children**.” – *The New York Times*

OR

b. The content may also *imply* that exposure to a particular chemical – or type of chemical – can have a negative impact on prenatal and/or pediatric health. The content may use key words to imply that a chemical is hazardous, such as *toxic, contaminated,* or *harmful*:

“According to the nonprofit Environmental Working Group, these fresh fruits and vegetables are consistently the most -- and least -- **contaminated by pesticides**. Highest levels of pesticides: Apples, Bell peppers, Celery…” – *Parents.com*

Content may assume that parents have existing fears/concerns about a chemical and thus the content simply provides information about how to reduce exposure, without ever explicitly stating health outcomes or complications:

"15 BPA-Free Baby Bottles and Sippy Cups – **You won't have to worry about Bisphenol-A** in your baby's milk when you feed her from one of these bottles or cups." – *Parents.com*

Keywords that may cue relevance:

Combined, the following two sets of keywords may help to locate PPEH information within the larger article:

Carcinogen(s)	Chemical(s)	Contaminant(s)
Toxin(s) / toxic	Pollutant(s)	Hazard(s) / hazardous
Environmental health / risk	Household / home health	Harmful / Unhealthy
Organic	All natural	Green

AND

Prenatal	Pregnant / pregnancy	Expecting / expectant
Fetal / fetus	Birth / baby / babies	Newborn(s) / infant(s)
Pediatric / paediatric	Child / children	Mother(s) / maternal

Although stories about the relationship between PPEH and chemicals in the environment will often contain one or more of the abovementioned keywords, this may not always the case. It is possible, for instance, that media content about toys manufactured overseas and the risk of lead poisoning does not mention the terms *toxic* or *chemical*, and yet still addresses the topic at hand sufficiently. Conversely, one of more of these keywords may be present but might not signal content about PPEH. For example, a news story may report on the *hazardous* effects of vigorous exercise on *prenatal* health – a health behavior outside the bounds of this study. Thus, these keywords may prove useful during the coding process, but they should not be considered necessary or sufficient for relevance.

Media content containing PPEH information may pertain to a specific chemical (e.g., mercury, bisphenol A, arsenic, chlorine), or it may refer to categories of chemicals (e.g., flame retardants, volatile organic compounds) more broadly. The following chemical keywords may help to locate PPEH information; however, similar to the aforementioned keywords, these should not be considered necessary or sufficient for relevance:

Specific chemicals from EPA's TEACH Summary

2, 4-D
Arsenic
Atrazine
Benzene
BaP (benzo(a)pyrene)
BPA (bisphenol A)
DEET
Dichlorvos (DDVP)
Formaldehyde
Lead poisoning
Manganese
Mercury
Nitrates / nitrites
PCDFs
PFCs
Permethrin / resmethrin
PCBs
Phthalates
PVC (polyvinyl chloride)
PBDEs
TCE (trichloroethylene)

Other specific chemicals

Asbestos
Aluminum (aluminium)
Ammonia (azane)
BPS (bisphenol S)
Cadmium
Carbon monoxide
Chlorine
Chromium
DDE
DDT
Diesel
Dioxane
Dioxin
EtO (ethylene oxide)
Nitrogen oxide
Ozone
PAHs
Perchlorates
Pyrethroids
Styrene
Sulfur dioxide
Thimerosol
Toluene (toluol)

Types of Chemicals & Pathways

Secondhand (cigarette) smoke
Food additives (dyes, artificial colors, preservatives, artificial sweeteners)
Pesticides/ insectides / rodenticides
Parabens
Flame retardants
Plasticizers
Heavy metals
PM (particulate matter)
Genetically modified organisms
Coolants/insulators
Glues/adhesives
Persistent organic pollutants
Organophosphates (OP)
Perchlorates
Endocrine disruptors
VOCs (volatile organic compounds)

Content is irrelevant if one or more of the following criteria are satisfied:

1. The entirety of the content is dedicated to the health or safety benefit(s) of a particular chemical or category of chemicals.
   Perhaps the best recent example of this is news coverage of flame retardants. While scientific research continues to emerge documenting the negative health consequences of prenatal and pediatric exposure to flame retardants, these chemicals are also lauded for their protective application (i.e., fire safety, burn prevention). A recent pajama recall warned parents that certain brands did not contain *enough* flame retardants to meet federal regulations. Articles that favor increased chemical exposure should be considered irrelevant. Consider this example:

   "Malaria is spread by mosquitoes and kills more than 650,000 people every year, mostly young children and pregnant women in Africa. Without a vaccine, officials have focused on distributing insecticide-treated bed nets, spraying homes with pesticides and ensuring access to good medicines." – *The Associated Press*

2. The content reports on the health consequences of chemical exposure to populations other than pregnant women and children under 6 years of age (preschoolers, toddlers, infants and/or newborns) in the United States. More specifically, irrelevant content would focus on *only* adolescents, teenagers, adults, the elderly, the environment and/or animals. Content discussing PPEH in international contexts (e.g., health effects of smog on infants in India) are also irrelevant. This criteria is most applicable to articles from the AP wire since the parenting magazines and websites will most likely contain targeted information. Consider these examples:

   "Johnson Controls Inc. said Monday it is ending lead-processing operations at battery **plant in Shanghai** that Chinese regulators linked to **elevated blood-lead levels in children who lived nearby**." – *The Associated Press*

   "The new study drew on CDC surveys of 2,838 **kids and teens, ages 6 to 19**. Researchers found that more than 22% of those with the highest BPA level in their urine were obese, compared to 10% of those with the lowest levels." – *USA Today*

   While this example is explicit about the age of the population of interest, it may be difficult to discern whether the article focuses on young children. Use context clues to aid with coding. For instance, if the article discusses issues related to young children or pregnant mothers (e.g., baby bottles, cribs, nurseries, a preschool classroom, breastfeeding), then it should be considered relevant.

3. For web-based content: the only mention of a chemical or category of chemicals is found in a hyperlink to another article. Consider this example:

   “**You can be a combo mom.**

   Lots of moms breastfeed and bottlefeed, or pump breast milk for once-in-a-while use in a bottle. However, know that your milk production will decrease. “I breastfed my son Max until he was 15 months, but he had bottles every now and then," says Amy Collins, who lives in Elmira Heights, New York. "When we got a sitter, I used formula to make things easier.”

