

Parental Intentions to Immunize Children Against Influenza:
A Randomized Trial of EPPM-based Immunization Messaging

by

Sarah Hall

A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Approved October 2015 by the
Graduate Supervisory Committee:

Megan Jehn, Chair
Paul Mongeau
Daniel Hruschka
Eric Margolis

ARIZONA STATE UNIVERSITY

December 2015

ABSTRACT

Background: This study examines how pro-vaccine flu messages, guided by the Extended Parallel Process Model (EPPM), affect parents' intentions to vaccinate their children.

Methods: Parents of children six months to five years old ($N = 975$) were randomly exposed to one of four high-threat/high-efficacy messages (narrative, statistical, combined, control) and completed a follow-up survey. Differences between message conditions were assessed with one-way ANOVAs, and binary logistic regressions were used to show how constructs predicted intentions.

Results: There were no significant differences in the ANOVA results at $p = .05$ for EPPM variables or risk EPPM variables. There was a significant difference between message conditions for perceived manipulation ($p = 0.026$), authority, ($p = 0.024$), character ($p = 0.037$), attention ($p < .000$), and emotion ($p < .000$). The EPPM model and perceptions of message model (positively), and the risk EPPM model and fear control model (negatively), predicted intentions to vaccinate. Significant predictor variables in each model at $p < .05$ were severity (aOR = 1.83), response efficacy (aOR = 4.33), risk susceptibility (aOR = 0.53), risk fear (aOR = 0.74), issue derogation (aOR = 0.63), perceived manipulation (aOR = 0.64), character (aOR = 2.00), and personal relevance (aOR = 1.88). In a multivariate model of the significant predictors, only response efficacy significantly predicted intentions to vaccinate (aOR = 3.43). Compared to the control, none of the experimental messages significantly predicted intentions to vaccinate. The

narrative and combined conditions significantly predicted intentions to search online (aOR = 2.37), and the combined condition significantly predicted intentions to talk to family/friends (aOR = 2.66).

Conclusions: The EPPM may not be effective in context of a two-way threat.

Additional constructs that may be useful in the EPPM model are perceptions of the message and fear control variables. One-shot flu vaccine messages will be unlikely to directly influence vaccination rates; however they may increase information-seeking behavior. The impact of seeking more information on vaccination uptake requires further research. Flu vaccine messages should be presented in combined form. Future studies should focus on strategies to increase perceptions of the effectiveness of the flu vaccine.

DEDICATION

This dissertation is dedicated to my parents, Andrew and Mary Hall. Thank you for always supporting me in my goals and helping me believe that I can do anything I put my mind to. You've supported me in my pursuits with music, dance, acrobatics, photography, and academics. Dad, you taught me that it is nice to be important, but it is more important to be nice. Mom, you taught me that "beauty will fade, but stupidity lasts forever." Thank you both for encouraging me to develop my intellect and talents.

ACKNOWLEDGMENTS

I would like to thank my advisory committee, Dr. Paul Mongeau, Dr. Eric Margolis, and Dr. Daniel Hruschka, for their valuable input and hours spent reviewing results. Dr. Hruschka, you are a fount of knowledge and expertise. Dr. Mongeau, your statistical analysis class was one of the reasons I decided to do my dissertation based on EPPM theory. Thank you for teaching me about methodology and analysis and for helping me become involved with the WSCA. Dr. Margolis, you are a life mentor and great friend. Thank you for encouraging my visual ethnography work and helping me have the confidence to submit my documentary for presentation in D.C. Your passion not only for academia, but for helping in the “real world,” is evident.

I would also like to thank Dr. Monica Gaughan for reading my field statements and attending my defense, even though she was not on my committee. You are encouraging and supportive, and your care for your students is evident. I learned so much about how a good teacher ought to be herself and be flexible enough to allow class discussion to go where it will. Your teaching style is so relevant, practical, and positive for students. Your course assignments and tests were creative and engaging and helped me to think more about what types of assignments I will be giving students in the future. Thank you for your help preparing me for my job interview, even down to fashion advice about what shoes to wear and how to do my hair. You are a role model to me.

I owe my deepest gratitude to my supervisory professor, Dr. Megan Jehn, for encouraging me to persist in the course I began. You have provided encouragement and

structure. Thank you for the hours you have spent guiding me in my design and analysis and helping me find funding. Thank you for helping me to take a deep breath and slow down at times. You constantly go above and beyond the call of duty in mentoring and teaching. I very much appreciated the chance to TA with you and engage in community partnerships, hands-on learning, and creative class sessions such as the epidemiology potluck. Your willingness to have coffee hour with students, meet outside of class with students for course projects, and generally ensure that students are learning and producing high-quality work is admirable. You do all of this without expectation of recognition or reward. I will certainly carry what you have taught me into my profession as a full-time professor.

TABLE OF CONTENTS

| | Page |
|-------------------------------------------------------------------------------|------|
| LIST OF TABLES | xv |
| LIST OF FIGURES | xvi |
| CHAPTER | |
| 1 INTRODUCTION | 1 |
| 2 FACTORS SURROUNDING PARENTAL DECISIONS TO VACCINATE THEIR CHILDREN | 3 |
| Physician Recommendation | 4 |
| Importance of Physician Recommendation | 4 |
| Parental Trust in Health Care Provider and Medical Community | 5 |
| Physician Empathy | 6 |
| Physician Knowledge | 6 |
| Management Issues | 7 |
| Recommendations to Increase the Influence of Physicians | 7 |
| Parental Knowledge and Beliefs | 8 |
| Parental Knowledge | 9 |
| Risk Heuristics | 10 |
| Parental Beliefs about Disease and Effectiveness of Vaccines | 11 |
| Concerns about Vaccine Safety | 12 |
| Policy | 16 |

| CHAPTER | Page |
|------------------------------------------------------------------|------|
| Medical and Personal Belief Exemptions..... | 17 |
| School Policy and Implementation..... | 18 |
| Attitudes of School Personnel..... | 19 |
| Recommendations to Increase the Influence of School Policy..... | 19 |
| Access..... | 20 |
| Health Care Systems | 20 |
| Cost | 21 |
| Time and Convenience..... | 22 |
| Transportation, Care for Other Children, and Other Factors | 23 |
| Confusion about Vaccination Schedule..... | 24 |
| Suggestions for Improving Access Issues | 25 |
| Demographic Factors..... | 25 |
| Race, Ethnicity, and Socioeconomic Status | 26 |
| Maternal Characteristics | 26 |
| Region | 27 |
| Information Sources..... | 28 |
| Internet..... | 29 |
| Government Agencies and Professional Organizations | 31 |
| Pro-vaccination Media Campaigns..... | 32 |
| Conclusion | 34 |

| CHAPTER | Page |
|-----------------------------------------------------------|------|
| 3 EXTENDED PARALLEL PROCESS MODEL..... | 36 |
| Core Communication Models | 36 |
| The EPPM and Communication Theories..... | 38 |
| Explanation of EPPM..... | 39 |
| EPPM Vaccination Studies..... | 41 |
| Experimental Studies | 41 |
| Descriptive Studies – Influenza and EPPM | 44 |
| Unique nature of vaccination messages | 45 |
| EPPM Methods | 46 |
| Message Creation | 46 |
| Survey Pilot Testing..... | 47 |
| Threat and Efficacy Variables | 47 |
| Fear Variable..... | 48 |
| Outcome variables | 49 |
| Fear Control and Additional Variables | 49 |
| Methodology Commonly Used in EPPM Studies..... | 50 |
| EPPM Critique..... | 51 |
| Social context and audience characteristics | 52 |
| Role of fear..... | 53 |
| Decision-making processes and longevity of response | 54 |

| CHAPTER | Page |
|---------------------------------------------------------------|------|
| Theoretical and Methodological Considerations | 55 |
| Outcome Variables and Critique..... | 58 |
| Attitude-Behavior Link..... | 59 |
| Intention-Behavior Link..... | 60 |
| Conclusion | 62 |
| 4 NARRATIVES IN HEALTH COMMUNICATION | 64 |
| Narrative Theory..... | 64 |
| Narrative and Statistical Messages and Persuasion..... | 66 |
| Health Studies Comparing Narratives and Statistics..... | 67 |
| Vaccination Studies Comparing Narratives and Statistics | 74 |
| Conclusion | 75 |
| 5 FACTORS THAT INFLUENCE HEALTH MESSAGES | 78 |
| Perceived Credibility | 78 |
| Message Engagement..... | 79 |
| Perceptions of Messenger Attractiveness and Similarity..... | 80 |
| Audience Characteristics, Beliefs, and Culture | 82 |
| Content of Message..... | 82 |
| Fiction vs. Nonfiction..... | 83 |
| Role of Visuals | 84 |
| Conclusion | 85 |

| CHAPTER | Page |
|------------------------------------------------------------|------|
| 6 RESEARCH DESIGN AND METHODS..... | 87 |
| Aims, Research Questions, and Hypotheses..... | 87 |
| Experimental Design..... | 89 |
| Message Development and Cognitive Response Testing..... | 90 |
| Pilot Test Survey Development..... | 93 |
| EPPM Constructs | 94 |
| EPPM Risk Constructs | 94 |
| Fear Control Variables | 95 |
| Credibility Variables | 96 |
| Engagement Variables | 96 |
| Attitudes | 97 |
| Intentions to Seek Information and to Vaccinate Child..... | 97 |
| Demographic Variables | 98 |
| Pilot Test | 98 |
| Pilot Test Reliability | 99 |
| Feedback Used in Message Revision..... | 100 |
| Pilot Test Analysis..... | 101 |
| Survey Revision | 102 |
| Combined Condition..... | 103 |
| Survey Item Revision | 103 |

| CHAPTER | Page |
|--------------------------------------------------------------------|------|
| Other Survey Revisions | 104 |
| Power, Data Collection, and Inclusion Criteria..... | 105 |
| Statistical analysis | 107 |
| Aim 1 Analysis | 107 |
| Aim 2 Analysis | 107 |
| Aim 3 Analysis | 110 |
| Other Analyses | 111 |
| 7 RESULTS | 112 |
| Demographic Distribution, Randomization, and Reliability..... | 112 |
| Demographic Distribution | 112 |
| Geographic Distribution | 114 |
| Reliability Tests | 115 |
| Aim 1 Results – Differences Between Message Conditions | 116 |
| Influence of Message Type on EPPM Variables | 116 |
| Influence of the Narrative Message on Perceived Manipulation | 117 |
| Influence of the Narrative Message on Perceived Credibility | 118 |
| Influence of Message Type on Attention and Emotion | 118 |
| Additional Aim 1 Results | 119 |
| Aim 2 Results – Variables that Predict Outcomes | 120 |
| Impact of EPPM Variables on Parental Intentions | 121 |

| CHAPTER | Page |
|---------------------------------------------------------------------------------|------|
| Perceived Fear/Perceived Threat of Vaccines on Parental Intentions..... | 122 |
| Fear Control Variables on Parental Intentions | 123 |
| Perceived Credibility and Engagement on Parental Intentions..... | 124 |
| Response Efficacy as Main Predictor Variable..... | 126 |
| Fear of Flu and Fear of Vaccines on Parental Intentions | 127 |
| Aim 3 Results – Impact of Message Type on Intentions | 129 |
| Results of Past Vaccination on Intentions..... | 132 |
| Remaining Parental Concerns..... | 133 |
| Ineffectiveness of the vaccine in preventing the flu..... | 134 |
| Developing the flu or flu-like symptoms after receiving the vaccine | 135 |
| Safety, side effects, or fear of allergic reaction to flu vaccine | 135 |
| Perceptions of effectiveness of flu vaccine in terms of strains in vaccine..... | 136 |
| Other Concerns | 136 |
| 8 DISCUSSION | 137 |
| Aim 1 Discussion - Differences Between Message Conditions | 137 |
| Hypothesis 1: EPPM Variables | 137 |
| Hypothesis 2: Perceived Manipulation..... | 140 |
| Hypothesis 3: Credibility | 141 |
| Hypothesis 4: Engagement | 142 |
| Attitudes | 144 |

| CHAPTER | Page |
|------------------------------------------------------------------------------------|------------|
| Aim 2 Discussion - Variables that Predict Outcomes | 144 |
| Hypothesis 5: EPPM Variables | 144 |
| Hypothesis 6: Risk EPPM Variables | 146 |
| Hypothesis 7: Fear Control Variables | 148 |
| Hypothesis 8: Credibility and Engagement | 149 |
| Hypothesis 9: Comparison of EPPM and Risk Threat Variables | 151 |
| Aim 3 Discussion - Impact of Message Type on Intentions | 153 |
| Hypothesis 10: Outcome Variables..... | 153 |
| EPPM In Context of a Two-Way Threat..... | 155 |
| Response efficacy | 156 |
| Past vaccination..... | 158 |
| Remaining concerns | 159 |
| 9 CONCLUSIONS, RECOMMENDATIONS, AND LIMITATIONS | 160 |
| Conclusions..... | 160 |
| EPPM In Context of a Two-Way Threat..... | 160 |
| The Influence of Message Type on Intention to Vaccinate and Seek Information. | 160 |
| Message Type and Predictor Variables | 166 |
| Variables Predicting Intention to Seek Information and Intention to Vaccinate..... | 172 |
| Remaining Concerns | 178 |
| Limitations | 179 |

| CHAPTER | Page |
|------------------------------------------------|------|
| Online Sampling and Data Quality Measures..... | 179 |
| Sample..... | 182 |
| Generalizability | 183 |
| Predictor Variables..... | 184 |
| One-shot Exposure..... | 184 |
| Intention-Behavior Link..... | 185 |
| Recommendations and Future Research..... | 185 |
| REFERENCES..... | 188 |
| APPENDIX | |
| A MESSAGES..... | 221 |
| BIOGRAPHICAL SKETCH | 230 |

LIST OF TABLES

| Table | Page |
|-----------------------------------------------------------------------------------|------|
| 1. EPPM-based Experimental Vaccination Studies ($N = 7$)..... | 43 |
| 2. Design Characteristics of Experimental Health Studies ($N = 22$)..... | 68 |
| 3. Pilot Test Reliability Analysis..... | 100 |
| 4. Reliability Ratings from Pilot Test After Dropping Items..... | 104 |
| 5. Demographics and Sampling Distribution of Study Population ($N=334$) | 113 |
| 6. Final Reliability Analysis | 115 |
| 7. Means, Standard Deviations and Significant Differences by Message Type..... | 116 |
| 8. Influence of Variables on Information Seeking and Intentions to Vaccinate..... | 120 |
| 9. Model of Significant Predictor Variables | 126 |
| 10. Threat and Fear Models on Outcomes | 122 |
| 11. Type of Message on Outcomes | 129 |
| 12. Type of Message on Three Types of Information Seeking..... | 131 |
| 13. Past Vaccination on Outcomes..... | 132 |

LIST OF FIGURES

| Figure | Page |
|---------------------------------------------------------------------------|------|
| 1. Theoretical Diagram of the Extended Parallel Process Model | 39 |
| 2. Skewness of Intention to Vaccinate | 108 |
| 4. Map of Participants by Zip Code | 114 |
| 5. Remaining Parental Concerns..... | 134 |
| 6. Suggested Additions to EPPM Model in Context of a Two-Way Threat | 156 |

CHAPTER 1: INTRODUCTION

Declining childhood vaccination rates throughout the United States have been associated with rising incidence of vaccine-preventable diseases (Rohani & Drake 2011). Vaccination is considered the most effective way to prevent vaccine-preventable diseases, including influenza, from spreading. However, the proliferation of misinformation from the anti-vaccine movement continues to discourage some parents from vaccinating their children. Unvaccinated individuals not only place themselves at risk, they also pose a threat to children who are too young to be vaccinated or cannot be vaccinated due to medical conditions (Omer et al. 2009). Immunization campaigns may persuade parents to take steps toward vaccinating their children.

This randomized controlled trial exposed parents of children aged six months to five years to one of three (statistical, narrative, or combined) high-threat / high-efficacy pro-flu vaccine messages based on the Extended Parallel Process Model (Witte 1992) or a control message. Parents completed a follow-up survey assessing their perceptions of potential predictor variables such as EPPM, Risk EPPM, Fear Control, Credibility and Engagement constructs. Outcome variables were intentions to seek information about vaccinating their child and intentions to vaccinate their child. Research objectives included: (1) determining if message type influenced potential predictor variables, (2) observing whether or not these variables predicted intentions, and (3) determining which, if any, experimental messages predicted intentions compared to the control message. Study

results have the potential to aid health professionals in determining the most cost-effective and persuasive way to create flu immunization messages targeting parents.

CHAPTER 2: FACTORS SURROUNDING PARENTAL DECISIONS TO VACCINATE THEIR CHILDREN

Rising trends in disease incidence coupled with declining vaccination rates has led to a demand for increased emphasis on immunization campaigns from state, county, and local health departments. Mass media campaigns have the potential to positively influence health behaviors across large populations (Wakefield, Loken & Hornik 2010). In recent years, there has been a proliferation of literature pointing to factors surrounding childhood vaccination delay and non-receipt. In order to create effective media campaigns, these factors must first be understood.

Various studies have attempted to parse out and rank other factors influencing childhood vaccination rates in the United States. The extent to which each of these factors contributes to actual vaccination rates is a matter of debate. A literature review across a variety of settings, health issues, and study designs revealed several consistent themes that influence decision-making including: (1) information, (2) talking to others about the issue, and (3) a sense of control throughout the process (Jackson, Cheater & Reid 2008). Another review found that primary barriers associated with childhood vaccination rates were access issues, lack of knowledge, interpersonal communication issues with medical staff, and parental beliefs such as perceptions of harm and distrust of those advocating vaccines (Mills et al. 2005).

Additional key factors surrounding parents' decisions to vaccinate their child include: (1) physician recommendation, (2) parental knowledge and beliefs, (3) local, state

and school vaccination exemption policies, (4) access issues, and (5) media influence.

These factors were drawn from a literature review as described below. The impact of each of these factors on vaccination rates may also be differentially influenced by socioeconomic status, ethnicity, gender, age, and education level. Each of these factors is discussed in greater detail below.

Physician Recommendation

In the United States, physicians have been cited as the most frequent and important source for vaccine-related information (Salmon et al. 2005; Kennedy, Basket & Sheedy 2011; Gellin, Maibach & Marcuse 2000). Several studies in the United States have found physician recommendation to be among parents' primary three reasons for deciding to vaccinate their child (Gargano et al. 2013; Freed 2004; Dorell et al. 2013; Smith et al. 2006). However, the influence of physicians can be diminished due to parental distrust of providers or the medical community, perceived lack of empathy from medical providers, physician knowledge, and management issues as outlined below.

Importance of Physician Recommendation

A national survey of parents showed relatively low refusal rates for childhood vaccination in health clinics and private medical offices (Fredrickson et al. 2004). Parents who were influenced by their health care providers have been found to be nearly twice as likely to have positive opinions about vaccine safety compared to parents who were not influenced by their health care provider (Smith et al. 2006).

Parents who are undecided about the safety of vaccines have coverage rates similar to parents who believe vaccines are unsafe (Allred et al. 2005), but parents who are undecided about vaccinating their children have been found to be open to discussions with their medical providers (Fredrickson et al. 2004). Parents who did not intend to vaccinate their children and later changed their minds cited information or assurances from health care provider as the main reason for choosing to vaccinate their child (Gust et al. 2008). The importance of physicians and other medical personnel in influencing parents' vaccination decisions provides an opportunity to educate undecided parents through this channel (Gellin, Maibach & Marcuse 2000).

Parental Trust in Health Care Provider and Medical Community

A review of qualitative studies found distrust of their health care provider or the medical community in general to be barriers to vaccination for some parents. Studies have found that parents' trust in their healthcare provider is central to their decisions regarding whether or not to vaccinate their child (Leask et al. 2006). While one study reported that 76% of parents have reported a great deal of trust in their child's physician (Freed et al. 2011), another study found that 33% of parents are not fully satisfied with their interactions with their pediatrician (Kennedy et al. 2011). These limitations can stymie physicians from achieving the full impact of their influence on parents.

Studies have also found that some parents are concerned that the medical community does not understand adverse effects of vaccination (Mills et al. 2005; see also Bond et al. 1998) and that providers give unbalanced information in favor of vaccinations

and do not address concerns to their satisfaction (Sporton & Francis 2001; Bond et al. 1998). From an ethical standpoint, parents feel that they must be made fully aware of both benefits and risks of vaccinations; when they feel information is unbalanced, they may be more likely to decide not to vaccinate their child (Shui et al. 2005).

Physician Empathy

When parents perceive a lack of empathy from physicians, this may also affect parents' decisions to vaccinate their children. Flanagan-Klygis, Sharp & Frader (2005) found that 40% of pediatricians said they would refuse to provide care for a family who refused all vaccines; the authors contend that this is unsympathetic and decreases future opportunities to educate parents about vaccination. In addition, studies have found that parents have major concerns about the pain their baby will feel when immunized (Kennedy, Basket & Sheedy 2011; Mills et al. 2005). Parents frequently perceive physicians as being unsympathetic to their baby's pain, and this has been found to be a contributing factor in postponing later visits to the physician (Harrington, Woodman & Shannon 2000).

Physician Knowledge

Studies of physician knowledge concerning various vaccines suggest that provider knowledge is a barrier to childhood immunization. One study found that one-third of physicians who were asked to design catch-up regimens for hypothetical scenarios of delayed vaccination responded to all scenarios incorrectly, and frequently omitted recommended vaccines. This study also found that pediatricians were four times more

likely to respond correctly than family practitioners (Cohen et al. 2003). Several studies have found that the majority of physicians could not correctly identify contraindications to receiving the vaccine (Dominguez & Daum 2005; Cohen et al. 2003). Studies have found that physicians would like ongoing education about immunization (Power et al. 2009; Kahn et al. 2009).

Management Issues

Logistical issues and management concerns may affect physician attitudes towards vaccination. This can, in turn, affect parental decisions. These concerns include: (1) professional buy-in (e.g. reimbursement, agreement in office), (2) parent buy-in (e.g. school requirements, characteristics of diseases, cost, media, information burn-out), and (3) delivery factors (e.g. vaccine supply chain issues and consent) (Humiston et al. 2009).

Physician barriers toward vaccination include cost of and reimbursement for the vaccines, storage and monitoring, and parental and provider attitudes including safety (Kimmel 2010). Authors suggest that vaccinations should be made easily available and that every visit, including illness visits, should be viewed as an opportunity to vaccinate (Keane et al. 1993; Dorell et al. 2011; Kimmel 2010; Diekema 2012). However, in order to achieve these goals, administrative issues such as cost, storage, supply, and monitoring must also be addressed.

Recommendations to Increase the Influence of Physicians

In order to foster goodwill and provide future opportunities to educate about vaccinations, some authors maintain that physicians should respect parents' decisions not

to vaccinate rather than sending them elsewhere (Diekema 2005). It has been suggested that health care providers maintain a strong relationship with their clients and provide correct and prompt information (Wilson 2000). Other authors urge primary care doctors to carefully listen to, understand, and address parents' specific concerns, encourage questions, and give truthful and personalized information about risks and benefits of immunization (Dorell et al. 2011; Kimmel 2010). Diekema (2012) suggests that physicians present vaccination recommendations by expressing personal concern for their child rather than presenting an "abstract public health goal" (p. 193). Others advise acknowledging the child's pain, engaging with the child (Harrington, Woodman & Shannon 2000) and making immunizations "less traumatic" (Houseman et al. 1997). Kennedy et al. (2011) suggest that longer visits might be necessary to increase parental adherence to medical advice.

Though these recommendations would likely increase parental trust, they may be overly optimistic considering time demands and administrative pressure on physicians that exist in many clinics. Thus, training physicians on interpersonal communication skills, educating them on vaccinations, and providing resources may be overly simplistic solutions for medical clinics that are overcrowded, understaffed, or designed to increase profitability with short medical appointments and a greater number of patients.

Parental Knowledge and Beliefs

Parental knowledge of vaccinations and beliefs toward immunization are heavily studied in the literature. Lack of parental knowledge, risk heuristics, beliefs that the

prevented diseases are not serious or severe, beliefs that vaccines are ineffective, and concerns about vaccine safety all contribute to parental decisions to immunize their children.

Parental Knowledge

A literature review and several other studies have found lack of parental knowledge to be one of the top five barriers to childhood vaccination (Mills et al. 2005; Soyer et al. 2011; Niederhauser & Markowitz 2007). This includes lack of knowledge and misperceptions about the disease (Mills et al. 2005; Wilson 2000), knowledge and misperceptions about available vaccines (Wilson 2000), knowledge about the timing of when to receive the vaccine (Lannon et al. 1995), and not knowing when the next shot was due (Yawn et al. 2000).

The content, quality, delivery, source, and timing of the information given to parents may influence parental knowledge (Jackson, Cheater & Reid 2008). A review of studies found that vaccination rates were lower for parents who perceived inadequate vaccination information given, were dissatisfied with the information given, were not pleased with the content and timing of the information, or considered the information to be biased (Brown et al. 2010). Because greater immunization coverage is associated with greater parental knowledge of the vaccine (Borras et al. 2009), it is important to transmit believable, accurate, and timely information to parents through health messages, physician visits, or other avenues.

Parental knowledge of vaccination varies by region. While some studies conclude that parental knowledge is not a major barrier to childhood vaccination, others conclude that knowledge is not a significant issue. For example, a study of parents in the poorest parts of Baltimore concluded that parents were well educated about vaccines and had favorable attitudes towards them, while access issues were considered the most important barriers (Strobino et al. 1996). Yet other studies maintain that improving the ability of parents to obtain knowledge about recommended vaccinations (Houseman et al. 1997) and providing health education (Lannon et al. 1995) will help increase childhood vaccination rates.

Risk Heuristics

Risk heuristics are “shortcuts that people use to simplify complex decisions and judgments” (Ball, Evans & Bostom, 1998, p. 455). Parents often weigh the perceived risk of their child contracting a disease against their perceptions of vaccine safety. Heuristics that have been found to affect parental decisions to vaccinate include omission bias (the notion that parents will feel more responsible for harmful side effects after taking action to vaccinate their child compared to harmful outcomes of VPD after not taking action to vaccinate their child), risk elimination (parents who will only take action to vaccinate if the risk of side effects is zero), freeloading logic (the idea that herd immunity will protect their child), bandwagoning (vaccinating due to the perception that everyone else is doing it), and altruism (accepting personal risk for the benefit of the society at large) (Ball, Evans & Bostrom 1998). In addition, religious objections to vaccinations (Taylor et al.

2002) and previous negative experiences with vaccinations (Mills et al. 2005; Wilson 2000) are associated with immunization status.

Parental Beliefs about Disease and Effectiveness of Vaccines

Parental perceptions of their child's susceptibility to the vaccine-preventable disease, perceptions of the severity of the disease, and beliefs about vaccine effectiveness against the illness contribute to decision-making about vaccination. A study found that the majority (87%) of parents of younger children thought vaccinating their child was important in order to prevent them from getting ill (Gellin, Maibach & Marcuse 2000), and another study of mothers whose last or only child was completely immunized believed the risk of contracting the disease outweighed the risk of immunization, even when they thought the likelihood of contracting the disease was low (Bond et al. 1998). However, there is also a general consensus that parents who believe that the disease is rare or mild and that vaccines are not very effective are more likely to refuse the vaccine or exempt their children from required school vaccinations (Brewer et al. 2007; Meszaros et al. 1996; Brown et al. 2010; Salmon et al. 2005; Gargano et al. 2013; Keane et al. 1993; Bond et al. 1998).

When incidence of a vaccine-preventable disease decreases and the disease is not commonly seen, parental beliefs toward the susceptibility of their child contracting the disease may decrease (Chen et al. 1998; Stockley et al. 2011). Some parents may believe that because other children in the community are vaccinated, their child is not susceptible to the disease. However, unvaccinated children are not necessarily protected from disease

even when there are high levels of vaccination in a community (Feikin et al. 2001).

Partially due to these factors, developed countries have seen a decrease in fear of vaccine-preventable diseases along with an increase in perceptions of adverse side effects from vaccines (Wilson & Marcuse 2001).

Concerns about Vaccine Safety

A large body of literature has found that parents who fear adverse side effects are less likely to vaccinate their children (Salmon et al. 2005; Allred et al. 2005; Rand et al. 2011; Meszaros et al. 1996; Freed et al. 2010; Fredrickson et al. 2004; Gust et al. 2004; Niederhauser & Markowitz 2007; Lannon et al. 2005; Yawn et al. 2000). Parental concerns about pain, the child contracting the illness from the vaccine, concerns about the ability of the immune system to cope with vaccination, and concerns about autism persist.

Historical tragedies resulting from vaccination gone awry has resulted in legislation designed to make immunization safer and to track individual adverse events, from the Biologics Control Act of 1902 after the death of 13 children to the National Childhood Vaccine Injury Act (1986), which led to the National Vaccine Injury Compensation Program and Vaccine Adverse Event Reporting System (Ball, Evans, and Bostrom 1988). Recently, the most commonly reported risks associated with vaccination are pain, redness, swelling, or low fever. More serious side effects can occur, although these are rare.

There is a wide range of reported statistics in regard to parental opinions about vaccine safety. A study found that although most parents of children under 18 years of age believed that vaccines are effective at preventing their child from getting a disease, over half were concerned about serious side effects and 11.5% of parents had refused at least one recommended vaccine (Freed et al. 2010). Other authors support this notion, arguing that the majority of parents who accept all recommended vaccines for their children still have concerns about vaccine safety (Kennedy et al. 2011; Gust et al. 2004; Bardenheier et al. 2004). Among parents who do not vaccinate, 69% have reported that they believed that the vaccine might cause harm, making vaccine safety the most frequently reported factor in not vaccinating their child (Salmon et al. 2005). Although the previously mentioned studies link parental safety concerns with immunization status, another large survey found the opposite, reporting that although 22.6% of parents were concerned about side effects this concern was not associated with actual immunization status of the child (Taylor et al. 2002). In contrast, another study found 93% of parents rated vaccines as safe and only 1% as unsafe (Allred et al. 2005). One study found that 79% of parents of children under age six were “confident” or “very confident” in vaccine safety (Kennedy, Basket & Sheedy 2011). Other studies fall somewhere in the middle. One study found that about 20% of parents reported “strong” concerns about the safety of vaccinations for their children (Shui et al. 2006). Several reasons may explain the inconsistent body of evidence including differing geographic region of the study population, inconsistent measurement tools and the phrasing of the survey questions.

Although information addressing safety concerns may be available, it may not be reaching parents (Freed et al. 2010). In addition, parents who distrust government or the medical community are less likely to believe safety information (Keane et al. 2005; Serpell & Green 2006; Mills et al. 2005; Brown et al. 2010; Shui et al. 2005; Salmon et al. 2005) although some parents choose to vaccinate in spite of their suspicions in order to conform with social norms (Shui et al. 2005) or perceptions of “good parenting” and “social responsibility” (Leask et al. 2006). Parental refusal or delay has been found to differ according to the type of vaccine, with varicella and the MMR (Gust et al. 2008) and newer vaccinations (Freed et al. 2010) causing the most concern.

The most frequently reported concern in regard to side effects is pain and the associated emotional distress experienced by parents (Kennedy, Basket & Sheedy 2011; Harrington, Woodman & Shannon 2000; Mills et al. 2005). A review of qualitative studies found that the belief that vaccines cause illness or disease and the fear of long-term unknown effects to be additional barriers to childhood immunization (Mills et al. 2005). Parents have construed fevers following vaccination to be evidence of this (Keane et al. 1993).

Parental beliefs about whether the child’s immune system can effectively cope with the vaccination or the disease may also affect decisions (Hilton, Petticrew & Hunt 2006). Studies have found that some parents believe that vaccines add stress to their child’s immune system (Bond et al. 1998), and that combined vaccines such as the MMR would overload the child’s immune system (Hilton, Petticrew & Hunt 2006). Other

parents are concerned that too many different vaccines in one visit could compromise the immune system (Kennedy, Basket & Sheedy 2011), a notion held by 25% of parents of children under six years of age in a nationwide survey (Gellin, Maibach & Marcuse 2000).

A literature review of twenty epidemiologic studies suggests that there is no scientific data to support this belief (Plotkin et al. 2009). Regardless of the lack of supporting scientific data, two-thirds of parents in a large national survey reported that their child should not receive more than two vaccinations in one visit (Taylor et al. 2002). Another study found that the largest barrier to timely immunization was due to the child or a family member having a minor illness at the time (Bond et al. 1998). However, a different study found that there was no difference in opinion between parents who fully immunize their children and parents who partially immunize their children with regard to receiving a vaccination for their child during an illness visit (Taylor et al. 2002).

Concerns about vaccinations being related to autism have lingered following widely publicized falsified data (Wakefield et al. 1998) and ongoing testimonials from celebrities like Jenny McCarthy commonly found on Internet channels such as YouTube and anti-vaccination websites. According to Plotkin et al. (2009), there have been several scientific theories designed to explain how vaccines could cause autism. The first is that a vaccine such as the MMR could damage the lining of the intestines making it possible for encephalopathic proteins to enter to bloodstream. The second is that the preservative thimerosal (which contains trace amounts of mercury) poisons the central nervous system. A literature review of studies linking thimerosal and autism does not provide any

evidence in support of this hypothesis (Shultz et al. 2010), yet thimerosal has been removed from most vaccines following a public outcry. As of 2012, thimerisol was only found in trace amounts (0.01% or less) in Tetanus Toxoid, a certain brand of Japanese Encephalitis, a certain brand of Meningococcal, and various influenza vaccines (<http://www.vaccinesafety.edu/thi-table.htm>). The possible link between autism and vaccinations has been extensively studied and all available epidemiologic evidence does not support a causal link between vaccines and autism (DeStefano 2007; Doja & Roberts 2006) although many parents continue to have concerns.

Policy

School immunization laws have historically been a key factor in reducing incidence of vaccine-preventable diseases (Middaugh & Zyla 1978; Lovejoy & Giandelis 1974; Fowinkle et al. 1981; Orenstein & Hinman 1999; Omer et al. 2009). Since 1905, the US Supreme Court has given the states power to create laws enforcing compulsory vaccination and all states have had school immunization entry requirements by the early 1980s (Omer et al. 2009). Categories of school vaccination exemptions vary by state. All states allow medical exemptions, 28 states allow exemptions for religious reasons, and 18 states allow personal beliefs exemptions (PBE) (*Vaccine Exemptions*, Johns Hopkins University). A study found that 17% of parents rated mandated state laws for school or daycare entry as their primary reason for vaccinating their child (Shui et al. 2006). However, factors such as types of exemptions allowed, school policy and

implementation, and attitudes of school personnel affect how frequently vaccination exemptions are requested and fulfilled.

Medical and Personal Belief Exemptions

A recent study has shown a significantly higher rate of medical exemptions in school settings in states where it is easier to get a medical exemption (Stadlin et al. 2012). While it is important to allow medical exemptions for those who legitimately need it, it is also important to have systems in place that ensure medical exemptions are grounded in actual medical need. Exemption rates are also higher for states that allow exemptions for non-medical reasons (Omer et al. 2009) including personal reasons (Salmon et al. 2005). For example, exemption rates for states that only allowed medical and religious exemptions hovered around 1% while states that allowed personal belief exemptions (PBEs) increased from 0.99 to 2.54% (Omer et al. 2006). Trends for required school vaccinations show that the proportion of school children granted non-medical exemptions has been climbing and that regions with higher school exemption rates are associated with geographic clustering of diseases such as pertussis and measles (Omer et al. 2008; Feikin, Lezotte & Hamman 2000; Salmon et al. 1999). For example, in Arizona, exemption rates for 2010-2011 were 14% higher than 2009-2010, 78% higher than 2005-2006 year, and 129% higher than 2000-2001 (Arizona Immunization Exemption Rates 2011, qtd. in Birnbaum et al. 2012).

School Policy and Implementation

School policy and implementation influence exemption rates. Administrative factors that increase student exemptions include lack of written instructions prior to enrollment and lack of implementation according to state laws. For example, in two states where PBEs were not authorized, 17-18% of schools permitted exemptions based on personal beliefs (Salmon et al. 2005). Administrative procedures may heavily influence exemption rates. A study comparing low vs. high measles incidence across the U.S. found that neither surveillance systems nor demographic issues were risk factors for lower vaccination rates; rather, states that strictly enforced school vaccination policies (especially the exclusion of non-compliant students from schools) were associated with low measles incidence rates (Robbins, Brandling-Bennet & Hinman 1981).

In contrast, in states like Arizona where it is relatively easy to receive a PBE (parents only need to sign a form), gaining an exemption may be more convenient than gathering vaccination records and visiting a medical clinic to receive the vaccination (Birnbaum et al. 2012). Requiring a physician signature before a PBE can be granted has been suggested as a means of reducing convenience exemptions as this makes the exemption process more time-intensive than signing a form (Ernst & Jacobs 2012). This would also allow parents the opportunity to discuss the vaccination with their provider, which may influence their decision to vaccinate. However, research is needed to discover the attitudes of doctors toward such policies.

Attitudes of School Personnel

Salmon et al. (2004) found that perceptions of school personnel were correlated with school exemption rates. A survey conducted in schools in four states found that the majority of school personnel believed that vaccines benefitted the children and community at large, although misconceptions about vaccines were common. Parents of children who attended a school with nurses were less likely to exempt their children than parents whose children attended schools with an alternative medical practitioner. Parents of children who attended schools where medical staff used professional or government resources or pharmacies for vaccine information were less likely to exempt their children than parents whose children attended schools where the medical staff did not trust health departments and the CDC to be credible (Salmon et al. 2004). Thus, immunization campaigns could potentially be targeted toward schools without nurses in order to involve the health practitioner and better reach the parents.

Recommendations to Increase the Influence of School Policy

Recommended actions surrounding school policy and implementation have included removing co-payments, strengthening school entry requirements, addressing misinformation regarding vaccines, and creating persuasive messages (Diekema 2012). A literature review of 59 studies found that increasing parental consent could be achieved by providing incentives, educating parents, improving the design of the consent form, minimizing out-of-pocket cost, and utilizing parental reminders and follow-up (Cawley, Hull & Rousculp 2010). Some have suggested offering in-school vaccinations as a means

for increasing vaccination rates (Cawley, Hull & Rousculp 2010) while others have found that parents prefer medical settings for vaccinating their children (Rand et al. 2011). In addition, studies have indicated that parental interest in having their child vaccinated at school varies by the type of vaccine. For example, a study found that while 57% of parents were willing to have their child immunized for influenza, only 27% were willing to have their children immunized for HPV at school (Middleman & Tung 2010). Therefore, information about vaccines may need to be carefully crafted toward opinions about the particular disease it prevents.

Access

Parents have reported a variety of access barriers related to immunizing their child including health care systems, cost, time constraints and convenience, lack of understanding the vaccination schedule, transportation, and care for other children. It is unclear to what extent these factors influence the vaccination status of their child. This is likely to differ by region, demographic factors, disease prevented, and type of vaccine.

Health Care Systems

Systems issues have been found to affect vaccination rates. A study in Virginia found that 35% of parents reported at least one barrier to accessing vaccinations for their children; those who used a military provider reported access problems more frequently than those using a private doctor (46% vs. 29%) and were less likely to be up-to-date on immunizations (Morrow et al. 1998). However, studies in other areas have found lower coverage levels for children who used private providers than those who used other types

of providers (e.g. 78% vs. 91% in San Diego and 71% vs. 57% in Colorado) (Rosenthal et al. 2004). Enrollment in the Women, Infants and Children (WIC) program has been associated with significantly higher timely childhood immunizations; those who are eligible for WIC but do not participate have lower vaccination rates for their children, and their children are less likely to be up-to-date (Luman et al. 2003; Brenner et al. 2001; Strobino et al. 1996; Morrow et al. 1998). Insurance coverage issues have also been found to affect vaccination rates (Salsberry, Nickel & Mitch 1993; Gore et al. 1999) with those on Medicaid or Civilian Health and Medical Program of the Uniformed Services being significantly associated with not having their child up-to-date on immunizations (Morrow et al. 1998). Suggestions for improvement of immunization systems include outreach, vaccine supply, and training of health care workers (Rainey et al. 2011).

Cost

Perceived cost of vaccination is an issue faced particularly by low-income parents (Wilson 2000; Houseman et al. 1997; Lannon et al. 1995; Salsberry, Nickel & Mitch 1993; McCormick et al. 1997; Niederhauser & Markowitz 2007; Morrow et al. 1998). A large nationwide survey found that cost is perceived as a barrier for only a small percentage of parents, but was associated with the immunization status of their children (Taylor et al. 2002). Cost can be especially problematic in low-income (Lashuay et al. 2000) and rural (Wilson 2000) areas. Providing vaccinations free-of-charge may help – however this does not mean the target population will be aware that cost is not an issue or that other access or attitudinal issues will be overcome. For example, California

launched a media campaign to make parents aware of free recommended vaccinations for their children. A post-campaign survey of low-income parents found that 26% of parents still considered cost to be barrier despite the fact that the majority (88%) of parents remembered seeing or hearing the vaccination ads (Lashuay et al. 2000). Another study found that even when immunizations were provided free-of-charge, parents still reported issues with accessing health care, especially in the public and military spheres (Morrow et al. 1998).

Time and Convenience

Parental perceptions of inconvenience associated with vaccinating their child has been found to correlate with children's immunization status (Taylor et al. 2002; Yawn et al. 2000). In particular, parents perceive time as an obstacle when it comes to immunizing their child (Wilson 2000; Houseman et al. 1997; Lannon et al.1995; McCormick 1997, Bond et al. 1998; Sporton & Francis 2001; Evers 2000; Harrington, Woodman & Shannon 2000; Keane et al. 1993). This includes scheduling issues such as the availability of medical office hours and waiting time at the office (Morrow et al. 1998; Salsberry, Nickel & Mitch 1993; Lannon et al. 1995; Gore et al. 1999).

A study of parents in public, private, and military health care systems in Virginia found clinic waiting time to be the most common barrier to vaccinating their child, with concern varying by the type of health care system (12% overall, 22% military provider, 17% public health clinics). The second most commonly reported concern was "difficulty obtaining a timely appointment" (10% overall, 24% military provider) (Morrow et al.

1998). Similarly, a study in an affluent community in Minnesota contested that inconvenience issues (e.g. long waiting times, available office hours) were the most common barriers reported by parents with cost not being a barrier (Yawn et al. 2000). Taking time off work, which has been perceived as affecting potential to be promoted or receive a pay raise, is another barrier to parents vaccinating their child in a timely manner (McCormick et al. 1997; Morrow et al. 1998; Lannon et al. 1995).

