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# The Use of the Internet for Alternative Views on Health

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# The Use of the Internet for Alternative Views on Health

## **Abstract**

Today, the majority of American adults uses the internet and looks for health information online. Of interest in this dissertation are people who do not subscribe to mainstream views of health, and may use the internet to discover, bolster, or share their alternative views. Although the Centers for Disease Control and Prevention (CDC) have named fluoridated drinking water and vaccination as two of the top ten public health achievements of the 20th century, there is a significant minority of people who has concerns about the safety and effectiveness of these practices.

There are two essential purposes for this dissertation. First, it describes the nature of internet use among people who hold nonmainstream views of health issues. Second, it tests the hypotheses that the extent of people's internet use is a reflection of two classes of influence: 1) individual traits, such as demographic characteristics, feelings of estrangement, and need for cognition, and 2) their inability to find support from other sources, specifically mainstream media and their face-to-face social network. These analyses are informed by three sets of data: interviews with people who have varying views on fluoridation, a pair of nationally representative surveys (one on the MMR vaccine, and one on fluoridated water), and a corresponding pair of purposive surveys.

The interview results identified important themes and issues surrounding nonmainstream health beliefs, especially their connection to personal experience and perceived credibility of information sources. The representative surveys found that approximately 10% of Americans believe that the MMR vaccine and fluoridated water are unsafe, with the rest of the population about evenly divided between being uncertain and believing that the health measures are safe. Notably, believing that these measures were unsafe was unrelated to any demographic characteristics, but internet use on those topics was strongly related. Internet use on those topics was associated with youth and college education, as well as perceiving the news media as having a different view from their own. The lack of social network support for one's views on these topics, however, was unrelated to internet use. The implications of these findings and future research directions are discussed.

## **Degree Type**

Dissertation

## **Degree Name**

Doctor of Philosophy (PhD)

## **Graduate Group**

Communication

## **First Advisor**

Robert C. Hornik

## **Keywords**

Fluoridation, Health beliefs, Health controversies, Internet use, Vaccination

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**Subject Categories**  
Communication

THE USE OF THE INTERNET FOR ALTERNATIVE VIEWS ON HEALTH

Angel Bourgoin

A DISSERTATION

in

Communication

Presented to the Faculties of the University of Pennsylvania in Partial Fulfillment of the  
Requirements for the Degree of Doctor of Philosophy

2013

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THE USE OF THE INTERNET FOR ALTERNATIVE VIEWS ON HEALTH

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## ACKNOWLEDGEMENTS

I have many people to thank for their contribution to this dissertation. Without their guidance and support, I would not have the knowledge or skills to be a researcher, let alone one who would complete a doctoral thesis. The amount of gratitude I feel greatly outmatches the space in which I am communicating it, and I hope this disparity can be forgiven.

First and foremost, I must thank my advisor and dissertation chair, Dr. Robert Hornik. His teachings and research guidance formed much of my education at Annenberg, and the lessons I have learned from him have stretched beyond academe. I am grateful to have benefited from his wisdom, patience, and thoughtfulness for these past six years. Thanks are also owed to my committee members: Dr. Messaris, for his kind and steady support in all my endeavors, and Dr. Katz, for his captivating questions and contagious curiosity. I am appreciative of the unique perspectives they have been able to offer on my thesis, and even more, their influence on how I think about and approach research as a whole.

I would also like to thank the Annenberg community for their encouragement, assistance, and friendship. Thanks to Walter and Leonore Annenberg, for generously endowing the Annenberg School for Communication, so that it can be a premier institution of communication scholarship. Thanks to Dean Michael Delli Carpini for always advocating for and enriching students' academic development. Thanks to Beverly Henry, Rose Halligan, and Joanne Murray, for shepherding me, among many other graduate students, to the completion of our degrees. Finally, thanks to the wonderful

colleagues and friends I have met at Annenberg. I have learned and gained so much from these bright and inspiring individuals. Thanks to my office mates, Brooke Duffy and Mario Rodriguez, whom I am indebted to for their tireless compassion and sense of fun. Thanks to my peer mentor, Rebekah Nagler, for her always helpful advice and example. I would also like to thank Cabral Bigman, Peter Busse, Derek Freres, Shawnika Hull, Rocio Nunez, Sarah Parvanta, Elizabeth Roodhouse, Ashley Sanders-Jackson, Adrienne Shaw, Andy Tan, Jason Tocci, and Sarah Vaala for their friendship, collaboration, and knowledge.

Last but not least, I owe thanks to my family. I am grateful to my parents, Julie and Dr. Ho, for their sacrifices and their faith in me. I am thankful for the support of my in-laws, who have welcomed me into their homes with the utmost warmth and kindness. And I am thankful especially to my husband, Keith Bourgoïn, who has been with me through my best and worst moments. He has been my greatest champion through all of graduate school and this dissertation. His patience, empathy, and encouragement have been invaluable to me, and I cannot thank him enough.

## **ABSTRACT**

### **THE USE OF THE INTERNET FOR ALTERNATIVE VIEWS ON HEALTH**

Angel Bourgoin

Robert C. Hornik

Today, the majority of American adults uses the internet and looks for health information online. Of interest in this dissertation are people who do not subscribe to mainstream views of health, and may use the internet to discover, bolster, or share their alternative views. Although the Centers for Disease Control and Prevention (CDC) have named fluoridated drinking water and vaccination as two of the top ten public health achievements of the 20<sup>th</sup> century, there is a significant minority of people who has concerns about the safety and effectiveness of these practices.

There are two essential purposes for this dissertation. First, it describes the nature of internet use among people who hold nonmainstream views of health issues. Second, it tests the hypotheses that the extent of people's internet use is a reflection of two classes of influence: 1) individual traits, such as demographic characteristics, feelings of estrangement, and need for cognition, and 2) their inability to find support from other sources, specifically mainstream media and their face-to-face social network. These analyses are informed by three sets of data: interviews with people who have varying views on fluoridation, a pair of nationally representative surveys (one on the MMR vaccine, and one on fluoridated water), and a corresponding pair of purposive surveys.

The interview results identified important themes and issues surrounding nonmainstream health beliefs, especially their connection to personal experience and



perceived credibility of information sources. The representative surveys found that approximately 10% of Americans believe that the MMR vaccine and fluoridated water are unsafe, with the rest of the population about evenly divided between being uncertain and believing that the health measures are safe. Notably, believing that these measures were unsafe was unrelated to any demographic characteristics, but internet use on those topics was strongly related. Internet use on those topics was associated with youth and college education, as well as perceiving the news media as having a different view from their own. The lack of social network support for one's views on these topics, however, was unrelated to internet use. The implications of these findings and future research directions are discussed.

## TABLE OF CONTENTS

LIST OF TABLES .....	vii
LIST OF FIGURES .....	ix
INTRODUCTION .....	1
CHAPTER ONE	
ALTERNATIVE BELIEFS AND ALTERNATIVE MEDIA .....	
The notion of alternative beliefs .....	4
Alternative belief #1: The MMR vaccination leads to autism .....	8
Alternative belief #2: Water fluoridation is a dangerous practice .....	12
Why do people choose to use the media that they do? .....	17
Why do people look for alternative information? .....	20
CHAPTER TWO	
GETTING TO KNOW PEOPLE WHO HOLD ALTERNATIVE BELIEFS .....	
Beyond stereotypes .....	24
Methods .....	25
Results .....	26
Discussion .....	31
CHAPTER THREE	
AMERICANS' ALTERNATIVE BELIEFS AND BEHAVIORS .....	
Past research on beliefs about the MMR vaccine and fluoridated water .....	33
Methods .....	36
Results .....	40
Discussion .....	50
CHAPTER FOUR	
VALIDATING INTERNET ENGAGEMENT .....	
Conceptualizing internet engagement .....	54
Criteria for validating the internet engagement measure .....	60
Methods .....	63
Results .....	69
Discussion .....	70
CHAPTER FIVE	
BASIC VARIABLES IN RELATION TO INTERNET ENGAGEMENT .....	
Demographics and their relation to health-related internet use .....	74
Methods .....	79
Results .....	82
Discussion .....	88

CHAPTER SIX	
MEDIA DISSOCIATION AND INTERNET ENGAGEMENT .....	
Personal position, perceived network position, and internet engagement .....	91
Methods.....	97
Results.....	102
Discussion.....	111
CHAPTER SEVEN	
NETWORK DISSOCIATION AND INTERNET ENGAGEMENT.....	
The role of social networks in one’s beliefs .....	114
Methods.....	117
Results.....	120
Discussion.....	126
CHAPTER EIGHT	
NEED FOR COGNITION AND INTERNET ENGAGEMENT .....	
Need for cognition .....	127
Methods.....	129
Results.....	131
Discussion.....	134
CONCLUSION.....	136
REFERENCES .....	142

## LIST OF TABLES

Table 3.1. Weighted demographic characteristics of the MMR vaccine and fluoridated water samples (representative samples). .....	41
Table 3.2. Weighted health information source use in the MMR vaccine and fluoridated water samples (representative samples). .....	41
Table 3.3. Weighted prevalence of behaviors supportive of and in opposition to the MMR vaccine.....	45
Table 3.4. Weighted prevalence of behaviors supportive of and in opposition to the MMR vaccine.....	45
Table 3.5. Weighted prevalence of holding the alternative belief about the MMR vaccine given various demographic characteristics. ....	46
Table 3.6. Weighted prevalence of holding the alternative belief about fluoridated water given various demographic characteristics. ....	46
Table 3.7. Weighted prevalence of holding the alternative belief about the MMR vaccine given different types of health information source use. ....	48
Table 3.8. Weighted prevalence of holding the alternative belief about fluoridated water given different types of health information source use.....	48
Table 3.9. Weighted prevalence of holding the alternative belief about the MMR vaccine given different behaviors related to the MMR vaccine. ...	50
Table 3.10. Weighted prevalence of holding the alternative belief about fluoridated water given different behaviors related to fluoridated water. ....	50
Table 4.1. Correlations of internet engagement with other variables. ....	70
Table 5.1. Demographic characteristics of the MMR vaccine and fluoridated water samples (purposive samples). ....	84
Table 5.2. Correlations of demographic characteristics with internet engagement on the MMR vaccine and fluoridated water. ....	85
Table 5.3. Correlations of psychological characteristics with internet engagement on the MMR vaccine and fluoridated water. ....	86

Table 5.4. Regression results predicting internet engagement by demographic characteristics and alienation in the MMR vaccine sample.....	87
Table 5.5. Regression results predicting internet engagement by demographic characteristics in the fluoridated water sample.....	88
Table 6.1. Distribution of personal and perceived news position regarding the MMR vaccine.....	102
Table 6.2. Distribution of personal and perceived news position regarding fluoridated water. ....	103
Table 6.3. Summary of regression analyses for internet engagement, based on personal position, interest, health information source use, and perceived news position in the MMR vaccine and autism survey.....	105
Table 6.4. Summary of regression analyses for internet engagement, based on personal position, interest, health information source use, and perceived news position in the fluoridated water survey.....	108
Table 7.1. Distribution of personal and perceived social network position regarding the MMR vaccine. ....	120
Table 7.2. Distribution of personal and perceived social network position regarding fluoridated water.....	120
Table 7.3. Summary of regression analyses for internet engagement, based on personal position, interest, health information source use, and perceived social network position in the MMR vaccine and autism survey. ....	122
Table 7.4. Summary of regression analyses for internet engagement, based on personal position, interest, health information source use, and perceived social network position in the fluoridated water survey. ....	124
Table 8.1. Summary of regression analyses for internet engagement, based on personal position, health information source use, and need for cognition in the MMR vaccine and autism survey. ....	132
Table 8.2. Summary of regression analyses for internet engagement, based on personal position, health information source use, and need for cognition in the fluoridated water survey. ....	133

## LIST OF FIGURES

Figure 3.1. Distribution of beliefs about the MMR vaccine and fluoridated water.....	42
Figure 6.1. Predicted scores for internet engagement in the MMR vaccine sample (media dissociation graph).....	106
Figure 6.2. Predicted scores for internet engagement in the fluoride sample (media dissociation graph).....	109
Figure 7.1. Predicted scores for internet engagement in the MMR vaccine sample (network dissociation graph).....	123
Figure 7.2. Predicted scores for internet engagement in the fluoride sample (network dissociation graph).....	125

## INTRODUCTION

At the end of the 20<sup>th</sup> century, the United States Centers for Disease Control and Prevention reviewed the public health achievements of the past hundred years, noting that the health and life expectancy of Americans had improved dramatically (Centers for Disease Control and Prevention, 1999). Among their list of top ten greatest public health achievements were two public health measures that still face some controversy today: vaccination and fluoridated drinking water. Though the mainstream medical establishment champions these measures as some of the greatest triumphs of medicine, activist groups such as Generation Rescue (who fight against toxins in vaccines) and the Fluoride Action Network (who aim to remove fluoride from public water systems) oppose them, with some visibility and success. Public health is not as easy as making recommendations that people will simply learn and follow, as we live in a society that prizes individual rights and freedoms, and an age in which people have ample access to purported experts of all kinds.

Today, the majority of American adults uses the internet and looks for health information online (Fox, 2011). The internet will likely remain a major source of information due to its convenience and sheer quantity of content, even though the quality of some of it may be questionable (Eysenbach, Powell, Kuss, & Sa, 2002). Of interest in this dissertation are people who do not subscribe to mainstream views of health, and may use the internet to discover, bolster, or share their alternative views. Arguably, alternative views held by these individuals are not especially harmful to society when it comes to individual-level health choices, such as eating fruits and vegetables. However, there are

some health decisions that must be decided by and affect the entire community, as is the case with vaccination and water fluoridation. These topics are of particular interest due to the necessity of community-level decisions and behavior, and the controversy over their safety and effectiveness, rather than simply the policy of implementation.

There are two essential purposes for this dissertation. First, it describes the nature of internet use among people who hold views of health issues that veer from the mainstream. Second, this dissertation tests the hypotheses that the extent of people's internet use is a reflection of two classes of influence: 1) individual traits, such as demographic characteristics, feelings of estrangement, and need for cognition, and 2) their inability to find support from other sources, specifically mainstream media and their face-to-face social network. These analyses are informed by three sets of data: a set of interviews with people who have varying views on fluoridation, a pair of nationally representative surveys (one on the MMR vaccine and the other on fluoridated water), and a pair of purposive surveys (again, one on the MMR vaccine and the other on fluoridated water).

Chapter One defines the term "alternative belief," which describes some belief that is held by a perceived minority of the population. This term unites the two health topics studied in this dissertation, and serves as the inspiration for the hypotheses studied. Chapter Two presents the results of interviews with people who have varying backgrounds and views on fluoridation, to offer some real world context for the issues studied. Chapter Three examines the distribution of alternative beliefs and related behaviors in the United States, as well as what characteristics might be associated with



them. Chapter Four then shifts from the description of alternative belief holders to the role of the internet for alternative beliefs. This chapter conceptualizes and validates a different, multidimensional approach to measuring internet use, called internet engagement. Chapter Five utilizes this measure to examine whether demographic and psychological characteristics are associated with it; Chapter Six tests whether the lack of support from mainstream media is linked with internet engagement; Chapter Seven tests whether the lack of social network support is linked with it; Chapter Eight examines need for cognition as a predictor of internet engagement. Together, these studies will offer a clearer understanding of the relationship between beliefs and media use that have implications for community policy and health.

## **CHAPTER ONE: ALTERNATIVE BELIEFS AND ALTERNATIVE MEDIA**

### **The notion of alternative beliefs**

My interest in fluoridation and vaccination stem from an interest in varying views about health. Depending on whom you ask, you may hear extremely different answers about who is a health expert, what should be done to prevent or treat some malady, and whether the medical field can be trusted at all. However, rather than investigating public opinion, I am interested in public *fact* (or public belief about facts). The definitions of fact and opinion are certainly distinct, with the former referring to a verifiable statement about the world and the latter referring to a subjective point of view. While it is perfectly acceptable for people to disagree on their opinions, to disagree on facts can impair discussion and understanding, especially when a community decision must be made. Although political news content may be biased and encourage different opinions, media coverage of science, and about health in particular, cannot afford the same latitude. Differences in political opinion are considered important and beneficial; disagreements about scientific fact are considered problematic and negative. Though research produces new findings every day, there are some well-established facts that, if contested by the public, can lead to serious consequences on both the individual and policy level.

I consider alternative beliefs to be related to but distinct from existing literature on concepts like misinformation, myth, and conspiracy theories. Two important dimensions in classifying whether a belief is credible are its validity (defined as “true” to the best of society’s expert knowledge) and the proportion of ordinary people who

believe it to be true. An accepted fact, for instance, is a belief that most people accept and for which society's experts have substantial evidence (e.g. the earth is round). On the other hand, sometimes there are beliefs that many people accept for which there is not much expert credence, such as myths and superstitions. Misinformation is a concept that only maps onto the validity dimension, and refers to information that has no or inaccurate evidence, regardless of how many people believe it. Current terms that describe beliefs held by a minority, such as conspiracy theory and new discovery, imply little or plenty of expert support, respectively.

For this dissertation, I am especially interested in a subset of beliefs held by a perceived minority of the population. I am interested in those views that are believed in spite of what the majority or experts think (not to spite them). Knowingly believing something that is in conflict with convention is understandably puzzling to most people, or people who hold the mainstream belief. Issues that are widely perceived as controversial and ambiguous can lead to uncertainty and inertia (Viscusi, Magat, & Huber, 1999; Han, Moser, & Klein, 2007), and these are considered very reasonable reactions. On the other hand, it takes a certain motivation in order to go against the grain and reject those beliefs that are (supposedly) widely accepted. I am not concerned with beliefs that people hold for the sake of being oppositional, as in the case of reactance, but rather unconventional ideas that people choose for some other reason. To be specific, I am interested in those beliefs that 1) are explicitly and discretely discussed in media, 2) are not supported by society's authorities on the subject, 3) are generally perceived as a minority belief, and 4) are related to socially relevant outcomes. I will label these as

“alternative beliefs,” because “alternative” suggests a different possibility without too strong of a positive or negative connotation, especially with regard to legitimacy.

I should clarify what I mean by perceived minority status. Actual belief distribution in the population is not my primary concern, but rather public perceptions about which beliefs are held by the majority or minority. Public perception of who is in the minority can be extrapolated from the discourse surrounding the belief in various spheres, such as news media coverage, laws, and blogs, and from alternative belief holders themselves. Perceived, not actual minority status, is the important criterion for my definition of alternative beliefs. While I imagine in many cases actual belief distribution is related to perceived distribution, they are not necessarily identical to one another. In fact, many social science models and concepts assume that actual and perceived belief distributions are distinct from one another, as in the case of the spiral of silence theory (Noelle-Neumann, 1974, 1984), bandwagon effect (Nadeau, Cloutier, & Guay, 1993), and false consensus effect (Ross, Green, & House, 1977). These models posit that people are able to perceive what the prevailing public opinion is, even without looking at poll results (e.g. Noelle-Neumann’s idea of a “quasi-statistical sense organ”; Gunther’s persuasive press inference model, 1988). These models hypothesize that perceiving oneself to be in the minority on some topic has an effect on one’s beliefs or the likelihood that one will express them out loud.

I would also like to clarify here that I am not interested in scientific controversy, but rather public controversy and discourse. Clearly, what experts research and publish has implications for public policy and what people believe. However, similar to my focus

on perceived belief distribution rather than actual belief distribution, I am interested in what is publicly perceived as factual and accurate, rather than what experts say. Public health campaigns and news coverage about scientific discoveries sometimes aim to reduce the discrepancy between what experts and the public believe. The larger public only understands scientific knowledge insofar as they have learned it from some source, such as their social networks or media use. Scientific controversy is only important to my interest in alternative beliefs insofar as it may be a part of public discourse, which would then affect a belief's perceived "alternativeness" on both policy/scientific grounds and on public belief grounds.

For this dissertation, I will focus on two public health measures that are considered highly valuable by most, but highly controversial by a few. Vaccination and water fluoridation have been listed among the top ten health achievements of the 20<sup>th</sup> century by the CDC, but there exist a vocal minority who disagree about the factual claims about the value of these behaviors, which leads some people to fight against policy promoting these measures. I categorize the beliefs that vaccination and fluoridation are dangerous to be "alternative beliefs" that go against conventional wisdom or authority. I will focus on these beliefs about risk rather than policy views, because I am interested in public fact, not opinion. Vaccination and water fluoridation danger are topics that fit my definition of alternative beliefs, because they are possible to examine in media content, are not supported by American authorities on the subject, are perceived to be a belief held by a minority of the population, and are related to socially relevant outcomes. Furthermore, these two cases are useful to contrast; they both relate to

community-level decisions about implementation, but they have received different amounts of recent mainstream media coverage. These two cases will be valuable to study my research questions and hypotheses, which are concerned with a person's views, what they perceive to be the view of the news media and their social network, and internet engagement. For the moment, however, let us turn to some background information about vaccination and water fluoridation and why these topics have been so disputed by some.

### **Alternative belief #1: The MMR vaccination leads to autism**

Anti-vaccination sentiment is nothing new (Streefland, 2001; Colgrove, 2005). It was particularly vehement during the Progressive Era in the United States, when legally mandated vaccination was much more controversial. Government and corporate expansion into previously private spheres, such as school screening for vision defects and life insurance companies requiring physical exams, triggered anxiety over whether citizens would be able to maintain control over their own health. Then, as now, there were also alternative health movements, like physical culture and chiropractic, which opposed the practice of vaccination. Such tensions remain today, with individual choices facing state control, and alternative medicine facing traditional medicine. The most recent vaccination scare has been about the measles, mumps, and rubella (MMR) vaccination.

In February 1998, *The Lancet* published a controversial paper that suggested a link between the MMR vaccine and autism (Wakefield et al., 1998). (In 2010, *The Lancet* retracted this article and the lead author had his medical license revoked due to unethical practices.) Although other medical studies failed to corroborate this link and health

professionals continued to support giving MMR vaccinations (Miller & Reynolds, 2009; Allan & Ivers, 2010; Madsen et al., 2002; Smeeth et al., 2004; Doja & Roberts, 2006), public confidence was shaken. The *Lancet* article stimulated a slew of public concerns over vaccine ingredients, too many vaccines overloading or weakening the immune system, and so on (Chatterjee & O'Keefe, 2010). Studies have found that the majority of American parents have concerns about vaccine safety and efficacy (Freed, Clark, Butchart, Singer, & Davis, 2010; Kennedy, Basket, & Sheedy, 2011; Kennedy, LaVail, Nowak, Basket, & Landry, 2011). Uptake of the MMR vaccine fell in both the US and the UK (Smith, Ellenberg, Bell, & Rubin, 2008; Ramsay, Yarwood, Lewis, Campbell, & White, 2002; Wright & Polack, 2005). Measles and mumps outbreaks, once thought to have been eliminated from these countries, have reappeared in recent years (DeNoon, 2012; CDC 2011), resulting in some fatalities.

Researchers have frequently pointed to media as a major source of damaging public confidence in the MMR vaccine, and have accused journalists of sensationalism and poor investigation (Begg, Ramsay, White, & Bozoky, 1998; Poland & Jacobson, 2001; Elliman & Bedford, 2001; Bedford & Elliman, 2003). In both the US and UK, grassroots organizations emerged to warn parents about the dangers of the MMR vaccine and to litigate on behalf of families with children who were allegedly harmed by vaccines. Celebrity spokespersons for the anti-vaccine movement, such as model and actress Jenny McCarthy, have written books about the subject and appeared on television shows like *Oprah*. Anti-vaccination activists and websites question the safety and effectiveness of immunization, as well as the credibility of scientists, vaccine

manufacturers, and the government (Leask & McIntyre, 2003; Zimmerman, 2005; Kata, 2010; Bean, 2011). Given the public discourse about this controversy, is there evidence that media covering the MMR vaccine-autism link led to preventable illness and death?

A couple of studies have found that parents reported feeling confused by the controversial media coverage, and parents who had already vaccinated their children questioned whether they had made the right decision (Petts & Niemeyer, 2004; Casiday, Cresswell, Wilson, & Panter-Brick, 2005). Indeed, US newspaper coverage of the link between the MMR vaccine and autism has been considerably divided; 41% of the articles from 1998 to 2006 said there was no link between the MMR vaccine and autism, 28% cited evidence both for and against a causal link, 21% did not mention evidence for either, and 10% said that there was a link between the two (Clarke, 2008). Dixon & Clarke (2012) found that exposure to news articles about the autism-vaccine controversy that gave support to both sides led to the belief that experts were divided on the issue, and thereby less certainty about the link between the MMR vaccine and autism.