   Click here: <u>15 BPA-Free Baby Bottles and Sippy Cups</u>” – *Parents.com*

CODEBOOK #2: Describing Relevant Media Content

Codebook #2 outlines the procedure for coding articles that were previously identified as relevant (i.e., stories that contain PPEH information; see codebook #1). I define each coding variable, including excerpts from actual articles to illustrate the variable of interest.

Source

Articles published in five media sources will be coded in this analysis:

1. The Associated Press Wire
2. Parents.com
3. Babycenter.com
4. *Parents Magazine*
5. *Parenting Magazine*

In the coding sheets labeled by source, enter the corresponding number for each media source in the Source column.

Month

Articles published between September 1, 2012, and February 28, 2013, will be coded in the analysis by month:

1. September 2012
2. October 2012
3. November 2012
4. December 2012
5. January 2013
6. February 2013
7. March 2013 (*additional month included for *magazines only*)

In the coding sheets labeled by source, enter the corresponding number for each month the content was available.

For websites, the process of coding month will be slightly different. In the website coding sheets, there are three additional columns labeled Timestamp, Frequency, and End Date. Cells in the Timestamp column are populated with timestamps (e.g., 9/14/2012) linked to the content during the automated scraping process. Cells in the Frequency column are populated with the number of consecutive days an article appeared on the website (range: 1-171), also derived from the scraping process. A formula pre-programmed into the coding sheet will populate the third column, End Date, with an additional timestamp (e.g., 1/18/2013). This value is calculated by adding the number of days an article appeared on the site (Frequency) to the Timestamp. For example, if an article was posted on 9/14/2012 and ran for 126 days, this signifies that it was removed on 1/18/2013 and will be counted as having been available for 5 months (September – January). In the website coding sheets, refer to the both the Timestamp and End Date columns. Add a row in the coding sheet for each month the article was available based on those two dates. For example, if an article ran for two months, add one new row. If an article ran for 4 months, add three new rows. In each row, enter the corresponding number for each month the content was available.

Article type

Article type will vary by source type. Articles from the Associated Press fall into one broad category: news stories. Articles featured on websites, however, fall into two categories: editorials and blogs. Blogs are identifiable by their designation in the webscraping file as 'Blog.' All other online articles are editorials. Finally, magazines will feature both editorials and advertisements that are also to be included in coding.

Associated Press

1. AP news story

Parenting Websites

2. Editorial
3. Blog

Parenting Magazines

4. Editorial
5. Advertisement

In the coding sheet, for each of the six types, enter the corresponding number for type of article (e.g., 1 = news story). Note that a story should not be classified as having more than one article type.

PPEH topic

The topical focus of most relevant articles will be on a specific chemical (e.g., mercury, lead poisoning) or a broad category of chemicals (e.g., flame retardants, pesticides). For each of these chemicals, official EPA chemical summary forms were used to determine the most common exposure media (e.g., indoor air, diet, drinking water) and the corresponding relative potential for children's exposure. Chemicals not freely recalled in the elicitation survey are grouped under an exposure pathway that was freely recalled. For instance, although benzene was never explicitly mentioned by mothers, cigarette smoke and air pollution were cited as concerning. Thus, any mention of benzene in an article is to be coded under the appropriate exposure pathway. Chemicals not included on the TEACH Summary may be mentioned often when discussing particular pathways (e.g., indoor air quality and VOCs) and should be coded under ‘Other’.

Magazine Coding Sheet Instructions

For each topic listed below, enter the topic number (i.e., 1 through 14) if the article focuses on that PPEH topic into the column labeled PPEH Topic in the magazine coding sheets. If an article discusses a specific chemical concerning to the EPA, but not separately assessed in this list (e.g., 2, 4-D), please note the chemical name under ‘Notes.’ If an article discusses a PPEH topic other than 1 through 14, then enter 15 for “Other” and specify the topic under ‘Notes.’ Articles may include more than one PPEH topic (e.g., cigarette smoke, indoor air pollution). Create a new line of data for each topic covered in a single article.

Website Coding Sheet Instructions

For each topic listed below, enter the topic number (i.e., 1 through 14) if the article focuses on that topic into the column labeled PPEH Topic in the website coding sheets. If an article discusses a specific chemical concerning to the EPA, but not separately assessed in this list (e.g., 2, 4-D), please note the chemical name under ‘Notes.’ If an article discusses a PPEH topic other than 1 through 14, then enter 15 for “Other” and specify the topic under ‘Notes.’ Articles may include up more than one PPEH topic (e.g., cigarette smoke and indoor air pollution). The webscraping and search term process for collecting the sample of content has already created new lines of data for each topic covered in a single article. Unlike the magazine coding sheet, new lines do not have to be manually created for web-based content; however, some lines of data may need to be removed. More specifically, for *chemical pathways* with multiple search terms, duplicate articles may appear in the dataset because the content included multiple keywords. For example, the same article about food additives may appear in the dataset three times because it includes dyes, preservatives and aspartame in the text. Duplicate articles should be removed unless one of the following criteria is met:

1. The duplicate articles were <u>scraped from different website sections</u>. Refer to the column labeled Section in the website coding sheets to determine where each article was posted.

2. The duplicate articles were <u>published on different dates</u>. Refer to the column labeled Timestamp to determine when each article was posted.

3. The duplicate articles were retrieved using search terms of <u>specific chemical names</u>. For example, if an article was retrieved twice because it mentioned both atrazine and dichlorvos, it should not be removed.

