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Abstract

This study examines source type, citation accuracy, and anecdotal reliance in parenting blog articles about the autism/vaccine controversy. Existing literature on common errors and shortcomings of traditional health journalism, in conjunction with existing guidelines and suggestions for optimal health journalism practices, were used to synthesize a content analysis code structure. The code structure was used to examine 122 parenting blog posts from 18 different blogs, spanning a time period from June 22, 2005 to January 9, 2012, for details including the following:

- author demographics (gender, profession, parenthood, vaccination patterns)
- type of blog the article appeared in
- author stance of the autism/vaccine link (support, reject, or conflicted)
- inclusion of cited sources in the form of hyperlinks, whether links were cited correctly, and which sources the links represented (blog, news article, medical research, etc)
- inclusion of anecdotal evidence
- whether sources and anecdotes were used to support or refute the autism/vaccine link.

Two coders (intercoder reliability 0.80 or higher for all variables) were used to analyze the blog sample. A statistical analysis including frequency descriptives, Pearson's correlation coefficient, one-way ANOVA, and independent t-tests were used to analyze the data.

A demographic overview of the blogs revealed that the majority of the sampled authors were mothers with no health or science background, and that most did not believe

that a relationship between vaccines and autism exists. An examination of the sources revealed that while most sources were cited correctly, the incorrectly-cited sources mirrored traditional journalism flaws. The statistical analyses revealed significant relationships between blog type and number of statements that supported the autism/vaccine link; and between the author's opinion on the autism/vaccine link and the number of "neutral" hyperlinks (not used to support or refute the autism/vaccine link).

While the realm of parenting blogs as medical information source merits further research, the results of this study indicate that parenting blogs, an important resource to parents, should be treated with caution as a health authority. Parents find great value in being able to discuss their fears and concerns with other parents, and blogs can serve as a way for parents to hear about breaking news that is quite relevant to them. However, a lack of credible sources indicates that parents should seek in-depth health formation from health outlets other than blogs.

Parenting Blog Coverage of the Autism-Vaccine Controversy

Aidan Bryant

This Thesis submitted in partial requirement for the degree of Master of Arts in Media
Studies

Media Studies

S.I. Newhouse School of Public Communication

Syracuse University

December 2012

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Acknowledgements

I would like to thank Dr. Fiona Chew for her unending wisdom, guidance, and encouragement throughout the thesis process and my studies at Syracuse University, as well as for the profound privilege of serving as her research assistant. Many thanks to Dr. Carol Liebler for not only dedicating her time as a committee member, but for her fervent tutelage and support during my time in the masters program. I would also like to thank the members of my thesis committee, Dr. Makana Chock and Dr. Bill Ward, for their time, patience, and expertise.

I would also like to thank the following people who lent their support, love, assistance, and knowledge during the thesis process:

My amazing cohort and Chopper for the laughs, tears, and overwhelming solidarity; Ki, for being a fantastic assistant and friend; and the PhDs, who helped me believe that it does get better.

Special thanks to Dr. Gina Chen for allowing me access to the manuscript of her paper “Don’t Call Me That: Examining the Discourse that Precedes the Term *Mommy Blogger*.”

Dr. Atsushi Tajima and Dr. Meredith Harrigan for helping me find my true calling, for their constant encouragement, and for giving me so many opportunities to excel.

My parents for their love and unending support throughout my life and education.

Alyx, for being my personal and academic role model.

And last, but far from least, to the following I dedicate this work:

Marissa, the best friend and broshark I could ask for, who has always been there for me without question or judgment,

And Chris, who constantly inspires me to be more than I am and more than I ever thought I could be.

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Chapter 1

Introduction

Preamble

In 1998, British physician Andrew Wakefield published an article in British medical journal the *Lancet* proposing that the measles-mumps-rubella (MMR) vaccine, traditionally given to children around the age of 2, was related to the onset of autism. Though his findings initially seemed extremely concerning, his method was flawed and failed to disclose a telling conflict of interest. Nonetheless, the media picked up the story and spread it to mainstream awareness. Parents were fearful, vaccination rates in the US and UK dropped, and celebrities took up the cause, advocating for the possibility of an autism-vaccine link. However, numerous studies failed to find any support for Wakefield's allegations, and in 2010 the *Lancet* retracted the study and Wakefield was disbarred from the UK Medical Register. It is the current opinion of the medical community, including the CDC and IOM, that there is no evidence of a relationship between the MMR vaccine and autism. However, discussion of the risks of vaccines (for autism as well as other mental disorders) persists in the media, with some parents still concerned or convinced that vaccinating their children is only inviting a host of autism-spectrum disorders.

As someone who is interested in health and medicine, as well as someone who spends a considerable amount of time reading news and blogs online, I have always been somewhat aware of this controversy. Moreover, my concurrent interests in biology and the media have contributed to my awareness of— and frustration with— the degree of misinformation that exists not only online, but in traditional media sources. The average individual does not have access to medical journals or academic literature, due to the lack of open-source material, so I was prompted to ask

the question: where do most people get their information? Moreover, where do they get their *misinformation*?

Because of the increasing presence of the internet in not only health communication, but advocacy and niche interests, I chose to examine blogs as the news media of interest in this research. Furthermore, the autism/vaccine controversy has such salience and tenacity largely due to the emotional impact of vast numbers of parents needing, or believing that they need, to protect their children from the possible adverse effects of vaccines. Because the controversy has the greatest potential impact on parents, I chose to focus on parenting blogs—blogs by and for parents, written about parenting topics.

Science and Misinformation

Science and health experts have found that American adults are currently widely misinformed of health and scientific information. A recent study conducted by the American Academy of Arts & Sciences (Miller, 2008) indicated that only 55% of American adults know that antibiotics do not kill viruses; 44% can give a correct definition of DNA; and a scant 35% can explain what it means to study something scientifically. While civic scientific literacy (science literacy in adults) rates have improved since 1988, they still hovered just below 30% in 2008 (Miller, 2008).

While issues of scientific illiteracy may be in part traced to the structure of formal education in the United States (Aud et al., 2011; Miller, 2008), school is not the only source of information, particularly for adults. Once formal education has ceased, media including books, magazines, TV, and the internet are the main sources of information for adults, including science and technology (National Science Foundation, 2010) and health information (Fox, 2011a; Grilli, Freemantle, Minozzi, Domenighetti, & Finer, 2000; Tu, 2011). News media outlets in particular

play an important role in bridging the communication gap between scientists and audiences. The Secretary of the Smithsonian Institution suggests that while it is important for scientists to communicate with the public, media sources such as the *New York Times* can be “better at explaining the issues to the public than the experts.” (Clough, 2011, p. 53). Clough cites an example of writers from the *New York Times* and *Times Picayune* being able to succinctly and accurately explain issues involved with hurricane protection systems in New Orleans, a topic surrounded by complex engineering concepts. Other examples of topics that science writers have successfully tackled include climate change and plate tectonics, discussed “in ways that allow an average person to grasp the fundamentals.” (Clough, 2011, p. 55)

Several surveys demonstrate the continuing importance of mediated sources in seeking health and science information. The National Science foundation reported that 40% of American adults turn to television news as their primary source of science and technology information. Eighty percent of all online American adults use the internet to search for health information (Fox, 2011a), 66% use the internet to search for information about a specific disease or health issue. A 2011 report released by the Center for Studying Health System Change (Tu, 2011) revealed that in 2010 the internet was the most popular source of health information, with 33% of polled individuals reporting that they used the internet to search for health information. Following the internet was friends or relatives (29%), books, magazines, and newspapers (18.2), and TV and radio (10%). In addition, the internet was the only source of information to increase in popularity from 2007 to 2010. A 2008 Roper Center survey documented how often respondents used various media sources. Fifty-five percent said that they used the internet to look for health information “some”, while 20% used the internet “a lot.” In contrast, only 2% of

the respondents said that they used newspapers “a lot”, with the majority (58%) using newspapers “not at all.”

News Media, Science, and Health Information

Despite general reliance on news media for information and updates, evidence suggests that news media in aggregate may not be the most reliable or accurate source of science and health information. Fjæstad (2007) points out that scientists and journalists place importance on different characteristics of news: scientists value novelty, correctness, and interestingness, respectively; while journalists place a higher priority on interestingness than accuracy. Therefore, details that would be considered very important by scientists or health practitioners might be given less attention by journalists. In addition to differences in priorities, there are many difficulties inherent in translating scientific research into layman terms (Radford, 2007). Journalists prefer short, punchy language; “mitochondrial DNA” has no concise synonym that can replace it. Therefore, complex yet important details may be passed over in favor of more accessible, yet less comprehensive summaries. In fact, the Kaiser Foundation (2009) identifies lack of in-depth coverage and difficulties making complex issues accessible as two of the biggest challenges facing health journalism.

The effects of health journalism and distilled reporting have a potentially great impact. Apart from general knowledge, news media can impact policy decisions and voter input (Kennedy, 2010). Prior research has suggested that news media have profound effects on audiences’ perceptions of health care and scientific knowledge (Elliott, 2006; Hodgetts & Chamberlain, 2003; Voelker, 1998). If the information that audiences derive from news media is incorrect or misleading, it can have — and has had — a negative impact on individuals (Dentzer, 2009; Molitor, 1993). For example, misleading journalism can lead patients and doctors to stop

taking and prescribing helpful drugs (Dentzer, 2009). Conversely, a 1988 study indicated that subjects who took aspirin had half the number of heart attacks; however, because of methodological limitations, it was concluded that aspirin should *not* be taken as a preventative measure (at least at that point in the research). News stories that incorrectly summarized the results caused aspirin companies to base entire ad campaigns on this unsupported premise (Molitor, 1993), suggesting daily aspirin intake. This was not only a case of people being persuaded to take a potentially-useless drug. The Mayo Clinic states that a daily dose of aspirin can be dangerous for individuals with stomach ulcers or clotting disorders, and can cause hemorrhagic strokes, hearing loss, and severe allergic reactions (Mayo Clinic, 2012).

Because of the importance but widespread lack of science literacy in the U.S., the state of science journalism has come under fire. Klaidman, of the Institute for Health Policy Analysis, describes the majority of mainstream science journalism as ranking from poor to merely fair (1990). Criticisms regarding the credibility of sources (Dunwoody & Ryan, 1987), lack of contact between reporters and sources (Hanson & Wearden, 2004) sensationalism (Kolata, 1999), lack of transparency (Rowe & Alexander, 2010), and news media's lack of reflection of current research (Chew, Mandelbaum-Schmid, & Gao, 2006) have all been aimed at science journalism. It must be noted that health and science journalism are challenging fields. The rapidly-changing face of research, complexity of scientific principles and vocabulary, and the controversy inherent in many discoveries all serve as barriers to concise yet effective communication (McBride, et al, 2007; Radford, 2007). Furthermore, scientists and journalists prioritize information so differently as to foster miscommunication, negligence of relevant issues, and even contentious relationships between the two professions (Crisp, 1986; Fjæstad, 2007; Reed and Walker, 2002). Reed and Walker (2002) interviewed scientists and science

journalists and reported on some of the points of conflict: scientists accused the media of fabricating conflict, reporting risk factors inaccurately, and refusing to allow scientists to do damage control when sensationalized stories “played with emotions” of their audiences. On the other hand, science journalists accused scientists of possessing “really bad talent.” A survey of journalists revealed the top complaint made by journalists about scientists: “so intellectual and immersed in their own jargon that they can’t communicate with journalists or the public.” (Hartz & Chappell, 1997, p. 31) Journalists also mentioned that scientists frequently fail to mention the relevance of their research to the average audience member (Hartz & Chappell, 1997).

Science Literacy, Science Journalism and Science Communication

There already exists a solid foundation of literature regarding scientific literacy and scientific journalism. Previous scholars and journalists have commented on the challenges that science journalism faces, including inappropriate sources (Dunwoody & Ryan, 1987), gaps in research coverage (Chew, Mandelbaum-Schmid, & Gao, 2006), and a lack of numerical literacy among reporters (Maier, 2003a, 2003b). However, there is a lack of research on the actual content of such news articles, other than which topics are most frequently covered (Kaiser Family Foundation, 2009). One could infer from the previously-mentioned shortcomings of science journalism that the accuracy of science news stories might be negatively affected; however, little research exists that examine what Allan (2009) refers to as “inaccuracies in ostensibly objective facts” (p. 281). The few studies that do focus on accuracy indicate that errors include unrealistic representation of risk, inaccurate statistical reporting, and misrepresentation and errors in citing sources (Burke, Olsen, Pinsky, Reynolds, & Press, 2001; Hanson & Wearden, 2004; Maier, 2003a).

A similarly understudied topic is the role of new media in the reinterpretation and dissemination of scientific journalism. It is important to note that scientific journalism— which has traditionally been conceptualized as professional reporting— is no longer the only source of scientific communication that audiences rely on for valuable information. The internet has allowed an independent, alternative form of science communication led by “the bloggers and YouTubers of ‘the iPod generation’” (Allan, 2009, p. 282). Because the internet allows anyone to create and disseminate content, it allows for not only diverse vocalizations of information and opinions, but also creates new gratifications of information sharing (Nardi, Schiano, Gumbrecht, & Swartz, 2004; Huang, Shen, Lin & Chang, 2007; Swanke, Zeman, & Doktor, 2009; In addition, the “anything goes” nature of new media creates new challenges for audiences and creators alike, such as assessing credibility (Johnson & Kaye, 2004) and ethical blogging practices (Perlmutter & Schoen, 2007).

It is important to discuss the difference between science journalism and science communication. While science journalism has traditionally been discussed in the context of professional newspaper, magazine, and television reporting, science communication is described as “the process by which the culture and knowledge of science are absorbed into the culture of the wider community” (Bryant, 2002; as cited in Burns, O’Connor, & Stocklmeyer, 2003) and includes a much more extensive set of media than only journalism. Therefore, science communication includes, but is not limited to, science journalism. The above-cited studies document the important issues and challenges that science journalism faces; In these studies, the sources of scientific information that have traditionally been examined are limited to print and television news. New media are increasingly prominent sources of news and health information— 8 out of 10 internet users get their health information online (Fox, 2011)— but the

pitfalls are clearly present as well, with 3% of U.S. adults attesting that they or someone they knew had been harmed by following advice found online (Fox, 2012). Ten percent stated that they felt frightened by the information they found online (Fox, 2012). As the benefits and risks of online health information become evermore pronounced, it may be an opportune time to examine the challenges that science communication beyond journalism faces — such as industry reports, legal communication, and non-journalist internet writing.

Focus on News Media vs Alternative Sources of Information

It is necessary to specify that this study uses the term “news media” to refer to general, mainstream, broad-topic news publications and broadcasts (both online and traditional). Publications such as *Wired* and *Popular Science*, specialized news programs such as *Nova*, and blogs and websites run by science professionals will not be included in this research’s conceptualization of science journalism. The editorial structures and assumed knowledge levels of general news media and science news media are different— not all newspapers or television stations (especially local) have a science or health section, much less a designated science journalist on staff; and a casual internet browsing session reveals that many casual bloggers do not have scientific, medical, or technological backgrounds. In addition, specialized news media tend to have a lower audience reach than general news media; compare *Wired*’s monthly circulation of 800,000 with *USA Today*’s daily circulation of 1.8 million (Conde Nast, 2011; Vega, 2011). This is of course not to assume that specialized news media do not contain inaccuracies or other journalistic weaknesses, but the scope of this paper will be limited to content with a more generalized, lay audience.

Purpose of this Study

Because of the changing modern media landscape and the relative lack of examination that has been given to blogs as a form of science communication, this study will provide a preliminary examination of the content of science communication in a new media context. Specifically, it will examine the coverage of the autism/vaccine controversy by parenting blogs. The coverage of the autism/vaccine controversy provides a highly visible example of a scientific issue that has received a great deal of attention from both scientific and lay communities, while parenting blogs provide an example of the ways in which blog media are used by a niche group. This research proposes the following questions: What are the author demographics of bloggers who discuss the autism/vaccine controversy? What stances on the autism/vaccine controversy do bloggers take? What kind of evidence do these bloggers use to support their stances and opinions? Answering these questions will provide a more established framework for further examination of discussion of the autism/vaccine controversy in the parenting blogosphere.

Chapter Two will provide background on the autism/vaccine controversy and discuss the importance of science journalism, current science journalism pitfalls, and suggestions for improvement. In addition, the chapter will discuss the importance of blogging to information dissemination among special interest populations; in this case, parents and parents of children with autism-spectrum disorders. This research is guided primarily by previous research on the issues that have been discovered in health journalism processes, as well as existing guidelines that health journalists, scientists, and health communication scholars have put forth for adequate news discussion. In addition, this research will be guided by the elaboration likelihood model (ELM) (Petty & Cacioppo, 1986), exemplification effects (Zillman, 2006), and framing theory (Scheufele, 1999). This research seeks to address whether parenting blogs are prone to the same

pitfalls and/or whether they adhere to journalistic standards, and to what degree, guided by the following questions:

RQ1a: What descriptive information regarding author information (career, parenthood, stance on vaccines, stance on autism/vaccine link), blog type, and blog content can be observed?