Interestingly, however, a study conducted by Smith, Ellenberg, Bell, & Rubin (2008) suggests that mainstream media are not responsible for a decline in MMR vaccination rates in the US. This study utilized a random-digit dialing national survey (N=215,643) to obtain the vaccination records of children between the ages of 19 and 35 months and overlaid these data with media coverage of MMR and autism using LexisNexis. Because vaccination uptake is associated with such factors as income and access to medical care, the outcome variable was divided into selective MMR nonreceipt and overall vaccine nonreceipt. Their data demonstrate a significant increase of selective



MMR nonreceipt in the two years after the 1998 *Lancet* article, but a decrease after that despite increased media coverage. In other words, some factor other than broadcast media coverage was likely responsible for the increase in selective MMR nonreceipt. They posited that some medical providers who had read the *Lancet* article may have become hesitant about giving the vaccine, and this may have had an effect on MMR immunization rates. This study also offers further evidence that mainstream media coverage was not responsible; the majority of articles found were about reports rejecting a causal relationship between MMR and autism.

However, information about MMR vaccination in mainstream media versus online may be very different. People who already have alternative health orientations may be more likely to utilize media to support anti-vaccination views (Cassell et al., 2006; Jones et al., 2012). For this group, mainstream media may not be a major influence, but narrowcast media like websites and niche magazines may be. A British survey found that mothers who did and did not comply with immunization recommendations were different in terms of their medical orientation, how much they trusted the government and pharmaceutical companies, and in the extent that they were finding information for themselves on the internet (Cassell et al., 2006). In 2001, 43% of the first 10 hits in online searches for “vaccination” and “immunization” on seven different search engines were antivaccination sites (Davies, Chapman, & Leask, 2002). The internet may also heighten selective exposure, given that people can ask for advice from a variety of expert sources, which may give different recommendations about the MMR vaccination (Schmidt & Ernst, 2003; Wolfe & Sharpe, 2005).

Although the internet may play some role in promoting anti-MMR vaccination views, it is necessary to tease apart exactly what role that is. In particular, how does internet use fit in with vaccination opponents' overall media use patterns? What characteristics lead to more internet use for MMR-related information, and can these relationships be explained by non-belief-related factors, such as demographics or personality traits? What circumstances might affect these relationships? Understanding these matters will offer insight not only into whether alternative beliefs lead to more intense internet use, but when and how.

### **Alternative belief #2: Water fluoridation is a dangerous practice**

To some people, the notion that anyone would oppose fluoridating the water in this day and age seems crazy. Most Americans have had personal experience with fluoride as a safe and useful substance in their toothpaste, and may have received supplements of fluoride in the form of pills or rinses, without experiencing any kind of health consequence. Especially for people who have lived in communities with fluoridated water all their lives, the battle over fluoridating public water systems can be very puzzling. After all, the American Dental Association (ADA), National Institutes of Health (NIH), Centers for Disease Prevention and Control (CDC), and the American Cancer Society (ACS) all endorse water fluoridation as a safe and effective public health measure to prevent tooth decay. Decades of research on fluoridated water uphold its safety and effectiveness as well (Richmond, 1985; Ripa, 1993; Clarkson & McLoughlin, 2000). Why, then, does only two-thirds of the American population utilize fluoridated

water (American Dental Association, 2010)? Why, in particular, are some Americans choosing to keep fluoride out of their municipal water systems or campaigning to take it out?

Antifluoridationists have been portrayed as extremists at worst, and at best, confused. Perhaps the most well-known representation of an antifluoridationist would be General Jack D. Ripper, a patriotic and paranoid character from the movie *Dr. Strangelove or: How I Learned to Stop Worrying and Love the Bomb*. In this movie, General Ripper fears fluoride as a communist conspiracy with the aim of contaminating his bodily “essence.” The American Dental Association, in its “Comments about Opponents of Fluoridation,” lumped together scientists who opposed fluoridation with extreme groups such as the John Birch Society and the Ku Klux Klan (1961). In 1978, *Consumer Reports* published a two-part series on fluoridated water and commented that the existing controversy over it was, “one of the major triumphs of quackery over science in our generation.” Researchers have attempted to dissect and combat the “fear mongering” tactics of antifluoridationists (Isman, 1981; Armfield, 2007) with very limited success (Freeze & Lehr, 2009). Are people who oppose fluoride really crazy and/or uninformed? Who are they and how did they come to oppose expert research and recommendation?

The controversy over fluoride has been an interesting subject of study for social scientists for decades. Authors of the early studies, trusting the medical establishments’ proclamation that fluoride is safe, effective, and beneficial for the public, often characterized opponents of fluoride as somehow deficient or deviant (Martin, 1989).

These studies investigated as to whether there might be a relation between anti-fluoridationist sentiment and demographics of age, education, and political orientation (Mausner & Mausner, 1955; Metz, 1966; Gamson & Irons, 1961; Frankel & Allukian, 1973). Alas, there was no consistent association to be found. Another major approach to understanding why people may oppose fluoridation was the alienation hypothesis. The idea was that people who opposed fluoridation were socially marginalized individuals venting their frustration by taking it out on a public health measure. Opposition to fluoride, according to this view, was a symbolic revolt against society's impositions on the powerless. Researchers gathered support for this hypothesis by examining anti-fluoridation literature, interviewing anti-fluoridation leaders, and conducting attitude surveys (Davis, 1959, Green, 1961, Gamson, 1961, & Simmel, 1961). Even so, it seems implausible that the data gathered from specifically anti-fluoridation literature and fluoridation opponents would generalize to the larger population. Furthermore, given that the votes are nearly 50/50 each time water fluoridation comes up in public referenda, it would be difficult to categorize about 50% of people in these communities as alienated (Freeze & Lehr, 2009).

It seems that rather than some stable, inherent characteristic that predicts opposition to fluoride, there is perhaps something in the environment that is much more influential (Frazier, 1980). What is particularly striking about people's voting patterns is that previous to the issue coming up for referendum, people tend to *support* water fluoridation. However, once the issue has been discussed in a public forum, the majority of the time, people vote in *opposition* to it (Sapolsky, 1968). This pattern of events has

inspired the confusion hypothesis (Crain et al., Sapolsky, 1968), which proposes that potential voters, perplexed by conflicting claims of apparent experts, choose to err on the side of caution. The confusion hypothesis is perhaps the best explanation we currently have for why voters initially favorable towards fluoridation decide to change their minds. It is also the most recent hypothesis social science researchers have proposed to understand the opposition to fluoridation.

Despite much social science research about fluoridation in the 1950s and 1960s, and some through the 70s and 80s, there has been little examination of it in recent decades. Much has changed since fluoridation was first introduced into an American municipal water system in the 1940s. No longer does opposition to fluoride necessarily mean one must be a conspiracy theorist. Although some other countries (Australia, Canada, Ireland, Malaysia, New Zealand, and Singapore) fluoridate their drinking water for the majority of the population, most of the countries in the world do not fluoridate their water at all. In fact, most countries in Western Europe (e.g. Austria, Finland, Germany, and Switzerland), though perfectly capable of fluoridation, have rejected it, often on both medical and ethical grounds. There have been an increasing number of prominent scientists and health professionals who have spoken out against fluoridation, including Dr. William Hirzy, a chemistry professor at American University and former Environmental Protection Agency (EPA) scientist, and Dr. Arvid Carlsson, Nobel laureate of medicine. Fluoridation opponents vocalize concerns ranging from health consequences, to environmental damage, to sheer economics. Mainstream dental health journal articles have expressed concern over increasing fluoride intake levels and the

extreme variability of fluoride intake (Burt, 1992; Fomon, Ekstrand, & Ziegler, 2000; Warren et al., 2009). It seems that some expert authorities may also be shifting their stance on fluoride. As recently as January 2011, the U.S. Department of Health and Human Services and the EPA proposed that the upper limit of fluoride per liter of drinking water be lowered from 1.2 milligrams to 0.7 milligrams. The ADA has recommended that parents use water with little or no fluoride when preparing infant formula (2006). While American health institutions still support fluoridated drinking water, it is possible these caveats suggest some moderation from previous endorsements. Nonetheless, these changes in expert opinion are still very recent and likely have not shifted public perception about fluoridated water, which is the relevant characteristic of alternative beliefs.

In addition to the changing voices about fluoride research, the technological revolution of the internet has also opened new opportunities for information exchange and dissemination. Prior to the internet, people who wanted to find out more about the dangers or ineffectiveness of fluoride would have to expend considerable effort by researching in libraries or finding experts who had such concerns. However, today 74% of American adults use the internet and about four in five adult internet users search for health information online (Fox, 2011). The internet also allows users not only to find information, but create and easily impart it to others. The medium's capabilities have transformed how scientific knowledge is delivered and shared, and perhaps understood. Given the different landscape in fluoride research and media use, the time is ripe to try a different perspective in understanding opposition to fluoridation.

## **Why do people choose to use the media that they do?**

What explains differences in people's media use? It's possible to imagine many reasons—the desire for entertainment, a specific curiosity, mood management, one's education, habit, and so on. The dissertation at hand examines this question in reference to seeking information online about controversial health issues. The three factors tested are: 1) media dissociation, or the difference between one's position on an issue and perceived position of the news media, 2) network dissociation, or the difference between one's position on an issue and the perceived position of one's face-to-face social network, and 3) need for cognition, a personality trait that reflects how much a person enjoys expending cognitive effort, in Chapters Six through Eight. The foundational literature for these factors comes from different domains in communication research. First I will address the broader question of why people choose to use different media, especially the internet, and then why people may look for information that goes against the mainstream, again with a focus on internet.

There are two primary notions in the communication literature that attempt to answer this question: uses and gratifications and selective exposure. These ideas are conceptually related, but distinct in perspective and resulting literature.

The first, the uses and gratifications approach, has a long history in communication research, stretching back to listening to radio soap operas and quiz shows (Herzog, 1941, 1944). The question of “what people do with media” emerged as a path of inquiry for communication researchers when they discovered that mass media did not have the same effect on all audiences. Researchers have used the uses and gratifications

approach to examine many media, including magazines (Payne, 1988), television (Rubin, 1983), and telephone use (Dimmick, Sikan, & Patterson, 1994). The uses and gratifications perspective has a number of basic assumptions, the most important of which is that the audience is active. Media consumption is conceptualized as a motivated, dynamic activity that fulfills certain needs. People are motivated to consume media to meet different wants and needs, whether actively or reactively (Atkin, 1985). Uses and gratifications studies examine “1) the social and psychological origins of 2) needs which generate 3) expectations 4) of mass media or other sources, which lead to 5) differential patterns of media exposure (or engagement in other activities), resulting in 6) need gratifications and 7) other consequences, perhaps mostly unintended ones” (Katz, Blumler, & Gurevitch, 1974). Uses and gratifications may be obtained from media content, exposure for itself, or the social context of its use.

The existing literature on internet uses and gratifications tends to examine general needs and general internet use (Stafford, Stafford, & Schkade, 2004). A typical study would use survey methods to ask the sample to rate how much they agreed or disagreed with a list of gratifications sought from internet use, usually based on prior literature from mass media or internet uses and gratifications studies (Parker & Plank, 2000; Papacharissi & Rubin, 2000). Some studies would associate certain gratifications sought with variation in time spent online (Korgaonkar & Wolin, 1999; Charney & Greenberg, 2001). These studies report that information seeking and socializing are common motives for internet use, but do not examine it in relation to specific content or other media use.



Related to the uses and gratifications perspective is selective exposure, or the idea that people will differentially seek, attend to, process, and remember media content based on pre-existing goals and preferences (Taber & Lodge, 2006). Stemming from the tradition of cognitive dissonance theory (Festinger, 1957), the assumption of selective exposure is that people will prefer to consume media content that is agreeable to their views while avoiding disagreeable, dissonant information. The literature on selective exposure has been contentious (Mills, Aronson, & Robinson, 1959; Klapper, 1960; McGuire, 1968; Chaffee & Miyo, 1983; Sears & Freedman, 1985). It may be that selective exposure is more or less likely under certain circumstances, such as how personal the topic is (Stroud, 2008), perceived information utility (Valentino, Banks, Hutchings, & Davis, 2009), or whether accuracy or reinforcement is the desired outcome (Kunda, 1990).

Researchers have been increasingly concerned with audience selectivity due to a proliferation of media sources, especially the internet (Ruggiero, 2000; Nyhan, 2010). Since the internet, it has never been easier for people to find specific knowledge about almost any subject, to distribute a message to a few friends or thousands of others, and to communicate richly, instantly, and constantly. Scholars have responded to this medium with great enthusiasm and reservation. On the one hand, the internet amplifies the power of democracy with a new marketplace of ideas; on the other, the promotion of antisocial beliefs and behaviors can cause concern over real world outcomes.

If people are more able to intentionally select what they want to hear, will they always choose content that reinforces pre-existing beliefs and attitudes? Empirical

evidence suggests that online exposure to dissimilar political views is relatively unusual. Some scholars suggest that the internet amplifies the phenomenon of people primarily accessing content amenable to pre-existing views and interacting with like-minded people (Sunstein, 2001). Iyengar & Hahn (2009) found evidence that people were more inclined to read articles from sources that matched their political views, even though the content was the same. People may choose to maintain their beliefs via media consumption regardless of how valid or appropriate they are considered by society. In one study, Lin & Pfau (2007) found that an inoculation message could enhance people's resistance to attitude change, confidence in attitude, and willingness to speak out about it in the context of a perceived majority opposition. Reinforcement-oriented selective exposure may take place because a person wants to legitimize his or her socially deviant beliefs or feel positive affect by consuming media consistent with his or her values.

Although there is much selective exposure research in political communication, it is still an open question as to whether selective exposure occurs in the context of health issues. This echo chamber effect has important ramifications for democratic citizenship; however, public opinion is not the emphasis of this dissertation. People may be entitled to their own opinions, but not their own facts, and in the case of health information, there could be serious consequences if people choose to maintain certain inaccurate beliefs.

### **Why do people look for alternative information?**

I propose that there are two main motivations to seek media content counter to mainstream beliefs: informational and normative. The informational motivation is driven

by the desire to learn, study, or verify answers about a subject. An example of information motivated behavior would be when someone hears that reflexology can cure back pain and then goes online to check whether this is so. The normative motivation is driven by the desire to justify one's minority status as a believer of an unusual idea. If someone holds a belief that runs counter to the mainstream, he or she may search for positive affect through favorable coverage of the belief, other believers for a sense of belonging, and further information to bolster the belief in the face of disagreement. An instance of norm motivated behavior would be when someone believes that vaccines are dangerous, and then joins a discussion group dedicated to promoting this idea. These motivations most likely occur in tandem, but I believe this distinction is important in terms of the communication literature surrounding them.

Information seeking is the term that best reflects the literature that surrounds media use for the sake of education. Although information seeking research does not revolve around any one theory, the commonality is the attempt to investigate "active efforts to obtain specific information outside of the normal patterns of exposure to mediated and interpersonal sources" (Niederdeppe et al., 2007). An important aspect of the information seeking literature is understanding antecedents of such behavior, such as how one generally copes with threat-related cues (monitoring/blunting; Miller, 1987) and emotions like anger and enthusiasm (Valentino, Hutchings, Banks, & Davis, 2008). The research suggests that people will be more likely to seek information about a topic when they feel anxious or are uncertain about it (Wilson, Ford, Ellis, & Foster, 2002). This kind

of scenario seems likely when ardent supporters of nonmainstream beliefs voice their concerns about health issues that could carry risk to one self and/or to one's children.

Media consumption for the rationalization of minority status fits in with public opinion models like spiral of silence, bandwagon effect, and false consensus effect. Noelle-Neumann's spiral of silence (1974, 1984) postulated that people fear the isolation that comes with holding a minority opinion, and people who have minority beliefs will stay silent about them in order to avoid sanctions. However, research by Asch (1951) demonstrated that having just one other person in a group agreeing with an otherwise lone believer dramatically increases the chances that he will speak up about his views. For people who hold minority beliefs, the internet may be a convenient and effective medium for finding others who are sympathetic to their ideas. Since the internet allows it users to communicate anonymously, it is possible for people to discuss transgressive topics such as political extremism or sexual deviance without the same repercussions they may experience in a face-to-face context (Wojcieszak, 2010; Malesky & Ennis, 2004). A person who holds a nonmainstream health belief may not feel as strong of a normative motivation to use the internet, but it is still a possible motivation, especially if the health issue is very important to the person. In the process of finding a more sympathetic health professional or other nonmainstream belief holders who want to change health policy, the connection with other like-minded people may lessen the feeling of isolation and deviance.

In practice, this distinction between informational and normative motivation may not always produce distinct media use behaviors, but they are still useful conceptual

guides. Perhaps, media dissociation may be most closely associated with the informational motivation while network dissociation may be most closely associated with the normative motivation.

Do these factors actually make a difference with regard to internet use? This dissertation examines this possibility in the context of the MMR vaccine and fluoridated water. Before showing the results of these tests, however, I present some foundational research: interviews with people who held varying views on these topics, a nationally representative survey of Americans' alternative beliefs and related behaviors, and some basic analyses of how demographics and other characteristics are related to one's beliefs about the MMR vaccine and fluoridated water.

## **CHAPTER TWO: GETTING TO KNOW PEOPLE WHO HOLD ALTERNATIVE BELIEFS**

### **Beyond stereotypes**

People who hold alternative beliefs are subject to scrutiny by others who hold the mainstream belief. Because the alternative belief and evidence used to support it are considered to be untrue rather than a matter of opinion, those who hold alternative beliefs are characterized as misinformed, deficient, crazy, and even dangerous. After all, why else would they reject the mainstream belief, which is clearly incontrovertible?

As mentioned previously, antifluoridationists have been portrayed as madcap in American popular culture, such as in the 1964 movie *Dr. Strangelove*. In the present day, people who oppose fluoride are derided as “the intellectual inheritor[s] of the John Birch Society, the cockamamie right-wing conspiracy theorist group” who believe they are “being purposely made stupid by fluoride in their water so they could be more easily controlled by globalist overlords” (Maddow, 2011). In the case of antivaccinationists, they are alternately characterized as overly paranoid mothers, backwards hippies, and government or healthcare conspiracy theorists. Jenny McCarthy, celebrity founder of Generation Rescue, an antivaccination group, encourages fellow “Mother Warriors” of children with autism to “[follow] her intuition even when people tell her she is crazy” (McCarthy, 2012). Medical professionals have declared antivaccinationists to be irrational and prone to conspiratorial thinking (Jacobson, Targonski, & Poland, 2007). Unlike antifluoridationists, whose most successful outcome would presumably lead to

higher rates of tooth decay, the success of antivaccinationists would lead to serious illness and death, according to the mainstream medical establishment.

These are hardly flattering portrayals of people who believe themselves to be fighting for the good of public health. Thus far I have discussed people who hold these alternative beliefs – that the MMR vaccination and fluoridated water are unsafe – in terms of their reputation. To better understand what alternative belief holders are actually like, I decided that interviews would be a good start. Although hardly anyone wanted to talk to me about the MMR vaccine, I found some who were willing to talk to me about their views on fluoridated water. I was particularly interested in these questions:

**RQ1:** What are people's beliefs about the safety of fluoridated water?

**RQ2:** What factors seem to distinguish people who hold the alternative belief from the mainstream belief?

**RQ3:** How do their beliefs about fluoridated water relate to other alternative beliefs?

## **Methods**

From November to December 2010, study participants were recruited and interviewed via an online classified advertisement site called Craigslist. Links about the study were posted in the volunteer section of Craigslist in twelve American cities of different sizes, located in different regions of the U.S. Through email and interviews with study participants, it was revealed that news of the study was picked up and distributed

on an antifuoridation email list, so there are many people against fluoride in this interview sample. Interviewees were asked about their personal background, knowledge of fluoridation, sources of information about fluoridation, and fluoridation-related behaviors. Interviews took place over the phone or Skype for about an hour, and were audio recorded. There were 14 interviewees.

## **Results**

### Fluoride supporters' and opponents' beliefs

I would describe 3 of the interviewees as supporters of fluoride and 12 of them as opponents of fluoride. However, within each of these groups, there was considerable variation in attitude strength and fluoride-related behavior. For instance, one interviewee, Ken, who believed in the safety of fluoride, did not necessarily believe in it strongly. Ken explained that he had not “really given it very much thought as to whether it’s something harmful or that it’s helpful. I mostly assumed that um, that it’s okay to have.” In contrast, Ellen was adamant about the safety and effectiveness of fluoride, and was incredulous of how “they’re talking it’s a communist plot, fluoride is this horrible, horrible poison (...) it maybe sounds possible if you’re kind of paranoid (...) I don’t know, they don’t use their critical thinking skills, is what I think.” None of the supporters had avoided or removed fluoride from their water, nor had they attempted to promote fluoridated drinking water.

Fluoride opponents ranged from somewhat weak beliefs to believing strongly enough to devote significant time and energy to fight against fluoridation. Mona, for example, described herself as having “mixed feelings,” because though she had heard



about the dental health benefits of fluoride, she felt “like it’s still a chemical (...) and I don’t feel as comfortable about that.” On the other hand, some interviewees like Eve were “100% against it. ‘Cuz I think it is, it’s unfounded, based on my research, it does not benefit anyone. In fact, it does the opposite—it’s harmful.” Some had science backgrounds, like Carl, who “studied this issue, as a health scientist for over 20 years and I’ve come to the conclusion that fluoridated water is not a good thing.” Most of the interviewees who opposed fluoride spent years investigating it, joined activist groups, and spread the word about the dangers of fluoride. That many of them had dedicated their efforts to rid water systems of fluoride was unsurprising, given that many of them had found out about the interview study through an antifuoridation email list.

#### Differentiating alternative from mainstream belief holders

The people I spoke to about fluoride varied widely in their demographics. They ranged in age from 20 to 74, from high school to postgraduate level in education, and from very liberal to very conservative in political orientation. Two of them were Canadian, and the rest were from different regions of the U.S., with variation in rural versus urban areas. Even though the interviewees came from diverse backgrounds, there was no discernible pattern between demographics and fluoride-related beliefs. Such a small sample size, however, would make finding these associations unlikely.

Nonetheless, supporters and opponents of fluoridated water clearly parted ways in terms of how they acquired information about fluoride, as well as what information sources they trusted. Supporters of water fluoridation had read far less about the subject

than opponents had. Supporters trusted their personal experience with fluoride to judge its safety and effectiveness. Tom explained, "I've never experienced any noticeable health problems from having consumed it for most of my life." Two of the fluoride supporters both grew up in military families, and because the military provides fluoridated water, they learned during childhood that fluoride was a safe and important compound. All three fluoride supporters said that they would seek the original research about fluoride in peer-reviewed, academic journals, if they were to seek further information about the subject.

Fluoride opponents also had personal experiences with fluoride, although these experiences were plainly negative. They mentioned developing or witnessing others develop fluorosis (discoloration of the teeth) and feeling very ill. Antifluoride activists described the side effects of fluoride as much more common, noticeable and disturbing than the fluoride supporters did. They also brought up research they had read, which linked fluoride to lowered intelligence, cancers, and other long-term health consequences. Although interviewees with weaker feelings of opposition had similar experiences as the supporters, they still felt concerned about potential long-term health problems. The health scientists interviewed did not mention personal experience as a source of information, but rather, the research that they had read and conducted. The fluoride opponents who had taken the time to research the subject devoted much time to do so, like Quentin, who said, "Because when you take 5,000 hours out of your life, that's a couple of years. (...) So literally, it had consumed me for about three years intensely and less so for the last two years."

It is noteworthy that most of the antifuoridation activists interviewed were very distrustful of government, mainstream media, and health professionals. For fluoride-related information, they tended to rely on social networks and trusted internet sites, such as the Fluoride Action Network ([www.fluoridealert.org](http://www.fluoridealert.org)) and would avoid what would be considered expert authorities by most Americans. For example, Eve gave “zero credibility whatsoever to the CDC, the American Academy of Pediatrics, the American Dental Association. I wouldn’t use their information for anything.” Some of them avoided mainstream newspapers, television, and radio altogether, even for general news. They were very concerned about financial incentives involved in the promotion of fluoride. Natalie explained that, “I think behind it is the corporate benefit of being able to sell this product instead of disposing of it properly, which would cost them a lot of money. So what bothered me was, you know, the scam behind it.” More broadly, they distrusted any group’s message if the group profited from a purported health product. Bea explained that, “Chemicals cause cancer. The body (...) has to be clean in order to not have cancer. (...) the pharmaceutical industry, which makes huge, huge amounts of money on cancer, they don’t want to address it. They just want to keep poisoning everybody.” Almost every fluoride opponent asked me about the source of my research funds (while no supporters asked). I even exchanged a dozen emails with a potential interviewee, only to be declined due to the belief that the University of Pennsylvania, which has a dental school, is consequently likely to be pro-fluoride. Every information source, including my own research which would become an information source related to fluoride, was worthy of their scrutiny.