AP Wire Coding Sheet Instructions

For each topic listed below, enter the topic number (i.e., 1 through 14) if the article focuses on that topic into the column labeled PPEH Topic in the AP wire coding sheet. If an article discusses a specific chemical concerning to the EPA, but not separately assessed in this list (e.g., 2, 4-D), please note the chemical name under 'Notes.' If an article discusses a PPEH topic other than 1 through 14, then enter 15 for "Other" and specify the topic under 'Notes.' Articles may include up more than one PPEH topic (e.g., cigarette smoke and indoor air pollution). The search term process for collecting the sample of content from Lexis-Nexis has already created new lines of data for each topic covered in a single article. Unlike the magazine coding sheet, new lines do not have to be manually created for AP wire content; however, some lines of data may need to be removed. Similar to the website coding sheets, for *chemical pathways* with multiple search terms, duplicate articles may appear in the dataset because the content included multiple keywords. For example, the same article about food additives may appear in the dataset three times because it includes dyes, preservatives and aspartame in the text. Duplicate articles should be removed unless one of the following criteria is met:

1. The duplicate articles were <u>released on separate AP wires</u>, such as The Associated Press and the Associated Press State and Local Wire. Refer to the column labeled Wire to determine where each article was released.

2. The duplicate articles were <u>published on different dates</u>. Refer to the column labeled Timestamp to determine when each article was posted.

3. The duplicate articles were retrieved using search terms of <u>specific chemical names</u>. For example, if an article was retrieved twice because it mentioned both atrazine and dichlorvos, it should not be removed.

In the coding sheets labeled by source, enter the corresponding number for each PPEH topic mentioned:

1. Arsenic*
    - In drinking water, ground water or soil (higher exposure risk)
    - In outdoor air, indoor air (secondhand smoke) or diet (lower exposure risk)

2. Lead*
    - From lead-based paint in homes or toys
    - From eating or drinking food or water containing lead
    - Includes references to leaded products and lead poisoning
    - Includes references to lead in the context of drinking water

3. Mercury* (including organic, non-elemental and elemental)

- From elemental mercury spills after a spill from a broken object, like a thermometer (higher exposure risk)
- From diet, particularly eating fish (higher exposure risk for organic/methylmercury)
- From herbal/home remedies or batteries (medium exposure risk for inorganic mercury)
- From vaccines or thimerosal (lower exposure risk for organic/methylmercury)

4. Bisphenol A (BPA)* (includes vinyl chloride*)

5. Indoor air quality (including formaldehyde*, dichlorvos*)
   - Indoor air - higher exposure risk for dichlorvos (pesticide)
   - Excludes references to asthma/allergies unless specific chemical threat is mentioned (e.g., smog); natural threats (e.g., pollen, dust) are not relevant.
   - Excludes references to formaldehyde in the context of cigarette smoke, and cigarette/secondhand smoke more generally (to be coded separately; see below).
   - Excludes radon and carbon monoxide (not listed in TEACH summary; to be coded separately as 'Other'; see below).

6. Polychlorinated biphenyls (PCBs)*
   - In fish (higher exposure risk)

7. Pesticides, herbicides and insecticides (including 2, 4-D*, atrazine*, DEET*, dichlorvos* and pyrethriods/permethrin/resmethrin*)
   - In drinking water (higher exposure risk)
   - In insect repellent (higher exposure risk for DEET only)[13]
   - In diet (medium exposure risk)
   - Excludes references to atrazine in the context of drinking water (higher exposure risk)
   - Excludes references to dichlorvos in the context of indoor air quality (higher exposure risk)

8. Phthalates*
   - In diet via plastics, toys (higher exposure risk)

---

[13] Insecticides and pesticides are very similar in their application and exposure media. DEET is a unique case in that the highest exposure risk comes not from contaminated drinking water or food, but from dermal application of insect repellant. Thought it could be coded independently from this grouping, it was not mentioned by mothers in the elicitation survey as particularly concerning; therefore, there does not appear to be a need to assess media coverage of this chemical separately from other pesticides, herbicides and insecticides.

  - Dermal exposure via lotions (medium exposure risk)

9. Cleaning supplies
    - Includes references to bleach, chlorine/chlorine-free, ‘organic’, ‘all-natural’, or the presence/absence of chemical/unnatural ingredients in the context of household cleaning products
    - Includes references to chlorinated swimming pools
    - Excludes references to bleach in personal care products (i.e., hair color, depilatories)
    - Excludes references to chlorine in drinking water (to be coded separately; see below)

10. Food additives
    - Includes references to dyes, preservatives, aspartame, high fructose corn syrup, bovine growth hormone/rBGH/rBST, trans fat
    - Includes references to ‘organic’, ‘all-natural’,‘no trans fat’ or the presence/absence of chemical/unnatural ingredients
    - Excludes preservatives mentioned in the context of vaccines or personal care products
    - Excludes hormones, generally; most articles related to hormones discuss hormones during pregnancy – not food-borne hormone exposure
    - Excludes articles related to food dyes used in arts and crafts (e.g., dying macaroni), unless mention of a chemical health risk is present.

11. Drinking water quality (including atrazine*, nitrates/nitrites*, trichloroethylene (TCE)*)
    - Includes references to filtered water, water filter, and water contaminat
    - Excludes references to lead in drinking water

12. Outdoor air pollution (including particulate matter (PM), polyvinyl chloride (PVC)*, smog, benzene*, formaldehyde*)
    - Excludes references to asthma/allergies unless specific chemical threat is mentioned (e.g., smog); natural threats (e.g., pollen, dust) are not relevant.

13. Cigarette smoke (including benzene* and BaP, benzo(a)pyrene*, formaldehyde*)
    - Includes references to smoking and secondhand smoke
    - Excludes references to marijuana and other drugs

14. Flame retardants (including PBDEs, or polybrominated diphenyl ethers*)

15. Other

- Includes references to asbestos, carbon monoxide, dichlorophenol, PFOA/PTFE/Teflon, perchloroethylene (perc), radon, styrene/styrofoam
- Includes references to paint fumes and volatile organic compounds/VOCs
- Excludes references to crafts using Styrofoam unless a chemical threat is mentioned
- Excludes references to carbon monoxide in the context of cigarette smoke

** Signifies that chemical is included in the EPA's TEACH Summary.*

The following coding instructions are to be used for only media content coded above as mentioning the following PPEH topics: arsenic, bisphenol A and pesticides.

Attributions of responsibility

In a single unit of media content (e.g., online slideshow, article, news story, magazine advertisement), there is either an implicit or explicit attribution of responsibility for either increasing or decreasing prenatal or pediatric exposure to one of the chemical topics coded above. An attribution must name an entity or locus (i.e., parents, manufacturers, a government agency) in order to be included. For sources targeting parents (i.e., web-based and magazine content), "You" should be interpreted as an attribution to parents as the entity or locus.