RQ1b: What type of sources and anecdotes are most frequently cited or referenced?

RQ2: What, if any, relationship exists between the author's stance on the vaccine/autism link and the number of statements appearing in the blog post that support or deny the vaccine/autism link?

RQ3: What, if any, relationship exists between author opinions on the autism/vaccine link and the sources/anecdotes they include?

The study will also address the following hypotheses, guided by ELM and exemplification effects:

H1a: Personal autism-centric blogs will contain a higher ratio of pro-autism/vaccine (A/V) statements to anti-A/V statements than will non-autism-centric blogs.

H1b: A higher proportion of autism-centric blogs will be framed as pro-A/V than will non-autism-centric blogs.

Chapter Three will present the method used to analyze a sample of 122 blog posts — a content analysis coding scheme used to describe author demographics, author stance on the autism/vaccine controversy, and the qualities of the evidence used to support the author's claims. The blogs were examined for statement citation, correctness and expertise of citations, and presence of anecdotal evidence, as well as which opinions (pro- or anti-autism/vaccine link) were supported. Chapters Four, and Five will discuss the results, discussion and conclusions, respectively.

Chapter Two

Background and Conceptualization

This chapter will provide an overview of the scientific and social origins of the autism/vaccine controversy, including its impact on health and the role of news media in propagating the controversy. This chapter will also elaborate upon the role and importance of accurate health communication, the increasing role of online media in health communication, and the emergence of blogging as a method of information seeking and sharing, as well as discussing the theoretical framework of the elaboration likelihood model (ELM), framing theory, and exemplification effects. Finally, it will describe the prevalence and gratifications of parenting blogs (“mommy blogs”) as a way for mothers to discuss their children’s health, especially for niche groups such as mothers of children with autism spectrum disorders.

Vaccines and Autism

In 1998, the British medical journal *The Lancet* published a study with dramatic and alarming results. Dr. Andrew Wakefield, a British surgeon and medical researcher reported that the MMR vaccine—the measles, mumps, and rubella vaccination that most British and American children receive at a very early age— was associated with an autistic-type disorder combined with unspecified gut disorders. (DeWilde, et al., 2001; Wakefield, et al., 1998). Although Wakefield’s study concluded, “We did not prove an association between measles, mumps, and rubella vaccine and the [autistic] syndrome described” (Wakefield, et al., 1998, p. 641), the study did not discount the link altogether and left the question burning: could, in fact, vaccines be responsible for autistic-spectrum disorders in children?

Panic swept the United Kingdom and United States. Parents began questioning whether their routine childhood vaccinations were doing more harm than good, and many elected to

protect their children from autism rather than measles. In London, the 92% vaccination rate fell to 50% and in 2006 and 2007 parts of the United Kingdom saw more cases of childhood measles than in the previous 10 years combined (Batty, 2009; Specter, 2009).

However, it came to light almost immediately that Wakefield's study was severely flawed. It contained methodological failings, such as a sample size of only twelve subjects (Wakefield, et al., 1998) and an illogically short time span between exposure to the vaccine and development of behavioral symptoms (6.3 days) (DeWilde, et al, 2001). (That is, the involved children were reported to have first displayed autistic-type symptoms a mere 6.3 days after receiving the vaccine.) However, the flaws were not only methodological. In 2004, an investigative piece by Sunday Times reporter Brian Deer revealed that the *Lancet* had labeled the study as “fatally flawed,” and revealed an unreported conflict of interest— Wakefield had accepted £55,000 from the families of the affected children to “prove” that there was a scientific link between vaccines and autism. None of his coauthors had been informed of this incentive (Deer, 2004). The study was so harshly criticized that ten of the thirteen authors withdrew any association they had with the research (Specter, 2009).

However, it took almost another decade for the study to be completely discredited. In 2010, twelve years after the study was released, Wakefield himself was disbarred from practicing medicine in the UK after being declared guilty of “serious professional misconduct,” “repeatedly breach[ing] fundamental principles of research medicine,” and acting “contrary to the clinical interests” of 9 of the 12 participating children (General Medical Council, 2010). The study was finally and completely retracted by the *Lancet* following the General Medical Council's investigation. In 2011, an editorial in the *British Medical Journal* declared Wakefield's study an

“elaborate fraud,” revealing that the authors of the study had essentially been funded by commercial investors who would have profited from a vaccine scare (Deer, 2011).

Because of the concern that Wakefield’s study spurred, despite its documented flaws, other researchers and agencies set out to determine whether Wakefield’s findings had any basis in truth. True to the scientific process, multiple studies were conducted in an effort to determine whether Wakefield’s results were replicable. Currently, there exists no clearly demonstrated link between vaccines and autism. The Center for Disease Control cites nine studies that either refute or fail to support a link (CDC, 2010), and as recently as 2011, the Institute of Medicine released findings that rejected a relationship between autism and the MMR vaccine (IOM, 2011). Additional studies have been presented in *Pediatrics* (Fombonne & Chakrabarti, 2001; Price, et al., 2010) and other sources (Demichelli, Jefferson, Rivetti, & Price, 2004; DeStefano, 2007; Gerber & Offit, 2009; Honda, Shimizu, & Rutter, 2005), all of which conclude that there is no observable link between the MMR vaccine and autism. A review of autism/vaccine literature by *Pediatrics* identified several studies that supported a link, but found their methodologies to be “of poor quality.” (Parker, Schwartz, Todd, & Pickering, 2004). The National Institute of Health similarly maintains that “no vaccine or component of any vaccine is responsible for the number of children who are currently being diagnosed with autism” (2010).

The National Institute of Health (2010) currently believes that autism may be in part influenced by mercury poisoning. Because mercury is present in small amounts in the vaccine preservative thimerosal (CDC, 2010), parents expressed concern that thimerosal was tied to autism (CDC, 2010), despite Wakefield’s original study not mentioning thimerosal. However, a 2010 study by the CDC concluded that prenatal or infant exposure to the mercury compounds was not linked to the development of autism spectrum disorders (2010); in addition, the mercury-

containing preservatives were all but discontinued in 2002 and are only found in some flu vaccines (CDC, 2010). Despite the corpus of studies asserting that the MMR vaccine is safe, parents remained concerned: one study estimated that 25% of U.S. parents still believe that some vaccines can cause autism (Freed, Clark, Butchart, Singer, & Davis, 2010), and parents continue to refuse vaccines for their children based on these concerns (Omer, et al., 2009).

Impact of the Vaccine-Autism Controversy

The autism-vaccine controversy is an example of a story that “grew legs” and ran far beyond what might be expected. Why, when so many more recent studies have refuted it, does Wakefield’s study continue to have such an impact on parents? There is evidence that popular media celebrity anti-vaccine endorsers have helped encourage skepticism about vaccine safety (Mooney, 2009). Charlie Sheen, Jim Carrey, Jenny McCarthy, and other celebrities have rallied against vaccinations; in 2005 journalist David Kirby’s book *Evidence of Harm* presented a seemingly well-reasoned case against vaccines (Mooney, 2009; Schulman, 2005).

Vaccine supporters also have the backing of celebrity spokespeople, including actress Amanda Peet (Lafsky, 2008), former first lady Rosalynn Carter (founder of immunization campaign Every Child By Two) (Szabo, 2009), and Bill Gates (Goodin, 2011). However, the messages of anti-vaccine celebrities are overwhelmingly powerful: a recent poll of 1017 American adults revealed that over half were familiar with Jenny McCarthy’s anti-vaccine message, and 23% of the surveyed adults reported that her campaign made them question vaccine safety (Szabo, 2009). Pediatrician and vaccine advocate Paul Offit stated, “It’s not hard to scare people... but it’s extremely difficult to unscare them.” (Mooney, 2009). Vaccine expert Stephen Cochi also suggested that the polarization of the issue may result in strengthening the

resolve of anti-vaccine parents, warning against labeling such individuals as “scientifically illiterate.”

While the medical community has largely discounted the link, a concerned public still finds voice in the media to voice its fears about the presence of mercury preservatives in vaccines and the perceived associated risks (Mercola, 2012; Mitchell, 2012; Mustich, 2012). However, covering the risks in mainstream news media has been deemed potentially problematic due to the fear of anti-vaccine sentiment (Nield, 2008; Schulman, 2005). Whether or not vaccines increase the risk of autism, mercury poisoning, or any other negative effects, it is widely acknowledged that vaccines themselves have been hugely influential in controlling and preventing severe disease outbreaks (CDC, 1999; Clements & Griffiths, 2002; POST, 2004) and even the eradication of certain diseases, such as smallpox and polio (CDC, 2011; WHO, 2001). It is estimated, for example, that vaccines are responsible for saving over a million lives a year (Mooney & Kirshenbaum, 2009). Today, the United States’ largest outbreak of measles in 15 years was attributed in part to the large number of unvaccinated children (CDC, 2012; Reinberg, 2011).

Role of News Media

While this controversy carries with it many overlapping influences (news media, celebrity culture, credibility of the medical community, etc), it is important to understand the role of popular and news media (both on and offline) in fueling uncertainty and skepticism. As this chapter will discuss, the news media are a prevailing source of health and risk information for most adults. However, they are also prone to a host of perils that jeopardize the effectiveness, credibility, and safety of health journalism. While the pitfalls of traditional health journalism have been documented (including misleading risk assessment, out-of-date reporting,

sensationalism, and overreliance on anecdotal evidence), the advent of online news, blogging, and niche reporting have introduced an assortment of communicators that are no longer limited to traditional journalists. There are now news websites that provide health information from a diverse range of individuals with various levels of training and experience: news sites that focus on solely medical information, blogs written by doctors and scientists, and articles written by individuals with no medical or journalistic training. Not only is the level of experience diverse, but so are the gratifications: some websites exist purely for factual dissemination, while others provide a forum for the author to voice their opinion and allow others to chime in as well.

Because of the changing nature of health communication, it is now relevant to examine these new alternative news sources—many of which do not do their own investigation, but reprinting and compiling existing information—to determine whether they fall prey to the same difficulties as traditional health and science journalism— or if they come with a unique set of issues.

The Case for Health and Science Journalism

Health and science journalism and communication are vitally important components of the media and scientific knowledge. Most grade school curricula include chemistry, biology, health, and other sciences; however, science educators (Elliot, 2006), health and social experts (Grilli, Freemantle, Minozzi, Domenighetti, & Finer, 2000), and government researchers (NSF, 2002) agree that once formal education ceases, the media serve as most adults' primary source of scientific knowledge. Elliott, a professor of science education, makes the case that socio-scientific newspaper stories can improve audiences' ability to connect scientific theory with everyday practice (2006). In a society that continues to suffer from scientific illiteracy, bridging the gap between scientific knowledge and everyday awareness is vital. Because most adults are exposed to news media and obtain their scientific knowledge in this manner, it is reasonable to

assume that most science journalism is understandable to the average viewer. Therefore, science journalism brings health and science principles to the lay audience through a ubiquitous, accessible, intelligible, and perhaps even entertaining medium.

Aside from augmenting knowledge beyond the school years, science journalism is vitally important for maintaining awareness of current events, research, and technological development (Burkett, 1973). Burkett emphasizes that “the science writer touches material of great social, political, and economic importance” (p. 3). The science industry is massive, spanning health care, pharmaceuticals, space exploration, environmental preservation, resource management, and military technology. The health care profession alone provided 14.3 million jobs in the United States (Bureau of Labor Statistics, 2010); the “professional, scientific and technical services” industry garnered over \$1.2 trillion in 2009 (US Census, 2010). Perhaps most importantly, however (at least to the audience), health and science journalism can have a profound impact on personal health decisions.

Audience Reception of Science News

Southwell and Torres (2006) demonstrated a correlation between science television news exposure and perceived ability to understand science; that is, people who consume a great deal of science media feel that they have a good understanding of science. In addition, these people initiate or engage in more conversations about science. Similarly, Hodgetts and Chamberlain (2003) and Quick (2009) discovered that media images have an effect on audience perceptions of doctors. Perhaps more importantly, public attitudes about doctors are varied and often conflicting, possibly due to the variety of often-polarizing media attention that doctors attract (for example, amazing medical breakthroughs versus cases of malpractice).

Hodgetts and Chamberlain (2003) and Southwell and Torres (2006) demonstrate the applicability of cultivation theory to science media. Cultivation theory states that audiences view media images as representations of reality (Eisend and Möller, 2003). Certain aspects of real life are over/underrepresented in media, exaggerated, vilified, or glorified by media in such a way that audiences come to expect the same, or nearly the same experience from real life. Eisend and Möller (2003) address the issue of accuracy— while media can certainly serve as an effective educational tool, media images are often of questionable accuracy. In addition, these effects are magnified when the viewer has no other alternative source of information (Rubin, 1986). Varied media accounts may result in a macrosocial sense of conflict regarding attitudes toward science.

While broader science journalism has educational value, it may not be relevant or interesting to all audiences. Health journalism, however, has a unique relevance and a great deal of sway. Voelker (1998) points out that while stories about space exploration and technology may be interesting, they do not generally have the same significance to audiences as stories about nutrition and health care. This is unsurprising— the name and vital statistics of a newly-discovered planet have far less personal resonance than a story about cancer prevention, and is less likely to have an impact on an individual's behavior. While Americans trust their physicians more than other sources of information, they are most often exposed to health information via the media (Chew, Mandelbaum-Schmid, & Gao, 2006; Gallup Organization, 2002). It is important to note that a 2004 study found that 55%-79% of physicians saw value in using the internet during the course of their practice, the majority of their medical information came from medical journals, professional colleagues, and the American Academy of Family Physicians website (Chew, Grant, & Tote, 2004). While physicians used internet-mediated sources, their sources

were more professionally-oriented (i.e., intended for health care professionals) than the sources that laypeople use.

News sources are instrumental in informing audiences of developing health research, health risks and how to avoid them, and positive breakthroughs in healthcare. Casual news audiences are not the only ones who benefit from health journalism; policy makers, physicians, and even other researchers use the news media as a source of information (Chew, Mandelbaum-Schmid, & Gao, 2006). In addition to breaking news, newspapers, magazines, and television often publish or show short interest pieces about, for example, how to reduce one's risk of diabetes or how to keep up with routine health checks.

Not only can health journalism provide immediate and primary information, it also prompts action and discussion in its audiences. Physicians often meet with patients who have questions about a newspaper article they read, or who are concerned about the latest flu scare covered by CNN (Voelker, 1998). Health officials attest that stories about health and nutrition “really can affect people's behavior” (Voelker, 1998, p. 417), whether they are galvanized into eating less fat or scheduling routine mammograms. Similarly, a recent study indicated that smokers who read news stories about people who quit smoking successfully subsequently declared a greater intention to stop smoking themselves (as opposed to smokers who read news stories that did not feature a successful cessation narrative) (Kim, Bigman, Leader, Lerman, & Cappella, 2012).

What is Good Journalism?

As the importance of science and health journalism has been frequently discussed, various authors and agencies ranging from professional health journalists (Kolata, 1999; Schwitzer, 2004) to scholars of science journalism (Dunwoody, 1988, 2005) to the National

Cancer Institute (1998) have formulated guidelines and suggestions for well-balanced, accurate news stories. Many of the independently-written guidelines share crucial aspects with one another, but most offer unique perspectives as well.

The National Cancer Institute (1998) a comprehensive list of health journalism guidelines that is not only directed at reporters, but editors and scientists as well. These guidelines do not place miscommunication blame on a single party but instead recognize the complex dynamic between science, research, and media professionals. The NCI recommends that good research and journalism enhances public understanding of health and avoids inappropriate characterization of food, drugs, and other technologies as broadly good or bad. The guidelines are very focused on fair representation, and the NCI cautions against “highlighting selective findings which, on their own, might present a misleading picture” (p. 195). More recently, the NCI composed a tip sheet for reporters that includes hints on how to report on study caveats, such as preliminary research or lab-only studies. The tip sheet also includes a list of questions that a reporter should be able to answer in the article; for example, how are different experimental groups treated? What is the absolute risk, rather than the relative risk? (Woloshin, Schwartz, & Kramer, 2009)

While larger news associations, such as the Association of Newspaper Editors, have journalist guidelines in place, health journalists believed that these codes did not adequately address the unique issues that health journalists face. Schwitzer (2004), on behalf of the Association of Health Care Journalists, composed a statement of principles for health care journalists. The statement summarize the goals and objectives of AH CJ, which include but are not limited to “educating journalists about medicine and health care, public policy, medical

research and practice, consumer health issues, public health, health law and ethics,” (p. W9) and “rewarding excellence in medical and health care journalism” (p. W9).

The statement of principles for AHCJ includes but is not limited to the following (Schwitzer, 2004): careful selection of sources and disclosure of their personal or professional interests; being aware of nuance and reflecting multiple sides of a story; understanding the medical research process; reducing reliance on stock news sources and fostering journalistic independence; and being vigilant that the finished story does not misrepresent through simplification or omission. While the entirety of the statement of principles is long and comprehensive, AHCJ has only 750 members. If every health journalist hypothetically belonged to AHCJ and followed these guidelines, there would be little reason for concern; however, most papers (especially smaller local papers) have no designated health or science journalist. Therefore, the AHCJ guidelines may not be reaching as wide an audience as might be ideal.