## Association of fluoride-related beliefs with other health beliefs

Some of the antifuoridation activists also mentioned concerns about health issues other than fluoride. Bea, for example, ate a raw, organic diet, and was careful about what she brought into her home, because, “Everything out there has toxins in it so you have to be very careful. (...) I buy soaps that are handmade. (...) I don’t put pesticides, herbicides or poisons in my garden. I don’t buy processed food.” Kurt was also concerned about toxins: he took pains to avoid fluoride in his water and beverages produced in fluoridated areas, avoided mercury by avoiding seafood, and purchased organic foods and products. However, not all fluoride opponents or activists had concerns beyond fluoride in their environment. Supporters of fluoride did not mention concerns about chemicals or toxins during their interviews.

Interestingly, opponents of fluoride did not necessarily oppose vaccinations. Some were strongly against vaccination; one interviewee attributed the death of her daughter to vaccines, and another interviewee was the director of an antivaccination group. On the other hand, some fluoride opponents had no issue with vaccination, like Isaac, who stated, “Oh, I’ve been vaccinated many times. I’d much rather be vaccinated than get some nasty disease.” Furthermore, it was not simply a matter of strength of opposition to fluoride, as one could be strongly opposed to fluoride while in support of vaccination, like Eileen. While it is evident that there is sometimes an association between opposition to fluoride and concerns about other potential toxins, it is not a simple relationship. Given these interview results, it seems that holding one alternative

belief could increase the chances of holding others in the same domain (health), but it is not a steadfast rule.

## **Discussion**

The results from the interviews provided understanding of a small convenience sample of people's beliefs about fluoridated water. The sample included people who had different stances on the safety of fluoridated water and also had diverse backgrounds. The interviews with supporters and opponents of fluoridated water demonstrated that belief in even a straightforward claim of safety is multifaceted. These beliefs are rooted – sometimes lightly and sometimes deeply – in personal experiences, hearsay, judgments of others, trust or lack thereof in powerful organizations, and other factors. In this sample, demographic characteristics like gender, education, and political orientation seemed to have no association with one's position regarding fluoridated water. It is possible, though, that this lack of relationship may have to do with the small sample size of interviewees, and the particularly involved nature of the thinking of some of the fluoride opponents; a survey of a larger group may yield different findings.

One main distinction between fluoride supporters and opponents was trust in their information sources, such that supporters tended to trust mainstream government and health officials and opponents did not. Moreover, because opponents tended to not trust mainstream sources and were on an antifuoridation email list, it is probable that alternative belief holders use the internet as an important source of information and for contacting others of similar mind. Were public health officials to attempt to convert

opponents of fluoride, these interviews suggest they might face the obstacles of poor credibility with their target audience, reaching them through media channels, and inhibiting anti-fluoride communication among them.

Beliefs about fluoride may be associated with other health beliefs. Though the three supporters of fluoride did not mention concerns about chemicals or toxins, some of the fluoride opponents did. Some of the interviewees might even be considered extreme in their lifestyle choices or devotion to health issues. The data illustrate the extent to which a person's beliefs about fluoride may be commingled with their views on health in general.

This qualitative data, although limited, is unique; though there are published media interviews from activists for and against fluoridation, to date there has been no published research that specifically compares and contrasts people of different opinions. The interviews were used to help uncover important themes and issues, to examine possible relationships for further inquiry, and to help ground the quantitative analyses in words that people have spoken for themselves. The next chapter examines alternative beliefs in the context of the U.S. adult population, and uses quantitative methods to investigate relationships between people's demographic characteristics, beliefs, and behaviors.

## **CHAPTER THREE: AMERICANS' ALTERNATIVE BELIEFS AND BEHAVIORS**

### **Past research on beliefs about the MMR vaccine and fluoridated water**

Most research on MMR vaccine beliefs has been studied in the United Kingdom, and has focused primarily on risk perception and its relationship to immunization rates. Focus group studies have elucidated some important factors in how people make sense of MMR vaccine safety (Evans, Stoddart, Condon, Freeman, Grizzell, & Mullen, 2001; Petts & Niemeyer, 2004; Hilton, Petticrew, & Hunt, 2007), but these qualitative studies have not found characteristics that distinguish people who hold the mainstream versus the alternative belief. Surveys examining mother's attitudes towards the MMR vaccine in the UK suggest that those who believe the vaccine is or could be linked to autism tend to have smaller families, distrust government and pharmaceutical companies, have a lower income, and are more likely to find information for oneself on the internet (Casiday, Cresswell, Wilson, & Panter-Brick, 2005; Ramsay, Yarwood, Lewis, Campbell, & White, 2002; Cassell, Leach, Poltorak, Mercer, Iyersen, & Fairhead, 2006). Though these studies were conducted in the UK, there may be similar associations in the U.S. Thus far, there has been one study of media coverage and MMR vaccination rates in the U.S. by Smith, Ellenberg, Bell, & Rubin, 2008, which was mentioned in the Chapter One. This study differentiated parents who did not vaccinate their children against MMR specifically versus those who did not vaccinate against other diseases as well. Not having vaccinated one's child against multiple diseases was associated with having more children in the family, being non-Hispanic Black, residing outside of the northeast region of the U.S.,

being seen in public health clinics, having lower income, less education, and being unmarried. That these factors are related is unsurprising, because non-vaccination has been associated with poverty and lack of access to medical care (Newacheck, Hughes, & Stoddard, 1996; Klevens & Luman, 2001; Luman, McCauley, Shefer, & Chu, 2003). However, selectively choosing to not vaccinate against MMR was only associated with going to a private practice for one's healthcare; the authors of the study surmised that these doctors were more hesitant about giving the vaccine due to the *Lancet* article.

What factors could be associated with the alternative belief may have changed since the withdrawal of the *Lancet* article and the revocation of Wakefield's medical license in 2010, and could differ between the U.S. and the UK. For instance, physicians in private practices may no longer have any hesitation to vaccinate children against MMR, or internet content may reflect mainstream news coverage to say that the MMR vaccination is safe. What factors are associated with this alternative belief is an empirical question that ought to be updated after the official debunking of the original study, and asked of an American sample.

There has been much less recent research on the beliefs about fluoridated water safety. Although there have been some sociological musings about its historical context, the last social science research on the topic was published over three decades ago. The studies failed to discover any factors that were associated with holding the alternative belief. Given the recent slight shifts in expert opinion on fluoridated water and the new technologies available for exchanging and disseminating information, new research on the topic may reveal not only the distribution of beliefs in the U.S. population, but also



whether any factors are associated with holding the alternative belief at this time in history.

This chapter investigates the characteristics of people who hold alternative beliefs using data from a pair of nationally representative surveys of American adults, with one survey focused on water fluoridation and the other on the MMR vaccine. This is the first time such information has been collected from the American adult population at large, and the data will offer insight into the prevalence of different health beliefs and related communication behaviors in the United States. The analyses address five basic research questions:

**RQ1:** What does the American population believe, in terms of the safety of the MMR vaccine and fluoridated water?

**RQ2:** How frequently do Americans use different sources for health information, such as television and internet, especially with regard to MMR vaccine and fluoridated water information online?

**RQ3:** How common are behaviors that support or oppose the MMR vaccine and fluoridated water, such as refusing to use them or donating money to organizations that support/oppose these health measures?

**RQ3:** In terms of demographics, are the people who hold alternative beliefs different from those who are uncertain or hold mainstream beliefs?

**RQ4:** In terms of health information sources, are the people who hold alternative beliefs different from those who are uncertain or hold mainstream beliefs?

**RQ5:** In terms of behaviors that support/oppose the MMR vaccine and fluoridated water, are the people who hold alternative beliefs different from those who are uncertain or hold mainstream beliefs?

## **Methods**

These survey questions were asked of a pair of nationally representative samples through the Annenberg National Health Communication Survey (ANHCS). ANHCS uses an online survey company called Knowledge Networks to acquire study participants. Knowledge Networks recruits online panel members by inviting randomly sampled addresses from the U.S. Postal Service's Delivery Sequence File via mail and telephone follow-up. Households without internet are provided with a laptop computer and free internet service for their participation. The ANHCS sample is randomly selected from Knowledge Network's larger address-based existing panel sample each month.<sup>1</sup> For the months of February and March in 2011, ANHCS subjects were randomly assigned to answer questions about the MMR vaccine or fluoridated water (N=292 for vaccination, N=318 for fluoride).

### Survey measures

*Beliefs about MMR vaccination safety.* To assess a person's beliefs about the MMR vaccination and autism, participants were asked how much they agreed or disagreed with the following statements: "If a child receives the measles, mumps and

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<sup>1</sup> Samples obtained by the address-based sampling method have been demonstrated to be comparable to those obtained by random digit dialing (Link, Battaglia, Frankel, Osborn, & Mokdad, 2008; DiSogra, 2010).

rubella (MMR) vaccine, that child has an increased chance of becoming autistic”;

“Children who get the MMR vaccine are no more likely to become autistic than children who don’t get the MMR vaccine” (reverse coded); “The MMR vaccine is a probable cause of autism”; and “I don’t think that MMR vaccination influences whether a child will become autistic” (reverse coded). Possible response options for all of these statements were strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree. These responses were averaged into a single belief score, ranging from 1 to 5. The average score was 2.69 (SD=.66), and the measure had a Cronbach’s alpha of .832. Respondents who had a score of 3 were classified as “uncertain,” while scores lower or higher were categorized as holding the mainstream or alternative belief, respectively.

*Beliefs about fluoridated water safety.* To assess a person’s position on water fluoridation, participants were asked how much they agreed or disagreed with the following statements: “Fluoride in drinking water exposes people to dangerous chemicals and health risks”; “The fluoride put into community water systems meets a high standard of safety” (reverse coded); “I believe that drinking fluoridated water is harmful to one’s health”; and “There is no need to worry about long-term health consequences from drinking fluoridated water” (reverse coded). Again, the possible response options for all of these statements were strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree. These responses were averaged into a single belief score, ranging from 1 to 5. The average score was 2.72 (SD=.66), and the measure had a Cronbach’s alpha of .855. Respondents who had a score of 3 were classified as “uncertain,” while

scores lower or higher were categorized as holding the mainstream or alternative belief, respectively.

*Demographics.* Demographic information was procured from Knowledge Networks' profile information on its panel members. Panel members disclosed their current age and highest degree received. They also answered the race and ethnicity questions according to the categories used in the U.S. census. For race, the categories were: White, Black, African-American, American Indian or Alaska Native, Asian, Hawaiian/Pacific Islander, 2+ races. For ethnicity, the categories were: White Non-Hispanic, Black Non-Hispanic, Other Non-Hispanic, Hispanic, 2+ races Non-Hispanic. For political orientation, participations were asked whether they thought of themselves as "extremely liberal," "liberal," "slightly liberal," "moderate, middle of the road," "slightly conservative," "conservative," "extremely conservative." Participants were also asked about the presence of children in the household age 6 and under. The only demographics information not procured from Knowledge Networks was the type of community they lived in, which respondents were asked describe as rural, suburban, or urban.

*Searching for information online.* In the MMR vaccination survey, participants were asked, "Have you ever looked for information about the MMR vaccine and autism using a search engine, such as Google, MSN, or Yahoo, before?" The same question was asked of participants in the fluoridated water survey, with "fluoridated water" in place of "the MMR vaccine and autism." Respondents could answer yes or no. In later chapters a more fully elaborated measure of internet engagement is defined and used for analysis.

For the purposes of the comparisons of concern here, this simpler measure, of ever use of the Internet on the specific topic is sufficient.

*Health information sources.* This measure asked respondents to indicate how often they have done each of the following in the past 30 days: read health information on the internet, read about health issues in newspapers or general magazines, read special health or medical magazines or newsletters, watched special health segments of television newscasts, watched television programs (other than news) which address health issues or focus on doctors or hospitals, and talked with family or friends about health issues. Survey participants could select not at all, less than once per week, once per week, or two or more times per week. These response options were coded as 0, 1, 2, and 3, respectively.

*Behaviors related to belief topic.* Respondents on the MMR vaccination survey were asked about whether they had done any of the following: a) had your child vaccination against MMR, b) refused to have your child vaccinated against MMR, b) told other parents that they SHOULD get their child vaccinated against MMR, c) told other parents that they should NOT get their child vaccinated against MMR, d) told other people that they should NOT vaccinate their children against MMR, e) donated money to an organization that SUPPORTS the MMR vaccine, f) donated money to an organization that OPPOSES the MMR vaccine, g) contacted an election official or media organization to SUPPORT the MMR vaccine, h) contacted an election official or media organization to OPPOSE the MMR vaccine, i) signed a petition or joined a protest, rally, or demonstration to SUPPORT the MMR vaccine, and j) signed a petition or joined a

protest, rally, or demonstration to OPPOSE the MMR vaccine. Similar questions were asked of respondents in the fluoridated water survey, specifically whether they had: a) drank fluoridated water (tap water is fluoridated in many places, but not all), b) removed fluoride from your water (Brita and Pur filters do not remove fluoride), c) told other people that they SHOULD drink fluoridated water, and items d-j replaced “the MMR vaccine” with “fluoridated water.” Respondents could answer yes or no to all items, or could choose to leave them blank.

#### Data analysis

To better reflect population estimates for the U.S., weights created from the Current Population Survey (CPS) were used to adjust the sample. Because the distribution of participant characteristics was similar in the weighted and unweighted samples, only the weighted samples are shown. Logistic regression was used to test whether alternative belief holders were significantly different those who held the mainstream belief or were uncertain. These were tests of association without claims of causal direction. All of these weighted analyses were conducted in STATA 12 using the survey (svy) commands.

#### Results

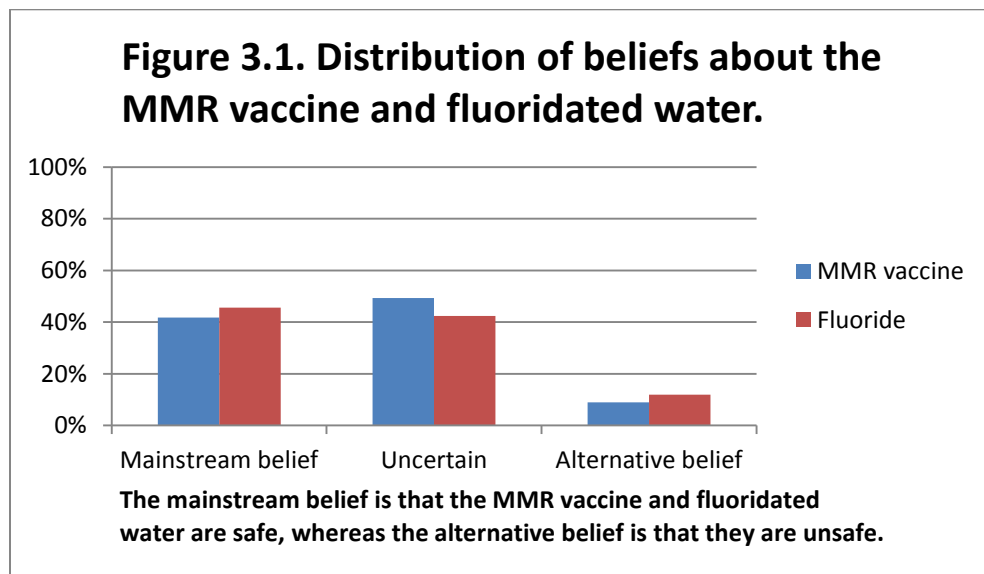
The weighted demographics for the participants in the MMR vaccine and fluoridated water survey are presented in Table 3.1. In the vaccine sample (N=292), a little over half of the sample was female (55.0%) while 44.5% of the sample was male. About half of the respondents described their community as being in a suburban area (49.7%), while 16.9% lived in an urban area and 33.4% lived in a rural area. About a

<b>Table 3.1. Weighted demographic characteristics of the MMR vaccine and fluoridated water samples (representative samples).</b>		
	<b>MMR vaccine sample, % or M (SD), N=292</b>	<b>Fluoridated water sample, % or M (SD), N=318</b>
Gender		
Male	46.1	49.6
Female	53.9	50.4
Community setting		
Urban	19.7	19.0
Suburban	44.6	51.3
Rural	34.4	29.7
Highest degree earned		
Less than 4-year college degree	71.5	72.0
4-year college degree	28.6	28.0
Political orientation		
Conservative	33.5	34.1
Moderate	38.2	34.6
Liberal	27.4	30.7
Race		
White	78.4	82.8
Non-white	21.7	17.2
Ethnicity		
Non-Hispanic	88.1	84.5
Hispanic	11.9	15.5
Age		
Years old	46.9 (16.5)	46.2 (17.1)
Children of 6		
Have kids under the age of 6	20.0	15.1
No kids under the age of 6	80.0	84.9

third of the sample obtained at least a 4-year college degree (34.2%). A bit over a third of the sample reported having a conservative political orientation (37.0%), about a third described themselves as moderate (35.2%), and about a fourth described themselves as liberal (27.8%). A sixth of the sample was nonwhite (16.3%) and 7.9% was Hispanic. The sample was divided into the age categories of 18 to 40, 41 to 60, and 61 to 90 in

approximate thirds (32.2%, 41.1%, and 26.7%, respectively). About a fifth of the sample (19.6%) reported having children under the age of 6.

In the fluoridated water sample (N=318), a little over half of the sample was female (55.0%) while 44.5% of the sample was male. The sample was about evenly divided between female (51.3%) and male (48.7%) participants. About a third of the sample (32.1%) obtained at least a 4-year college degree. About a sixth of them described where they live as an urban setting (17.6%), about half as suburban (52.5%), and nearly a third as rural (29.9%). About two-fifths of the respondents described themselves as having a conservative political stance (39.9%), 32.4% described themselves as moderate, and about a quarter described themselves as liberal (27.8%). The majority of the sample was White (87.9%) and not Hispanic (90.6%). The age of respondents ranged from 18 to 90, breaking down into approximate thirds in the 18 to 40, 41 to 50, and 51 to 90 age categories (31.1%, 39.6%, and 29.2%, respectively).





The first research question asked about the distribution of beliefs regarding the safety of the MMR vaccine and fluoridated water (see Figure 3.1). In the vaccine sample, two-fifths of the sample held the mainstream belief (41.8%), about half were uncertain (49.3%), and less than a tenth held the alternative belief (8.9%). In the fluoride sample, almost half of the sample held the mainstream belief (45.6%), about two-fifths were uncertain (42.4%), and about a tenth held the alternative belief (11.9%).<sup>2</sup>

The second research question asked what Americans' health information source use patterns look like, especially with regard to MMR vaccine and fluoridated water information online. From these estimates (see Table 3.2), about a sixth of American adults have searched for MMR vaccine information online, and less than ten percent have searched for fluoridated water information online. In terms of general health information source use, it is helpful to remember that the scale went from 0 to 3, with 0 representing not at all in the past month, 1 representing less than once per week, 2 as once per week, and 3 as two or more times per week. The samples from the two surveys look fairly similar, and most sources were used less than once per week on average.

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<sup>2</sup> These MMR vaccine survey results are fairly similar to those of other national polls. One national survey found that 19% of American adults agreed with the statement "Autism is caused by a preservative once found in childhood vaccines," while 43% were unsure about a causal link, and 38% believed that there was no link (Science Daily, 2008). To the best of my knowledge, however, there have been no polls regarding beliefs about the safety of fluoridated water. The most recent, relevant survey on fluoridated water was conducted by Gallup in 1956, and asked whether the respondent had heard or read anything about fluoridated water helping to prevent tooth decay (75% said yes, 25% said no) and whether they would favor or oppose fluoridating the water in their community (60% were in favor, 16% opposed it, and 24% had no opinion).

<b>Table 3.2. Weighted health information source use in the MMR vaccine and fluoridated water samples.</b>		
	<b>MMR vaccine sample, M (SD), N=292</b>	<b>Fluoridated water sample, M (SD), N=318</b>
Ever searched for MMR vaccine or fluoridated water information online	.16 (.37)	.08 (.28)
Read health information online (0-3 scale)	.77 (.90)	.97 (1.03)
Read about health issues in newspapers or general magazines (0-3 scale)	.54 (.79)	.62 (.87)
Read special health or medical magazines or newsletters (0-3 scale)	1.09 (1.06)	1.00 (1.05)
Watched special health segments of TV newcasts (0-3 scale)	1.27 (1.07)	1.26 (1.13)
Talked with family or friends about health issues (0-3 scale)	1.47 (.92)	1.60 (1.07)

The third research question asked about the incidence of behaviors that demonstrate support for or opposition to the MMR vaccine and fluoridated water. The results are displayed in Tables 3.3 and 3.4 for the prevalence of behaviors related to each topic, respectively. The majority of Americans reported having engaged in the behavior that would suggest holding the mainstream belief; about two-thirds of Americans who have children reported having vaccinated their child (or children) against MMR, and two-thirds of American adults reported having drunk fluoridated water. Refusing to have one's child vaccinated and removing fluoride from one's water were reported far less commonly (4% and 11%, respectively). About a tenth of each sample (11%) said that they told others that they should engage in the mainstream behavior. All other behaviors in support of or in opposition to the MMR vaccine and fluoridated water were reported at very low levels, ranging from 1 to 5%.

<b>Table 3.3. Weighted prevalence of behaviors supportive of and oppositional to the MMR vaccine.</b>	
<b>N=292</b>	<b>M (SD)</b>
Had your child vaccinated against MMR*	.66 (.48)
Told others they SHOULD get their child vaccinated	.11 (.32)
Donated money to an organization that SUPPORTS the MMR vaccination	.02 (.13)
Contacted an election official or media organization to SUPPORT the MMR vaccine	.01 (.12)
Signed a petition or joined a protest, rally, or demonstration to SUPPPORT the MMR vaccine	.02 (.13)
Refused to have your child against MMR	.04 (.20)
Told others they should NOT get their child vaccinated	.04 (.19)
Donated money to an organization that OPPOSES the MMR vaccination	.01 (.12)
Contacted an election official or media organization to OPPOSE the MMR vaccine	.01 (.11)
Signed a petition or joined a protest, rally, or demonstration to OPPOSE the MMR vaccine	.03 (.16)

\* among those with children age 6 and under

<b>Table 3.4. Weighted prevalence of behaviors supportive of and oppositional to fluoridated water.</b>	
<b>N=318</b>	<b>M (SD)</b>
Drank fluoridated water	.68 (.47)
Told others they SHOULD drink fluoridated water	.09 (.28)
Donated money to an organization that SUPPORTS fluoridated water	.01 (.09)
Contacted an election official or media organization to SUPPORT fluoridated water	.01 (.08)
Signed a petition or joined a protest, rally, or demonstration to SUPPPORT fluoridated water	.01 (.09)
Removed fluoride from water	.11 (.31)
Told others NOT to drink fluoridated water	.05 (.22)
Donated money to an organization that OPPOSES fluoridated water	.01 (.09)
Contacted an election official or media organization to OPPOSE fluoridated water	.03 (.16)
Signed a petition or joined a protest, rally, or demonstration to OPPOSE fluoridated water	.02 (.14)

At this point, the analyses turn to the question of whether holding the alternative belief is associated with people's characteristics or behaviors. Logistic regression analyses were used to test whether demographics, health information source use patterns,

and belief-related behaviors were associated believing the MMR vaccine or fluoridated water to be unsafe.

As seen in Tables 3.5 and 3.6, none of the demographic characteristics had statistically significant associations with holding the alternative belief. Gender, community setting, college education, political orientation, race, ethnicity, age, and having young children were not associated were not predictive of believing that the MMR vaccine causes autism or that fluoridated water is unsafe to drink.

**Table 3.5. Weighted prevalence of holding the alternative belief about the MMR vaccine given various demographic characteristics.**

<b>N=292</b>	<b>Weighted odds ratio</b>	<b>95% CI</b>	<b>P &gt;  t </b>
Gender	.793	.289 – 2.176	.652
Community	1.300	.864 – 1.942	.209
College	2.600	.932 – 7.222	.068
Political orientation	1.681	.941 – 3.002	.079
Non/White	.501	.087 – 2.893	.438
Non/Hispanic	2.315	.536 – 10.042	.261
Age	.976	.951 – 1.002	.073
Having kids 6 and under	1.251	.710 – 2.204	.437

**Table 3.6. Weighted prevalence of holding the alternative belief about fluoridated water given various demographic characteristics.**

<b>N=318</b>	<b>Weighted odds ratio</b>	<b>95% CI</b>	<b>P &gt;  t </b>
Gender	1.631	.712 – 3.735	.246
Community	.675	.391 – 1.167	.159
College	.566	.216 – 1.485	.247
Political orientation	1.004	.617 – 1.634	.986
Non/White	1.022	.281 – 3.716	.973
Non/Hispanic	.759	.154 – 3.730	.733
Age	.999	.971 – 1.028	.941
Kids	.556	.246 – 1.255	.230

Tables 3.7 and 3.8 present the logistic regression results for whether use of different health information sources predicts holding the alternative belief. People who had ever searched for MMR vaccine information online were about four times as likely as those who had not to believe that the MMR vaccine causes autism (OR=4.40, 95% CI = 1.58 – 12.27). In terms of frequency of general health information use, the associations with holding the alternative belief were not as strong. People who reported reading special health or medical magazines or newsletters (OR=1.54, 95% CI = 1.01 – 2.35) and watching non-news TV programs about health more frequently (OR=1.71, 95% CI = 1.10 – 2.65) were more likely to believe that the MMR vaccine causes autism. Reading health information online, reading about health issues in newspapers or magazines, watching special health segments of TV newscasts, and talking with family or friends about health were not predictive of holding the alternative belief.