Enter the corresponding number for each type of attribution of responsibility in the columns labeled Attribute Type 1 and Attribute Type 2:

1. Responsibility for <u>increasing</u> chemical exposure or causing the problem. An example of responsibility for increasing exposure is:

   "China manufactured every one of the 24 kinds of toys recalled for safety reasons in the United States so far this year… The toys were coated at a factory in China with lead paint, which can damage brain cells, especially in children." – *The New York Times*

2. Responsibility for <u>decreasing</u> chemical exposure or administering the solution. An example of responsibility for decreasing exposure is:

   "The Food and Drug Administration may consider new standards for the levels of arsenic in rice as consumer groups are calling for federal guidance on how much of the carcinogen can be present in food." – *The Associated Press*

Enter 0 if there are no attributions of responsibility present in the content unit. Each article may include up to a total of two attributions for increasing and/or decreasing chemical exposure. Focus all subsequent coding in this section on the two most prominent attributions in the content.

Enter the corresponding number for each entity named as responsible in the corresponding columns labeled Locus 1 and Locus 2:

1. Parents or caregivers. Again, for sources targeting parents (i.e., web-based and magazine content), "You" should be interpreted as an attribution to parents or caregivers. An example of parent/caregiver attribution is:

   "The chemicals you use to get rid of unwanted critters could be harming your family." – *Parenting Magazine*

2. Manufacturers. This includes companies that produce products such as baby bottles or shampoo as well as food companies and farms or farmers that grow and process food consumed by pregnant women and/or children. A specific entity need not be mentioned; however, general statements that a chemical can be "found in" certain product categories (e.g., cans, bottles, plastic toys) should not be counted as an attribution to manufacturers. An example of manufacturer attribution is:

   "Johnson & Johnson plans to remove potentially cancer-causing and other dangerous chemicals from nearly all its adult toiletries and cosmetic products worldwide within 3 1/2 years." – *The Associated Press*

3. Policymakers. This includes government agencies and non-profit organizations that regulate chemicals in the United States and abroad. An example of policymaker attribution is:

   "The Food and Drug Administration said Tuesday that baby bottles and children's drinking cups could no longer contain bisphenol A, or BPA, an estrogen-mimicking industrial chemical used in some plastic bottles and food packaging." – *The New York Times*

Advice

One important research question is whether PPEH articles also provide educational information that offers advice to the reader on how to reduce the risk of chemicals in the environment and/or improve PPEH. If an article contains such information, then enter 1 ("Yes, efficacy information present") in the coding sheet. All advertisements should be coded as 1 since they inherently provide advice to the target audience about a recommended behavior. Some examples of advice are:

> "What you need to know: Serving your child conventionally raised foods is still find, but if you can swing the cost, organic foods, especially some forms of produce, will help minimize pesticide exposure." – *Parenting Magazine*

Enter 0 if no advice is present in the content unit.

APPENDIX F

Study 3 Cross-Sectional Survey (March 2013)

NEW & EXPECTING MOTHER CROSS-SECTIONAL SURVEY

First Page

PID.
[Embed URL so Qualtrics can capture SSI PID.]

CONSENT. Welcome!

The University of Pennsylvania is conducting a research study on what mothers think about the relationship between children's health and chemicals in the environment.

This brief survey should take 10-15 minutes to complete. Your participation is completely voluntary. The information you give will be kept confidential and will not be linked to your name. If you have any questions about the study, you may contact the research coordinator Susan Mello at mello@asc.upenn.edu.

To participate, please click NEXT below.
[Respondents either continue to next page or close the browser if do not wish to participate]

PART 1 – SCREENING 1

New Page

SEX. What is your sex?

Female 1
Male 0

[Forced response]
[If they enter 0, receive debriefing below; otherwise, skip to next question]

PART 1 – SCREENING 2

New Page

PREG. To your knowledge, are you now pregnant?

Yes... 1
No 0
Don't know/unsure 9

[Forced response]

New Page

CHILD_U6. Please indicate the total number of children you have who are **currently age 6 and under**. *Please do not include a current pregnancy in this total.*

No children age 6 or under.......................... 0
1 child age 6 or under 1
2 children age 6 or under 2
3 or more children age 6 or under............... 3

[Forced response]
[If CHILD_U6=0 and PREG=0 or 9, receive debriefing below; otherwise skip to SCAN]

DEBRIEFING STATEMENT FOR NON-ELIGIBLE PARTICIPANTS

Thank you for your interest in our survey. Based on your response to the previous question, you are ineligible for inclusion in the study at this time. To learn more about the relationship between chemicals in the environment and children's health, visit the United States Environmental Protection Agency's website here: http://www.epa.gov/gateway/learn/pestchemtox.html. Thank you again!

Click here to return to SSI

PART 1 – SCREENING 3

New Page

Some people are actively looking for information about chemicals in the environment that may be harmful to children's health while others just happen to hear or come across such information. Some people don't come across information about these potentially harmful chemicals at all.

SCAN. Thinking about the past six (6) months, did you hear or come across information about the relationship between children's health and chemicals in the environment even when you were not actively looking for it? For instance, from the mass media, doctors or other people…

Yes 1
No 0

[Force response]

PART 2 – DEPENDENT VARIABLES

New Page

CONCRN. A variety of chemicals and toxins can sometimes be found in our environment - in the food we eat, the water we drink, the air we breathe and the products we use. Below is a list of specific chemicals and chemical sources in the environment that may be harmful to children's health.

Thinking about your child's health now and in the future, please specify how concerned you are about your child's exposure to each chemical or chemical source listed below.

[randomly ordered]	Not concerned at all	Not really concerned	Concerned	Very concerned	I do not recognize this
Arsenic	0	1	2	3	4
Bisphenol A, or BPA	0	1	2	3	4
Lead	0	1	2	3	4
Mercury	0	1	2	3	4
Cigarette smoke	0	1	2	3	4
Pesticides	0	1	2	3	4
Outdoor air pollution	0	1	2	3	4

[Force response]

New Page

[If CHILD_U6 >0 and PREG=1, receive text below; otherwise skip to BEH_BPA].