Challenges of Health Journalism

Despite the existing guidelines for successful science journalists, health journalism still remains problematic. Scientific concepts and relationships are complex; their interaction with society and policy even more so. Effectively reporting research goes beyond reporting the facts; it includes covering controversy, careful use of language and framing, and pointing out possible weaknesses of existing research. Southwell and Torres (2006) indicated a positive relationship between health news consumption and perceived knowledge of science; however, the study did not address the accuracy of said news content. If audiences are consuming inaccurate news media, they still subsequently believe that they have a better understanding of science than people who do not consume science news. This points to science news’ ability to self-propagate with potentially positive or negative effects. The most common shortcomings of science

journalism tend primarily towards inadequately or simplistically presented information; or are a function of the journalist simply not having enough information to write a well-balanced story.

The repercussions of inaccurate reporting can range from socially inconvenient to personally detrimental. Chew, Mandelbaum-Schmid, and Gao (2006) conceptualized the phenomenon known as the “state of the science gap,” or the discrepancy between health recommendations presented in mainstream media and what is actually recommended by organizations such as the National Institute of Health. This research found that mammography guidelines presented in most mainstream news was inconsistent with and even contradictory to the NIH recommendations. Following the media guidelines for breast cancer screening among women aged 40 did not necessarily aid in early detection, and overuse of mammograms (as would result from following media guidelines) could even result in increased cancer risk.

In other cases, crucial details of the emerging study may be omitted. For example, preliminary research suggested that aspirin could be used to prevent heart attacks, and news sources quickly hailed aspirin as a miracle drug. However, much of the coverage neglected to mention that the preventative powers of aspirin should only be used by certain individuals with specific health conditions. While a daily dose of aspirin may save some lives, it is actually severely detrimental to other populations— a fact that most news reports failed to mention (Molitor, 1993). The inaccurate mammography guidelines and omissive aspirin reports go far beyond misinforming and miseducating the public— they have direct and potentially serious influence on the health behaviors of their audiences.

The credibility of science journalism has come under fire from many directions. A study by Moynihan, et al. (2002) revealed that of 207 newspaper stories on medication effects, 50% cited at least one expert with a financial tie to the drug manufacturer. Dunwoody and Ryan

(1987) suggest that sources are not always well matched to the topic of the article; in fact, as many as one in three “experts” are not qualified to speak to the topic at hand. Especially in the case of controversial topics, some qualified experts will hesitate to comment on the issue; therefore, the only authority willing to comment may in fact not be the most credible source. For example, in a study of marijuana-related news articles, “the primary sources were not the scientists engaged in [marijuana] research but were instead scientific bureaucrats” (Dunwoody & Ryan, 1987, p. 22). One issue may be the journalists’ ability to find both willing and credible sources. Larsson, Oxman, Carling, and Herrin (2003) discovered that many health journalists expressed not having enough time to find reliable sources, and the experts they could find were impractical to communicate (one journalist said that his expert only wanted to communicate through fax) or were afraid of bad press. Another obstacle was finding independent researchers who were not afraid of jeopardizing their prospects or those of their investors.

In addition to standard issues of credibility, certain cultural groups tend to face scientific research with more skepticism than others. For example, as a result of historically unethical treatment by the medical community, African Americans tend to be less inclined to participate in clinical studies and have higher levels of distrust of the scientific community than other populations (Freimuth, et al., 2001). While these cultural concerns go much deeper than poor journalism and should be addressed by scientific authorities, it is important to address concerns of credibility where they arise to prevent practices that reinforce distrust. Skepticism may be healthy, but systematically rejecting research without analysis or discretion is far from ideal.

One of the most basic, yet most onerous challenges facing science journalists is translating technical medical and science jargon into layman terms without losing significant meaning, according to Stephen Klaidman of the Institute for Health Policy Analysis (1990).

Journalists and scientists have different goals for information; the news media prioritize novelty, entertainment value, and accuracy, respectively (Fjæstad, 2007). Scientists prioritize entertainment appeal last. It is therefore the task of the journalist to make research reports palatable to lay audiences. Radford (2007) addresses the importance of punchy, bright language to news reporting; there are no conveniently pithy synonyms for terms such as *photoreceptors* or *chameleon circuits*. Therefore, it may be difficult for news reporters to present a story that both holds the reader's attention and conveys the necessary details.

The Appeal of the Anecdote

Perhaps as a result of the need to keep news content engaging for readers, health and science news can also fall prey to sensationalism and the “tyranny of the anecdote” (Kolata, 1999), which refers to the credibility that personal anecdotes seem to hold over researcher findings. This phenomenon occurs when preliminary research “grows legs” and causes more speculation than formal inquiry. While it is important to appeal to both the logic and emotion of news audiences, stories may use inappropriately colorful language. The National Cancer Institute, for example, advises against using terms such as “scientific breakthrough” or “medical miracle” (1998). Labels such as these not only paint scientific research with a sensational yet vague brush, they also increase audiences' expectations of and faith in the research. For example, the aforementioned research on aspirin used phrases such as “dramatic,” “broad implications,” and “lifesaving effects” (Molitor, 1993). This language, in part, contributed to audiences' blind faith in the incontestable power of aspirin. Similarly, Mann (1995) and Kolata describe the role of the tyranny of the anecdote in terms of breast implants. Preliminary research indicated that breast implants could be linked to adverse conditions such as sarcoma; while the research was inconclusive, doctors, lawyers, and patients alike anecdotally confirmed the findings. News

articles about vaccines and autism frequently quote parents who assert that their vaccinated children later developed autism, and those whose unvaccinated children were seldom ill with even a cold (Specter, 2009).

Similarly, Zillman (2006) discusses exemplification effects, which encompass the formation of beliefs based on both direct and vicarious witnessing. These beliefs often “come to represent, impartially or in distorted ways, the whole of the respective phenomena and issues” (p. S221). Exemplification effects are particularly pronounced when the phenomena in question is in relation to a perceived threat to oneself or others. While it may be in the interest of balanced and engaging journalism to include layperson concerns and opinions, it is important to report such real-life stories extremely vigilantly so as to avoid outweighing professional opinions with anecdotal assertions.

It is dangerous for news articles to rely too heavily on anecdotal evidence; however, health journalists face a dilemma when a story with few cogent results also indicates great public risk. Dunwoody (2005), a science communication researcher, proposes a solution to this dilemma in the form of weight-of-evidence reporting. Dunwoody suggests that “if you cannot tell what’s true, then at least capture truth claims accurately. Objective journalism effectively reproduces the views of its sources” (p. 90). That is, if a journalist does not know if a claim is true, they should present the assertion of the research as accurately as possible. If a research result is highly suggestive yet inconclusive, that result should be reported as such rather than reported as a truth. According to Dunwoody, all viewpoints should be represented in order to establish balance and to avoid making assertive claims that may in fact be inaccurate.

Finally, it is important for journalists to recognize that science journalism is not as straightforward as simply reporting facts. McBride, et al. (2007), demonstrate that with some

kinds of research comes a host of ethical implications. For example, the discovery of the “gay gene”, which not only garners objective reporting of the research, but acknowledgement or coverage of the resulting controversy as well. Research on sexuality, reproductive rights, mental illness, and drug research pose very contentious ethical issues. Inappropriate reporting might increase stigma of these issues or increased polarization. However, skillful reporting can have positive effects— in the case of the “gay gene”, LGBT activists were glad to have scientific evidence that being gay is not a choice, but biological.

Blogging, Mommy Blogs & Advocacy, and Concerned Parents

For audiences of traditional news, media consumption can take place in a relatively isolated environment. Audiences of the same news stories can discuss what they have read or seen with one another, but not through the same medium through which the original story was presented. With the advent of social media and blogging, however, web users can compile archives of news and musings relevant to a more narrow topic, share their thoughts with other interested web users, and engage in discussion about reposted news articles. Blogging has seen an explosion of popularity in recent years: in 2009 there were an estimated 12-26 million bloggers in America, with 57-94 million readers (Miller & Pole, 2010).

Blogs are particularly conducive to the expression of personal thoughts, feelings, habits, and opinions, often in relation to world and news events. Nardi, Schiano, Gumbrecht, and Swartz (2004) observe, “Blogs combine the immediacy of up-to-the-minute posts, latest first, with a strong sense of the author’s personality, passions, and point of view” (p. 42). Another important attribute of blogs as a form of social discourse is the ability of readers to provide direct feedback to the blog author and to one another. The more popular personal uses of blogs have been documented to include providing commentary, functioning as a diary or journal, catharsis, and

providing a forum for community discussion (Nardi, Schiano, Gumbrecht, & Swartz, 2004). Indeed, blogs can be a very profound form of self-expression, as observed by Nardi, Schiano, Gumbrecht, and Swartz, “Part of the allure of blogs is the easy way they move between the personal and the profound” (p. 46).

Huang, Shen, Lin, and Chang (2007) surveyed 311 independent bloggers and added one more crucial blog motivation to the more emotional gratifications described by Nardi, Schiano, Gumbrecht, and Swartz: information searching. Despite the fact that many blogs take on a more intimate tone, even personal blogs are often used to discuss news and topical issues. Their highly specific content and audience demographic therefore makes blogs a highly powerful tool for advocacy and charged discourse.

In the past, blogging has been a way for stories ignored by mainstream media to surface (Johnson & Kaye, 2004), allowing varied and minority voices to be heard. Because of its connective nature and virtual community, blogging is an important gateway to the outside world for individuals with limited social or physical mobility. Disability blogging has therefore become a particularly salient advocacy tool, in this case, for individuals with autism and their families.

Bloggers and Journalistic Standards

As blogs quickly rise to supplement traditional news sources, issues of journalism standards and blogging become evermore relevant. Some have expressed concern that bloggers are not held to the same professional standards that journalists are (Gunter, Campbell, Touri, & Gibson, 2009). Besides some legal debate revolving around the protection of bloggers under shield laws (Bauer, 2009; Rosen & Hirce, 2011; Wischnowski, 2011), there does not appear to exist any standardized or accepted practice of bloggers.

One oft-discussed issue regarding blogs as news sources is that of credibility. In some cases, such as with breaking news and story ideas, journalists regard blogs to be credible sources and use them as information sources (Johnson & Kaye, 2004). In the early days of internet credibility studies, it was suggested that the internet should be viewed as less credible due to its anonymity, freedom, and lack of editorial supervision and social pressures to keep content correct. In addition, the internet is host to numerous parody and rumor sites, which are often professionally designed and may be hard to distinguish from valid information sources (so said critics) (Johnson & Kaye, 2004).

Johnson and Kaye (2004) performed a study in which 74% of respondents viewed blogs as “moderately to very credible” (p. 630); however, 50% of respondents assessed blogs to be “somewhat” or “not very accurate” and 62% said that blogs are “somewhat” or “not very fair”. If these numbers seem bleak, blogs were still rated as more credible than any other online source of information (online news, TV, and radio), and significantly more credible than any traditional media. It is important to note that “people tend to trust the news media they opt to use or use most often” (Gunter, Campbell, Touri, & Gibson, 2009, p. 197), so as blogs increase in popularity as a source of information, their credibility may increase as well. Gunter (2006) suggested that offline news sources that migrate online (for example, the blog of the *New York Times*) may hold greater credibility than other online news sources.

Currently, little information exists regarding blogs as a source of health information. Miller and Pole (2010) conducted a survey of 951 health blogs and bloggers and examined blogger demographics, topics, and perspectives. They found that half of the bloggers were employed in a health-related field, although two-thirds of the bloggers held a master’s degree or doctorate. The bloggers who were not employed as health professionals assumed a

patient/consumer stance, while a small portion wrote from the caretaker perspective. Miller and Pole reported that half of the blogs in their sample addressed particular health conditions, which in turn were written primarily by bloggers from a patient-consumer or caregiver perspective. Miller and Pole suggested that this connection may indicate “that health blogs are being used, in part, to forge support networks among bloggers and their readers.” (p. 1516) A recent Pew study found that 34% of internet users have read about health information on an online news group or blog. (Fox, 2011b).

A 2011 (Gao, Zhang, & Sadri, 2011) study revealed a difference in the number of sources used by newspapers and “health expert blogs” (the inclusion criteria were unclear) when discussing the H1N1 epidemic. Newspapers used significantly more sources than blogs, and cited health agencies, non-health government agencies, and scientific research more often than blogs did. Conversely, blogs cited mass media more often than newspapers did (it was unclear whether the mean comparisons were controlled for length of the blog/news article). A study by Hu and Sundar (2010) revealed no significant difference in the credibility of layman vs. professional sources in health blogs; however, respondents reported greater behavioral intentions when receiving information from a website (type unspecified) than from a blog. In addition, a combination of selecting source (website/blog/other) and original source (layperson vs doctor) had no significant effect on either perceived credibility or behavioral intention.

Prevalence and Gratifications of Mommy Blogs

While blogs clearly embody a vast range of incarnations, the genre that this thesis will focus on is “mommy blogging,” blogs written by mothers who write about their children and the construct of motherhood (Lopez, 2009). This analysis expands “mommy blogging” into parent-blogging. Many mommy blogs are personal blogs written by an individual in a narrative sense

(Lopez, 2009), in contrast to “filter blogs”: article-based blogs that collect and redistribute topical news (Herring, et al., 2004). It was deemed relevant to examine parenting blogs in their many forms, due to the journalism-like functions that bloggers can fulfill. However, the specific constructs and gratifications that surround the mommy-blog genre are still important to explore.

One mommy blogger compiled a list of the types of mommy blogs she encountered through her writing, including “diary-of-a-mom” (daily journal format), therapy (using the blog to “vent” or build support networks), humor, infomercial/product review, social commentary/change, and research and tips (PhDinParenting, August 13, 2009). It is evident that many of the themes that this blogger encountered can be linked back to the gratifications observed by Nardi, Schiano, Gumbrecht, and Swartz (2004) and Huang, Shen, Lin, and Chang (2007). The themes deemed most relevant to this thesis are connectivity, advocacy, and information-seeking.

One of the major gratifications of blogging in general, but particularly mommy blogging, is connecting with other mothers (Nardi, Schiano, Gumbrecht, & Swartz, 2004; Swanke, Zeman, & Doktor, 2009; Zeman, Swanke, and Doktor, 2011). In 2010, Lowell General Hospital and Boston’s Floating Hospital for children established a mom-run blog through the hospital, providing advice for moms, from moms, and receiving overwhelmingly positive feedback (Howell, 2010). Lowell General’s marketing director was quoted as saying “Moms don’t necessarily want to hear from health experts all the time... They want to talk with people who are going through the journey of raising children with them.” (Howell, 2010, p. 18) The blog posts were not edited for content by hospital officials.

Mommy Blogs and Advocacy

The prevalence of blogs as connective tools for mothers is particularly salient in the case of mothers of children with autism-spectrum disorders (ASD). For these families, the internet is a valuable resource for helping parents connect with one another, offering support, advice, and solidarity. Zeman, Swanke, and Doktor (2011) observe that children with ASD and their families face social challenges and misunderstanding. The authors discovered that the act of blogging allowed mothers to express frustration with their mixed roles of parent, therapist, and advocate (referred to as “role strain”) and to discuss their feelings of isolation. In addition, the bloggers discovered the profound role that the blogging process held in delivering the perception of a much-needed support system, one mother writing, “I’m sorry that you [the readers] understand so well; but I really am thankful that we’ve found each other.” (p. 47)

Blogging can also be used as a template or a journal for change and advocacy; in a previous study, Swanke, Zeman, and Doktor (2009) concluded that blogger mothers of children with autism sought to create an “other world” (p. 208) for their children, and that blogging served as a way for these mothers to articulate the vision they had for their children, as well as ways in which they were attempting to construct a better world. While little research exists on the use of mommy blogs in general as an advocacy platform, blogging has become a popular way for individuals with autism and other disabilities to express their grievances and hopes for the future.

Theoretical Framework and Definitions

This study will use the following frameworks and operationalizations to guide the hypotheses and method. These definitions were composed based on observations during an initial examination of the blog sample and the blogosphere in general.

Frame. According to Scheufele (1999), framing can be conceptualized as a dependent or independent variable, and is used to organize a story or idea. Framing selects elements of the message and brings them to the forefront of the audience's cognition, making these elements more salient than others (Entman, 1993). The frame of the blog post refers to how the blogger constructs the message he or she is attempting to convey. For example, a blogger may frame him- or herself as believing that vaccines are safe; the blog post may contain explicit statements as such ("I am sure that vaccines are not harmful") or more implicit content such as links to articles about research that demonstrates the safety of vaccines. The primary frames that this article will examine include vaccine safety, recommendation of vaccines (or lack thereof), and the bloggers' belief in or rejection of the theory that vaccines are a contributing cause of autism.