As seen in Table 3.8, people who had ever searched for fluoridated water information online were about seven times as likely as those who had not to believe that fluoridated water is unsafe to drink (OR=7.08, 95% CI = 2.52 – 19.9). Frequency of health information source use in general, however, was not at all related to believing that fluoridated water is unsafe to drink.

**Table 3.7. Weighted prevalence of holding the alternative belief about the MMR vaccine given different types of health information source use.**

<b>N=292</b>	<b>Weighted odds ratio</b>	<b>95% CI</b>	<b>P &gt;  t </b>
Ever searching for MMR vaccine information online	4.403**	1.580 – 12.269	.005
Reading health information online	1.152	.759 – 1.748	.505
Reading about health issues in newspapers or magazines	1.094	.720 – 1.661	.673
Reading special health or medical magazines or newsletters	1.538*	1.008 – 2.347	.046
Watching special health segments of TV newscasts	1.319	.874 – 1.990	.186
Watching non-news TV programs about health	1.708*	1.102 – 2.647	.017
Talking with family or friends about health	1.091	.712 – 1.672	.690

\* significant at  $p < .05$ , \*\* significant at  $p < .005$

**Table 3.8. Weighted prevalence of holding the alternative belief about fluoridated water given different types of health information source use.**

<b>N=318</b>	<b>Weighted odds ratio</b>	<b>95% CI</b>	<b>P &gt;  t </b>
Ever searching for fluoridation information online	7.079***	2.518 – 19.905	.0005
Reading health information online	1.561	.813 – 3.00	.180
Reading about health issues in newspapers or magazines	1.140	.724 – 1.793	.571
Reading special health/medical magazines or newsletters	1.254	.789 – 2.129	.400
Watching special health segments of TV newscasts	1.104	.711 – 1.714	.659
Watching non-news TV programs about health	1.003	.643 – 1.565	.989
Talking with family or friends about health	1.062	.710 – 1.589	.768

\*\*\* significant at  $p < .0005$

The last research question asked whether holding the alternative belief was significantly associated with behaviors that support or oppose that alternative belief. Due to the very small numbers of people who donated money, contacted an election official or media organization, or signed a petition or joined a protest, rally, or demonstration to support or oppose the issues of vaccination and fluoridation, it was not possible to conduct meaningful logistic regression analyses for these behaviors. However, Tables 9 and 10 display most of the associations between the alternative belief and utilizing or rejecting the MMR vaccine and fluoridated water, and whether participants told others to do the same. Refusing to have one's child vaccinated against MMR was excluded, because there were too few cases among parents who had children age 6 and under.

As seen in Tables 3.9 and 3.10, holding the alternative belief is not significantly associated with engaging in the mainstream behavior of having one's child vaccinated (OR = .74, 95% CI = .09 – 6.41) or drinking fluoridated water (OR = 1.32, 95% CI = .52 – 3.41). It is also not associated with telling others that they should engage in the mainstream behavior. However, holding the alternative belief is associated with engaging in the alternative behavior of removing fluoride from one's water (OR = 9.30, 95% CI = 3.59 – 24.07). Holding the alternative belief is also associated with telling others to not have their child vaccinated (OR = 16.77, 95% CI = 4.02 – 69.9) and telling others to not drink fluoridated water (OR = 88.28, 95% CI = 21.48 – 362.78). In other words, holding the alternative belief does not make people less likely than those who are uncertain or hold the mainstream belief to engage in mainstream behaviors, but they are more likely than the others to engage in the alternative behaviors.

<b>Table 3.9. Weighted prevalence of holding the alternative belief about the MMR vaccine given different behaviors related to the MMR vaccine.</b>			
<b>N=292</b>	<b>Weighted odds ratio</b>	<b>95% CI</b>	<b>P &gt;  t </b>
Had your child vaccinated against MMR <sup>♦</sup>	.739	.085 – 6.408	.780
Told others they SHOULD get their child vaccinated	1.223	.303 – 4.933	.776
Told others they should NOT get their child vaccinated	16.773***	4.022 – 69.946	.0005

<sup>♦</sup> only parents of children age 6 and under were included for this analysis (N=58)

\*\*\* significant at  $p < .0005$

<b>Table 3.10. Weighted prevalence of holding the alternative belief about fluoridated water given different behaviors related to fluoridation.</b>			
<b>N=318</b>	<b>Weighted odds ratio</b>	<b>95% CI</b>	<b>P &gt;  t </b>
Drank fluoridated water	1.331	.520 – 3.407	.550
Told others they SHOULD drink fluoridated water	2.006	.475 – 8.472	.342
Removed fluoride from water	9.295***	3.590 – 24.067	.0005
Told others NOT to drink fluoridated water	88.281***	21.483 – 362.775	.0005

\*\*\* significant at  $p < .0005$

## **Discussion**

In this chapter, data from nationally representative samples surveys about the MMR vaccine and fluoridated water were analyzed to examine prevalence of beliefs, information source use, and behaviors related to the MMR vaccine and fluoridated water. Logistic regression analyses were used to test whether holding the alternative belief was associated with any demographics, information source use, or belief-related behaviors.



The data reveal that a little less than a tenth of Americans believe that the MMR vaccine causes autism and a little over a tenth of Americans believe that fluoridated water is unsafe to drink. The remaining Americans are about split in half between those who hold the mainstream belief (the MMR vaccine does not cause autism, fluoridated water is safe to drink) and those who are uncertain about the safety of these health measures. Based on these data, it seems that the beliefs espoused by health professionals and government agencies are not shared confidently by the majority of the U.S. population. Interestingly, this discrepancy demonstrates that mainstream health beliefs are not necessarily held by the majority. The logistic regression analyses revealed that it would be difficult to easily identify people who hold the alternative belief based on demographic data, as no statistically significant associations were found.

Approximately one sixth of American adults have searched for MMR vaccine information online, and less than ten percent have searched online for information about fluoridated water. Searching online about these topics was associated with holding the alternative belief. On average, Americans reported using different sources like television shows and talking to family and friends for general health information less than once a week. In the MMR vaccine sample, people who read special health or medical magazines or newsletters and watched non-news television programs about health more frequently were more likely to hold the alternative belief. There were no associations between general health information source use and holding the alternative belief in the fluoridated water survey sample. The difference between these two surveys may be explained by greater coverage of the MMR vaccine controversy than fluoridated water in general

health information sources, especially coverage in special health magazines, newsletters, and television programs.

Fortunately for mainstream medicine, the majority of Americans reported engaging behaviors that follow mainstream recommendations; about two-thirds of Americans who had children age 6 and under reported having vaccinated their child (or children) against MMR, and two-thirds of Americans reported having drunk fluoridated water. With regard to the MMR vaccination, the self-reported compliance rate is lower than the nationally reported 91.6% for children aged 19-35 months (CDC, 2012), but it is possible that some children of parents in the sample were too young to have received one or both doses of the MMR vaccine, or some parents may simply not have known what specific vaccinations their children received. As for drinking fluoridated water, about three-quarters of Americans (72.4%) have access to fluoridated water (American Dental Association, 2010), and it is similar to the proportion of study participants who reported drinking it (68%). About a tenth of the MMR vaccine and fluoridated water sample said that they told others to engage in the mainstream behavior. It is interesting that people who held the alternative belief were not significantly more or less likely than those who were uncertain or held the mainstream belief to follow mainstream recommendations or tell others to do so. Perhaps it is a behavior they engaged in only once and have since changed their mind, or they believe themselves or their own child to be particularly susceptible to the consequences of these health measures. Unfortunately, the data are insufficient to answer this question.

Refusing to have one's child vaccinated was relatively rare (4%), though about a tenth of Americans claimed to remove fluoride from their water. Because so few parents with young children refused to vaccinate them against MMR, it was impossible to make any meaningful comparisons, other than to say that it rarer than the rate of expressed opposition. However, people who held the alternative belief were significantly more likely to tell others that they should not vaccinate their children against MMR. Believing that fluoridated water is unsafe to drink was associated with removing fluoride from one's water and with telling others to do the same. All other behaviors in support of or opposition to the MMR vaccine and fluoridated water, such as donating money to organizations or signing a petition, were also too rare to perform any meaningful analyses (1 to 5%).

The survey data reveal how common alternative beliefs are in the U.S. population, and how these beliefs are or are not related to demographics, information source use, and health behaviors. This research is the first to examine these topics since the retraction of the Wakefield article and the shifting position of U.S. experts on fluoride. In some ways the most striking association in these analyses was the very strong relationship between holding alternative views and using the Internet with regard to this topic, with alternative believers four and seven times as likely to be searching for information on the Internet for MMR and fluoridation respectively. The rest of this dissertation builds on this finding and focuses on the role of internet use regarding the MMR vaccine and fluoridation. The next chapter begins with a discussion and validation of a new internet engagement measure.

## **CHAPTER FOUR: Validating internet engagement**

### **Conceptualizing internet engagement**

The internet has been described as a “mega-medium,” an amalgamation of many previous technologies. It delivers news articles like newspapers, television shows like television, and video games like video game consoles. More than any single mediated predecessor, it offers text, images, sound, and video in different combinations in a practically infinite number of sites about an infinite number of topics. It also includes an interactive component, whether with websites or other people, which did not exist (at least so quickly or easily) in traditional mass media. Given the unique qualities of the internet, researchers have asked whether the people use the internet in unique ways, along with what might predict such use or what the outcomes may be. However, conceptualizing and operationalizing internet use is a complicated matter.

Some characteristics of the medium make internet use particularly challenging to study. For instance, the ability to have private access to boundlessly diverse, and sometimes transgressive, content at one’s fingertips, can make accurate self-report and observational data difficult to obtain. The internet can also be accessed from multiple platforms beyond computers at home and work, like video game consoles, phones, and various mobile devices, which makes it tricky to track online behaviors. To complicate matters further, sometimes behaviors are very similar in their online and offline forms, such as reading news articles and instant messaging versus texting, which may not be distinguishable in terms of self-report or related antecedents or outcome variables. These

issues must be kept in mind as potential limitations of research on internet use, though their prominence will depend on the specific study.

Internet use most often has been measured as a quantity of behavior in terms of frequency of use or simply using versus not using the internet (LaRose, Mastro & Easton, 2001; Weiser, 2001; Nie, Hillygus, & Erbring, 2002; Dimaggio & Bonikowski, 2008). Some studies have measured internet use as an arbitrary collection of different activities, such as reading blogs or news sites, especially in relation to a particular subject like health or politics (Baker, Wagner, Singer, & Bundorf, 2003; Lee, 2006). There are many possible ways to measure internet use on a survey, but the question is whether a measure suits its particular research question and perspective. Some studies have examined general internet use and what motivates people to use the medium (Parker & Plank, 2000; Flanagin & Metzger, 2001; Weiser, 2001; Papacharissi & Rubin, 2000; Stafford, Stafford, & Schkade, 2004). In the context of internet addiction, it makes sense to ask about total time spent online, or to ask about potentially habit-forming behaviors such as online gaming or shopping (Young, 1998; Chak, 2004). In the context of whether the internet creates stronger or weaker social ties, an internet use measure would likely focus on online interactions with others, such as email, chatting, or message board use (Kraut, Patterson, Lundmark, Kiesler, Mukopadhyay, & Scherlis, 1998; Zhao, 2006). The most relevant internet use measures to this study have to do with online health information seeking. Studies on online health information seeking have typically asked whether a person has sought health information online amidst other topics, sought information

about various specific health-related topics, or talked with doctors, family, friends, or others online about health-related topics (Cotton & Gupta, 2003; Fox & Jones, 2009).

Notably, the common thread between these areas of research is that they treat the internet as a homogenous concept. A typical measure of internet use is simply whether one has access to the internet or how much time spends online, with variations on duration and frequency. Alternatively, internet use is measured as an arbitrary collection of particular behaviors. Granted, the questions asked were relevant to each study's research aims, but there has been a lack of recognition of the diversity of online behavior. Given the vastness and many modes of the internet, studying "general internet use" is problematic. Internet use could mean anything from reading online newspapers, to posting pictures on a social network site, to hunting for the latest recipe or bargain. Simply asking how much time one spends online fails to distinguish among these very different activities. Little attention has been paid to conceptualizing the total scope of online behavior or how general internet use would relate to more specific kinds of online behavior. A systematic approach to capturing the heterogeneity of internet use would better reflect the multifaceted nature of the internet and internet use by revealing those aspects which are prevalent and in what circumstances. Furthermore, the more specific the measure of online behavior is to other variables, such as health-related or politic-related matters, the stronger and more predictive the relationship will be.

Most existing survey measures of internet use simply ask about time and/or topics sought, but experimental and observational studies often measure online activities in more detail. These studies frequently use software to track subjects' online behavior, such

as how often they clicked on certain links on a website, how much time they spent looking at different web pages, and what they typed into search engines (Eysenbach & Kohler, 2002; Hansen, Derry, Resnick, & Richardson, 2003). This method of measurement is more specified and perhaps more representative than simply asking how much time one has spent online. Using web tools to track user data sometimes may not be feasible or generalizable, but it still is possible to increase the level of detail and representativeness of self-report by asking more specific questions to aid the comprehensiveness and accuracy of respondents' answers.

One of this study's main contributions will be the conceptualization of *internet engagement*, a construct that attempts to capture different dimensions of online behavior. To my knowledge, there has been no comprehensive approach to capturing these means. To better gauge the level of online activity, I propose understanding internet engagement in terms of three dimensions: depth, breadth, and interactivity.

The first, *depth*, is a concept that describes how far a person will go to find content online. Depth can be captured in terms of using search engines, how far a person looks through the search results, and clicking on links within a website. The second, *breadth*, reflects the range of access to different information sources regarding the subject, especially ones that might give different perspectives. A person who looks for both mainstream and nonmainstream information sources, such as newspaper sites and personal blogs, or from expert and non-expert sources, looks for diverse presentations of the topic. The third dimension, *interactivity*, refers to how much a person actively connects with others online about the subject. There is a large range of interactivity

possible online, from joining an email listserv to posting updates on social media, from commenting on a blog to conversing in a chat room. I expect for these three dimensions to correlate with one another, but they are meant to measure distinct behavioral patterns. This multidimensional construct of online activity will offer an awareness of how people use the internet beyond time spent, to the different ways in which they can engage with a specific topic online.

It is worth pointing out that time spent doing any of these aspects of internet engagement is not included in this measure. Time is a separate concept from breadth, depth, and interactivity, even though time could be considered a proxy variable for internet engagement. This measure of internet engagement measure is meant to capture behaviors closer to actual involvement or *engagement* with a specific topic online. Because the current study examines internet use with regard to a single health-related topic – the MMR vaccination and autism or fluoridated water – it is more appropriate to ask topic-specific questions than general ones. Also, because these topics are not ones that would typically require or prompt ongoing media consumption (such as in the case of diet or exercise), the measure asks about behaviors that respondents have “ever” done, rather than within a limited timeframe. Finally, the three different parts of the measure attempt to reflect the multidimensionality of internet use, a matter which has been rarely recognized or addressed in internet research. By asking questions about the level of engagement with online tools, sources, and other internet users on a particular topic, it becomes possible to more completely capture the range and depth of various online activities.



The internet engagement measure is more conceptually expansive than existing survey measures of internet use, insofar as it is meant to represent different modes of interacting with online content. The dimensions of depth, breadth, and interactivity were informed by research literature, interviews, and personal experience. Search engine use and website activity, the two major components of the depth dimension, are common emphases in experimental and observational studies. Furthermore, because interview respondents often reported engaging in such behavior with regard to fluoridated water and the MMR vaccination, it seemed sensible to examine this type of activity. Asking about different information sources, conceptualized as breadth of internet engagement, is a familiar approach to asking about internet use in surveys; it has simply been tailored to the current topics at hand. Interactivity, which describes interacting with others online about a topic, is a unique contribution to research on internet use. This dimension was most informed by interviews and personal experience, which demonstrated that internet use is hardly a solo activity, especially when it comes to health subjects.

These three dimensions are meant to capture the full meaning of internet engagement; they certainly go beyond existing survey measures of online activity, conceptually and operationally. Although it is possible to include other measures that may affect internet engagement, such as computer skill level or connection speed, these would be influences on online behaviors, rather than behaviors themselves. All online behaviors that might have to do with fluoridated water and MMR vaccination and autism were included in here, but other topics could potentially have other relevant dimensions. For instance, a study on social media may include a gaming dimension, or one on dieting

may include a shopping dimension. Future studies would necessarily need to tailor questions as well as dimensions to their research needs. However, this study moves the field forward by conceptualizing a multidimensional view of internet engagement and focusing on specific behaviors, and the current set of items seems appropriate for this study.

### **Criteria for validating the internet engagement measure**

The internet engagement measure combines depth, breadth, and interactivity as a sum of specific behaviors that reflect each dimension. These three major dimensions, each made up of separate sets of items, are conceptualized as indices rather than as scales. The items are meant to capture related behaviors that may be considered distinct from one another, rather than merely indicators of the same underlying concept. For example, in the interactivity dimension, a person who chats to others online about fluoridated water would not necessarily be expected to create a website on the subject, although they both capture forms of interactivity, which justifies their summing as (part of) an index. The measurement model underlying the indices is that the self-reported behaviors are the basis for measuring the level of the three dimensions of internet engagement, rather than there exists a construct called internet engagement which leads to these behaviors. While there is some expectation that the individual items will correlate (because each behavior reflects similar influences) the validity of an index is not appropriately assessed by the covariation among the items that make up the index (e.g. with Cronbach's alpha). The items are simply grouped together to express the ideas of

depth, breadth, and interactivity, and ultimately internet engagement, more parsimoniously.<sup>3</sup>

To quantitatively test the soundness of the internet engagement measure, this chapter assesses two facets of validity appropriate for assessing an index: discriminant validity and nomological validity. The first facet, discriminant validity, concerns whether what is measured reflects the intended variable best, rather than reflecting some other variable that others might think it reflected. The second facet, nomological validity, addresses whether the variables which ought to be associated with the measure, such as antecedents and outcomes, are correlated with it.

*Discriminant validity.* Discriminant validity is the type of validity achieved if the measure is related most strongly to a comparable measure, and less so to measures of other concepts. Although it is reasonable to expect internet engagement to be related to reading health information online, offline health media use, and time spent online daily, these correlations should be of low to moderate level, because they are measuring distinct constructs. Evidence of a small relationship with these variables would refute an argument that the topic-specific internet engagement measures are merely indicators of a general involvement with health media, or a general tendency to be online or to read (non-specific) health information online. Although all three of these behaviors have at least one part in common with internet engagement – a focus on health, or a focus on internet – reading health information online has both components in it. Therefore, it is

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<sup>3</sup> The argument for putting the items together as indices rather than scales is based on theoretical grounds. Were these items to be put together as a scale, however, there would be a fair amount of reliability. In the MMR vaccine data, the Cronbach's alpha was .608 for depth, .795 for breadth, and .892 for interactivity. In the fluoridated water data, the Cronbach's alpha was .656 for depth, .767 for breadth, and .862 for interactivity.

expected that internet engagement will be more strongly associated with one of those measures, reading health information online, than it will be with offline health media use or time spent online, since it is more closely related to the construct.

**H1:** Reading health information online will be positively correlated with internet engagement.

**H2:** Offline health media use will be positively correlated with internet engagement, though this relationship will be less strong than the association of reading health information online and internet engagement.

**H3:** Time spent online daily will be positively correlated with internet engagement, though this relationship will be less strong than the association of reading health information online and internet engagement.

*Nomological validity.* Interest in the specific topic, a construct distinct from internet engagement and an expected antecedent of it, should be positively correlated with internet engagement. In addition, supportive and oppositional behaviors toward water fluoridation and the MMR vaccination, expected outcomes of internet engagement, should also be positively correlated with it.

**H4:** Interest in the topic will be positively correlated with internet engagement on the topic.

**H5:** Internet engagement will be positively correlated with supportive behaviors toward water fluoridation and MMR vaccination.

**H6:** Internet engagement will be positively correlated with oppositional behaviors toward water fluoridation and MMR vaccination.

## **Methods**

The data analyzed in this chapter include two sets of surveys: a pair of nationally representative surveys, and a pair of purposive surveys. Each type of survey had one that focused on the topic of the MMR vaccination and autism, and the other focused on fluoridated water. The recruitment method and participant characteristics for the nationally representative surveys were described in Chapter Three: American's Alternative Beliefs and Behaviors. In brief, the purposive surveys were also online surveys that utilized a sample of American adults screened for their views on the alternative belief and their demographics. More information about the recruitment method and participant characteristics of the purposive surveys can be found in Chapter Five: Basic Variables in Relation to Internet Engagement.

The nationally representative samples (N=292 for vaccination, N=318 for fluoride) and the purposive samples (N=578 for vaccination, N=595 for fluoride) for each topic were combined (N=870 for vaccination, N=913 for fluoride). The use of all available survey data allows for the maximization of variation in the true score of internet engagement, which will reduce the noise from error.

## Key measures

*Internet engagement.* The internet engagement measure is a sum of the observed scores from the depth, breadth, and interactivity indices. The majority of respondents in both datasets had a score of 0 – that is, they had never sought MMR vaccine or fluoridated water related information online. In the vaccine sample, 71.7% of respondents scored 0, and 79.5% of the fluoride sample scored a 0. The scores ranged from 0 to 22, out of a possible range of 0 to 24.

*Internet engagement: depth.* The dimension of depth was measured by first asking, “Have you ever looked for information about fluoridated water using a search engine, such as Google, MSN, or Yahoo, before?” If the answer was no, no further questions were asked regarding depth. If yes, they were asked, “How often have you looked for information about fluoridated water on search engines?” Possible response options were: only once, two or three times, and more than three times. They were also asked, “When did you last look for information about fluoridated water on a search engine?” with possible responses of in the past year or more than a year ago. They were then asked, “How far did you go in your search for information about fluoridated water?” They were allowed to select multiple response options from: I only looked at the first page of search results, I looked beyond the first page of search results, I went to one or two of the sites listed in the search results, I went to three or more of the sites listed in the search results, I went back to the search engine and searched for more fluoridated water-related information.” If a respondent went to any websites, then they were asked, “Have you done any of the following when visiting a website about fluoridated water?” They

were allowed to select multiple response options from: I skimmed through the site, I read the site thoroughly, I clicked on something while there, such as a link, video, or poll, and I shared the website with someone else.

Only a limited portion of the respondents had ever searched online for information about the MMR vaccination (N=246, 28.3%) or fluoridated water (N=187, 20.5%). All variation beyond 0 in depth, breadth, and interactivity is based on this group of respondents. Depth was categorized into three basic activities: frequency of search (range 0 to 3; never=0, once=1, two or three times=2, more than three times=3), search engine use (range 0 to 4; the following scores were added together: 0 if a person only looked at the first page of search results, 1 if he looked beyond the first page of search results, 1 if he visited one or two sites, 2 if he visited three or more sites, and 1 for going back to the search engine for more information), and website use (range 0 to 4; never visiting a site=0, skimming it=1, reading it=2, clicking on something while there=3, and sharing the site with others=4). The total possible range goes from 0 to 11.

*Internet engagement: breadth.* On the fluoridated water survey, respondents were asked, “Have you ever encountered information about fluoridated water from any of the following sources?” They could respond with a yes or no to: the U.S. government (Centers for Disease Control, National Institutes of Health, etc.), a professional health association (American Academy of Pediatrics, American Dental Association, etc.), a mainstream news organization (CNN, New York Times, FOX, etc.), a college or university, an advocacy group for or against fluoridated water (Fluoride Action Network, Fluoride Information Network, etc.), and other (Wikipedia, a personal website, etc.). The

MMR vaccination survey asked about the same sources, but a couple of the examples were altered: a professional health association (American Academy of Pediatrics, American Medical Association, etc.) and an advocacy group for or against MMR vaccination (Generation Rescue, etc.). These items were added together to create an index (range: 0 to 6), and this measure was limited to those respondents who had ever searched for information about fluoridated water or the MMR vaccination.