Transportation, Care for Other Children, and Other Factors

Several other factors have been identified as access barriers to timely vaccination. These barriers include transportation issues (Niederhauser & Markowitz 2007; Yawn et al. 2000; Wilson 2000; Evers 2000; Morrow et al. 1998; Houseman 1997; Lannon 1995; McCormick 1997), having other children who need to be looked after (McCormick et al. 1997; Wilson 2000; Evers 2000; Lannon et al. 1995; Houseman 1997) and “chaotic home environments” (Lannon et al. 1995). Another reported problem is having an inadequate number of healthcare professionals in the area; this has been found to be a problem for rural areas in particular (Gore et al. 1999; Wilson et al. 2000). Parents have implicated clinics in low vaccination rates in various studies, reporting inadequate immunization clinic support, difficulty with the immunization seeking process (Gore et al. 1999), and requesting reminders from clinics (Wilson 2000). Difficulty in remembering medical appointments has been found to be a problem in some studies; however, one study found that even though providers perceive this as a problem, only 20% use reminder systems (Salsberry, Nickel & Mitch 1993).

Confusion about Vaccination Schedule

A large nationwide survey found that a small percentage of parents considered the vaccination schedule to be confusing, and that this was associated with the immunization status of their child (Taylor et al. 2002). Not knowing when the next shot is due has been found to be a barrier (Salsberry, Nickel & Mitch 1993). A study in an affluent community revealed that this factor had the highest attributable risk for under-immunization (along with fear of reactions) (Yawn et al. 2000). The more time that elapses following the birth of the baby, the less likely parents may be to stay up-to-date on immunizations. A birth cohort study in D.C. showed that 75% of babies were up-to-date at 3 months of age, but only 41% were up-to-date at 7 months of age (Brenner et al. 2001). Whether this was due to decreased communication with the child's physician, decreased access to resources such as time, or other factors is unknown.

While the majority of the literature considers access issues to influence parents' ability to immunize their children, some authors contest that access issues are not a major problem with regard to vaccination status. A nationwide survey of over 13,500 children found that 74% of parents responded that there was "nothing difficult" about immunizing their child (Taylor et al. 2002). Similarly, a study in an affluent community in Minnesota revealed that while 47% of parents perceived barriers to immunizations, only 3% considered these barriers to be significant (Yawn et al. 2000). In this affluent community, parent-reported barriers and demographic considerations combined explained less than 30% of under-immunization (Yawn et al. 2000). These studies imply that in some areas,

parental attitudes and beliefs are more important than access issues. However, a study in rural West Virginia found that access issues influence parental beliefs, with 28% of the variation in beliefs about vaccination explained by general access perceptions and perceived clinic support. The same study found that 20% of the variation in completion of immunization for their child was explained by parental attitude towards vaccination combined with perceived clinic support, implying that access issues play a greater role than parental attitudes (Gore et al. 1999).

Suggestions for Improving Access Issues

Suggestions for improvement in regard to access issues include providing more flexible appointment schedules (Lannon et al. 1995), implementing appointment reminder systems (Yawn et al. 2000; Houseman et al. 1997), decreasing waiting times at clinics, and improving wait room facilities (Houseman et al. 1997; Lannon et al. 1995). Other suggestions include providing childcare and transportation assistance (Houseman et al. 1997; Lannon et al. 1995), although how this would be implemented and who would be responsible is not stated. Using a unified immunization schedule (Yawn et al. 2000) or other tools for making information accessible and available may aid in improving timely vaccinations.

Demographic Factors

Issues such as race and ethnicity, socioeconomic status, maternal characteristics, and region have been found to influence parents' attitudes and behaviors with regard to immunizing their children.

Race, Ethnicity, and Socioeconomic Status

Interviews with parents drawn from the National Immunization Survey found the highest proportion of parents actually refusing vaccines for their children were white (Gust et al. 2008). This is supported by data from the CDC regarding the 2011-2012 flu season, which shows that flu vaccination rates for children aged 6 months to 17 years in the United States were lower for whites (47.6%) compared to blacks (53.7%), Hispanics (59.5%), Asians (58.2%), and American Indian/Alaska Natives (52.3%) (CDC, Flu Vaccination Coverage).

Several studies have found that Hispanics and nonwhites had the highest level of concerns about vaccinations (Shui et al. 2006; Freed et al. 2010). Despite their concerns about safety, studies have found that Hispanic (Freed et al. 2010) or black (Gust et al. 2008) parents are more likely to report that they complied with their medical provider's recommendations and less likely to report that they refused vaccines.

Socioeconomic status has been found to be associated with vaccination rates. Some studies have found low-income groups to be more likely to have high-level concerns about vaccination (Shui et al. 2006) and to delay vaccination for their children (Gust et al. 2008; Luman et al. 2003). However, an Arizona study found the highest rate of PBEs at high-income schools and charter schools (Birnbaum et al. 2012).

Maternal Characteristics

Maternal characteristics have been found to affect issues surrounding vaccination. Studies have found young mothers to be less likely to have their children be up-to-date on

immunizations (Strobino et al. 1996; Morrow et al. 1998) while mothers over the age of 30 have been found to have greater knowledge of immunization and a lower level of concern about vaccinations (Borras et al. 2009; Gust et al. 2008; Danis et al. 2010). Mothers with higher education levels have been found to be more likely to vaccinate their children on time (Gust et al. 2008; Shui et al. 2006) with those that have a high school education or less having significantly greater risk of under-vaccination for their children (Luman et al. 2003; Morrow et al. 1998). Maternal employment has also been found to affect vaccination rates (Brenner et al. 2001). Mothers who are not married have been found to have a significantly higher risk of their child being under-vaccinated (Luman et al. 2003; Morrow et al. 1998). Families with a larger number of children have been found to have a higher rate of delayed vaccination (Strobino et al. 1996; Luman et al. 2003; Morrow et al. 1998). While one study found that women had greater trust in pro-vaccine information than men (Freed et al. 2011), another found that women were more likely to report that they were concerned about vaccine side effects (including autism) and more likely to refuse vaccines for their children (Freed et al. 2010).

Region

Pockets of lower vaccination rates have been found in specific geographic areas. The number of children who are under-immunized in rural areas of the United States is on the rise (Pruitt, Kline & Kovaz 1995). Studies have found immunization rates to be exceptionally low in rural areas of several states, such as Missouri (Wilson 2000) and South Carolina (Pruitt, Kline & Kovaz 1995). A study in a rural area of West Virginia

showed better results - 65% of children two or younger were up-to-date on immunizations (Gore et al. 1999); however, this was based on self-report and the number is likely inflated. Immunization rates for youth have been found to be lower in low-income inner-city areas (Brenner et al. 2001). In contrast, a study in Arizona found higher rates of PBEs in cities compared to towns. Higher exemptions rates were found in the northern part of the state, with clusters of higher rates Northeast Yavapai County, Sedona, and Colorado City (Birnbaum et al. 2012).

Information Sources

A study exploring parents' decision-making process toward vaccinating their child found that parents often delay the decision by going into a stage of questioning with accompanying information-seeking and information processing (Sporton & Francis 2001). Most parents actively seek information about immunization from a variety of sources including the Internet, government and professional organizations, and traditional media before deciding whether or not to immunize their child (Kennedy et al. 2011). Receiving negative or conflicting messages toward immunization from these sources may cause further delay. A national survey found that family physicians, pediatricians, and public health nurses perceive negative messages from TV, radio, or word of mouth to be the most common reasons for parents' refusal to vaccinate their children (Fredrickson et al. 2004). Vaccine-refusing parents are more likely to distrust healthcare providers and government-backed research in favor of media, especially the Internet (Brown et al. 2010).

Internet

In 2010, 24% of surveyed parents reported the Internet as one of the top three most important sources of information about childhood vaccination (Kennedy et al. 2011). The opportunity for laypeople to express their opinions regarding vaccination through Internet platforms such as YouTube, blogs, and Facebook has contributed to a “power shift” in which opinions of doctors may be overshadowed by others who are easily able to spread their messages via these mediums (Kata 2012). It is important to address the balance of pro-vaccine versus vaccine-critical information available on websites. A study found that using the keyword search “vaccination” on the Internet yielded about 60% vaccine-critical sites and 40% pro-vaccination sites. However, using the keyword search “immunization” yielded 98% pro-vaccination sites and only 2% vaccine-critical sites (Wolfe & Sharp 2005).

While the majority of literature focuses on negative media messages about vaccination, the media has also been found to be a positive outlet for providing immunization information. For example, a study on the HPV vaccine showed that 48.1% of study participants reported learning about the HPV vaccine from the media while slightly fewer (47.3%) reported learning about it from their healthcare provider (Grabiel et al. 2013).

Vaccine-critical websites have been found to influence parental attitudes and intentions to vaccinate their children. An experiment found that spending just five to ten minutes on vaccine-critical websites increased the perceived risk of vaccinating, decreased

the perceived risk of not vaccinating, and decreased intentions to vaccinate (Betsch et al. 2010). Even a mix of positive and negative information can be detrimental to vaccination decisions. An experimental study provided evidence that when parents are exposed to an equal amount of pro-autism and anti-autism vaccine controversy, parents are more likely to believe medical experts are polarized on the vaccine-autism link, leading them to be “less certain that vaccines did not cause autism” (Dixon & Clarke 2013). In contrast, another study exposing parents to either pro-vaccine or vaccine-critical television vignettes found that although mothers “expressed surprise and concern about alleged vaccine risks” they “quickly reinstated their support for vaccination by deference to authority figures” and “type-casted immunization opponents” (Leask et al 2006, pp. 146-148).

Platforms such as YouTube, MySpace, and Facebook allow parents to participate in the immunization debate. An analysis of YouTube videos revealed that 48% were pro-vaccine, 32% were vaccine-critical, and 20% were ambiguous. However, critical videos had more views and higher ratings (Keelan 2007). An analysis of YouTube videos and the HPV vaccine found that the majority of the videos had a negative tone, disapproved of the vaccine, and related to conspiracy theory and civil liberty issues. The negative videos had more “likes” by viewers than positive or neutral videos (Briones et al. 2012). An analysis of MySpace blogs and the HPV vaccine found that 52% of the blogs were positive, 43% were negative, and 17% were neutral toward the vaccine, with a higher

percentage of male bloggers being critical of the vaccine (60% vs. 36%) (Keelan et al. 2010).

Several themes have emerged through studies on vaccine-critical websites. Perhaps the most common relate to vaccine safety, which includes allegations that vaccines cause illness, damage, or death and cause diseases like multiple sclerosis, autism, and diabetes; appeals to civil liberties and allegations of financial motives, government cover-up, or conspiracy theories were other major themes (Bean 2011; Kata 2010; Zimmerman et al. 2005). Statements about vaccines containing mercury or other harmful substances, claims that immunity wanes and the diseases they prevent are not serious, and appeals to being a responsible parent by educating themselves and “resisting the establishment” were also commonly found (Zimmerman et al. 2005). Rhetorical strategies such as claiming vaccines are “toxic” or “unnatural,” skewing science, attacking critics, and presenting the site as “pro-safe vaccines” rather than “anti-vaccine” has emerged (Kata 2012). Presence of expert and parent testimonials opposing vaccination has recently proliferated, as well as information about homeopathic treatments (Bean 2011; Kata 2010). Parental stories about purported negative side effects of vaccination found in media may manifest themselves during the decision-making processes, leading undecided parents to overestimate the frequency of rare risks (Ball 1998).

Government Agencies and Professional Organizations

Government agencies and professional organizations are important sources of information to parents. A study found that 28% of parents reported that the American

Academy of Pediatrics was one of the three most important sources of information, and 26% of parents identified the CDC as one of the three most important sources (Kennedy et al. 2011). However, some parents distrust government and these parents are less likely to trust vaccine information provided by government sources (Keane et al. 2005; Serpell & Green 2006; Mills et al. 2005; Shui et al. 2005; Salmon et al. 2005).

Traditional media is infrequently reported as one of the top three immunization information sources. A study found that only 5% of parents mentioned newspapers, 4% mentioned magazines and TV news shows, 1% mentioned radio, and less than 1% mentioned other TV shows as sources of vaccine-related information (Kennedy et al. 2011). Surprisingly, a study asserts that original scientific publications purporting the link between the MMR vaccine and autism increased vaccine refusal even prior to media coverage (Smith et al. 2008).

Pro-vaccination Media Campaigns

Exposure to effective health campaigns has the potential to influence intentions toward engaging in particular health behaviors (Witte & Allen 2000; Peter, Ruiter & Kok 2013; Sheeran, Harris & Epton 2013; Beck 1984; Insko, Arkoff & Insko 1965; Stainback & Rogers 1983). The more people who are reached and the more frequently the message is heard, the greater the likelihood that the public will respond and vaccination rates will increase (Hornik 2002).

In social psychology, it is contested that supporting data, a rational argument, a messenger who is trustworthy, and emotional appeals are necessary for a health message

to be effective (Diekema 2012; Opel et al. 2009). Diekema (2012) contends that “data and facts, no matter how strongly supportive of vaccination, will not be sufficient to compete with the opposition’s emotional appeals.” Stories and narratives are powerful in engaging the audience’s emotions (Gardner 2004) especially stories about just one person (Newman 2003, Small et al. 2007; Diekema 2012). There has been a call for stories of real people who have been affected by vaccine-preventable diseases (Leask et al 2006), perhaps in order to combat personal stories set forth by those opposing immunization. The role of various types of health messages – whether narrative or statistical – in increasing vaccination rates will be further explored in Chapter 4.

Childhood immunization rates can suffer when parents perceive information to be biased (Brown et al. 2010; Sporton & Francis 2001), implying that vaccination messages should frankly and accurately address possible pros and cons of immunizing. An experimental study found that parents had increased intentions to vaccinate their child immediately after being exposed to an ad showing possible risks associated with the MMR vaccine compared to possible risks of the diseases. Significantly more experimental subjects were “leaning towards” immunizing their child after exposure to the ad (39% pre-test, 55% post-test) (Wallace, Leask & Trevena 2006). However, this study suggests that while there was an overall desired effect, providing information about possible side effects in an ad does not fully address the needs of some parents. Parents who were “leaning away” from vaccinating their child and those who were “undecided” had lingering concerns about perceived negative side effects of vaccination, such as autism (Wallace,

Leask & Trevena 2006). In addition, this MMR case study may not translate to other vaccines or diseases. Furthermore, the longevity of the attitude or intention change and the connection to actual behavior is generally lacking in such studies, casting doubt on the ability of such ads to increase vaccination rates in practice.

Conclusion

Physician recommendation, parental knowledge and beliefs, policy, access issues, and media play a role in parents' decisions to vaccinate their children. Due to the myriad of factors surrounding parental vaccination decisions, it may be overly optimistic to purport that even the best communication campaign, carefully tailored to the target population, will provide a large or sustained increase in vaccination rates. Issues surrounding decreasing childhood vaccinations are complex and likely require a holistic approach. Effective campaigns may need to be combined with solutions addressing issues such as physician training, administrative clinic issues, state policy, school enforcement of policies, and access issues. The need for each of these is likely to vary by region or demographic factors.

The majority of communication studies surrounding vaccination measure parents' intentions to vaccinate their children. However, it may not be prudent to expect parent intentions to change based on exposure to a brief media message. Most parents actively seek information before deciding to vaccinate their child. A campaign that directs people to resources that persuade them to vaccinate may be more likely to achieve greater vaccination rates than attempting to directly persuade parents to vaccinate through a

health message. My study will include information seeking (including intention to talk to a doctor) as outcome variables rather than only intention to vaccinate. In practice, the impact of such messages is likely to be heightened when combined with additional strategies addressing policy and access issues.

CHAPTER 3: EXTENDED PARALLEL PROCESS MODEL

Investigations into the types of health messages that most effectively persuade people to change their behavior has given rise to health communication models seeking to describe emotional and rational factors in the decision-making process. The most contemporary fear-based theory of human behavior is the Extended Parallel Process Model (EPPM). The conditions under which the EPPM most effectively influences attitudes, intentions, or behaviors have been extensively explored. However, how the model functions in relation to a recommended health behavior that may be fearful in and of itself (e.g. vaccination) has not been extensively explored. In this chapter, I will (1) introduce core communication models, (2) explain how each model relates to the EPPM, (3) explain the theory behind the EPPM, (4) highlight EPPM vaccination studies, (5) discuss methods surrounding EPPM studies, (6) provide a critique of the EPPM and discuss research gaps.

Core Communication Models

Theories used to guide message framing in public health include the Health Belief Model (Rosenstock 1966; Rosenstock 1974), the Theory of Reasoned Action and the Theory of Planned Behavior (Ajzen & Fishbein 1974; Fishbein & Ajzen 1975; Ajzen & Fishbein 1980; Ajzen 1991), Social Cognitive Theory (Bandura 1974; Bandura 1991), Stages of Change (Prochaska & DiClemente 1983; Prochaska & DiClemente 1986), and the Extended Parallel Process Model (Witte 1992).

The original Health Belief Model (HBM) included constructs of *perceived susceptibility*, *perceived severity*, *perceived barriers*, and *perceived benefits* as factors that influence health behavior. A later iteration of the HBM, influenced by Social Cognitive Theory, expanded the model to include *self-efficacy* as a separate independent variable (Rosenstock, Strecher, & Becker 1988). The Theory of Reasoned Action (TRA) posits that behavioral intentions will be explained by the theoretical constructs of *attitudes* (weighted sum of positive and negative beliefs toward the health behavior) and *subjective norms* (what society does and the perceived importance of complying with society's expectations) (Miller 2005). Social Cognitive Theory posits that people learn through observing others' behaviors and the ensuing consequences. Constructs include *observational learning*, *expectation of outcome*, *goal setting*, *self-regulation*, and *self-efficacy* (Bandura 1974; Bandura 1991). The Stages of Change model, or Transtheoretical Model (TTM) posits five phases of health behavior change: *pre-contemplation*, *contemplation*, *preparation*, *action*, *maintenance*, and *termination*. While *self-efficacy* was not included in the original model, a later TTM study found that *self-efficacy* mediated behavior change at all stages (DiClemente, Prochaska & Gibertini 1985). A more recent TTM model includes four constructs: *stages of change*, *processes of change*, *decisional balance*, and *self-efficacy* (Prochaska & Velicer 1997). The choice of which model is most appropriate to use may vary according to the health behavior and surrounding cultural issues. For example, health marketers may want to approach long-term sustained behavior change (e.g. smoking) with the TTM to allow for flux between the stages. Marketers may

choose to address cultural practices with a message about social norms or responsibility (e.g. condom use) based on the TRA.

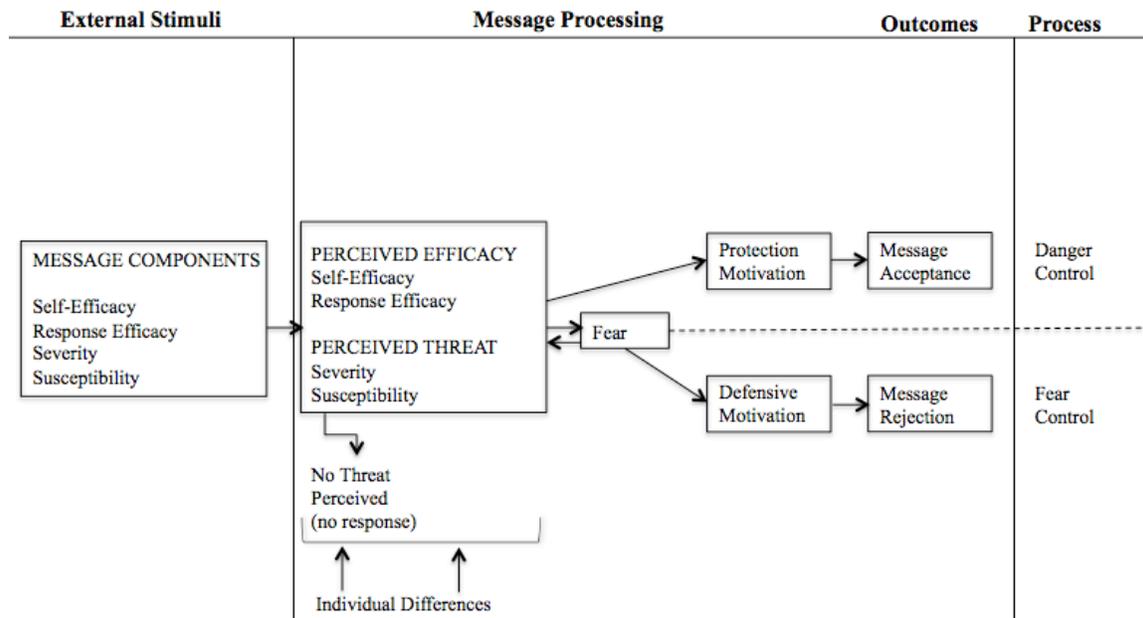
The EPPM and Communication Theories

A component of attitude and behavior change research in health communication is in relation to fear. A fear appeal has been defined as “a persuasive message that arouses fear by outlining the negative consequences that occur if a certain action is not taken” (Witte, Meyer & Martell 2001, p. 2). Communication theories in the realm of fear appeals seek to describe the relationship between fear and intentions/behavior. The most contemporary fear appeal theory is the widely used Extended Parallel Process Model (EPPM) (Witte 1992).

The EPPM incorporates many elements of models, which were previously mentioned, including constructs of *severity* and *susceptibility* from the HBM and *self-efficacy* from Social Cognitive Theory. It also includes elements of Protection Motivation Theory (PMT), which puts forth three components of fear appeal messages: (1) the prevalence and/or severity of the undesired event, (2) the probability of the undesired event’s occurrence, and (3) the effectiveness of the recommended behavior in averting the threat (Rogers 1975; Maddux & Rogers 1983). The modern EPPM also borrows prior ideas that the emotion of fear itself mediates attitude and behavior change (Hovland, Janis & Kelley 1953; Janis 1967) and that defensive reactions can occur when fear is too high (Leventhal & Trembly 1968). Measured outcomes are built on a previous danger control/fear control framework (Leventhal 1970). EPPM studies frequently use

behavioral intentions as the outcome variable rather than directly observed behavior, since intentions are easier to measure than actual behavior. This draws from the notion that *intentions* link to behaviors as postulated in the TRA. A diagram of the EPPM is found below.

Figure 1. Theoretical Diagram of the Extended Parallel Process Model



Theory is based on Witte, K. (1994). Fear control and danger control: a test of the extended parallel process model (EPPM). *Communication Monographs*, 61, 113-134.

Explanation of EPPM

The EPPM is based on the premise that if people fear a particular health outcome and believe that they can easily and successfully avoid it, then they will take action to avoid it. The three main concepts in the EPPM are *fear*, *threat*, and *efficacy*. Witte (1994) defines *fear* as “an internal emotional reaction characterized by subjective experience and physiological arousal” (p. 114). *Fear* is posited to rise when *threat* is increased. *Threat* is defined as “a danger or harm that exists in the environment” (Witte 1994, p. 114). *Threat*

is posited to increase by heightening perceptions of *susceptibility* (probability of personally experiencing the threat) and *severity* (gravity of consequences) (Witte, 1998; Witte et al., 1996). *Efficacy* has been defined as “the effectiveness, feasibility, and ease with which a recommended response impedes or averts a threat” (Witte 1996, p. 320). *Perceived efficacy* variables in the model are *response efficacy* (beliefs about how well the recommended behavior averts the threat) and *self-efficacy* (capability of engaging in recommended behavior) (Witte 1992; Witte 1994; Bandura 1977).

High Efficacy is an important construct in fear appeal theory, and several meta-analyses have supported the claim that fear appeal messages with a *high efficacy* component elicit greater positive change in outcome variables than messages using only *threat* and *fear* (Mongeau 1998; Gore & Bracken 2005; Sutton 1982; Witte & Allen 2000). For example, while increasing *threat* variables may incite fear, there is evidence that a raised fear level alone affects *attitudes* about the threat but not *behaviors* (Liu & Stout 1987). A significant interaction effect has been found between *threat* and *efficacy*, with *threat* only having a significant effect under *high efficacy* conditions and vice versa (Peters, Ruiters & Kok 2013). In addition, a meta-analysis of 98 fear appeal studies across a wide variety of topics with various manipulations of *threat* and *efficacy* support the notion that fear-based messages must include a *high efficacy* component in order to be effective (Witte & Allen 2000). Several studies have found that fear appeals are most successful when both *self-efficacy* and *response efficacy* are high (Edgar & Volkman 2012; Roberto et al. 2002).

According to the model, when a person is exposed to a fear appeal message there are three possible outcomes. The first is *no response*, which occurs when little to no *threat* is perceived regardless of *efficacy*. The second outcome is *message rejection*, which occurs when the perceived *threat* is high but perceived *efficacy* is low. With this outcome, the person perceives a threat but does not think there is much they can do to avert the threat. The person enters into the Defensive Motivation to try to reduce their fear of the threat (the Fear Control Process). The third is *message acceptance*, which occurs when perceived *threat* and perceived *efficacy* are both high. With this outcome, the person perceives a threat, but also perceives that they are able to engage in behavior to avert the threat. This is referred to as Protection Motivation and is part of the Danger Control Process.

EPPM Vaccination Studies

Experimental Studies

The topic of vaccination in the context of the EPPM is interesting, because vaccination has the possibility of a perception of a two-way threat. While people may fear VPDs, they may also fear possible side effects or pain from vaccination. Most EPPM literature is based on health issues for which there is little to no perceived threat of the recommended behavior (e.g. eating vegetables, wearing sunscreen). Thus, it is important to test the EPPM in this new context without presuming it operates the same as one-way threat health issues.

Experimental vaccination messages testing EPPM theory are limited. Searches through the ASU Library (searches included PubMed, CINAHL on EBSCO, Web of Science, various ProQuest databases, and many others) with search terms “EPPM + vaccine,” (N=70) and “EPPM + immunization” (N=50) revealed seven EPPM-based experimental vaccination studies testing a wide range of factors. These factors include message medium (Prati, Pietrantonio & Zani 2012), message framing emphasizing various consequences of the disease (Krieger & Sarge 2013; Carcioppolo et al. 2013), threat level (Gore & Bracken 2005; Venkatesan 2010), fear-only messages versus fear/hope messages (DeJuliis et al. 2011) and forewarning cues (Siu 2008). While there are many studies that have used EPPM constructs to measure existing attitudes and perceptions of diseases and vaccines, these studies are more descriptive in nature and do not specifically test the influence of message manipulation on vaccine attitudes, intentions, and behavior.

The majority of these studies (6/7) used undergraduate students as their study population. The remaining study used seniors aged 65 and older. This is problematic for several reasons. First, college students and seniors are not representative of the general population (Kraus 1995). There are no known EPPM-based experimental vaccination studies performed on non-college student and non-seniors (65+), who represent the majority of parents, thus evidence of the effect of such messages on this population is virtually unknown. This is important because age has been found to affect vaccination decisions related to influenza (Bonfiglioli et al. 2013), and no known EPPM-based experimental studies have been published to examine parental intentions to vaccinate their

children against influenza. Secondly, none of these studies have included fear of vaccines as a variable, and as noted in the previous chapter, fear of side effects of vaccination is an important determinant of parental decisions to vaccinate their children.

Table 1. EPPM-based Experimental Vaccination Studies (N = 7)

| Author (Year) | Disease Studied | Study Population | Study Design | Findings |
|-----------------------------------|------------------------|-----------------------------------------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Carcioppolo et al. (2013) | HPV | 442 female college students | (1) Cervical cancer vs. genital warts, (2) Six threat to efficacy ratios | 1-to-1 threat to efficacy ratio was most effective at increasing prevention intentions. Those exposed to genital wart message had higher prevention intentions mediated by response efficacy. |
| Deluliis et al. (2011) | H1N1 | 180 college students enrolled in comm course | (1) fearful PSA, (2) fearful + hopeful PSA | No difference between fearful and hopeful messages. Emotional engagement mediated threat (severity) and protection motivation. |
| Gore & Bracken (2005) | Meningitis | 145 college students | (1) HT/no efficacy, (2) HE/no threat | Messages containing only threat may cause the audience to deny or derogate the threat. |
| Krieger & Sarge (2013) | HPV | 182 Female college students and their parents | (1) Emphasizing genital warts, (2) Emphasizing cervical cancer | Message emphasizing prevention of genital warts had increased perceptions of self-efficacy, response efficacy, and intentions to talk to their doctor about the HPV vaccine for college women. There was no significant difference found on parents. For both study populations, response efficacy mediated self-efficacy and behavioral intentions. |
| Prati, Pietrantonio & Zani (2012) | Influenza | 311 Italians age 65+ | (1) Narrative, (2) didactic, (3) no message | Narrative message condition showed higher perceptions of disease risk, vaccine efficacy, and self-efficacy. No significant differences in intentions to vaccinate were found between the three conditions. |
| Siu (2008) | Influenza - H5N1 | 265 college students | Same message, different forewarning cues | Forewarning of topic and stance was associated with greater fear arousal, perceived self-efficacy, and behavioral intention to vaccinate for H5N1. |
| Venkatesan (2010) | HPV | 72 female college students | (1) HT, (2) LT (with unrelated visual task to measure attention) | HT condition was associated with greater knowledge retention at 6 weeks after experiment conclusion. Attention was associated with greater knowledge retention and intention to receive vaccine at 6 weeks after experiment conclusion. Results for all conditions were mediated by perceptions of personal relevance. |

*HT = high threat, LT = low threat, HE = high efficacy, LE = low efficacy

Descriptive Studies – Influenza and EPPM

Several descriptive studies on perceptions of the influenza vaccine in particular have used theoretical constructs from the EPPM to illuminate themes associated with pre-existing ideas about threat and efficacy for various populations. While these studies did not manipulate threat and efficacy in a health message, they may provide clues as to *how* to manipulate constructs of threat and efficacy based on current perceptions.

Cameron et al. (2009) performed six focus groups with African Americans aged 65 and older. The study showed that perceived susceptibility varied based on how healthy the participant perceived himself or herself to be, background knowledge, and age-related risk. Perceptions of severity also differed; some thought influenza was not serious, while others viewed it as being life-threatening. In addition, low levels of efficacy most often related to cost and accessibility to the vaccine, perceived side effects, and efficacy of the vaccine (Cameron et al. 2009).

Nan, Xie & Madden (2012) found that presenting different message types (gain-framed versus loss-framed messages) influenced intention to vaccinate differently based on the individual's perception of vaccine efficacy, with loss-framed messages increasing intention to vaccinate when the individuals perceived low vaccine efficacy; there was no difference in either message condition with regard to intention to vaccinate for those who perceived high vaccine efficacy. The authors observe, "evidence regarding the interaction between message framing and perceived vaccine safety is limited" (p. 1). This study was

performed on seniors and used pre-existing notions of response efficacy rather than manipulating the construct in the experimental message.

Yang (2012) used a convenience sample of college students to assess their knowledge of H1N1 and found that the majority of students overestimated their knowledge of the disease. The author cited anecdotal evidence such as YouTube videos of college students contracting diseases such as Guillain Barre and Dystonia after vaccination as a factor in this population being afraid of receiving a seasonal influenza vaccine. LaVela, Smith, & Weaver (2007) administered a cross-sectional survey to discover the perceived risk of influenza among veterans with spinal cord injuries. The authors found that 59% of participants were in the *danger control* process (message acceptance). Those in *fear control* were more likely to report contracting influenza, and to report access issues such as not knowing where to receive the vaccine and believing that it was not available. The article concludes that for those in *fear control*, messages should strive to heighten efficacy while for those in *danger control*, it should seek to heighten threat. These descriptive studies are limited in that they were performed on seniors, college students, and other esoteric populations and may not be generalizable.

Unique nature of vaccination messages

The threat component in EPPM vaccination messages relate to perceived susceptibility to the disease and perceived severity of the disease. Efficacy relates to the perceived ease of receiving the vaccine and the perceived effectiveness of the vaccine. This is perhaps less complicated in typical fear messages than vaccination messages, due to the

perceived threat of the recommended behavior itself (see Chapter 2). This perceived two-way threat (threat of both disease and vaccine) has the potential to confound or influence the way fear appeal theory operates in situations in which the recommended response is also a perceived threat.

Studies have found that vaccination rates are lower for parents who believe that the immunization information they receive is biased (Brown et al. 2010; Shui et al. 2005; Sporton & Francis 2001). Furthermore, Wallace, Leask & Trevena (2006) conducted an experiment in which parents were exposed to a message comparing possible risks of the MMR vaccine to possible risks of the diseases. They found that significantly more parents were “leaning towards” vaccinating their child after viewing the ad (39% before, 55% after). This evidence suggests that vaccination messages may be more effective when side effects are frankly addressed, although it is also possible that by unnecessarily drawing attention to rare side effects, the reverse may also be true.

EPPM Methods

Message Creation

Effective messages should include high-threat and high-efficacy components. The EPPM postulates that individuals sequentially evaluate their susceptibility to the threat and the severity of the threat first; if both are high, they next evaluate response efficacy and self-efficacy (Witte 1998; DeJuliis et al. 2011; Lazarus 1968). Studies have supported the theory that message acceptance is greater when threat is presented first and efficacy immediately thereafter than when efficacy is presented before, during, or quite a while

after presentation of threat (Skilbeck, Tulips, & Ley, 1977, and Leventhal & Singer, 1966; cited in Witte, 1998). Lapka et al. (2008) suggest that once messages are crafted, cognitive response testing (CRT) is useful in order to probe the message. In this procedure, pilot test participants are asked to paraphrase items, discuss thoughts or emotions that come to mind, and offer suggestions for improvement.

Survey Pilot Testing

Risk communication message experiments typically include exposure to the message immediately followed by a survey (Witte et al. 1998; Witte et al. 1996). These surveys are typically pilot tested prior to the experiment. To bolster reliability, multiple word choices are used for each concept as each may have a slightly different connotation - typically at least three questions per concept. Internal consistency between the three items in each concept is often determined using Cronbach's alpha. It is generally accepted that survey items with an inter-reliability rating of $> .8$ have good internal consistency.

Threat and Efficacy Variables

Studies based on the EPPM are typically measured under experimental conditions in which study participants are randomly exposed to either a control message or a message in which *threat* and *efficacy* constructs have been manipulated. Immediately following message exposure, *perceived threat*, *perceived efficacy*, and *outcome variables* (e.g. *attitudes*, *intentions*, *behaviors*) are self-rated by study participants in a follow-up survey.

In health studies, *perceived severity* is typically measured by the level of agreement with survey items such as “[health condition] is serious,” “[health condition] is significant,” and “[health condition] is severe” (Witte et al. 1996). *Perceived susceptibility* is often measured by the level of agreement with survey items such as “I am at risk for getting [health condition]” (Witte et al., 1996). Participants are asked to rate how true these statements are on a Likert scale typically ranging from one (strongly disagree) to five or seven (strongly agree).

Efficacy survey questions tend to vary more widely than *threat* questions, possibly because the behaviors the message intends to persuade the audience to engage in (or cease) are highly variable across studies. *Response efficacy* may be measured with survey questions such as “[particular health behavior] works in preventing [particular health threat.]” *Self-efficacy* often includes rating items such as perceived ability, ease, cost, or convenience of performing the recommended behavior (Witte et al. 1996, Popova 2012).

Fear Variable

When *fear* is measured in an EPPM study, it is often assessed through respondent self-rating of how “frightened,” “scared,” and “anxious” they are (Witte et al. 1998). Some argue that self-report measures are inadequate for the fear construct (Mongeau 2013; Ruiters, Abraham & Kok 2001). However, several studies have used physical indicators such as heart rate and found them to be strongly correlated with self-ratings of fear (Ordoñana et al. 2009, Mewborn & Rogers 1979). Others assert “self-report measures of

fear have the highest utility because they have high validity and are the easiest to administer” (Popova 2012).

Outcome variables

Outcome variables in EPPM literature typically include *attitudes, intentions, or behaviors*. Attitudes are often measured using semantic differentials measured on a 5-point or 7-point scale and includes variations such as “[health behavior] is good / bad,” “[health behavior] is desirable / undesirable,” and “[health behavior is favorable / unfavorable].” Intentions are generally measured with survey items such as “I plan to [engage in health behavior],” “I intend to [engage in health behavior],” and “I will [engage in health behavior]” (Witte et al. 1998; Witte et al. 1996). Directly observing behaviors is not typically done in fear appeals studies, since such studies are conducted in experimental conditions with the behavior (e.g. wearing safety belts, receiving a vaccination, screening for cancer, quitting smoking) not directly observable at the time. Thus, studies often assume an intention – behavior link, which will be discussed extensively in the “outcome variables and critique” section.

Fear Control and Additional Variables

To measure individual psychological resistance and defensive tactics, some studies have included survey items to address defensive avoidance, issue derogation, and perceived manipulation (Witte & Morrison 2000; Witte et al. 1998). Defensive avoidance refers to when people refuse to think about the threat or when they minimize the threat (Goldenbeld, Levelt & Heidstra 2000). Issue derogation refers to perceptions of message

strength and has been measured by items such as “the message was overblown / exaggerated / overstated” (Witte et al. 1998). Perceived manipulation refers to the perceptions of honesty of the message and has been measured by items such as “the message was manipulative/misleading/distorted” (Witte et al. 1998).

Methodology Commonly Used in EPPM Studies

The manner in which predictor variables are combined in EPPM methodology has been a subject of debate. The constructs of *severity* and *susceptibility* are generally treated as an additive relationship combining to produce overall *threat*. Similarly, *self-efficacy* and *response efficacy* combine to create overall *efficacy*. Some have argued that these should instead be treated in a multiplicative manner (Weinstein 2000). For example, “no matter how harmful an event is judged to be, if it has zero probability of occurring, it would be irrational to take precautionary actions. Similarly, if an event is likely, but the threat of it is nonexistent, no protective measures need to be taken” (Popova 2012, p. 466). Another study concluded that an additive model is a better fit than a multiplicative one when used to predict *behavioral intentions* but not when used to predict *behavior* (Goei et al. 2010). This study will evaluate the impact of all EPPM threat and efficacy constructs in aggregate to determine how the combination predicts parental intentions to vaccinate against the flu. Since severity and susceptibility to the flu are not the same, this study will also evaluate the strength of perceptions of each construct within the EPPM model separately (severity, susceptibility, fear, self-efficacy, and response efficacy) on

intentions to vaccinate in order to determine which variables are the strongest predictors of vaccination.

EPPM Critique

The theoretical effectiveness of the EPPM is the subject of much debate. (Mongeau 2013). Many studies have shown fear appeals to be effective in eliciting attitudinal or behavioral change (Witte & Allen 2000; Peters, Ruitter & Kok 2013; Sheeran, Harris & Epton 2013; Beck 1984; Insko, Arkoff & Insko 1965; Stainback & Rogers 1983, Nabi, Roskos-Ewoldsen, & Dillman). However, other studies have not shown significant effects (Carey, McDermott & Sarma 2013; Janis & Feshback 1953; Kohn et al. 1982; Krisher, Darley & Darley 1973). It is not widely understood how, when, and why fear appeals work. There is much evidence that high-threat, high-efficacy messages are most effective – the stronger the fear appeal, the more attitude, intentions, and behaviors will change (Witte & Allen 2000). However, others have said that an inverted U-shaped relationship would occur when it comes to fear levels, with levels of fear that are too low or too high leading to the fear control process rather than danger control (Sternthal & Craig 1974); however there is little evidence supporting this claim. Mongeau (2013) states that when the impact of threat and efficacy variables are considered separately, the model functions well; however certain combinations of threat and efficacy (e.g., high-threat/low-efficacy messages) function to predict attitudes more than would be expected from the model. I believe that presentation of the message and audience characteristics (e.g. social context, type of message) can influence the effectiveness of an EPPM message. Other

factors include theoretical and methodological considerations in message and survey design. Few studies comprehensively address these predictive factors.

Social context and audience characteristics

The social context, such as social stigma surrounding the health issue, may impact how well the EPPM is able to predict behavior. For example, using a condom may imply that someone has an STD, so the behavior may not be adopted (Tanner, Hunt & Eppright 1991). In addition, personality and socioeconomic characteristics may impact the effectiveness of fear appeals (Burnett & Oliver 1979). The failure to explicitly consider audience characteristics is a factor that may be an important shortcoming of EPPM theory and persuasion theory in general (DeJuliis et al. 2011, Eagly & Chaiken, 1993; Mongeau, 1998; Roskos-Ewoldsen, Yu & Rhodes, 2004; Witte & Allen, 2000).

The EPPM, and persuasion theory in general, assumes a clean slate; therefore, pre-existing emotions and cognitions surrounding the issue are typically ignored (Popova 2012). If the audience already has strong beliefs about the behavior prior to message exposure, the message may have little to no effect. It has been suggested that the EPPM should not be used when the audience already has a high level of fear surrounding the issue (Nabi et al. 2008; Muthusamy, Levine & Weber et al. 2009). It is also considered inappropriate to use EPPM when low efficacy perceptions cannot be changed (Maloney, Lapinski, & Witte 2011; Peters, Ruitter & Kok 2013).

Role of fear

The role of *fear* in influencing behavior change is a subject of debate. The EPPM does not clearly differentiate between the emotion of fear and cognitive processing of threat, making it uncertain which component relates to intention or behavior change (Ruiter, Abraham, and Kok 2001). Some studies of the effectiveness of interventions intended to be fearful have not pinpointed fear as a motivating factor in changing intentions or behaviors (Fisher & Fisher 1992; Rippetoe & Rogers 1987). Several studies point to the assessment of threat through cognitive rather than emotional processes that results in change (Maddux & Rogers 1983; Mewborn & Rogers 1979; Robberson & Rogers 1988; Rogers & Mewborn 1976; cited in Tanner, Hunt & Eppright 1991). In contrast, others argue that emotion is a powerful tool that may engage attention, improving comprehension and affecting message processing (Lazarus 1968; Liu & Stout 1987; Lazarus & Folkman 1984; Folkman, Schaefer & Lazarus 1979). Others have suggested that EPPM theory not only holds for fear, but for a variety of emotion-based messages such as guilt (Lewis, Watson & White 2013). Some seek to modify the model to include cognitive appraisal theory of emotion (Lazarus 1991) and coping styles (Miller 1995) in addition to emotion (So 2013). Thus, it is inconclusive whether *fear* is a cause of intention and behavior change, a predictive factor affecting cognition or processing, or a byproduct that does not affect outcomes.

Fear is difficult to isolate because of the ambiguous definition and propensity to be mixed with other closely related emotions such as guilt. Block (2005) states that “fear

appeals are ads that evoke fear through descriptions of a negative consequence, while guilt appeals refer to messages that evoke guilt through attributions of responsibility for those negative consequences” The definition of these constructs in fear appeal theory are nearly inseparable since a recommended behavior averting threat is built into fear appeal theory and failing to take the recommended action implies a level of responsibility in averting the threat. These emotions could be especially confounded in fear appeal messages where the health action is aimed toward another individual, such as the message recipient’s spouse or child.