PREG_U6. You mentioned that you are currently pregnant and have at least one child age 6 or under.

When responding to the next series of questions, please think about your behaviors as a pregnant woman. In other words, please report how often you engage in certain behaviors for your unborn baby's health, rather than for your other child or children.

New Page

BEH_BPA. **Bisphenol A**, or **BPA**, is a chemical used to make certain types of plastics and resins. These plastics are found in many products such as refillable beverage containers, protective linings in food cans, compact disks and plastic dinnerware.

Thinking about the past six (6) months, how often did you engage in any of the following behaviors in order to reduce your child's exposure to BPA?

Please read and consider each response option carefully.

[randomly ordered]	Never	Sometimes	Often	Always
1T. Avoided heating food and beverages in plastic containers/cling wrap	0	1	2	3
2T. Purchased products labeled BPA-free	0	1	2	3
3T. Washed plastics by hand instead of in the dishwasher	0	1	2	3
4T. Used alternatives to plastic for food packaging, such as glass, when possible	0	1	2	3
5T. Limited consumption of canned goods, including baby formula	0	1	2	3
6F. Limited consumption of rice and/or rice products (rice milk, crackers, cereals)	0	1	2	3
7F. Drank bottled or filtered water instead of tap water	0	1	2	3

[Force all responses]

New Page

INT_BPA. Thinking about the next six (6) months, how often do you intend to engage in the following behaviors in order to reduce your child's exposure to BPA?

[randomly ordered]	Never	Sometimes	Often	Always
Avoid heating food and beverages in plastic containers/cling wrap	0	1	2	3
Purchase products labeled BPA-free	0	1	2	3
Wash plastics by hand instead of in the dishwasher	0	1	2	3
Use alternatives to plastic for food packaging, such as glass, when possible	0	1	2	3
Limit consumption of canned goods, including baby formula	0	1	2	3

[Force all responses]

New Page

BEH_ARS. **Arsenic** is a common metal found naturally in our environment. It has also been used for industrial purposes, including petroleum refining, mining and wood preservation. Arsenic can be found in the atmosphere, in water, in soil and in food.

Thinking about the past six (6) months, how often did you engage in any of the following behaviors in order to reduce your child's exposure to arsenic?

Please read and consider each response carefully.

[randomly ordered]	Never	Sometimes	Often	Always
1T. Drank bottled or filtered water instead of tap water	0	1	2	3
2T. Limited consumption of rice and/or rice products (rice milk, crackers, cereals)	0	1	2	3
3T. Limited consumption of apple juice that was not certified organic	0	1	2	3
4T. Limited exposure to cigarette smoke	0	1	2	3
5T. Washed hands after soil exposure (gardening, playground), particularly before eating	0	1	2	3
6F. Used alternatives to plastic for food packaging, such as glass, when possible	0	1	2	3
7F. Avoided heating food and beverages in plastic containers/cling wrap	0	1	2	3

[Force all responses]

New Page

INT_ARS. Thinking about the next six (6) months, how often do you intend to engage in the following behaviors in order to reduce your child's exposure to arsenic?

[randomly ordered]	Never	Sometimes	Often	Always
Drink bottled or filtered water instead of tap water	0	1	2	3
Limit consumption of rice and/or rice products (rice milk, crackers, cereals)	0	1	2	3
Limit consumption of apple juice that is not certified organic	0	1	2	3
Limit exposure to cigarette smoke	0	1	2	3
Wash hands after soil exposure (gardening, playground), particularly before eating	0	1	2	3

[Force all responses]

New Page

BEH_PEST. **Pesticides** are a collective term for chemicals widely used to prevent, repel or destroy unwanted insects, plants, molds and rodents. Pesticides are found in food, water, homes, schools, workplaces, lawns and gardens.

Thinking about the past six (6) months, how often did you engage in any of the following behaviors in order to reduce your child's exposure to pesticides?

Please read and consider each response option carefully.

[randomly ordered]	Never	Sometimes	Often	Always
1T. Limited pesticide use at home, or used natural pest-control alternatives to chemicals	0	1	2	3
2T. Limited use of insect repellents containing DEET	0	1	2	3
3T. Purchased organic fruits and vegetables	0	1	2	3
4T. Thoroughly washed fruits and vegetables before eating	0	1	2	3
5T. Drank bottled or filtered water instead of tap water	0	1	2	3
6F. Avoided heating food and beverages in plastic containers/cling wrap	0	1	2	3
7F. Limited consumption of canned goods, including baby formula	0	1	2	3

[Force all responses]

New Page

INT_PEST. Thinking about the next six (6) months, how often do you intend to engage in the following behaviors in order to reduce your child's exposure to pesticides?

[randomly ordered]	Never	Sometimes	Often	Always
Limit pesticide use at home, or use natural pest-control alternatives to chemicals	0	1	2	3
Limit use of insect repellents containing DEET	0	1	2	3
Purchase organic fruits and vegetables	0	1	2	3
Thoroughly wash fruits and vegetables before eating	0	1	2	3
Drink bottled or filtered water instead of tap water	0	1	2	3

[Force all responses]

PART 3 – MEDIATORS

New Page

In the next series of questions, you will be presented scales with multiple points ranging from *very unlikely* to *very likely*, *very little* to *very much*, and so on. The points represent your feelings in between the two extremes on each scale. Please select the point on each scale that best reflects your feelings about reducing your child's exposure to **bisphenol A, or BPA.**

LIKE_BPA. Imagine you have taken no action(s) to reduce your child's exposure to BPA. In this scenario, what would you say is the likelihood that your child would be exposed to BPA in the next six (6) months?

very unlikely	1	2	3	4	5	6	7	very likely

SEV_BPA. How much does exposure to BPA negatively affect children's health?

very little	1	2	3	4	5	6	7	very much

ATT_BPA. My engagement in behaviors to reduce my child's exposure to BPA in the next six (6) months would be:

extremely bad	1	2	3	4	5	6	7	extremely good
very harmful	1	2	3	4	5	6	7	very beneficial
very foolish	1	2	3	4	5	6	7	very wise
very unhealthy	1	2	3	4	5	6	7	very healthy