*Internet engagement: interactivity.* On the fluoridated water survey, respondents were asked, “Have you ever...?”: joined an email listserv about fluoridated water, chatted about fluoridated water using an instant messaging service, such as AIM, Yahoo, Gchat, etc., joined a discussion about fluoridated water in a chat room, joined a discussion about fluoridated water on a message board, written or commented on a blog post about fluoridated water, posted about fluoridated water using social media (Facebook status, tweet on Twitter, etc.), created a website about fluoridated water. The response options available to these seven items were yes and no. The same questions were asked to the MMR vaccination survey participants, with “fluoridated water” being replaced with “the MMR vaccination and autism.” These items were added together to create an index (range: 0 to 7), and this measure was limited to those respondents who had ever searched for information about fluoridated water or the MMR vaccination.

*Reading health information online.* This question asked participants, “How often in the past 30 days did you read health information on the Internet when you were not trying to find out about a specific health concern?” Response options were not at all, less than once per week, once per week, or two or more times per week.



*Offline health media use.* The measure asked respondents to indicate how often they have done each of the following in the past 30 days: read about health issues in newspapers or general magazines, read special health or medical magazines or newsletters, watched special health segments of television newscasts, watched television programs (other than news) which address health issues or focus on doctors or hospitals and talked with family or friends about health issues. Survey participants could select not at all, less than once per week, once per week, or two or more times per week. The responses to these items were added together to create an offline health media index, which ranged from 0 to 15.

*Interest in water fluoridation and MMR vaccination.* This question was only asked to the purposive samples. Interest in these topics was measured by asking participants, “How interested are you in the issue of fluoridated water?” on the fluoridated water, and “How interested are you in the issue of MMR vaccination and autism?” on the MMR vaccination survey. Respondents could choose from not at all, a little, some, and a lot as their answer.

*Time spent online.* This question was also only asked to the purposive samples. Participants were asked, “Counting all of your online sessions, how much time do you typically spend online each day?” Response options included less than an hour, about an hour, more than 1 hour but less than 2 hours, 2 hours or more but less than 3 hours, 3 hours or more but less than 4 hours, and 4 hours or more.

*Supportive behaviors related to belief topic.* Respondents on the water fluoridation survey were asked about whether they had done any of the following: drank

fluoridated water (tap water is fluoridated in many places, but not all), told others to drink fluoridated water, donated to an organization that supported fluoridated water, contacted an election official or media organization to support fluoridated water, and signed a petition or joined a protest, rally, or demonstration to support fluoridated water. Similar questions were asked on the MMR vaccination surveys, asking whether respondents: had their child vaccinated against MMR, told other parents to vaccinate their child against MMR, contacted an election official or media organization to support the MMR vaccination, and signed a petition or joined a protest, rally, or demonstration to support the MMR vaccination. Respondents could answer yes or no to all items, except for the first behavior item on the MMR survey, for which there was a “N/A” option.

*Oppositional behaviors related to belief topic.* Respondents on the water fluoridation survey were asked about whether they had done any of the following: removed fluoride from water (Brita and Pur filters do not remove fluoride), told others to NOT drink fluoridated water, donated to an organization that supported fluoridated water, contacted an election official or media organization to oppose fluoridated water, and signed a petition or joined a protest, rally, or demonstration to oppose fluoridated water. Similar questions were asked on the MMR vaccination surveys, asking whether respondents: had refused to have their child vaccinated against MMR, told other parents to NOT vaccinate their child against MMR, contacted an election official or media organization to oppose the MMR vaccination, and signed a petition or joined a protest, rally, or demonstration to oppose the MMR vaccination. Respondents could answer yes

or no to all items, except for the first behavior item on the MMR survey, for which there was a “N/A” option.

## **Results**

*Discriminant validity.* Hypothesis 1 was supported. Reading health information online was positively correlated with internet engagement for both topics ( $r=.359$ ,  $p<.0005$  in the fluoride data;  $r=.321$ ,  $p<.0005$  in the vaccine data). Hypothesis 2 was partially supported. Offline health media use was positively correlated with internet engagement for both topics. However, this relationship was weaker than the relationship between reading health information online and internet engagement for only the fluoride data ( $r=.299$ ,  $p<.0005$ ); it was stronger in the vaccine data ( $.366$ ,  $p<.0005$ ). Finally, Hypothesis 3 was partially supported. While the relationship between time spent online daily and internet engagement was lower than the relationship between internet engagement and reading information online for both topics, there was no statistically significant relationship between time spent online daily and internet engagement. The correlation in the fluoride data was  $.121$  ( $p<.0005$ ) but only  $.029$  ( $p<.490$ ) in the vaccine data. Table 4.1 summarizes these results.

*Nomological validity.* Hypothesis 5 was supported. Interest in fluoridated water was associated with internet engagement on the topic, and the same was found with the topic of MMR vaccination and autism. The relationship was of moderate strength ( $r=.440$ ,  $p<.0005$  for fluoride,  $r=.425$ ,  $p<.0005$  for the MMR vaccine). Hypotheses 6 and 7 were also supported. Internet engagement correlated with supportive behaviors of

fluoride at  $r=.240$  ( $p<.0005$ ) and with supportive behaviors of the MMR vaccine at  $r=.421$  ( $p<.0005$ ). Internet engagement was also correlated with oppositional behaviors toward fluoride ( $r=.493$ ,  $p<.0005$ ) and oppositional behaviors toward the MMR vaccine ( $r=.512$ ,  $p<.0005$ ). In other words, the data indicate that the internet engagement construct is associated with antecedent and outcome variables in expected ways.

	<b>Fluoride</b>	<b>N</b>	<b>Vaccine</b>	<b>N</b>
Reading health information online (H1)	.359†	911	.321†	870
Offline health media use (H2)	.299†	900	.366†	864
Time spent online daily (H3)	.121†	595	.029	578
Interest in fluoride/the MMR vaccine (H4)	.440†	595	.425†	352
Supportive behaviors of fluoride/the MMR vaccine (H5)	.240†	906	.421†	587
Oppositional behaviors toward fluoride/the MMR vaccine (H6)	.493†	905	.512†	638

*Note:* †  $p<.0005$ .

## **Discussion**

This chapter argues that internet engagement is a construct that advances the concept of internet use, proposes a method of measuring this multidimensional construct, and provides evidence that the measures are valid indicators of the construct. The measures appear to have discriminant validity; the construct of internet engagement is clearly measuring something other than reading health information online, offline health media use, and time spent online daily. Furthermore, the results mostly support the

expected pattern of correlations based on the similarity of these other constructs to internet engagement. Finally, the construct also has nomological validity, as variables expected to come before and after it – interest and supportive and oppositional behaviors – are associated with internet engagement.

The finding that some hypotheses only garnered partial support may point to the distinctiveness of each topic and its relation to internet engagement. It was unexpected that offline health media use had a stronger relationship than reading health information online to internet engagement in the vaccine data, but this finding may be due to there being more MMR vaccination than fluoridated water media coverage. It is possible that people with higher levels of internet engagement with regard to the MMR vaccine were more likely to go to online sources as a supplement to offline health media exposure to the topic, whereas people with higher levels of internet engagement with regard to fluoridation turned to the internet as their primary source of information, which would lead to a different pattern of associations. The other partially supported hypothesis—that time spent online daily was less strongly associated with internet engagement, but so much less so that it was not associated at all—also reveals the importance of topic distinctiveness. That time spent online daily was not associated with internet engagement at all for either topic speaks not to the failure of the construct’s validity, but rather the problem of operationalizing internet use at a single point in time. It is possible that were these topics more commonplace, current, or broad, such as celebrity gossip, economic issues during an election year, or health information in general, time spent online daily would be associated with internet engagement. The unique characteristic of a topic

should be carefully considered when studying internet engagement related to it, especially when it would significantly depart from other measures of internet use.

The primary limitation of this measure is its generalizability. Measures of internet engagement must be topic specific if they are to capture any distinction with regard to the variation in quality and quantity online behavior. Future studies that utilize a measure of internet engagement will need to tailor dimensions and questions to their needs, and should also conduct validity tests, as the measure will be specific to both topic and population. Though the current measures of internet engagement are limited to the subjects of fluoridated water and the MMR vaccination, the findings here demonstrate that it is possible to create a multidimensional construct of internet engagement that focuses on specific behaviors, which is a significant theoretical and methodological advancement in the study of internet use.

Accuracy of recall is also an issue, due to the nature of self-reported data. The internet engagement questions ask whether participants have *ever* performed particular behaviors, rather than within a recent timeframe, such as the past week or six months. Despite potentially poor recollection, however, most expected associations were found in the data. It is also possible that people who have interest in water fluoridation or MMR vaccination, consume health-related information offline, and engage in supportive or oppositional behaviors toward those topics may have *assumed* that they engaged with the topics online without actually having done so, because it would be consistent with their interests and other behaviors. The specificity of internet engagement behaviors should

help to mitigate this concern; certainly more so than existing general measures of internet use.

Despite these limitations, internet engagement seems to be a theoretically and methodologically useful construct that captures internet use more comprehensively and specifically than current measures. The fact that the validity tests results from both the water fluoridation and MMR vaccination data were supportive of the construct is promising. Establishing validity for this construct, though specific to these two topics and populations, is a stepping stone for future researchers who may be interested in using the internet engagement construct.

## **CHAPTER FIVE: BASIC VARIABLES IN RELATION TO INTERNET ENGAGEMENT**

Before tackling the main hypotheses of this dissertation, it is worthwhile to conduct some background analyses to see how some basic variables also may relate to internet engagement. This chapter will examine how demographic characteristics, political alienation, and anomie may be associated with internet engagement on the topics of the MMR vaccine and water fluoridation.

### **Demographics and their relation to health-related internet use**

As an increasing number of Americans have gained access to the internet, more and more of them are finding, encountering, and sharing health information online. According to the Pew Research Center, 74% of American adults use the internet (Fox, 2011). Various studies have found that the majority of American internet users, somewhere between 60 and 80%, look for health information online (Hesse et al., 2005; Fox & Jones, 2009). Those who look for health information online tend to be younger, female, college graduates, and have more experience with the internet (Dutta-Bergman, 2002; Hesse et al., 2005; Rice, 2006). Furthermore, people who are more willing to look for health information are more likely to use the internet as their primary health source, rather than more traditional media (Dutta-Bergman, 2004). Although the influence of online health information may be mostly minor, six in ten American adults reported that their most recent search had an influence on their own health or the way they care for someone else (Fox & Jones, 2009).



Many health professionals have expressed concerns about the credibility of online health content (Winker et al., 2000). In a review of studies that examined the quality of health-related websites, 55 studies (70%) concluded that quality is a problem, 17 (22%) were neutral, and 7 studies (9%) reviewed them positively (Eysenbach, Powell, Kuss, & Sa, 2002). There is even some evidence that the internet may challenge orthodox medicine, as people may be exposed to treatments they otherwise would not have heard of and push for treatments other than what was prescribed by the doctor (Hardey, 1999). Exposure to scientifically unsound or even harmful content is worrisome, as it may translate into real world effects. Given the potential consequences of this kind of media use, health professionals and researchers might wish to target groups that may be more likely to look for alternative health information online. Thus far, there has been little research on this subcategory of internet use.

Although there has not been much research on what demographic characteristics predict searching for alternative health information online, there has been some research on what demographics are related to using complementary and alternative medicine (CAM). To the extent that one's likelihood of holding an alternative belief is related to going online to find out more information about it, these predictors may be a useful starting point. Believing that the MMR vaccine or fluoridated water is unsafe and going online to find information on these topics are not the same thing; people who are uncertain might want to simply check the facts, and people who are in the mainstream might look up information to bolster their own views or share it with others online. However, it is plausible that the demographics associated with holding the alternative

belief are also associated with internet engagement about it, because these groups may be more open to the alternative belief and media on the subject.

Use of complementary and alternative medicine, such as spiritual healing, herbal medicine, and chiropractic is relatively common in the United States. According to an analysis of the 2007 National Health Interview Survey, 16.6% of Americans reported using CAM providers in the past 12 months, 18.8% said they had used CAM products, and 22.2% said they had used CAM practices (Upchurch & Rainisch, 2012). In this sample, women were more likely to use CAM than men, Whites and Asians more than Blacks and Hispanics, those who were middle aged more than those who younger or older, and those who were more educated than less. These findings replicate the results from the 1999 National Health Interview Survey (Ni, Simile, & Hardy, 2002).

Commitment to environmentalism, feminism, and interest in spirituality and personal growth psychology—movements typically associated with a liberal political orientation— have also been associated the use of alternative medicine (Astin, 1998).

With regard to actually searching for alternative treatment or medicine information online, Fox & Jones (2009) found that a quarter of American adults did so, up from 16% in 2002. In their analysis, they found that women were more likely than men to search for alternative treatment or medicine information online, and people younger than 65 years old were more likely to search for it than people over 65. Based on the findings from this literature, it is likely that there are some demographics that would be associated with looking for MMR vaccination or fluoridated water information online. Consequently,

gender, education, political orientation, age, race, and ethnicity will be examined as possible predictors of internet engagement.

**RQ1:** Are gender, education, political orientation, age, race, and ethnicity associated with internet engagement on the subjects of the MMR vaccination or water fluoridation?

A couple of other demographic characteristics specific to these issues may be associated with internet engagement as well. In the case of the MMR vaccine, it may be that parents of young children are more likely to be worried about its safety, and therefore look up information online about it online. In the case of fluoridated water, people who have had less personal experience with it due to living in rural areas may also be more concerned about its safety, and therefore look up information online about it. These relationships are merely speculative, but will also be tested.

**RQ2:** Does being the parent of a young child have lower or higher internet engagement on the subject of the MMR vaccination?

**RQ3:** Does the urbanity of one's community affect internet engagement on the subject of water fluoridation?

Aside from demographics, there has also been some research on nonmainstream health beliefs and the feeling of estrangement from society. Social science research on understanding antifluoridationists' characteristics examined whether alienation or anomie

might be associated with opposition to the fluoridated water (Green, 1961; Gamson, 1961). The theory was that antifuoridationists were individuals who felt socially marginalized, and their opposition was a symbolic revolt against the victimization and manipulation by the government. Put into more contemporary terms, people who oppose fluoridation may have a general rejection of mainstream values. Political alienation, a social psychological construct that describes a person's estrangement to the dominant political system, might encourage antifuoridationist sentiment. Political alienation, rather than a general feeling of alienation, may be more pertinent to the topics of MMR vaccination and fluoridated water, due to the role of government in the distribution of these health measures. Anomie, or in the context of this study, a sense of detachment due to poor ties to society, might also be associated with a person's interest in alternative beliefs. Someone who feels distant from their community may feel indifferent towards others' needs as long as their own needs are taken care of, or may reject the views of a society that does not seem to share their values. Today, the internet allows people easy access to diverse viewpoints and to connect with others who might share nonmainstream views. People who feel alienated or experience anomie may be more inclined to reject mainstream health recommendations, and therefore go online for alternative health information.

**RQ4:** Are feelings of political alienation or anomie related to internet engagement?

## **Methods**

This chapter utilizes the data from a pair of purposive surveys on the MMR vaccination and autism (N=578) and fluoridated water (N=595). These samples were screened for a number of characteristics to ensure variability on key theoretical constructs. Each of these purposive samples was composed of three groups: people who held the mainstream health belief, people who held the nonmainstream belief, and people who were unsure about the health belief. Furthermore, these groups were screened in order to maintain some demographic comparability between the groups. To maintain some balance between groups in the fluoridated water survey, gender, education, and rural/urban location were screened to ensure that a substantial number of individuals who represented each value on these variables were found in each belief category. Similarly, in the MMR vaccination survey, gender, education, and having kids under the age of 6 were used as criteria in the screening process to assure substantial overlap. The data were collected in two waves, in August 2011 and November 2011, through an online survey company called Survey Sampling International.

Due to the purposive nature of this sample, insofar as demographic characteristics are associated with beliefs, and beliefs are associated with internet engagement, there is some built in control for demographics and internet engagement. Insofar as the demographics screened for are associated with other demographic characteristics, those may also be controlled for partially as well. The analyses using this data may represent a lower limit of the relationship between demographic characteristics and internet engagement.

## Key measures

*Internet engagement.* The internet engagement measure is a sum of the observed scores from the depth, breadth, and interactivity indices. The depth score ranges from 0 to 11, breadth from 0 to 6, and interactivity from 0 to 7. The range of the internet engagement measure goes from 0 to 24. In the vaccine sample, 71.7% of the sample scored a 0, and the average score was 2.82 (SD=4.57). In the fluoride sample, 79.5% of respondents scored 0, and the average score was 2.22 (SD=4.15). A full description of the internet engagement variable and its dimensions can be found in Chapter Four:

### Validating Internet Engagement.

*Demographics.* For *age*, respondents were asked to fill in a blank for “How old are you?” *Gender* was measured by asking whether they were male or female. For *race*, respondents were asked to select all groups that applied to them: White, Black/African America, American Indian/Alaska Native, Asian, Native Hawaiian/Pacific Islander, and Other. Separately, they were also asked about being *Hispanic* by asking whether they were of Hispanic, Latino, or Spanish origin. *Education* was measured by asking respondents about the highest level of education they’d obtained: 8<sup>th</sup> grade or less, some high school but did not graduate, high school or GED, some college/2-year degree, 4-year college degree, or more than 4-year college degree. They were also asked to describe the community in which they lived as *rural*, *suburban*, or *urban*. For their *political orientation*, participants were asked to classify themselves as very conservative, conservative, moderate, liberal, or very liberal. Finally, on the MMR vaccination survey

only, respondents answered how many *children* under the age of 1 they had by filling in a blank.

*Political alienation.* This measure was taken from the General Social Survey and was asked only in the purposive surveys. The questions asked were whether the participant tended to feel that: “The people running this country don’t really care what happens to you,” “The rich get richer and the poor get poorer,” “What you think doesn’t count very much anymore,” “You’re left out of things going on around you,” “Most people with power try to take advantage of people like yourself,” and “The people in Washington, D.C. are out of touch with the rest of the country.” Respondents answered that they did “Feel” or did “Not Feel” those things, or they could respond with “Don’t Know.” The average score for alienation in the MMR vaccination sample was .718 (SD=.282), with a Cronbach’s alpha of .716. In the fluoridated water sample, the mean alienation score was .728 (SD=.284), with a Cronbach’s alpha of .712.

*Anomie.* This measure, also borrowed from the General Social Survey, was asked in the purposive surveys to assess respondents’ lack of faith in society. This 9-item measure asked participants whether they agreed or disagreed with the following statements: “Next to health, money is the most important thing in life,” “You sometimes can’t help wondering whether anything is worthwhile anymore,” “To make money, there are no right and wrong ways anymore, only easy and hard ways,” “Nowadays, a person has to live pretty much for today and let tomorrow take care of itself,” “In spite of what people say, the lot (situation/condition) of the average man is getting worse, not better,” “It’s hardly fair to bring a child into the world with the way things look for the future,”

“Most public officials (people in public office) are not really interested in the problems of the average man,” “These days a person doesn’t really know whom he can count on,” and “Most people don’t really care what happens to the next fellow.” Possible response options were: agree, disagree, and don’t know. On average, respondents had an anomie score of .518 (SD=.272) in the MMR vaccination scale, and the Cronbach’s alpha was .754. In the fluoridated water sample, the average anomie score was .556 (SD=.264), with a Cronbach’s alpha of .719.

### Analytic approach

Pearson correlations were used to assess bivariate associations between internet engagement and the potential predictor variables. Correlation coefficients were utilized to show the relative impact of each of the bivariate relationships, as they are the same as standardized beta values from ordinary least squares regression models. Significant associations among the psychological variables were then put into hierarchical linear regression models to examine their effects beyond demographic characteristics. The internet engagement variable was transformed for the sake of linearity by adding 1 to the raw score and then taking its natural log. All independent variables tested were either binary or had a linear relationship with the transformed internet engagement variable.

### Results

Table 5.1 displays the demographic characteristics of the MMR vaccine and fluoridated water survey samples. In the vaccine sample, a little over half were female



(56.2%) and a little under half were male (43.8%). About half of the sample reported living in a suburban area (48.6%), while about a quarter lived in an urban area (22.3%) and 29.1% in rural areas. The proportion of respondents who held at least a 4-year college degree was 42.7%. The most common political orientation reported was “moderate” (41.2%), while about a third of the sample described themselves as conservative (36.7%) and about a fourth as liberal (22.1%). The majority of the sample was White (78.0%) and non-Hispanic (90.0%). The average age of the sample was 40.28 (SD=15.95). Over a third of the sample reported having children under the age of 6 (39.8%).

In the fluoridated water sample, a little over half were female (54.5%) and a little under half were male (45.5%; see Table 1). Over a third of this sample reported living in a suburban area (38.5%) and the rest were equally divided between urban and rural communities. Less than half of the sample reported obtaining at least a 4-year college degree (41.2%). Similar to the vaccine sample, “moderate” was the most commonly reported political orientation (41.0%), while about a third described themselves as conservative (36.3%) and about a fourth as liberal (22.7%). The majority of this sample was White (79.6%) and non-Hispanic (92.9%). The average age of this sample was 42.47 (SD=16.48). The question about having children under age 6 was not asked of the fluoridated water sample.

<b>Table 5.1. Demographic characteristics of the MMR vaccine and fluoridated water samples (purposive samples).</b>		
	<b>MMR vaccine sample, % or M (SD), N=578</b>	<b>Fluoridated water sample, % or M (SD), N=595</b>
Gender		
Male	43.8	45.5
Female	56.2	54.5
Community setting		
Urban	22.3	29.1
Suburban	48.6	38.5
Rural	29.1	29.1
Highest degree earned		
Less than 4-year college degree	57.3	58.8
4-year college degree	42.7	41.2
Political orientation		
Conservative	36.7	36.3
Moderate	41.2	41.0
Liberal	22.1	22.7
Race		
White	78.0	79.6
Non-white	22.0	20.4
Ethnicity		
Non-Hispanic	90.0	92.9
Hispanic	10.0	7.1
Age		
Years old	40.28 (15.95)	42.47 (16.48)
Children		
Have kids under the age of 6	39.8	N/A
No kids under the age of 6	60.2	N/A

Table 5.2 displays the correlations of demographic characteristics with internet engagement from both the MMR vaccination and fluoridated water data. Some of the demographics were associated with internet engagement in both samples, some in only one, and some in neither. Gender was not related to internet engagement for MMR vaccine information, but males were more likely than females to look for fluoridated water information online ( $r=-.120$ ,  $p<.0005$ ). Having a college degree was associated

with looking for alternative belief information online in both groups ( $r=.173$ ,  $p<.0005$  in the MMR vaccination sample;  $r=.124$ ,  $p<.0005$  in the fluoridated water sample). Having a liberal political orientation was not linked with internet engagement in either sample, but youth was (age  $r=-.251$ ,  $p<.0005$  in the MMR vaccination sample;  $r=-.154$ ,  $p<.0005$  in the fluoridated water sample). There did not seem to be any association with being White versus non-White, but being non-Hispanic was associated with internet engagement ( $r=-.071$ ,  $p<.035$  in the MMR vaccination sample;  $r=-.098$ ,  $p=.003$  in the fluoridated water sample). Parents of young children and people living in suburban or urban areas were more likely to look up information about the MMR vaccine online ( $r=.288$ ,  $p<.0005$ ,  $r=-.095$ ,  $p<.0005$ , respectively), but parenthood and community setting were not associated with internet engagement in the fluoridated water sample.

**Table 5.2. Correlations of demographic characteristics with internet engagement on the MMR vaccination and fluoridated water.**

	MMR vaccine sample			Fluoridated water sample		
	r	Sig.	N	r	Sig.	N
Female	-.036	.286	870	-.120	.0005	913
College degree	.173	.0005	870	.124	.0005	913
Liberal politics	-.038	.269	865	.015	.645	904
Age	-.251	.0005	870	-.154	.0005	913
Non-White	.022	.525	860	.011	.740	914
Hispanic	-.071	.035	870	-.098	.003	914
Is a parent	.288	.0005	869	-.079	.159	318
Rural community	-.095	.0005	868	-.045	.174	913

Table 5.3 displays the correlations of the psychological variables with internet engagement. Feeling less alienated, contrary to the hypothesis, was associated with looking for MMR vaccine-related internet engagement ( $r=-.100$ ,  $p<.038$ ); there was no

such relationship in the fluoridated water sample. The perception of anomie also had no relationship with internet engagement in either sample.