The ideal level of *fear* in EPPM is debated. Some graphically display the ideal level of fear as an upside-down U shape with moderate levels of fear presumed to be more effective than weak or strong appeals (Janis 1969). This idea assumes that a weak level of fear will not sufficiently move the audience to action, while a fear appeal that is too strong results in turning away from the message or feeling manipulated and denying the message. Most studies have not found support for the inverted U shape relationship, instead showing that strong vs. weak fear appeals produced greater reported fear, attitude change, and behavior change (Boster & Mongeau 1984; Mongeau 1998). Others assert the optimal level of fear varies according to the audience’s perceptions of the relevance of the appeal to themselves (Wheatley 1971; Ruiter, Abraham & Kok 2001).

Decision-making processes and longevity of response

Since EPPM studies generally measure attitudes or behavioral intentions immediately after message exposure, these studies offer a snapshot in the decision-making

processes. There are few longitudinal studies that evaluate theoretical constructs and outcome variables over time (Rimal 2001). Typical EPPM methodology disregards longevity of the response for long-term behaviors (e.g. the Transtheoretical Model maintenance phase). Information burnout may also affect EPPM messages for frequent behaviors. Thus, the EPPM may be more appropriate for research involving infrequent behaviors (e.g. receiving a vaccination, getting a mammogram) than long-term behavior (e.g. quitting smoking, exercising).

Heckhausen (1991) suggests that it may be better to view the decision-making process as related to intentions in two phases, the motivational phase (in which intention is formed), and the volitional phase (in which the behavior is planned – the when, where, and how). Planning has been shown to be a significant predictor of health behavior (Gollwitzer & Oettingen, 1998; Sniehotta, Scholz & Schwarzer 2005). These phases have been differentiated as “implementation intentions” and “goal intentions,” respectively (Gollwitzer 1999). A meta-analysis which provided support between the intention-behavior link included the stipulation that when intentions are goal-oriented, the correlation between intentions and behaviors may not hold (Sheppard, Hartqick & Warshaw 1988). EPPM theory neglects the planning phase that occurs between the intention measure and the actual behavior.

Theoretical and Methodological Considerations

Inconsistencies in findings could result from flawed methodological design or omission of important constructs in the theory itself (Peters, Ruiter & Kok 2013).

Methodological considerations such as insufficient samples sizes or the use of younger (student) samples have been found to significantly influence results (Kraus 1995; Ravis & Sheeran 2003).

There are many theoretical constructs that have been postulated to influence health outcomes in other major communication theories. These constructs are not addressed by the EPPM, but deserve some mention since they may influence vaccination behavior. These include *perceptions of norms*. Ajzen (1974) theorized that *attitudes* plus *normative beliefs* multiplied by *motivation to comply with the norms* create *behavioral intentions*, which in turn correlate with *behavior* (Ajzen 1974). *Normative beliefs* include *subjective* and *descriptive norms*. *Subjective norms* are perceived social pressure from important others to participate (or not participate) in a behavior (Ravis & Sheeran 2003). Many studies have supported the notion that subjective norms are predictive of intentions, although some argue that the overlap between *subjective norms* and *attitudes* makes it difficult to parse them out into separate variables (Miniard & Cohen 1981). Studies have provided evidence that increasing awareness of *norms* significantly influences *intentions* (van den Putte, Yzer, & Brunsting 2005) even when personal attitudes are negative (Vermeir & Verbeke 2006). Others have argued that subjective norms are a weak predictor of intentions as a result of poor measurement and definition (Armitage & Connor 2001). *Descriptive norms*, a construct omitted in EPPM theory, can be defined as what important others do when it comes to the behavior in question. A meta-analysis found a medium to strong average correlation between descriptive norms

and intentions ($r = .44$) (Rivis & Sheeran 2003). Failure to measure these items or account for them in EPPM theory may partially account for the varying degrees of effectiveness in EPPM studies.

In addition, some have suggested that *perceived barriers* be added as a predictor variable in EPPM theory (Carpioppolo 2008). Perceived barriers can include cost, pain, convenience, and a variety of other factors. While it may be argued that such components are considered in the rating of *self-efficacy*, some are not explicitly addressed. One such perceived barrier could be disregard for potential harmful unintended effects of the behavior. For example, if people have pre-existing beliefs that receiving a vaccine can be harmful, the fear message may not change their attitudes, intentions, or behavior. Failing to weigh *perceived barriers* against *perceived efficacy* under such circumstances may affect study conclusions.

Other conditions, such as certainty in message and behavior familiarity may affect how health messages are processed. For example, an EPPM study on bedbugs found that presenting the threat as being uncertain resulted in increased information-seeking behavior compared to when the threat was presented as being certain. Furthermore, when the efficacy of the recommended action was presented as being uncertain this was more likely to lead to information avoidance compared to when the efficacy of the recommended action was presented as being more certain (Goodall & Reed 2013). The strength of perceived efficacy in predicting *behavioral intentions* or *behavior* may vary under certain conditions. A study found that *perceived behavioral control* (similar to *perceived self-*

efficacy) more strongly predicts both *behavior* and *behavioral intention* when the behavior is familiar (Notoni 1998). While the aforementioned factors may influence the model's effectiveness, a disadvantage of examining these constructs for inclusion in EPPM theory is that it would result in a decrease in parsimony (see Littlejohn and Foss 2005) and near impossibility to design a message taking into account all these considerations as well as more possible theoretical constructs that could influence the message.

Outcome Variables and Critique

The EPPM frequently uses *attitudes* and *intentions* as outcome variables. The TRA posits that *attitudes* predict *intentions*, which in turn predicts *behaviors* (Fishbein & Ajzen 1975). Several meta-analyses support the *attitude-intention-behavior* link (Armitage & Connor 2001; Kim & Hunter 1993; Albarracin et al. 2001). One of these meta-analyses found that across a wide variety of topics, *attitudes* and *intentions* were very strongly related (Kim & Hunter 1993). While the majority of studies support the notion that *intentions* predict *behaviors* better than *attitudes* predict *behaviors*, some studies have found *attitudes* to have a strong direct effect on *behavior* regardless of *intentions* (Zuckerman & Reis 1978; Bentler & Speckart 1979) and a few studies have found evidence that *attitudes* and *behaviors* may be more strongly related than *intentions* and *behaviors* (Schwartz & Tessler 1972; Albrecht & Carpenter 1976; cited in Liska 1984). My study will measure attitude and intentions, assuming that these are important of behavior.

Attitude-Behavior Link

Attitude is a common outcome variable measured in EPPM studies and is generally defined as a positive or negative evaluation of a subject (Liska 1984). Some scholars assert that *attitudes* strongly predict *behaviors* (Fazio & Zanna 1981; Schuman & Johnson 1976) while others have found discrepancies between reported *attitudes* and actual *behaviors* (Wicker 1969; Wicker 1971). Mean correlations between *attitudes* and *behaviors* taken from studies have ranged from as low as $r = .15$ (Wicker 1969) to $r = .79$ (Kim & Hunter Part 1 1993).

How well attitudes predict behavior is highly variable and affected by several factors (Ajzen 2000). Several meta-analyses have found that attitudes more strongly predict behavior when they are stable over time, easy to recall (accessible), when attitude certainty or confidence is high, and when direct experience is involved (Glasman & Albarracin 2006; Kraus 1995). Other factors that have been found to increase the strength of the association between attitude and behavior include: (1) when information received is one-sided (Glasman & Albarracin 2006), (2) when past behaviors have showed low variability (Zanna, Olson & Fazio 1980), (3) when there is low self-monitoring (Zanna, Olson & Fazio 1980; Kraus 1995), (4) when attitude intensity is high (Sample & Warland 1973), (5) when there is affective-cognitive consistency (Kraus 1995), (6) when there is a shorter time interval between measured attitude and behavior performed (Schwartz 1978), and (7) when there is a higher perception of degree of relevancy (Kim & Hunter 1993; Sivacek & Crano 1982). Another meta-analysis suggests that when there are situational

difficulties, such as higher perceived social pressure, attitudes are less likely to predict behavior (Wallace et al. 2005).

Intention-Behavior Link

Theories such as the TRA (Fishbein & Ajzen, 1975) and the PMT (Maddux, 1993; Maddux & Rogers, 1983) assume that *behavioral intention* is the closest predictor of *behavior* (Sniehotta, Scholz & Schwarzer 2005). My study will use behavioral intention in the measurement instrument, assuming it correlates to future behavior.

According to Ajzen (1991): the stronger the intention to engage in a behavior, the more likely should be its performance... To the extent that a person has the required opportunities and resources, and intends to perform the behavior, he or she should succeed in doing so (p. 182).

However, my behavioral intention measure will be used with caution since the degree to which behavioral intentions and intentions correlate is postulated on several factors such as how well the intention measure corresponds with the behavior, the amount of time elapsed between the measure of intention and the behavior, and the ability of the person to act on their intentions without being assisted by others (Fishbein & Ajzen 1975). The intention-behavior link has been supported in many studies (Ajzen 1974; Armitage & Connor 2001; Kim & Hunter 1993; Sheppard, Hartqick & Warshaw 1988; Albarracin et al. 2001; Webb & Sheeran 2006). A meta-analysis of 47 experimental studies on the intention-behavior relation found “a medium-to-large change in intention leads to a small-to-medium change in behavior” (Webb & Sheeran 2006).

It has been noted, “although some people may develop an intention to change their health behavior, they might not take any action” (Sniehotta, Scholz & Schwarzer 2005). This phenomenon has been coined the *intention–behavior gap*. This gap has been found to be mostly a consequence of people who intend to act but do not follow through (Orbell & Sheeran 1998; Sheeran 2002). In practice, the intention-behavior gap may be influenced by a variety of conditions such as “behavior type, intention type, properties of intention, and cognitive and personality variables” (Sheeran 2002).

Intervention strategies, such as detailed action planning, have been found to mediate *intentions* and *behavior* over time (Sniehotta, Scholz & Schwarzer 2005). Self-regulation, or “action control” has also been found to improve the intention-behavior gap (Abraham, Sheeran & Johnston, 1998; Kuhl & Fuhrmann, 1998; Sniehotta, Scholz & Schwarzer 2005).

The question of time elapsed between the measure of *attitude* and *intentions* and the performance of the behavior has been studied with inconclusive results. Some authors contest that, for example, “inducing pro-vaccine attitudes at one point in time does not guarantee that people will choose to receive the vaccine” (Glasman & Albarracin 2006). However, a meta-analysis exploring the interval of time in relation to intention-behavior correlation found that “the average intention-behavior correlation coefficient remains strong over a prediction interval of as long as 15 years.” However, factors such as type of behavior being measured and the use of self-report measures were found to influence the strength of the correlation (Randall & Wolff 1994).

Study design methodology has also been found to affect the strength of the attitude-intention-behavior correlation. A meta-analysis of 88 studies found that attitude-behavior correlations were higher when influenced by self-report behavior measures and specificity of attitude and behavior measures (Kraus 1995). The structure of the questionnaire may affect correlations between attitudes, intentions, and behaviors because the subject may draw from prior survey questions to influence their responses to later questions (Feldman & Lynch 1988). The phrasing of the questions (e.g. “plan to,” “intend to,” “will,” “expect to”) may also affect intention outcome measures (Sheppard, Hartqick & Warshaw 1988). Some scholars argue that the construct of *behavioral intention* is less accurate than the construct of *behavioral expectation* (an individual’s “self-prediction of his or her future behavior”) because it allows the subject to assess additional factors that may assist or hinder them in performing the behavior (Warshaw & Davis 1985; Sheppard, Hartqick & Warshaw 1988). Contrary to these findings, a meta-analysis suggests that the way in which intentions were measured was not found to affect the intention-behavior correlation, but self-report measures and behavior over time were influential (Randall & Wolff 1994).

Conclusion

Despite years of EPPM research, the role of fear as a driving factor in decision-making is still ambiguous. First, the EPPM does not typically take into consideration elements of message development and delivery (e.g. statistical, narrative, combined) and how perceptions of the message may influence outcomes (e.g. perceptions of message

credibility and engagement in the message). The potential effects of these factors on message effectiveness will be explored in Chapter 4. Second, the EPPM's effectiveness may differ based on audience characteristics and pre-existing beliefs, barriers to performing the recommended action, and the nature of the health issue. Third, information seeking is rarely measured as an outcome variable. As noted in the previous chapter, most parents seek information about vaccination from a variety of sources before deciding to vaccinate their child. Fourth, in the context of vaccination, experimental studies testing EPPM-based messages against controls are scarce and these are important because the effectiveness of the EPPM in vaccination studies may differ from typical fear studies in that fear may flow in two directions (e.g. fear of disease and fear of vaccine). EPPM studies in such contexts are largely unexplored. Finally, it is difficult to determine how attitudes and behavioral intentions typically measured in EPPM surveys translate to actual behaviors. My study design includes message presentation type (statistical, narrative, control, combined) in the context of vaccination. It also includes attitudes, behavioral intentions, and information-seeking intentions as outcome variables, while recognizing the limitation of using these as outcome measures.

CHAPTER 4: NARRATIVES IN HEALTH COMMUNICATION

A narrative has been defined as “a representation of connected events and characters that has an identifiable structure, is bounded in space and time, and contains implicit or explicit messages about the topic being addressed” (Kreuter et al. 2007).

Narrative theory asserts that people are innate storytellers and that stories are effective tools for helping people understand the world around them (Hart 2005). In this chapter, I will discuss the theory behind how narratives influence people, provide a literature review comparing the effectiveness of narrative health messages and evidence-based messages, highlight vaccination studies, and discuss predictive factors and audience characteristics that have been found to influence the persuasiveness of narrative messages. I will conclude by discussing limitations of prior studies and illuminating gaps in the research.

Narrative Theory

The use of narratives in health communication efforts is growing (Edgar & Volkman 2012). Thus, it is important to understand factors that influence the creation of a successful narrative message. Narrative theory asserts that elements of good narratives include plot development, character development, character eloquence, emotional intensity, dramatic tension, imagery, and production attributes (e.g. lighting, editing, sound quality) (Kreuter et al. 2007). Fisher’s (1987) narrative theory contends that people evaluate stories based on concepts of coherency (whether the story fits together) and fidelity (judgment of whether the story seems true or false) (Hart 2005). Kreuter et al. (2007) proposes several other factors including “perceptions of the source or

messenger of a narrative, the transparency of persuasive intent, and whether a narrative is fiction or nonfiction.”

Mechanisms by which narratives are postulated to be more persuasive than statistics are that narratives: (1) are more difficult to refute or counter-argue (Slater 2002), (2) provide an emotional connection (Oatley 2002), (3) enhance memory and recall (Green, Strange & Brock 2002), (4) improve knowledge (Mazor 2007), (5) overcome resistance and enhance information processing (Kreuter et al. 2007), (6) make rare events seem more probable (Fischhoff 1975), (7) trigger relevant personal memories (Schank & Abelson 1977), and (8) increase imagination by creating more details (Sherer & Rogers 1984).

It should be noted that because narratives are not always comparable in content or tone, it is difficult to consider narratives as a single construct (Shaffer & Zikmund-Fisher 2013). Narrative theory notes that every story is different and is embedded in different culture and history; therefore narratives should be tailored to the audience (Hart 2005). Audience characteristics may affect the persuasiveness of narrative communication. Narratives are not all created equal in terms of purpose, content, or tone (Shaffer & Zikmund-Fisher 2013). For example, a synthesis of narrative versus statistical messages showed that narratives given in the first person were twice as likely to find an effect than those given in the third person (Winterbottom et al. 2008). From a social psychology perspective, supporting data, a rational argument, a messenger who is trustworthy, and emotional appeals are necessary for a health message to be effective (Opel et al. 2009).

Narrative and Statistical Messages and Persuasion

There is mixed evidence supporting which type of message (narrative or evidence-based) most effectively changes attitudes, intentions, or behaviors. A meta-analysis of statistical messages compared to narrative messages found that statistical messages were slightly more persuasive than narratives (Allen & Priess 2009). Another meta-analysis found that statistical evidence had a stronger influence on attitudes while narrative had a stronger influence on intentions (Zebregs et al. 2015). A literature synthesis found that narratives outperformed statistical messages and controls in five of the 17 studies in terms of positively influencing health attitudes, intentions, or behaviors (Winterbottom et al. 2008). This review found a lack of consistent methodology used to develop and test narrative messages in health studies including considerable variation in narrative length, number of narratives given, and topics covered.

Others state that either one can be more persuasive as each has unique potential to influence outcomes. For example, Bing and Fink (2012) argue that perceived vividness is the factor that makes narratives more persuasive than evidence-based messages, while evidence-based messages can be more persuasive than narratives due to the amount of information included. Kopfman et al. (1993) state that the processing of the messages influence results, with statistical messages creating cognitive reactions and narrative messages creating affective reactions. The authors argue that statistical messages are able to trigger both systematic and heuristic processing while narratives only trigger heuristic processing.

There are no clear guidelines on length and content to guide narrative message development (Khangura et al., 2008). Furthermore, none of the narratives in the Winterbottom et al. (2008) review included a recommendation to discuss the illness or prevention technique with a physician or other medical provider. Much of the research involving narratives has been performed on student populations (Morman 2000), which impedes generalizability of the results.

Health Studies Comparing Narratives and Statistics

This review highlights recent studies that test the effectiveness of narrative messages in influencing attitudes, behaviors and/or intentions. The studies included in this review were selected in a two-step procedure. The first step utilized a previous review of narrative studies, which included studies that measured narratives verses statistical information in a health context with the following study designs: experimental, randomized control trials, before and after studies, and cohort studies (Winterbottom et al. 2008). The studies in the Winterbottom review (N=17) were investigated and included in the present review if they met the following inclusion criteria: (1) experimental studies with randomly assigned messages; (2) messages about a health-related behavior; (3) compared narrative message against statistical or evidence-based messages or controls; and (4) required participants to make a decision about a real or hypothetical health behavior or observe participants performing a task related to that behavior. Studies were not included if they only compared different types or aspects of narratives. Of the 17 articles in the Winterbottom review, 8 met the inclusion criteria and were included in the present review.

Secondly, a search was conducted through the ASU Library, which included PubMed, CINAHL on EBSCO, Web of Science, various ProQuest databases, and others with search terms *narrative message*, *experimental*, and *health*. The search was limited to articles published between 2007 and 2015 and constrained to scholarly, peer-reviewed material. This search yielded 181 results. Article titles were scanned for relevance, and potentially relevant articles were examined for content. An additional 14 studies were found through this method.

Table 2. Design Characteristics of Experimental Health Studies (N = 22)

| Author / Year | Sample | Model | Health Issue | Findings |
|------------------------|------------------------------------------------|---------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Braverman (2008) | 249 adults; 187 college students; 158 adults | Elaboration Likelihood Model | Diet and Weight Loss | (1) Audio narrative more convincing than written; (2) Informational and narrative messages equally convincing; (3) Individuals high in “need for cognition” more convinced by testimonial |
| Cox & Cox (2001) | 174 adults; 14 adults | N/A | Mammography | Narrative version was significantly more engaging and increased perceptions of susceptibility, but there was no change in attitudes or intentions to get a mammogram. |
| DeFulius et al. (2011) | 180 college students | Extended Parallel Process Model | H1N1 Vaccine | Comparison of fearful PSA and fearful + hopeful PSA. Emotional engagement mediated threat and efficacy constructs and increased behavioral intentions. |
| de Wit et al. (2008) | 118 men who have sex with men | N/A | Hepatitis B vaccine | Narrative message group had higher intention to vaccinate than statistical group; mediated by perceived risk. |
| Fagerlin et al. (2005) | 613 prospective jurors; 875 prospective jurors | N/A | Angina | (1) When statistical information was presented in prose, treatment choices were influenced by anecdotes; when pictograph and quiz were included, there was no difference; (2) Addition of quiz did not change effect of anecdotes; but pictograph reduced the impact of anecdotes. |
| Greene & Brinn (2003) | 141 students | Health Belief Model | Skin Cancer | Statistical group had lowered intentions to tan, decreased tanning behavior, and increased perceived susceptibility to skin cancer. Narrative group had increased perceptions of realism and decreased intentions to tan. |

| Author / Year | Sample | Model | Health Issue | Findings |
|------------------------------|----------------------------------------------|------------------------------------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hopfer et al. (2012) | 404 college students | Culture-centric narrative theory | HPV Vaccine | Comparison of peer only, medical expert only, and combined narratives. Peer-expert nearly doubled vaccination uptake compared to controls (22% vs. 12%). Peer-only and expert-only did not significantly increase vaccination uptake. |
| Janssen et al. (2003) | 233 females (Dutch) | N/A | Skin Cancer | Narrative message group could more easily imagine themselves developing skin cancer from tanning beds; this mediated results. |
| Kopfman et al. (1993) | 90 students | Heuristic Systematic Model of Persuasion | Organ Donation | Statistical messages created cognitive reactions and narrative messages created affective reactions. Level of prior thought influenced results for both message types. Statistical messages triggered both systematic and heuristic processing while narratives only triggered heuristic processing. |
| Lemal & van den Buick (2010) | 230 college students (Flemish) | N/A | Skin Cancer | Narrative group was 2-5 times more likely to engage in recommended health behaviors than control group. Non-narratives and controls only differed for information seeking, with non-narratives being higher. |
| Lu (2013) | 150 students | N/A | Running for exercise | Narrative personal health blogs created more positive thoughts and stronger identification. Source similarity was stronger in the non-narrative than the narrative. |
| McQueen et al. (2011) | 489 African-American women over 40 years old | N/A | Breast Cancer | Narrative video group identified more with the message, was more engaged, reported talking to their family members more, and had increased recall. |
| Morman (2000) | 80 students | Extended Parallel Process Model | Testicular self-examination | Under high threat/high efficacy conditions, both narratives and statistics were found to generate fear, threat, efficacy, and knowledge with no difference between the two. Narrative was viewed as more exaggerated, boring, and distorted. |
| Nan et al. (2015) | 174 college students | N/A | HPV Vaccine | Hybrid (both statistical and narrative) increased perceived risk of HPV compared to statistical and narrative messages. First-person narrative increased risk of HPV compared to third-person narrative. |
| Niederdepp e et al. (2011) | 500 adults at shopping mall | N/A | Obesity | Narrative group had greater belief that societal actors are responsible for addressing obesity, but only for Liberals. Reduction of counter-arguing was a mediating factor higher in the narrative than the statistical or combined groups. |

| Author / Year | Sample | Model | Health Issue | Findings |
|------------------------|-----------------------------------------------|------------------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nyhan et al. (2014) | 1769 participants in online panel | N/A | MMR Vaccine | Autism correction, disease risks, disease dramatic narrative, and disease images did not increase parental intentions to vaccinate a future child. Dramatic narrative increased beliefs about serious vaccine side effects. |
| Nyhan & Reifler (2015) | 1,000 people in online panel | N/A | Flu Vaccine | Comparison of correction group (flu vaccine does not cause flu) and danger group (flu risks). Correction group had reduced beliefs that the flu vaccines could cause the flu and that flu vaccines are unsafe. A boomerang effect was found for the correction group, in which those most concerned about vaccine side effects had <i>reduced</i> intentions to vaccinate. There was no increased intention to vaccinate in either group when compared to a control. |
| Ricketts et al. (2010) | 142 students | N/A | Injury stories and safety behaviors | When building a swing set, those who received story-based messages in the instructions had improvement in their safety behavior compared to those with non-narrative instructions. |
| Slater & Rouner (1996) | 218 students | Elaboration Likelihood Model | Alcohol Education | Statistically based alcohol messages geared toward college students were most effective when the message aligned with their values and beliefs, but narrative evidence was more effective when the message did not align with their values and beliefs. |
| Ubel et al. (2001) | Study 1: 537, Study 2: 593 prospective jurors | N/A | Angina | Written testimonials affected hypothetical treatment choices (angioplasty vs. bypass surgery). |
| Wilson et al. (2005) | 97 alternative medical students in Canada | N/A | Polio vaccination | Comparison of an evidence-based lecture on the benefits of the polio vaccine and a presentation from a polio victim showed no difference for any of the survey indicators between the two groups. However, 25% of students were <i>less</i> likely to recommend the vaccine after participating in the evidence-based lecture. |
| Wirtz (2014) | 72 Hispanic adults at Texas outdoor festival | N/A | Healthy Eating and Physical Activity | 2*2 (narrative, non-narrative / gain-framed, loss-framed) study showed no significant difference between narrative and non-narrative messages. Loss-framed messages increased intentions. |

Half of the studies ($N=11$) used student samples. Studies that used non-student samples included men who have sex with men, prospective jurors, a Dutch population, African-American women over 40, online panels, and community members recruited through a variety of means such as fliers, emails, and shopping malls. Only a few of the studies were based on theory or models ($N=7$) with only two based on a health communication theory ($N=3$). These two theories are the Health Belief Model (Greene & Brinn 2003) and the Extended Parallel Process Model (DeJuliis et al. 2011; Morman 2000). Only one study contained a combined (narrative + statistical) message. There was a wide range of health behaviors tested, most for preventative behaviors such as diet, alcohol education, cancer prevention, vaccination, and safely assembling a swing set. Only one of these studies had information seeking as an outcome measure and this was in regard to skin cancer (Lemal & van den Buick 2010). Results are shown in the table below.

Results are difficult to compare due to variation in the type of recommended health behaviors and measured outcomes. Some studies measured intentions, others behaviors, and still others beliefs about various aspects of the health issues. Narrative messages outperformed statistical messages in several of the studies for outcomes such as intention to vaccinate (deWit et al. 2008), decreased tanning behavior (Lemal & van den Buick 2010), safety behaviors in building a swing set (Ricketts et al. 2010), and talking to friends and family about breast cancer (McQueen et al. 2011). Statistics outperformed narratives in at least one study for decreased tanning behavior (Greene & Brinn 2003). Another study on skin cancer found that the statistical message did not impact intentions,

but did increase intentions to seek information (Lemal & van den Buick 2010). Other studies across a range of health behaviors found no differences between statistical and narrative messages such as diet and weight loss (Braverman 2008) and intention to get a mammogram (Cox & Cox 2001). Another study found that a hybrid message increased perceived risk of HPV compared to statistical-only and narrative-only messages (Nan et al. 2015).

Factors found to favor the narrative condition included reduction of counter-arguing in an obesity study (Niederdeppe et al. 2011), and increased ability to imagine developing skin cancer from tanning beds (Janssen et al. 2003). Cox and Cox (2001) found that a narrative message about mammography was significantly more engaging and increased perceptions of susceptibility compared to a statistical message; however, there was no change in attitudes or intentions to get a mammogram. Factors that did not favor narratives were revealed in a study on testicular self-examination, which found that participants rated the narrative message as being more exaggerated, boring, and distorted (Morman 2000). This could have been confounded due to lack of thorough methodology in designing comparable messages as the author states the narrative message was longer, harder to read, and overplayed in tone when compared to the statistical message.

Boomerang effects were found for narrative messages in several cases. Wilson et al. (2005) found that 25% of alternative medical students who participated in the evidence-based polio vaccine lecture were *less* likely to recommend the vaccine after watching the lecture, suggesting that those who have strong, negative pre-existing beliefs

about vaccination only strengthen their resolve when presented with information that goes against their beliefs. This experiment was not guided by communication theory. An experimental study by Nyhan et al. (2014) testing various types of messages about the MMR vaccine found that a dramatic narrative *increased* beliefs about serious side effects of vaccines compared to other messages.

Nyhan and Reifler (2015) performed an experimental study comparing a correction group (a message emphasizing that the flu vaccine does not cause the flu) and a danger group (a message about flu risks). While this study did not directly compare narratives and statistics, it is worth mentioning since it is an experimental study relating to the flu vaccine. The authors found that the correction group had reduced beliefs that the flu vaccines could cause the flu and that flu vaccines are unsafe. A boomerang effect was found for the correction group, in which those most concerned about vaccine side effects had reduced intentions to vaccinate after being exposed to a message that the flu vaccine does not cause the flu. There was no increased intention to vaccinate in either group when compared to a control. This study suggests again that pro-vaccination messages can reduce intentions to vaccinate for those most opposed to vaccination. All three of these studies were within the context of vaccination, so the perceived risk of the recommended health behavior – vaccination – may have played into the boomerang effect compared to a health behavior that is not generally seen as risky.

In addition, the influence of the messages differed depending on audience characteristics such as perceived risk (deWit et al. 2008), political party (Niederdeppe et

al. 2011), perceived similarity with the messenger (Lu 2013), level of prior thought given to the health issue (Kopfman et al. 1993), participant desire to fully understand the issue (Braverman 2008), and alignment with personal values and beliefs (Slater & Rouner 1996; Wilson et al. 2005).

Vaccination Studies Comparing Narratives and Statistics

A few vaccination studies have illuminated conditions under which narratives may have more persuasive effects than statistical messages. Two studies tested statistical information about vaccination compared to stories of the illness; the first study compared narrative vs. evidence-based lectures (Wilson et al. 2005) while the second tested written messages (de Wit et al. 2008). Results of these studies varied. An experiment involving men who have sex with men and the Hepatitis B vaccine found that narratives were more effective than either statistical information or controls at increasing intention to vaccinate (De Wit et al. 2008). Intention to vaccinate was lower when there was less perceived risk of susceptibility to the disease and severity of the disease (De Wit et al. 2008). In contrast, the Wilson et al. (2005) study found no overall difference between the evidence-based lecture and the first-person polio victim lecture, although there was a boomerang effect for those who had previous strong beliefs against vaccination after viewing the evidence-based lecture. Limitations of these studies include that neither is based on a theory and both use esoteric populations such as men who have sex with men (de Wit et al. 2008) and alternative medicine students in Canada (Wilson et al. 2005).

Another experimental study tested the effectiveness of narrative vaccine messages by comparing different types of narratives. This study explored peer only, medical expert only, and combined narratives on HPV vaccination among college women. The authors reported that the peer-expert combination nearly doubled vaccination uptake compared to controls (22% vs. 12%), while peer-only and expert-only did not significantly increase vaccination uptake (Hopfer et al. 2012). This study is encouraging because it demonstrates that vaccination messages can change actual behavior rather than altering attitudes or intentions alone. This study measured HPV knowledge, sexual activity, mother-daughter communication, self-efficacy, intent to vaccinate, and vaccination uptake.

As previously stated, some have suggested that persuasive narratives may be better able to engage audiences than persuasive statistical information. A study on H1N1 vaccination decisions based on EPPM framework showed that the audience's emotional engagement with the message mediated threat and efficacy constructs and increased behavioral intentions. Measured survey items included EPPM constructs, engagement level, knowledge of the pandemic, attitudes toward vaccination, and behavioral intention (DeJuliis et al. 2011). Thus, narrative messages may work within the EPPM framework to heighten threat and efficacy and make the message more effective.

Conclusion

Although many studies have been performed in regard to the relative effectiveness of narrative messages compared to statistical messages, few of these have been done in the

realm of vaccination. None of the studies investigated parental intention to vaccinate their children, so outcomes regarding performing a health behavior for someone other than self is largely unexplored. Few of the studies used an existing health communication theory or pilot testing to guide message creation. Few of these studies (and none in the context of vaccination) used a combined narrative and statistical message condition. Furthermore, few of these health studies used information seeking as an outcome variable. Experimental studies on information seeking behavior in the realm of vaccination decisions are needed, as physician recommendation is a top reason parents choose to vaccinate their children, and because parents actively seek information from a variety of sources such as family, friends, and the Internet before deciding to vaccinate their child (see Chapter 2).

While much has been done to understand the influence of narratives in health communication, there is much more to be explored. My study will address several knowledge gaps, including: (1) using an existing communication model (the EPPM) to guide the development and pilot testing of the narrative and statistical messages, (2) including a combined narrative and statistical condition to determine how these types of appeals function together, and (3) including information seeking as an outcome variable. In addition, the study will use a non-student sample and focus on parental decisions to vaccinate their children rather than decisions to vaccinate self. While narratives and statistical messages can influence people to vaccinate under certain conditions, the extent to which intentions or behaviors are changed appear to differ according to pre-existing cognitions, how the message is constructed, and the level of emotional engagement the

narrative is able to evoke. Factors that can influence the effectiveness of the message will be explored in the following chapter.

CHAPTER 5: FACTORS THAT INFLUENCE HEALTH MESSAGES

A variety of factors have been found to influence the effectiveness of advertising appeals such perceived credibility of the message (including perceived authority and character of the message source) and message engagement (including perceived relevance, emotion evoked, and attention paid to the message). In addition, perceptions of messenger attractiveness and similarity, audience characteristics and culture, content of the message, whether a story contained within the message is fictional or non-fictional, and the role of pictures and other visual imagery have been found to influence message effectiveness.

Perceived Credibility

Perceptions of messenger credibility have been found to influence the general acceptance or rejection of a health message. This includes the way an audience perceives the authority and character of the message source (McCroskey 1996). Credibility can come from either professional qualification (e.g. doctor, healthcare professional) or personal experiences (e.g. survivor of car crash involving drunk driver, survivor of disease) (Erwin et al. 1996; cited in Kreuter et al. 2007). Perceived character includes perceived trustworthiness of the messenger. When the message source is perceived as being untrustworthy, this tends to invite greater skepticism, while information given by someone who is perceived as being trustworthy is more likely to be accepted without scrutiny (Priester & Petty, 1995; 2003). Persuasive messages should strive to ensure the message source is perceived as experienced and trustworthy.

Message Engagement

The level to which an audience is immersed, or engaged, in the message has also been hypothesized to contribute to successful or unsuccessful reception of the message. If an audience views a message, but does not pay attention or feel connected to it, they are unlikely to be moved to action. Message engagement includes a variety of factors, such as personal relevance (Wang 2006, Venkatesen 2010), emotion (Plummer et al. 2006) and attention (Venkatesen 2010).

Some authors have asserted that within the context of EPPM messages, the optimal level of fear to create varies according to audience perceptions of relevance of the health condition to themselves (Wheatley 1971; Ruitter, Abraham & Kok 2001). Venkatesen (2010) found that perceptions of personal relevance of the HPV vaccine to college students mediated their intentions to receive the vaccine. Perceptions of personal relevance should be increased in order to create more effective health messages.

In addition, attention paid to the message has also been found to impact the persuasive abilities of the message. Venkatesen (2010) found that the level of attention female college students paid to a fear-based message about HPV was associated with greater knowledge retention and intentions to receive an HPV vaccine at 6 weeks after the message exposure. Marketers should strive to increase the levels of personal relevance and attention paid to health messages.

Emotion has been widely researched in fear and guilt based appeals. Social psychology states that emotional appeals are necessary for a health message to be

effective (Opel et al. 2009). Emotion may engage attention resulting in improved comprehension or differences in message processing (Lazarus 1968; Liu & Stout 1987; Lazarus & Folkman 1984; Folkman, Schaefer & Lazarus 1979). A study on H1N1 vaccine decision-making based on EPPM constructs revealed that when the audience was more emotionally engaged with the message, perceptions of threat and efficacy were higher along with intention to vaccinate (DeJuliis et al. 2011). A study of vaccine adverse effects found that high emotional narratives had a greater impact on the perceived risk than low emotional appeals (Betsch et al. 2011). However, previous studies have shown that there is a threshold level at which a person will become reactive and try to diminish emotions (Ghingold 1981). Some studies have found that moderate levels of fear or guilt are better than low or high appeals. High-emotion appeals may “arouse feelings of anger, annoyance, and irritation” (Coulter and Pinto 1995; qtd. in Hibbert 2007, p. 725). A message that is too strong may cause the audience to become reactive and reject the message and this may vary under conditions such as the audience’s familiarity and feelings toward the narrator (Kreuter et al. 2007). Marketing professionals are warned to avoid messages that are either too extreme or not extreme enough (see Chapter 3).

Perceptions of Messenger Attractiveness and Similarity

Physical attractiveness of the messenger has been found to influence experimental outcomes in several studies. An experimental study using undergraduates showed that attractive messengers had a greater influence on persuasion than unattractive messengers, with females inducing greater persuasion than males. Furthermore, messengers who were

considered more attractive tended to have success indicators such as high GPA and Scholastic Aptitude scores and also perceived themselves in a more positive light, suggesting that these participants may have developed greater communication skills (Chaiken 1979). The majority of studies relate to charitable giving, in which it has been consistently found that more attractive messengers yield a great amount donated with greater frequency than unattractive or average looking messengers (Hamermesh and Biddle 1994; Glaeser et al. 2000).

People tend to be attracted to those who they believe are more similar to them. Perceptions of similarity between the messenger and themselves, such as socioeconomic status, group identity, geography, life experience, or personal values may influence outcomes (Kreuter et al. 2007). Identification with characters in narratives may also increase perceived susceptibility to the health threat, empathy for those with the health threat, and perception of social norms regarding the health behavior (Kreuter et al. 2007). Similarity attributes such as race and gender may have a greater effect on behavior or behavioral intention under conditions when perceptions of relevancy are low (Chaiken 1987). For example, an African American women who perceives breast cancer as a disease afflicting white women may change her attitude about screening when exposed to an autobiographical narrative from another African American women (Bailey, Erwin & Belin 2000; Erwin et al. 1996). My study uses written messages so as not to confound results due to messenger attractiveness or source similarity. The name of the individual contained in the narrative was created to be inclusive of various ethnic and racial groups.

Audience Characteristics, Beliefs, and Culture

Although little is known as to the reasons why, audience characteristics may factor into which aspects of messages most influence behavioral intentions. One of these is gender. A study on Public Service Announcements showed that males were influenced by graphic content, while females were influenced by the fear of consequences of the threat (Lennon & Rentfro 2010). The audience's pre-existing beliefs and values may also affect the persuasiveness of the message. For example, a study found that statistically based alcohol messages geared toward college students were most effective when the message aligned with their values and beliefs, but narrative evidence was more effective when the message did not align with their values and beliefs (Slater & Rouner 1996). Tailored messages should be used based on formative research of the audience in order to generate more effective health messages.

Content of Message

Message content is a very broad category, and many elements are addressed throughout this paper. This section will focus on narrative content that is based on theory. It has been suggested that narratives that adhere to theoretical constructs will improve the quality of the message because they reflect observed principles of human behavior (Kreuter et al. 2007). The EPPM model is posited to change attitudes, intentions, and behaviors based on principles of threat and efficacy. For example, a study on Public Service Announcements showed that when the PSA included all EPPM

predictors, over 70% of the variation in effectiveness of the message was explained (Lennon & Rentfro 2010).

Stories have increased perceived severity of health threats because the audience can see and hear a firsthand report from a victim. For example, a PSA by an Academy Award winning actor and lifetime smoker (who later died of lung cancer) was persuasive in encouraging people not to smoke (Kreuter et al. 2007). Susceptibility may increase in narrative form because of an increase in relevancy to self, as noted above. Narratives including the construct of response efficacy may be effective by modeling – if it worked for this person, it could work for me (Edgar & Volkman 2012). While focusing on theoretical message components in narrative messages, health practitioners should also be aware of other types of important health information that may be accidentally omitted, such as the benefits and drawbacks or potential side effects of a health behavior (Kreuter et al. 2007).

Fiction vs. Nonfiction

Narratives may be perceived as more real, firsthand, and believable than other types of information. However, the effectiveness of fictional vs. nonfictional narrative messages is inconclusive and may differ according to audience characteristics (Kreuter et al. 2007). Studies have found that certain fictional narratives have changed audience's perceptions surrounding the problem (Strange and Leung 1999). A drug prevention intervention for teens used real-life narratives as the basis for creating fictional performance scenario videos; this was found to be successful (Hecht & Miller-Day 2007).

Another study found that regardless of whether a particular story was presented as fiction or nonfiction, readers' transportation into the story remained the same (Green and Brock 2000). However, another study suggests that people can detect fake stories, which undermines the effectiveness of the communication (Hart 2005). Ethical issues may arise when dealing with fictional narratives. Personal narratives from non-professionals may contain information about the health threat that is misleading or inaccurate. Some studies have used professional actors to control for conditions or misinformation, which could be considered deceitful. My study will use an actual story for the narrative conditions as found on familiesfightingflu.org.

Role of Visuals

The link between sympathy and behavior performed to benefit others is well established (Hatfield, Cacciopo and Rapson 1994). This can relate to vaccination, as it has been found that some parents vaccinate to be altruistic (see Chapter 2). Sympathy can be evoked through visual images. Much of the visual literature focuses on the concept of emotional contagion, or the notion that emotional facial expressions create similar feelings in those who vicariously observe them. Stated differently, viewers can "catch" the emotions on another human's face. Viewers are particularly sympathetic when they see sad expressions versus happy or neutral expressions, and these increased feelings of sympathy have been found to correspond with change in behavior (Small and Verrochi 2009; Hatfield, Cacciopo and Rapson 1994; Neumann and Strack 2000; Bagozzi and Moore 1994). Visuals in messages have influenced attitude change. Shelton and Rogers

(1981) showed, in a non-health-related study, that empathy-arousing appeals facilitate attitude change. Furthermore, Campbell and Babrow (2004) found that empathy mediates the relationship between exposure to HIV prevention messages and perceptions of HIV risk. My study will not include visual imagery so as not to confound results of testing narrative versus statistical messages.

Conclusion

There are many factors surrounding the perceptions of the message itself that may contribute to the effectiveness of a health message in encouraging an audience to change health behavior. While EPPM theoretical constructs (e.g. severity, susceptibility, self-efficacy, response efficacy) are often studied as factors in the effectiveness of the message, perceptions of message credibility (authority and character) and message engagement (relevance, attention, and emotion) have not been explored often in context of the EPPM. In addition, it is important to measure these variables as potential predictive factors when it comes to message presentation (e.g. statistics, narratives, combined messages).

In addition to EPPM-based variables, my study incorporates perceived authority, perceived character, personal relevance, attention, and emotion as constructs in the survey to determine their role in the link between message presentation and intentions to vaccinate or seek more information. Second, it tests theory-based messages presenting the threat of flu in several different forms (narrative, statistical, and combined) to determine the effect of message content. Third, It uses a non-fiction story for the narrative

presentation. The study design strives to control for factors such as perceptions of messenger attractiveness and similarity and the role of visuals by having the health messages presented entirely in written form.

CHAPTER 6: RESEARCH DESIGN AND METHODS

This chapter gives an overview of the aims, research questions, and hypotheses. It then discusses the experimental design. It then gives detailed information about how the messages and survey were developed, pilot tested, and revised. Next, data collection (including sample size, inclusion criteria, and data cleaning) is described in detail. Tests for assumptions and statistical procedures used to test hypotheses are then described. Lastly, limitations of online panels and data quality measures are discussed.