Elaboration Likelihood Model. The elaboration likelihood model (ELM) (Petty & Cacioppo, 1986) suggests that some individuals will process a message using biased elaboration, that is, allowing their personal experiences and beliefs to predominately guide how they perceive the media message. Therefore, we might expect that individuals with prior experience with autism (i.e., caring for their autistic children) could exhibit a bias regarding the causes of autism. In addition, a 2006 study of parents of children with autism revealed that 40% of the surveyed parents believed that vaccines were a contributing factor to their childrens' autism (Mercer, Creighton, Holden, & Lewis, 2006). This is in contrast to the estimated 25% of U.S. parents who believe that autism and vaccines are related (Freed, Clark, Butchart, Singer, & Davis, 2010).

Blogs and blog types. While extensive research has been done on the uses and gratification of the blog medium, little current literature exists that categorizes different blog formats. What literature does exist appears to focus on genre (political, personal, etc) rather than *who* is blogging: mothers, companies, journalists, etc. This study categorizes blogs into four

different types (with one subcategory) based on who is writing the blog and what (if any) the blogger's commercial affiliation is.

Personal blog. A personal blog is written by usually one but no more than two contributors and fits the definition of a mommy blog described by Lopez (2009). The personal blog's main purpose (in the context of this study) is to discuss family life and motherhood, ruminate on current events as they pertain to oneself, and to share other topics of interest to the blogger. While personal blogs may be written with an audience in mind, focus on a specific topic, or even feature some level of advertising, they are primarily of a personal and individual nature. This study also discusses **personal autism-centric blogs**, which are primarily focused on discussing the lives of parents of children with autism-spectrum disorders.

Aggregate blog. These blogs do not employ regular bloggers but instead allow submissions from a number of contributors. While many types of blogs allow guest contributions, aggregate blogs are primarily made up of these independent writers and do not have regular features by blog staff.

Independent blog. Independent blogs are run as businesses: they have a staff, feature advertisements, and maintain a regular update schedule with staff bloggers. Often, independent blogs are owned by a larger company; an example would be Jezebel, which is owned by Gawker Media.

Affiliate blog. An affiliate blog is one that is run as a part of a larger organization's website, as opposed to existing for its own sake. For example, many magazines and newspapers incorporate an online blog in addition to their regular features. Affiliate blogs differ from independent blogs in that while independent blogs may be owned by a media conglomerate, they are not owned by a larger media producer such as a TV station or newspaper.

Types of evidence. There are two forms of evidence that can be used to support a claim: **cited evidence** and **anecdotal evidence** (Kolata, 1999). Cited evidence refers back to a claim made by a professional figure or spokesperson; examples in this study include referencing CDC vaccination guidelines, or citing the work of Jenny McCarthy. Anecdotal evidence refers to evidence drawn from everyday or vicarious experience; for example, observing autism-like symptoms in one's child after vaccination, or hearing similar from a friend. Anecdotal evidence can also take place in a professional setting; for example, what an individual observes during his or her career as a pediatrician.

Positions. There are two primary positions that will be examined in this study: **pro-autism/vaccine link (AVL)**, or belief that autism and vaccines are in fact correlated. Pro-A/V bloggers believe that vaccines are a direct or contributing cause of autism. The opposing viewpoint, **anti-autism/vaccine link (AVL)**, is held by individuals who do not believe that autism is caused directly or peripherally by vaccines.

It is important to note that these positions only correspond to opinions on the autism-vaccine controversy. There may be anti-AVL bloggers who believe that vaccines may have other harmful effects. In addition, some bloggers may be evenly conflicted, or have no opinion. However, until demonstrated otherwise this study makes the assumption that the majority of bloggers will fall on one side of the debate or the other.

Hypotheses and Research Questions

This study was driven by the following research questions:

RQ1a: What descriptive information regarding author information (gender, parenthood, profession, stance on vaccines, stance on autism/vaccine link), blog type, and blog content can be observed?

RQ1b: What type of sources and anecdotes are most frequently cited or referenced?

RQ2: What, if any, relationship exists between the author's stance on the vaccine/autism link and the number of statements appearing in the blog post that support or deny the vaccine/autism link?

RQ3: What, if any, relationship exists between author opinions on the autism/vaccine link and the sources/anecdotes they include?

The following hypotheses were also used to guide this study:

H1a: Personal autism-centric blogs will contain a higher ratio of pro-autism/vaccine (A/V) statements to anti-A/V statements than will non-autism-centric blogs.

H1b: A higher proportion of autism-centric blogs will be framed as pro-A/V than will non-autism-centric blogs.

Theoretical framework: As discussed above, the elaboration likelihood model (ELM) (Petty & Cacioppo, 1986) suggests that personal experiences and beliefs may guide how individuals receive and process media messages. Therefore, we might expect that individuals who care for or have personal experience with children with autism will exhibit a bias regarding the causes of autism. This is in conjunction with the aforementioned 40% of parents of children with autism who believed that vaccines were a contributing factor to their children's autism (Mercer, Creighton, Holden, & Lewis, 2006), as opposed to 25% of total U.S. parents who believe that autism and vaccines are related (Freed, Clark, Butchart, Singer, & Davis, 2010).

Chapter Three

Method

This chapter will describe the method used to collect the analysis sample and the code structure used to analyze the sample, including the relationship between the code and precedent literature, and the establishment of intercoder reliability. In addition, the statistical measures used to address the research questions and hypotheses will be described.

While precedent research thoroughly outlines aspects of ideal health journalism, common pitfalls, and why these pitfalls exist, little research exists on health communication in the blog setting. Therefore, the purpose of this study is to quantitatively describe the ways in which the information is presented, not to explain the reasons behind these inaccuracies or the repercussions. If the types of inaccuracies are pinpointed, it may be easier for future journalists to understand the prevalence of flawed science journalism and to address these issues.

It is relevant to note that different readers, especially blog readers, may have different expectations of news content; for example, some may prefer human interest stories while others expect hard data and objectivity. It may be argued that expecting bloggers to adhere to the same rigorous journalistic standards as professional journalists seems excessive, and even antithetical to the spirit of blogging; blogging is inherently a medium that is intended to be employed and enjoyed by a wide audience, regardless of background or training. However, in the case of blogs as science communication, it is important to consider that the information included in even a layperson's blog post may have profound effects on its audience's behavior, due to the combination of the strong social reliance aspect of blogging (Nardi, Schiano, Gumbrecht, & Swartz, 2004; Zeman, Swanke, & Doktor, 2011) and its high perceived credibility (Gunter, Campbell, Touri, & Gibson, 2009; Johnson & Kaye, 2004). Because blogs are used as a source

of advice and information, especially for niche groups, it may be argued that it is important that the information that blogs disseminate be presented as fairly, if not accurately, as possible in order to avoid offering ineffectual or even harmful guidance, particularly if health information is the focus. Therefore, this study approaches its examination of parenting blogs with the assumption that bloggers, like journalists, should strive for fair, accurate, and thorough coverage when reporting on health risks. This study also makes the assumption that the inclusion of anecdotal evidence and personal opinion should be treated with caution, based on Kolata's (1999) assertion that the "tyranny of the anecdote" and sensationalist reporting can interfere with accuracy as well as Zillman's (2006) discussion of exemplification effect and how an incomplete or partial view of a situation (as with personal experience) may come to represent the whole of the situation.

Structure and Sample

A recent survey estimated that North America alone hosts 3.9 million mommy blogs; however, only 500 have "considerable power and reach." (Laird, 2012). Due to the large demographic and relative obscurity of the topic, a combination purposive-snowball sampling approach was used to identify the blogs that were coded, an approach that Miller and Pole (2010) describe as "especially appropriate for studying blogs" (p.1515) when a known population is not available. The process for gathering the blogs and blog posts was as follows: parenting blogs were located through Google searches of "mommy blog," "mom blog," "parenting blog," and "autism parent blog." Google search results were examined for relevance; blogs that appeared beyond the third or fourth page of search results were not included, due to their low probable impact. Additional parenting blogs were located through snowball sampling; for example, Babble.com (2010), which was located through a Google search, provides lists and rankings

(referred to as “blogrolls”) of popular blogs. In addition, many parenting blogs link to or cite other, similar blogs. After the parenting blogs were identified, each blog was examined to determine whether any of its posts or articles discussed the autism/vaccine controversy (many blogs have an internal search feature). Relevant blog posts were identified using the blog’s own search function with keyword searches of “autism vaccine,” “autism vaccines,” and “autism vaccinations” (because many blog search engines do not recognize Boolean operators or the * notation). Blogs were eliminated if they did not have a search function or if they did not return any results for the relevant keyword searches. For blogs specifically about autism, variations on the word “vaccine” were used as keywords. Each blog post listed in the search results was then saved to a PDF file. After saving, the blog posts were screened. Any posts that did not discuss vaccines and/or autism in the context of the vaccine/autism controversy were discarded. For example, some posts included the word “autism” because a link to an autism-related article appeared on the webpage. The post itself was therefore irrelevant to the MMR vaccine/autism discussion. A complete list of the 18 blogs used as well as their readership statistics are listed below in Figure 1.

Figure 1. List of blogs and blog statistics

Blog Title	Year Established	Monthly Pageviews	Pageview Ranking, US	Blog Type	URL	Number of Posts Analyzed
A Mom Blog	2009	n/a	n/a	personal autism-centric	amomblog.com	1
Alphamom	2006	214.8K	9042	independent	alphamom.com	1
Café Mom	2006	8.9M (est.)	129	social networking	thestir.cafemom.com	41
Caffeinated Autism Mom	2011	n/a	n/a	personal autism-centric	caffeinatedautismmom.com	2
Diary of a Mom	2008	7.0K	n/a	personal autism-centric	adiaryofamom.wordpress.com	6
Dooce	2001	132.9K	13879	personal	dooce.com	1
Finslippy	2004	8.8K	153433	personal	finslippy.com	1
Mom-Blog	2002	n/a	n/a	personal autism-centric	mom-blog.com	5
Mom-NOS	2005	n/a	n/a	personal autism-centric	momnos.blogspot.com	1
Mommyish	2011	102.7K	17455	independent (B5 media)	mommyish.com	4
Motherhood Uncensored	2005	n/a	277390	personal	motherhooduncensored.net	3
Mothering	2009	n/a	n/a	affiliate (Mothering magazine)	mothering.com	3
Motherlode	2008	28.5K (est.)	n/a	affiliate (New York Times)	parenting.blogs.nytimes.com	5
OC Mom	2008	n/a	n/a	affiliate (Orange County register)	themomblog.ocregister.com	5
Parenting	n/a	n/a	n/a	affiliate (Parenting magazine)	parenting.com/blogs/showandtell	8
Parenting-Blog	2006	n/a	n/a	independent	parenting-blog.net	1
Parents	n/a	220.3K	7807	affiliate	parents.com/blogs	9

		(parents.com)		(Parents magazine)		
We Go With Him	2005	782	n/a	personal autism-centric	autism.typepad.com	25
TOTAL						122

Source: quantcast.com

The blog posts were collected during January 2012. Dates for the gathered blog posts ranged from June 22, 2005 to January 9, 2012. Because the autism-vaccine controversy broke in 1998 (before any of the analyzed blogs had even been established), it was concluded that all dates since 1998 were relevant to the analysis. In total, 122 blog posts were gathered from 18 different blogs.

The blogs used in the sample were differentiated into five categories:

- 1) personal blogs, written by a single individual for the purpose of personal journaling, reflection, and recording of experiences;
- 2) personal autism-centric blogs, written in the same style as a conventional personal blog but by an individual who is parent to one or more children with an autism-spectrum disorder;
- 3) affiliate blogs, which are owned and run by a parent company or organization as a part of said company's official website (for example, the blog of *Parenting* magazine);
- 4) independent blogs, which may be owned by a larger media company or may be part of a network of blogs, but does not represent a single company;
- 5) aggregate blogs, which do not employ regular bloggers but instead allow submissions from guest contributors.

Coding and Variables

The blogs were analyzed using a code structure synthesized during a preliminary, pilot examination of the blog sample. The code structure included basic post information, such as word count and date posted, and demographic information, such as the profession, parenting status, and gender of the blogger. The bloggers were also coded for their attitude toward

vaccines, including whether they vaccinated their children, based on provided information and context clues, as follows:

Author has vaccinated own children

- 1 yes
- 2 no
- 3 vaccinated some but not others
- 4 no children
- 5 not mentioned

Author recommends vaccinating

- 1 yes
- 2 no, because of autism risk
- 3 yes, with provisions (list)
- 4 no, but for reasons other than autism or for unspecified reasons (list)
- 5 no recommendation made

The author's stance on vaccines and the author's stance on the autism/vaccine link are core measures and were coded as follows:

Author's stance on vaccines. Context clues and overall tone of article were used to infer whether the author was:

- 1 pro-vaccine
- 2 anti-vaccine because of autism risk
- 3 anti-vaccine for other reasons
- 4 pro-vaccine with provisions (alterations to schedule, skipping some shots, etc)
- 5 is conflicted

6 no stance or opinion given

Author's stance on vaccine/autism link. Similarly, context clues and overall tone of article were used to infer whether the author:

- 1 supports link
- 2 denies link
- 3 is conflicted
- 4 no opinion given

Each sentence or statement in the blog posts was coded for whether it supported or rejected the autism/vaccine link. Statements that did not relate to the autism/vaccine link were not coded.

Statements that described the link between vaccines and autism were coded as the following:

- 1 supports autism/vaccine link
- 2 denies autism/vaccine link
- 3 indicates personal conflict regarding link (example: "I am torn—both arguments are compelling.")
- 4 indicates or acknowledges public conflict regarding link (example: "There has been much debate over whether vaccines cause autism.")
- 5 indicates author's lack of stance (example: "I don't care what causes autism.")

Parts of the content analysis were adapted from aspects of prior literature on the accuracy of science journalism, including the following:

Credibility of sources (Kolata, 1999). The code examined sources in the form of hyperlinks, books, and cited professionals/spokespeople, as well as the presence of any anecdotal evidence that was offered by the blogger. Hyperlinks were counted, dated by the original source's posting, and sorted by the type of source they represented (see Figure 1, below).

In addition, the code called for noting how many times each blog post mentioned any of the following key terms or players in the autism/vaccine debate: Andrew Wakefield, Jenny McCarthy, thimerosal, mercury, David Kirby, CDC, FDA, NIH, Lancet, Pediatrics, American Pediatric Association (people were counted only if they were identified by their names, not by pronouns). This research identified sources as interviews, journal articles, news stories, other blog posts, and websites. All sources were included, even if they were not accompanied by a hyperlink. In addition, all hyperlinks were included, even if they did not contextually appear to relate to the autism/vaccine controversy.

Personal communications and anecdotes were counted in a separate category. “Personal communications” include any interpersonal interaction, such as conversations with friends and family members, that are NOT made in a professional context. If the author was, for example, a pediatrician, and was speaking about an incident or conversation that happened in the course of his/her professional observation (for example, “I see many worried parents”), this was cited as an anecdote (see below), not as a source. If the author, however, was interviewing or quoting a pediatrician, this would be cited as a source.

Thoroughness of truth claims and including all relevant truths (Dunwoody, 2005). Each cited source was examined (if possible) to determine whether it was cited or reported correctly by the blogger; for example, to determine whether a quote or statement (as reported in the blog post) was taken out of context. The “link status” of each included hyperlink was coded as follows:

Link status: each link was briefly visited to determine whether the link was still valid, and if so, if it was inappropriate or unrelated to its corresponding citation; for example, citing an NIH study but linking to the NIH homepage.

- 1 appropriate
- 2 inappropriate/unrelated
- 3 dead

Hyperlinks were further coded based on how the source was cited:

Is source cited correctly? Each link was examined to determine whether it was cited or described correctly in the context of the blog post. If not, the error was briefly described (misinterpreted results, out of context statement, etc).

- 1 yes, correct
- 2 no, incorrect
- 3 unknown (dead link, inappropriate page, etc)

Source (as cited, in context of article) pertains to autism/vaccine link. The hyperlinks were also noted for whether they were used to provide information about the autism/vaccine link.

- 1 yes
- 2 vaccines but not autism
- 3 autism but not vaccines
- 4 neither vaccines nor autism

Source is used to refute or support link. Finally, each hyperlink was coded by whether it was used to support or deny the link. The purpose of the original source was not considered—the links were coded for whether they were used for support or refutation in the context of the blog post.

- 1 refute
- 2 support
- 3 neither (for example, provides a definition or other resource)

Consistency with existing scientific research (Chew, Mandelbaum-Schmid, & Gao, 2006). The date of each cited source was recorded in order to determine whether the source was up-to-date at the time of the blog posting. In addition, examination of the cited sources was intended to reveal any trends regarding what types or sources were cited, and whether these sources were accurate and appropriate (see below, Figure 2).