**Table 5.3. Correlations of psychological characteristics with internet engagement on the MMR vaccination and fluoridated water.**

	MMR vaccine sample			Fluoridated water sample		
	r	Sig.	N	r	Sig.	N
Political alienation	-.100	.038	434	-.052	.281	424
Anomie	-.041	.391	438	.020	.678	429

Psychological variables with significant bivariate relationships with internet engagement were then put into hierarchical regression models to see whether they still had an impact beyond demographic characteristics. In the cases of these analyses, only political alienation was significantly associated with internet engagement in the MMR vaccine data. Table 5.4 displays two models using the MMR vaccine data, with the first model showing the coefficients of only demographic variables, and the second with demographics and the alienation variable. When all the demographics were added together in the same model, having a college degree ( $B=.402, p<.0005$ ), being Hispanic ( $B=.356, p<.008$ ), young ( $B=-.014, p<.0005$ ), and being a parent of a young child ( $B=.531, p<.0005$ ) were all predictive of internet engagement. The only variable that lost its relationship to internet engagement due to other predictors was community setting ( $B=-.027, p<.761$ ). The alienation variable was added in Model 2, and had no relationship with internet engagement above the demographic characteristics ( $B=-.113, p<.504$ ).

<b>Table 5.4. Regression results predicting internet engagement by demographic characteristics and alienation in the MMR vaccine sample.</b>						
Predictors	Model 1: Demographics only			Model 2: Demographics + Political alienation		
	B	SE B	$\beta$	B	SE B	$\beta$
(Constant)	.969†	.187	--	1.038†	.224	--
Female	-.101	.080	-.048	-.062	.096	-.029
College degree	.402†	.082	.192	.435†	.097	.204
Rural community	-.027	.088	-.012	.035	.105	.015
Liberal politics	-.022	.053	-.016	.002	.064	.001
Non-White	.049	.112	.017	.049	.135	.016
Hispanic	.356†	.135	.103	.430†	.152	.131
Age	-.014†	.003	-.211	-.014†	.003	-.214
Is a parent	.531†	.088	.250	.443†	.105	.207
Political alienation	--	--	--	-.113	.169	-.030
$\Delta R^2$	.205			.001		

Table 5.5 displays a regression model with the demographic variables as predictors of internet engagement using the fluoridated water data. Because there was no relationship between internet engagement and alienation or anomie, those variables were not included in the regression analysis. There was a significant relationship between being male and engaging in fluoridated water-related internet engagement ( $B=-.294$ ,  $p<.0005$ ). Having a college degree was positively related to internet engagement

( $B=.214$ ,  $p<.007$ ), and age was negatively related ( $B=-.014$ ,  $p<.0005$ ). The  $R^2$  for this model was .098.

**Table 5.5. Regression results predicting internet engagement by demographic characteristics in the fluoridated water sample.**

Predictors	B	SE B	$\beta$
(Constant)	1.204†	.165	--
Female	-.294†	.077	-.151
College degree	.214*	.078	.108
Rural community	-.004	.083	-.002
Liberal politics	.020	.052	.016
Non-White	.013	.115	.005
Hispanic	.179	.153	.047
Age	-.014†	.002	-.241

## Discussion

This chapter examined the relationship of demographic characteristics, political alienation, and anomie to internet engagement on the MMR vaccine and fluoridated water. In some cases, the analyses of demographic relationships corresponded to previous research findings on who looks for health information online, especially nonmainstream health information. In both the MMR vaccine and fluoridated water sample, youth and education were positively associated with internet engagement. However, liberal political orientation and being White had no relationship with internet engagement. Interestingly, though the literature suggests that women are both more likely to have an interest in

alternative health topics and go online for health information, they were not more likely to engage in MMR vaccine information online, and men were actually more likely to engage in fluoridated water information online. It is unclear why this pattern with gender emerged. Being a parent of young children was positively associated with internet engagement about the MMR vaccine, but not with fluoridated water. Living in a rural area was not associated with internet engagement, but unexpectedly, living in a suburban or urban area was associated with MMR vaccine-related internet engagement. Speculatively speaking, people in urban or suburban areas may have been more exposed to vaccination messaging due to living in higher density areas, and are therefore prompted to look for more information online.

Though anomie was not related to internet engagement for either topic, alienation had a small, positive bivariate relationship with MMR vaccine-related internet engagement. This relationship, however, disappeared after controlling for demographic characteristics. It is possible that alienation or anomie could still lead to rejection of mainstream beliefs and behaviors, but the evidence here suggests that they do not make a difference with regard to internet engagement. Therefore, mediation hypotheses that alienation or anomie would lead to alternative health views, which would increase internet engagement, would not be supported by this data.

Due to the purposive nature of this sample, insofar as demographic characteristics are associated with beliefs, and beliefs are associated with internet engagement, there is some built in control for demographics and internet engagement. Insofar as the demographics screened for are associated with other demographic characteristics, those

may also be controlled for partially as well. The analyses using this data may represent a lower limit of the relationship between demographic characteristic and internet engagement. Regardless of the nature of the actual relationship between demographics and internet engagement, however, these analyses were important to serve as context for the main hypotheses. The demographic variables examined in this chapter will be controlled for in Chapter Six through Eight.



## **CHAPTER SIX: MEDIA DISSOCIATION AND INTERNET ENGAGEMENT**

### **Personal position, perceived news position, and internet engagement**

Health professionals and researchers have been concerned about the internet and its potentially damaging effects on the public (Cline & Haynes, 2001; Ayoob, Duyff, & Quagliani, 2002; Benigeri & Pluye, 2003). Their concern is perhaps not unfounded, as experts have judged online sources as unreliable in a number of health contexts (Tatsioni, Gerasi, Charitidou, Simou, Mavreas, & Ioannidis, 2003; Scullard, Peacock, & Davies, 2010; Kata 2010). Given its dubiousness, using the internet as a main information source is sometimes maligned as the habit of people who deliberately seek “crazy” content. Still, is there actually evidence that people who hold alternative beliefs go online more often than others for belief-related content? This question, as applied to the subjects of MMR vaccine and fluoridated water safety, will be examined in this chapter.

**H1:** People who hold the alternative belief will have greater internet engagement related to the topic, such that those who believe that the MMR vaccine or fluoridated water are unsafe will be more likely than others to engage in online content related to the MMR vaccine or fluoridated water.

Furthermore, this chapter will also examine whether it is truly one’s alternative position, rather than some other factor such as interest in the topic or use of health information sources more broadly that explains this greater internet use. People who are

equally interested in the MMR vaccine or fluoridated water could believe in the safety or the danger of these health measures. H2 proposes that controlling for interest, the latter should be more likely to engage in internet-related belief-related content use.

Additionally, frequency of health information source in general is associated with holding the alternative belief and internet engagement. H2 also proposes that controlling for offline health information source use, people who hold the alternative position will have greater internet engagement than others who are uncertain or hold the mainstream position.

**H2:** People who hold the alternative belief will have greater internet engagement related to the topic, even when controlling for potential confounders: interest in the topic and offline health information source use.

Despite the hypotheses suggesting a causal order between the variables, the sequence is actually unclear. It is unknown whether someone's interest led them to hold the alternative view or vice versa, and the same goes for general health information source use. Unfortunately, the cross-sectional design of this study does not allow for the causal order of these variables to be teased apart. The reader may wish to consider H1 a test of the upper limit of the relationship between personal position and internet engagement, while H2 tests a lower limit of it.

Another construct that may influence one's internet engagement is one's perception of the news media's position. "The media" are oft lamented as biased; the

content may be considered too liberal or too conservative, or simply untrustworthy (Groseclose, 2011; Alterman, 2003). This variation in perceived media ideology leads to differences in media consumption. People tend to prefer to use sources they trust for information, which usually means using media sources that have similar views to their own (Wanta & Hu, 1994). With regard to news media consumption, Tsfati & Cappella (2003) found that skeptics of mainstream media had a higher proportion of nonmainstream news sources (such as political talk radio and internet) in their media diets. Having conducted a meta-analysis of selective exposure experiments, D'Alessio and Allen (2002) concluded that individuals who experience greater cognitive dissonance in different contexts are more likely to search for attitudinally consistent messages. Given these findings, it is reasonable that people whose views are more divergent from mainstream media are more likely to use nonmainstream sources.

Failing to find that mainstream media coverage addresses their needs, different kinds of minority groups may turn to the internet as a functional media alternative. There are three basic categories of minorities—minority by identity, behavior, or belief—and there has been some research on use of internet sites for each of these. For instance, ethnic minorities such as Arab Americans, who often who often encounter negative portrayals of their ethnic group, may use the internet for information seeking, especially for foreign based news sources (Muhtaseb, 2008). Young gay males use the internet to obtain information needs that are often ignored in traditional mass media, such as advice about coming out, potential consequences of gay self-identification, and how to meet other young gay people (Hamer, 2003). There are also sites dedicated to deviant

behaviors, such as pro-anorexia and pro-bulimia sites, which offer “thinspiration” material, or images and prose to encourage extreme eating habits for thinness, as well as tips and tricks to do so (Borzekowski, Schenk, Wilson, & Peebles, 2010; Norris, Boydell, Pinhas, & Katzman, 2006). People belonging to a minority when it comes to their beliefs may also turn to the internet to find more information, and this is where alternative health beliefs would fit in. Although there are certainly sites that promote the anti-vaccination and anti-fluoridation positions, there is little empirical evidence specific to this topic which shows that dissonance from mainstream media leads to internet use.

The study that has most explicitly examined whether dissonance from the mainstream media leads to internet use is one about political dissent and online news consumption. Hwang, Schmierbach, Paek, Gil de Zuniga, & Shah (2006) examined the relationship between how much people disagree with mainstream media coverage and internet use explicitly. They defined the difference between a person’s stance on an issue and his or her perception of mainstream media’s portrayal of the issue as *media dissociation*. In their online survey, Hwang et al. examined a snowball sample of people holding a minority opinion—that of opposing the Iraq war, during a time of pro-war coverage. Utilizing structural equation modeling, they found that media dissociation drove online news consumption and discussion. In this case, the internet may have been a crucial tool for the political minority to access nonmainstream perspectives, which could inform democratic debate. In the case of health information, however, reliance on non-mainstream sources, if those sources offered untrustworthy conclusions, could potentially harm people and their communities. In the health context, diversity of views may not

always be beneficial to the public. The current study extends the ideas of both media dissociation and internet use by putting them into a different context and offering more clearly defined measures of people's online behavior.

Given these research findings, one might expect that people who hold alternative health beliefs— those who believe there is a link between the MMR vaccine and autism, those who believe that fluoridated drinking water is unsafe—would turn to nonmainstream sources for information. However, it is possible that people may perceive the mainstream media as not being supportive enough of the safety of the MMR vaccine or fluoridated drinking water, and also turn to the internet for information on these issues. If people are much more supportive *or* oppositional towards an issue in relation to how they perceive mainstream media, would that lead to the same effect of more internet use? In the Hwang et al. study, the entire sample was composed of people who were against the Iraq War, and therefore this question could not be answered. The current study utilizes a purposive sample of people who agree with, disagree with, and are uncertain about the alternative beliefs. By having a sample with a variety of views on the MMR vaccine and fluoridated water, it is possible to take one's personal position into account, and not simply the difference between one's personal position and their perception of the news media's position.

**H3:** People who hold a position different from their perceived media position will have greater internet engagement related to the topic, such that people who hold

an alternative position but perceive the news media to hold the mainstream position will be more likely to engage in online content, and vice versa.

There are a couple of issues worth noting about this hypothesis. First, the independent variable here is perceived news position, not actual news position. That is, what matters for this study is not media content, but people's judgments about it. Using a measure of actual media content versus the perceived media content is akin to using possible exposure to media content as opposed to self-reported exposure to media content. In particular, because people who hold alternative beliefs may have very different media consumption patterns in comparison with people who hold mainstream beliefs, it would be risky to assume that actual mainstream media position was equivalent to perceived media position.

The other issue is ambiguous causal order. The reverse scenario of internet use leading to certain perceptions of news media is certainly plausible; for example, someone who is interested in the health risks of MMR vaccination may go online to find very frightening information, and subsequently feel that mainstream media coverage of the topic is inadequate. However, prior comparisons of theoretical models by Hwang et al. (2006) suggest that media dissociation is antecedent to one's media habits, which suggests that perceived news position would also be antecedent to internet use. The current study begins with a cross-sectional design to test whether a relationship exists in the context of health beliefs and leaves longitudinal work for future research.

## Methods

This chapter utilizes the data from a pair of purposive surveys on the MMR vaccination and autism (N=578) and fluoridated water (N=595). These samples were screened to make sure that there was variation on people's views on the health belief and demographics. For a more detailed description of this screening process and the summary of participant characteristics, please see Chapter Five: Individual Traits and Internet Engagement.

### Key measures

*Personal position: MMR vaccination safety.* To assess a person's position on the MMR vaccination and autism, participants were asked how much they agreed or disagreed with the following statements: "If a child receives the measles, mumps and rubella (MMR) vaccine, that child has an increased chance of becoming autistic"; "Children who get the MMR vaccine are no more likely to become autistic than children who don't get the MMR vaccine" (reverse coded); "The MMR vaccine is a probable cause of autism"; and "I don't think that MMR vaccination influences whether a child will become autistic" (reverse coded). Possible response options for all of these statements were strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree. These four items were averaged into a personal position scale (Cronbach's alpha=.804), with a possible range of 1 to 5. Respondents who scored a 3 were classified as uncertain, while scores higher than 3 were taken to indicate the person held the alternative belief, and scores lower than 3 were taken to mean that the person

held the mainstream belief. The average personal position on the MMR vaccine was 2.73, with a standard deviation of .83.

*Media position: MMR vaccination safety.* To assess respondents' perceptions of news media stance, they were asked how much they agreed or disagreed with: "According to the news media, the MMR vaccine leads to autism in children"; "News articles warn parents about vaccinating their children with the MMR vaccine, because it could lead to autism"; "Most news stories about the MMR vaccine and autism debunk the link between them" (reverse coded); and "I think that the news media do not support the belief that the MMR vaccine influences autism" (reverse coded). Possible response options for all of these statements were strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree (coded using values 1 through 5, respectively). The average perceived news media position was 2.96, with a standard deviation of .67 (Cronbach's alpha=.727).

*Personal position: water fluoridation safety.* Personal position for this topic was measured by asking four questions about the safety of drinking fluoridated water. To assess a person's position on water fluoridation, participants were asked how much they agreed or disagreed with the following statements: "Fluoride in drinking water exposes people to dangerous chemicals and health risks"; "The fluoride put into community water systems meets a high standard of safety" (reverse coded); "I believe that drinking fluoridated water is harmful to one's health"; and "There is no need to worry about long-term health consequences from drinking fluoridated water" (reverse coded). Possible response options for all of these statements were strongly disagree, disagree, neither



agree nor disagree, agree, and strongly agree. These four items were averaged into a personal position scale (Cronbach's  $\alpha=.873$ ), with a possible range of 1 to 5. Again, respondents who scored a 3 were classified as uncertain, while scores higher than 3 were taken to indicate the person held the alternative belief, and scores lower than 3 were taken to mean that the person held the mainstream belief. The average personal position on fluoridated water for the sample was 3.01, with a standard deviation of .89.

*Media position: water fluoridation safety.* To assess their perceptions of news media stance, they were asked about their views on these statements: "According to the news media, fluoridated water is unsafe to drink"; "News articles warn people to not drink fluoridated water because it will lead to health problems"; "Most news stories talk about the fluoridation of water as a beneficial public health measure" (reverse coded); and "I think that the news media do not support the belief that fluoridated water is dangerous to drink." Possible response options for all of these statements were strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree (coded using values of 1 through 5, respectively). The average perceived news media position was 2.79, with a standard deviation of .67 (Cronbach's  $\alpha=.757$ ).

*Internet engagement.* The internet engagement measure is a sum of the observed scores from the depth, breadth, and interactivity indices. The depth score ranges from 0 to 11, breadth from 0 to 6, and interactivity from 0 to 7. The range of the internet engagement measure goes from 0 to 24. In the vaccine sample, 71.7% of the sample scored a 0, and the average score was 2.82 (SD=4.57). In the fluoride sample, 79.5% of respondents scored 0, and the average score was 2.22 (SD=4.15). For a full description of

the internet engagement variable and its dimensions, please see Chapter Four: Validating Internet Engagement.

*Interest in MMR vaccination and water fluoridation.* Interest in these topics was measured by asking participants, “How interested are you in the issue of MMR vaccination and autism?” on the MMR vaccination survey, and “How interested are you in the issue of fluoridated water?” on the fluoridated water survey. Respondents could choose from not at all, a little, some, and a lot as their answer, coded as 0, 1, 2, and 3, respectively. Even though this is an ordinal variable, it was treated as an interval variable in the regression analyses. In the vaccine sample, the average response was between “a little” and “some,” with a mean of 1.39 (SD=.99). Similarly in the fluoridated water sample, the mean was 1.16 (SD=.97).

*Offline health information source use.* These measures were taken from the Annenberg National Health Communication Survey. The prompt asks respondents to indicate how often they have done each of the following in the past 30 days: read about health issues in newspapers or general magazines, read special health or medical magazines or newsletters, watched special health segments of television newscasts, watched television programs (other than news) which address health issues or focus on doctors or hospitals, and talked with family or friends about health issues. Survey participants could select not at all, less than once per week, once per week, or two or more times per week. Though this is also an ordinal variable, it was treated as an interval variable (0 to 3), with the average of these responses used in the regression analyses. In the vaccine sample, respondents tended to use these information sources less than once

per week (mean=1.31, SD=.76). Similarly, the mean in the fluoridated water sample, the mean was 1.28 (SD=.74).

### Analytic approach

A series of ordinary least squares regression models were used to test H1, H2, and H3. The first model includes only personal position as a predictor of internet engagement. The second model adds in the potential confounders of interest and health information source use. The third model adds in perceived news position, and the fourth model adds in interactions between personal position and perceived news position. All regression results shown control for the demographic characteristics that were examined in the Chapter Five: gender, education, community, political orientation, race, ethnicity, and having kids under age 6 (the kids variable is applicable only to the MMR vaccine data).

Due to the skewed distribution of the internet engagement variable, it was transformed by adding 1 to the raw score and then taking its natural log. Personal position and perceived news position were transformed into three categories each to classify a person's views and perceived news position as being alternative, uncertain, or mainstream. Alternative personal position and alternative perceived news position were used as the reference categories. There were no other transformations performed in these analyses.

## Results

Tables 6.1 and 6.2 present the distribution of personal position and perceived news position regarding the MMR vaccine and fluoridated water. In the MMR vaccine sample, about half of the sample (51.2%) held the mainstream position that the MMR vaccine does not cause autism. The rest of the sample was about evenly split between holding the alternative belief (26.2%) and being uncertain as to whether or not the vaccine causes autism (22.5%). Among this sample, the participants were roughly divided into thirds in terms of how they perceived the news on the subject of MMR vaccine safety; 37.9% perceived the news media as holding the mainstream position, 29.4% perceived the news media as uncertain, and 32.7% perceived them as holding the alternative position. In the fluoridated water sample, less than half of participants held the mainstream belief (41.5%), about a fifth were uncertain (19.7%), and over a third held the alternative belief (38.8%). Half of the sample perceived the news media as holding the mainstream position (50.9%), and the rest was evenly divided between perceiving the news media as being uncertain (25.0%) and holding the alternative belief (24.0%).

		Personal position						Total	
		Mainstream		Uncertain		Alternative			
		N	Column %	N	Column %	N	Column %	N	Column %
Perceived news position	Mainstream	152	51.4	23	17.7	44	28.9	219	37.9
	Uncertain	75	25.3	74	56.9	21	13.8	170	29.4
	Alternative	69	23.3	33	25.4	87	57.2	189	32.7
Total		296	100.0	130	100.0	152	100.0	578	100.0

<b>Table 6.2. Distribution of personal and perceived news position regarding fluoridated water.</b>									
		Personal position						Total	
		Mainstream		Uncertain		Alternative			
		N	Column %	N	Column %	N	Column %	N	Column %
Perceived news position	Mainstream	183	74.1	39	33.3	81	35.1	303	50.9
	Uncertain	37	15.0	67	57.3	45	19.5	149	25.0
	Alternative	27	10.9	11	9.4	105	45.5	143	24.0
Total		247	100.0	117	100.0	231	100.0	595	100.0

Notably, in both samples, respondents tended to perceive the news as holding the same position as their own regarding the MMR vaccine and fluoridated water. Although one could argue that this pattern was to be expected, it did not necessarily have to be so; for example, most people with the alternative position might have considered the news media to echo the views of the mainstream medical establishment. The potential reasons for the strong perceived similarity between one’s own position and that of the news media’s are many, but the data at least provide some evidence that this relationship exists at all.<sup>4</sup>

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<sup>4</sup> The reader may wonder whether holding a nonmainstream belief on one topic is associated with holding nonmainstream beliefs on other health topics. As a side analysis, I examined the relationship between beliefs about the safety MMR vaccine, fluoridated water, and aspartame in both purposive samples. I grouped the responses for each of these topics into mainstream, uncertain, and alternative belief categories (disagreeing or strongly disagreeing with “The artificial sweetener aspartame is safe for human consumption” was categorized as holding the alternative belief). In the MMR vaccine sample, believing that the vaccine caused autism was associated with believing that fluoridated drinking water and aspartame were unsafe for consumption ( $\gamma=.330$ ,  $p<.0005$  and  $\gamma=.326$ ,  $p<.0005$ , respectively). In the fluoridated water sample, believing that fluoride was unsafe to drink was associated with believing that the MMR vaccine and aspartame were dangerous ( $\gamma=.356$ ,  $p<.0005$  and  $\gamma=.408$ ,  $p<.0005$ , respectively).

For the sake of clarity, the results for H1 through H3 will be presented for the MMR vaccine data first, followed by the results from the fluoridated water data.

The first hypothesis proposed that alternative belief holders would have greater internet engagement than people who held the mainstream belief or were uncertain about MMR vaccine or fluoridated water safety. As seen in Table 6.3, a person's beliefs about the safety of the MMR vaccine is strongly associated with his or her internet engagement with the topic. People who are uncertain or hold the mainstream belief do not go online for MMR vaccine content as much as those who hold the alternative belief (see the Bivariate Model;  $B = -.674, p < .0005$ ;  $B = -.613, p < .0005$ ). The MMR vaccine data support H1.

Hypothesis 2 proposed that this relationship would persist even when controlling for interest in the topic and general health information source use (see Model 1). These variables are also strongly associated with internet engagement ( $B = .206, p < .0005$ ;  $B = .290, p < .0005$ ). However, people who are uncertain or hold the mainstream belief still engage in less MMR vaccine-related internet use than those who hold the alternative belief ( $B = -.445, p < .0005$ ;  $B = -.428, p < .0005$ ). The MMR vaccine data also support H2.

The third hypothesis proposed that perceiving the news media as holding a position different from oneself would also increase internet engagement. Perceiving the news as being uncertain about MMR or holding the mainstream position does not seem to have any significant association with internet engagement (see Model 2,  $B = .049, p < .605$ ;  $B = .062, p < .479$ ). The set of interaction terms taken together explained a small though statistically significant amount of variance in internet use beyond the variables already in

Table 6.3. Summary of regression analyses for internet engagement, based on personal position, interest, health information source use, and perceived news position in the MMR vaccination and autism survey.												
N=578	Bivariate Models			Model 1			Model 2			Model 3		
Predictors	B	SE B	$\beta$	B	SE B	$\beta$	B	SE B	$\beta$	B	SE B	$\beta$
(Constant)	--	--	--	.437*	.204	--	-.440*	.205	--	-.474*	.205	--
Personal position (uncertain)	-.674†	.107	-.271	-.445†	.103	-.179	-.458†	.109	-.184	-.528†	.118	-.212
Personal position (mainstream)	-.613†	.090	-.295	-.428†	.087	-.206	-.447†	.091	-.215	-.507†	.096	-.244
Interest	.330†	.039	.314	.206†	.040	.196	.205†	.040	.196	.195†	.040	.186
Health information source use	.419†	.049	.306	.290†	.050	.212	.294†	.050	.215	.303†	.050	.222
Perceived news position (uncertain)	-.275†	.099	-.120	--	--	--	.049	.096	.022	.024	.098	.010
Perceived news (mainstream)	-.152	.093	-.071	--	--	--	.062	.088	.029	.034	.090	.016
Personal <sub>uncertain</sub> *news <sub>uncertain</sub>	--	--	--	--	--	--	--	--	--	-.390	.268	-.081
Personal <sub>uncertain</sub> *news <sub>mainstream</sub>	--	--	--	--	--	--	--	--	--	-.451	.275	-.079
Personal <sub>mainstream</sub> *news <sub>uncertain</sub>	--	--	--	--	--	--	--	--	--	-.439	.247	-.096
Personal <sub>mainstream</sub> *news <sub>mainstream</sub>	--	--	--	--	--	--	--	--	--	-.575†	.197	-.128
$\Delta R^2$	--	--	--	.095†	--	--	.001	--	--	.011*	--	--

Note: The results shown in this table are the coefficients after controlling for the demographic characteristics seen in Table 1 (gender, education, community, political orientation, race, ethnicity, and having kids under age 6). The  $R^2$  for the model including demographics and personal position was .276; interest and health information source use added a  $R^2$  of .095. The final  $R^2$  in Model 3 was .382. † denotes  $p < .0005$ , \* denotes  $p < .05$

the model ( $\Delta R^2 = .011$ ,  $p < .049$ ; the total  $R^2 = .382$ ). Looking at the predicted values will help to understand the pattern of internet engagement personal and perceived news position.