Aims, Research Questions, and Hypotheses

This project includes three main research aims. In Aim 1, I assess the effect of message condition (statistical, narrative, combined, and control) on EPPM variables, risk EPPM variables, fear control variables, perceived credibility, and message engagement. In Aim 2, I explore the effect of EPPM variables, risk EPPM variables, fear control variables, perceived credibility, and message engagement on two key outcomes of intent to seek more information and intent to vaccinate. In Aim 3, I evaluate the effect of message condition on key outcomes of intention to talk to family and friends, intention to talk to a doctor, intention to seek information online, and intention to vaccinate. Research questions and hypotheses include:

- RQ1: How does message type influence potential predictor variables?
 - *H1*: Parents in the three experimental conditions will have higher ratings of threat and efficacy than parents in the control condition.

- *H2*: Parents in the narrative condition will have higher ratings of perceived manipulation compared to parents in the other conditions.
- *H3*: Parents in the statistical and combined conditions will have higher ratings of perceived credibility (authority and character) than parents in the other conditions.
- *H4*: Parents in the narrative and combined conditions will have higher levels of engagement (relevance, attention, emotion) than parents in the other conditions.
- RQ2: Which message components significantly predict parental intentions to seek more information or to vaccinate their child?
 - *H5*: EPPM threat, fear, and efficacy variables will predict parental intentions to seek more information and vaccinate their child.
 - *H6*: Perceived threat of vaccines, perceived fear of vaccines, and avoidance of vaccines will negatively predict parental intentions to seek more information and to vaccinate their child.
 - *H7*: Fear control variables will negatively predict parental intentions to seek more information and to vaccinate their child.
 - *H8*: Perceived credibility and engagement variables will predict parental intentions to seek more information and to vaccinate their child.
 - *H9*: Threat and fear of flu will be more important predictors of intention to vaccinate than threat and fear of vaccines. Threat and fear of vaccines

will be more important predictors of intent to seek information than threat and fear of flu.

- RQ3: Which type(s) of EPPM-based health message(s) most effectively influence parental intention to talk to family and friends, intention to talk to a doctor, intention to seek information online, and intention to vaccinate?
 - *H10*: Parents in all three of the experimental conditions (statistical, narrative, and combined) will be more likely to seek information and to vaccinate their children than parents in the control condition.

Experimental Design

Qualtrics Panels was used to recruit an online sample of parents of children between the ages of six months and five years of age. Participants were randomized to one of four message conditions: (1) statistical message, (2) narrative message, (3) combined message, and (4) control message. The statistical, narrative, and combined messages included story-based and/or statistics-based EPPM threat components of susceptibility (commonness of childhood flu), and severity (seriousness of childhood flu). Each of these messages contained verbatim EPPM components of self-efficacy (ability, convenience, and ease of vaccinating their child against the flu), and response efficacy (effectiveness of flu vaccine in preventing the flu). The control message was designed to be informational, containing no threat or efficacy components.

The statistical message contained facts about childhood influenza from the CDC and flu.gov. The narrative message contained a true story about a child who contracted

influenza from familiesfightingflu.org. The combined message condition began with the story and concluded with the statistics. The control condition contained general information about the biology of viruses, but no specific information about the effects of influenza on humans.

All messages were controlled for length, except the combined message, which was longer since it contained all the threat information from both the narrative and statistical conditions. Written messages were used to avoid confounding factors of perceived attractiveness of or similarity to the messenger.

After being exposed to one of the four randomly assigned messages, parents immediately completed a follow-up survey assessing EPPM variables, “risk EPPM” variables (threat and fear related to vaccination), fear control variables, credibility variables, and engagement variables. Outcomes included intentions to seek more information about childhood flu and the flu vaccine, and intentions to vaccinate their child against the flu. The Arizona State University’s Health Institutional Review Board approved of, and classified this study as exempt. All participants provided informed consent before taking part in the study.

Message Development and Cognitive Response Testing

Messages presenting both high-threat and high-efficacy were initially crafted for two message conditions (statistical and narrative). Threat of influenza was given first, followed by efficacy of receiving an influenza vaccine. The statistical message text was developed by including high-threat statistics from websites such as: cdc.gov, flu.gov, and

county and local health departments. The narrative message text was condensed from the true story of Emily Lastinger, whose story is found on familiesfightingflu.org. The original control message was based on flu virus nomenclature. These messages were edited and formatted to be the same length (between 560 and 562 words and six paragraphs each). The format, font, and color were held constant for each condition.

All three messages were initially tested on a convenience sample of friends and family members ($N = 10$) for initial impressions using Cognitive Response Testing (CRT) (Lapka 2008). Respondents were specifically asked to offer feedback about each message according to whether it did or did not: (1) increase perceptions of threat of childhood influenza, and (2) increase perceptions of efficacy of receiving a flu vaccine. They were also asked to offer general impressions for each message, including: (1) what they did and did not understand about the message, (2) how it made them feel, (3) how professional the message was, (4) how believable the message was, and (5) if it did or did not make them more likely to seek information about the flu vaccine or vaccinate their child. They were asked to share any additional thoughts and offer suggestions for improvement.

The CRT revealed that respondents considered the messages to be too long. Thus, the messages were shortened to 372-375 words. Several respondents had complaints about the control (nomenclature) message, indicating that it was “difficult to understand” and “boring” to read. Although the control message was crafted to create no threat, one respondent thought that the control message was the “scariest.” The respondent said:

The [control message] made me more nervous because the flu is something I'm familiar with and know something about. That [control message] started talking about generic flu, swine flu, and all these different ways flu viruses begin. It brings a feeling of uncertainty and unknown about what kind of flu is out there. That makes me think "I need to know more information about this" or "this mutation... these flus can have dire consequences." I felt more threatened by [the control] message than the other two because it introduced different terms. It made me feel like I didn't know anything about it. So it mentioned swine flu and I thought of a mass epidemic, which I don't think of when I think of a regular flu. Even though I know the vaccine for the flu... they put different strains in there, but not all those strains. Actually it made me think that the flu vaccine is less effective... "wait a second, I get the regular flu vaccine, what about all this other stuff that I can get that may not be in the flu vaccine?" I read [the narrative and statistic] and think, "yes, I get the vaccine and I'm good." I read the [control] and think, "oh, it's not going to cover all this stuff." Yes, that is why it made me more nervous.

Due to this response, the control message was re-written. Instead of containing information about virus nomenclature, it was changed to a message about virus biology, size, and shape based on information found on microbeworld.org.

A second CRT with the shortened messages and re-written control message was performed on the same participants as the first CRT. Responses from participants indicated that the shortened messages were about the right length. General feedback about

the statistical message was that it came across as believable, reliable, and professional. General feedback about the narrative message was that it was emotional and sad, but that the story was believable. The new control message was not seen as fearful in terms of overall content during the second round of CRT. However, certain words that might evoke fear such as “spikes,” “bricks,” and “infectious organisms” were pointed out by one respondent. These words were replaced with words such as “built up material,” “rectangles,” and “virus-like organisms.” On the whole, after the second round of CRT, participants found the statistical and narrative messages to be high threat and high efficacy. They found all messages to be believable, professional, and easy to understand. All three revised and re-written messages were controlled for length (between 372 and 375 words) and entered into Qualtrics for the pilot survey.

Pilot Test Survey Development

A Qualtrics follow-up survey was created to assess perceptions of flu, vaccination, the message itself, and intentions. Survey items included EPPM constructs in relation to the flu, EPPM constructs in relation to the flu vaccine, fear control variables, credibility variables, engagement variables, attitudes, intentions to seek more information about the flu vaccine, and intentions to vaccinate their child against the flu. In the pilot test, each construct contained at least three survey items in order to assess reliability. The survey also included demographic items. Each construct is found below with corresponding survey items as found in the survey pilot test.

EPPM Constructs

EPPM constructs were adapted from Witte et al. (1996) and measured on a 7-point Likert scale from “strongly disagree” to “strongly agree,” as is typical of such studies. Pilot test constructs included constructs of severity (N=3) (childhood influenza is severe / childhood influenza is a significant problem / childhood influenza is serious), susceptibility (N=3) (my child is at risk for getting influenza / it is likely my child will contract influenza / it is possible that my child will contract influenza), self-efficacy (N=3) (I am able to get my child vaccinated for influenza / getting my child vaccinated for influenza is easy to do / it is convenient to get my child vaccinated against influenza), response efficacy (N=3) (vaccinating my child for influenza helps prevent my child from getting ill / my child will be protected from the flu if he or she is vaccinated / if I vaccinate my child, he or she is less likely to get influenza), and fear (N=3) (if my child contracted influenza it would be frightening / if my child got sick with influenza it would be scary / I would feel anxious if my child became ill with influenza).

EPPM Risk Constructs

While typical EPPM studies measure EPPM variables in relation to the health risk, this study additionally measures EPPM constructs in relation to fear of vaccines on a 7-point Likert scale. Fear was included because vaccination is sometimes perceived as a risky behavior, and this study investigates how the EPPM may operate differently in this context. The scale was developed by adapting the threat components of the EPPM scale (Witte et al. 1996) and applying the concepts to vaccination rather than flu. Pilot test

constructs included risk severity (N=3) (I believe that side effects of flu vaccines are serious / I believe that side effects of flu vaccines are severe / I believe that flu vaccinations have significant negative repercussions for children), risk susceptibility (N=3) (my child is at risk for illness or injury if I vaccinate him/her for influenza / it is likely that my child will become ill due to receiving an influenza vaccine / I believe that side effects of flu vaccines are likely to occur), risk fear (N=3) (if my child received an influenza vaccine, it would be frightening / if my child received an influenza vaccine, it would be scary, if my child received an influenza vaccine, I would feel anxious). Risk avoidance (N=3) was also included, as was avoidance of hearing about flu included in fear control variables (I do not like hearing about vaccination / I avoid hearing about vaccination / I shy away from hearing about vaccination).

Fear Control Variables

Fear control variables of defensive avoidance, issue derogation, and perceived manipulation were adapted from Witte et al. (1996) and measured on a 7-point Likert scale in order to evaluate factors that may cause people to deny the message and enter into the fear control processing. Pilot test constructs included defensive avoidance of both messages about the flu in general and the particular message they read (N=6) (I do not like hearing about influenza / I avoid hearing about influenza / I shy away from hearing about influenza / I did not like reading this message / I did not like reading this message because it made me angry, sad, or otherwise emotionally involved / I liked reading this message), issue derogation (N=3) (the message about influenza was overblown / the message about

influenza was exaggerated / the message about influenza was overstated), and perceived manipulation (N=3) (the message was manipulative / the message was misleading / the message was distorted).

Credibility Variables

Perceived credibility items were initially measured with semantic differentials on a 7-point scale adapted from McCroskey (1996). Semantic differential scales are often used in EPPM studies. These items consist of a partial statement (e.g. “having my child receive a vaccine for influenza is...”) followed by antonym adjectives on opposite ends of a scale (e.g. “bad” rated as a 1, with “good” as 7, and 4 being neutral). Pilot test constructs included authority (N=5) (the person giving the message is unreliable-reliable / uninformed-informed / unqualified-qualified, inexpert-expert, unintelligent-intelligent) and character (N=5) (the person giving the message is dishonest-honest / unfriendly-friendly / unpleasant-pleasant, selfish-unselfish / awful-nice).

Engagement Variables

Message engagement included constructs of emotion (Wang 2006), attention (Wang 2006; Laczniak, Kempf, & Muehling 1999), and personal relevance (Zaichowsky 1994) on 7-point Likert scales. Constructs included attention (N=3) (I paid close attention to the message / I was absorbed in the message / the message was engaging), emotion (N=3) (I felt sad when I read the message / I felt emotion when I read the message / I felt angry when I read the message), and relevance (N=5) (the message was important / the message

was relevant to me / the message was valuable / the message was involving / the message about childhood flu vaccine is needed).

Attitudes

Attitudes toward vaccination were measured using selected semantic differential adjectives on a 7-point scale from a review by Valois & Godin (1991) as well as 7-point Likert scale items developed from concerns about vaccination found through literature review (see Chapter 2). Previous research has found that the “right” adjectives to choose for a semantic differential scale vary by the type of health behavior being promoted (Valois & Godin 1991). The semantic differential items (N=5) included (having my child receive a vaccine for influenza is bad-good / harmful-helpful / negative-positive / unimportant-important / foolish-wise). Attitude items measured on the 7-point Likert scale (N=6) included (vaccines are a good way to prevent disease / vaccines are a breakthrough medical advance / vaccines have helped stop the spread of disease / vaccines do nothing to prevent disease / vaccines are harmful to my child / vaccines exist to pad the pockets of the pharmaceutical industry).

Intentions to Seek Information and to Vaccinate Child

Intentions to seek more information and intentions to vaccinate child were measured on a 7-point Likert scale. Information seeking is not often studied in the literature, although most parents seek more information before deciding to vaccinate their child (Kennedy et al. 2011). Including information seeking items can capture the persuasiveness of “nudging” parents, since expecting a parent to decide to vaccinate their child after brief

exposure to a message may be unrealistic. Pilot test constructs included information seeking (N=3) (I plan to learn more about influenza by talking to family or friends this year / I plan to find out more about childhood influenza online or from other sources this year / I plan to talk to my child's doctor about the influenza vaccine this year) and intent to vaccinate (N=3) (I plan to vaccinate my child for influenza this year / I intend to immunize my child against influenza this year / I will vaccinate my child against influenza this year).

Demographic Variables

Demographic information was collected at the end of the survey. The type of demographic questions were selected from previous literature demonstrating that these variables affect whether or not parents vaccinate their children: age (Danis et al. 2010), gender (Danis et al. 2010), ethnicity (Luman et al. 2003; Gust et al. 2008; Lashuay et al. 2007), education level (Guest et al. 2008), employment status (Brenner et al. 2001), marital status (Luman et al. 2003), number of children (Strobino et al. 1996), and age of children. A text box was included for final comments or feedback about the survey, and participants were thanked for their participation.

Pilot Test

The survey was pilot tested on a convenience sample of parents recruited through social media ($N = 162$) to determine the reliability of the survey instrument and gain qualitative feedback about the messages. Parents had children in their home aged 6 months to five years and lived in the United States. Surveys that were incomplete and surveys

with a response time of less than eight minutes were deleted and the sample size was reduced ($N = 91$). Responses were fairly equal across message conditions: statistical message ($N = 28$), narrative message ($N = 34$), and control message ($N = 29$).

Pilot test respondents were primarily white (82.4%) and female (81.3%). Most respondents were between the ages of 26 and 30 (36.3%) or 31-35 (35%). The majority (62.7%) held at least a bachelor's degree while a large portion held a master (22.0%). More than half (54.9%) were caretakers at home, while a large portion were employed full-time (22.0%). The majority of respondents (87.9%) were married. There was some variance in number of children, with participants having one (27.5%), two (34.1%), three (11.0%), four (13.2%), five or more (5.5%) or an unknown number (8.8%). The convenience sample of respondents came from at least 19 states, with a larger portion from Arizona (15%), New York (15%), and Utah (19%).

The main purpose of the pilot was: (1) to test the reliability of the survey instrument and guide in survey revision, (2) to obtain feedback about the messages themselves in order to aid in message revision, and (3) to perform a preliminary analysis of intention to seek more information about vaccination and intention to vaccinate.

Pilot Test Reliability

To test the reliability of scale items, Cronbach's alpha was determined for each of the multi-item constructs in the pilot test. Excellent internal consistency ($\alpha > 0.90$) was found for 12 of the 19 constructs (severity, response efficacy, fear, intent to vaccinate, attitudes, authority, character, relevance, issue derogation, perceived manipulation, risk

severity, and risk fear). Good internal consistency ($0.78 < \alpha < 0.90$) was found for all remaining constructs (susceptibility, self-efficacy, intent to seek information, attention, emotion, avoidance, and risk susceptibility). Alpha levels were used to condense the survey as noted in the message revision section.

Table 3. Pilot Test Reliability Analysis

| Variables (N Items) | α |
|------------------------------------------|----------------------------|
| EPPM Variables (Threat/Efficacy of Flu) | |
| Severity (3) | 0.94 |
| Susceptibility (3) | 0.80 |
| Fear (3) | 0.94 |
| Self-Efficacy (3) | 0.84 |
| Response Efficacy (3) | 0.95 |
| Risk EPPM Variables (Threat of Vaccines) | |
| Risk Severity (3) | 0.92 |
| Risk Susceptibility (3) | 0.88 |
| Risk Fear (3) | 0.90 |
| Fear Control Variables | |
| Defensive Avoidance (6)* | 0.81 |
| Issue Derogation (3)* | 0.97 |
| Manipulation (3)* | 0.93 |
| Perceived Credibility Variables | |
| Authority (5)* | 0.94 |
| Character (5)* | 0.95 |
| Message Engagement Variables | |
| Relevance (5)* | 0.95 |
| Attention to message (3) | 0.78 |
| Emotion evoked (3) | 0.87 |
| Attitudes (11)* | 0.95 |
| Outcome | |
| Information seeking (3) | 0.81 |
| Intent to vaccinate (3) | 0.99 |

*Asterisks indicate constructs that were reduced to fewer items in final survey

Feedback Used in Message Revision

Pilot test participants were given an open-ended question asking them about perceptions of the message they received. Respondents in the statistical condition reported that the message was believable and seemed credible. Only minor suggestions for improvement were offered (e.g. adding citations and minor grammar suggestions).

Respondents in the control condition indicated that they understood the message and that

it seemed professional and believable, although a few indicated that they were puzzled that the message did not seem to be persuasive.

Responses for the narrative were more variable. While some of the participants in the narrative condition commented that the story was sad and made them want to learn more about vaccinating their child for the flu, a few mentioned that they would like statistics coupled with the story. For example, one participant stated, “it seems odd to provide only one case study and not provide additional stats... it seems to be searching for people who make emotional decisions, which is not the way they should be made.” Another said, “Message was a case study, not a statistic, and it lacked reliable sources.” This prompted the addition of a combined condition in the final study.

Pilot Test Analysis

One-way ANOVAs and Tukey Honestly Significant Differences (HSD) post-hoc tests were used to determine pilot test results for outcome variables intention to seek more information and intention to vaccinate child. As expected, the mean for intention to seek more information $F(2, 88) = 13.79, p < .001, \eta = .239$, and intention to vaccinate child $F(2, 88) = 9.94, p < .001, \eta = .184$, was significantly higher in the experimental groups than in the control group.

For information seeking, the Tukey post-hoc test revealed a significant ($p < .001$) difference between the statistical ($M = 5.07, SD = 1.25$) and control message ($M = 3.50, SD = 1.43$). There was also a significant difference ($p < .001$) between the narrative ($M = 5.28, SD = 1.48$) and control message ($M = 3.50, SD = 1.43$). There was no significant

difference between the statistical and narrative message ($p = .803$). While parents in the statistical and narrative conditions fell somewhere between “slightly agree” and “moderately agree,” those in the control group fell between “slightly disagree” and “neutral” on intentions to seek more information.

For intention to vaccinate, the Tukey post-hoc test revealed a significant ($p < .001$) difference between the control group ($M = 3.14, SD = 2.23$) and the statistical group ($M = 5.72, SD = 1.79$). There was also a significant ($p = .003$) difference between the narrative ($M = 5.09, SD = 2.57$) and control group ($M = 3.14, SD = 2.23$). There was no significant difference between the statistical and narrative conditions ($p = .501$). While the means for the parents exposed to the statistical and narrative messages fell between “slightly agree” and “moderately agree,” the means for the parents exposed to the control message fell between “slightly disagree” and “neutral.” As expected, the standard deviation was highest for the narrative message.

The pilot test results were consistent with the hypothesis that both statistical and narrative health messages will significantly influence parental intentions to seek information about influenza as well as their intentions to vaccinate their children against the flu. However, these results are not meant to provide concrete evidence of this due to insufficient power and the small sample size.

Survey Revision

The main revisions made after the pilot study were adding a fourth message condition (the combined condition), dropping survey items based on reliability ratings in

order to shorten the survey, and adding data quality measures to reduce negative effects of recruiting an online sample. Other survey revisions included rephrasing semantic differential measures to 7-point Likert scales for consistency, adding screening questions at the beginning of the survey, adding questions about past vaccination and medical contraindications to the flu vaccine, and making small changes to the messages as described below.

Combined Condition

A fourth experimental condition, which contains the narrative message followed by the statistical message, was added to the survey. This condition included the efficacy component found in both the narrative and statistical messages. Although the combined message was longer than the other three messages, it was important to preserve the identical messages found in the statistic and narrative condition to determine whether the combined effect of narratives and statistics affected parental intentions to take steps toward vaccinating their children.

Survey Item Revision

Since all constructs had good to excellent reliability ratings, most constructs with more than three items were condensed to three items in order to shorten the survey. Due to the length of the survey, the fear control variables were dropped to two items each. The table below shows items that were retained and dropped in each construct with new inter-item reliability ratings, as calculated from the pilot survey, for the remaining items in

each construct to be used in the final survey. Six of the eight constructs show excellent reliability ratings ($\alpha > .90$) and one shows a good reliability rating ($\alpha = 0.83$).

Table 4. Reliability Ratings from Pilot Test After Dropping Items

| Scale | Items Retained | Items Dropped | α |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Authority | ...Reliable ...Informed ...Qualified | ...Expert ...Intelligent | 0.91 |
| Attitudes | ...Good ...Helpful ...Important ...Good way to prevent disease. ...Breakthrough medical advance. ...Helped stop the spread of disease... | ...Positive ...Wise ...Do nothing to prevent disease. ...Are harmful to my child. ...Pad the pockets of the pharma... | 0.91 |
| Avoidance | I do not like hearing about influenza. I avoid hearing about influenza | I shy away from hearing about... I did not like reading the message. Message made me angry, sad... I liked reading the message. | 0.83 |
| Character | ...Honest ...Trustworthy | ...Friendly ...Nice ...Pleasant ...Unselfish | _* |
| Derogation | The message... was overblown. The message... was exaggerated. | The message... was overstated. | 0.96 |
| Manipulation | The message was manipulative. The message was misleading. | The message was distorted. | 0.90 |
| Relevance | ...Important ...Relevant ...Needed | ...Valuable ...Involving | 0.92 |
| Risk Avoidance | Do not like hearing about vaccines... Avoid hearing about vaccines... | Shy away from hearing... | 0.90 |

Cronbach's alpha scores of retained items in each construct after shortening survey.

*Because only one of the remaining items for the character construct was included in the pilot test, inter-item reliability could not be calculated.

The character construct did not have a revised reliability rating because pilot test items were changed based on qualitative feedback. One pilot test participant stated, "I found the questions about the writer of the message hard to answer... because based on what I read there's no way I could know if they were nice or friendly." Therefore, character items from previous literature (unpleasant/pleasant, selfish/unselfish, unfriendly/friendly, and awful/nice) were removed. One item (honest/dishonest) was

retained and another item (deceptive/trustworthy) was added to the survey in place of previous items.

Other Survey Revisions

Revisions were made to the survey in order to minimize challenges of online sampling, including adding a screener at the beginning of the survey to ensure respondents met inclusion criteria, setting validation measures (force response for each question), adding three attention filter questions, including ASU's logo and theme colors, and setting minimum timers on both the message and the total survey.

Minor grammatical changes were made to the messages, and sources were cited underneath the messages to increase credibility. The real name of "Emily" in the narrative was changed to "Mia" to be more inclusive of various ethnic groups. Various demographic variables such as ethnicity, history of vaccinating children, and medical concerns (contraindications) were added. A link to a Google Form was included at the end of the survey in order to allow participants the option to provide any additional qualitative data without timing out of the survey. The final survey can be found in Appendix A.

Power, Data Collection, and Inclusion Criteria

An a priori power calculation determined that 280 complete surveys were needed for the analysis (*effect size* = 0.2, *alpha* = 0.05, *power* = 0.8). An alpha of 0.05 and power of 0.80 are typical of such studies. While the effect size found in such health communication studies is typically small (0.1 to 0.2), the effect size is based off a single

exposure to the message. Research has shown that in the real world, the effect of such messages on behavior change accumulate with repeated exposure (Gantz et al. 1990).

Qualtrics Panels (www.qualtrics.com) was used to recruit a national online panel of parents of children between the ages of six months and five years ($N = 975$) from October 21, 2014 through October 27, 2014. Qualtrics contacted a subset of their pool of four million people and asked these people to take part in the study. Participants received compensation from Qualtrics (valued under \$5) based on survey completion. Qualtrics survey software was used to design and implement the survey.

Prospective participants first completed a screening survey to verify inclusion criteria indicating that they were: (1) at least 18 years of age, (2) living in the United States, and (3) had at least one child between the ages of six months and five years old living in their home. Participants who met these criteria and gave informed consent continued with the survey. The data was cleaned based duration and completion. Qualtrics automatically terminated the survey and eliminated participants from analyses ($N = 632$) who did not: (1) spend a minimum length of time reading the message, (2) complete the survey within five to forty-five minutes, (3) correctly answer the hidden attention questions, or (4) answer all questions in the survey. Parents who had children with contraindications to the flu vaccine were also excluded from the analysis ($N = 9$). Remaining respondents were retained in the survey analysis ($N = 334$). The breakdown between message conditions was: statistic ($N = 78$), narrative ($N = 91$), control ($N = 77$), and combined ($N = 88$).

Statistical analysis

The data was imported into SPSS for analysis. Demographics were calculated across each message condition and Pearson's Chi Square was used to assess the sampling distribution. Results are shown in Table 5. Participants were also mapped by zip code and this can be found in the Results chapter in Figure 4. Cronbach's alpha was used to assess inter-item reliability and results are found Table 6. One-way ANOVAs and binary logistic regressions were used to evaluate hypotheses as described below.

Aim 1 Analysis

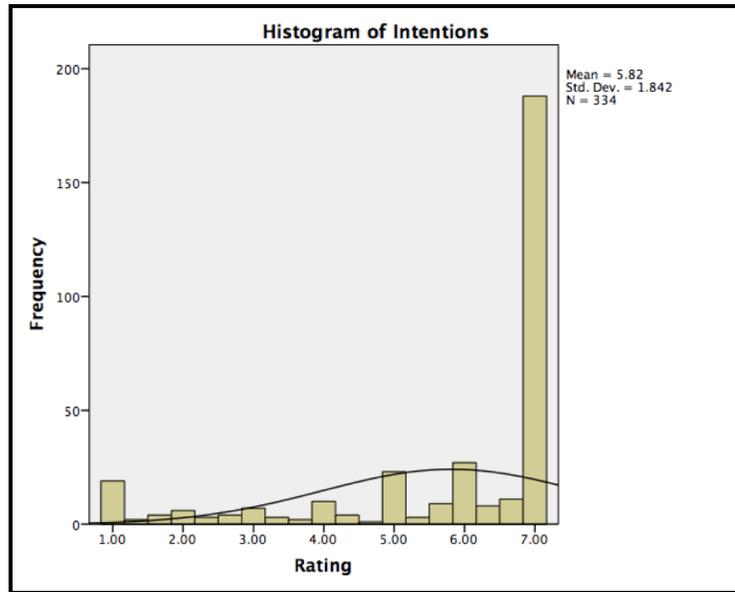
The means and standard deviations were found for all constructs across the four message conditions ($N = 334$). Each of the multi-item averaged constructs were subject to one-way ANOVAs across the four message conditions to determine the effect of message type on these variables and to draw conclusions for *H1-H4* (EPPM variables, risk EPPM variables, fear control variables, perceived credibility variables, and message engagement variables). Post-hoc Tukey's HSD tests were used to probe significant findings. The results can be found in the Results chapter in Table 7.

Aim 2 Analysis

Outcome variables *information seeking* and *intent to vaccinate* were tested for skewness. Since a high degree of skewness was found in the outcome variable *intent to vaccinate*, binary logistic regression was used to explore the effect of variables (EPPM variables, risk EPPM variables, fear control variables, message component variables) on two primary outcome variables (intent to seek more information about the flu vaccine and

intent to vaccinate). Although a median split analysis was considered, the median for the variable “intention to vaccinate” on a 1-7 scale was a 7.00, and thus this analysis was not feasible.

Figure 2. Skewness of Intention to Vaccinate



Prior to the regression, the data was prepared for covariates. Because few participants were found in several age categories (18-20 yrs = 5, 46-50 yrs = 9), age was collapsed into five categories (18-25 yrs, 26-30 yrs, 31-35 yrs, 36-40 yrs, 41+ yrs). Because few total participants were found in several race categories (American Indian = 9, Native Hawaiian = 3, Multiple = 6, Other = 5), these categories were also collapsed into an “other” category, leaving African-American, Asian, White, and other race categories.

Information seeking was comprised of three averaged survey items: “I plan to learn more about influenza by talking to family or friends this year,” “I plan to find out more about childhood influenza online or from other sources this year,” and “I plan to

talk to my child's doctor about the influenza vaccine this year." Intentions to vaccinate their child were also comprised of three averaged survey items: "I plan to (or already have) vaccinated my child against influenza this year," "I intend to (or already have) vaccinated my child against influenza this year," and "I will (or already have) vaccinated my child against influenza this year." These two averaged outcome variables originally measured on a 1-7 Likert scale were dichotomized because the data was highly skewed. This was done by collapsing intention to vaccinate and information seeking measures >4.00 (slightly agree to strongly agree) into "leaning towards vaccination," and collapsing intention to vaccinate and information seeking measures <4.00 (strongly disagree to slightly disagree) to "leaning away from vaccination" categories. Neutrals (4.00) were omitted but sensitivity analyses were conducted to determine if omitting neutral responses impacted the analysis. The concept of "leaning toward" or "leaning against" vaccination with neutrals (or undecided) has been used in previous literature (Wallace, Leask & Trevena 2006).

Goodness-of-fit was assessed with the Hosmer-Lemeshow test and all values were found to be above .05 as described in the Results chapter. All independent variables (EPPM variables, EPPM risk variables, fear control variables, credibility variables, and engagement variables) were calculated in the binomial logistic regression on a 7-point Likert scale from "strongly disagree" to "strongly agree."

Eight separate regression models were performed in order to test *H5-H8*. The first two were performed on EPPM variables for intention to seek information and intention to

vaccinate, the next two were performed on Risk EPPM variables for intention to seek information and intention to vaccinate, the next set were performed on Fear Control variables for intention to seek information and intention to vaccinate, and the last two were performed on Credibility and Engagement variables for intention to seek information and intention to vaccinate. Bonferroni Correction for multiple comparisons was applied to adjust the critical alpha level. Results of this analysis are found in Table 9. An additional regression analysis was performed on intentions to vaccinate in order to compare the significant variables from each of the four previous regressions on intentions to vaccinate. To test *H9*, threat and fear of flu variables were entered into one regression equation and threat and fear of vaccine variables were entered into another with the dichotomous outcomes of intent to seek information and intent to vaccinate.

All models were calculated with 95% confidence intervals for information seeking ($N = 313$) and intentions to vaccinate ($N = 324$). Sample size is different because neutrals were omitted from the analysis. Hosmer-Lemeshow was found for all regressions and these values are recorded in the Results chapter. All regression results were adjusted for age, race, gender, and ethnicity.

Aim 3 Analysis

Binary logistic regression was again used as described in the previous section (adjusted for age, race, gender, and ethnicity) to evaluate message type (statistical, narrative, combined) on outcomes intent to seek information and intent to vaccinate compared to the control message (*H10*). To further determine the specific types of

information seeking involved, message type on intention to seek information was broken down into individual items (intention to talk to family and friends, intention to talk to a doctor, and intention to seek information online) instead of using the average of the three (intention to seek information).

Other Analyses

A binary logistic regression was added to compare history of past vaccination (yes/no) on intentions to seek more information and intentions to vaccinate using the same methodology as described above. This can be found in the Results chapter in Table 13. Lingering concerns about vaccination included in the survey are displayed in a line graph and found in the Results chapter in Figure 5. Qualitative data recorded in the optional Google Form was categorized by theme and these themes are summarized in the Results section.

CHAPTER 7: RESULTS

Demographic Distribution, Randomization, and Reliability

Of the 975 individuals who initiated the survey, 334 completed the survey within the stated duration and correctly answered attention questions. Breakdown between conditions was: statistical ($N=78$), narrative ($N=91$), combined ($N=88$), control ($N=77$).

Demographic Distribution

The majority of parents were between 26 to 30 (30.5%) or 31-35 (29.6%) years of age. The majority of respondents (87.4%) were female. The majority of participants reported not being Hispanic or Latino (87.4%). The majority of participants identified as white (67.1%) followed by African-American (18.9%) and Asian (6.9%), with other races representing far fewer (less than 3.0% each).

The majority of the sample held at least a bachelor's degree (33.5%) or had some college (38.0%). The rest of the participants listed some high school (0.6%), high school graduation (21.3%) or graduate school (6.6%) as their highest education levels. The greatest percentages of participants were caretakers at home (44.6%) although almost one-third of respondents worked full-time (31.1%). A smaller portion of participants listed working part-time (13.2%) or being unemployed (11.1%). The bulk of parents fell into the income categories of under \$35K (28.8%), \$35K-\$50K (28.1%) and \$50K-\$75K (29.3%), \$75-\$100K (8.4%), and over \$100K (5.4%). The majority of participants were married (72.8%). There was variation in the number of children, with parents having one (28.7%), two (40.4%), three (21.3%) four (4.8%) or five or more (4.8%).

A large percentage of parents reported having one or more of their children vaccinated against the flu previously (75.7%). Fewer reported never having vaccinated any of their children against the flu (23.7%). Pearson's chi-square was not significant for any of the tested demographic variables, as shown below.

Table 5. Demographics and Sampling Distribution of Study Population (N=334)

| Category | Statistical (N = 78) | Narrative (N = 91) | Control (N = 77) | Combined (N = 88) | <i>p</i> |
|----------------------|-------------------------|-----------------------|---------------------|----------------------|----------|
| Age, N (%) | | | | | 0.33 |
| 18-25 | 15 (4.5%) | 19 (5.7%) | 10 (3.0%) | 15 (4.5%) | |
| 26-30 | 27 (8.1%) | 26 (7.8%) | 20 (6.0%) | 29 (8.7%) | |
| 31-35 | 18 (5.4%) | 30 (9.0%) | 26 (8.0%) | 25 (7.5%) | |
| 36-40 | 9 (2.7%) | 5 (1.5%) | 15 (4.5%) | 8 (2.4%) | |
| 41+ | 9 (2.7%) | 11 (3.3%) | 6 (1.8%) | 11 (3.3%) | |
| Gender, N (%) | | | | | 0.30 |
| Male | 5 (1.5%) | 13 (4.0%) | 12 (3.6%) | 12 (3.6%) | |
| Female | 73 (21.9%) | 78 (23.4%) | 65 (19.5%) | 76 (22.8%) | |
| Ethnicity, N (%) | | | | | 0.37 |
| Hispanic/Latino | 13 (4.0%) | 9 (2.7%) | 10 (3.0%) | 10 (3.0%) | |
| Not Hispanic/Latino | 65 (19.5%) | 82 (24.6%) | 67 (20.1%) | 78 (23.4%) | |
| Race, % | | | | | 0.73 |
| African-American | 19 (5.7%) | 13 (4.0%) | 15 (4.5%) | 16 (4.8%) | |
| American Indian | 2 (0.6%) | 3 (0.9%) | 2 (0.6%) | 2 (0.6%) | |
| Asian | 5 (1.5%) | 6 (1.8%) | 5 (1.5%) | 7 (2.1%) | |
| Pacific Islander | 0 | 1 (0.3%) | 1 (0.3%) | 1 (0.3%) | |
| White | 49 (14.7%) | 66 (19.8%) | 52 (15.6%) | 57 (17.1%) | |
| Multiple | 0 | 1 (0.3%) | 1 (0.3%) | 4 (1.2%) | |
| Other | 3 (0.9%) | 1 (0.3%) | 1 (0.3%) | 1 (0.3%) | |
| Education, N (%) | | | | | 0.38 |
| Some high school | 1 (0.3%) | 1 (0.3%) | 0 | 0 | |
| High school grad/GED | 18 (5.4%) | 21 (6.3%) | 8 (2.4%) | 24 (7.2%) | |
| Some college | 29 (8.7%) | 33 (9.9%) | 37 (11.1%) | 28 (8.4%) | |
| College grad | 23 (6.9%) | 30 (9.0%) | 27 (8.1%) | 32 (9.6%) | |
| Grad school | 7 (2.1%) | 6 (1.8%) | 5 (1.5%) | 4 (1.2%) | |
| Employment, N (%) | | | | | 0.33 |
| Full time | 25 (7.5%) | 29 (8.7%) | 24 (7.2%) | 26 (7.8%) | |
| Part time | 11 (3.3%) | 15 (4.5%) | 9 (2.7%) | 9 (2.7%) | |
| Home Caretaker | 30 (9.0%) | 37 (9.0%) | 40 (12.0%) | 42 (12.6%) | |
| Unemployed | 12 (3.6%) | 10 (3.0%) | 4 (1.2%) | 11 (3.3%) | |
| Income N (%) | | | | | 0.96 |
| Less than 15K | 5 (1.5%) | 1 (0.3%) | 1 (0.3%) | 3 (0.9%) | |
| 15-20K | 8 (2.4%) | 11 (3.3%) | 9 (2.7%) | 6 (1.8%) | |
| 25-35K | 11 (3.3%) | 12 (3.6%) | 12 (3.6%) | 17 (5.1%) | |
| 35-50K | 24 (7.2%) | 22 (6.6%) | 22 (6.6%) | 26 (7.8%) | |
| 50-75K | 19 (5.7%) | 32 (9.6%) | 21 (6.3%) | 26 (5.1%) | |
| 75-100K | 6 (1.8%) | 8 (2.4%) | 7 (2.1%) | 7 (2.1%) | |
| 100-150K | 4 (1.2%) | 3 (0.9%) | 3 (0.9%) | 2 (0.6%) | |
| More than 150K | 1 (0.3%) | 2 (0.6%) | 2 (0.6%) | 1 (0.3%) | |

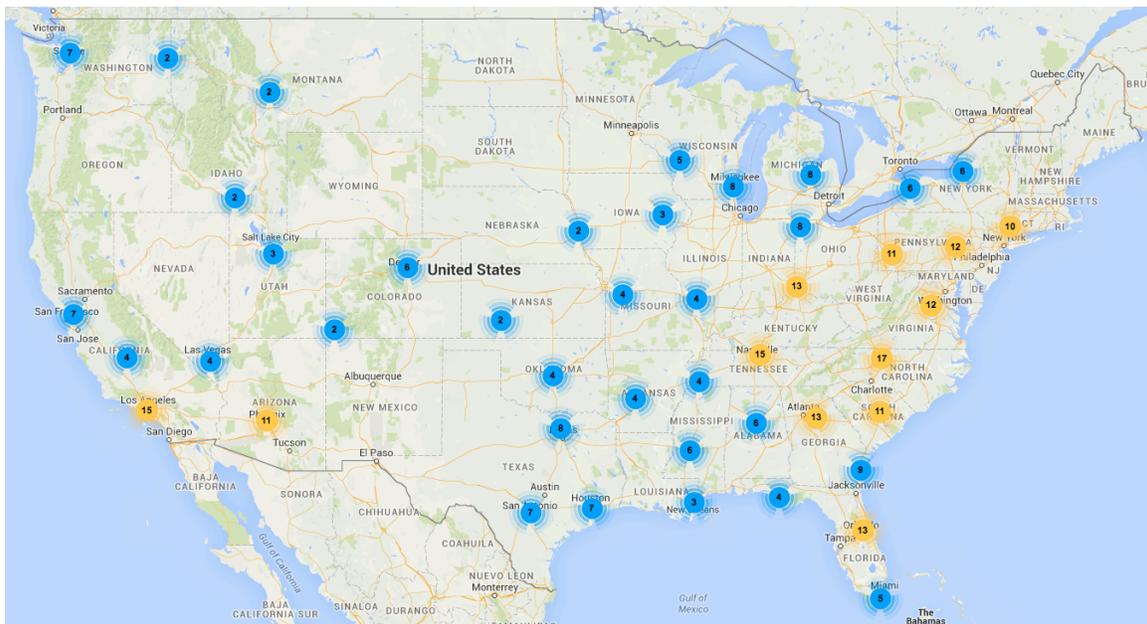
| Category | Statistical (N = 78) | Narrative (N = 91) | Control (N = 77) | Combined (N = 88) | p |
|-------------------------------------|-------------------------|-----------------------|---------------------|----------------------|------|
| Marital Status, N (%) | | | | | 0.18 |
| Married | 50 (15.0%) | 70 (21.0%) | 60 (18.0%) | 63 (18.9%) | |
| Not Married | 28 (8.4%) | 21 (6.3%) | 17 (5.1%) | 25 (7.5%) | |
| Number Children in Household, N (%) | | | | | 0.84 |
| 1 | 23 (4.8%) | 24 (7.2%) | 25 (5.4%) | 24 (7.2%) | |
| 2 | 28 (8.4%) | 41 (12.3%) | 30 (9.0%) | 36 (10.8%) | |
| 3 | 21 (6.3%) | 16 (4.8%) | 16 (4.8%) | 18 (5.4%) | |
| 4 | 3 (0.9%) | 3 (0.9%) | 4 (1.2%) | 6 (1.8%) | |
| 5 or more | 3 (0.9%) | 7 (2.1%) | 2 (0.6%) | 4 (1.2%) | |
| Age of Children, N (%)** | | | | | |
| <1 yr | 17 (5.1%) | 16 (4.8%) | 9 (2.7%) | 19 (5.7%) | 0.31 |
| 1 yr | 23 (6.9%) | 28 (8.4%) | 17 (5.1%) | 20 (6.0%) | 0.54 |
| 2 yrs | 19 (5.7%) | 24 (7.2%) | 16 (4.8%) | 32 (9.6%) | 0.13 |
| 3 yrs | 20 (6.0%) | 28 (8.4%) | 19 (5.7%) | 20 (6.0%) | 0.65 |
| 4 yrs | 20 (6.0%) | 21 (6.3%) | 21 (6.3%) | 18 (5.4%) | 0.75 |
| 5 yrs | 16 (4.8%) | 19 (5.4%) | 14 (4.2%) | 21 (6.3%) | 0.85 |
| Past Flu Vaccine, N (%) | | | | | 0.13 |
| Yes | 62 (18.6%) | 64 (19.2%) | 61 (18.3%) | 66 (19.8%) | |
| No | 14 (4.2%) | 27 (8.1%) | 16 (4.8%) | 22 (6.6%) | |
| Don't Know | 2 (0.6%) | 0 | 0 | 0 | |

Pearson's χ^2 was non-significant for differences across intervention groups (see below)

** percentages don't total to 100% because some parents have more than one child under five years of age

Geographic Distribution

Figure 3. Map of Participants by Zip Code



*Yellow dots indicate >10 participants in cluster while blue dots represent < 10 participants. Hawaii (N=2) is not pictured. Some respondents did not report valid zip codes and were not included on map.