Prevalence and presentation of anecdotal evidence (Kolata, 1999; Zillman, 2006), including the frequency of anecdotal evidence, whether the anecdotes were presented to refute or support the autism-vaccine link, and the source of the anecdotes. Anecdotes are considered to be stories from author's personal experience, as well as stories author heard from other people in the author's life (for example, "my cousin thinks..." or "one of the other PTA moms is sure that..."). The number of anecdotes in each blog post was recorded, and each anecdote was coded according to the following:

Does the anecdote support or reject the autism/vaccine link? Note that the method used to code the anecdotes for support or refutation is the same used to code the non-opinion statements.

- 1 supports autism/vaccine link
- 2 denies autism/vaccine link
- 3 indicates personal conflict regarding link (example: "I am torn—both arguments are compelling.")
- 4 indicates or acknowledges public conflict regarding link (example: "There has been much debate over whether vaccines cause autism.")
- 5 indicates author's lack of stance (example: "I don't care what causes autism.")

Anecdote source. The source of the anecdote is who it originated from; for example, is the blogger describing something that happened to his/her own children, or is s/he repeating a story told by a friend or coworker?

- 1 author's experience (personal)
- 2 author's experience (professional— provide context)— author heard the story during the course of his/her work, such as a pediatrician's discussions with parents (in this example the author is the pediatrician)
- 3 vicarious experience (friend, family)— author heard from said person but was not directly involved in the quoted incident or experience
- 4 other

The blog posts were also analyzed through a researcher perspective similar to the lens used to scrutinize academic articles in one's own field. As most scholars are aware, a properly presented research study includes such details as sample size, population, statistical analysis and results, and the age of the study as well as its position relative to previous and contemporary literature. While a blog post may not provide such meticulous detail as a research article, the inclusion of these relevant details is mandatory to encouraging critical analysis of the research results. That is, informing readers of the structure and possible drawbacks of existing research allows them to draw their own conclusions about credibility and relevance to their own affairs. The code structure appears in Appendix A.

Because the method incorporated a content analysis, a second coder was hired to assist in analyzing the sample. The coder was an alumnus of the Media Studies program and was compensated for her work. A sample of 17 blog posts (14% of the total selection, representing one post per blog) was used to calculate intercoder reliability. The reliability calculation process

was also used to refine the code, as much of the preliminary disagreement related to subjectivity of aspects of the code, such as the source of anecdotes. The intercoder reliability was measured using Cohen's kappa test in SPSS (Lombard, Snyder-Duch, & Bracken, 2010) and was 0.85 or higher for all variables, as Krippendorff (1980) suggests that a kappa of more than 0.80 is indicative of good reliability.

All reliability measures and statistical analysis of the code were conducted in SPSS 19. Results were rounded up to two decimal places where needed.

Variable Categorization

Analysis of author demographics focused on profiling gender and parental status; author stance on the autism/vaccine link as well as vaccines themselves; whether authors had vaccinated their children (if any); and author profession, which was determined via examination of the authors' biographies or "About" page (if present). Analysis of the blog content focused primarily on cited sources (hyperlinks), source type/origin; non-anecdotal statements regarding the autism/vaccine link (for example, "It was discovered that the research pointing to an autism/vaccine link was a fraud"); and anecdotes related to the autism/vaccine link (for example, "My own child developed autism not long after her vaccination").

Hyperlinks, statements, and anecdotes were examined for how they were used insofar as supporting or rejecting the autism/vaccine link, as well as for any correlations with the type of blog in which they appeared, or with the stance of the author. Anecdotes and sources were not only coded for what stance they supported, but from whom they originated. For example, it was noted whether anecdotes were taken from the author's personal experience ("My child developed autism after receiving her vaccines") or from the experience of someone the author knows or heard of ("My neighbor never vaccinated her children, and two of them have autism").

Hyperlinks were coded for whether they were cited correctly, as well as for the type of error that was involved in the incorrectly cited sources. Errors included the following:

1. Wrong page cited: the hyperlink was described as linking to a website that differed from what the hyperlink actually led to (for example, referring to a specific New York Times article but linking to the New York Times homepage).
2. Unsupported detail: the blog post made a statement or claim that could not be substantiated by the corresponding citation. The claim was not necessarily false, but it could not be identified in the cited source.
3. Inappropriate generalization: A claim or number was generalized or paraphrased to the point of losing its original meaning. For example, one blog post referred to findings of “several” studies, while only two studies were referenced in the cited source.
4. Suitability: Some sources were not necessarily cited incorrectly, but may have not been the best source to support the claim. For example, one blog post about chicken pox vaccines linked to another blog post about vaccines. The linked blog post was about a basketball team receiving vaccinations, rather than about the vaccine itself.

Hyperlinks were also classified by the type of source they represented,¹ in order to determine what types of news and information sources were most often cited by bloggers. Figure 1 displays the categories that were used to filter the sources. The blog posts were also examined for common themes, references, and “authorities” (including medical institutions and celebrities). For example, many blog posts mentioned Andrew Wakefield, the Lancet, or Jenny

¹ The hyperlinks were sorted using a Python program that can be found at <https://gist.github.com/3113734>, courtesy of Chris Lonnen.

McCarthy. These mentions were counted separately from sources if the blogger made mention of the term or person without providing a hyperlink or other citation.

Figure 2. Types of information sources represented in cited hyperlinks

Medical news	Community & forum pages
Personal websites	General information sources*
Research sites	Magazines
Professional websites	Government sites
Health & medical organizations	Advocacy & awareness groups
Higher education websites	Blogs used in thesis analysis
Academic journals	Blogs
Medical information sites**	News
Product pages	Other

*Wikipedia, About.com, etc

**Medical information not affiliated with a medical organization, such as WebMD.

Statistical Analysis

The research questions and hypotheses were addressed using frequency distribution, crosstabulation, correlation, and ANOVA measures in SPSS. RQ1a and b examined author demographics, blog type and focus, and blog content including themes and source types. Author demographics were analyzed with frequency measures, calculating percentages for gender and parenting status as well as what the authors' stances on vaccines and the autism/vaccine controversy were. Percentage of parent-authors who vaccinated their children was also calculated.

Blog type was similarly examined using frequency analyses. The content of the blogs, including word count and number of sources/anecdotes/statements, was examined using descriptive measures including mean and standard deviation. The support breakdown of the sources, anecdotes, and statements was calculated using percentages to reveal the proportion of evidence used to support or reject the autism/vaccine link. The following variables were calculated using percentages: number of non-source terms (Wakefield, Jenny McCarthy, etc) mentioned; proportion of correctly-cited hyperlinks; source of anecdotes (self, friend, etc); proportion of hyperlink source type (blog, academic journal, news source, etc); and types of errors made while citing sources.

Pearson's correlation coefficient tests were used to calculate the relationship between the number of words in a blog post and the number of hyperlinks, anecdotes, and non-anecdotal A/V-related statements made in the blog post; and to calculate the relationship between word count and the number of hyperlinks, anecdotes, and non-anecdotal A/V-related statements made in the blog post. An independent t-test (rather than an ANOVA) was run to examine the relationship between author stance and anecdotal support when two out of three groups were tested, due to

one of the groups having a zero count. A one-way ANOVA was used to examine the hypotheses. Probability levels for all statistics were set at $p < .05$.

Chapter Four

Results

This chapter reveals the outcome of the statistical analyses described in the previous chapter. All research questions were answered and neither hypothesis was supported.

RQ1a: What descriptive information regarding author information (gender, parenthood, profession, stance on vaccines, stance on autism/vaccine link), blog type, and blog content can be observed?

Author Demographics – Profession, Parental Status, Blog Type

The 122 blog posts were written by 50 unique authors. As shown in Table 1, the majority of the bloggers (92%) were female, and most bloggers (83%) were confirmed to be parents themselves. Ten percent (n=5) of the unique authors had current or previous experience as a reporter, journalist, or broadcaster; 4% (n=2) could be identified as having professional experience writing about science or health. The blog post types were not evenly distributed. The majority of articles were from social or personal autism-centric blogs. Personal blogs that were not about autism made up the smallest percentage of the sample (4%).

Table 1 Percentage of author demographic variables

<i>Variables</i>	<i>%</i>
Author gender	
Female	91.8
Male	1.6
Unknown	6.6
Author parenthood	
Parent	82.7
Not a parent	0.0
Unknown	17.2
<i>(N=50)</i>	
Author profession	
Medical professional	2.0
Health/science journalist	4.0
Other current/former journalist	6.0
Other	88.0
Blog type	
Personal non-autism-centric	4.1
Independent	4.9
Affiliate	23.8
Personal autism-centric	32.8
Social	34.4
<i>(N=122)</i>	

Table 2 shows how bloggers discussed their personal experiences with vaccines and their opinions on vaccine risk. Most bloggers did not disclose whether or not they chose to vaccinate their children, however, of those who did, articles about vaccinators (18%) outnumbered those about non-vaccinators (<1%). Approximately 5% of blog posts expressed the author being opposed to vaccines, due to perceived risk of autism and other effects; nearly 30% expressed support of following vaccine recommendations (21%) or vaccinating with an altered schedule; for example, delaying vaccines or skipping doses (8%). Over half of the blog posts took a position of rejecting the autism/vaccine link (51%).

Table 2 Percentage of author opinion on vaccines and the vaccine/autism link

<i>Variables</i>	<i>%</i>
Vaccinated children	
No, because of autism risk	0.8
Yes, vaccinated	18.0
Unknown	81.1
	(<i>N</i> = 122)
Author opinion of vaccines	
Anti-vaccine because of autism risk	1.7
Anti-vaccine for other reasons	2.5
Conflicted	8.3
Pro-vaccine, with alterations to schedule	8.3
Pro-vaccine	21.5
No opinion provided	57.9
	(<i>N</i> = 122)
Author opinion on autism/vaccine link	
Accepts autism/vaccine link	4.2
Acknowledges public conflict of link	11.8
No opinion	13.4
Is personally conflicted	19.3
Rejects autism/vaccine link	51.3
	(<i>N</i> = 122)

Blog Content and Support for/Rejection of Autism/Vaccine Link

As shown in Table 3, hyperlinks were most often used with a mean of 5.38 per article, followed by non-anecdotal statements with a mean of 2.21. Anecdotes were used relatively infrequently, with a mean of .30 per article. All of the pro-A/V blog posts had higher-than-average word counts; however, the word counts of blog posts that were both pro-A/V and autism-centric were consistent with the average word count of autism-centric blogs.

Table 3 Means and standard deviation for word count, number of linked sources, number of non-anecdotal statements relating to autism/vaccine link, and number of anecdotes

<i>Variables</i>	<i>Mean</i>	<i>SD</i>	<i>N</i>	<i>Min</i>	<i>Max</i>
Number of linked sources	5.38	4.70	656	0	26
Number of statements relating to autism/vaccine link	2.21	2.12	236	0	16
Number of anecdotes	.30	.703	36	0	4
Word count by blog type					
Social	666.69	550.12	—	111	2410
Personal autism-centric	1049.88	560.61	—	163	3088
Personal non-autism centric	893.60	376.54	—	569	1448
Independent	680.00	329.09	—	330	1127
Affiliate	551.62	421.87	—	133	1600
Word count by author stance					
Pro-A/V link	1312.40	338.84	—	871	1700
Anti-A/V link	709.80	514.33	—	111	709.80
Personally conflicted	630.13	394.15	—	145	1609
No opinion	1144.63	804.74	—	294	3088
Public conflict	702.79	356.91	—	178	1268
	774.90	544.30	93358	111	3088

As shown in Table 4, 15% of the sources that discussed the autism/vaccine link rejected the autism/vaccine link and 4% supported it. Twenty-eight percent of the hyperlinks related to the autism/vaccine link; the remainder provided a definition or other resource, some of which related to either autism or vaccines, but not both. For example, if a type of vaccine was mentioned, the hyperlink might lead to a Wikipedia article describing the vaccine. Non-anecdotal statements were used to reject the autism/vaccine link 44% of the time, but supported the link 22% of the time, a higher proportion than was seen for hyperlinks. Anecdotes, however, demonstrated the opposite effect: 22% rejected the autism/vaccine link while 53% supported it.

Table 4 Percentage of cited source that reject/support autism/vaccine link and relationship to autism/vaccine link; non-anecdotal statement that reject/support autism/vaccine link; and anecdotal reject/support of autism/vaccine link

<i>Variables</i>	<i>%</i>
Cited source	
Does the cited source support or reject the autism/vaccine link?	
Unknown	2.0
Supports autism/vaccine link	3.7
Rejects autism/vaccine link	15.3
Neither (provides definition or other resource)	79.0
	(N=649)
Does the cited source relate to the autism/vaccine link?	
Unknown	1.2
Neither autism nor vaccines	11.5
Vaccines but not autism	15.5
Autism/vaccine link	27.8
Autism but not vaccines	43.9
Statement	(N=651)
Does the statement reject or support the autism/vaccine link?	
Author has no stance on autism/vaccine link	1.5
Author is conflicted about autism/vaccine link	4.1
Author supports autism/vaccine link	22.7
Author acknowledges public conflict regarding link	28.3
Author rejects autism/vaccine link	43.5
Anecdote	(N=269)
Does the anecdote reject or support the autism/vaccine link?	
Author is conflicted about autism/vaccine link	11.1
Author acknowledges public conflict regarding link	13.9
Author rejects autism/vaccine link	22.2
Author supports autism/vaccine link	52.8
	(N=36)

A Pearson's correlation coefficient test (Table 5) revealed weak positive relationships between the number of words in a blog post and the number of hyperlinks ($r = .34$, $p < 0.01$), and between the number of words in a blog post and the number of anecdotes ($r = .23$, $p < 0.05$).

Table 5 Pearson correlation coefficients for word count, number of linked sources, number of non-anecdotal statements relating to autism/vaccine link, and number of anecdotes

<i>Variables</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
1. Word count	—	.34**	.03	.23*
2. Number of linked sources	—	—	.17	-.08
3. Number of statements relating to autism/vaccine link	—	—	—	.10
4. Number of anecdotes	—	—	—	—

*p < 0.05

**p < 0.01

Source Accuracy and Common Themes

Table 6 profiles the hyperlinks and whether the blog posts cited them correctly; 76.2% of the hyperlinks were cited correctly. While most citations were correct, several error types could be observed. The most common error (38.5% of the incorrect citations) was citing the wrong page; for example, referring to a specific *New York Times* article but linking to the *New York Times* homepage. The second most common error (12.8%) was making an unsupported claim. For example, one blog post said that scientists “tossed out” the possibility of vaccines being a cause of autism (Dermody, January 12, 2009). While this claim is not strictly incorrect, the source the article cited did not support the claim.

Three hyperlinks were plainly cited incorrectly (rather than being an error of exaggeration or omission). One blog post described Wakefield’s *Lancet* article as being published in 1997, when in actuality the study was published in 1998. One cited source was misquoted, and the third contained information that was contradictory to a claim the blog post made.

Table 6 Percentage of correctness of hyperlink citation

Variables	%
Is the hyperlink cited correctly by the blog post?	
Incorrect	2.0
Dead link	18.9
Correct	76.2
	(N=647)
Types of errors	
Incorrect	2.6
Hyperbolic	2.6
Misrepresented	5.1
Suitability	7.7
Vague	7.7
Generalization	10.3
Other	12.8
Unsupported	12.8
Cites wrong page	38.5
	(N=39)

Table 7 lists key terms mentioned in the blog posts. Andrew Wakefield was mentioned the most often, in 26% of the blog articles. A list of the recorded recurring terms appears in Table 6; 66% of the blog posts ($n=80$) contained at least one of the terms. These references were examined in part because authorities such as the Institute of Medicine or the CDC, or claims from celebrities and medical officials, were often mentioned without being directly cited from a source. For example, one blog post stated, “In a typical year, the Centers for Disease Control sees 60 to 70 cases of measles” (Anderson, 2011). While the CDC was referenced, no hyperlink or source for this figure was provided.

Table 7 Percentage of reference terms mentioned

<i>Variables</i>	<i>% of terms used</i>	<i>% of articles using term</i>
FDA	1.0	1.6
Pediatrics	1.6	4.1
British Medical Journal	1.6	3.3
Institute of Medicine	2.6	1.6
Lancet	5.2	11.5
David Kirby	6.8	4.1
Thimerosal	8.4	13.9
CDC	9.4	14.8
Mercury	12.6	17.2
Jenny McCarthy	16.2	15.5
Andrew Wakefield	34.6	26.2
	(N=309)	(N=122)
Percentage of articles using >1 term		66.0 (N=80)

A Pearson's correlation coefficient test revealed a strong positive correlation ($r = .64$, $p < 0.01$) between the number of statements relating to the autism/vaccine link and the number of cited sources relating to the autism/vaccine link (Table 8). This indicates that while not all of the statements the bloggers made about the autism/vaccine link were substantiated with an outside source, a significant portion were in fact supported. This figure, of course, does contribute to any assumptions as to whether the cited sources were accurate or credible.