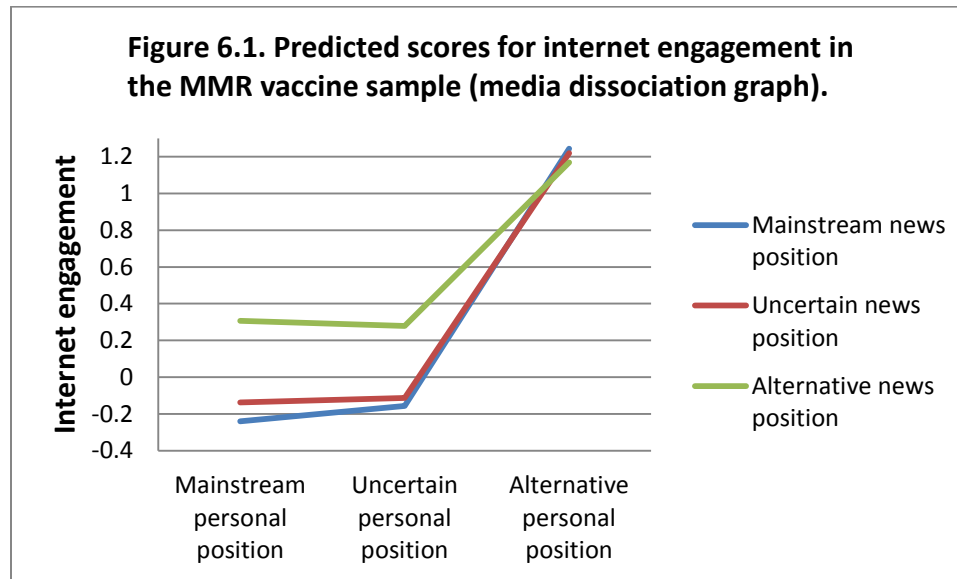


Figure 6.1 presents the predicted scores of internet engagement based on variables in Model 3. The perceived news position lines create a backwards L-shape, with the points among the mainstream and uncertain personal position at a roughly similar level, and the highest points associated with holding the alternative position. That they all have a similar pattern illustrates the strong effect that personal position has. Within the mainstream belief category, the greater the discrepancy between one's personal position and perceived news position, the greater the internet engagement. In other words, within the mainstream personal position category, the lowest level of internet engagement is among those who perceive the news media to also hold the mainstream view, while the highest level is among those who perceive the news media to hold the alternative view. In terms of absolute numbers, within the alternative personal position category, the lowest



level of internet engagement is among those who perceive the news media to also hold the alternative view, and the highest level is among those who perceive the news media to hold the mainstream view; however, because these differences are so small, they are not meaningful. The expected pattern from the media dissociation hypothesis is not found in the uncertain personal position group. Overall, there is partial support for H3.

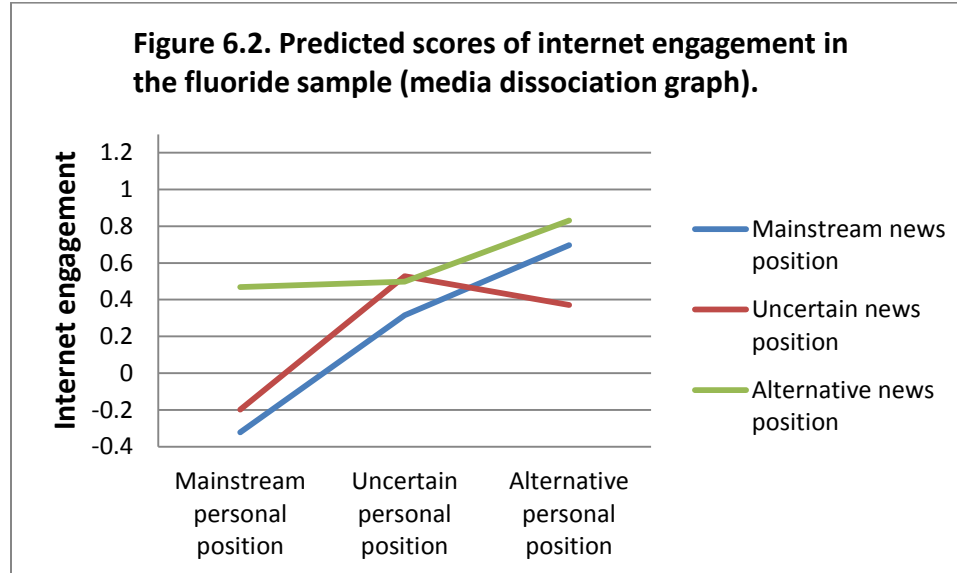
In the next set of analyses, the hypotheses are tested using the fluoridated water survey data. As seen in Table 6.4, people who hold the alternative belief engage in more online content regarding fluoridated water than those who are uncertain (see the Bivariate Model;  $B = -.346$ ,  $p < .001$ ) or hold the mainstream belief ( $B = -.253$ ,  $p < .004$ ). Hypothesis 1 is supported.

Model 1 displays the relationship between personal position and internet engagement, controlling for interest and health information source use. Though interest and health information source use are strong predictors ( $B = .288$ ,  $p < .0005$ ;  $B = .291$ ,  $p < .0005$ ), personal position remains significant ( $B = -.346$ ,  $p < .001$  for the uncertain group,  $B = -.251$ ,  $p < .004$  for the mainstream group). H2 is supported by the fluoridated water data as well.

Hypothesis 3 proposed that greater media dissociation would lead to greater internet engagement. The simple main effects of perceived media position were not significant, as was true for the MMR analysis. However the set of interactions added in Model 3 contributed a statistically significant amount of explained variance ( $\Delta R^2 = .016$ ,  $p < .012$ ; the total  $R^2 = .304$ ). To help interpret the interactions, Figure 6.2 displays the predicted values based on Model 3.

Table 6.4. Summary of regression analyses for internet engagement, based on personal position, interest, health information source use, and perceived news position in the fluoridated water survey.												
N=595	Bivariate Models			Model 1			Model 2			Model 3		
Predictors	B	SE B	$\beta$	B	SE B	$\beta$	B	SE B	$\beta$	B	SE B	$\beta$
(Constant)	--	--	--	1.127†	.181	--	.424*	.176	--	.399*	.177	--
Personal position (uncertain)	-.346*	.106	-.142	-.346*	.106	-.142	-.102	.104	-.042	-.201	.070	-.104
Personal position (mainstream)	-.253*	.086	-.129	-.251*	.086	-.127	-.249*	.085	-.126	-.221*	.085	-.112
Interest	.369†	.037	.370	.288†	.039	.289	.279†	.039	.280	.273†	.039	.274
Health information source use	.429†	.050	.326	.291†	.050	.221	.288†	.050	.218	.301†	.050	.229
Perceived news position (uncertain)	-.439†	.108	-.196	--	--	--	-.183	.107	-.082	-.289*	.118	-.129
Perceived news (mainstream)	-.176	.094	-.091	--	--	--	-.017	.093	-.009	-.076	.102	-.039
Personal <sub>uncertain</sub> *news <sub>uncertain</sub>	--	--	--	--	--	--	--	--	--	.309	.307	.068
Personal <sub>uncertain</sub> *news <sub>mainstream</sub>	--	--	--	--	--	--	--	--	--	-.053	.312	-.011
Personal <sub>mainstream</sub> *news <sub>uncertain</sub>	--	--	--	--	--	--	--	--	--	-.316	.257	-.065
Personal <sub>mainstream</sub> *news <sub>mainstream</sub>	--	--	--	--	--	--	--	--	--	-.697†	.212	-.162
$\Delta R^2$	--			.165†			.005			.016*		

Note: The results shown in this table are the coefficients after controlling for the demographic characteristics seen in Table 1 (gender, education, community, political orientation, race, and ethnicity). The model with demographics and personal position had a  $R^2$  of .118; interest and health information source use added .165  $R^2$ . The total  $R^2$  in Model 3 was .304. † denotes  $p < .0005$ , \* denotes  $p < .05$



The lines in Figure 6.2 have a different shape from those in Figure 6.1. Although the pattern of internet engagement among people who hold the mainstream belief matches the media dissociation hypothesis (people who hold the alternative belief have the highest level of internet engagement while those who hold the mainstream belief have the lowest), the other categories do not match. This difference in findings may be due to the difference in media coverage of the MMR vaccine and fluoride as well as how the different belief groups may perceive this coverage. If a person believes that fluoridated water is safe to drink, but encounters a news article that says otherwise, it is reasonable that s/he would look for more information online. People who are uncertain about the safety of fluoridated water likely have not thought much about the issue. Because there is little coverage about fluoride, they likely assume that the news media have one stance or the other without much evidence. However, if they were to actually encounter news about

fluoride, it would likely be of a controversial nature, which would encourage them to seek further information online. Finally, among the alternative belief holders, people who view the news media as having a stance on fluoride are more likely to go online for fluoride-related information. Due to the little media coverage of fluoride, and because alternative believers are the most likely to have gone online for fluoride-related information, they are the most likely to have the reverse causation of internet engagement affecting their personal and perceived news position. Unfortunately, these speculations rest on the premise of perceived level and type exposure to fluoride news coverage being different among the belief groups, which was not measured in this study. For now, the data suggest only partial support for H3, which may or may not be due to media coverage of the topic.

Despite the different patterns seen in Figures 6.1 and 6.2, the data do bear important similarities. First, one's own position has a significant impact on internet engagement. Second, those who hold the alternative position and view the news as holding the alternative position have tend to have lots of internet engagement, regardless of their similarity in views to the news media. Finally, those who hold the mainstream position but perceive the news to hold the alternative position have higher internet engagement levels than one would expect based on their own views, especially when compared to other mainstream belief holders. This finding is the strongest support for the media dissociation hypothesis; the future research might consider testing the previously mentioned speculations as potential mitigating factors.

## **Discussion**

This chapter examined whether people's beliefs about the safety of the MMR vaccine and fluoridated water, their interest in these topics, general health information source use, and perception of the news media influenced their internet engagement. H1, which proposed that people who held the alternative belief would have greater internet engagement than those who were uncertain or held the mainstream belief, was supported in the analyses from both datasets. H2, which proposed that this relationship between personal beliefs and internet engagement would persist even when controlling for interest and health information source use, was also supported for both topics. The third hypothesis, which proposed that larger differences between one's personal and perceived media position would be associated with greater internet engagement, was partially supported by the MMR vaccine data and the fluoridated water data. In particular, people who held the mainstream view but perceived the news to hold the alternative view had greater internet engagement than expected, based on their personal position. Perceived level and type of exposure may explain the other differences in the patterns of the two analyses.

The cross-sectional nature of the data makes the causal direction between personal position, interest, health information use, perceived news position, and internet engagement unclear. It is possible that the relationship goes in the reverse direction or there is a reciprocal relationship. The research design was not intended to establish causal order, but rather the existence of a relationship, due to its exploratory nature of health-related alternative beliefs and internet engagement. It is worth noting, nonetheless, that

Hwang's original study on media dissociation and online news consumption and discussion found that the model with media dissociation as the antecedent was stronger than the inverse.

Another limitation to the interpretation of the results is the nature of the self-reported data. People may not accurately remember their online behavior, especially when asked if they have ever done specific activities. They may have answered in a way that they thought was logically consistent rather than accurate, and this way may have coincided with the hypothesis. Still, self-report was still a useful, direct, and practical method to gather a large amount of data on individuals' perceptions and private behavior. Future research may wish to consider different methods for comparison.

Finally, another limitation is the purposive nature of the data. In order to test the hypotheses, the samples were screened in order to obtain comparable proportions of different beliefs, among other characteristics. It is possible that the relationship found in these samples may not look the same in a representative population. For instance, the purposive samples had a higher proportion of people who held the alternative belief and who held a college degree than in representative samples. However, these characteristics were deliberately selected for in order to better maximize variation on personal position, perceived news position and potential confounders. A representative sample may not have the same results due to differences in distribution on these variables.

This first investigation into whether personal position and perceived news position lead to different levels of internet engagement in the context of alternative health beliefs tested several hypotheses. For the most part, these hypotheses were supported;

alternative belief holders were more likely to engage in belief-related internet use, even when controlling for internet and general health information source use, and greater media dissociation seems positively related to internet engagement with regard to the MMR vaccine among those who hold the mainstream belief. Future research may be able to address the limitations of cross-sectional design, self-reported data, and the generalizability of purposive samples.

## **CHAPTER SEVEN: NETWORK DISSOCIATION AND INTERNET ENGAGEMENT**

### **The role of social networks in one's beliefs**

In the classic social psychological study *When Prophecy Fails*, Leon Festinger and his associates observed how a doomsday cult dealt with the reality that their predicted apocalypse did not arrive on December 21, 1954. The observations of this group's experiences helped to form Festinger's theory of cognitive dissonance, which proposes that people try to reduce their conflicting cognitions in various ways, such as by creating a new belief system or by trivializing the worth of a dissonant element. In the case of the cult members, Festinger correctly predicted that the failure of the prophecy would reverse the members' secretive practices around their beliefs into a fervent campaign to proselytize anyone who would listen. He surmised that this attempt to convert new members was to help maintain and strengthen their beliefs, because their beliefs would expire without social support. If one does not have confirming evidence for one's belief, but rather the contrary, the fact that others still hold on to the belief can be a form of evidence in and of itself.

With the advent of the internet and its myriad ways to communicate with others, it is easier than ever to find (or create) a community for any interest. Marginalized members of society, whether they are minorities due to their identity, behaviors, or beliefs, have found support from others like themselves through message boards, blogs, email, and other interactive features of the internet. Unlike traditional mass media, the internet is far more convenient due to its synchronous nature, and it may be especially



useful for those who prefer to remain anonymous due to nonmainstream lifestyles or ideas. Gay and lesbian online communities allow members to explore different aspects of their sexual identities through friendships, romantic relationships, and practicing disclosure (Munt, Bassett, & O’Riordan, 2002; Hillier & Harrison, 2007). The internet also offers ethnic minority groups a forum for the promotion of cultural awareness and pride, as well as social networking (Nagel & Staeheli, 2004). People have also used the internet in Arab cyberspace to share views on social, moral, and political issues that would be taboo in public (Hofheinz, 2005). Online communities for deviant behaviors exist as well. Pro-anorexia and pro-bulimia online support forums normalize and strengthen pro-eating disorder attitudes and allow members to bond through sharing their secret practices (Giles, 2006; Brotsky & Giles, 2007; Gavin, Rodham, & Poyer, 2008). Pedophiles can also find like-minded others in online message boards, where they can share their feelings in a supportive environment and validate them through minimizing consequences and other forms of justification (Malesky & Ennis, 2004). Much of the research reviewed here is qualitative, and although people in minority groups have described lack of offline support as a reason for internet use, to my knowledge there is no study that quantitatively connects lack of offline support of minority status with internet engagement.

Furthermore, there has been little research about minority status for health beliefs and internet engagement. In contemporary American society, health is not merely a measure of bodily or mental wellness, but also of a person’s character, as people who partake in unhealthy behaviors are judged as morally inferior (Brandt & Rozin, 1997;

Metzl & Kirkland, 2010). Groups that embrace traditionally stigmatized health issues, such as fat acceptance organizations, have encountered criticism from mainstream medicine and society at large (Bowers, 2010). Perhaps even more controversial are antivaccination and antifuoridated water groups, who directly challenge the mainstream medical establishment's safety claims and more clearly affect the health of their community. In the face of contrary evidence, as well as mockery and accusations of harming their communities, opponents of vaccination and fluoridation may find (and generate) valuable social support online.

Parallel to the concept of media dissociation is network dissociation, a yet untested construct that describes the difference between one's own belief and the perceived stance of one's offline network. The quantitative research closest to examining offline ties and connecting with other minorities online has been conducted by Wojcieszak (2010), who has published several studies about whether online discussions would lead to more or less accurate perceptions of others' opinions. In a study of neo-Nazi online discussion forums, Wojcieszak (2010) examined whether participation in these forums would attenuate or exacerbate respondents' extremist views, and whether political dissimilarity with one's social network would affect this relationship. The study utilized a combination of cross-sectional survey data and observation of content from respondents on major online neo-Nazi forums. Indeed, dissimilarity from offline ties was a moderator of the relationship between online participation and opinion extremism, such that those who perceived high dissimilarity would become more extreme given their online participation. The current dissertation study does not examine whether

dissimilarity from offline ties is a moderator of one's opinion or online participation in forums, but rather whether the dissimilarity increases the amount of belief-related online activity. The current study examines whether network dissociation is a factor in internet engagement in the context of alternative health beliefs.

**H1:** People who hold a position different from what they perceive their social network to hold will have greater internet engagement related to the topic, such that people who hold an alternative position but perceive their social network to hold the mainstream position will be more likely to engage in online content, and vice versa.

As in the case of media dissociation, there are a couple of issues worth noting with regard to network dissociation. First, the variable used here is perceived network position, rather than actual network position. Although actual network position probably influences perceived network position, the latter should have a more proximal relationship with internet engagement. The other issue is ambiguous causal order, because the relationship between network dissociation and internet engagement could be a reciprocal one. However, given the newness of this variable, this dissertation is simply a start to examining this potential relationship at a cross-sectional level.

## **Methods**

This chapter utilizes the same data from the previous chapter on personal position, perceived media position, and internet engagement. The data come from a pair of

purposive surveys on the MMR vaccination and autism (N=578) and fluoridated water (N=595), which were screened to obtain certain levels of variability and comparability on key constructs.

The key measures are the same as the ones used in the previous chapter, but rather than using the perceived media position variable, this analysis investigates perceived social network position. To assess perceived social network position, respondents were asked to list the initials of the six people who were closest to them, such as family, friends, coworkers, and acquaintances. For each of these six people, respondents answered whether they first knew the person online or offline and whether they communicated with the person mostly online or offline. They were also asked, depending on the survey topic, how much each person would agree or disagree with the statements that the MMR vaccine causes autism or that fluoridated water is unsafe to drink. Response options were strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree (which were assigned scores of 1 through 5, respectively).

The cases used for the perceived social network position variable, which was an average of the perceived positions of the six closest people to the respondent, were restricted by the following criteria: 1) the network members must have been known from an offline context, 2) the respondent must communicate with the network members primarily offline, and 3) there were at least three responses about the perceived position of these offline network members (i.e. if a person had only two network members whom they knew from offline and communicated with primarily offline, they would not have a perceived network position score). The data used were restricted to offline network

members, because a respondent's interaction with network members known from online or communicated with primarily online may overlap with internet engagement. The minimum of three responses for the belief question from offline network members was to increase the reliability of the construct. The number of cases used in the MMR vaccine analysis is N=484, and N=514 in the fluoridated water analysis.

The analytic approach used for this analysis is parallel to the one used in the previous chapter. The hierarchical regression predicts internet engagement based on personal position, perceived social network position, and the interactions between personal position and perceived social network position. The coefficients in the model reflect the regression results after having controlled for demographic characteristics as well as interest and health information source use, which are known to have strong independent effects on internet engagement. For the sake of consistency, the bivariate models were conducted only on those cases which had data available for the perceived social network position variable.

Like in the previous chapter, the internet engagement was transformed for the sake of linearity by adding 1 to the raw score and then taking its natural log. Personal position and perceived social network position were transformed into three categories each to classify a person's views and perceived social network position as being alternative, uncertain, or mainstream. Alternative personal position and alternative perceived social network position were used as the reference categories.

## Results

The participant characteristics for this analysis were similar to those in the media dissociation analysis. There were no noticeable differences in terms of gender, education, community, political orientation, race, ethnicity, age, interest in the MMR vaccination or fluoridated water, offline health media use, or internet engagement.

Tables 7.1 and 7.2 present the distribution of personal position and perceived social network position regarding the MMR vaccine and fluoridated water. The majority of respondents perceived their position on these topics to be the same as their closest family, friends, and acquaintances (in the MMR vaccine sample,  $\gamma=.633$ ,  $p<.0005$ ; in the fluoridated water sample,  $\gamma=.493$ ,  $p<.0005$ ).

**Table 7.1. Distribution of personal and perceived social network position regarding the MMR vaccine.**

		Personal position						Total	
		Mainstream		Uncertain		Alternative			
		N	Column %	N	Column %	N	Column %	N	Column %
Perceived network position	Mainstream	157	63.1	17	15.3	26	21.0	200	41.3
	Uncertain	65	26.1	81	73.0	27	21.8	173	35.7
	Alternative	27	10.8	13	11.7	71	57.3	111	22.9
Total		249	100.0	111	100.0	152	100.0	484	100.0

**Table 7.2. Distribution of personal and perceived social network position regarding fluoridated water.**

		Personal position						Total	
		Mainstream		Uncertain		Alternative			
		N	Column %	N	Column %	N	Column %	N	Column %
Perceived network position	Mainstream	96	44.9	16	16.3	34	16.8	146	28.4
	Uncertain	73	34.1	56	57.1	51	25.2	180	35.0
	Alternative	45	21.0	26	26.5	117	57.9	188	36.6
Total		214	100.0	98	100.0	202	100.0	514	100.0

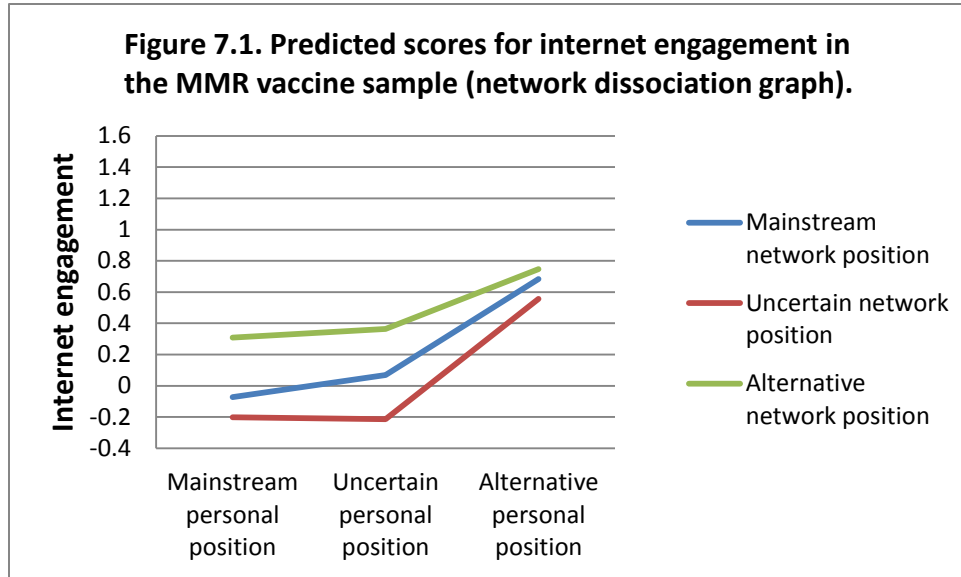
Hypothesis 1 proposed that people who held a different position from their social network's position would have greater internet engagement on the MMR vaccine or fluoridated water. The regression results shown in Tables 7.3 and 7.4 do not support H1. Although there was an association between perceived network position and internet engagement on a bivariate level, this relationship disappeared after controlling for demographics, interest, and offline health media use. As seen in Model 1 of Table 7.3, perceived social network position had no main effect on internet engagement ( $B = -.131$ ,  $p < .250$  for perceiving one's network as uncertain;  $B = -.010$ ,  $p < .933$  for perceiving one's network as holding the mainstream position). None of the interactions were close to statistically significant, and the set of interactions did not add a significant amount of explained variance to the model ( $\Delta R^2 = .004$ ,  $p < .548$ ). The  $R^2$  for the final model was .350.

Figure 7.1 helps to visualize these regression results by displaying the predicted scores. Although perceived network position looks to have a slight effect on internet engagement in the same direction as personal position (e.g. alternative personal position and alternative network position both increase internet engagement), the effect is the same across all categories of personal position. The expectation from H1, that greater network dissociation would be associated with greater internet engagement, was not supported by the data.