Participants came from all over the United States. Clusters of participants are shown by zip code above. Several participants did not include valid zip codes, so these participants are not included on the map.

Reliability Tests

Reliability ratings were calculated for each construct using Cronbach's alpha to ensure inter-item reliability. All scale items had good reliability ratings ($\alpha > .80$). Given the good reliability ratings, the multi-item constructs were averaged to create a single score for each construct.

Table 6. Final Reliability Analysis

| Variables (N Items) | α |
|------------------------------------------|----------------------------|
| EPPM Variables (Threat/Efficacy of Flu) | |
| Severity (3) | 0.88 |
| Susceptibility (3) | 0.83 |
| Fear (3) | 0.92 |
| Self-Efficacy (3) | 0.81 |
| Response Efficacy (3) | 0.89 |
| Risk EPPM Variables (Threat of Vaccines) | |
| Risk Severity (3) | 0.86 |
| Risk Susceptibility (3) | 0.87 |
| Risk Fear (3) | 0.95 |
| Fear Control Variables | |
| Defensive Avoidance (2) | 0.80 |
| Issue Derogation (2) | 0.93 |
| Manipulation (2) | 0.93 |
| Perceived Credibility Variables | |
| Authority (3) | 0.94 |
| Character (2) | 0.95 |
| Message Engagement Variables | |
| Relevance (3) | 0.94 |
| Attention to message (3) | 0.93 |
| Emotion evoked (3) | 0.85 |
| Attitudes (6) | 0.94 |
| Outcomes | |
| Information seeking (3) | 0.85 |
| Intent to vaccinate (3) | 0.98 |

Aim 1 Results – Differences Between Message Conditions

The means and standard deviations were computed for all variables across the four message conditions. To test *H1-H4*, all variables were subject to one-way ANOVAs across the four message conditions to determine any significant differences between the conditions. An alpha level of .05 was used for all statistical tests. Significant results were probed using the post-hoc Tukey HSD. Results are shown in the table below.

Table 7. Means, Standard Deviations, and Significance Levels of Variables by Message Type

| Variable | Statistical (N=78) Mean (SD) | Narrative (N=91) M (SD) | Control (N=77) M (SD) | Combined (N = 88) M (SD) | P |
|---------------------------------|------------------------------------|-------------------------------|-----------------------------|--------------------------------|-------|
| EPPM Variables (Flu) | | | | | |
| Severity | 6.09 (1.03) | 5.80 (1.28) | 5.68 (1.11) | 6.05 (1.17) | .070 |
| Susceptibility | 4.92 (1.39) | 4.41 (1.64) | 4.91 (1.23) | 4.72 (1.68) | .098 |
| Fear | 6.02 (1.22) | 6.03 (1.29) | 5.66 (1.33) | 6.14 (1.30) | .101 |
| Self-efficacy | 6.46 (0.75) | 6.42 (1.07) | 6.32 (1.18) | 6.38 (1.04) | .868 |
| Response Efficacy | 5.68 (1.58) | 5.81 (1.38) | 5.50 (1.48) | 5.61 (1.53) | .596 |
| Risk EPPM Variables (Vaccine) | | | | | |
| Risk Severity | 3.89 (1.70) | 3.75 (1.50) | 3.40 (1.59) | 3.78 (1.77) | .277 |
| Risk Susceptibility | 3.38 (1.70) | 3.51 (1.60) | 3.15 (1.55) | 3.34 (1.86) | .592 |
| Risk Fear | 2.68 (1.68) | 3.26 (2.04) | 2.69 (1.86) | 2.88 (1.92) | .143 |
| Fear Control Variables | | | | | |
| Defensive Avoidance | 2.53 (1.48) | 2.66 (1.39) | 2.49 (1.46) | 2.65 (1.47) | .820 |
| Issue Derogation | 2.46 (1.51) | 2.59 (1.67) | 2.40 (1.27) | 2.45 (1.67) | .867 |
| Manipulation | 2.31 (1.56) | 2.78 (1.77) | 2.15 (1.24) | 2.18 (1.52) | .026* |
| Perceived Credibility Variables | | | | | |
| Authority | 6.12 (1.06) | 5.56 (1.46) | 5.93 (1.12) | 6.02 (1.38) | .024* |
| Character | 6.01 (1.17) | 5.52 (1.58) | 5.93 (1.13) | 6.03 (1.34) | .037* |
| Message Engagement Variables | | | | | |
| Relevance | 6.35 (0.97) | 6.01 (1.36) | 6.15 (1.11) | 6.43 (0.98) | .055 |
| Attention to message | 5.79 (1.19) | 5.95 (1.37) | 5.45 (1.36) | 6.30 (1.04) | .000* |
| Emotion evoked | 4.06 (1.36) | 5.66 (1.30) | 2.70 (1.29) | 5.95 (0.93) | .000* |
| Attitudes | 6.03 (1.35) | 5.94 (1.38) | 5.92 (1.56) | 5.95 (1.40) | .954 |

*Indicates that there was a statistically significant difference between two or more message groups at $p < .05$.

Influence of Message Type on EPPM Variables

Hypothesis 1 predicted that parents in the three experimental conditions would have higher ratings of threat and efficacy than parents in the control condition. No significant differences were found between any of the four message conditions for EPPM

variables, indicating that the different messages did not significantly influence parental perceptions of severity of childhood flu, $F(3, 330) = 2.38, p = .070, \eta_p^2 = .021$, parental perceptions of their child's susceptibility to the flu, $F(3, 330) = 2.12, p = .098, \eta_p^2 = .019$, parental fear of childhood flu, $F(3, 330) = 2.09, p = .101, \eta_p^2 = .019$, parental perceptions of self-efficacy (convenience, ability, ease) of getting their child vaccinated against the flu, $F(3, 330) = 0.24, p = .868, \eta_p^2 = .002$, or parental perceptions of response efficacy (effectiveness of flu vaccine in preventing childhood flu) $F(3, 330) = 0.63, p = .596, \eta_p^2 = .006$.

Influence of the Narrative Message on Perceived Manipulation

Hypothesis 2 predicted that parents in the narrative condition would have higher ratings of perceived manipulation compared to parents in the other conditions. A significant difference was found for perceived manipulation $F(3, 330) = 3.13, p = .026, \eta_p^2 = .028$. Parents in the narrative message condition ($M = 2.78, SD = 1.77$) reported significantly ($p = .043$) higher levels of manipulation compared to the control ($M = 2.15, SD = 1.24$). Parents in the narrative message condition ($M = 2.78, SD = 1.77$) also reported significantly ($p = .049$) higher levels of manipulation compared to parents in the combined message group ($M = 2.18, SD = 1.52$). No significant differences were found for the fear control variables defensive avoidance, $F(3, 330) = .308, p = .820, \eta_p^2 = .003$, and issue derogation, $F(3, 330) = .24, p = .867, \eta_p^2 = .002$.

Influence of the Narrative Message on Perceived Credibility

Hypothesis 3 predicted that parents in the statistical and combined conditions would have higher ratings of perceived credibility (authority and character) than parents in the other conditions. Message condition significantly influenced message credibility variables of perceived authority, $F(3, 330) = 3.20, p = .024, \eta_p^2 = .028$, and perceived character, $F(3, 330) = 2.85, p = .037, \eta_p^2 = .025$ of the message source. Perceptions of authority were significantly ($p = .025$) lower for those in the narrative condition ($M = 5.56, SD = 1.46$) compared to the statistical condition ($M = 6.12, SD = 1.06$), while the other message conditions did not significantly differ from each other. The mean for perceived character was significantly ($p = .049$) lower in the narrative condition ($M = 5.52, SD = 1.58$) compared to the combined condition ($M = 6.03, SD = 1.34$). None of the other message conditions significantly differed from each other.

Influence of Message Type on Attention and Emotion

Hypothesis 4 was that parents in the narrative and combined conditions would have higher levels of engagement (relevance, attention, emotion) than parents in the other conditions. Significant differences were found for message engagement variables of level of attention paid to the message, $F(3, 330) = 6.65, p < .000, \eta_p^2 = .057$, and level of emotion evoked by the message, $F(3, 330) = 124.39, p < .000, \eta_p^2 = .531$. However, no significant difference was found for perceived personal relevance, $F(3, 330) = 2.56, p = .055, \eta_p^2 = .023$.

Self-ratings of levels of attention showed significantly ($p = .050$) higher mean ratings of attention for those in the narrative condition ($M = 5.95$, $SD = 1.37$) compared to the control ($M = 5.45$, $SD = 1.36$). It likewise showed significantly ($p < .000$) higher mean ratings of attention for those in the combined condition ($M = 6.30$, $SD = 1.04$) compared to the control ($M = 5.45$, $SD = 1.36$). There was also a significantly ($p = .042$) higher mean rating of attention for those in the combined condition ($M = 6.30$, $SD = 1.04$) compared to the statistical condition ($M = 5.79$, $SD = 1.19$).

The statistical ($M = 4.06$, $SD = 1.36$), narrative ($M = 5.66$, $SD = 1.30$), and combined ($M = 5.95$, $SD = 0.93$) messages all had significantly ($p < .000$) higher means for evoking emotions such as sadness and anger compared to the control message ($M = 2.70$, $SD = 1.29$). The narrative ($M = 5.66$, $SD = 1.30$) and combined ($M = 5.95$, $SD = .093$) messages also had significantly ($p < .000$) higher ratings of emotions such as sadness and anger than the statistical message ($M = 4.06$, $SD = 1.36$).

Additional Aim 1 Results

No differences were expected for risk EPPM variables, since a random sample was not expected to have parents in one group be more fearful of vaccines than parents in another group. No significant differences were found for “risk” EPPM variables including parental perceived severity of vaccination side effects on their children, $F(3, 330) = 1.29$, $p = .277$, $\eta_p^2 = .012$, parental perceived susceptibility of their child suffering from negative side effects of the flu vaccine, $F(3, 330) = .64$, $p = .592$, $\eta_p^2 = .006$, and parental fear of negative side effects of the flu vaccine on their child, $F(3, 330) = 1.82$, $p = .143$, η_p^2

= .016. In addition, none of the messages had a significant effect on attitudes toward the flu vaccine $F(3, 330) = 0.11, p = .954, \eta_p^2 = .001$.

Aim 2 Results – Variables that Predict Outcomes

To test *H5-H8*, binary logistic regression models were run for both information seeking and intent to vaccinate on four different models: EPPM variables (*H5*), EPPM risk variables (*H6*), fear control variables (*H7*), and perceived credibility and engagement variables (*H8*). The results of these tests are found in Table 8. To test *H9*, regressions were performed on threat and fear of flu variables, and threat and fear of vaccine variables to compare which had the largest effect on intentions. Results are shown below.

Table 8. Influence of Variables on Information Seeking and Intentions to Vaccinate

| Item | Intent to Seek Information (N = 313) aOR (95% CI) | Intent to Vaccinate (N = 324) aOR (95% CI) |
|----------------------------|---------------------------------------------------------|--------------------------------------------------|
| EPPM Variables (Flu) | | |
| Severity | 1.24 (0.88, 1.75) | 1.83 (1.14, 2.93)* |
| Susceptibility | 1.46 (1.14, 1.86)* | 0.92 (0.63, 1.35) |
| Fear | 1.80 (1.35, 2.40)* | 0.95 (0.65, 1.39) |
| Self-efficacy | 0.85 (0.80, 1.25) | 1.10 (0.68, 1.77) |
| Response Efficacy | 1.87 (1.44, 2.44)* | 4.33 (2.77, 6.77)* |
| Risk EPPM Variables | | |
| Risk Severity | 0.83 (0.63, 1.11) | 0.77 (0.50, 1.18) |
| Risk Susceptibility | 0.74 (0.55, 0.99)* | 0.53 (0.34, 0.82)* |
| Risk Fear | 1.10 (0.88, 1.36) | 0.74 (0.57, 0.95)* |
| Fear Control Variables | | |
| Defensive Avoidance | 0.81 (0.65, 1.01) | 0.91 (0.70, 1.18) |
| Issue Derogation | 0.75 (0.54, 1.04) | 0.63 (0.44, 0.92)* |
| Manipulation | 0.82 (0.59, 1.12) | 0.64 (0.45, 0.93)* |
| Credibility and Engagement | | |
| Authority | 0.86 (0.47, 1.59) | 0.97 (0.51, 1.83) |
| Character | 1.12 (0.62, 2.03) | 2.00 (1.06, 3.75)* |
| Relevance | 2.15 (1.34, 3.45)* | 1.88 (1.19, 2.97)* |
| Attention to message | 1.33 (0.97, 1.83) | 1.16 (0.80, 1.69) |
| Emotion evoked | 1.40 (1.13, 1.74)* | 1.14 (0.88, 1.48) |

Binomial logistic regression results with coefficients expressed as aORs and 95% confidence intervals in parentheses, Bonferroni Correction applied (cutpoints omitted; * $p < 0.01$). All variables were measured on 1-7 Likert scales. Results were adjusted for age, ethnicity, race, and gender.

Hosmer-Lemeshow goodness-of-fit test was found to be non-significant for all regressions for the information seeking outcomes (EPPM variables = .408, risk EPPM variables = .342, fear control variables = .280, credibility and engagement variables = .313). Hosmer-Lemeshow was also non-significant for the intention to vaccinate outcome for all regressions (EPPM variables = .641, risk EPPM variables = .895, fear control variables = .629, credibility and engagement variables = .607). The results of the eight models are found in the table below.

Impact of EPPM Variables on Parental Intentions

Hypothesis 5 predicted that EPPM threat, fear, and efficacy variables would predict parental intentions to seek more information and vaccinate their child. The result of the full logistic regression model for EPPM variables on intent to vaccinate was statistically significant, indicating that severity, susceptibility, fear, self-efficacy, and response efficacy as a set significantly predicted intentions to vaccinate ($\chi^2 = 156.61, p < .000$, with $df = 8$). Nagelkerke's R^2 of .664 indicated a very strong relationship between the predictor variables as a set and intention to vaccinate. Only severity (aOR = 1.83, 95%CI=1.14, 2.93, $p = .012$) and response efficacy (aOR = 4.33, 95%CI = 2.77, 6.77, $p < .000$) made a significant contribution to prediction. Susceptibility (aOR = 0.92, 95%CI = 0.63, 1.35, $p = .680$), fear (aOR = 0.95, 95%CI = 0.65, 1.39, $p = .791$), and self-efficacy (aOR = 1.10, 95%CI = 0.68, 1.77, $p = .701$) did not. The odds ratios indicate that when perceptions of severity of flu are raised by one unit on a 1-7 scale, parents are 1.83 times

more likely to lean toward vaccination. When perceptions of response efficacy are raised by one unit on a 1-7 scale, parents are 4.33 times more likely to lean toward vaccination.

The results of the full logistic regression model for EPPM variables on intent to seek more information showed that the overall model was statistically significant, indicating that severity, susceptibility, fear, self-efficacy, and response efficacy as a set significantly predicted intentions to seek more information ($\chi^2 = 106.30, p < .000$, with $df = 8$). Nagelkerke's R^2 of .461 indicated a strong relationship between the predictor variables as a set and intentions to seek more information. Only susceptibility (aOR = 1.46, 95%CI = 1.14, 1.86, $p = .003$), fear (aOR = 1.80, 95%CI = 1.35, 2.40, $p < .000$), and response efficacy (aOR = 1.87, 95%CI = 1.44, 2.44, $p < .000$) made a significant contribution to prediction, while severity (aOR = 1.24, 95%CI = 0.88, 1.75, $p = .215$) and self-efficacy (aOR = 0.85, 95%CI = 0.80, 1.25, $p = .411$) did not. The odds ratios indicate that when susceptibility increases one unit on a 1-7 scale, parents are 1.46 times more likely to lean toward information seeking. When fear increases one unit on a 1-7 scale, parents are 1.80 times more likely to lean toward information seeking. When response efficacy increases one unit on a 1-7 scale, parents are 1.87 times more likely to lean toward information seeking.

Perceived Fear/Perceived Threat of Vaccines on Parental Intentions

Hypothesis 6 was that perceived threat of vaccines and perceived fear of vaccines would negatively predict parental intentions to seek more information and to vaccinate their child. The result of the full logistic regression model for Risk EPPM variables on

intent to vaccinate was statistically significant, indicating that risk severity, risk susceptibility, and risk fear as a set significantly predicted intentions to vaccinate ($\chi^2 = 100.37, p < .000$, with $df = 6$). Nagelkerke's R^2 of .462 indicated a moderate relationship between predictor variables and intent to vaccinate. Only risk susceptibility (aOR = 0.53, 95%CI = 0.34, 0.82, $p = .004$) and risk fear (aOR = 0.74, 95%CI = 0.57, 0.95, $p = .019$) made a significant contribution to prediction while risk severity (aOR = 0.77, 95%CI = 0.50, 1.18, $p = .231$) did not. Odds ratios were less than 1, indicating a negative relationship between variables and outcomes.

The result of the full logistic regression model for Risk EPPM variables on information seeking was statistically significant, indicating that risk severity, risk susceptibility, and risk fear as a set significantly predicted intentions to seek information ($\chi^2 = 19.58, p = .003$, with $df = 6$). Nagelkerke's R^2 of .097 indicated a very weak relationship between the predictor variables as a set and information seeking intentions. Only Risk susceptibility significantly made a significant contribution to prediction (aOR = 0.74, 95%CI = 0.55, 0.99, $p = .041$). Risk severity (aOR = 0.83, 95%CI = 0.63, 1.11, $p = .214$) and risk fear (aOR = 1.10, 95%CI = 0.88, 1.36, $p = .397$) did not. Again, the odds ratio is less than 1 indicating a negative relationship between variables and outcomes.

Fear Control Variables on Parental Intentions

Hypothesis 7 was that fear control variables would negatively predict parental intentions to seek more information and to vaccinate their child. The results of the full model containing fear control variables on intentions to vaccinate was statistically

significant, indicating that issue derogation, perceived manipulation, and defensive avoidance as a set significantly predicted intentions to vaccinate ($\chi^2 = 73.88, p < .000$, with $df = 6$). Nagelkerke's R^2 of .353 indicated moderately weak relationship between the predictor variables as a set and intent to vaccinate. Only issue derogation (aOR = 0.63, 95%CI = 0.44, 0.92, $p = .015$) and perceived manipulation (aOR = 0.64, 95%CI = 0.45, 0.93, $p = 0.19$) made a significant contribution to prediction. Defensive avoidance did not (aOR = 0.91, 95%CI = 0.70, 1.18, $p = .462$). Odds ratios were less than 1, indicating an inverse relationship between predictors and outcome.

The full model for fear control variables on intentions to seek more information was statistically significant, indicating that issue derogation, perceived manipulation, and defensive avoidance as a set significantly predicted intentions to seek more information ($\chi^2 = 39.14, p < .000$, with $df = 6$). Nagelkerke's R^2 was .188, indicating a weak relationship between the predictor variables as a set and intention to seek more information about the flu vaccine. None of the fear control variables individually significantly predicted intentions to seek more information: defensive avoidance (aOR = 0.81, 95%CI 0.65, 1.01, $p = .058$), issue derogation (aOR = 0.75, 95%CI 0.54, 1.04, $p = .083$), perceived manipulation (aOR = 0.82, 95%CI = 0.59, 1.12, $p = .209$).

Perceived Credibility and Engagement on Parental Intentions

Hypothesis 8 was that perceived credibility and engagement variables would predict parental intentions to seek more information and to vaccinate their child. The full model for credibility and engagement variables on intention to vaccinate was significant,

indicating that authority, character, relevance, attention, and emotion as a set significantly predicted intentions to vaccinate ($\chi^2 = 99.21$, $p < .000$, with $df = 8$). Nagelkerke's R^2 was .457 indicating a moderate relationship between predictor variables and intent to vaccinate. Character (aOR = 2.00, 95%CI = 1.06, 3.75, $p = .032$) and relevance (aOR = 1.88, 95%CI = 1.19, 2.97, $p = .007$) made a significant contribution to prediction. Authority (aOR = 0.97, 95%CI = 0.51, 1.83, $p = .923$), attention (aOR = 1.16, 95%CI = 0.80, 1.69, $p = .433$), and emotion (aOR = 1.14, 95%CI = 0.88, 1.48, $p = .309$) did not. Odds ratio values indicate that when character increases by one unit on a 1-7 scale, parents are twice as likely to lean toward vaccination. When relevance increases by one unit on a 1-7 scale, parents are 1.88 times more likely to lean toward vaccination.

The full model for credibility and engagement variables on information seeking was significant, indicating that authority, character, relevance, attention, and emotion as a set significantly predicted intentions to seek more information ($\chi^2 = 80.83$, $p < .000$, with $df = 8$). Nagelkerke's R^2 was .365, indicating a moderately weak relationship between the predictor variables as a set and intentions to seek more information. Relevance (aOR = 2.15, 95%CI = 1.34, 3.45, $p = .002$) and emotion (aOR = 1.40, 95%CI = 1.13, 1.74, $p = .002$) made a significant contribution to prediction. Authority (aOR = 0.86, 95%CI = 0.47, 1.59, $p = .637$), character (aOR = 1.12, 95%CI = 0.62, 2.03, $p = .707$), and attention (aOR = 1.33, 95%CI = 0.97, 1.83, $p = .081$) did not. Odds ratios indicate that for every one unit increase in relevance on a 1-7 scale, parents were 2.15 times more likely to lean

toward information seeking. For every one-unit increase in emotion on a 1-7 scale, parents were 1.40 times more likely to lean toward information seeking.

Response Efficacy as Main Predictor Variable

The full model for significant variables found in the four previous regression models (EPPM, Risk EPPM, Fear Control, and Credibility/Engagement models) on intention to vaccinate was significant, indicating that these variables (severity, response efficacy, risk susceptibility, risk fear, issue derogation, perceived manipulation, character, and relevance) as a set significantly predicted intentions to seek more information ($\chi^2 = 189.30, p < .000$, with $df = 8$). Nagelkerke's R^2 was .767, indicating a strong relationship between the predictor variables as a set and intentions to vaccinate.

Table 9. Model of Significant Predictor Variables

| Item | Intent Vaccinate (N = 324) aOR (CI) |
|------------------------|-------------------------------------------|
| Severity | 1.60 (0.92, 2.78) |
| Response efficacy | 3.43 (2.12, 5.54)* |
| Risk susceptibility | 0.68 (0.40, 1.18) |
| Risk fear | 0.69 (0.44, 1.08) |
| Issue Derogation | 0.60 (0.31, 1.16) |
| Perceived Manipulation | 0.88 (0.42, 1.86) |
| Character | 1.10 (0.62, 1.95) |
| Relevance | 1.02 (0.52, 2.01) |

Binomial logistic regression results with coefficients expressed as aORs and 95% confidence intervals in parentheses (cutpoints omitted; * $p < 0.05$). All variables were measured on 1-7 Likert scales. Results were adjusted for age, ethnicity, race, and gender.

Only response efficacy made a significant contribution to prediction in this model (aOR = 3.43, 95%CI = 2.12, 5.54, $p < .000$). All other variables did not: severity (aOR = 1.60, 95%CI = 0.92, 2.78, $p = .096$), risk susceptibility (aOR = 0.68, 95%CI = 0.40, 1.18, $p = .173$), risk fear (aOR = 0.69, 95%CI = 0.44, 1.08, $p = .101$), issue derogation (aOR = 0.60, 95%CI = 0.31, 1.16, $p = .128$), perceived manipulation (aOR = 0.88, 95%CI = 0.42,

1.86, $p = .744$), character (aOR = 1.10, 95%CI = 0.62, 1.95, $p = .741$), and relevance (aOR = 1.02, 95%CI = 0.52, 2.01, $p = .945$).

Odds ratio indicate that for every one-unit increase in perceptions of response efficacy on a 1-7 scale, parents were 3.43 times more likely to lean toward vaccinating their child.

Fear of Flu and Fear of Vaccines on Parental Intentions

Hypothesis 9 predicted that threat and fear of flu would be more important predictors of intention to vaccinate than threat and fear of vaccines, and threat and fear of vaccines would be more important predictors of intent to seek information than threat and fear of flu. This analysis compared a regression model containing threat and fear of flu with a regression model containing threat and fear of vaccine side effects. For threat/fear of flu variables, Hosmer-Lemeshow was non-significant for information seeking (.569), and intentions (.470). For threat/fear of vaccination variables, Hosmer-Lemeshow was non-significant for information seeking (.342) and intentions (.895).

Table 10. Threat and Fear Models on Outcomes

| Item | Intent Seek Information (N = 313) aOR (CI) | Intent Vaccinate (N = 324) aOR (CI) |
|-----------------------------|--------------------------------------------------|-------------------------------------------|
| Threat and Fear of Flu | | |
| Severity of flu | 1.59 (1.87, 2.13)* | 2.16 (1.58, 2.94)* |
| Susceptibility to flu | 1.51 (1.21, 1.88)* | 1.23 (0.98, 1.55) |
| Fear of flu | 1.73 (1.32, 2.25)* | 0.98 (0.75, 1.29) |
| Threat and Fear of Vaccines | | |
| Severity of vaccines | 0.83 (0.63, 1.11) | 0.77 (0.50, 1.18) |
| Susceptibility to vaccines | 0.74 (0.55, 0.99)* | 0.53 (0.34, 0.82)* |
| Fear of vaccines | 1.10 (0.88, 1.36) | 0.74 (0.57, 0.95)* |

Binomial logistic regression results with coefficients expressed as aORs and 95% confidence intervals in parentheses (cutpoints omitted; * $p < 0.05$). All variables were measured on 1-7 Likert scales. Results were adjusted for age, ethnicity, and gender, race, and gender.

The results of the full logistic regression model for threat and fear of flu variables on information seeking was statistically significant, indicating that perceptions of severity of flu, susceptibility to flu, and fear of flu as a set significantly predicted intentions to seek more information ($\chi^2 = 78.05, p < .000$, with $df = 6$). The Nagelkerke pseudo effect size was .354, indicating a moderately weak relationship between predictor variables and intent to seek more information. All three variables for threat/fear of flu made a significant contribution to prediction: severity (aOR 1.59, 95%CI = 1.87, 2.13, $p = .002$), susceptibility (aOR = 1.51, 95%CI = 1.21, 1.88, $p < .000$) and fear (aOR = 1.73, 95%CI = 1.32, 2.25, $p < .000$). As noted previously, the result of the full logistic regression model for threat and fear of vaccination on information seeking was statistically significant, indicating that risk severity, risk susceptibility, and risk fear as a set significantly predicted intentions to seek information ($\chi^2 = 19.58, p = .003$, with $df = 6$). It appears that the model for threat and fear of flu was a stronger predictor for intent to seek information than the model for threat and fear of vaccine side effects.

For threat and fear of flu, the results of the full logistic regression model on intention to vaccinate was statistically significant, indicating that perceptions of severity of flu, susceptibility to flu, and threat of flu significantly predicted intentions to vaccinate ($\chi^2 = 46.51, p < .000$, with $df = 6$). Nagelkerke's R^2 was .232, indicating a moderately weak relationship between predictor variables and intent to vaccinate. Only severity of flu made a significant contribution to prediction (aOR = 2.16, 95%CI = 1.58, 2.94, $p < .000$) while susceptibility to the flu (aOR = 1.23, 95%CI = 0.98, 1.55, $p = .076$) and fear

of flu (aOR = 0.98, 95%CI = 0.75, 1.29, $p = .898$) did not. As noted previously, the result of the full logistic regression model for Risk EPPM variables on intent to vaccinate was statistically significant, indicating that risk severity, risk susceptibility, and risk fear as a set significantly predicted intentions to vaccinate ($\chi^2 = 100.37, p < .000$, with $df = 6$). It appears that the model for threat/fear of vaccine side effects on intention to vaccinate was a stronger predictor than the model for threat/fear of flu on intentions to vaccinate.

Aim 3 Results – Impact of Message Type on Intentions

Hypothesis 10 predicted that parents in all three of the experimental conditions (statistical, narrative, and combined) would be more likely to seek information and to vaccinate their children than parents in the control condition. To test *H10*, the experimental message conditions were compared to the control for information seeking and intention to vaccinate using binary logistic regression.

Table 11. Type of Message on Outcomes

| Item | Intention to Seek Information (N = 313) aOR (CI) | Intention to Vaccinate (N = 324) aOR, (CI) |
|--------------|--------------------------------------------------------|--------------------------------------------------|
| Message Type | | |
| Control | - | - |
| Statistical | 2.60 (1.14, 5.93)* | 0.86 (0.33, 2.24) |
| Narrative | 2.16 (1.02, 4.55)* | 0.73 (0.30, 1.78) |
| Combined | 2.85 (1.26, 6.45)* | 0.69 (0.28, 1.69) |

Binary logit models with coefficients expressed as aORs and 95% confidence intervals in parentheses (cutpoints omitted; * $P < 0.05$). All variables were measured on 1-7 Likert scales. Results were adjusted for age, ethnicity, race, and gender. Hosmer-Lemeshow test was non-significant for both analyses (message type on information seeking = .646, message type on intent to vaccinate = .582).

Table 10 shows that none of the experimental message conditions had significantly higher odds of intent to vaccinate by message condition when compared to the control:

statistical (aOR = 0.86, 95%CI = 0.33, 2.24, $p = .762$), narrative (aOR = 0.73, 95%CI = 0.30, 1.78, $p = .762$) and combined (aOR = 0.69, 95%CI = 0.28, 1.69, $p = .417$).

Nagelkerke's R^2 (.013) indicated a very weak relationship between type of message and intention to vaccinate. This indicates that the type of message did not significantly predict parental intentions to vaccinate their children against influenza.

On the other hand, all three of the experimental conditions had significantly higher odds of intention to seek more information about the flu vaccine compared to the control message. Compared to the control message, those who read the statistical message had 2.60 times higher odds (95%CI=1.14, 5.93, $p = .023$) to seek more information about the flu vaccine. Those in the narrative condition reported 2.16 times higher odds (95%CI = 1.02, 4.55, $p = .044$) of intentions to seek more information about the flu vaccine when compared to the control message. Similarly, those in the combined condition reported 2.85 times higher odds of intentions to seek more information than the control (95%CI=1.26, 6.45, $p = .012$). The Nagelkerke's R^2 was .056 for this model, suggesting a very weak relationship between message type and intentions to seek more information.

To further explore the impact of message type on information seeking intentions, sub-analyses were conducted for each information-seeking item (intention to talk to family/friends, intention to talk to a doctor, and intention to search for more information online/other sources). The results are shown in Table 12.

Table 12. Type of Message on Three Types of Information Seeking

| Item | Talk to Family/Friends (N = 260) aOR (CI), p | Talk to Doctor (N = 305) aOR (CI), p | Online/Other Sources (N = 274) aOR (CI), p |
|--------------|----------------------------------------------------|--------------------------------------------|-----------------------------------------------------|
| Message Type | | | |
| Control | - | - | - |
| Statistical | 1.90 (0.91, 3.95) | 1.60 (0.59, 4.30) | 1.96 (0.89, 4.29) |
| Narrative | 1.97 (0.95, 4.06) | 1.34 (0.54, 3.33) | 2.37 (1.08, 5.18)* |
| Combined | 2.66 (1.25, 5.65)* | 1.76 (0.66, 4.70) | 2.45 (1.10, 5.47)* |

Binary logit models with coefficients expressed as aORs and 95% confidence intervals in parentheses (cutpoints omitted; * P,0.05). Results were adjusted for age, ethnicity, race, and gender. Hosmer-Lemeshow results were non-significant for all three analyses (family/friends = .282, doctor = .871, online/other sources = .167).

Parents in the combined condition had 2.66 times higher odds (95%CI = 1.25, 5.65, $p = .011$) of intending to talk to family and friends about childhood influenza compared to parents in the control condition. Parents in the statistical (aOR = 1.90, 95%CI = 0.91, 3.95, $p = .087$) and narrative conditions (aOR = 1.97, 95%CI = 0.95, 4.06, $p = .067$) did not have significantly higher odds of intending to talk to family or friends about childhood influenza when compared to parents in the control group.

The odds of parent's intentions to talk to their child's doctor about the flu vaccine were not significantly higher in any of the message conditions when compared to the control: statistical (aOR = 1.60, 95%CI = 0.59, 4.30, $p = .355$), narrative (aOR = 1.34, 95%CI = 0.54, 3.33, $p = .527$) and combined (aOR = 1.76, 95%CI = 0.66, 4.70), $p = .256$).

Parents in the narrative condition had 2.37 times higher odds (95%CI = 1.08, 5.18, $p = .031$) of planning to find out more about childhood influenza online or from other sources when compared to the control. Likewise, parents in the combined condition had 2.45 times higher odds (95%CI = 1.10, 5.47, $p = .029$) compared to the control. However,

parents in the statistical condition did not have significantly higher odds (aOR = 1.96, 95%CI = 0.89, 4.29, $p = .093$) of planning to seek more information online or from other sources when compared to the control.

Results of Past Vaccination on Intentions

A binary logistic regression was run for predictor variables “have any of your children ever received a flu vaccine?” Those who answered “yes” were categorized as “past vaccination” and those who answered “no” were categorized as “no past vaccination.” 75.5% of parents ($N = 253$) reporting vaccinating at least one of their children against flu in the past while 23.7% ($N = 79$) reported never having done so. Two participants did not know and were dropped from the analysis.

Table 13. Past Vaccination on Outcomes

| Flu vaccination history | Info. Seeking (N = 311) aOR (CI) | Vaccinate (N = 322) aOR, (CI) |
|-------------------------|-------------------------------------|----------------------------------|
| History | | |
| No past vaccination | - | - |
| Past vaccination | 3.09 (1.68, 5.68)* | 36.98 (15.77, 86.69)* |

Binary logistic regression with coefficients expressed as aORs and 95% confidence intervals in parentheses (cutpoints omitted; * $p < .05$). All variables were measured on 1-7 Likert scales. Results were adjusted for age, ethnicity, race, and gender. Hosmer-Lemeshow was non-significant for both information seeking (.454), and intention to vaccinate (.776).

The result of the logistic regression model for past vaccination on information seeking was statistically significant ($\chi^2 = 15.17$, $p = .004$, with $df = 4$). Those who had vaccinated at least one of their children against flu in the past had more than three times higher odds of intending to seek information that year compared to those who had not vaccinated at least one of their children against flu in the past (aOR 3.09, 95%CI = 1.68, 5.68, $p < .000$). The result of the full logistic regression model for past vaccination on

intent to vaccinate was statistically significant ($\chi^2 = 101.38$, $p < .000$, with $df = 4$). Those who had vaccinated at least one of their children against flu in the past had almost 37 times higher odds of intending to vaccinate their child against flu that year compared to those who had not vaccinated at least one of their children against flu in the past (aOR = 36.98, 95%CI = 15.77, 86.69, $p < .000$).

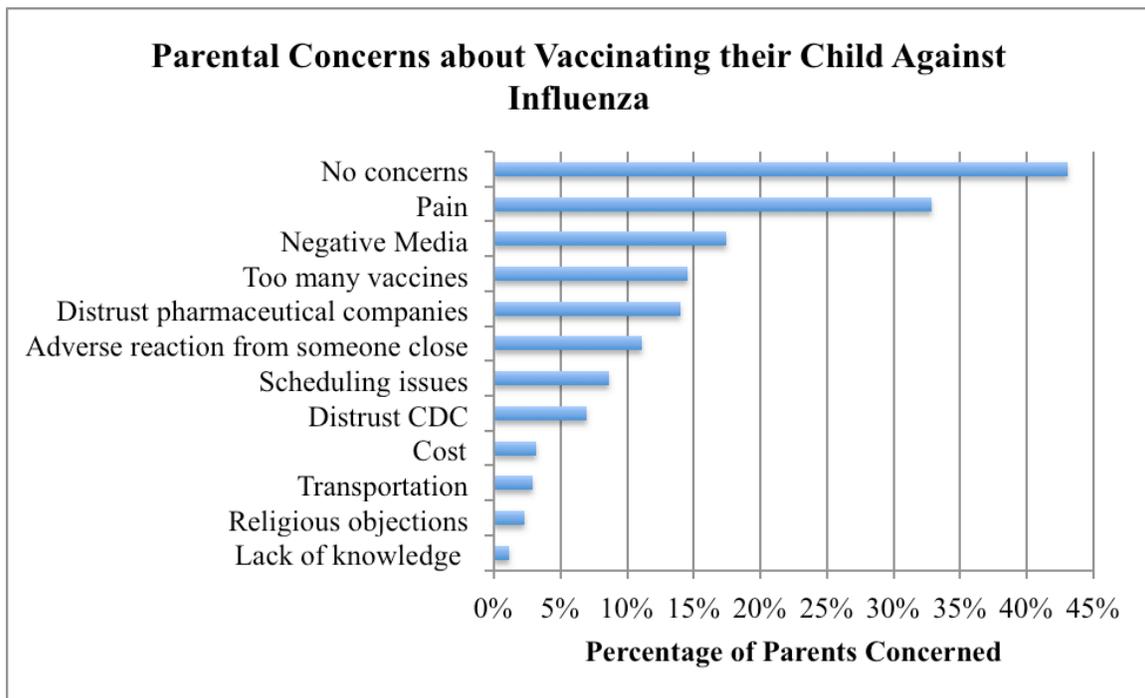
Remaining Parental Concerns

After reading the message and taking the survey, respondents were asked to select any remaining concerns they had about the influenza vaccination. A large percentage of parents reported no lingering concerns (43.1%). The greatest percentage reported the pain the child would feel when they received the vaccine (32.9%). The next greatest concern was exposure to stories in the media as being an obstacle (17.5%) followed by a fear of too many vaccines too close together (14.6%). Distrust of the CDC (7.0%), and pharmaceutical companies (14.0%) were also found to be concerns. Others reported someone close to them having an allergic reaction (11.1%). Very few had religious objections (2.3%). Fewer parents had logistical or access concerns such as cost (3.2%), transportation issues (2.9%), scheduling (8.7%), or lack of knowledge of where to receive a vaccine (1.2%).

Respondents had the opportunity to add any concerns in writing. 28 participants left comments. This qualitative data revealed several more areas of parental concerns about their child receiving the flu vaccine. Themes included ineffectiveness of the flu vaccine in preventing the flu, developing the flu or flu-like symptoms from the vaccine,

safety or side effects of vaccines, perceptions regarding the strains of flu included in flu vaccines. Most of these comments seemed to be geared toward personal experiences, experiences of others, or concerns about the flu vaccine versus vaccination in general (e.g. the right strains will not be included in the vaccine). Themes and comments are noted below.

Figure 4. Remaining Parental Concerns



Ineffectiveness of the vaccine in preventing the flu

Personal experiences, experiences of others, and perceptions of the effectiveness of the flu vaccine in preventing the flu were noted. Comments included: “every year we GET the shot, my children and I all get the flu worse than we’ve EVER had it in the years when we didn’t get the shot,” “they still got the flu that year,” “still get sick with the

vaccine,” “does not prevent the illness,” “getting sick even after vaccine,” “doesn’t seem to keep others from getting the flu”.

Developing the flu or flu-like symptoms after receiving the vaccine

Most of the comments included personal experiences, past experiences with their child receiving a flu vaccine, or experiences of others. Comments included: “I fear she will get the flu from the vaccine,” “my child has developed a high fever for several days after receiving a flu vaccine,” “flu vaccine made me very sick,” “I’ve heard from several people that have gotten the flu vaccine that themselves or their children either had severe flu-like symptoms upon getting the shot, or got the flu later anyway,” “he got sick right after receiving the vaccine,” “getting a mild case of flu from the flu shot,” “I know too many people who have gotten the flu after getting vaccinated for it, I don’t think it’s safe,” “I have flu-like symptoms after a flu shot and don’t want my child to experience it,” and “getting sick afterwards”.

Safety, side effects, or fear of allergic reaction to flu vaccine

These comments tended to be geared more toward vaccines in general rather than the flu vaccine specifically. Comments included: “the side effects aren’t worth it,” “vaccines are unsafe, and at worse poisonous, often causing the very illness they’re supposed to prevent as well as other problems,” “I am afraid of side effects or them being exposed to a harmful flu virus even though they had a shot,” “many vaccines have thimerisol added which is a toxic mercury which causes autism in children, no thank you, you can keep it,” “not sure of all the side effects,” “my nephew had a severe reaction a few years ago that

ended him up in the hospital, it was basically a fluke and logically I know this but, there is just so much panic in my head when I think about my daughter possibly ending up so sick like that,” and “my child had severe allergy with some of the content of the flu vaccine in the past”.

Perceptions of effectiveness of flu vaccine in terms of strains in vaccine

These comments are all very specific toward the flu vaccine, since it concerns the specific strains of flu included in the vaccine each year. Comments included: “Doesn’t protect against every strain,” “does it really even work? Is it worth it? They get the strain wrong every year,” “the likelihood of getting a vaccine for the same strain they get is low,” and “there are different strains of the flu each year and there’s no guarantees that my child’s vaccine will match the strain she might be exposed to.”

Other Concerns

Other comments included: “I do not feel like it is necessary,” “the flu shot will not let my child’s immune system build up on it’s own,” “I generally find that most if not all pharmaceutical companies are profit based and not really interested in anything more than profit margins and have very powerful influence over the FDA and government policy in general”. All other comments fell into one of the four themes listed above.

CHAPTER 8: DISCUSSION

Aim 1 was to assess the effect of message condition (statistical, narrative, combined, and control) on several possible predictor variables (EPPM variables, EPPM risk variables, fear control variables, perceived credibility, and message engagement). Aim 2 explored how these variables predicted (or did not predict) two key outcomes (intent to seek more information and intent to vaccinate). Aim 2 also explored the moderating effect of perceived manipulation and the comparative predictive power of threat/fear of flu in comparison to threat/fear of flu vaccine side effects. Aim 3 investigated the effect of message condition on key outcomes of intention to talk to family and friends, intention to talk to a doctor, intention to seek information online, and intention to vaccinate. This chapter also proposes a revised model of the EPPM in context of a two-way threat. Past vaccination as a predictor variable and remaining concerns are further discussed below.

Aim 1 Discussion - Differences Between Message Conditions

Hypothesis 1: EPPM Variables

The ranges of means for parent's perceptions of EPPM constructs (7 point Likert scale) across all message conditions were: severity (5.68-6.09), susceptibility (4.41-4.92), fear (5.66-6.14), self-efficacy (6.32-6.46), and response efficacy (5.50-5.81). This indicates that the threat of childhood flu comes from perceptions of the dangers of consequences of the flu, fear of flu, and worries that their child will contract the flu. However, the threat is greater for perceptions of the gravity of the consequences of childhood flu (severity) than for the likelihood of their child contracting the flu

(susceptibility). Parents' perceptions of self-efficacy of vaccinating their child against the flu were very high for this sample, indicating that the ease, ability and convenience of vaccinating their child against the flu were not significant obstacles. However, response efficacy was lower than self-efficacy, indicating that perception of the effectiveness of the flu vaccine to prevent childhood flu is a bigger obstacle than ability to vaccinate their child against the flu.