[randomly ordered]

SE_BPA. For me, reducing my child's exposure to BPA in the next six (6) months is under my control:

not at all	1	2	3	4	5	6	7	completely

[Force all responses]

New Page

BPA. Please indicate how much you agree or disagree with the following statements about BPA:

[randomly ordered]	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
PRI_BPA. I am personally responsible for reducing my child's exposure to BPA in the next six (6) months	1	2	3	4	5
PRM_BPA. Companies and manufacturers are responsible for reducing my child's exposure to BPA in the next six (6) months	1	2	3	4	5
PRG_BPA. Government regulatory agencies, like the Environmental Protection Agency, are responsible for reducing my child's exposure to BPA in the next six (6) months	1	2	3	4	5
DNORM_BPA. Most mothers like me will engage in behaviors to reduce their child's exposure to BPA in the next six (6) months	1	2	3	4	5
INORM_BPA. Most people who are important to me think I should engage in behaviors to reduce my child's exposure to BPA in the next six (6) months	1	2	3	4	5

[Force all responses]

New Page

In the next series of questions, you will be presented scales with multiple points ranging from *very unlikely* to *very likely*, *very little* to *very much*, and so on. The points represent your feelings in between the two extremes on each scale. Please select the point that best reflects your feelings about reducing your child's exposure to **arsenic.**

LIKE_ARS. Imagine you have taken no action(s) to reduce your child's exposure to arsenic. In this scenario, what would you say is the likelihood that your child would be exposed to arsenic in the next six (6) months?

very unlikely 1 2 3 4 5 6 7 very likely

SEV_ ARS. How much does exposure to arsenic negatively affect a child's health?

very little 1 2 3 4 5 6 7 very much

ATT_ ARS. My engagement in behaviors to reduce my child's exposure to arsenic in the next six (6) months is:

extremely bad	1	2	3	4	5	6	7	extremely good
very harmful	1	2	3	4	5	6	7	very beneficial
very foolish	1	2	3	4	5	6	7	very wise
very unhealthy	1	2	3	4	5	6	7	very healthy

[randomly ordered]

SE_ ARS. For me, reducing my child's exposure to arsenic in the next six (6) months is under my control:

not at all	1	2	3	4	5	6	7	completely

[Force all responses]

New Page

ARS. Please indicate how much you agree or disagree with the following statements about arsenic:

[randomly ordered]	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
PRI_ARS. I am personally responsible for reducing my child's exposure to arsenic in the next six (6) months	1	2	3	4	5
PRM_ARS. Companies and manufacturers are responsible for reducing my child's exposure to arsenic in the next six (6) months	1	2	3	4	5
PRG_ARS. Government regulatory agencies, like the Environmental Protection Agency, are responsible for reducing my child's exposure to arsenic in the next six (6) months	1	2	3	4	5
DNORM_ARS. Most mothers like me will engage in behaviors to reduce their child's exposure to arsenic in the next six (6) months	1	2	3	4	5
INORM_ARS. Most people who are important to me think I should engage in behaviors to reduce my child's exposure to arsenic in the next six (6) months	1	2	3	4	5

[Force all responses]

New Page

In the next series of questions, you will be presented scales with multiple points ranging from *very unlikely* to *very likely*, *very little* to *very much*, and so on. The points represent your feelings in between the two extremes on each scale. Please select the point that best reflects your feelings about reducing your child's exposure to **pesticides**.

LIKE_PEST. Imagine you have taken no action(s) to reduce your child's exposure to pesticides. In this scenario, what would you say is the likelihood that your child would be exposed to pesticides in the next six (6) months?

very unlikely	1	2	3	4	5	6	7	very likely

SEV_PEST. How much does exposure to pesticides negatively affect a child's health?

very little	1	2	3	4	5	6	7	very much

ATT_PEST. My engagement in behaviors to reduce my child's exposure to pesticides in the next six (6) months is:

extremely bad	1	2	3	4	5	6	7	extremely good
very harmful	1	2	3	4	5	6	7	very beneficial
very foolish	1	2	3	4	5	6	7	very wise
very unhealthy	1	2	3	4	5	6	7	very healthy

[randomly ordered]

SE_PEST. For me, reducing my child's exposure to pesticides in the next six (6) months is under my control:

not at all	1	2	3	4	5	6	7	comple tely

[Force all responses]

New Page

PEST. Please indicate how much you agree or disagree with the following statements about pesticides:

[randomly ordered]	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
PRI_PEST. I am personally responsible for reducing my child's exposure to pesticides in the next six (6) months	1	2	3	4	5
PRM_PEST. Companies and manufacturers are responsible for reducing my child's exposure to pesticides in the next six (6) months	1	2	3	4	5
PRG_PEST. Government regulatory agencies, like the Environmental Protection Agency, are responsible for reducing my child's exposure to pesticides in the next six (6) months	1	2	3	4	5
DNORM_PEST. Most mothers like me will engage in behaviors to reduce their child's exposure to pesticides in the next six (6) months.	1	2	3	4	5
INORM_PEST. Most people who are important to me think I should engage in behaviors to reduce my child's exposure to pesticides in the next six (6) months	1	2	3	4	5

[Force all responses]

PART 4 – INDEPENDENT VARIABLES

New Page

Some media sources do a good job keeping parents informed about these types of health issues. Others do not do such a good job. Thinking about the media sources you've come across, would you say they do poor, fair, good or excellent job keeping parents informed about the relationship between children's health and chemicals in the environment?

Excellent 3
Good 2
Fair 1
Poor 0

[Request response]

New Page

Some people are actively looking for information about chemicals in the environment that may be harmful to children's health while others just happen to hear or come across such information. Some people don't come across information about these potentially harmful chemicals at all.

SEEK. Thinking about the past six (6) months, did you actively look for information about the relationship between children's health and chemicals in the environment? For instance, from the mass media, doctors or other people…

Yes 1
No 0

[Force response]

New Page

SEEK_CE. How many times did you actively look for information about the relationship between children's health and chemicals in the environment in the past six (6) months from each of the following sources? If you are not sure, please make your best guess.