Table 7.3. Summary of regression analyses for internet engagement, based on personal position, interest, health information source use, and perceived social network position in the MMR vaccine and autism survey.									
N=484	Bivariate Models			Model 1			Model 2		
Predictors	B	SE B	$\beta$	B	SE B	$\beta$	B	SE B	$\beta$
(Constant)	--	--	--	.454*	.217	--	.492*	.219	--
Personal position (uncertain)	-.478†	.111	-.203	-.415†	.122	-.176	-.383*	.138	-.163
Personal position (mainstream)	-.446†	.093	-.225	-.437†	.104	-.220	-.437†	.106	-.220
Perceived social network position (uncertain)	-.317†	.105	-.153	-.131	.114	-.063	-.190	.123	-.092
Perceived social network (mainstream)	-.212*	.103	-.105	-.010	.113	-.005	-.062	.123	-.031
Personal <sub>uncertain</sub> *network <sub>uncertain</sub>	--	--	--	--	--	--	-.387	.308	-.090
Personal <sub>uncertain</sub> *network <sub>mainstream</sub>	--	--	--	--	--	--	-.233	.356	-.041
Personal <sub>mainstream</sub> *network <sub>uncertain</sub>	--	--	--	--	--	--	-.320	.265	-.077
Personal <sub>mainstream</sub> *network <sub>mainstream</sub>	--	--	--	--	--	--	-.319	.255	-.071
$\Delta R^2$	--			.003			.004		

Note: The results shown in this table are the coefficients after controlling for the demographic characteristics seen in Table 5.1 (gender, education, community, political orientation, race, ethnicity, and having kids under age 6), as well as interest and health information source use. For the sake of comparison, the bivariate models were restricted to the cases that appear in Models 1 and 2. The  $R^2$  for the model that included demographics, interest, and health information source use was .342. Adding the perceived social network variables added .003  $R^2$ . † denotes  $p < .0005$ , \* denotes  $p < .05$



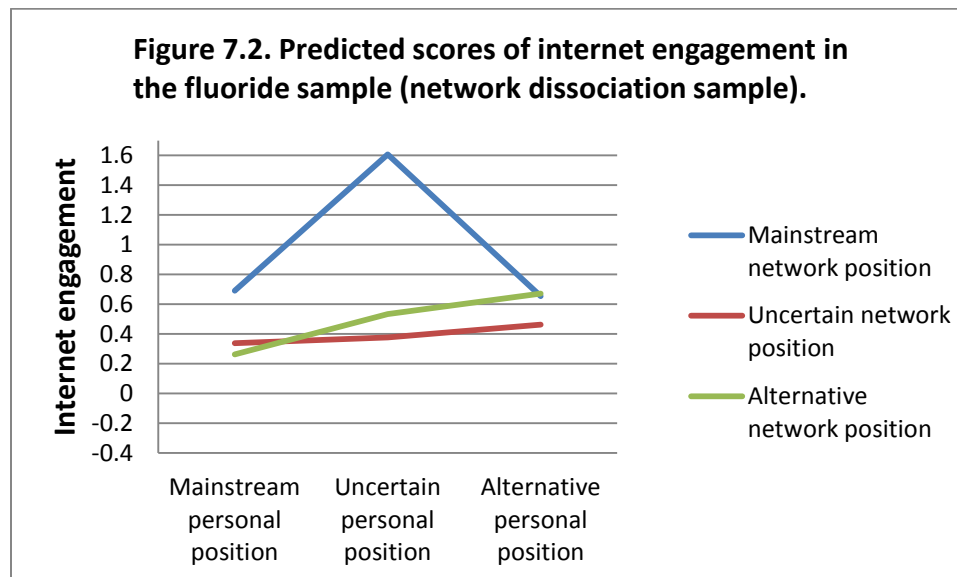


The regression results from the fluoridated water survey data echoed these findings. Table 7.4 shows that on a bivariate level, people who perceived their social network to be uncertain engaged in significantly less internet engagement than those who perceived their social network to view fluoridated water as dangerous ( $B = -.224, p < .010$ ). There was no difference between those who perceived their social network to hold the mainstream versus the alternative position on the bivariate level ( $B = -.135, p < .130$ ). After controlling for demographics, interest in the topic, and offline health media use, there were no statistically significant main effects of perceived social network position ( $B = -.171, p < .055$  for people who perceived their social network to be uncertain;  $B = -.041, p < .668$  for people who perceived them to hold the mainstream position). Although one interaction—those who were uncertain themselves and perceived their network to have the mainstream position—was close to significant ( $B = .541, p < .072$ ), none of the others were. The interactions taken together did not add explained variance to the model ( $\Delta R^2 = .008, p < .265$ ). The  $R^2$  for Model 2 was .266.

Table 7.4. Summary of regression analyses for internet engagement, based on personal position, interest, health information source use, and perceived social network position in the fluoridated water survey.									
N=514	Bivariate Model			Model 1			Model 2		
Predictors	B	SE B	$\beta$	B	SE B	$\beta$	B	SE B	$\beta$
(Constant)	--	--	--	.389*	.181	--	.359*	.182	--
Personal position (uncertain)	-.142	.102	-.061	-.096	.105	-.041	-.086	.118	-.037
Personal position (mainstream)	-.262†	.080	-.142	-.237†	.086	-.128	-.281†	.095	-.152
Perceived social network position (uncertain)	-.224*	.086	-.117	-.171	.089	-.090	-.134	.091	-.070
Perceived social network (mainstream)	-.135	.089	-.067	-.041	.095	-.020	-.011	.099	-.006
Personal <sub>uncertain</sub> *network <sub>uncertain</sub>	--	--	--	--	--	--	.026	.234	.006
Personal <sub>uncertain</sub> *network <sub>mainstream</sub>	--	--	--	--	--	--	.541	.300	.091
Personal <sub>mainstream</sub> *network <sub>uncertain</sub>	--	--	--	--	--	--	.192	.202	.051
Personal <sub>mainstream</sub> *network <sub>mainstream</sub>	--	--	--	--	--	--	.303	.212	.078
$\Delta R^2$	--			.006			.008		

Note: The results shown in this table are the coefficients after controlling for the demographic characteristics seen in Table 5.1 (gender, education, community, political orientation, race, and ethnicity), as well as interest and health information source use. For the sake of comparison, the bivariate models were restricted to the cases that appear in Models 1 and 2. The  $R^2$  for the model that included demographics, interest, and health information source use was .253. Adding the perceived social network variables added .006  $R^2$ . † denotes  $p < .0005$ , \* denotes  $p < .05$

Figure 7.2 displays the predicted internet engagement scores from the fluoridated water regression results. The pattern here is different from the one in Figure 7.1, which had three lines that never met. In Figure 7.2, there is essentially one group that stands out: people who hold are uncertain about fluoridated water safety and perceive their social network to hold the mainstream position. The remaining pattern is otherwise fairly similar to Figure 7.1, with a couple of points of contact between the lines, but no strong crossover. The pattern displayed in Figure 7.2 fails to support the hypothesis that network dissociation is associated with greater internet engagement. Though the people who are uncertain and perceive their social network to be mainstream have the highest level of internet engagement among these groups, it is likely due to chance, as the coefficients are not significant. There were only 16 people in the sample who had an uncertain personal position and a mainstream network position.



## **Discussion**

This chapter examined whether the perception of one's social network position on the MMR vaccine and fluoridated water, and particularly the difference between one's own and one's social network position, were associated with internet engagement on these topics. Although one's perception of their social network position was associated with internet engagement on a bivariate level, this relationship disappeared after controlling for personal position on the topic, interest, offline health media use, and demographic characteristics. The analyses from both datasets also failed to find evidence of network dissociation as a predictor of internet engagement. The lack of data about whether people's uncertainty was due to absent or conflicting knowledge, as well as not knowing the level of (perceived) media coverage for the topics, makes the speculation difficult to confirm. It is also possible that there was no support for network dissociation, unlike in the case of media dissociation, due to the smaller number of cases used for the analyses, or because people rely more on mediated sources than their social networks for trustworthy health information. Ultimately, however, the interaction results were not statistically significant, and the hypothesis was not supported by the data.

## **CHAPTER EIGHT: NEED FOR COGNITION AND INTERNET ENGAGEMENT**

### **Need for cognition**

The previous two chapters have focused on environmental factors that may lead to internet engagement on an alternative belief. In contrast to the dynamic, circumstantial motivations of media use as in the tradition of uses and gratifications, there may also be more consistent, underlying influences, such as personality traits. Research on personality and internet use has found some modest relationships with characteristics such as agreeableness, conscientiousness, and extraversion (negative relationship; Landers & Lounsbury, 2006) and shyness (positive relationship; Ebeling-Witte, Frank, & Leser, 2007). Understanding the personalities of those who go online, especially with regard to nonmainstream topics, may provide better insight into what motivates them to do so. This chapter examines a personality trait that may be related to seeking alternative information on the internet: need for cognition (NFC).

Need for cognition is a construct that describes how much a person enjoys expending cognitive effort (Cacioppo & Petty, 1982). A person with a high NFC may be more likely than others to pursue information, and perhaps even more so when it comes to contradictory information. Tsfaty & Cappella (2005) found that news media skepticism is negatively related to media exposure, but that this relationship disappears among people with high NFC. It is possible that NFC influences the likelihood that a person seeks information from multiple sources to fulfill their cognitive needs, with people low in NFC seeking fewer, similar, agreeable sources, while people high in NFC may be more likely to seek from more, diverse, perhaps oppositional sources. People with higher

NFC may also be more likely to consider the merits of opposing positions, or alternatively, people with low NFC may find contradictory evidence cognitively taxing and pay less attention to information that is inconsistent with one's preexisting beliefs (Kardash & Scholes, 1996b). Although people with high NFC likely care about the accuracy of the information, they are also more likely to gain fulfillment from diverse media content because they enjoy thinking about complex issues from different vantage points. For this group, enjoyment from the exposure to different media content supersedes the concern about exposure to poor or untrustworthy sources, which makes them more likely to seek alternative information online.

In the context of general internet use, Das, Echambadi, McCarle, & Lockett (2003) found that people with high NFC were more likely to use the internet for information seeking. More specific to the exposure to different viewpoints, in an experiment of one-sided versus two-sided blog articles, Winter & Kramer (2012) found that people tended to prefer the two-sided articles, and that need for cognition amplified this preference. Given these findings, it is reasonable to propose that need for cognition is positively associated with seeking alternative belief related information online. Whether this personality trait continues to be associated with internet engagement above and beyond specific factors—interest in a topic, as well as general health media habits—is also worth investigating. Unlike media dissociation and network dissociation, the causal direction for these hypotheses should be clear, as the personality trait of NFC should be antecedent to internet engagement.

**H1:** Need for cognition will be positively associated with internet engagement regarding the alternative belief.

**H2:** Need for cognition will be positively associated with internet engagement, even when controlling for potential confounders: one's personal position on the topic, interest in the topic and offline health information source use.

Furthermore, it is possible that NFC may not only have a main effect on internet engagement, but may also interact with one's personal position. NFC may have a stronger impact on internet engagement among those who hold the mainstream view or are uncertain than those who hold the alternative view.

**H3:** Need for cognition will be more positively associated with internet engagement among people who hold the mainstream or uncertain position than people who hold the alternative position.

## **Methods**

As in the previous two chapters, these analyses utilize the data from two purposive surveys on the MMR vaccination and autism (N=578) and fluoridated water (N=595). The key independent variables in these analyses are internet engagement (see Chapter Four: Validating Internet Engagement) and personal position (see Chapter Six: Media Dissociation and Internet Engagement) and need for cognition.

The 9-item need for cognition scale used was borrowed from Tsfatı & Cappella (2005), who adapted it from the original 32-item measure by (Cacioppo & Petty, 1982). Respondents were asked how well each of the following statements described them: 1) I would prefer complex to simple problems, 2) it's enough for me that something gets the job done; I don't care how or why it works, 3) I usually end up deliberating about issues even when they do not affect me personally, 4) thinking is not my idea of fun, 5) I really enjoy a task that involves coming up with new solutions to problems, 6) learning new ways to think doesn't excite me very much, 7) I prefer my life to be filled with puzzles that I must solve, 8) I only think as hard as I have to, and 9) I find satisfaction deliberating long and hard for hours. Possible response options were "not at all like me," "not too much like me," "uncertain," "somewhat like me," and "a lot like me" (given scores 1 through 5, respectively; items 2, 4, 6, and 8 were reverse coded). In the MMR vaccination survey, the mean NFC score was 3.38 (SD=.64) with a Cronbach's alpha of .734. In the fluoridated water survey, the mean NFC score was 3.32 (SD=.67) with a Cronbach's alpha of .753.

Hierarchical regression models were used to predict internet engagement based on personal position, interest, health information source use, need for cognition, and the interactions between personal position and need for cognition. Like in the previous analyses, the coefficients reflect the regression results after having controlled for demographic characteristics. The transformation of internet engagement and personal position categories were also the same. For personal position, the alternative personal position is used as the reference category.



## Results

The first hypothesis proposed that need for cognition would be positively associated with internet engagement. The second hypothesis proposed that this relationship would remain even after controlling for one's personal position on the topic, interest, and general health information source use. Without controlling for any variables, need for cognition was positively correlated with internet engagement in both the MMR vaccine sample ( $r=.101$ ,  $p<.016$ ) and fluoridated water sample ( $r=.206$ ,  $p<.0005$ ). However, the regression results revealed that need for cognition had no independent effect on internet engagement once other known predictors were added to the models.

Table 8.1 displays the relationship between need for cognition controlling first for demographics, and then interest and health information source use in the MMR vaccine sample. After controlling for gender, education, community, political orientation, race, ethnicity, and having kids under age 6, need for cognition no longer had a relationship with internet engagement ( $B=.109$ ,  $p<.075$ ). There was also no relationship after adding personal position, interest, and health information source use to the model ( $-.033$ ,  $p<.562$ ). Neither of the interactions, nor the pair of them together helped to predict internet engagement any further ( $B=-.137$ ,  $p<.406$  for NFC among those who were uncertain,  $B=-.035$ ,  $p<.781$  for NFC among those who held the mainstream view). The  $R^2$  of Model 2 was .372.

Table 8.1. Summary of regression analyses for internet engagement, based on personal position, interest, health information source use, and need for cognition in the MMR vaccine and autism survey.									
N=578	Bivariate Models			Model 1			Model 2		
Predictors	B	SE B	$\beta$	B	SE B	$\beta$	B	SE B	$\beta$
(Constant)	--	--	--	.534*	.265	--	.556*	.267	--
Personal position (uncertain)	-.674†	.107	-.271	-.448†	.104	-.180	-.458†	.105	-.184
Personal position (mainstream)	-.613†	.090	-.295	-.427†	.0187	-.205	-.423†	.087	-.204
Interest	.330†	.039	.314	.208†	.040	.198	.211†	.040	.201
Health information source use	.419†	.049	.306	.294†	.050	.215	.293†	.050	.214
Need for cognition (NFC)	.109	.061	.068	-.033	.057	-.020	-.039	.057	-.024
Personal <sub>uncertain</sub> *NFC	--	--	--	--	--	--	-.137	.165	-.033
Personal <sub>mainstream</sub> *NFC	--	--	--	--	--	--	-.035	.126	-.011
$\Delta R^2$	--			.000			.001		

Note: The results shown in these tables are the coefficients after controlling for the demographic characteristics of gender, education, community, political orientation, race, ethnicity, and having kids under age 6. The model with demographics, personal position, interest, and health information source use as predictors had a  $R^2$  of .371. Model 1 added need for cognition to those predictors, giving the model an additional .000  $R^2$ . The final  $R^2$  in Model 2 was .372. † denotes  $p < .0005$ , \* denotes  $p < .05$

Table 8.2. Summary of regression analyses for internet engagement, based on personal position, interest, health information source use, and need for cognition in the fluoridated water survey.									
N=578	Bivariate Models			Model 1			Model 2		
Predictors	B	SE B	$\beta$	B	SE B	$\beta$	B	SE B	$\beta$
(Constant)	--	--	--	.438*	.180	--	.430*	.180	--
Personal position (uncertain)	-.346*	.106	-.142	-.158	.098	-.065	-.168	.100	-.069
Personal position (mainstream)	-.253*	.086	-.129	-.244†	.078	-.124	-.242†	.078	-.123
Interest	.369†	.037	.370	.282†	.039	.283	.282†	.039	.283
Health information source use	.429†	.050	.326	.281†	.051	.214	.284†	.052	.216
Need for cognition (NFC)	.241†	.058	.167	.060	.055	.041	.056	.056	.039
Personal <sub>uncertain</sub> *NFC	--	--	--	--	--	--	-.091	.160	-.023
Personal <sub>mainstream</sub> *NFC	--	--	--	--	--	--	-.027	.113	-.009
$\Delta R^2$	--			.001			.000		

Note: The results shown in these tables are the coefficients after controlling for the demographic characteristics of gender, education, community, political orientation, race, and ethnicity. The model with demographics, personal position, interest, and health information source use as predictors had a  $R^2$  of .283. Model 1 added need for cognition to those predictors, giving the model an additional .001  $R^2$ . The final  $R^2$  in Model 2 was .285. † denotes  $p < .0005$ , \* denotes  $p < .05$

Table 8.2 displays the regression results from the fluoridated water sample. Unlike in the MMR vaccination sample, after controlling for demographic characteristics, need for cognition remained a significant predictor of internet engagement ( $B=.241$ ,  $p<.0005$ ). However, the rest of the analyses echoed the findings from the MMR vaccination sample. Once personal position, interest, and health information source use were added to the model, need for cognition no longer had an independent effect ( $B=.060$ ,  $p<.278$ ). The interactions of personal position and need for cognition also did not help predict internet engagement ( $B=-.091$ ,  $p<.570$  for NFC among those who were uncertain,  $B=-.027$ ,  $p<.811$  for NFC among those who held the mainstream view). The  $R^2$  of Model 2 was .285.

## **Discussion**

This chapter examined whether one particular personality trait, need for cognition, influenced internet engagement with regard to the MMR vaccine or fluoridated water. It also examined whether the interaction between one's views on these topics and NFC made a difference in internet engagement. Need for cognition was associated with internet engagement on a bivariate level, but this relationship was small and only persisted in the fluoridated water sample after controlling for demographic characteristics. After adding in the interest and health information source use variables, need for cognition did not have an impact on internet engagement and neither did NFC's interaction with personal position. Comparatively speaking, then, interest and one's health information use habits are much stronger predictors of internet engagement on the

MMR vaccine and fluoridated water. Future research may consider whether other enduring individual traits, such as preference for novelty (Cloninger, 1994) or one's information seeking "style" (Kelly et al., 2010), might be significant predictors of internet engagement.

## CONCLUSION

When it comes to the MMR vaccine and fluoridated water, much is at stake. Lives have already been lost, and people are at risk of preventable illnesses. Regardless of what you believe about vaccination and fluoridation, however, it is always the other side that is responsible for needless morbidity and mortality. The contest over truth in public health matters is now, perhaps more than ever, a part of American society. This struggle has intensified at least in part due to the internet, where people are able to encounter, share, and generate information that thwarts the mainstream medical establishment.

The purpose of this dissertation was twofold. First, it described the nature of internet use among people who hold alternative views on health, in order to better understand their characteristics and prevalence. Second, it tested whether this internet use was associated with individual traits and inability to find support from other sources, specifically mainstream news media and one's offline social network.

In Chapter One, I introduced the notion of alternative beliefs. I defined them as a subset of beliefs held by a perceive minority of the population that are 1) are explicitly and discretely discussed in media, 2) are not supported by society's authorities on the subject, 3) are generally perceived as a minority belief, and 4) are related to socially relevant outcomes. The alternative beliefs selected for study in this dissertation were "the MMR vaccine causes autism" and "fluoridated water is unsafe to drink." These two topics were selected due to their broad support from American health authorities and opposition from vocal minorities, their relevance to community and not just individual health, and their contrast in quantity of mainstream media coverage.

To better understand people with alternative beliefs beyond their stereotypes, I interviewed people with different views on the safety of water fluoridation, the results of which were presented in Chapter Two. This was the first social science research on people's understanding of fluoridated water in decades, and it was the first set of interviews to examine both supporters and opponents of the health measure. The interviews helped to shape later surveys by identifying important themes and issues, and enriched abstract constructs with real people's experiences. Interviewees shared multifaceted views on fluoridated water, their trust in varying health information sources, and how their fluoridated water views related to other alternative health topics.

Alternative health belief and behaviors were then examined on a national scale in Chapter Three, using online surveys. According to these data, roughly 10% of the population held the alternative belief (the MMR vaccination causes autism, or fluoridated water is unsafe to drink), while the rest were about evenly divided between believing those health measures were safe or being uncertain about their safety. That the majority of people in the U.S. did not subscribe to the mainstream belief is particularly notable because it demonstrates that the perceived mainstream belief is not necessarily held by most people. Fortunately for the mainstream health establishment, even when people hold the alternative belief or are uncertain, most people still engage in the mainstream health behaviors. Holding the alternative belief was associated with having searched online for alternative belief information, and internet engagement on the topics. About a sixth of American adults reported looking for MMR vaccination information online, and less than a tenth searched for fluoridated water information.

Chapter Four delved into the problems with current internet use measures like time spent or summing arbitrary collections of behaviors, and argued for a multidimensional approach. The internet engagement measure proposed assessed internet use along the dimensions of depth, breadth, and interactivity, and was supported by the data in tests of discriminant and nomological validity. Though future studies that attempt to use a similar multidimensional approach will need to tailor the dimensions and questions to their needs, the internet engagement measure used in this study has moved the field forward theoretically and methodologically.

Chapter Five examined whether demographic characteristics, political alienation, and anomie were related to internet engagement. Generally, the findings echoed past research on the subject. Youth and education were positively associated with internet engagement. Researchers attempting to reach groups more likely to look for alternative health information should consider targeting people with these characteristics. Political alienation and anomie were not related to internet engagement.

Chapter Six moved beyond individual traits to investigate the impact of one's personal position, one's perception of mainstream media's position, and the difference between these positions affect internet engagement. Believing that the MMR vaccination and fluoridated water are unsafe was positively associated with internet engagement, even when controlling for interest and general health information source use. Though there was prior research that found a link between media dissociation and internet engagement, this was the first study to use data that included people who held the mainstream belief, held the alternative belief, and were uncertain. That media



dissociation was linked to internet engagement was supported by the MMR vaccine data and partially by the fluoridated water data, possibly due to differences in terms of perceived level and type of exposure for these topics.

Chapter Seven extended the concept of media dissociation to network dissociation by testing whether the difference between one's own position and one's perception of his or her social network position impacted internet engagement. The analyses failed to support the hypothesis that network dissociation would predict internet engagement regarding the MMR vaccine or fluoridated water.

Finally, Chapter Eight tested whether need for cognition influenced internet engagement directly and also whether it interacted with one's personal position on the belief. The analyses found that any association between need for cognition with internet engagement disappeared after controlling for demographic characteristics, interest in the topic, and general health information source use.

There were a number of limitations to the findings in this dissertation. There were no interviews regarding the MMR vaccine to ground the later survey findings, or for comparison against the fluoridated water interviews. The cross-sectional nature of the survey data prevented tests of causal relationships between media and network dissociation and internet engagement. The self-reported data may also have been distorted in favor of finding associations between these variables, or in the case of the individual traits, against. However, the present research still managed to contribute to the field of health communication in several important ways—particularly, the novel interview and survey data, and the conceptualization and operationalization of internet

engagement and network dissociation. Future research may wish to delve further into the subject of alternative health beliefs by utilizing different forms of data and examining different health topics.

To the public health scholars and practitioners reading this, I would say there are three basic ideas worth remembering from this dissertation research. The first is that though my survey research classifies people as holding the mainstream belief, alternative belief, or as uncertain, there is complexity to these beliefs, as illustrated in the interview data. These beliefs differ in origin, strength, and their relation to behaviors. One cannot assume that people who do not hold the mainstream belief are all “crazy.” The second is that people trust different information sources and will use those sources. For the people who staunchly believe that the MMR vaccine and fluoridated water are dangerous, no amount of messaging from the mainstream medical establishment will change their minds. As the interview results and media dissociation analyses indicated, people can and will go online to find the information they cannot find elsewhere. Finally, if you are interested in researching and/or reaching individuals who are looking for alternative health information online, consider a multidimensional approach to conceptualizing internet use. This area of research requires significant development, and in time will hopefully create a more nuanced understanding of online behavior, as well as more effective outreach.

The findings of this dissertation research may not only apply to fluoridation and vaccination, but to other nonmainstream subjects, such as alternative treatments for cancer, global warming, and extreme political movements. Though they are but a start,

theory and methods assembled in this dissertation may serve as a guide to future exploration of the internet's role in discovering, bolstering, and sharing nonmainstream views, especially ones that affect society at large. The conceptualization of alternative beliefs requires refinement, for the nature of beliefs is very complicated. Because beliefs may be fluid, contradictory, or not explicitly known, it may be worthwhile to consider belief certainty or multiplicity. It would also be worthwhile to examine whether having a single versus many alternative beliefs can be distinguishable by demographics, behaviors, or other factors. Other problems with measuring internet engagement also need to be tackled, such as that of media convergence and multi-platform accessibility. As the internet becomes more accessible and relied upon for information, the potential benefits and risks for the public become ever greater. Hopefully, future research will continue to examine how to navigate and utilize the contemporary information landscape to serve the public good.

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