Hypothesis 1 predicted that parents in the three experimental conditions would have higher ratings of threat and efficacy than parents in the control condition. Although an examination of the means show that severity, fear, self-efficacy, and response efficacy were indeed higher for all three message conditions than for the control, this was not significant at the .05 level. In contrast to the hypothesis, the mean for susceptibility was higher in the control message ($M = 4.91$) than in the narrative ($M = 4.41$) and combined ($M = 4.72$) messages, however this was not significant at .05.

I failed to reject the null hypothesis at $p < .05$ because there were no significant differences between any of the message conditions for EPPM variables of severity, susceptibility, fear, self-efficacy, or response efficacy. It appears that the high-threat / high-efficacy messages did not significantly affect parental perceptions of the threat of childhood flu or provoke fear about childhood flu, likely because parents in this sample already fear it and believe that flu is severe for their under-five child. The message did not seem to change perceptions of the efficacy of the flu vaccine, which was relatively high for this sample.

One possible explanation is that the messages were not persuasive enough. However, the messages went through two rounds of CRT and a pilot test to gain feedback about the messages, and respondents indicated that the experimental messages were high-threat / high-efficacy while the control was not. Another possible explanation is that the control message or survey questions about whether or not flu is a threat to children aroused feelings of threat of flu or efficacy of vaccines suggesting that people already have a good amount of information on the flu..

Perhaps the most plausible explanation is that one-shot messages about common diseases are not effective in overcoming prior beliefs about the disease, particularly when they already have knowledge of the disease. Since the flu is a common disease that many people have experienced, exposure to a message may have little impact on existing beliefs about childhood flu. More research is needed on lesser-known diseases, such as meningitis or pertussis, to determine if high-threat / high-efficacy messages behave differently when little is known about the disease. In addition, the flu vaccine is one of the least effective in preventing the flu, thus a transparent message about flu vaccine efficacy may not be persuasive. More research is needed on various methods of presenting ideas about the effectiveness of flu vaccines in preventing the flu or lessening severity of childhood flu, and whether or not any of the messages can increase perceptions of response efficacy. Although response efficacy was relatively high for this sample, it could be improved.

Hypothesis 2: Perceived Manipulation

Hypothesis 2 predicted that parents in the narrative condition would have higher ratings of perceived manipulation compared to parents in the other conditions. While parents in the narrative condition did have a higher mean rating of perceived manipulation compared to all three of the other groups, this was only significant at the .05 level in some cases. This hypothesis was partially accepted because parents in the narrative condition ($M = 2.78$) had significantly higher mean ratings of manipulation than parents in both the control ($M = 2.15$) and the combined ($M = 2.18$) groups. However, parents in the narrative message condition did not have significantly higher ratings of manipulation than those in the statistical ($M = 2.31$) group. It should be noted that the means for manipulation fell between moderately disagree and slightly disagree for all messages, so even those in the narrative condition on the whole did not feel highly manipulated.

It is important to note that the narrative message caused parents to feel more manipulated compared to the exact same narrative followed by statistical information (combined condition). This provides evidence that coupling a sad story with statistics may eliminate increased feelings of manipulation that occur when a sad story alone is presented. Interestingly, it does not appear that it is the story itself that causes increased manipulation, but the lack of including facts or statistics along with the story that causes the increased manipulation. This is in line with some of the pilot test respondents that were in the narrative condition who stated, “it seems odd to provide only one case study and not provide additional stats... it seems to be searching for people who make

emotional decisions, which is not the way they should be made” and “message was a case study, not a statistic, and it lacked reliable sources.”

Hypothesis 3: Credibility

Hypothesis 3 was that parents in the narrative condition would have significantly lower perceptions of credibility (authority and character) of the message than parents in the statistical and combined conditions. An examination of the means shows that both authority and character were indeed lower in the narrative condition than for all the other message conditions; however, this was not always significant at the .05 level.

While the mean for parents in the narrative condition ($M = 5.56$) indicated significantly lower perceptions of authority than for those in the statistical condition ($M = 6.12$), the difference between the means of the narrative ($M = 5.56$) and combined ($M = 6.02$) message was not significant. The mean for perceptions of character was also significantly lower for parents in the narrative condition ($M = 5.52$) than parents in the combined condition ($M = 6.03$); however the difference between the narrative and statistical ($M = 6.01$) condition was not significant. While the means for credibility were still positive (falling between slightly agree and moderately agree) in the narrative condition, the means for both the statistical and combined messages were even more positive (falling just above moderately agree).

On the whole, this suggests that a narrative message is not seen as being as credible as a statistics-only or combined message. There is evidence that presenting a narrative followed by statistics (combined condition) will increase perceptions of

credibility when compared to a message presented in narrative-only form. This is an important finding in terms of persuading parents to vaccinate their children.

Hypothesis 4: Engagement

Hypothesis 4 was that parents in the narrative and combined conditions would have higher levels of engagement (relevance, attention, emotion) than parents in the other conditions. An examination of the means shows that parents in the combined condition did indeed have higher ratings of relevance, attention, and emotion than the other three conditions; however this was not always significant at the .05 level. The narrative message had the second highest mean for attention and emotion; however the statistical message and control message had a higher mean for personal relevance than the narrative; however this was not always significant at the .05 level.

I failed to reject the null hypothesis for perceived personal relevance because there were no significant differences in the means between conditions (although significance was very close at $p = .055$). Furthermore, the narrative message had the lowest mean (6.01), when it was expected to have one of the highest. Perceptions of relevance were quite high for all conditions, ranging from 6.01-6.43. The highest mean was found in the combined condition (6.43). This suggests that no matter which message parents were exposed to, they overall felt that the flu message was relevant to them. Although it appears that message presentation type was not a significant factor in relevance at $p = .05$, caution should be used when presenting only a narrative, since the narrative-only paradoxically

seemed to decrease feelings that the situation could happen to them, while presenting a story with statistics seemed to increase personal relevance in comparison.

The hypothesis for attention was partially accepted. Although the narrative ($M = 5.95$) and combined ($M = 6.30$) conditions did have significantly higher mean ratings of attention than the control ($M = 5.45$), only the combined condition had significantly higher ratings of attention than the statistical ($M = 5.79$) condition. It is interesting that the audience paid more attention overall to the same type and amount of statistics when those statistics followed a sad story than when the statistics were presented alone. It is also interesting that the combined condition held significantly better attention than the statistical and control messages, because the combined condition contained both the narrative and statistical threat components and was thus longer than the other three messages. These results suggest that messages containing both stories and statistics will hold audience attention better than presenting only statistical information, although the differing length of the combined message may have confounded the results.

The hypothesis for emotion was accepted. The narrative ($M = 5.66$) and combined ($M = 5.95$) messages had significantly higher mean ratings of evoking emotions such as sadness and anger when compared to the statistical message ($M = 4.06$). All three of the messages had significantly higher mean ratings of emotions compared to the control ($M = 2.70$). While those in the control slightly-to-moderately disagreed that the message caused them to feel emotion, those in the statistical condition were closer to neutral, while those in the narrative and combined slightly-to-moderately agreed. These results suggest that if

the goal is to cause the audience to experience emotion while not diminishing perceptions of character or personal relevance, a story coupled with statistics should be used. The role of emotion on vaccination decision-making should also be researched more in order to determine whether or not health messengers should strive to increase emotional involvement in the message and which types of emotions would best motivate to action. This study's survey only investigated sadness, anger, and overall emotion level.

Attitudes

Attitudes toward vaccines were generally fairly positive, with the means for all groups hovering near moderately agree for perceptions of vaccines being good, helpful, and important. Although those in the control condition had a lower mean for attitudes toward vaccination ($M = 5.92$) than those in the other three conditions: statistical ($M = 6.03$), narrative ($M = 5.94$), combined ($M = 5.95$), this was not significant at .05. This suggests that none of the message conditions had a significant effect on attitudes toward vaccines.

Aim 2 Discussion - Variables that Predict Outcomes

Hypothesis 5: EPPM Variables

Hypothesis 5 was that EPPM threat, fear, and efficacy variables would predict parental intentions to seek more information and vaccinate their child. This hypothesis was accepted because the overall models were significant for both information seeking ($p < .000$) and intention to vaccinate ($p < .000$). There was a moderately strong relationship between EPPM variables and intention to vaccinate ($R^2 = .664$) and a moderate

relationship between EPPM variables and intention to seek information (R^2 of .461).

These results provide evidence for EPPM theory, as high perceptions of threat and efficacy are postulated to lead to intent to engage in health behavior.

However, tying these results together with the Aim 1 ANOVA results, in which no significant differences were found between message conditions for any of the EPPM variables, it is likely that intentions were based on pre-message exposure perceptions of threat of flu and efficacy of the flu vaccine, and not the manipulation of these variables within the health messages.

In the intention to vaccinate model, severity and response efficacy significantly predicted intentions to vaccinate, while susceptibility, fear, and self-efficacy did not. The model predicting intention to seek information found that susceptibility, fear, and response efficacy positively predicted intentions to seek more information, while severity and self-efficacy did not. This suggests that different variables are taken more strongly into consideration for different types of intentions (e.g. information seeking versus intention to vaccinate). For example, the emotion of fear was an important predictor in the information-seeking model, but not in the intention to vaccinate model. This could suggest that people do not like to make emotional decisions without doing further cognitive investigation. It is interesting to note that self-efficacy (the ability, ease or convenience of vaccinating their child), did not significantly predict either intentions to seek more information or to vaccinate in either model. As previously mentioned, the means for self-efficacy were quite high for all experimental groups. This suggests that for

this sample, it was not parents' ability to vaccinate their child that caused them to intend to vaccinate or not, but rather perceptions of severity of childhood flu and expectations regarding the ability of the flu vaccine to prevent the flu.

Also interesting to note is that response efficacy positively predicted both intentions to seek more information and intentions to vaccinate for both models. Response efficacy (aOR = 4.33) was by far the strongest predictor of intention to vaccinate of all EPPM variables. It was also the strongest predictor for intent to seek more information (aOR = 1.87), although fear (aOR = 1.80) was a close second.

This suggests at minimum that flu vaccine messages should focus on increasing perceptions of efficacy of the flu vaccines in preventing the flu. If current statistics about the effectiveness of the flu vaccine are not persuasive enough, this suggests that the flu vaccine must become more effective at preventing the flu in order to encourage those that do not have high perceptions of response efficacy to vaccinate their child. More research is needed on whether response efficacy is a large predictor of intentions to vaccinate for other diseases for which the vaccine is more effective at preventing the disease.

Hypothesis 6: Risk EPPM Variables

Hypothesis 6 was that perceived threat and fear of vaccines would negatively predict parental intentions to seek more information and vaccinate their child. This hypothesis was accepted because the models for both information seeking ($p = .003$) and intentions to vaccinate ($p < .000$) were significant. Although there was a moderate relationship between risk EPPM variables and intention to vaccinate ($R^2 = .462$), the

relationship between risk EPPM variable and intention to seek information was very weak ($R^2 = .097$) and only had predictive success for those leaning toward vaccination. This suggests that while threat and fear of vaccine side effects negatively predict intent to vaccinate, they may not have much of an influence on intentions to seek information.

In the intention to vaccinate model, only susceptibility to vaccine side effects and fear of vaccine side effects significantly negatively predicted intentions to vaccinate; however severity of vaccine side effects did not. The information-seeking model showed only susceptibility to vaccine side effects significantly negatively predicted intentions to seek more information; severity of vaccine side effects and fear of vaccine side effects did not. This again suggests that certain variables may be more strongly taken into consideration. It appears that parent's perceptions of their child's susceptibility to vaccine side effects is a more important contributor for both intention types than parent's perceptions of whether or not these side effects will be severe. When parents feel that their child is susceptible to negative side effects from vaccine and they fear these side effects, their intention to vaccinate should be lowered.

Taking the Aim 1 ANOVA results into consideration suggests that these messages did not significantly impact threat or fear of vaccine side effects no matter what the presentation method. This study did not specifically address vaccine side effects in the message; rather it intended to measure the impact of existing opinions of vaccine side effects on intentions to vaccinate and seek information. While some past research has been done on addressing negative perceptions of vaccination in health messages, it is

suggested that future vaccine studies consider whether health messages addressing susceptibility to vaccine side effects can reduce perceptions of susceptibility.

Hypothesis 7: Fear Control Variables

Fear control variables are theoretically important in that people who experience them may enter into the fear control response and reject the message rather than entering the danger control response and accepting the message. *Hypothesis 7* was that fear control variables would negatively predict parental intentions to seek more information and to vaccinate their child. This hypothesis was accepted because the regression models significantly predicted both intentions to vaccinate ($p < .000$) and intention to seek more information ($p < .000$). However, prediction was moderately weak for intention to vaccinate ($R^2 = .353$) and weak ($R^2 = .188$) for intention to seek more information.

For the intention to vaccinate model, only issue derogation and perceived manipulation significantly negatively predicted intentions to vaccinate while defensive avoidance did not. None of these variables individually significantly predicted information seeking. This suggests that intentions to vaccinate are affected by perceptions of the message itself - those who view a vaccination message as being overblown or exaggerated (issue derogation) or feel the message was manipulative or misleading (manipulation) will have decreased intention to vaccinate. This may not be a fair conclusion, however, since those who have previous negative feelings toward vaccination may also be more likely to perceive a vaccination messages as being overblown, exaggerated, manipulative, or

misleading. This study did not evaluate previous perceptions toward vaccination, so this chicken-or-egg scenario cannot be parsed out.

This study further suggests that although these variables may cause people to enter into the fear control process and reject the message in terms of intending to vaccinate, they do not have a large impact on rejecting the health concern altogether because intent to seek information is not largely affected. Thus, when the measured intention is information seeking, these fear control variables do not necessarily place people into a fear control process that will lead to message rejection, because they may enter a contemplation phase where they learn more about the health issue and solution before making a decision. The EPPM model does not currently allow for this contemplation phase after a message exposure, thus, it may be overly simplistic when describing decision-making processes.

Hypothesis 8: Credibility and Engagement

Hypothesis 8 was that perceived credibility and engagement variables would predict parental intentions to seek more information and to vaccinate their child. This hypothesis was accepted because both the intent to vaccinate model ($p < .000$) and the intent to seek information model ($p < .000$) were significant. A moderate relationship was found between credibility and engagement variables for intent to vaccinate ($R^2 = .457$) and a moderately weak relationship was found for intention to seek more information ($R^2 = .365$).

For the intention to vaccinate model, character and personal relevance positively predicted intentions; however, authority, attention and emotion did not. For the information-seeking model, relevance and emotion positively predicted information seeking, but authority, character, and attention did not. This again suggests that certain variables are more strongly taken into consideration for different types of intentions. Perception of personal relevance was an important predictor for both intention to vaccinate (aOR = 1.88) and intention to seek information (aOR = 2.15). Character was also important for intention to vaccinate (aOR = 2.00). Emotion was important for intention to seek more information (aOR = 1.40).

It is interesting that the message causing emotion (including sadness and anger) positively predicted information seeking, but it neither positively nor negatively predicted intentions. This was the same for the emotion of fear of flu (under EPPM variables). However, the emotion of fear of vaccines (under Risk EPPM variables) did significantly predict intentions. While this suggests that emotions that would nudge people toward vaccinations do not directly predict intentions to vaccinate, emotions that would nudge people away from vaccination do. The reverse is true for information seeking. While fear of flu and emotions resulting from reading the message positively predicted information seeking, fear of vaccines did not. The reasons for this require further investigations.

It is recommended that health messages try to increase credibility and engagement, but especially focusing on components of character of the message source and personal

relevance if trying to directly influence intentions. If trying to influence information seeking, personal relevance and emotion may be emphasized.

Hypothesis 9: Comparison of EPPM and Risk Threat Variables

While the EPPM has generally been found to be effective at changing attitudes, intentions, and/or behavior, there has been little research on the impact of the EPPM in the context of a 2-way threat in which the recommended behavior in and of itself is seen as being a threat. *Hypothesis 9* was that threat and fear of flu would be more important predictors of intention to vaccinate than threat and fear of vaccines while threat and fear of vaccines would be more important predictors of intent to seek information than threat and fear of flu.

The opposite was found to be true. Perceptions of severity of vaccine side effects, susceptibility to vaccine side effects, and fear of vaccine side effects as a set had a stronger negative relationship with intent to vaccinate ($R^2 = .462$) than the positive relationship between the set of severity of flu, susceptibility to flu, and fear of flu ($R^2 = .232$). Perceptions of severity of flu, susceptibility to flu, and fear of flu as a set had a stronger positive relationship with intent to seek information ($R^2 = .354$) than perceptions of severity of vaccine side effects, susceptibility to vaccine side effects, and fear of vaccine side effects had a negative relationship with intent to seek information ($R^2 = .097$). This suggests that threat and fear of flu are more important predictors of intent to seek more information than threat and fear of vaccines, and that threat and fear of

vaccines are more important predictors of intentions to vaccinate than threat and fear of flu.

Severity, susceptibility, and fear of flu were all significant positive predictors of intent to seek information while only susceptibility to vaccine side effects was a significant negative predictor of information seeking. Severity of flu was the only significant positive predictor of intent to vaccinate while susceptibility to and fear of vaccine side effects were both negative predictors.

This provides evidence that parent's fear of vaccine side effects, particularly their child's susceptibility to possible side effects, is a barrier for their intentions to vaccinate. Increasing perceptions of severity of childhood flu may help persuade them to vaccinate, but there is not evidence that the increased severity will overcome fears of vaccine side effects enough for them to decide to get their child a flu vaccine. More research is needed to determine what parents specifically fear their children are susceptible to if they get a flu vaccine (e.g. pain, autism, allergic reaction) and whether or not perceptions of susceptibility to vaccine side effects can be decreased.

This also provides evidence that increased perceptions of threat of flu can cause parents to be persuaded toward seeking more information about the flu vaccine. The very small effect size of threat and fear of vaccine side effects on intent to seek information suggests that these variables have little sway on intentions to seek information. Thus, if health marketers can heighten perceptions of threat and fear of flu, they may not have to

worry about lowering perceptions of threat and fear of vaccine side effects if the goal is to direct people to seek more information about the flu vaccine.

Taken together, this study suggests that vaccination messages based on the threat of a disease will likely not be effective in persuading people to vaccinate when threat of vaccines exist. However, vaccination messages that can increase threat or fear of a disease are likely to be effective in encouraging information seeking, as threat/fear of the disease is a more important predictor of information seeking than threat/fear of flu.

Aim 3 Discussion - Impact of Message Type on Intentions

Hypothesis 10: Outcome Variables

Hypothesis 10 was that parents in all three of the experimental conditions (statistical, narrative, and combined) would have significantly greater intentions to seek information and to vaccinate their children than the control condition. This hypothesis was accepted for the averaged information seeking variables, because all three experimental conditions had significantly higher intentions to seek information compared to the control. The hypothesis was rejected for intention to vaccinate, because none of the experimental conditions had significantly higher intentions to vaccinate when compared to the control.

When the averaged information seeking variable was broken down into three types of information seeking, only intentions to talk to family or friends and intentions to search online or from other sources was significant for some of the experimental conditions when compared to the control. Intentions to talk to family or friends was only

significant for those in the combined group compared to the control. Intentions to search online or from other sources was significant for both the combined and narrative groups. Intentions to talk to their child's doctor about the flu vaccine was not significant for any of the experimental message conditions compared to the control.

This is an interesting result, because none of the messages encouraged parents to talk to their physician. However, the message did state that the parent could talk to their health care provider if they had any questions or concerns. One possible reason for the non-significance for talking to a doctor is that parents find it easier to talk to friends or family or search online than to make an appointment to talk to their health care provider. Another possible reason is that people shy away from doing what they are specifically invited to do in the health message because they do not want to feel as if they are just doing what they are told.

The combined condition had a higher odds ratio than the statistical and narrative messages for the averaged information-seeking variable when compared to the control. In addition, only the combined condition was significant for intentions to talk to family and friends while the statistical and narrative were not. Although both the narrative and combined were significant for intentions to search online or from other sources, the combined condition had a higher odds ratio. This suggests that a combined narrative and statistical message most effectively influences multiple types of information seeking. Health messages should use a combined narrative and statistical message rather than a narrative-only or statistical-only in order to increase information-seeking intentions as

well as to increase perceptions of credibility and engagement and lower perceptions of manipulation, as previously discussed.

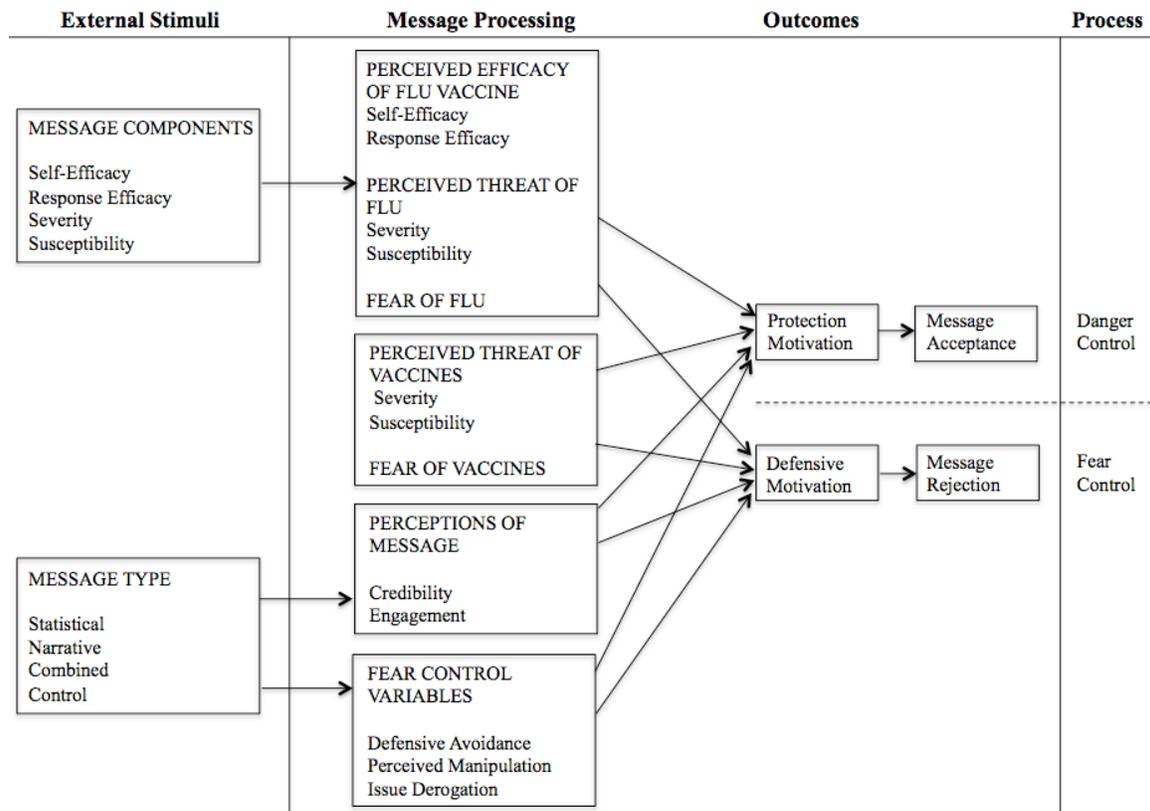
More research is needed to determine whether or not talking to family or friends or searching online increases vaccination uptake. The results would largely depend on the opinions of family or friends with regard to the flu vaccine and the type of information parents search for online. For example, more follow-up research could be done to determine if parents actually searched online, which sources they used, and whether this increased intentions to vaccinate or vaccination uptake. More research could also be done using a message that specifically links people to reliable websites, such as the CDC, and measuring how many of them click on the link. More research is also needed to determine if this increases vaccination uptake.

EPPM In Context of a Two-Way Threat

The results of my study suggest that EPPM variables (perceived threat and fear of flu and perceived efficacy of the flu vaccine), risk EPPM variables (threat and fear of vaccines), perceptions of the message itself (credibility and engagement), and fear control variables (perceived manipulation, defensive avoidance, and issue derogation) all influence message processing. These analyses suggest that there are more elements involved in processing of EPPM-based messages than the current model suggests. The figure below shows additions to the EPPM model based on my study findings. For example, this study found that message type affects perceptions of credibility of the message and

engagement within the message. Furthermore, perceptions of the message and fear control variables have been added to the model as important predictors of decision-making.

Figure 5. Suggested Additions to EPPM Model in Context of a Two-Way Threat



The results of my study suggest reconsideration of the way the EPPM works when in the context of a two-way threat. While health studies using the EPPM only consider threat in terms of threat of health risk (e.g. threat of breast cancer, threat of heart disease) they do not generally consider the threat of the recommended behavior (e.g. threat of mammogram, threat of exercising). In contrast to getting a mammogram or exercising, which are generally not perceived as dangerous activities, many people

perceive vaccination as being dangerous. My study suggests that the EPPM operates differently in the context of vaccination, since many people perceive vaccination itself to be a threat to their child's well-being. Thus, it is not only threat and fear of flu that affect the processing of the message, but also threat and fear of vaccines. One threat steers decision-making toward vaccination and the other threat steers decision-making away from vaccination.

Response efficacy

The results of the regression that included all significant predictor variables from the four categories of regression models (EPPM, risk EPPM, fear control variables, perceptions of message) found that response efficacy was the only significant predictor in the model. The odds ratio was 3.43. This finding suggests that the most important predictor of whether or not parents intend to vaccinate their child against the flu is their perception of how effectively the flu vaccine prevents the flu.

This quantitative finding is enriched by the qualitative feedback, in which parents indicated their concerns about the effectiveness of the flu vaccine including: "every year we GET the shot, my children and I all get the flu worse than we've EVER had it in the years when we didn't get the shot," "they still got the flu that year," "still get sick with the vaccine," "does not prevent the illness," "getting sick even after vaccine," and "doesn't seem to keep others from getting the flu". Specifically (and unique to the flu vaccine), several parents were skeptical about the ability of the flu vaccine in preventing the specific strains of flu that would be most common that year. Comments included:

“Doesn’t protect against every strain,” “does it really even work? Is it worth it? They get the strain wrong every year,” “the likelihood of getting a vaccine for the same strain they get is low,” “there are different strains of the flu each year and there’s no guarantees that my child’s vaccine will match the strain she might be exposed to.”

These findings suggest that flu vaccination messages focus on changing perceptions of how effectively the flu vaccine prevents the flu. This may be a challenge until the flu vaccine becomes more effective at preventing the flu. Challenges to persuading parents to vaccinate their children against the flu may differ from other vaccines for a number of reasons: the flu vaccine is recommended on an annual basis; it is not required for school; efficacy has historically been lower than other vaccines; and the composition of the vaccine is continually changing based on anticipated circulating strains of the flu.

Past vaccination

Those who had vaccinated at least one of their children against the flu in the past had three times higher odds for information seeking and 37 times higher odds for intention to vaccinate. More research is needed on whether this population intends to vaccinate their children for the flu on their own or if they require a reminder or some other strategy to move them to action each year. A once-a-year reminder may be an easy health marketing strategy for this population.

Remaining concerns

Although 43.1% of parents had no lingering concerns about the flu vaccine, 1/3 of parents were still concerned about the pain their child would experience when receiving the vaccine. It should be investigated to what degree expectations of their child feeling pain when receiving a vaccine is an actual barrier to vaccination, and to what extent they are concerned about pain but plan to vaccinate their child anyway. Negative stories in the media and a fear of too many vaccines to close together were also concerns.

Although quite a few parents distrusted pharmaceutical companies (14.0%) and the CDC (7.0%), it is unlikely that vaccination campaigns that consist of information from these sources will be viewed as credible or that this population will change their minds about vaccines based on a vaccination message. Religious objections were only a concern for a small minority of parents (2.3%). Because this is such a small percentage and because those with religious objections are unlikely to change their mind about vaccinating children, it is recommended that this population not be targeted in campaigns.

Logistical or access concerns such as cost, transportation issues, and lack of knowledge of where to receive that vaccine were extremely low for this population, indicating that self-efficacy is not a major concern (this is also reflected on the high self-efficacy means in Aim 1).

CHAPTER 9: CONCLUSIONS, RECOMMENDATIONS, AND LIMITATIONS

Conclusions

EPPM In Context of a Two-Way Threat

As noted in the discussion chapter, this study provides several additions to the EPPM model, including perceptions of the message (such as credibility and engagement) and fear control variables. It is further proposed that, when in context of a two-way threat where the desired health response may also be perceived as being dangerous (e.g. vaccination), the model also include threat and fear of the recommended behavior in the processing of the message. While much support has been found for the EPPM and fear control messaging, this study did not find the EPPM message to influence intentions to vaccinate. These additions to the model make an important contribution in explaining why.

The Influence of Message Type on Intention to Vaccinate and Seek Information

Several recent studies have reported that messages about vaccines are not effective because they do not increase intentions to vaccinate (Prati, Pietrantonio & Zani 2012) or even reduce intentions to vaccinate (Nyhan et al. 2014; Nyhan & Reifler 2015). In contrast, other recent studies have reported that messages have increased intentions to vaccinate, such as messages about the Hepatitis B vaccine among men who have sex with men (de Wit et al. 2008) and messages about the HPV vaccine among college students (Nan et al. 2015; Venkatesan 2010). This suggests that more work must be done to explain these discrepancies in results. Discrepancies may exist in terms of how the

message is crafted and resulting cognitive processing, type of vaccine, and study population. These studies did not include information seeking as an outcome variable. I argue that even messages that do not directly increase intentions to vaccinate may indirectly increase future vaccination by means of information seeking intentions; however more research must be done to determine if this is true. My study furthermore includes a combined narrative plus statistical message, while the aforementioned studies have only tested message effectiveness with one or the other. My study found that combined conditions are received more positively than statistical-only or narrative-only messages and recommends that future studies test vaccination messaging using a combined condition against a control, although this may have been confounded by length.

Prior research has found that parents seek information from a variety of sources such as the Internet, CDC, and other media before deciding to vaccinate their child (Kennedy et al. 2011). In addition, the public is more likely to respond to health messages the more frequently messages are heard (Hornik 2002). Gantz (1990) has reported that repeated exposure to messages is needed for change rather than one-shot messages, and all previous studies are one-shot message exposures (including this study). To expect a one-shot vaccination message to change parental intentions before parents have had an opportunity to search for information on their own may not be realistic.

Although this study did not find significant differences in intention to vaccinate across message conditions, it did find that overall intentions to seek information were significantly higher for all experimental conditions when compared to the control. When

the averaged information-seeking variable was broken down into three types of information seeking, only intention to talk to family or friends and intention to search online or from other sources was significant.

Intention to talk to a doctor did not differ significantly across conditions. However, this does not mean that health messages cannot effectively increase intentions to talk to a doctor. A study emphasizing genital warts caused increased intentions to talk to a doctor about the HPV vaccine among college women, although it did not increase intention to talk to a doctor for their parents. However, the same study found that a different message emphasizing cervical cancer did not increase intentions to talk to a doctor among college students or their parents (Krieger & Sarge 2013). This suggests that health messages can persuade participants to intend to talk to a doctor, when the right type of threat is presented. In this case, threatening college students with physical appearance was effective while threatening them with cancer was not.

In the United States, physician recommendation is one of the most important sources for vaccine-related information and one of the top reasons reported for people deciding to vaccinate (Salmon et al. 2005; Kennedy, Basket & Sheedy 2011; Gellin, Maibach & Marcuse 2000; Gargano et al. 2013; Freed 2004; Dorell et al. 2013). Parents who are unsure about vaccination safety have similar coverage rates to parents who believe vaccines are unsafe (Allred et al. 2005). However, parents who are undecided about vaccinating their children are open to discussions with their medical providers (Fredrickson et al. 2004), and parents who are influenced by their health care providers

are almost twice as likely to have positive opinions about vaccine safety than those who are not (Smith et al. 2006). Relatively low refusal rates have been found for childhood vaccination in health clinics and medical offices (Fredrickson et al. 2004). The type of threat that can persuade parents to talk to a doctor about the childhood flu vaccine, if any, should be investigated, as this is likely to increase vaccination rates.

Intention to talk to family or friends was only significant for those in the combined group compared to the control. This suggests that the combined group best influences intentions to engage in actual behavior. However, whether talking to family and friends would increase vaccination uptake depends largely on the opinions of family and friends. Health theories such as the Theory of Reasoned Action (Ajzen & Fishbein 1980) suggest that subjective norms (e.g. the beliefs of important other people in a person's social environment) influences health behavior. While talking to family and friends might be useful in encouraging childhood flu vaccination, it may also decrease childhood flu vaccination if family and friends have negative attitudes toward the flu vaccine.

Intention to search online or from other sources was significant for both the combined and narrative groups when compared to the control. Whether or not this would increase vaccination uptake depends largely on the types of websites explored and search terms entered. For example, an analysis of YouTube videos about vaccination showed 48% were pro-vaccine, 32% were vaccine-critical, and 20% were ambiguous (Keelan 2007). A study found that using the keyword search *vaccination* on the Internet resulted in about 60% vaccine-critical sites and 40% pro-vaccination sites while using the keyword

search *immunization* yielded 98% pro-vaccination sites and only 2% vaccine-critical sites (Wolfe & Sharp 2005).

Studies investigating the effect of Internet sites of vaccination decisions have conflicting conclusions. Some studies have found negative effects. One study found that spending five to ten minutes on vaccine-critical websites decreased intentions to vaccinate (Betsch et al. 2010). Another found that when parents are exposed to an equal amount of pro-autism and anti-autism vaccine controversy, parents less sure that vaccines do not cause autism (Dixon & Clarke 2013). Thus, intentions to seek information online may actually decrease vaccination rates if parents read vaccine-critical websites or even an equal amount of pro-vaccine and vaccine-critical websites. In contrast, a study found that although mothers were concerned about vaccine risks presented in vaccine-critical television vignettes, they “quickly reinstated their support for vaccination by deference to authority figures” and “type-casted immunization opponents” (Leask et al 2006). Although pro-vaccine messages may effectively persuade parents to search for more information online, the results in terms of attitudes toward vaccination and decisions whether or not to vaccinate could be either positively or negatively affected depending on the information parents are exposed to online. Thus, messages directing people to seek more information may consider directing people straight to CDC or other credible websites, and using the term *immunization* rather than *vaccination*.

Although this study found message type to significantly predict intentions to talk to family and friends and intentions to seek more information online, it is unclear how the

intentions translate to actual information seeking behavior. It is generally assumed that behavioral intentions strongly correlate to actual behavior (Ajzen 1991). Support was found for this link in a meta-analysis, which found that a medium-to-large change in intention led to a small-to-medium change in actual behavior (Webb & Sheeran 2006). The intention-behavior link has been supported in many other studies (Ajzen 1974; Armitage & Connor 2001; Kim & Hunter 1993; Sheppard, Hartwick & Warshaw 1988; Albarracin et al. 2001; Webb & Sheeran 2006). However, some have noted that some people intend to act but do not follow through (Orbell & Sheeran 1998; Sheeran 2002).

While participants may self-report intentions to seek information, they may only be in the motivational phase (Heckhausen 1991) of the decision-making process, and not yet in the planning phase, which would better predict actual behavior. (Gollwitzer & Oettingen, 1998; Sniehotka, Scholz & Schwarzer 2005). The gap between intentions and actual behavior can be influenced by a variety of conditions such as the type of intention and behavior (Sheeran 2002), self-report measures (Randall & Wolff 1994), and time elapsed between exposure and action (Glasman & Albarracin 2006). Although those in the combined condition may intend to talk to family and friends or search for more information online, this does not necessarily mean they will.

In conclusion, although this study did not find message type to significantly predict intention to vaccinate, other studies have found pro-vaccine messages to impact intentions to vaccinate as noted in the prior literature review. Differences in study results include type of disease, type of vaccine, type of threat, and study population. This study

provides evidence that fear-based flu vaccine messages aimed toward parents of children aged 6 months to five years will not effectively directly persuade them to vaccinate their child. While the combined message condition best influenced intentions to seek information, this was only true for intentions to talk to family or friends and intentions to search online or from other sources. Even with these differences in intentions, the link between intentions to seek information and actual information-seeking behavior is uncertain. Additional caution should be used with these results since actually talking to family and friends or searching online could have either a negative, neutral, or positive effect on vaccination uptake, since outcomes would largely depend on the attitudes of those they are speaking with and the types of websites they visit. Although intention to talk to a doctor did not significantly differ across conditions in this study, other studies have found immunization messages to significantly increase intentions to talk to a doctor, and further research should be done to determine if a health message can effectively persuade parents to talk to their pediatrician about the flu vaccine since this would likely increase vaccination uptake. Various types of information seeking and the connection to the vaccination uptake should be explored in future studies.

Message Type and Predictor Variables

Varying outcomes of past experimental pro-vaccination message studies in terms of influencing intention to vaccinate may differ for several reasons including presentation of the messages (de Wit et al. 2008, Nan et al. 2015, Nyhan et al. 2014, Wilson et al. 2005, Kreiger & Sarge 2013, Venkatesan 2010), degree to which messages are tailored to

the target population (Hart 2005), the degree to which study participants feel the message is manipulative, blown out of proportion, or the extent to which they avoid the issue (Witte 1994), perceptions of message source credibility (Priester & Petty 1995, Kreuter et al. 2007, McCroskey 1996), level of engagement in the message (DeJuliis et al. 2011, Wang 2006, Plummer 2006, Venkatesen 2010), and perceptions of risk of vaccine safety and side effects among the population (Salmon et al. 2005; Allred et al. 2005; Rand et al. 2011; Meszaros et al. 1996; Freed et al. 2010; Fredrickson et al. 2004; Gust et al. 2004; Niederhauser & Markowitz 2007; Lannon et al. 2005; Yawn et al. 2000). This study investigated many of these factors by message condition (statistical, narrative, combined, control) for the childhood flu vaccine in particular.

The results of this study suggest that narrative-only messages heighten feelings of manipulation while lowering perceptions of authority and character (and possibly relevance), while statistical-only messages lower attention paid to the message and emotional involvement with the message. The combined statistical and narrative message neither increased perceptions of manipulation nor lowered perceptions of any credibility or engagement variable when compared to the other messages.

The lower ratings of attention and emotion in the statistical-only message found in this study provides some evidence for Diekema's (2012) claim that "data and facts, no matter how strongly supportive of vaccination, will not be sufficient to compete with the opposition's emotional appeals." Although the statistical condition did not cause

increased manipulation or decreased credibility as the narrative condition did, this came at the cost of level of attention the message held and emotional involvement in the message.

The increased heightened ratings of emotion found in both the narrative and combined condition in this study supports assertions that stories and narratives are powerful tools to engage emotion (Gardner 2004) and provide emotional connection (Oatley 2002), especially stories about just one person (Newman 2003, Small et al. 2007; Diekema 2012). Emotion is postulated to engage attention, resulting in improved comprehension (Lazarus 1968; Liu & Stout 1987; Lazarus & Folkman 1984; Folkman, Schaefer & Lazarus 1979). However, for this particular narrative, this came at the cost of decreased perceptions of authority and character of the message source and increased feelings of being manipulated. Thus, message credibility in the narrative-only condition was compromised although this was not the case in the combined condition.

While some argue that a narrative can make rare events seem more probable (Fischhoff 1975), the narrative condition in this study did not significantly increase parent's perceptions of their child's susceptibility to the flu. While others suggest that narratives reduce counter-arguing (Niederdeppe, Shapiro, & Porticella 2011), several experimental vaccination studies have found that narrative-only messages have increased participants' negative feelings toward vaccination (Wilson et al. 2005), or that a sad, dramatic narrative increased beliefs about serious vaccine side effects (Nyhan et al. 2014) among those most strongly opposed to vaccination. These studies did not include

combined conditions, thus there is no way to determine if these “boomerang effects” would not be present if the narratives were coupled with facts and statistics.

In addition, previous research has suggested a threshold level for strong emotional appeals at which a person will become reactive and try to diminish emotions, possibly by rejecting the threat (Ghingold 1981). High-emotion appeals may “arouse feelings of anger, annoyance, and irritation” (Coulter and Pinto 1995; qtd. in Hibbert 2007, p. 725). A message that is too strong may cause the audience to become reactive and reject the message and this may vary under conditions such as the audience’s familiarity and feelings toward the narrator (Kreuter et al. 2007). This may have been the case in the Nyhan et al. (2014) study, causing a boomerang effect. In contrast, a study on H1N1 vaccine decision-making based on EPPM constructs revealed that when the audience was more emotionally engaged with the message, intention to vaccinate was higher (DeJuliis et al. 2011). My study did not find any such effects for the narrative-only message – neither a boomerang effect nor a greater intent to vaccinate. However, there was an increased perception of manipulation for the narrative-only message in my study.

Although my study found that the narrative increased attention and emotion, it also increased ratings of manipulation and decreased perceptions of message credibility compared to other messages. The combined condition neither increased manipulation nor decreased credibility compared to the other messages even though it contained the very narrative found in the narrative-only condition. Although Leask et al. (2006) calls for more personal stories about people who have been affected by vaccine-preventable

diseases, this study provides evidence that the stories alone may not be effective unless they are coupled with statistics, data, or facts. This is again in line with Diekema's (2012) assertion that supporting data, a rational argument, a messenger who is trustworthy, and emotional appeals are necessary for a health message to be effective.

Although a combined message may be viewed in a more positive light in terms of credibility and engagement, it is unlikely to change attitudes in accordance with EPPM theory. This study did not find any of the experimental messages, including the combined message, to increase threat of flu or efficacy of flu vaccines beyond that of the control message. It appears that pre-existing beliefs regarding these variables determined outcomes, rather than being exposed to a health message. This suggests that flu vaccination messages may not be effective at changing perceptions of threat of flu or efficacy of flu vaccines. More research is needed to determine if other messaging strategies can impact perceptions of these variables, or if these types of messages are ineffective due to strong pre-existing beliefs, or because one-shot messages are not effective.

However, Nan et al. (2015) found that a hybrid narrative and statistical message increased perceived risk of HPV compared to statistical-only and narrative-only messages. The differences between the two studies could be due to several factors such as differences in message constructions or differences in strength of previously held beliefs regarding flu among parents versus HPV among college students. Furthermore, differences in perceived risk of vaccination in children under five years of age is likely to be very different than perceived risk of immunization among college students, as concerns toward childhood

vaccination are more likely to include perceptions of harm while concerns toward adolescent vaccination are more likely to include lack of knowledge, lack of recommendation from a medical provider, and beliefs that the vaccine is not necessary (Stockley et al. 2011; Chen et al. 1998).