[randomly ordered]	Not at all	1 or 2 times	3 times or more
a. Books	0	1	2
b. Newspapers (online and print)	0	1	2
c. Television and radio	0	1	2
d. Magazines (print only)	0	1	2
e. Internet (search engines only)	0	1	2
f. Websites (excluding search engines, social networks like Facebook, and newspaper websites)	0	1	2
g. Doctor or other medical professional	0	1	2
h. Family, friends, or co-workers	0	1	2

[Force all responses]
[If d =1 or 2, ask SEEK_MAG]
[If f =1 or 2, ask SEEK_WEB]

New Page

SEEK_MAG. You mentioned that you've actively looked for this type of information in magazines.

During the past six (6) months, how many times did you actively look for this type of information in each of the magazines listed below?

[randomly ordered]	Not at all	Maybe, but I'm not sure	1 or 2 times	3 times or more
Parents Magazine	0	9	1	2
Parenting Magazine	0	9	1	2
My Children Magazine	0	9	1	2

[Force response]

New Page

SEEK_WEB. You mentioned that you've actively looked for this type of information on websites.

During the past six (6) months, how many times did you actively look for this type of information on each of the websites listed below?

[randomly ordered]	Not at all	Maybe, but I'm not sure	1 or 2 times	3 times or more
Babycenter.com	0	9	1	2
Parents.com	0	9	1	2
Mychildren.com	0	9	1	2

[Force response]

New Page
SCAN_CE. How many times did you hear or come across information about the relationship between children's health and chemicals in the environment in the past six (6) months from each of the following sources when you were not actively looking for it? If you are not sure, please make your best guess.

[randomly ordered]	Not at all	1 or 2 times	3 times or more
a. Books	0	1	2
b. Newspapers (online and print)	0	1	2
c. Television and radio	0	1	2
d. Magazines (print only)	0	1	2
e. Websites (not including search engines, social networks like Facebook, or newspaper websites)	0	1	2
f. Doctor (or other medical professional)	0	1	2
g. Family, friends, or co-workers	0	1	2

[Force all responses]
[If d =1 or 2, ask SCAN_MAG]
[If e =1 or 2, ask SCAN_WEB]

New Page

SCAN_MAG. You mentioned that you've come across this type of information in magazines.

During the past six (6) months, how many times did you come across this type of information when you were not actively looking for it in each of the magazines listed below?

[randomly ordered]	Not at all	Maybe, but I'm not sure	1 or 2 times	3 times or more
Parents Magazine	0	9	1	2
Parenting Magazine	0	9	1	2
My Children Magazine	0	9	1	2

[Force response]

New Page

SCAN_WEB. You mentioned that you've come across this type of information on websites.

During the past six (6) months, how many times did you come across this type of information on when you were not actively looking for it on each of the websites listed below? If you are not sure, please make your best guess.

[randomly ordered]	Not at all	Maybe, but I'm not sure	1 or 2 times	3 times or more
Babycenter.com	0	9	1	2
Parents.com	0	9	1	2
Mychildren.com	0	9	1	2

[Force response]

PART 5 – CONFOUNDERS

New Page

HEALTH. Would you say that in general your child's health is:

Excellent 4
Very good 3
Good 2
Fair 1
Poor 0

[Request response]

New Page
BF1. Do you currently breastfeed or feed your breast milk to your child?

Or if you are pregnant, do you intend to breastfeed or feed your breast milk to your unborn baby?

Yes 1
No 0

New Page

PSDQ. For each item, rate how often you exhibit this behavior with your child(ren) ages 6 and under. *If you are pregnant with your first child, imagine how often you intend to exhibit these behaviors once your child is born.*

[randomly order]	Never	Once in awhile	About half the time	Very often	Always
AV_1. I am responsive to my child's feelings and needs.	1	2	3	4	5
AV_2. I emphasize the reasons for rules.	1	2	3	4	5
AV_3. I take into account my child's preferences in making plans for the family.	1	2	3	4	5
AR_1. When my child asks why he/she has to conform, I state: because I said so, or I am your parent and I want you to.	1	2	3	4	5

AR_2. I scold and criticize to make my child improve.	1	2	3	4	5
AR_3. I use physical punishment as a way of disciplining my child.	1	2	3	4	5
PM_1. I find it difficult to discipline my child.	1	2	3	4	5
PM_2. I give into my child when the child causes a commotion about something.	1	2	3	4	5
PM3. I spoil my child.	1	2	3	4	5

[Request response]

New Page

SKEPTIC. Thinking about the media sources you come across that provide information about children's health… Please select the point in between each pair (of words and phrases with opposite meaning) that best represents how you feel about the media sources you have in mind.

Are fair	1	2	3	4	5	Are unfair
Are accurate	1	2	3	4	5	Are inaccurate
Tell the whole story	1	2	3	4	5	Do not tell the whole story
Can be trusted	1	2	3	4	5	Cannot be trusted
Help society solve its problems	1	2	3	4	5	Get in the way of society's solving its problem

[Randomly order]
[Request response]

LABEL. How often do you read information about ingredients and/or certifications (e.g., USDA organic, all natural, non-toxic) printed on the different products you purchase?

Never 0
Rarely 1
Sometimes 2
Often 3
Always 4

[Request response]

New Page

SOCIAL_D. Listed below is a number of statements concerning personal attitudes and traits. Please read each item and decide whether the statement is true or false as it pertains to you personally. It's best to go with your first judgment and not spend too long mulling over any one question.

[randomly ordered]	True	False
1. It is sometimes hard for me to go on with my work if I am not encouraged.	1	2
2. I sometimes feel resentful when I don't get my way.	1	2
3. No matter who I'm talking to, I'm always a good listener.	1	2
4. There have been occasions when I took advantage of someone.	1	2
5. I'm always willing to admit it when I make a mistake.	1	2
6. I sometimes try to get even rather than forgive and forget.	1	2
7. On a few occasions, I have given up doing something because I thought too little of my ability.	1	2
8. I am always courteous, even to people who are disagreeable.	1	2
9. I have never been irked when people expressed ideas very different from my own.	1	2
10. There have been times when I was quite jealous of the good fortune of others.	1	2
11. There have been times when I felt like rebelling against people in authority even though I knew they were right.	1	2
12. I am sometimes irritated by people who ask favors of me.	1	2
13. I have never deliberately said something that hurt someone's feelings.	1	2

[Request response]

New Page

POLITIC. In general, would you describe your own political views as…

Very conservative 1
Conservative 2
Moderate 3
Liberal 4
Very liberal 5
Don't know 9

SMOKE. Do you smoke cigarettes every day, some days, or not at all?