Table 8 Pearson correlation coefficients for number of non-anecdotal statements relating to autism/vaccine link and number of cited sources relating to autism/vaccine link

<i>Variables</i>	<i>1</i>	<i>2</i>
1. Number of statements relating to autism/vaccine link	—	.636*
2. Number of cited sources relating to autism/vaccine link	—	—

*p < 0.01

RQ1b: What type of sources and anecdotes are most frequently cited or referenced?**Sources and Anecdotes**

Table 9 shows that the most frequently-used sources included news (17%) and blogs, which were split into blogs included in the analysis (33%) and “other” blogs (13%). Sources such as government websites (NIH, CDC, etc), academic journals, health- and medical-specific news and websites, and research sites were used infrequently. Eleven of the eighteen analyzed blogs cited themselves in at least one post. Self-citation accounted for 31% of the total citations.

Table 9 Percentage of sources used

<i>Variables</i>	<i>% of sources</i>
Medical news	0.4
Personal websites	0.4
Research sites	0.9
Professional websites	1.2
Health & medical organizations	1.3
Higher education websites	1.5
Academic journals	1.6
Medical information sites*	1.6
Product pages	1.6
Community & forum pages	1.8
General information sources**	2.2
Magazines	2.5
Government sites	4.8
Advocacy & awareness groups	6.6
Other	11.8
Blogs	13.2
News	17.3
Blogs used in thesis analysis	32.5
	(N=710)

*Medical information not affiliated with a medical organization, such as WebMD.

**Wikipedia, About.com, etc

Table 10 reports that of the sources cited, nearly half (48%) of the anecdotes were from the author's experience with his or her own children, for example, "I am fortunate that my kids have had minimal reactions to these vaccines." (Lara, 2009) The second most prevalent anecdote source was shared or vicarious experience, that is, hearing about the experience of a friend or family member. The relationship between the source of the anecdote and whether the anecdote supported or rejected the autism/vaccine link could not be determined due to small sample size of 36.

Table 10 Percentages for anecdote source

<i>Variables</i>	<i>%</i>
Anecdote source	
Other	2.7
Author's experience, professional	10.8
Vicarious experience (friend, family, etc)	37.8
Author's experience, personal	48.6
	100.0%
	(<i>n</i> = 36)

RQ2: What, if any, relationship exists between the author's stance on the vaccine/autism link and the number of statements appearing in the blog post that support or rejected the vaccine/autism link?

Relationships Between Author Opinions and Statement Support

RQ2 examined any relationship between author stances on the autism/vaccine link and the number of statements appearing in the blog post that rejected or supported the autism/vaccine link. An ANOVA test (Table 11) showed no significant relationship between the author's stance and the number of statements relating to each opinion.

Table 11 ANOVA results comparing author's stance on autism/vaccine link by number of statements confirming or rejecting link

<i>Statements</i>	<i>Author stance on autism/vaccine link</i>			<i>F</i>	<i>df</i>	<i>Sig</i>
	<i>Supports link mean (&SD) (N = 5)</i>	<i>Rejects link mean (& SD) (N = 61)</i>	<i>Conflicted/No opinion mean (& SD) (N = 56)</i>			
Indicates lack of stance	.05 (.401)	.02 (.128)	.05 (.401)	.278	119	.757
Indicates personal conflict	.13 (.470)	.05 (.218)	.13 (.470)	.870	119	.422
Indicates public conflict	.66 1.083	.61 (.862)	.66 (1.083)	.117	119	.890
Confirms link	.36 (.819)	.59 (.920)	.36 (.819)	1.918	119	.131
Opposes link	.88 (1.453)	1.13 (1.162)	.88 (1.453)	1.519	119	.223

RQ3: What, if any, relationship exists between author opinions on the autism/vaccine link and the sources/anecdotes they include?

Relationships Between Author Opinions and Source/Anecdotal Support

RQ3 examined any relationship between author stances on the autism/vaccine link, the number of sources (hyperlinks) that supported or rejected the autism/vaccine link, and the number of anecdotes that supported or rejected the autism/vaccine link. An ANOVA test (Table 12) was run on blogs that supported or rejected the link or indicated conflict. The results revealed no significant relationships between author opinion and whether the anecdotes used supported or rejected the autism/vaccine link or indicated conflict.

Table 12 ANOVA results comparing author's stance on autism/vaccine link by number of anecdotes confirming or rejecting link

<i>Anecdotes</i>	<i>Author stance on autism/vaccine link</i>			<i>F</i>	<i>df</i>	<i>Sig</i>
	<i>Supports link mean (&SD) (N = 5)</i>	<i>Rejects link mean (&SD) (N = 61)</i>	<i>Conflicted/No opinion mean (&SD) (N = 56)</i>			
Indicates personal conflict	.05 (.227)	.03 (.180)	.05 (.227)	.266	119	.767
Indicates public conflict	.04 (.187)	.05 (.218)	.04 (.187)	.175	119	.840
Confirms link	.04 (.187)	.10 (.300)	.04 (.187)	1.111	119	.333
Opposes link	.20 (.664)	.10 (.396)	.20 (.644)	.993	119	.373

An ANOVA and an independent t-test were also used to assess the relationship between author stance on the autism/vaccine link (support, reject or conflicted) and the number of hyperlinks that were used to reject or support the link (Table 13). There was a significant relationship ($p < 0.05$) between author stance, specifically a conflicted or non opinionated blog and the number of hyperlinks that neither supported nor rejected the link (for example, those that linked to a definition); however, there was no significant relationship between author stance and the number of sources that rejected the autism/vaccine link and the number of sources that supported the link.

Table 13 ANOVA results comparing author's stance on autism/vaccine link by number of hyperlinks used to confirm or reject link

<i>Hyperlinks</i>	<i>Author stance on autism/vaccine link</i>			<i>F</i>	<i>df</i>	<i>Sig</i>
	<i>Supports link mean (& SD) (N = 5)</i>	<i>Rejects link mean (& SD) (N = 61)</i>	<i>Conflicted/No opinion mean (& SD) (N = 56)</i>			
Source rejects link	.20 (.45)	.92 (1.21)	.84 (1.41)	.72	2	.49
Source supports link	.60 (.89)	.21 (.58)	.14 (.59)	1.40	2	.25
Indicates public conflict	3.20 (4.09)	3.52 (3.30)	5.13 (5.27)	2.15	2	.12
Source neither supports nor rejects link	—	.05 (.22)	.20* (.72)	—	—	—

* $t = 1.58, p < 0.05$

Hypotheses 1a and 1b:

H1a: Personal autism-centric blogs will contain a higher ratio of pro-autism/vaccine (A/V) statements to anti-A/V statements than will non-autism-centric blogs.

H1b: A higher proportion of autism-centric blogs will be framed as pro-A/V than will non-autism-centric blogs.

Hypothesis 1a addressed the relationship between autism-centric personal blogs and the number of pro-A/V statements they contained. A one-way ANOVA (Table 14) revealed a significant relationship between blog type and the number of statements supporting the autism/vaccine link ($p < .001$).

Table 14 ANOVA comparing blog type by number of statements confirming or rejecting link (DV)

<i>Statements</i>	<i>Blog type</i>			<i>F</i>	<i>df</i>	<i>Sig</i>
	<i>Social mean (& SD) (N = 42)</i>	<i>Personal mean (& SD) (N = 45)</i>	<i>Affiliate/Independent mean (& SD) (N = 35)</i>			
Indicates lack of stance	.07 (.463)	.02 (.149)	.00 (.000)	.053	2	.528
Indicates personal conflict	.17 (.537)	.07 (.252)	.03 (.169)	.202	2	.219
Indicates public conflict	.64 (.932)	.58 (.723)	.71 (1.250)	.184	2	.822
Supports link	1.21 ^b (1.298)	.38 ^a (.684)	1.46 ^b (1.597)	8.973	2	.000 ¹
Rejects link	.55 (.993)	.49 (.815)	.46 (.817)	.106	2	.899

¹ Scheffe test is significant at 0.05 level. Different superscripts indicate differing groups.

Hypothesis 1b addressed the relationship between autism-centric personal blogs and whether the blogs were framed as being pro-A/V or anti-A/V. The data analysis revealed that only five blog posts took a stance that was firmly supportive of the autism/vaccine link; because of this small sample, Hypothesis 1b cannot be adequately tested focusing originally on proportion size or percentages of the blogs. Therefore an ANOVA was used to compare the mean number of statements supporting, rejecting, or having no opinion on the link. The ANOVA revealed no significant difference between pro-A/V framing and anti-A/V framing (Table 15).

Table 15 ANOVA results comparing author's stance on autism/vaccine link by Pro A/V and Anti A/V framing

<i>Framing</i>	<i>Author stance on autism/vaccine link</i>			<i>F</i>	<i>Df</i>	<i>Sig</i>
	<i>Supports link mean (&SD) (N = 5)</i>	<i>Rejects link mean (&SD) (N = 61)</i>	<i>Conflicted/No opinion mean (&SD) (N = 56)</i>			
Pro A/V	.20 (.45)	1.13 (1.16)	.88 (1.45)	1.92	119	.15
Anti A/V	.04 (.71)	.59 (.92)	.36 (.82)	1.52	119	.22

Chapter Five

Discussion and Conclusion

This chapter will summarize the conclusions reached in the Methods section and their relevance, particularly in conjunction with existing literature. It will also discuss the study's limitations and propose areas for future research.

Author Demographics and Blog Types

The study's key findings regarding author demographics indicate that the primary authors of mommy blogs are, indeed, mothers, and that the majority (94%) do not have a background in science or health. While the blogs were not strictly health blogs, this finding is in stark contrast to Miller and Pole's findings (2012) that half of the examined health bloggers were employed in some form of healthcare. However, Miller and Pole did observe that a small proportion of the non-healthcare-employed bloggers served as caretakers within their own families, which could certainly encompass parents of children with autism (and potentially parenting in general). The blogs were collected via snowball sampling and a comprehensive search and represented the most "visible" sample of mommy blogs possible at this phase of research on this topic. Despite the number of parents who wrote about vaccines, the majority of authors did not voice an opinion on vaccines themselves (57.9%), perhaps in an effort to appear more objective on the topic; nor did most authors discuss their personal vaccination history. While it is unknown whether the five collected blog types were proportionally representative of the parenting blogosphere in general, the blogs were collected via snowball sampling and a comprehensive search and represented the most "visible" sample of mommy blogs possible at this phase of research on this topic. Regardless of representation, the sample in this research offers an insight into which parenting blogs are discussing autism and vaccines, and how.

The number of bloggers who believed there was a link between autism and vaccines was in the small minority (4.2%). This indicates a majority acceptance (at least among this sample) of the CDC's current stance on vaccine safety, combined with a dose of skepticism from nearly a third (31.1%) of the bloggers who acknowledged either personal or public conflict regarding the link. It is also relevant to note that the proportion of bloggers who believed in an autism/vaccine link is significantly lower than the national approximation of the 25% of parents who believe there is a link. This, of course, raises the question of where the 25% of parents are getting their information from. It is also important to note that while 4% of the bloggers sampled in this study supported the autism/vaccine link, this number cannot be definitively translated to the blogosphere in general.

While the proportion of authors aligning themselves with scientifically-supported research is encouraging, the ways in which the blogs discussed the link were mixed. There was no significant association between the author's opinion regarding the A/V link and the number of statements supporting or rejecting the link, indicating that the opinion was stated as simply that— an opinion, not as a thesis statement awaiting further support. However, there was a weak positive relationship between the number of non-anecdotal statements and the number of cited sources in a post. While it is encouraging that bloggers are at least somewhat concerned about citing their sources, the proportion appears low and should be compared with proportion of cited sources in other forms of health communication (see future research).

While a minority of the hyperlinks were used to support a claim (21%), the links used to support a claim were cited correctly 76% of the time. The major errors were citing the wrong web page and making unsupported claims; other errors that reflect issues in health journalism include making inappropriate generalizations and misrepresenting data or source quotes (for

example, out-of-context quotes). The major errors made by the bloggers would be difficult to replicate in traditional health journalism, but it is important to note that bloggers and journalists are still prone to misinterpreting their sources in similar ways.

Another result that lends itself to concern involved the types of sources that were cited, especially considering that one of the aforementioned pitfalls of health communication is non-expert citations. The majority of hyperlinks originated from other parenting blogs (most of which were blogs already used in the sample, indicating that authors may have been citing themselves frequently), mainstream news sources, and autism advocacy and awareness groups. Firmly medical sources, such as research sites, government sites, academic journals, and (non-advocacy) health and medical organizations made up less than 10% of the total sources. This is also tangentially consistent with Gao, Zhang, and Sadri's findings that traditional journalist used significantly more sources, including medical, scientific, and government sources, than blogs did (2011). It is also interesting to note that the majority of the hyperlinks (79%) were not used to support or reject the autism/vaccine link, and rather provided links to other reading and information about related issues (for example, descriptions of vaccines or resources for parents of children with autism). This finding is consistent with prior literature describing blogging as a source of information (crowdsourcing) and advocacy. Bloggers are interested not only in defending their own opinion, but sharing whatever information they find interesting or useful.

The terms mentioned demonstrate how pervasive Andrew Wakefield and Jenny McCarthy's influence have become to the topic, with 42% of the blog articles mentioning one or both. However, it is also important to note that these individuals were not mentioned in support of the A/V link (for the most part). Anecdotes were seldom used, and those that were mentioned

primarily originated from the author's own experience, rather than from second- or third-hand sources.

Significant Relationships

In general, there were few significant relationships between the blog stance and the number of statements, sources, or anecdotes used to support or reject the A/V link. This finding in and of itself may be significant, because this lack of a relationship may indicate that blog authors are motivated, despite their own beliefs on the topic, to represent both sides of the issue (of course, it is yet unknown which is more powerful to audiences: the frame of the blog or the proportion of evidence).

One exception to the general lack of significance was the relationship between author's stance and the number of hyperlinks used to confirm or reject the link. No significant relationships were found except in the case of hyperlinks that neither rejected nor supported the link— these hyperlinks were used significantly more by authors who had a conflicted or no opinion. This may indicate that conflicted authors were more comfortable discussing other topics, mentioning autism and vaccines only in passing, or that they were hesitant to include sources in which they themselves did not have total faith.

A one-way ANOVA that revealed a significant association between blog type and the number of statements supporting the A/V link: personal blogs revealed a lower mean of statements supporting the A/V link than did social or affiliate blogs. A possible reason for this could be in the authorship: social blogs are more likely to have multiple authors (over a dozen) posting on the same site. A personal blog has one or two, while an affiliate blog has a small staff. Therefore, five bloggers from five personal blogs may have vastly diverse opinions, while a dozen social blogger on one social blog site may be more likely to reflect the opinions of one

another and the site in general. This finding was the opposite of what was hypothesized—Hypothesis 1a assumed that personal blogs would contain more statements supporting the A/V link than rejecting it.

While the elaboration likelihood model and exemplification theory were used to guide the hypotheses, it may be possible that the snowball sampling method may have resulted in a skewed sample of parents of children with autism. That is, the majority of the bloggers took the stance of rejecting the A/V link, and therefore may have linked more readily to other authors who rejected the link.

A significant relationship was also found between the length (word count) of the blog posts and the number of hyperlinks and anecdotes in each blog post. Generally, short blog posts consist of summaries of news stories (or even reposted news stories), while longer posts take on a more personal, reflective, or diary-type format. The strong relationship between post length and number of hyperlinks may indicate that even while writing reflectively, parents are interested in sharing the sources of their knowledge and opinions.

Study Limitations

This study has several limitations, most important of which is the sample size/selection. Due to the limited precedent research on parenting blogs, the sample may not have been representative of the blogosphere's most popular or influential parenting blogs. While this research used a comprehensive search and snowball sampling to collect its corpus of blog posts, future research would benefit by “double checking” the sample with more purposive sampling, perhaps by allowing parenting blog readers to contribute suggestions (see below). In addition, the blogs were sorted by type after the blog sample was collected, which resulted in an unevenly-

distributed sample of blog types. It is yet unknown if this research's distribution of blog types is representative of a real-world distribution.

In addition, Wakefield's 2010/2011 disbaring may have had an effect on the opinions expressed in the blog posts, many of which did, in fact, discuss Wakefield's disbaring. It is unknown whether the number of pro-A/V statements or anti-A/V statements changed significantly after Wakefield's disbaring.

Research Implications

The purpose of this study was to examine the ways in which parenting blogs discussed the autism-vaccine controversy, specifically with regard to discussion frames and the types of evidence and support that were included. This research centered on the idea that blogging can serve as a form of news dissemination and as a health information resource for parents, and therefore sought to determine whether blogging is prone to the same journalistic pitfalls as traditional health journalism.

The findings of this research indicate that health blogging may mirror some of the issues of traditional journalism. Problematic issues in the blog sample were incorrectly cited sources and research, lack of credible sources (in the case of newspapers and blogs outweighing academic journals and scientific sources in citation numbers), and authors with little to no health or science background. These mirror problems in traditional journalism, namely, incorrect or misleading interpretation of research results; minimal or inappropriate expert consultation; and the foreign nature of health research to both reporters and their audiences.