It is important not to over-generalize the results of this study to all narratives, since not all narratives are comparable in content or tone (Shaffer & Zikmund-Fisher 2013), plot development, character development, emotional intensity, dramatic tension, transparency of persuasive intent (Kreuter et al. 2007), coherency, or fidelity (Hart 2005). Whether narratives are presented in first or third person (Winterbottom et al. 2008) has also been found to affect changes in attitudes or intentions.

In addition, the type of behavior the audience is being persuaded toward may also influence effectiveness of the message, and for a behavior that is sometimes perceived as a threat (vaccination) parents may be more likely to be defensive than for other types of health messages. However, a study in context of vaccination found that a peer-expert combination narrative nearly doubled HPV vaccination uptake among college students compared to controls (22% vs. 12%), while peer-only and expert-only did not significantly increase vaccination uptake (Hopfer et al. 2012). Since my study neither included a peer-expert combination narrative nor a first-person narrative, further research could investigate a first-person peer plus expert narrative coupled with facts on parent's decisions to immunize their children against influenza.

This study provides evidence that to minimize perceptions of manipulation and maximize perceptions of credibility and engagement, health messages should be presented in combined (narrative + statistical) form. However, this study also provides evidence that reading high-threat messages about the flu combined with high-efficacy components about the flu vaccine did not change perceptions of threat, feelings of fear, and perceptions of efficacy no matter what form (statistical, narrative, combined) it is presented in. Thus, using the EPPM framework to create high-threat / high-efficacy messages about childhood flu may not be an effective approach for flu vaccine messages in terms of changing attitudes or intentions to vaccinate. While combined messages may influence information seeking, it is unclear whether or not increased information seeking will increase or decrease vaccination rates, so these results should be used with caution.

Variables Predicting Intention to Seek Information and Intention to Vaccinate

This study suggests that multiple forces are at play when predicting vaccination decisions. While EPPM variables along with credibility and engagement variables positively predict intent to vaccinate, risk EPPM variables and fear control variables negatively predict vaccination. Pre-existing beliefs such as threat and fear of flu, efficacy of the flu vaccine, and threat and fear of vaccines, are likely to influence decisions. This study suggests that message construction can also influence intentions regardless of prior beliefs – such as perceptions of message credibility, engagement in the message and perceptions of the message being manipulative. However, these perceptions can also be influenced by prior beliefs, although the fact that these perceptions differed by message

condition in a randomized study suggests that the presentation of the message itself is at least partially responsible for these perceptions. Overall, intentions were not significantly different between message conditions. However, this study provides insight into individual factors that affect this two-way threat decision-making process. These factors positively and negatively influencing intentions to vaccinate can interact with each other to neutralize intentions to vaccinate

Perceptions of the effectiveness of the flu vaccine in preventing the flu was the largest predictor variable for intent to vaccinate in the EPPM model, and the only significant predictor when the significant variables from all the models were combined into a single regression. Perceptions of severity of childhood flu was another significant predictor variable for intentions to vaccinate in the EPPM model, while parent's perceptions of their child's susceptibility to flu and fear of their child contracting the flu were significant predictors for intentions to seek information in the EPPM model. Ability, ease, and convenience of vaccinating their child against the flu were not significant predictors for either EPPM model and the means were quite high, indicating this is not a significant barrier.

Several authors have suggested that a significant interaction effect has been found between threat and efficacy, with threat only having a significant effect under high efficacy conditions and vice versa (Peters, Ruiter & Kok 2013). While this study did not directly test this assertion, findings from this study support that in an EPPM model, perceptions of vaccine efficacy are crucial to intentions to vaccinate. It is likely that given

the importance of response efficacy in this context, a message containing threat of flu will not persuade parents to vaccinate their children unless they perceive the flu vaccine as effectively preventing the flu. Flu vaccine messages should focus on increasing perceptions of efficacy of flu vaccines. Qualitative responses indicate that this may partially be accomplished by addressing concerns about vaccines not including the right strains of the flu, and concerns about the vaccine not being able to prevent the flu.

While threat and fear of flu positively impacted intentions to vaccinate, threat and fear of vaccines negatively predicted intentions to vaccinate. Susceptibility to vaccine side effects and fear of vaccine side effects were important predictors. The greatest concern reported by parents in this study was the pain their child would experience, which is in line with previous studies in which parents have been found to have major concerns about the pain their baby will feel when vaccinated (Kennedy, Basket & Sheedy 2011; Mills et al. 2005). Qualitative responses indicated that other concerns include the child developing flu-like symptoms after receiving a flu vaccine, getting the flu from the vaccine, and vaccines being unsafe. Some of the qualitative responses included personal past experiences or past experiences of family or friends. It seems unlikely that a one-shot marketing narrative will compete with a personal experience or an experience of a close friend or relative.

While this study suggests that high-threat messages about the flu do not significantly increase perceived threat of flu or comparative threat of the flu vaccine, this study did not include any information about the risk of vaccines within the messages. A

previous experimental study found that when parents were exposed to an ad showing risks of the MMR compared to risks of the diseases, significantly more experimental subjects were leaning towards immunizing their child after exposure to the ad (39% pre-test, 55% post-test) (Wallace, Leask & Trevena 2006). Thus, further research should be done to determine if a message comparing risk of childhood flu to risk of the childhood flu vaccine could increase intentions.

In addition, fear control variables were found to negatively impact intentions to vaccinate. Feelings that the message was overblown, exaggerated, manipulative, or misleading significantly predicted intentions to vaccinate. However, these variables had very little influence on intentions to seek more information about the flu vaccine. Health messages should take care that people do not come away from reading the message feeling as though they are being manipulated into the health behavior, or that the message was overstated. More subtle health narratives may be preferable. The narrative message condition had significantly higher ratings of manipulation than the other conditions, suggesting that when people hear a sad story that is not backed up by facts/statistics, they may feel manipulated, and manipulation in turn negatively predicts intentions to vaccinate. Due to the negative effect on manipulation that was found in the narrative-only message (which was not present in the combined condition), a sad story should be presented along with statistics to curb the unintended consequence of perceived manipulation that occurs when presenting a sad story alone.

While fear control variables are generally thought to place people into a fear control process that leads to message rejection, this study suggests that regardless of these variables, people may still enter a contemplation phase where they learn more about the health issue and solution before making a decision. The EPPM model does not currently allow for this contemplation phase after a message exposure, and this study suggests a contemplation phase be added to EPPM theory instead of merely a dichotomous response (message acceptance or message rejection). Assuming that people have merely rejected the message because they do not immediately report intentions to engage in the health behavior may be erroneous if they are considering the behavior by doing more research on it. Fear control variables causing people to enter a fear control process that eventually leads to message rejection may be an overly simplistic when describing decision-making processes.

Credibility and engagement variables positively predicted both intentions to vaccinate and intentions to seek more information. For the intention to vaccinate model, character and personal relevance significantly positively predicted intentions; however, authority, attention and emotion did not. However, a previous study vaccination study found emotional involvement with the message did increase behavioral intention (DeJuliis et al. 2011). Another study on the HPV vaccine found attention paid to message to be associated with both knowledge retention and increased intention to vaccinate at six weeks after message exposure (Venkatsan 2010). Thus, while attention and emotion were

not significant for this particular regression model, they likely do assert some influence on intentions.

For the information-seeking model, relevance and emotion positively significantly predicted information seeking, but authority, character, and attention did not. This suggests that certain variables are more strongly taken into consideration for different types of intentions. It is recommended that health messages try to increase credibility and engagement overall, and this study suggests that the best way to do this is to present information in both narrative + statistical form.

While the message causing emotion (including sadness and anger) positively predicted information seeking, emotion neither positively nor negatively predicted intentions. This was the same for the emotion of fear of flu (under EPPM variables). However, the emotion of fear of vaccines (under Risk EPPM variables) did significantly predict intentions. While fear of flu and emotions resulting from reading the message positively predicted information seeking, fear of vaccines did not. The reasons for some emotions affecting only intentions to vaccinate while other emotions affected only intentions to seek information requires further investigation.

Marketers should consider what outcome they are looking for when presenting vaccination messages. For example, this study suggests that public health marketing messages sparking emotions such as sadness and anger is likely to increase intentions to seek information, although those emotions did not directly predict intentions in this study. Thus, emotion may be a useful tool, and this was found to be most effective in the

narrative and combined conditions. Again, to avoid feeling of manipulation, it is suggested that if a sad story is to be used to increase emotion, it is coupled with reliable facts and statistics. Marketers should also strive to increase perceptions of personal relevance.

Remaining Concerns

This sample showed that many (43.1%) of parents did not have any remaining concerns toward vaccination after being exposed to one of the four health messages. However, over 1/3 of the parents had concerns about pain the child would feel when they received the vaccine. Exposure to negative stories in the media (17.5%) and fear of too many vaccines too close together (14.6%) were additional concerns. One access barrier with was scheduling (8.7%), so vaccination campaigns may consider trying to alleviate scheduling issues by offering vaccination in a convenient location where parents may already be with their children. This has been suggested in previous literature, including providing more flexible appointment schedules and decreasing waiting times at clinics (Lannon et al. 1995, Houseman et al. 1997). Distrust of the CDC (7.0%), and pharmaceutical companies (14.0%) were also found to be concerns for a minority of the sample, and this population is unlikely to be affected by messages if they do not believe these messages are credible (Keane et al. 2005; Serpell & Green 2006; Mills et al. 2005; Brown et al. 2010; Shui et al. 2005; Salmon et al. 2005). However, some authors report that these suspicious parents sometime chose to vaccinate due to social norms (Shui et al. 2005) or perceptions of “good parenting” and “social responsibility” (Leask et al. 2006). Thus, using a different theory that more heavily emphasizes social norms in message

design may be better than a fear-based message for those distrustful of the CDC and pharmaceutical companies. Very few parents had religious objections (2.3%) or access concerns such as cost (3.2%), transportation issues (2.9%), or lack of knowledge of where to receive a vaccine (1.2%). It is suggested that messages focus on easing concerns about pain, countering negative media, and debunking myths about too many childhood vaccines being received too close together.

Limitations

There are several limitations to this study. First, the sample was recruited online, which has a number of challenges as stated below. There are also sample-specific limitations to generalizability. There are additional limitations to generalizability of the results such as generalizability across diseases type and presentation of narrative. While this study included a large number of predictor variables, it did not include all possible predictor variables. This study is a one-shot exposure to a health messages, and health communication campaigns are typically multi-faceted with multiple exposures to message. Lastly, the intention-behavior link is unclear, as well as the relationship between various intentions to seek information and their potential effect on vaccination uptake. Each of these limitations is described in detail below.

Online Sampling and Data Quality Measures

There are some unique challenges to opt-in online panels. Because respondents are not monitored and most likely completing the survey from their home, they may be distracted. However, they may also be distracted in a real life campaign when they receive

messages. Since respondents are rewarded with incentives, there is a greater possibility of “speeders” quickly completing the survey without providing careful responses. There may be issues with respondents taking the survey multiple times in order to receive multiple incentives. There is also a possibility of people who do not meet the inclusion criteria taking the survey in order to receive the incentive.

In order to reduce the impact of these limitations, data quality measures were embedded into the survey. These quality measures included screeners, validation, attention filters, institutional credibility, duration filters, and multiple submission guards in order to limit the number of unreliable results.

Screeners: The consent form indicated that participants would be taken to a screener to determine whether or not they meet the inclusion criteria of the study. Participants were blind to the inclusion criteria prior to the screener. The screener questions were inserted to ensure that the participant lived in the United States, was over 18 years old, had children living at home, and had at least one child between the ages of 6 months to five years. Instead of asking yes or no questions which could potentially alert the respondent to the inclusion criteria, respondents were asked questions such as “how many children do you have?” and “what are the ages of your children?”. Skip logic was used so that participants who did not answer according to the criteria were automatically taken out of the survey. Participants who fit the criteria were taken to the survey instructions.

Validation: Qualtrics was programmed to “force response” for each question so that only complete surveys would be counted in the analysis. Respondents who did not answer a question could not proceed to the next survey page. However, respondents could close or opt-out of the survey at any time.

Attention Filters: Four attention questions (e.g. “If you are reading this, please select moderately disagree”) were embedded into question matrices in order to reduce the number of “straight-liners” or “speeders.” Those who answered incorrectly were immediately taken out of the survey.

Institutional Credibility: Surveys sponsored by academic institutions tend to have higher response rates. ASU’s logo appeared in the survey, and the instructions clearly stated that the survey was an academic study through Arizona State University.

Duration Filters: The messages were attached to a hidden timer so that participants who did not spend an adequate amount of time reading the message before clicking the “next” button were automatically taken out of the survey. 20 seconds was the minimum amount of time required to read the statistical, narrative and control message. Respondents assigned to the longer combined message were required to spend at least 30 seconds reading the message. Respondents who failed to spend the minimum amount of time reading were automatically taken out of the survey. Total survey duration was also recorded. Respondents who took less than five minutes to complete the entire survey were not counted as “completes.” Likewise, respondents who spent more than 45 minutes on the survey were likely distracted, and were not included in the analysis.

Multiple Submission Guards: The IP address of each respondent was recorded in the analysis. Respondents were sorted by IP address and any responses from the same address were deleted from the analysis.

Sample

The target population was parents of children aged 6 months to five years. As previously stated in this chapter, the literature has demonstrated that parents have different concerns surrounding vaccination of very young children compared to teens (Stockley et al. 2011; Chen et al. 1998). Thus, a vaccination message geared toward persuading parents to vaccinate younger children may not be as effective as one aimed at persuading parents to vaccinate older children, teens, or themselves. This population was mostly white and middle-income and consequently does not adequately represent all parents with young children. However, results from the National Immunization Survey suggest that the highest proportion of vaccine-refusing parents were white (Gust et al. 2008). Similarly, an extensive study in Arizona found that kindergartens with the highest proportion of white students were 14 times more likely to obtain a personal belief exemption than those with the lowest proportion of white students (Birnbaum et al. 2012). The population was also predominantly female, and females may not be influenced by the same components of fear-based messaging as males (Lennon & Rentfro 2010). However, since mothers are generally make decisions regarding their children's health, this may also be more of an advantage than a limitation.

It is possible that parents who completed the study may have held more positive views toward vaccination than those who terminated the survey early; however due to informed consent this bias is difficult to avoid.

Generalizability

It is unknown how generalizable this flu vaccine message study is to other diseases. There is evidence that parents perceive some vaccines to be more risky than others (Gust et al. 2008, Freed et al. 2010). A variety of factors could affect how well a target audience responds to flu in relation to other diseases, such as the commonness vs. uncommonness of the disease, their knowledge level surrounding diseases, their perceptions of severity of the disease, the disgust factor surrounding the disease, perceptions about efficacy or risk of the particular vaccine, etc. Thus, it is unknown how a similar study would fare for a lesser-known disease, such as meningitis.

These results are not generalizable across all narratives, since many different elements of a narrative message affect the persuasiveness of the message. For example, this narrative was sad, while happy narratives may have a different effect. In addition, the narrative was not given in first-person in order to preserve the integrity of the message. The sources in the message may not have all been perceived as equally credible. While the CDC is well-known, Families Fighting Flu may not be. Like most EPPM self-report surveys, people may have a challenge rating their levels of emotion such as fear and manipulation.

Predictor Variables

Another limitation is that this study used the Extended Parallel Process Model to frame messages. Many other health theories are postulated to influence behavior. It cannot then be concluded that flu vaccination messages do not work because an EPPM study did not influence intentions. Other factors predicted to influence health behaviors, such as social responsibility or perceived norms, were not incorporated into the message design. More research should be done to determine if vaccination messages based on other theories, rather than a fear-based theory, more effectively persuades parents to vaccinate their children.

This study, while measuring more potential predictor variables than most, was unable to measure all possible predictor variables such as political party (Niederdeppe et al. 2011), perceived similarity with the messenger (Lu 2013), level of prior thought given to the health issue (Kopfman et al. 1993), participant desire to fully understand the issue (Braverman 2008), alignment with personal values and beliefs (Slater & Rouner 1996; Wilson et al. 2005), etc. Thus, it is not meant to be comprehensive in terms of providing explanations of cognitive processing of flu vaccine messages.

One-shot Exposure

Another limitation is that respondents were only exposed to one message at one time. Health campaigns are generally multifaceted, with health messages received through different mediums, in different ways, and at different times. One-shot exposures are unlikely to be as effective as repeated exposures. Thus, it cannot be concluded that flu

vaccination campaigns do not influence intentions even if a one-shot message did not influence intentions.

Intention-Behavior Link

Finally, the link between intentions to seek information and actual information seeking is not measured in this study. The link between information seeking and subsequent vaccination is also uncertain. Specifically, talking to family and friends about vaccination and searching online and the connection to vaccination uptake is unknown. Thus, this study cannot claim that health messages are effective, even if intentions to seek information increased when the messages were presented in different forms. Finally, future longitudinal assessments are needed to assess whether intention to vaccinate and intention to seek information will lead to an increased uptake of the vaccine.

Recommendations and Future Research

Findings from this randomized controlled trial of parents of young children support the impetus to develop effective vaccination messaging strategies and to increase physician-parent communication regarding influenza vaccination. It is recommended that future studies promoting vaccination focus on effective strategies to direct parents to talk to their child's pediatrician about vaccines as well as increasing perceptions of the effectiveness of the flu vaccine in preventing childhood flu.

This study recommends that vaccination messages begin with a narrative and conclude with statistical information, as these messages are more likely to be viewed as more credible and engaging than statistics-only or narrative-only messages. In addition,

there is evidence that presenting narratives along with statistics compensates for feelings of being manipulated when compared with narrative-only messages. This is important because perceptions of manipulation were found to negatively predict intentions to vaccinate.

Health messages are unlikely to change attitudes for parents who already have strong existing beliefs about the flu or flu vaccine. Before attempting to increase perceptions of threat of the flu and efficacy of the flu vaccine in large-scale campaigns, campaign organizers should investigate attitudes of the target population toward the flu vaccine in order to tailor the message. This study also suggests that messages should be pilot tested to aid in increasing perceptions of effectiveness of the flu vaccine, increasing perceptions of personal relevance, ensuring the message does not seem overblown or manipulative, and increasing perceptions of the trustworthiness of the source. Future research should also include tests of other health theory constructs in encouraging flu vaccination, such as notions of social responsibility.

Response efficacy was the strongest predictor variable of parents leaning toward vaccinating their child against the flu. Several participants in this study had concerns that the wrong strains of flu would be included in the vaccine, and that the vaccine is not effective at preventing the flu. It is recommended that for the flu vaccine, more research should be done on different types of response efficacy messages to determine if any of these messages can change perceptions of the effectiveness of the flu vaccine in preventing the flu (such as emphasizing how well it prevents people from contracting the

flu, how effectively it decreases severe consequences of the flu such as hospitalizations and deaths, etc.). Since response efficacy was the largest predictor of intention to vaccinate for flu, efforts concentrated in this area may be well justified.

It is also recommended that further research be conducted on the effect of various types of information-seeking intentions and actual information-seeking behavior. Furthermore, outcomes such as attitudes toward the flu vaccine and vaccination uptake should be investigated with regard to information seeking to determine if talking to family and friends or searching for more information online can effectively increase vaccination uptake and prevent the spread of the flu. If information seeking does not actually increase vaccination rates, these messages may not be effective. More research should also be done to determine if multiple, multi-faceted message exposures increase perceptions of threat of childhood flu or efficacy of the flu vaccine, as this one-shot message is less likely to be effective.

REFERENCES

- Abraham, C., Sheeran, P., & Johnston, M. (1998). From health beliefs to self-regulation: Theoretical advances in the psychology of action control. *Psychology and Health, 13*(4), 569-591.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211.
- Ajzen, I. & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.
- Ajzen, I., & Fishbein, M. (1974). Factors influencing intentions and the intention-behavior relation. *Human Relations, 27*(1), 1-15.
- Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin, 84*(5), 888.
- Ajzen, I., & Fishbein, M. (2000). Attitudes and the attitude-behavior relation: reasoned and automatic processes. *European Review of Social Psychology, 11*(1), 1-33.
- Albarracín, D., Johnson, B. T., Fishbein, M., & Muellerleile, P. A. (2001). Theories of reasoned action and planned behavior as models of condom use: a meta-analysis. *Psychological Bulletin, 127*(1), 142.
- Albarracín, D., McNatt, P. S., Klein, C. T., Ho, R. M., Mitchell, A. L., & Kumkale, G. T. (2003). Persuasive communications to change actions: an analysis of behavioral and cognitive impact in HIV prevention. *Health Psychology, 22*(2), 166.
- Albrecht, S. L., & Carpenter, K. E. (1976). Attitudes as predictors of behavior versus behavior intentions: A convergence of research traditions. *Sociometry, 1*-10.
- Allen, M. & Preiss, R.W. Comparing the persuasiveness of narrative and statistical evidence using meta-analysis. *Communication Research Reports, 14*(2), 125-131.
- Allred, N. J., Shaw, K. M., Santibanez, T. A., Rickert, D. L., & Santoli, J. M. (2005). Parental vaccine safety concerns: results from the National Immunization Survey, 2001–2002. *American Journal of Preventive Medicine, 28*(2), 221-224.
- Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology, 40*(4), 471-499.

- Bagozzi, R. P., & Moore, D. J. (1994). Public service advertisements: emotions and empathy guide prosocial behavior. *Journal of Marketing*, 58(1).
- Bailey E. J., Erwin D. O., & Belin P. (2000). Using cultural beliefs and patterns to improve mammography utilization among African-American women: The Witness Project. *Journal of the National Medical Association*, 92:136–142.
- Ball, L. K., Evans, G., & Bostrom, A. (1998). Risky business: challenges in vaccine risk communication. *Pediatrics*, 101(3), 453-458.
- Bamberger, E. & Srugo, I. (2008). What is new in pertussis? *European Journal of Pediatrics*, 167, 133-139.
- Bandura, A. (1974). Behavior theory and the models of man. *American Psychologist*, 29(12), 859.
- Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191.
- Bandura, A. (1991). Social cognitive theory of moral thought and action. *Handbook of Moral Behavior and Development*, 1, 45-103.
- Bardenheier, B., Yusuf, H., Schwartz, B., Gust, D., Barker, L., & Rodewald, L. (2004). Are parental vaccine safety concerns associated with receipt of measles-mumps-rubella, diphtheria and tetanus toxoids with acellular pertussis, or hepatitis B vaccines by children? *Archives of Pediatrics & Adolescent Medicine*, 158(6), 569.
- Basil, M., & Witte, K. (2011). Health risk message design using the extended parallel process model. *Health Communication Message Design*, 41-58.
- Bean, S. J. (2011). Emerging and continuing trends in vaccine opposition website content. *Vaccine*, 29(10), 1874-1880.
- Beck, K. H. (1984). The effects of risk probability, outcome severity, efficacy of protection and access to protection on decision making: A further test of protection motivation theory. *Social Behavior and Personality: an International Journal*, 12(2), 121-125.
- Bentler, P. M., & Speckart, G. (1979). Models of attitude–behavior relations. *Psychological Review*, 86(5), 452.

- Bernard, H.R. (2001). *Research Methods in Anthropology: Qualitative and Quantitative Approaches*. 5th ed., New York, NY: AltaMira.
- Betsch, C., Renkewitz, F., Betsch, T., & Ulshöfer, C. (2010). The influence of vaccine-critical websites on perceiving vaccination risks. *Journal of Health Psychology, 15*(3), 446-455.
- Betsch, C., Ulshöfer, C., Renkewitz, F., & Betsch, T. (2011). The influence of narrative v. statistical information on perceiving vaccination risks. *Medical Decision Making, 31*(5), 742–753.
- Birnbaum, M. S., Jacobs, E. T., Ralston-King, J., & Ernst, K. C. (2013). Correlates of high vaccination exemption rates among kindergartens. *Vaccine, 31*(5), 750-756.
- Block, L. G. (2005). Self-referenced fear and guilt appeals: the moderating role of self-construal. *Journal of Applied Social Psychology, 35*(11), 2290-2309.
- Bond, L., Nolan, T., Pattison, P., & Carlin, J. (1998). Vaccine preventable diseases and immunisations: a qualitative study of mothers? Perceptions of severity, susceptibility, benefits and barriers. *Australian and New Zealand Journal of Public Health, 22*(4), 441-446.
- Bonfiglioli, R., Vignoli, M., Guglielmi, D., Depolo, M., & Violante, F. S. (2013). Getting vaccinated or not getting vaccinated?: different reasons for getting vaccinated against seasonal or pandemic influenza. *BMC Public Health, 13*(1), 1221.
- Borràs, E., Domínguez, À., Fuentes, M., Batalla, J., Cardeñosa, N., & Plasencia, A. (2009). Parental knowledge of paediatric vaccination. *BMC Public Health, 9*(1), 154.
- Boster F. J., Mongeau P. (1984). Fear-arousing persuasive messages, in Bostrom RN, Westley BH (eds.): *Communication Yearbook 8* Beverly Hills, CA, Sage, 1984, pp. 330-375.
- Braverman, J. (2008). Testimonials versus informational persuasive messages: the moderating effect of delivery mode and personal involvement. *Communication Research, 35*(5), 666-694.
- Brenner, R. A., Simons-Morton, B. G., Bhaskar, B., Das, A., & Clemens, J. D. (2001). Prevalence and predictors of immunization among inner-city infants: a birth cohort study. *Pediatrics, 108*(3), 661-670.

- Brewer, N. T., Chapman, G. B., Gibbons, F. X., Gerrard, M., McCaul, K. D., & Weinstein, N. D. (2007). Meta-analysis of the relationship between risk perception and health behavior: the example of vaccination. *Health Psychology, 26*(2), 136.
- Briones, R., Nan, X., Madden, K., & Waks, L. (2012). When vaccines go viral: an analysis of HPV vaccine coverage on YouTube. *Health Communication, 27*(5), 478-485.
- Brown, K. F., Kroll, J. S., Hudson, M. J., Ramsay, M., Green, J., Long, S. J., & Sevdalis, N. (2010). Factors underlying parental decisions about combination childhood vaccinations including MMR: a systematic review. *Vaccine, 28*(26), 4235-4248.
- Burnett, J. J., & Oliver, R. L. (1979). Fear appeal effects in the field: a segmentation approach. *Journal of Marketing Research (JMR), 16*(2).
- Cameron, K. A., Rintamaki, L. S., Kamanda-Kosseh, M., Noskin, G. A., Baker, D. W., & Makoul, G. (2009). Using theoretical constructs to identify key issues for targeted message design: African American seniors' perceptions about influenza and influenza vaccination. *Health Communication, 24*(4), 316-326.
- Campbell, R. G., & Babrow, A. S. (2004). The role of empathy in responses to persuasive risk communication: Overcoming resistance to HIV prevention messages. *Health Communication, 16*(2), 159-182.
- Carcioppolo, N., Jensen, J. D., Wilson, S. R., Collins, W. B., Carrion, M., & Linnemeier, G. (2013). Examining HPV threat-to-efficacy ratios in the Extended Parallel Process Model. *Health Communication, 28*(1), 20-28.
- Carey RN, McDermott DT, Sarma KM. (2013). The impact of threat appeals on fear arousal and driver behavior: a meta-analysis of experimental research 1990-2011. *PloS one; 8*(5): e62821.
- Cawley, J., Hull, H. F., & Rousculp, M. D. (2010). Strategies for implementing school-located influenza vaccination of children: a systematic literature review. *Journal of School Health, 80*(4), 167-175.
- Celentano, LP, Massari, M., Paramatti, D., Salmaso, S. & Tozzi, AE. (2005). Resurgence of pertussis in Europe. *The Pediatric Infectious Disease Journal (24)*, 761-765.

- Centers For Disease Control and Prevention (2013). Flu vaccination coverage, United States, 2011-12 Season. Retrieved from http://www.cdc.gov/flu/fluview/coverage_1112estimates.htm
- Chaiken, S. (1979). Communicator physical attractiveness and persuasion. *Journal of Personality and Social Psychology*, 37(8), 1387.
- Chaiken, S. (1987). The heuristic model of persuasion. Retrieved from <http://psycnet.apa.org/psycinfo/1987-97608-001>
- Chaiken, S., & Stangor, C. (1987). Attitudes and attitude change. *Annual Review of Psychology*, 38(1), 575–630.
- Chen, R. T., DeStefano, F., Pless, R., Mootrey, G., Kramarz, P., & Hibbs, B. (2001). Challenges and controversies in immunization safety. *Infectious Disease Clinics of North America*, 15(1), 21-39.
- Chowell, G., Viboud, C., Wang, X., Bertozzi, S. M., & Miller, M. A. (2009). Adaptive vaccination strategies to mitigate pandemic influenza: Mexico as a case study. *PLoS One*, 4(12), e8164.
- Cohen, N. J., Lauderdale, D. S., Shete, P. B., Seal, J. B., & Daum, R. S. (2003). Physician knowledge of catch-up regimens and contraindications for childhood immunizations. *Pediatrics*, 111(5), 925-932.
- Corbin, J. and A. Strauss, *Grounded Theory Research: Procedures, Cannons, and Evaluative Criteria*. Qualitative Sociology, 1990. 13(1).
- Coulter, R. H., & Pinto, M. B. (1995). Guilt appeals in advertising: what are their effects? *Journal of Applied Psychology*, 80(6), 697.
- Cox D.S., & Cox A. D. (2001). Communicating the consequences of early detection: The role of evidence and framing. *Journal of Marketing*, 65, 91–103.
- Danis, K., Georgakopoulou, T., Stavrou, T., Laggas, D., & Panagiotopoulos, T. (2010). Socioeconomic factors play a more important role in childhood vaccination coverage than parental perceptions: a cross-sectional study in Greece. *Vaccine*, 28(7), 1861-1869.
- De Wit, J. B., Das, E., & Vet, R. (2008). What works best: objective statistics or a personal testimonial? An assessment of the persuasive effects of different types of message evidence on risk perception. *Health Psychology*, 27(1), 110.

- DeJuliis, D., Donaldson, C., Herring, C., & Maglalang, O. (2011). The mediating role of message engagement in the Extended Parallel Process Model. *Journal of Health and Mass Communication, 3*(1-4), 138.
- Dempsey, A. F., Singer, D., Clark, S. J., & Davis, M. M. (2009). Parents' views on 3 shot-related visits: implications for use of adolescent vaccines like human papillomavirus vaccine. *Academic Pediatrics, 9*(5), 348-352.
- DeStefano, F. (2007). Vaccines and autism: evidence does not support a causal association. *Clinical Pharmacology & Therapeutics, 82*(6), 756-759.
- DiClemente, C. C., Prochaska, J. O., & Gibertini, M. (1985). Self-efficacy and the stages of self-change of smoking. *Cognitive Therapy and Research, 9*(2), 181–200.
- Diekema, D. S. (2005). American Academy of Pediatrics. When parents refuse to immunize their children. *Pediatrics, 115*(5), 1428-1431.
- Diekema, D. S. (2005). Responding to parental refusals of immunization of children. *Pediatrics, 115*(5), 1428-1431.
- Diekema, D.S. (2012). Improving childhood vaccination rates. *New England Journal of Medicine, 366*, pp. 391–393.
- Dixon, G. N., & Clarke, C. E. (2013). Heightening uncertainty around certain science media coverage, false balance, and the autism-vaccine controversy. *Science Communication, 35*(3), 358-382.
- Dixon, G., & Clarke, C. (2013). The effect of falsely balanced reporting of the autism–vaccine controversy on vaccine safety perceptions and behavioral intentions. *Health Education Research, 28*(2), 352-359.
- Doja, A., & Roberts, W. (2006). Immunizations and autism: a review of the literature. *The Canadian Journal of Neurological Sciences, 33*(4), 341-346.
- Dominguez, S. R., & Daum, R. S. (2005). Physician knowledge and perspectives regarding influenza and influenza vaccination. *Human Vaccines, 1*(2), 74-79.
- Dorell, C., Yankey, D., & Strasser, S. (2011). Parent-reported reasons for nonreceipt of recommended adolescent vaccinations, National Immunization Survey—Teen, 2009. *Clinical Pediatrics, 50*(12), 1116-1124.

- Dorell, C., Yankey, D., Kennedy, A., & Stokley, S. (2013). Factors that influence parental vaccination decisions for adolescents, 13 to 17 years old National Immunization Survey–Teen, 2010. *Clinical Pediatrics*, *52*(2), 162-170.
- Eagly, A. H., & Chaiken, S. (2007). The advantages of an inclusive definition of attitude. *Social Cognition*, *25*(5), 582-602.
- Edgar, T., & Volkman, J. E. (2012). Using communication theory for health promotion: practical guidance on message design and strategy. *Health Promotion Practice*, *13*(5), 587-590.
- Edwards, K. M. (2005). Overview of pertussis: focus on epidemiology, sources of infection, and long term protection after infant vaccination. *The Pediatric Infectious Disease Journal*, *24*(6), S104-S108.
- Ernst, K. & Jacobs, B. (2012). Implications of philosophical and personal belief exemptions on re-emergence of vaccine-preventable disease: the role of spatial clustering in under-vaccination. *Human Vaccination Immunization*, *8*(6).
- Erwin, D. O., Spatz, T. S., Stotts, R. C., Hollenberg, J. A., & Deloney, L. A. (1996). Increasing mammography and breast self-examination in African American women using the witness project™ model. *Journal of Cancer Education*, *11*(4), 210–215.
- Evers, D. B. (2000). Insights on immunizations from caregivers of children receiving Medicaid-funded services. *Journal for Specialists in Pediatric Nursing*, *5*(4), 157-166.
- Fagerlin, A. Wang, C. & P.A. Ubel. (2005). Reducing the influence of anecdotal reasoning on people's health care decisions: is a picture worth a thousand statistics? *Medical Decision Making*, *25*, 398–405.
- Families Fighting Flu: <http://www.familiesfightingflu.org/member-families/the-lastinger-family/>
- Fazio, R. H., & Zanna, M. P. (1981). Direct experience and attitude-behavior consistency. *Advances in Experimental Social Psychology*, *14*, 161-202.
- Feikin, D. R., Chen, R. T., Salmon, D. A., & Hoffman, R. E. (2001). Public health risks of not vaccinating children—reply. *JAMA: The Journal of the American Medical Association*, *285*(12), 1573-1574.

- Feikin, D. R., Lezotte, D. C., Hamman, R. F., Salmon, D. A., Chen, R. T., & Hoffman, R. E. (2000). Individual and community risks of measles and pertussis associated with personal exemptions to immunization. *JAMA: the Journal of the American Medical Association*, 284(24), 3145-3150.
- Feldman, J. M., & Lynch, J. G. (1988). Self-generated validity and other effects of measurement on belief, attitude, intention, and behavior. *Journal of Applied Psychology*, 73(3), 421.
- Fischhoff, B. (1975). Hindsight is not equal to foresight: The effect of outcome knowledge on judgment under uncertainty. *Journal of Experimental Psychology: Human Perception and Performance*, 1(3), 288.
- Fischhoff, B., & Beyth, R. (1975). I knew it would happen: Remembered probabilities of once—future things. *Organizational Behavior and Human Performance*, 13(1), 1-16.
- Fishbein, M. & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.
- Fisher, J. D., & Fisher, W. A. (1992). Changing AIDS-risk behavior. *Psychological Bulletin*, 111(3), 455.
- Fisher, W. R. (1987). Technical logic, rhetorical logic, and narrative rationality. *Argumentation*, 1(1), 3-21.
- Flanagan-Klygis EA, Sharp L, Frader JE. (2005). Dismissing the family who refuses vaccines: a study of pediatrician attitudes. *Archives of Pediatrics and Adolescent Medicine*; 159:929-34.
- Fleming M., & Petty R. (2000). Identity and persuasion: An elaboration likelihood approach. In Terry D, Hogg M (eds), *Attitudes, Behavior, and Social Context: The Role of Norms and Group Membership*. Mahwah, NJ: Lawrence Erlbaum Associates, 171–199.).
- Folkman, S., Schaefer, C., & Lazarus, R. S. (1979). Cognitive processes as mediators of stress and coping. *Human Stress and Cognition*, 265-298.
- Fowinkle, E. W., Barid, S., & Bass, C. M. (1981). A compulsory school immunization program in Tennessee. *Public Health Reports*, 96(1), 61.

- Francis, J. J., Eccles, M. P., Johnston, M., Walker, A., Grimshaw, J., Foy, R., ... & Bonetti, D. (2004). Constructing questionnaires based on the theory of planned behaviour. *A Manual for Health Services Researchers, 2010*, 2-12.
- Fredrickson, D. D., Davis, T. C., Arnould, C. L., Kennen, E. M., Humiston, S. G., Cross, J. T., & Bocchini, J. A. (2004). Childhood immunization refusal: provider and parent perceptions. *Family Medicine – Kansas City, 36*, 431-439.
- Freed, G. L., Clark, S. J., Butchart, A. T., Singer, D. C., & Davis, M. M. (2010). Parental vaccine safety concerns in 2009. *Pediatrics, 125*(4), 654-659.
- Freed, G. L., Clark, S. J., Butchart, A. T., Singer, D. C., & Davis, M. M. (2011). Sources and perceived credibility of vaccine-safety information for parents. *Pediatrics, 127*(Supplement 1), S107-S112.
- Freed, G. L., Clark, S. J., Hibbs, B. F., & Santoli, J. M. (2004). Parental vaccine safety concerns: the experiences of pediatricians and family physicians. *American Journal of Preventive Medicine, 26*(1), 11-14.
- Friestad, M., & Wright, P. (1994). The persuasion knowledge model: How people cope with persuasion attempts. *Journal of Consumer Research, 1*–31.
- Gantz, W., Fitzmaurice, M., & Yoo, E. (1990). Seat belt campaigns and buckling up: Do the media make a difference? *Health Communication, 2*(1), 1-12.
doi:10.1207/s15327027hc0201_1
- Gardner, H. (2004). *Changing Minds: the Art and Science of Changing Our Own and Other People's Minds*. Boston, MA Harvard Business School Press.
- Gargano, L. M., Herbert, N. L., Painter, J. E., Sales, J. M., Morfaw, C., Rask, K., ... & Hughes, J. M. (2013). Impact of a physician recommendation and parental immunization attitudes on receipt or intention to receive adolescent vaccines. *Human Vaccines and Immunotherapeutics, 9*(12), 0-1.
- Gellin B. G., Maibach E. W., & Marcuse E. K. (2000). Do parents understand immunizations? A national telephone survey. *Pediatrics, 106*, 1097–102.
- Gerend M. A., Weibley E., & Bland H. (2009). Parental response to human papillomavirus vaccine availability: uptake and intentions. *Journal of Adolescent Health, 45*:528-531.

- Ghingold, M. (1981). Guilt arousing marketing communications: An unexplored variable. *Advances in Consumer Research*, 8(1).
- Glaeser, Edward L., David I. Laibson, José A. Scheinkman, and Christine L. Soutter. (2000). Measuring trust, *Quarterly Journal of Economics*, 115, 811-846.
- Glasman, L. R., & Albarracín, D. (2006). Forming attitudes that predict future behavior: a meta-analysis of the attitude-behavior relation. *Psychological Bulletin*, 132(5), 778.
- Goei, R., Boyson, A. R., Lyon-Callo, S. K., Schott, C., Wasilevich, E., & Cannarile, S. (2010). An examination of EPPM predictions when threat is perceived externally: An asthma intervention with school workers. *Health Communication*, 25(4), 333-344.
- Goldenbeld, C., Levelt, P. B. M., & Heidstra, J. (2000). Psychological perspectives on changing driver attitude and behaviour. *Recherche-Transports-Sécurité*, 67, 65-81.
- Gollwitzer, P. M. (1999). Implementation intentions: strong effects of simple plans. *American Psychologist*, 54(7), 493.
- Gollwitzer, P. M., & Oettingen, G. (1998). The emergence and implementation of health goals. *Psychology and Health*, 13(4), 687-715.
- Goodall, C. E., & Reed, P. (2013). Threat and efficacy uncertainty in news coverage about bed bugs as unique predictors of information seeking and avoidance: An extension of the EPPM. *Health Communication*, 28(1), 63-71.
- Gore, P., Madhavan, S., Curry, D., McClung, G., Castiglia, M., Rosenbluth, S. A., & Smego, R. (1999). Predictors of childhood immunization completion in a rural population. *Social Science & Medicine*, 48(8), 1011-1027.
- Gore, T. D., & Bracken, C. C. (2005). Testing the theoretical design of a health risk message: Reexamining the major tenets of the Extended Parallel Process Model. *Health Education & Behavior*, 32(1), 27-41.
- Grabiell, M., Reutzell, T. J., Wang, S., Rubin, R., Leung, V., Ordonez, A., ... & Jordan, E. (2013). HPV and HPV vaccines: the knowledge levels, opinions, and behavior of parents. *Journal of Community Health*, 1-7.

- Graesser, A. C., Olde, B., Klettke, B., Green, M., Strange, J., & Brock, T. (2002). How does the mind construct and represent stories? *Narrative Impact: Social and Cognitive Foundations*, 229–262.
- Green, M. C., & Brock, T. C. (2000). The role of transportation in the persuasiveness of public narratives. *Journal of Personality and Social Psychology*, 79(5), 701-721.
- Green, M., Strange J., & Brock T. (eds). (2002). *Narrative Impact: Social and Cognitive Foundations*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Greene, K. & Brinn, L.S. (2003). Messages influencing college women's tanning bed use: statistical versus narrative evidence format and a self-assessment to increase perceived susceptibility. *Journal of Health Communication*, 8, 443–461.
- Gust, D. A., Darling, N., Kennedy, A., & Schwartz, B. (2008). Parents with doubts about vaccines: which vaccines and reasons why. *Pediatrics*, 122(4), 718-725.
- Gust, D. A., Strine, T. W., Maurice, E., Smith, P., Yusuf, H., Wilkinson, M., & Schwartz, B. (2004). Underimmunization among children: effects of vaccine safety concerns on immunization status. *Pediatrics*, 114(1), e16-e22.
- Hamermesh, D. & Biddle, J. (1994). “Beauty and the Labor Market,” *American Economic Review*, 84, 1174-1194.
- Han, B., & Fink, E. L. (2012). How do statistical and narrative evidence affect persuasion? The role of evidentiary features. *Argumentation & Advocacy*, 49(1).
- Harrington, P. M., Woodman, C., & Shannon, W. F. (2000). Low immunization uptake: Is the process the problem? *Journal of Epidemiology and Community Health*, 54(5), 394-394.
- Hart, J. (2005). Narrative theory. In *Encyclopedia of Public Relations*. Retrieved from https://login.ezproxy1.lib.asu.edu/login?url=http://literati.credoreference.com.ezproxy1.lib.asu.edu/content/entry/sagepr/narrative_theory/0
- Hatfield, E., & Cacioppo, J. T. (1994). *Emotional contagion*. Cambridge University Press.
- Hecht, M. L., & Miller-Day, M. (2007). The drug resistance strategies project as translational research. *Journal of Applied Communication Research*, 35(4), 343–349.