Every day 2
Some days 1
Not at all 0

OWN. Do you own or rent your current residence?

Own 1
Rent 2
Do not pay for housing 3

[Request responses]

PART 6 – DEBRIEFING STATEMENT

[Respondents receive this page once complete the survey]

DEBRIEFING STATEMENT FOR SURVEY PARTICIPANTS

Thank you for participating in this survey! The aim of this study was to learn more about what mothers think about the relationship between chemicals in the environment and their children's health. To find out more about chemicals in the environment, visit the United States Environmental Protection Agency's website here: http://www.epa.gov/gateway/learn/pestchemtox.html.

If you have any questions about the study, please contact:

Susan Mello
Annenberg School for Communication
University of Pennsylvania
3620 Walnut Street
Philadelphia, PA 19104
mello@asc.upenn.edu

If you have any concerns about the ethical conduct of this study, please contact:

University of Pennsylvania
Office of Regulatory Affairs
Institutional Review Board
3624 Market Street, Suite 301 South
Philadelphia, PA 19104-6006
(215) 898-2614

Click here to return to SSI

APPENDIX G

Study 3 Additional Analyses

Knowledge of Exposure Pathways of Three Focal Chemicals: Measure Distributions by Percent (n = 822)

	Bisphenol A	Arsenic	Pesticides
Low (0 correct)	55.0	79.2	74.1
Moderate (1 correct)	35.2	8.3	13.5
High (2 correct)	9.9	12.5	12.4

Perceived Responsibility for Reducing Exposure to Three Focal Chemicals in the Next 6 Months: Measure Distributions by Percent (n = 822)

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
BPA					
Individual	0.9	2.6	17.4	39.8	39.4
Industry	3.5	6.0	25.8	44.0	20.7
Government	3.6	7.8	27.6	38.3	22.6
Arsenic					
Individual	0.6	1.9	19.8	41.7	35.9
Industry	2.2	5.4	23.2	43.6	25.7
Government	2.9	4.3	24.6	41.0	27.3
Pesticides					
Individual	0.5	1.9	16.7	42.1	38.8
Industry	2.4	6.4	25.2	42.3	23.6
Government	2.6	5.1	26.3	40.4	25.7

Matrix of Correlations Between Scanning and Seeking

		Scan							Seek						
		TV	Newsp	Mags	Web	Books	Interp	Med	TV	Newsp	Mags	Web	Books	Interp	Med
Scan	TV	1													
	Newsp	0.59	1												
	Mags	0.53	0.62	1											
	Web	0.49	0.55	0.53	1										
	Books	0.50	0.64	0.61	0.50	1									
	Interp	0.48	0.51	0.51	0.58	0.53	1								
	Med	0.50	0.53	0.53	0.52	0.57	0.63	1							
Seek	TV	0.64	0.56	0.49	0.43	0.52	0.46	0.5	1						
	Newsp	0.50	0.67	0.53	0.50	0.60	0.49	0.52	0.59	1					
	Mags	0.46	0.59	0.68	0.47	0.59	0.47	0.51	0.57	0.68	1				
	Web	0.43	0.56	0.54	0.48	0.70	0.46	0.53	0.55	0.67	0.65	1			
	Books	0.43	0.46	0.42	0.65	0.49	0.53	0.49	0.50	0.59	0.52	0.55	1		
	Interp	0.42	0.46	0.45	0.49	0.47	0.66	0.54	0.53	0.54	0.56	0.54	0.59	1	
	Med	0.41	0.45	0.49	0.48	0.53	0.52	0.71	0.54	0.55	0.56	0.62	0.61	0.61	1

Intra-scan | Intra-seek | Cross source Cross seek and scan | Intra-source

APPENDIX H

Study 3 Model Summaries

Summary of 15 Multiple Regression Models (5 Outcomes × 3 Chemicals) – Significant Predictors

	Behavior			Intention			Knowledge			Descriptive Norms			Perceived Threat		
	BPA	Ars	Pest	BPA	Ars	Pest	BPA	Ars	Pest	BPA	Ars	Pest	BPA	Ars	Pest
Media scanning	***	*	*	*	-	*	-	*	*	***	-	-	**	*	***
Interpersonal scanning	*	-	*	-	-	-	-	-	*	*	-	-	-	*	-
Doctor scanning	-	**	*	**	***	**	***	**	-	-	*	-	-	-	-
Children under 7 (>=2)	*	**	*	*	**	-	-	*	-	*	-	-	-	-	-
Pregnant (yes)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mother's age	-	-	-	-	-	*	-	*	-	-	-	-	-	-	-
Race/ethnicity (White)	-	-	-	*	-	-	-	-	-	-	*	-	-	*	-
Education (>=college)	-	-	-	-	-	-	-	-	-	-	*	-	-	-	*
Income (>=$50,000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Homeowner (yes)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Political orientation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Breastfeeding	**	-	-	*	-	-	**	-	-	**	-	-	*	-	*
Smoker (yes)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Child health (excellent)	-	*	-	-	-	-	-	-	-	-	*	-	-	-	-
Authoritarian parenting	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Authoritative parenting	**	**	***	***	***	***	-	-	-	**	***	***	***	***	***
Permissive parenting	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Media trust	*	*	-	***	*	**	-	-	-	*	*	*	***	***	*
Information sufficiency	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Social desirability	***	***	**	*	**	*	***	-	*	***	***	-	-	-	-

*** $p < .001$; ** $p < .01$; * $p < .05$; - *n.s.*

Note. The 12 grey asterisks signify results that did not follow a consistent pattern across models. These results, which made up 15% of the total significant coefficients in the 15 multivariate models tested, were excluded from the interpretation of findings to mitigate Type 1 error.

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