However, blogging also managed to escape other journalism pitfalls. Anecdotal evidence composed the minority of cited evidence either for or against the autism/vaccine link. While it is unknown if the presence of anecdotal evidence in the blog sample is consistent with the amount

of anecdotal evidence included in traditional news stories, the bloggers did not tend to sensationalize their stories with whatever anecdotes they included. In addition, it is important to note that the author's opinion on the autism/vaccine controversy did not have a significant effect on the number of statements, anecdotes, or sources that supported or rejected the A/V link.

These findings raise the question of what blog audiences should expect from parenting blogs. The sample indicates that the majority of parenting bloggers are not supporters of the A/V link, or that they are conflicted; however, self-selection bias could lead readers who did believe in an autism-vaccine link to find bloggers who echoed their views. While the majority of bloggers were in agreement with the CDC's stance on autism and vaccines, the sources they cited were not wholly credible—many of these sources including other blogs and non-medical news sources. This research did not delve into whether the cited sources were accurate, but given the extensive literature on the issues encompassed by traditional health journalism, it is possible that citing blogs or news sources could result in a game of factual “Telephone,” moving parenting blogs' content incrementally further from the original scientific research. Therefore, it may not be advisable that parenting blogs serve as a hard-and-fast lexicon of health information. As with any source of information (even scientific research), the information provided in parenting blogs should not be immediately taken as irrefutable fact, but treated with a measure of common sense and healthy skepticism.

However, this is not to say that parenting blogs do not have value, even as sources of health information. The autism-vaccine controversy is, in some ways, a unique case due to the extreme polarization of opinions and high visibility it has garnered. However, even outside of controversial cases such as this, new research is being released every day about topics relevant to parents, such as the benefits of breastfeeding or the risks of lead and other environmental toxins.

Blogs, especially those that frequently regurgitate mainstream news, are a convenient way for parents to get the first inklings of research or findings that may be relevant to them and their children. In addition, parenting blogs provide a valuable forum for parents to discuss the fear and confusion that they may hold in cases such as the autism-vaccine controversy— a place where they can weigh the facts and evidence and consort with other parents. This is, again, true even in cases of less controversial research. However, it is important that readers of these blogs remember that while discussion is valuable, it is not necessarily a replacement for more established and credible resources.

Future Research

Further research should center primarily on expanding and refining the sample size. Potential samples could be collected based on equal distribution across the five blog types, or by collecting a sample that is representative of the real-world distribution. As mentioned above, it is unknown whether the current sample is representative of the internet's most popular or influential parenting blogs. A potential sampling technique could be to survey parents on their top blog sources of health information for their children. It might be valuable to survey regular readers of parenting blogs, and then to analyze the blogs that appear to be most popular or have the most "buzz." While this study attempted to include popularity of the blogs via pageview ranking, many blogs did not have a ranking, or had a very small ranking in contrast to others.

Additionally, the coding structure used to analyze the blogs should be expanded and refined to allow for less subjective interpretation. While an acceptable level of intercoder reliability was reached, the code went through several revisions in an attempt to facilitate this measure. In addition, the code should be revised to include an analysis of emotional content, due

to the ability of emotional content to cause audiences to create a more determined opinion of the topic at hand (Zillman, 2006).

Possible topics of future research might include more qualitative measures, including interviewing the bloggers themselves about their information-gathering techniques and what, if any, criteria they use to vet sources. Because there was no significant association between blogger stance and the number of pro- or anti-A/V statements, it may be relevant to determine why bloggers choose to include the information they do. For example, do bloggers purposely omit their opinions on vaccines in an effort to appear objective? Do they attempt to include sources from both sides of the A/V link spectrum in an attempt to adhere to one of the more well-known journalistic tenets (fairness and balance)? Or is the information they include just a part of a stream-of-consciousness, with little planning or calculation involved?

Once a more comprehensive overview of the blogs themselves is achieved, the effect of the blogs should be investigated. In particular, the comments left on the blog posts should be analyzed to assess audience response — for example, it may be concerning if a blog post spreads incorrect information with weak support, but if the readers of the blog realize this and “call out” the blogger in the comments, this is also an important dynamic to document. Similarly, audience opinions could be examined in relation to blog content— for example, are the sources the blogger cites related to degree of audience agreement with the post? The blogger-reader dynamic is never static — each informs the other.

Although this research does not yet provide a soundly representative view of parenting blogs, it does provide guidance for further research and exploration into not only the relationship between parenting bloggers and autism, but the greater relationship between health and the blogosphere.

References

- Anderson, J. (October 25, 2011). An unnecessary measles outbreak. Retrieved from parenting.blogs.nytimes.com/2011/10/25/an-unnecessary-measles-outbreak/?pagemode=print
- Aud, S., Hussar, W., Kena, G., Bianco, K., Frohlich, L., Kemp, J., & Tahan, K. (2011). The condition of education 2011. Washington, DC: National Center for Education Statistics.
- Babble.com. (2010). Top 50 mom blogs, 2010. Retrieved from <http://www.babble.com/babble-50/mommy-bloggers/mom-bloggers-top-50-full-list/>
- Batty, D. (January 9, 2009). Record number of measles cases sparks fear of epidemic. Retrieved from <http://www.guardian.co.uk/society/2009/jan/09/meales-record-numbers>
- Bauer, A. (2009). Blogging on broken glass: Why the proposed Free Flow of Information Act needs a specific test for determining when media shield laws apply to bloggers. *Minnesota Journal of Law, Science, and Technology*, 10(2), 747-772.
- Bowditch, P. (2011). Confirmation bias, denialism and Morton's demon. *Australasian Science*, 32(4), 44.
- Bureau of Labor Statistics. (2010). Career guide to industries, 2010-11 edition: Healthcare. Retrieved from <http://www.bls.gov/oco/cg/cgs035.htm>
- Burkett, D. W. (1973). *Writing science news for the mass media*. Houston, TX: Gulf Publishing Company.
- Burns, T. W., O'Connor, D. J., & Stocklmayer, S. M. (2003). Science communication: A contemporary definition. *Public Understanding of Science*, 12, 183-202.

- Center for Disease Control. (1999). Achievements in public health, 1900-1999 impact of vaccines universally recommended for children— United States, 1990-1998. *MMWR*, 48(12), 243-248.
- Center for Disease Control. (February 11, 2010). Thimerosal. Retrieved from <http://www.cdc.gov/vaccinesafety/Concerns/thimerosal/>
- Center for Disease Control. (September 13, 2010). CDC study on “Prenatal and infant exposure to thimerosal from vaccines and immunoglobins and risk of autism.” Retrieved from www.cdc.gov/vaccinesafety/Concerns/Thimerosal/QA_Pediatrics-thimerosal-autism.html
- Center for Disease Control. (September 27, 2010). CDC: Immunization safety and autism— Thimerosal and autism research chart. Retrieved from http://www.cdc.gov/vaccinesafety/00_pdf/VSD_Chart_of_Autism_Studies-Updated_Sep_27_2010.pdf
- Center for Disease Control. (2011). Polio vaccine: What you need to know. Retrieved from <http://www.cdc.gov/vaccines/pubs/vis/downloads/vis-ipv.pdf>
- Center for Disease Control. (2012). Measles outbreak associated with an arriving refugee— Los Angeles County, California, August-September 2011. *MMWR*, 61(21), 385-389.
- Chew, F., Grant, W., & Tote, R. (2004). Doctors on-line: Using diffusion of innovations theory to understand internet use. *Family Medicine*, 36(9), 645-650.
- Chew, F., Mandelbaum-Schmid, J., & Gao, S. K. (2006). Can health journalists bridge the state-of-the-science gap in mammography guidelines? *Science Communication*, 27, 331-351. doi: 10.1177/1075547005284751
- Clements, C. J., & Griffiths, E. (2002). The global impact of vaccines containing aluminum adjuvants. *Vaccine*, 20(3), S24-S33.

- Clough, G. W. (2011). *Increasing scientific literacy: A shared responsibility*. Washington, DC: Smithsonian Institution.
- Conde Nast. (2011). Circulation/demographics. Retrieved from <http://www.condenastmedia.com/wir/circulation.cfm>
- Crisp, D. W. (1986). Scientists and the local press. In S. M. Friedman, S. Dunwoody, & C. L. Rogers (Eds.), *Scientists and journalists: Reporting science as news* (pp. 73-80). New York, New York: The Free Press.
- Deer, B. (February 22, 2004). Revealed: MMR research scandal. Retrieved from <http://briandeer.com/mmr/lancet-deer-1.htm>
- Deer, B. (January 11, 2011). How the vaccine crisis was meant to make money. Retrieved from <http://www.bmj.com/content/342/bmj.c5258.full>
- Demichelli, V., Jefferson, T., Rivetti, A., & Price, D. (2004). Vaccines for measles, mumps and rubella in children. *Cochrane Database of Systematic Reviews*, 4. doi: 10.1002/14651858.CD004407.pub2
- Dentzer, S. (2009). Communicating medical news: Pitfalls of health care journalism. *The New England Journal of Medicine*, 360(1), 1-3. doi:10.1056/NEJMp0805753
- Dermody, C. (January 12, 2009). Autism linked to environment. Retrieved from thestir.cafemom.com/toddler/2263/Autism_Linked_to_Environment
- DeStefano, F. (2007). Vaccines and autism: Evidence does not support a causal association. *Clinical Pharmacology & Therapeutics*, 82, 756-759. doi: 10.1038/sj.clpt.6100407
- DeWilde, S., Carey, I. M., Richards, N., Hilton, S. R., & Cook, D. G. (2001). Do children who become autistic consult more often after MMR vaccination? *British Journal of General Practice*, 51, 226-227

- Dr. Mercola. (July 10, 2012). Merck accused of lying about vaccine effectiveness. Retrieved from http://www.foodconsumer.org/newsite/Non-food/Drug/vaccine_effectiveness_0709120959.html
- Dunwoody, S. (1988). Don't ask us to educate the masses. *American Scientist*, 76, 448.
- Dunwoody, S. (2005). Weight-of-evidence reporting: What is it? Why use it? *Nieman Reports*, 59(4), 89-91.
- Dunwoody, S., & Ryan, M. (1987) The credible scientific source. *Journalism Quarterly*, 64, 21-27.
- Eisend, M., & Möller, J. (2007). The influence of TV viewing on consumers' body images and related consumption behavior. *Market Lett*, 18, 101-116. doi: 10.1007/s11002-006-9004-8
- Elliott, P. (2006). Reviewing newspaper articles as a technique for enhancing the scientific literacy of student-teachers. *International Journal of Science Education*, 11(15), 1245-1365.
- Entman, R. M. (1993). Framing: Towards clarification of a fractured paradigm. *Journal of Communication*, 43(4), 51-58.
- Fjæstad, B. (2007). Why journalists report science as they do. In Bauer, M. W., & Bucchi, M. (Eds.), *Journalism, science, and society* (pp. 123-132). New York, New York: Routledge.
- Fombonne, E., & Chakrabarti, S. (2001). No evidence for a new variant of measles-mumps-rubella-induced autism. *Pediatrics*, 108(4), e58. doi: 10.1542/peds.108.4.e58
- Fox, S. (2011a). Health topics. Retrieved from <http://www.pewinternet.org/Reports/2011/HealthTopics/Summary-of-Findings.aspx>

- Fox, S. (2011b). The social life of health information, 2011. Retrieved from pewinternet.org/~media/Files/Reports/2011/PIP_Social_Life_of_Health_Info.pdf
- Fox, S. (September 6, 2012). The internet's downsides: Tell us your stories. Retrieved from <http://thehealthcareblog.com/blog/2012/09/06/the-internet%E2%80%99s-downsides-tell-us-your-stori/>
- Freed, G. L., Clark, S. J., Butchart, A. T., Singer, D. C., & Davis, M. M. (2010). Parental vaccine safety concerns in 2009. *Pediatrics*, *125*(4), 654-659. doi: 10.1542/peds.2009-1962
- Freimuth, V. S., Quinn, S. C., Thomas, S. B., Cole, G., Zook, E., & Duncan, T. (2001). African Americans' views on research and the Tuskegee syphilis study. *Social Science and Medicine*, *52*, 797-808.
- Gallup Organization. (2002). Gallup poll September 2002 on health related questions. Retrieved from http://www.ropercenter.ucon...Xqt0Gf/HAHTpage/study_link?STDY_ID=25465
- Gao, F., Zhang, M., & Sadri, S. (2011). Newspapers use more sources compared to health blogs in H1N1/swine flu coverage. *Newspaper Research Journal*, *32*(2), 89-96
- Gao, K. (2003). *The role of situational factors in health-related knowledge gaps: A breast cancer study analysis* (Master's thesis). Syracuse University, Syracuse, NY.
- General Medical Council. (2010). Fitness to practise panel hearing, 24 May 2010, Andrew Wakefield, determination of serious professional misconduct. Retrieved from http://www.gmc-uk.org/Wakefield_SPM_and_SANCTION.pdf_32595267.pdf
- Gerber, J. S., & Offit, P. A. (2009). Vaccines and autism: A tale of shifting hypotheses. *Clinical Infectious Diseases*, *48*(4), 456-461. doi: 10.1086/596476
- Goodin, K. (November 5, 2011). Celebs and vaccines. Retrieved from <http://www.parenting.com/gallery/celebs-and-vaccines?view=home&pnid=112624>

- Grilli, R., Freemantle, N., Minozzi, S., Domeighetti, G., & Finer, D. (2000). Mass media interventions: Effects on health services utilization. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/10796539>
- Gunter, B. (2006). Who do online news consumers trust? *Library and Information Update*, 5(9), 40-41
- Gunter, B., Campbell, V., Touri, M., & Gibson, R. (2009). Blogs, news, and credibility. *Aslib Proceedings*, 61(2), 185-204
- Hanson, G., & Wearden, S. T. (2004). Measuring newscast accuracy: Applying a newspaper model to television. *Journalism and Mass Communication Quarterly*, 81(3), 546-558.
- Hartz, J., & Chappell, R. (1997). *Worlds apart: How the distance between science and journalism threatens America's future*. First Amendment Center: Nashville, TN
- Herring, S. C., Kouper, I., Scheidt, L. A., & Wright, E. L. (2004). Women and children last: The discursive construction of weblogs. Retrieved from http://blog.lib.umn.edu/blogosphere/women_and_children.html
- Hodgetts, D., & Chamberlain, K. (2003). Television documentary in New Zealand and the construction of doctors by lower socio-economic groups. *Social Science & Medicine*, 57, 113-124.
- Honda, H., Shimizu, Y., & Rutter, M. (2005). No effect of MMR withdrawal on the incidence of autism: A total population study. *Journal of Child Psychology and Psychiatry*, 46(6), 572-579. doi: 10.1111/j.1469-7610.2005.01425.x
- Howell, W. L. J. (2010). Mom-to-mom blogs: Hospitals invite women to share experiences. *Hospitals & Health Networks*, 84(10), 18

- Hu, Y., & Sundar, S. S. (2010). Effects of online health sources on credibility and behavioral intentions. *Communication Research, 37*, 105-132
- Huang, C. Y., Shen, Y. Z., Lin, H. X., & Chang, S. S. (2007). Bloggers' motivations and behaviors: A model. *Journal of Advertising Research, 47*(4), 472-484. doi: 10.2501/S0021849907070493
- Institute of Medicine. (August 25, 2011). Adverse effects of vaccines: Evidence and causality. Retrieved from <http://www.iom.edu/Reports/2011/Adverse-Effects-of-Vaccines-Evidence-and-Causality.aspx>
- Johnson, T. J., & Kaye, B. K. (2004). Wag the blog: How reliance on traditional media and the internet influence credibility perceptions of weblogs among blog users. *Journalism & Mass Communication Quarterly, 81*(3), 622-642
- Kaiser Family Foundation/Association of Health Care Journalists. (2009). *Survey of AHJC members*. Menlo Park, CA: Kaiser Family Foundation.
- Kaiser Family Foundation & the Pew Research Center's Project for Excellence in Journalism. (2009). *Health news coverage in the U.S. media*. Menlo Park, CA: Kaiser Family Foundation
- Kennedy, D. (2010). The future of science news. *Daedalus, 139*(2), 57-65, 153.
- Kim, H. S., Bigman, C. A., Leader, A. E., Lerman, C., & Cappella, J. N. (2012). Narrative health communication and behavior change: The influence of exemplars in the news on intention to quit smoking. *Journal of Communication, 62*(3), 473-492
- Klaidman, S. (1990). How well the media report health risks. *Daedalus, 119*(4), 119-132.
- Kolata, G. (1999). Fairness, accuracy and the tyranny of the anecdote: Challenges facing science reporting. *The Quill, 87*(2), 29-32.

- Krippendorff, K. (1980). *Content analysis: An introduction to its methodology*. Thousand Oaks, CA: Sage.
- Laird, S. (May 8, 2012). The rise of the mommy blogger [Infographic]. Retrieved from mashable.com/2012/05/08/mommy-blogger-infographic/
- Lara. (March 2, 2009). Children's vaccines: Are they really safe? Retrieved from www.parenting-blog.net/news/childrens-vaccines-are-they-really-safe/#more-860
- Larsson, A., Oxman, A. D., Carling, C., & Herrin, J. (2003). Medical messages in the media – Barriers and solutions to improving medical journalism. *Health Expectations*, 6, 323-331.
- Lasfsky, M. (July 11, 2008). Autism and vaccinations: A celebrity smackdown. Retrieved from <http://blogs.discovermagazine.com/realitybase/2008/07/11/autism-and-vaccinations-a-celebrity-smackdown/>
- Lombard, M., Snyder-Duch, J., & Bracken, C. C. (2010). Practical resources for assessing and reporting intercoder reliability in content analysis research projects. Retrieved from www.matthewlombard.com/reliability/
- Maier, S. R. (2003a). How sources, reporters view math errors in news. *Newspaper Research Journal*, 24(4), 49-63
- Maier, S. R. (2003b). Numeracy in the newsroom: A case study of mathematical competence and confidence. *Journalism and Mass Communication Quarterly*, 80(4), 921-936
- Mann, R. D. (1995). Breast implants: The tyranny of the anecdote. *Journal of Clinical Epidemiology*, 48(4), 504-506.
- Mayo Clinic. (April 6, 2012). Daily aspirin therapy: Understand the benefits and risks. Retrieved from <http://www.mayoclinic.com/health/daily-aspirin-therapy/HB00073>

- McBride, K. R., Sanders, S. A., Janssen, E. , Grabe, M. E., Bass, J., Sparks, J. V., Brown, T. R., & Heiman, J. R. (2007). Turning sexual science into news: Sex research and the media. *Journal of Sex Research, 44*(4), 347-358. doi: 10.1080/00224490701586722
- Mercer, L., Creighton, S., Holden, J. J. A., & Lewis, M. E. S. (2006). Parental perspectives on the causes of an autism spectrum disorder in their children. *Journal of Genetic Counseling, 15*(1), 41-50. doi: 10.1007/s10897-005-9002-7
- Miller, J. D. (2008). The conceptualization and measurement of civic scientific literacy for the twenty-first century. In Meinwald, J., & Hildebrand, J. G. (Eds.), *Science and the educated American: A core component of liberal education* (pp. 241-255). American Academy of Arts & Sciences.
- Miller, E. A., & Pole, A. (2010). Diagnosis blog: Checking up on health blogs in the blogosphere. *American Journal of Public Health, 100*(8), 1514-1519.
doi:10.2105/AJPH.2009.175125
- Mitchell, C. (June 2012). Is autism caused by parents or environmental factors? Retrieved from <http://guardianlv.com/2012/06/is-autism-caused-by-parents-or-environmental-factors/>
- Molitor, F. (1993). Accuracy in science news reporting by newspapers: The case of aspirin for the prevention of heart attacks. *Health Communication, 5*(3), 209-224.
- Mooney, C. (2009). Why does the vaccine/autism controversy live on? *Discover*. Retrieved from <http://discovermagazine.com/2009/jun/06-why-does-vaccine-autism-controversy-live-on>
- Mooney, C., & Kirshenbaum, S. (2009). *Unscientific America: How scientific literacy threatens our future*. New York, NY: Perseus.

- Moynihan, R., Bero, L., Ross-Degnan, D., Henry, D., Lee, K., Watkins, J., Mah, C., Soumerai, S. C. (2000). Coverage by the news media of the benefits and risks of medications. *The New England Journal of Medicine*, 342(22), 1645-1650.
- Mustich, E. (June 19, 2012). Vaccines: 'Shot-limiting' on the rise in Portland, study finds. Retrieved from http://www.huffingtonpost.com/2012/06/19/shot-limiting-study-vaccines_n_1609102.html
- Nardi, B. A., Schiano, D. J., Gumbrecht, M., & Swartz, L. (2004). Why we blog. *Communications of the ACM*, 47(12), 41-46.
- National Cancer Institute. (1998). Improving public understanding: Guidelines for communicating emerging science on nutrition, food safety, and health. *Journal of the National Cancer Institute*, 90(3), 194-199.
- National Institute of Health. (2010). Autism. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0002494/>
- National Science Foundation. (2002). Science and technology: Public attitudes and public understanding. Retrieved from <http://www.nsf.gov/statistics/seind02/c7/c7s4.htm>
- National Science Foundation. (2010). *Science and engineering indicators 2010*. Arlington, VA: National Science Foundation.
- Nield, L. S. (2008). Anti-vaccine media: Its impact—and strategies to combat it. *Consultant for Pediatricians*, September 2008, 54-58.
- Omer, S. B., Salmon, D. A., Orenstein, W. A., deHart, M. P., & Halsey, N. (2009). Vaccine refusal, mandatory immunization, and the risks of vaccine-preventable diseases. *New England Journal of Medicine*, 360, 1981-1988.

- Parker, S. K., Schwartz, B., Todd, J., & Pickering, L. K. (2004). Thimerosal-containing vaccines and autistic spectrum disorder: A critical review of published original data. *Pediatrics*, *114*(3), 793-804. doi: 10.1542/peds.2004-0434
- Parliamentary Office of Science and Technology. (2004). Vaccines and public health. *Postnote*, *219*, 1-4.
- Perlmutter, D. D., & Schoen, M. (2007). "If I break a rule, what do I do, fire myself?" Ethics codes of independent blogs. *Journal of Mass Media Ethics*, *22*(1), 37-48.
- PhDinParenting. (August 13, 2009). Typology of the mommy blogger. Retrieved from <http://www.phdinparenting.com/2009/08/13/typology-of-the-mommy-blogger/#.UAhP1DGe7GI>
- Price, C. S., Thompson, W. W., Goodson, B., Weintraub, E. S., Croen, L. A., Hinrichsen, V. L., Marcy, M., Robertson, A., Eriksen, E., Lewis, E., Bernal, P., Shay, D., Davis, R. L., & DeStefano, F. (2010). Prenatal and infant exposure to thimerosal from vaccines and immunoglobulins and risk of autism. *Pediatrics*, *126*(4), 656-664. doi: 10.1542/peds.2010-0309
- Quick, B. (2009). The effects of viewing Grey's Anatomy on perceptions of doctors and patient satisfaction. *Journal of Broadcasting and Electronic Media*, *53*(1), 38-55
- Radford, T. (2007). Scheherazade: Telling stories, not educating people. In Bauer, M. W., & Bucchi, M. (Eds.), *Journalism, science, and society* (pp. 95-100). New York, NY: Routledge.
- Reed, R., & Walker, G. (2002). Listening to scientists and journalists. Retrieved from <http://www.nieman.harvard.edu/reports/article/101305/Listening-to-Scientists-and-Journalists.aspx>

- Reinberg, S. (October 21, 2011). Unvaccinated behind largest US measles outbreak in years. Retrieved from <http://yourlife.usatoday.com/health/story/2011-10-21/Unvaccinated-behind-largest-US-measles-outbreak-in-years/50852098/1>
- Rosen, B. S., & Hirce, K. A. (2011). Are bloggers, citizen journalists, and other new media covered by shield laws? *Communications Lawyer*, 28(3). Retrieved from http://www.marcw.com/pdf/bloggers_citizen_journalists_new_media_shield_laws.pdf
- Roper Center. (2008). EBRI/MGA consumer engagement in health care survey, Aug, 2008. Retrieved from http://webapps.ropercenter.uconn.edu/cfide/psearch_test/webroot/multquestion_view.cfm?QSTN_ID2=1735744&QSTN_ID2=1735746&QSTN_ID2=1735748&QSTN_ID2=1735749&QSTN_ID2=1735750&QSTN_ID2=1735751&QSTN_ID2=1735752&qid=+1735748+1735749+1735750+1735751+1735752+1735744+1735746&pid=4&ccid=0&x=56&y=4
- Rowe, S., & Alexander, N. (2010). Transparency in health/nutrition news: Stripping away the “emperor’s new clothes.” *Nutrition Today*, 46(6), 258-261.
- Rubin, A. M. (1986). Uses, gratifications, and media effects research. In Bryant, J., & Zillmann, D. (Eds.) *Perspectives on media effects* (pp 281-301). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Scheufele, D. A. (1999). Framing as a theory of media effects. *Journal of Communication*, 49(1), 103-122. doi: 10.1111/j.1460-2466.1999.tb02784.x
- Schulman, D. (2005). Drug test. *Columbia Journalism Review*, 44(4), 44-50.
- Schwitzer, G. (2004). A statement of principles for health care journalists. *The American Journal of Bioethics*, 4(4), W9-W13. doi: 10.1080/15265160490908086

- Smith, M. J., Ellenberg, S. S., Bell, L. M., & Rubin, D. M. (2008). Media coverage of the measles-mumps-rubella vaccine and autism controversy and its relationship to MMR immunization rates in the United States. *Pediatrics, 121*. e836-e843. doi: 10.1542/peds.2007-1760
- Southwell, B. G., & Torres, A. (2006). Connecting interpersonal and mass communication: Science news exposure, perceived ability to understand science, and conversation. *Communication Monographs, 73*(3), 334-350.
- Specter, M. (2009). *Denialism: How irrational thinking harms the planet and threatens our lives*. New York, NY: Penguin.
- Swanke, J., Zeman, L. D., & Doktor, J. (2009). Discontent and activism among mothers who blog while raising children with autism spectrum disorders. *Journal for the Association for Research on Mothering, 11*(1), 199-210.
- Szabo, L. (December 22, 2009). Are celebrities crossing the line on medical advice? Retrieved from http://www.usatoday.com/news/health/2009-12-23-celebrity23_CV_N.htm
- Tu, H. T. (2011). Surprising decline in consumers seeking health information. Retrieved from <http://www.hschange.com/CONTENT/1260>
- United States Census Bureau. (2010). Professional, scientific, and technical services. Retrieved from http://www2.census.gov/services/sas/data/54/2009_NAICS54.pdf
- Vega, T. (May 3, 2011). Wall Street Journal still first in daily circulation. Retrieved from <http://mediadecoder.blogs.nytimes.com/2011/05/03/wall-street-journal-still-first-in-daily-circulation/>
- Voelker, R. (1998). Getting the story straight on nutrition. *JAMA, 279*(6), 417.

- Wakefield, A. J., Murch, S. H., Anthony, A., Linnell, J., Casson, D. M., Malik, M., Berelowitz, M., Dhillon, A. P., Thomson, M. A., Harvey, P., Valentine, A., Davies, S. E., & Walker-Smith, J. A. (1998). Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children. *The Lancet*, *351*(9103), 637-641
- Wischnowski, B. J. (2009). Bloggers with shields: Reconciling the blogosphere's intrinsic editorial process with traditional concepts of media accountability. Retrieved from http://www.uiowa.edu/~ilr/issues/ILR_97-1_Wischnowski
- Woloshin, S., Schwartz, L. M., & Kramer, B. S. (2009). Promoting healthy skepticism in the news: Helping journalists get it right. *Journal of the National Cancer Institute*, *101*(23), 1596-1599
- World Health Organization. (2001). Smallpox. Retrieved from <http://www.who.int/mediacentre/factsheets/smallpox/en/>
- Zeman, L. D., Swanke, J., & Doktor, J. (2011). Strengths classification of social relationships among cybermothers raising children with autism spectrum disorders. *The School Community Journal*, *21*(1), 37-51
- Zillman, D. (2006). Exemplification effects in the promotion of safety and health. *Journal of Communication*, *56*, S221-S237.

Appendix A Coding Structure

File name

Parent blog name — if blog is part of a parent blog, include both; for example, “Goodyblog/Parenting.com”

Word count — Highlight contents of blog post, beginning with title and ending at the LAST sentence written by the blog author, including any leads to further information (“for more information, see [website]”), polls, and discussion prompts (“commenters, what do you think?”). DO NOT include photo captions, comment section, related links, date posted, or author byline.

Number of photos — do not include embedded videos

Number of words in photo captions

Date posted — if date cannot be found, use date of earliest posted comment.

Author/User name

Author’s gender

- 1 female
- 2 male
- 3 unknown

Author’s parenting status — can be found either in the blog post or blogger’s bio

- 1 mother
- 2 father
- 3 not a parent
- 4 unknown

Age of author’s child(ren) at time of blog post (approx.) (if applicable) — if age is not apparent, list number of child(ren). Can be found either in blog post or blogger bio. If no information can be found, write **n/a**

Author’s profession/credentials/background — if not evident in blog post, check blogger bio. Be as specific as possible, ie, “pediatrician” is better than “doctor.” Make note of “former” careers (for example, “blogger, former health columnist”)

Blog type

- 1 social (blog with many freelance contributors, as opposed to blogs that have many contributors who work for the blog. Articles from the Stir and CafeMom fall into this category.)
- 2 personal autism-centric
- 3 personal non-autism-centric

- 4 affiliate (run by a parent company, for example, the blog of a newspaper or magazine)
- 5 independent (may be owned by a larger media company but functions as an independent blog)

Author has vaccinated own children

- 1 yes
- 2 no
- 3 vaccinated some but not others
- 4 no children
- 5 not mentioned

If author chose not to vaccinate some or all children, list reason(s) why.

Author recommends vaccinating (note: some parents do not recommend vaccinating but have vaccinated own children, or vice-versa)

- 1 yes
- 2 no, because of autism risk
- 3 yes, with provisions (list)
- 4 no, but for reasons other than autism or for unspecified reasons (list)
- 5 no recommendation made

Author's stance on vaccines — use context clues and overall tone of article to infer

- 1 pro-vaccine
- 2 anti-vaccine because of autism risk
- 3 anti-vaccine for other reasons
- 4 pro-vaccine with provisions (alterations to schedule, skipping some shots, etc)
- 5 is conflicted
- 6 no stance or opinion given

Author's stance on vaccine/autism link — use context clues and overall tone of article to infer

- 1 Indicate author's lack of stance
- 2 Indicates personal conflict regarding link
- 3 Acknowledges public conflict regarding link
- 4 Deny autism/vaccine link
- 5 Support autism/vaccine link

Copy and paste statements that describe the link between vaccines and autism. Code each statement as the following:

- 1 Indicate author's lack of stance
- 2 Indicates personal conflict regarding link
- 3 Acknowledges public conflict regarding link
- 4 Deny autism/vaccine link
- 5 Support autism/vaccine link

Post mentions any of the following (# of times):

Andrew Wakefield (by name), Jenny McCarthy, thimerosal, mercury, David Kirby, CDC, FDA, NIH, Lancet, Pediatrics, American Pediatric Association— **List number of each; for names, do not include pronouns**

Number of outside sources cited in post— sources include interviews, journal articles, news stories, other blog posts, websites. Do not include personal communications or anecdotes. “Personal communications” includes any interpersonal interaction, such as conversations with friends and family members, that are NOT made in a professional context. Include ALL sources/references, even if they are not accompanied by a link. Include ALL sources even if they do not appear to directly relate to the autism/vaccine controversy.

If the author is, for example, a pediatrician, and is speaking about an incident or conversation that happened in the course of her professional observation (for example, “I see many worried parents”), cite this as an ANECDOTE (see below), not as a source. If the author, however, is speaking to or quoting a pediatrician, this would be cited as a source.

For each source, provide the following:

Link to source (if provided)

Link status (note if link is inappropriate or unrelated to citation; for example, citing an NIH study but linking to the NIH homepage)

- 1 appropriate
- 2 inappropriate/unrelated
- 3 dead

Date the source material was created or posted

Is source cited correctly?— if not, explain error (misinterpreted results, out of context statement, etc)

- 1 yes, correct
- 2 no, incorrect
- 3 unknown (dead link, inappropriate page, etc)

Source (as cited, in context of article) pertains to autism/vaccine link

- 1 yes
- 2 vaccines but not autism
- 3 autism but not vaccines
- 4 neither vaccines nor autism

Source is used to refute or support link

- 1 refute
- 2 support
- 3 neither (for example, provides a definition or other resource)

Number of personal anecdotes provided in post— include stories from author’s personal experience, as well as stories author heard from other people (for example, “my cousin thinks…” or “one of the other PTA moms is sure that…”)

For each anecdote, provide the following:

Does anecdote support or refute the autism/vaccine link?

- 1 supports autism/vaccine link
- 2 denies autism/vaccine link
- 3 indicates personal conflict regarding link (example: “I am torn—both arguments are compelling.”)
- 4 indicates or acknowledges public conflict regarding link (example: “There has been much debate over whether vaccines cause autism.”)
- 5 indicates author’s lack of stance (example: “I don’t care what causes autism.”)

Anecdote source

- 1 author’s experience (personal)
- 2 author’s experience (professional— provide context)
- 3 vicarious experience (friend, family)— author heard from said person but was not directly involved in the quoted incident or experience
- 4 other

Vita

Aidan Bryant was born in Rochester, New York, on August 26th, 1988. After completing her Bachelor of Arts in Communication at the State New York of Geneseo in 2010, Aidan entered the Media Studies program at Syracuse University. She graduated with a Master of Arts in 2012. At the time this thesis was completed, she was employed as a User Experience Researcher at UserTesting.com, Mountain View, California.

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