- Heckhausen, H., & Leppmann, P. K. (1991). *Motivation and action*. Springer-Verlag Publishing.
- Hibbert, S., Smith, A., Davies, A., & Ireland, F. (2007). Guilt appeals: Persuasion knowledge and charitable giving. *Psychology & Marketing, 24*(8), 723–742.
- Hill, D., & Gardner, G. (1980). Repression-sensitization and yielding to threatening health communications. *Australian Journal of Psychology, 32*(3), 183-193.
- Hilton, S., Petticrew, M., & Hunt, K. (2006). Combined vaccines are like a sudden onslaught to the body's immune system: Parental concerns about vaccine overload and immune-vulnerability. *Vaccine, 24*(20), 4321-4327.
- Hoeken, H., & Hustinx, L. (2009). When is statistical evidence superior to anecdotal evidence in supporting probability claims? The role of argument type. *Human Communication Research, 35*(4), 491-510.
- Hopfer, S. (2012). Effects of a narrative HPV vaccination intervention aimed at reaching college women: a randomized controlled trial. *Prevention Science, 13*(2), 173–182.
- Hornik, R. (Ed.). (2002). *Public Health Communication: Evidence for Behavior Change*. Routledge.
- Houseman, C., Butterfoss, F. D., Morrow, A. L., & Rosenthal, J. (1997). Focus groups among public, military, and private sector mothers: insights to improve the immunization process. *Public Health Nursing, 14*(4), 235-243.
- Hovland, C. I., Janis, I. L., & Kelley, H. H. (1953). *Communication and persuasion; psychological studies of opinion change*.
- Humiston, S. G., Albertin, C., Schaffer, S., Rand, C., Shone, L. P., Stokley, S., & Szilagyi, P. G. (2009). Health care provider attitudes and practices regarding adolescent immunizations: a qualitative study. *Patient Education and Counseling, 75*(1), 121-127.
- Insko, C. A., Arkoff, A., & Insko, V. M. (1965). Effects of high and low fear-arousing communications upon opinions toward smoking. *Journal of Experimental Social Psychology, 1*(3), 256-266.
- Jackson, C., Cheater, F. M., & Reid, I. (2008). A systematic review of decision support needs of parents making child health decisions. *Health Expectations, 11*(3), 232-251.

- Janis, I. L. (1967). Effects of fear arousal on attitude change: Recent developments in theory and experimental research. *Advances in Experimental Social Psychology*, 3, 166-224.
- Janis, I. L. (1969). Some implications of recent research on the dynamics of fear and stress tolerance. *Research publications-Association for research in nervous and mental disease*, 47, 86.
- Janis, I. L., & Feshbach, S. (1953). Effects of fear-arousing communications. *The Journal of Abnormal and Social Psychology*, 48(1), 78.
- Janssen, E., Osch, L., Vries, H., & Lechner, L. (2013). The influence of narrative risk communication on feelings of cancer risk. *British Journal of Health Psychology*, 18(2), 407-419.
- Kahn J. A., Cooper H.P., & Vadaparampil S. T. (2009). Human papillomavirus vaccine recommendations and agreement with mandated human papillomavirus vaccination for 11-to-12-year-old girls: A statewide survey of Texas physicians. *Cancer Epidemiology Biomarkers Prevention*, 18:2325–32.
- Kaiser, F. G., & Fuhrer, U. (2003). Ecological behavior's dependency on different forms of knowledge. *Applied Psychology*, 52(4), 598-613.
- Kata, A. (2010). A postmodern Pandora's box: Anti-vaccination misinformation on the Internet. *Vaccine*, 28(7), 1709-1716.
- Kata, A. (2012). Anti-vaccine activists, Web 2.0, and the postmodern paradigm—An overview of tactics and tropes used online by the anti-vaccination movement. *Vaccine*, 30(25), 3778-3789.
- Keane, M. T., Walter, M. V., Patel, B. I., Moorthy, S., Stevens, R. B., Bradley, K. M., ... & Vernon, T. M. (2005). Confidence in vaccination: a parent model. *Vaccine*, 23(19), 2486-2493.
- Keane, V., Stanton, B., Horton, L., Aronson, R., Galbraith, J., & Hughart, N. (1993). Perceptions of vaccine efficacy, illness, and health among inner-city parents. *Clinical Pediatrics*, 32(1), 2-7.
- Keelan, J., Pavri-Garcia, V., Tomlinson, G., & Wilson, K. (2007). YouTube as a source of information on immunization: a content analysis. *JAMA: The Journal of the American Medical Association*, 298(21), 2482-2484.

- Keelan, J., Pavri, V., Balakrishnan, R., & Wilson, K. (2010). An analysis of the Human Papilloma Virus vaccine debate on MySpace blogs. *Vaccine*, *28*(6), 1535-1540.
- Kennedy, A., Basket, M., & Sheedy, K. (2011). Vaccine attitudes, concerns, and information sources reported by parents of young children: results from the 2009 HealthStyles survey. *Pediatrics*, *127*(Supplement 1), S92-S99.
- Kennedy, A., LaVail, K., Nowak, G., Basket, M., & Landry, S. (2011). Confidence about vaccines in the United States: understanding parents' perceptions. *Health Affairs*, *30*(6), 1151-1159.
- Kennedy, A., Stokley, S., Curtis, C. R., & Gust, D. (2012). Limited awareness of vaccines recommended for adolescents and other results from two national consumer health surveys in the United States. *Journal of Adolescent Health*, *50*(2), 198-200.
- Khangura, S., Bennett, C., Stacey, D., & O'Connor, A. M. (2008). Personal stories in publicly available patient decision aids. *Patient Education and Counseling*, *73*(3), 456-464.
- Kim, M. S., & Hunter, J. E. (1993). Attitude-behavior relations: A meta-analysis of attitudinal relevance and topic. *Journal of Communication*, *43*(1), 101-142.
- Kim, M. S., & Hunter, J. E. (1993). Relationships among attitudes, behavioral intentions, and behavior: a meta-analysis of past research, part 2. *Communication Research*, *20*(3), 331-364.
- Kimmel, S. R. (2010). Adolescent vaccination: physician challenges and solutions. *Journal of Adolescent Health*, *46*(2), S16-S23.
- Kincaid, D. L., Delate, R., Storey, D., & Figueroa, M. E. (2012). Closing the gaps in practice and in theory. *Public Communication Campaigns*, 305.
- Kohn, P. M., Goodstadt, M. S., Cook, G. M., Sheppard, M., & Chan, G. (1982). Ineffectiveness of threat appeals about drinking and driving. *Accident Analysis & Prevention*, *14*(6), 457-464.
- Kopfman, J.E., Smith, S.W., Ah Yun, J.K. & A. Hodges. (1998). Affective and cognitive reactions to narrative versus statistical evidence organ donation messages. *Journal of Applied Communication Research*, *26*, 279-300.

- Kotowski, M. R., Smith, S. W., Johnstone, P. M., & Pritt, E. (2011). Using the Extended Parallel Process Model to create and evaluate the effectiveness of brochures to reduce the risk for noise-induced hearing loss in college students. *Noise and Health, 13*(53), 261.
- Kraus, S. J. (1995). Attitudes and the prediction of behavior: A meta-analysis of the empirical literature. *Personality and Social Psychology Bulletin, 21*(1), 58-75.
- Kreuter, M. W., Caburnay, C. A., Chen, J. J., & Donlin, M. J. (2004). Effectiveness of individually tailored calendars in promoting childhood immunization in urban public health centers. *American Journal of Public Health, 94*(1), 122-127.
- Kreuter, M. W., Green, M. C., Cappella, J. N., Slater, M. D., Wise, M. E., Storey, D., ... & Woolley, S. (2007). Narrative communication in cancer prevention and control: a framework to guide research and application. *Annals of Behavioral Medicine, 33*(3), 221-235.
- Krieger, J. L., & Sarge, M. A. (2013). A serial mediation model of message framing on intentions to receive the Human Papillomavirus (HPV) vaccine: Revisiting the role of threat and efficacy perceptions. *Health Communication, 28*(1), 5-19.
- Krisher, H. P., Darley, S. A., & Darley, J. M. (1973). Fear-provoking recommendations, intentions to take preventive actions, and actual preventive actions. *Journal of Personality and Social Psychology, 26*(2), 301.
- Kuhl, J., & Fuhrmann, A. (1998). Decomposing self-regulation and self-control: The Volitional Components Inventory.
- Labovitz, S., & Hagedorn, R. (1973). Measuring social norms. *Pacific Sociological Review, 283-303*.
- Laczniak, R. N., Kempf, D. S., & Muehling, D. D. (1999). Advertising message involvement: the role of enduring and situational factors. *Journal of Current Issues & Research in Advertising, 21*(1), 51-61.
- Lam, P. P., Chambers, L. W., MacDougall, D. M. P., & McCarthy, A. E. (2010). Seasonal influenza vaccination campaigns for health care personnel: systematic review. *Canadian Medical Association Journal, 182*(12), E542-E548.

- Lannon, C., Brack, V., Stuart, J., Caplow, M., McNeill, A., Bordley, W. C., & Margolis, P. (1995). What mothers say about why poor children fall behind on immunizations: a summary of focus groups in North Carolina. *Archives of Pediatrics & Adolescent Medicine*, *149*(10), 1070.
- Lapinski, M. K., & Rimal, R. N. (2005). An explication of social norms. *Communication Theory*, *15*(2), 127-147.
- Lapka, C., Jupka, K., Wray, R. J., & Jacobsen, H. (2008). Applying cognitive response testing in message development and pre-testing. *Health Education Research*, *23*(3), 467-476.
- Lashuay, N., Tjoa, T., Zuniga de Nuncio, M. L., Franklin, M., Elder, J., & Jones, M. (2000). Exposure to immunization media messages among African American parents. *Preventive Medicine*, *31*(5), 522-528.
- LaVela, S. L., Smith, B., & Weaver, F. M. (2007). Perceived risk for influenza in veterans with spinal cord injuries and disorders. *Rehabilitation Psychology*, *52*(4), 458.
- Lazarus, R. S. (1991). Progress on a cognitive-motivational-relational theory of emotion. *American Psychologist*, *46*(8), 819.
- Lazarus, R.S. (1984). On the primacy of cognition. Retrieved from <http://psycnet.apa.org/journals/amp/39/2/124/>
- Lazarus, R.S., & Folkman, S. (1984). Stress. *Appraisal and Coping*, New York. Retrieved <http://www.postgraduatetoolkit.com/pdf/Dr%20Layla%20Cassim%20Health%20Presentation.pdf>
- Lazarus, RS. (1968). Emotions and adaptation: Conceptual and empirical relations. In *Nebraska symposium on motivation*. University of Nebraska Press. Retrieved from <http://psycnet.apa.org/psycinfo/1970-18661-001>
- Leask, J., Chapman, S., Hawe, P., & Burgess, M. (2006). What maintains parental support for vaccination when challenged by anti-vaccination messages? A qualitative study. *Vaccine*, *24*(49), 7238-7245.
- Lemal, M., & Van den Bulck, J. (2010). Testing the effectiveness of a skin cancer narrative in promoting positive health behavior: A pilot study. *Preventive Medicine*, *51*(2), 178-181.

- Lennon, R., & Rentfro, R. (2010). Are young adults fear appeal effectiveness ratings explained by fear arousal, perceived threat and perceived efficacy. *Innovative Marketing*, 6(1), 58–65.
- Lennon, R., Rentfro, R., & O’Leary, B. (2010). Social marketing and distracted driving behaviors among young adults: The effectiveness of fear appeals. *Academy of Marketing Studies Journal*, 14(2).
- Leventhal, H. (1970). Findings and theory in the study of fear communications. *Advances in Experimental Social Psychology*, 5, 119-186.
- Leventhal, H., & Trembly, G. (1968). Negative emotions and persuasion. *Journal of Personality*.
- Lewis, I., Watson, B., & White, K. M. (2013). Extending the explanatory utility of the EPPM beyond fear-based persuasion. *Health Communication*, 28(1), 84-98.
- Liska, A. E. (1974). Emergent issues in the attitude-behavior consistency controversy. *American Sociological Review*, 261-272.
- Liska, A. E. (1984). A critical examination of the causal structure of the Fishbein/Ajzen attitude-behavior model. *Social Psychology Quarterly*, 61-74.
- Liu, S. S., & Stout, P. A. (1987). Effects of message modality and appeal on advertising acceptance. *Psychology & Marketing*, 4(3), 167-187.
- Lovejoy, G. S., Giandelia, J. W., & Hicks, M. (1974). Successful enforcement of an immunization law. *Public Health Reports*, 89(5), 456.
- Lu, A.S. (2013). An experimental test of the persuasive effect of source similarity in narrative and non-narrative health blogs. *Journal of Medical Internet Research*, 15(7).
- Luman, E. T., McCauley, M. M., Shefer, A., & Chu, S. Y. (2003). Maternal characteristics associated with vaccination of young children. *Pediatrics*, 111(Supplement 1), 1215-1218.
- Maddux, J. E., & Rogers, R. W. (1983). Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. *Journal of Experimental Social Psychology*, 19(5), 469-479.

- Maloney, E. K., Lapinski, M. K., & Witte, K. (2011). Fear appeals and persuasion: A review and update of the extended parallel process model. *Social and Personality Psychology Compass*, 5(4), 206-219.
- Mazor, K. M., Baril, J., Dugan, E., Spencer, F., Burgwinkle, P., & Gurwitz, J. H. (2007). Patient education about anticoagulant medication: Is narrative evidence or statistical evidence more effective? *Patient Education and Counseling*, 69(1), 145–157.
- McCormick, L. K., Bartholomew, L. K., Lewis, M. J., Brown, M. W., & Hanson, I. C. (1997). Parental perceptions of barriers to childhood immunization: results of focus groups conducted in an urban population. *Health Education Research*, 12(3), 355-362.
- McCroskey, J. C. (1966). *Scales for the measurement of ethos*. Speech monographs, 33(1), 65-72.
- McQueen, A., Kreuter, M. W., Kalesan, B., & Alcaraz, K. I. (2011). Understanding narrative effects: The impact of breast cancer survivor stories on message processing, attitudes, and beliefs among African American women. *Health Psychology*, 30(6), 674.
- Meszaros, J. R., David A. A., Baron J., Hershey J. C., Kunreuther H., & Schwartz-Buzaglo J. (1996). Cognitive processes and the decisions of some parents to forego pertussis vaccination for their children. *J Clin Epidemiol*; 49:697-703.
- Mewborn, C. R., & Rogers, R. W. (1979). Effects of threatening and reassuring components of fear appeals on physiological and verbal measures of emotion and attitudes. *Journal of Experimental Social Psychology*, 15(3), 242-253.
- Middaugh, J. P., & Zyla, L. D. (1978). Enforcement of school immunization law in Alaska. *JAMA: the Journal of the American Medical Association*, 239(20), 2128-2130.
- Middleman, A. B., & Tung, J. S. (2010). Urban middle school parent perspectives: the vaccines they are willing to have their children receive using school-based immunization programs. *Journal of Adolescent Health*, 47(3), 249-253.
- Miller, K. (2005). *Communications theories: perspectives, processes, and contexts*. New York: McGraw-Hill.

- Mills, E. J., Montori, V. M., Ross, C. P., Shea, B., Wilson, K., & Guyatt, G. H. (2005). Systematically reviewing qualitative studies complements survey design: an exploratory study of barriers to paediatric immunisations. *Journal of Clinical Epidemiology*, 58(11), 1101-1108.
- Mills, E., Jadad, A. R., Ross, C., & Wilson, K. (2005). Systematic review of qualitative studies exploring parental beliefs and attitudes toward childhood vaccination identifies common barriers to vaccination. *Journal of Clinical Epidemiology*, 58(11), 1081-1088.
- Miniard, P. W., & Cohen, J. B. (1981). An examination of the Fishbein-Ajzen behavioral-intentions model's concepts and measures. *Journal of Experimental Social Psychology*, 17(3), 309-339.
- Mongeau, P. (2013). Fear Appeals. In J. P. Dillard & L. Shen (Eds). *The Sage Handbook of Persuasion: Developments in Theory and Practice*. Los Angeles, CA. Sage, 184-199.
- Mongeau, P. Another look at fear arousing messages, in Allen M, Preiss R (eds.). (1998). *Persuasion: Advances Through Meta-Analysis*. Cresskill, NJ, Hampton Press, 53-68.
- Mooi, F., Loo, IV, & King, A. (2001). Adaptation of Bordetella pertussis to vaccination: a cause for its reemergence? *Emerging Infectious Diseases* 7, 526.
- Morman, M.T. (2000). The influence of fear appeals, message design and masculinity on men's motivation to perform the testicular self examination. *Journal of Applied Communication Research*, 28, 91-116.
- Morrow, A. L., Rosenthal, J., Lakkis, H. D., Bowers, J. C., Butterfoss, F. D., Crews, R. C., & Sirotkin, B. (1998). A population-based study of access to immunization among urban Virginia children served by public, private, and military health care systems. *Pediatrics*, 101(2), e5-e5.
- Muthusamy, N., Levine, T. R., & Weber, R. (2009). Scaring the already scared: Some problems with HIV/AIDS fear appeals in Namibia. *Journal of Communication*, 59(2), 317-344.
- Nabi, R. L., Roskos-Ewoldsen, D., & Dillman Carpentier, F. (2008). Subjective knowledge and fear appeal effectiveness: Implications for message design. *Health Communication*, 23(2), 191-201.

- Nan, X., Xie, B., & Madden, K. (2012). Acceptability of the H1N1 vaccine among older Adults: the interplay of message framing and perceived vaccine safety and efficacy. *Health Communication, 27*(6), 559-568.
- Nan, X., Dahlstrom, M. F., Richards, A., & Rangarajan, S. (2015). Influence of evidence type and narrative type on HPV risk perception and intention to obtain the HPV vaccine. *Health Communication, 30*(3), 301-308.
- Neumann, R., & Strack, F. (2000). “ Mood contagion”: the automatic transfer of mood between persons. *Journal of Personality and Social Psychology, 79*(2), 211.
- Newman, T. B. (2003). The power of stories over statistics. *BMJ: British Medical Journal, 327*(7429), 1424.
- Newman, TB. (2003). The power of stories over statistics. *BMJ, 327*(7429) 1424- 1427.
- Niederdeppe, J., Shapiro, M. A., & Porticella, N. (2011). Attributions of responsibility for obesity: Narrative communication reduces reactive counter-arguing among liberals. *Human Communication Research, 37*(3), 295-323.
- Niederhauser, V. P., & Markowitz, M. (2007). Barriers to immunizations: Multiethnic parents of under-and unimmunized children speak. *Journal of the American Academy of Nurse Practitioners, 19*(1), 15-23.
- Nisbett R, Ross L. (1980). *Human Inference: Strategies and Short-comings of Social Judgment*. Englewood Cliffs, NJ: Prentice Hall.
- Noar, S. M., & Mehrotra, P. (2011). Toward a new methodological paradigm for testing theories of health behavior and health behavior change. *Patient Education and Counseling, 82*(3), 468-474.
- Nyhan, B., & Reifler, J. (2015). Does correcting myths about the flu vaccine work? An experimental evaluation of the effects of corrective information. *Vaccine, 33*(3), 459-464.
- Nyhan, B., Reifler, J., Richey, S., & Freed, G. L. (2014). Effective messages in vaccine promotion: a randomized trial. *Pediatrics, 133*(4), e835-e842.
- Oatley K. (2002). Emotions and the story worlds of fiction. Green MC, Strange JJ, Brock TC (eds), *Narrative Impact: Social and Cognitive Foundations*. Mahwah, NJ: Lawrence Erlbaum Associates, 2002, 39–69.

- Oatley, K., & Djikic, M. (2002). Emotions and transformation varieties of experience of identity. *Journal of Consciousness Studies*, 9(9-10), 9–10.
- Omer, S. B., Enger, K. S., Moulton, L. H., Halsey, N. A., Stokley, S., & Salmon, D. A. (2008). Geographic clustering of nonmedical exemptions to school immunization requirements and associations with geographic clustering of pertussis. *American Journal of Epidemiology*, 168(12), 1389-1396.
- Omer, S. B., Pan, W. K., Halsey, N. A., Stokley, S., Moulton, L. H., Navar, A. M., ... & Salmon, D. A. (2006). Nonmedical exemptions to school immunization requirements. *JAMA: The Journal of the American Medical Association*, 296(14), 1757-1763.
- Omer, S. B., Salmon, D. A., Orenstein, W. A., deHart, M. P., & Halsey, N. (2009). Vaccine refusal, mandatory immunization, and the risks of vaccine-preventable diseases. *New England Journal of Medicine*, 360(19), 1981-1988.
- Opel, D. J., Diekema, D. S., Lee, N. R., & Marcuse, E. K. (2009). Social marketing as a strategy to increase immunization rates. *Archives of Pediatrics & Adolescent Medicine*, 163(5), 432–437.
- Orbell, S., & Sheeran, P. (1998). Regulation of behaviour in pursuit of health goals. *Psychology and Health*, 13(4), 753-758.
- Ordonana, J. R., González-Javier, F., Espín-López, L., & Gómez-Amor, J. (2009). Self-report and psychophysiological responses to fear appeals. *Human Communication Research*, 35(2), 195-220.
- Orenstein, W. A., & Hinman, A. R. (1999). The immunization system in the United States—the role of school immunization laws. *Vaccine*, 17, S19-S24.
- Peters, G. J. Y., Ruiter, R. A., & Kok, G. (2013). Threatening communication: a critical re-analysis and a revised meta-analytic test of fear appeal theory. *Health Psychology Review*, 7(sup1), S8-S31.
- Plotkin, S., Gerber, J. S., & Offit, P. A. (2009). Vaccines and autism: a tale of shifting hypotheses. *Clinical Infectious Diseases*, 48(4), 456-461.
- Plummer, J., Cook, B., Diforio, D., Schachter, B., Sokolyanskaya, I., & Korde, T. (2006). Measures of engagement. *New York: The Advertising Research Foundation*.

- Popova, L. (2012). The Extended Parallel Process Model illuminating the gaps in research. *Health Education & Behavior, 39*(4), 455-473.
- Power ML, Leddy MA, Anderson BL, et al. (2009). Obstetrician-gynecologists' practices and perceived knowledge regarding immunization. *American Journal of Preventative Medicine: 37*:231-4.
- Prati, G., Pietrantoni, L., & Zani, B. (2012). Influenza vaccination: the persuasiveness of messages among people aged 65 years and older. *Health Communication, 27*(5), 413-420.
- Priester J. R., & Petty R. E. (2003). The influence of spokesperson trustworthiness on message elaboration, attitude strength, and advertising effectiveness. *Journal of Consumer Psychology, 13*:408-421.
- Priester, J. R., & Petty, R. E. (1995). Source attributions and persuasion: Perceived honesty as a determinant of message scrutiny. *Personality and Social Psychology Bulletin, 21*(6), 637-654.
- Prochaska, J. O. DiClemente, C. C. (1983). Stages and processes of self-change change of smoking: toward an integrative model of change. *J Consult Clin Psychol, 51*(3), 390-5.
- Prochaska, J. O. DiClemente, C. C. (1986). Toward a comprehensive model of change. In: Miller, WR; Heather, N. (eds.) *Treating addictive behaviors: processes of change*. New York: Plenum Press.
- Prochaska, J. O. DiClemente, C. C. (2005). The transtheoretical approach. In: Norcross, JC; Goldfried, MR. (eds.) *Handbook of psychotherapy integration*. 2nd ed. New York: Oxford University Press, 147-171.
- Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion, 12*(1), 38-48.
- Pruitt, R. H., Kline, P. M., & Kovaz, R. B. (1995). Perceived barriers to childhood immunization among rural populations. *Journal of Community Health Nursing, 12*(2), 65-72.
- Rainey, J. J., Watkins, M., Ryman, T. K., Sandhu, P., Bo, A., & Banerjee, K. (2011). Reasons related to non-vaccination and under-vaccination of children in low and middle income countries: findings from a systematic review of the published literature, 1999-2009. *Vaccine, 29*(46), 8215-8221.

- Rand, C. M., Humiston, S. G., Schaffer, S. J., Albertin, C. S., Shone, L. P., Blumkin, A. K., & Szilagyi, P. G. (2011). Parent and adolescent perspectives about adolescent vaccine delivery: practical considerations for vaccine communication. *Vaccine*, *29*(44), 7651-7658.
- Randall, D. M., & Wolff, J. A. (1994). The time interval in the intention-behaviour relationship: meta-analysis. *British Journal of Social Psychology*, *33*(4), 405-418.
- Ricketts, M., Shanteau, J., McSpadden, B., & Fernandez-Medina, K. M. (2010). Using stories to battle unintentional injuries: narratives in safety and health communication. *Social Science & Medicine*, *70*(9), 1441-1449.
- Rimal, R. N. (2001). Perceived risk and self-efficacy as motivators: Understanding individuals' long-term use of health information. *Journal of Communication*, *51*(4), 633-654.
- Rimal, R. N., & Real, K. (2003). Understanding the influence of perceived norms on behaviors. *Communication Theory*, *13*(2), 184-203.
- Rippetoe, P. A., & Rogers, R. W. (1987). Effects of components of protection-motivation theory on adaptive and maladaptive coping with a health threat. *Journal of Personality and Social Psychology*, *52*(3), 596.
- Rivis, A., & Sheeran, P. (2003). Descriptive norms as an additional predictor in the theory of planned behaviour: A meta-analysis. *Current Psychology*, *22*(3), 218-233.
- Robberson, M. R., & Rogers, R. W. (1988). Beyond fear appeals: Negative and positive persuasive appeals to health and self-esteem. *Journal of Applied Social Psychology*, *18*(3), 277-287.
- Robbins, K. B., Brandling-Bennett, D., & Hinman, A. R. (1981). Low measles incidence: association with enforcement of school immunization laws. *American Journal of Public Health*, *71*(3), 270-274.
- Roberto, A. J. (2013). Editor's note for the Extended Parallel Process Model: two decades later. *Health Communication*, *28*(1), 1-2.
- Roberto, A., Meyer, G., Johnson, A. J., Atkin, C., & Smith, P. (2002). Promoting gun trigger-lock use: Insights and implications from a radio-based health communication intervention. *Journal of Applied Communication Research*, *30*(3), 210-230.

- Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *The Journal of Psychology, 91*(1), 93-114.
- Rogers, R. W., & Mewborn, C. R. (1976). Fear appeals and attitude change: Effects of a threat's noxiousness, probability of occurrence, and the efficacy of coping responses. *Journal of Personality and Social Psychology, 34*(1), 54.
- Rohani, P., & Drake, J. M. (2011). The decline and resurgence of pertussis in the US. *Epidemics, 3*(3), 183-188.
- Rosenstock, I.M. (1966). Why people use health services. *Milbank Memorial Fund Quarterly 44*(3), 94-127.
- Rosenstock, I. M. (1974). The health belief model and preventive health behavior. *Health Education & Behavior, 2*(4), 354-386.
- Rosenstock, I. M.; Strecher, V. J., Becker, M. H. (1 January 1988). Social learning theory and the Health Belief Model. *Health Education & Behavior 15* (2): 175-183.
- Rosenthal, J., Rodewald, L., McCauley, M., Berman, S., Irigoyen, M., Sawyer, M., & Kalton, G. (2004). Immunization coverage levels among 19-to 35-month-old children in 4 diverse, medically underserved areas of the United States. *Pediatrics, 113*(4), e296-e302.
- Roskos-Ewoldsen, D. R., Yu, J. H., & Rhodes, N. (2004). Fear appeal messages affect accessibility of attitudes toward the threat and adaptive behaviors. *Communication Monographs, 71*(1), 49-69.
- Rothman, S. M., & Rothman, D. J. (2009). Marketing HPV vaccine. *JAMA: the Journal of the American Medical Association, 302*(7), 781-786.
- Ruiter, R. A., Abraham, C., & Kok, G. (2001). Scary warnings and rational precautions: A review of the psychology of fear appeals. *Psychology and Health, 16*(6), 613-630.
- Saitoh, A., Nagata, S., Saitoh, A., Tsukahara, Y., Vaida, F., Sonobe, T., & Murashima, S. (2013). Perinatal immunization education improves immunization rates and knowledge: A randomized controlled trial. *Preventive Medicine.*

- Salazar, L. F., Crosby, R. A., Noar, S. M., Walker, J. H., & DiClemente, R. (2011). Models based on perceived threat and fear appeals. *Health Behavior Theory for Public Health: Principles, Foundations, and Applications*, 83.
- Salmon D. A., Haber M, Gangarosa E. J., Phillips L., Smith N. J., Chen R. T. (1999). Health consequences of religious and philosophical exemptions from immunization laws: individual and societal risk of measles. *JAMA*; 282:47-53.
- Salmon D.A., Omer SB, Moulton LH, et al. (2005). Exemptions to school immunization requirements: the role of school-level requirements, policies, and procedures. *American Journal of Public Health*, 95, 436-40.
- Salmon, D. A., Halsey, N. A., Stadlin, S., Bednarczyk, R. A., Omer, S. B., Naranbhai, V., ... & Carr, W. H. (2012). Keeping the M in Medical Exemptions: Protecting Our Most Vulnerable Children, 987.
- Salmon, D. A., Moulton, L. H., Omer, S. B., Chace, L. M., Klassen, A., Talebian, P., & Halsey, N. A. (2004). Knowledge, attitudes, and beliefs of school nurses and personnel and associations with nonmedical immunization exemptions. *Pediatrics*, 113(6), e552-e559.
- Salmon, D. A., Moulton, L. H., Omer, S. B., dehart, M. P., Stokley, S., & Halsey, N. A. (2005). Factors associated with refusal of childhood vaccines among parents of school-aged children: a case-control study. *Archives of Pediatrics & Adolescent Medicine*, 159(5), 470.
- Salsberry, P. J., Nickel, J. T., & Mitch, R. (1993). Why aren't preschoolers immunized? A comparison of parents' and providers' perceptions of the barriers to immunizations. *Journal of Community Health Nursing*, 10(4), 213-224.
- Schank, R., & Abelson, R. (1977). *Scripts, goals, and understanding*. Hillsdale, NJ: LEA.
- Sharkey, NE, & Mitchell, DC (1985). Word recognition in a functional context: The use of scripts in reading. *Journal of Memory and Language*, 24, 253-270.
- Schneider, S., Gadinger, M., & Fischer, A. (2012). Does the effect go up in smoke? A randomized controlled trial of pictorial warnings on cigarette packaging. *Patient Education and Counseling*, 86(1), 77-83.
- Schultz, S. T. (2010). Does thimerosal or other mercury exposure increase the risk for autism? *Acta Neurobiol Exp*, 70, 187-195.

- Schuman, H., & Johnson, M. P. (1976). Attitudes and behavior. *Annual Review of Sociology*, 161-207.
- Schwartz, S. H. (1978). Temporal instability as a moderator of the attitude–behavior relationship. *Journal of Personality and Social Psychology*, 36(7), 715.
- Schwartz, S. H., & Tessler, R. C. (1972). A test of a model for reducing measured attitude-behavior discrepancies. *Journal of Personality and Social Psychology*, 24(2), 225.
- Serpell, L., & Green, J. (2006). Parental decision-making in childhood vaccination. *Vaccine*, 24(19), 4041-4046.
- Shaffer, V. A., & Zikmund-Fisher, B. J. (2013). All stories are not alike: a purpose-, content-, and valence-based taxonomy of patient narratives in decision aids. *Medical Decision Making*, 33(1), 4–13.
- Shaffer, V. A., Hulsey, L., & Zikmund-Fisher, B. J. (2013). The effects of process-focused versus experience-focused narratives in a breast cancer treatment decision task. *Patient Education and Counseling*, 93(2), 255–264.
- Sheeran, P. (2002). Intention—behavior relations: A conceptual and empirical review. *European Review of Social Psychology*, 12(1), 1-36.
- Sheeran, P., Harris, P. R., & Epton, T. (2013). Does heightening risk appraisals change people's intentions and behavior? A meta-analysis of experimental studies.
- Shelton, M. L., & Rogers, R. W. (1981). Fear-arousing and empathy-arousing appeals to help: the pathos of persuasion. *Journal of Applied Social Psychology*, 11(4), 366–378.
- Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *Journal of Consumer Research*, 325-343.
- Sherer, M., & Rogers, R. W. (1984). The role of vivid information in fear appeals and attitude change. *Journal of Research in Personality*, 18(3), 321-334.
- Shui, I. M., Weintraub, E. S., & Gust, D. A. (2006). Parents concerned about vaccine safety: Differences in race/ethnicity and attitudes. *American Journal of Preventive Medicine*, 31(3), 244-251.

- Shui, I., Kennedy, A., Wooten, K., Schwartz, B., & Gust, D. (2005). Factors influencing African-American mothers' concerns about immunization safety: a summary of focus group findings. *Journal of the National Medical Association, 97*(5), 657.
- Siu, W. (2008). Extended parallel process model and H5N1 Influenza virus. *Psychological Reports, 102*(2), 539-550.
- Sivacek, J., & Crano, W. D. (1982). Vested interest as a moderator of attitude–behavior consistency. *Journal of Personality and Social Psychology, 43*(2), 210.
- Skilbeck, C., Tulips, J., & Ley, P. (1977). The effects of fear arousal, fear position, fear exposure, and sidedness on compliance with dietary instructions. *European Journal of Social Psychology, 7*(2), 221-239.
- Slater M. D. (2002). Entertainment education and the persuasive impact of narratives. In Green M. C., Strange J. J., Brock T. C. (eds). *Narrative Impact: Social and Cognitive Foundations*. Mahwah, NJ: Lawrence Erlbaum Associates, 157–181.
- Slater, M. D., & Rouner, D. (1996). How message evaluation and source attributes may influence credibility assessment and belief change. *Journalism & Mass Communication Quarterly, 73*(4), 974–991.
- Slater, M. D., & Rouner, D. (1996). Value-affirmative and value-protective processing of alcohol education messages that include statistical evidence or anecdotes. *Communication Research, 23*(2), 210–235.
- Slater, M. D., & Rouner, D. (2002). Entertainment—education and elaboration likelihood: understanding the processing of narrative persuasion. *Communication Theory, 12*(2), 173–191.
- Slater, M. D., Green, M. C., Strange, J. J., & Brock, T. C. (2002). Entertainment education and the persuasive impact of narratives. *Narrative Impact: Social and Cognitive Foundations, 157–181*.
- Slater, M. D., Rouner, D., Beauvais, F., Murphy, K., Rodríguez, M. M. D., & Van Leuven, J. (1996). Adolescent perceptions of underage drinkers in TV beer ads. *Journal of Alcohol and Drug Education, 42*, 43–56.
- Slater, M. D., Rouner, D., Murphy, K., Beauvais, F., Leuven, J. V., & Rodríguez, M. D. (1996). Male adolescents' reactions to TV beer advertisements: the effects of sports content and programming context. *Journal of Studies on Alcohol and Drugs, 57*(4), 425.

- Slater, M. D., Rouner, D., Murphy, K., Beauvais, F., van Leuven, J., & Domenech-Rodriguez, M. M. (1996). Adolescent counterarguing of TV beer advertisements: Evidence for effectiveness of alcohol education and critical viewing discussions. *Journal of Drug Education, 26*(2), 143–158.
- Small, D. A., & Verrochi, N. M. (2009). The face of need: facial emotion expression on charity advertisements. *Journal of Marketing Research, 46*(6), 777–787.
- Small, D., Loewenstein, G., Slovic P. (2007). Sympathy and callousness: the impact of deliberative thought on donations to identifiable and statistical victims. *Organizational Behavior and Human Decision Processes, 102*(2), 143- 153.
- Smith P. J., Kennedy A. M., Wooten K., Gust D. A., Pickering L. K. (2006). Association between health care providers' influence on parents who have concerns about vaccine safety and vaccination coverage. *Pediatrics, 118*(5), e1287-e1292.
- Smith, M. J., Ellenberg, S. S., Bell, L. M., & Rubin, D. M. (2008). Media coverage of the measles-mumps-rubella vaccine and autism controversy and its relationship to MMR immunization rates in the United States. *Pediatrics, 121*(4), e836-e843.
- Smith, P. J., Humiston, S. G., Marcuse, E. K., Zhao, Z., Dorell, C. G., Howes, C., & Hibbs, B. (2011). Parental delay or refusal of vaccine doses, childhood vaccination coverage at 24 months of age, and the Health Belief Model. *Public Health Reports, 126*(Suppl 2), 135.
- Sniehotta, F. F., Scholz, U., & Schwarzer, R. (2005). Bridging the intention–behaviour gap: Planning, self-efficacy, and action control in the adoption and maintenance of physical exercise. *Psychology & Health, 20*(2), 143-160.
- So, J. (2013). A Further Extension of the Extended Parallel Process Model (E-EPPM): Implications of Cognitive Appraisal Theory of Emotion and Dispositional Coping Style. *Health Communication, 28*(1), 72-83.
- Soyer, O. U., Hudaverdiyev, S., Civelek, E., Isik, E., Karabulut, E., Kocabas, C., & Sekerel, B. E. (2011). Parental perspectives on influenza vaccination in children with asthma. *Pediatric Pulmonology, 46*(2), 139-144.
- Sporton, R. K., & Francis, S. A. (2001). Choosing not to immunize: are parents making informed decisions?. *Family Practice, 18*(2), 181-188.

- Stadlin, S., Bednarczyk, R. A., & Omer, S. B. (2012). Medical exemptions to school immunization requirements in the United States—association of state policies with medical exemption rates (2004–2011). *Journal of Infectious Diseases*, *206*(7), 989-992.
- Stainback, R. D., & Rogers, R. W. (1983). Identifying effective components of alcohol abuse prevention programs: Effects of fear appeals, message style, and source expertise. *Substance Use & Misuse*, *18*(3), 393-405.
- Stokley, S., Cohn, A., Dorell, C., Hariri, S., Yankey, D., Messonnier, N., & Wortley, P. M. (2011). Adolescent vaccination-coverage levels in the United States: 2006–2009. *Pediatrics*, *128*(6), 1078-1086.
- Strange, J. J., & Leung, C. C. (1999). How anecdotal accounts in news and in fiction can influence judgments of a social problem's urgency, causes, and cures. *Personality and Social Psychology Bulletin*, *25*(4), 436–449.
- Strobino, D., Keane, V., Holt, E., Hughart, N., & Guyer, B. (1996). Parental attitudes do not explain underimmunization. *Pediatrics*, *98*(6), 1076-1083.
- Sutton, S. (1992). Shock tactics and the myth of the inverted U. *British Journal of Addiction*, *87*(4), 517-519.
- Tan E. S. H. (1996). *Emotion and the Structure of Film: Film as an Emotion Machine*. Mahwah, NJ: Lawrence Erlbaum Associates, 1996.
- Tanner Jr, J. F., Hunt, J. B., & Eppright, D. R. (1991). The protection motivation model: A normative model of fear appeals. *The Journal of Marketing*, 36-45.
- Taylor, J. A., Darden, P. M., Brooks, D. A., Hendricks, J. W., Wasserman, R. C., & Bocian, A. B. (2002). Association between parents' preferences and perceptions of barriers to vaccination and the immunization status of their children: a study from Pediatric Research in Office Settings and the National Medical Association. *Pediatrics*, *110*(6), 1110-1116.
- Ubel, P.A., Jepson, C. & J. Baron. (2001). The inclusion of patient testimonials in decision aids: effects on treatment choices. *Medical Decision Making*, *21*, 60–68.
- Vaccine Exemptions, Johns Hopkins, <http://www.vaccinesafety.edu/cc-exem.htm>

- Valois, P., & Godin, G. (1991). The importance of selecting appropriate adjective pairs for measuring attitude based on the semantic differential method. *Quality and Quantity*, 25(1), 57-68
- van den Putte, B., Yzer, M. C., & Brunsting, S. (2005). Social influences on smoking cessation: a comparison of the effect of six social influence variables. *Preventive Medicine*, 41(1), 186-193.
- Venkatesan, A. (2010). An event-related potential (ERP) study of attention allocation in the processing of a fear appeal and its relation to HPV vaccine acceptance. Doctoral dissertation, Rutgers University-Graduate School-New Brunswick.
- Venkatesh, V., Brown, S. A., Maruping, L. M., & Bala, H. (2008). Predicting different conceptualizations of system use: the competing roles of behavioral intention, facilitating conditions, and behavioral expectation. *Mis Quarterly*, 32(3), 483-502.
- Vermeir, I., & Verbeke, W. (2006). Sustainable food consumption: exploring the consumer “attitude-behavioral intention” gap. *Journal of Agricultural and Environmental Ethics*, 19(2), 169-194.
- Wakefield A. J., Murch S. H., Anthony A., et al. (1998). Ileal-lymphoid-nodular hyperplasia, non specific colitis and pervasive developmental disorder in children. *Lancet* 351:637–641.
- Wakefield, M. A., Loken, B., & Hornik, R. C. (2010). Use of mass media campaigns to change health behaviour. *The Lancet*, 376(9748), 1261-1271.
- Wallace, C., Leask, J., & Trevena, L. J. (2006). Effects of a web based decision aid on parental attitudes to MMR vaccination: a before and after study. *BMJ: British Medical Journal*, 332(7534), 146.
- Wallace, D. S., Paulson, R. M., Lord, C. G., & Bond Jr, C. F. (2005). Which behaviors do attitudes predict? Meta-analyzing the effects of social pressure and perceived difficulty. *Review of General Psychology*, 9(3), 214.
- Wang, A. (2006). Advertising engagement: A driver of message involvement on message effects. *Journal of Advertising Research*, 46(4), 355.
- Warshaw, P. R., & Davis, F. D. (1985). Disentangling behavioral intention and behavioral expectation. *Journal of Experimental Social Psychology*, 21(3), 213-228.

- Webb, T. L., & Sheeran, P. (2006). Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychological Bulletin*, 132(2), 249.
- Weinstein, N. D. (2007). Misleading tests of health behavior theories. *Annals of Behavioral Medicine*, 33(1), 1-10.
- Wheatley, J. J. (1971). Marketing and the use of fear or anxiety-arousing appeals. *The Journal of Marketing*, 62-64.
- Wicker, A. W. (1969). Attitudes versus actions: The relationship of verbal and overt behavioral responses to attitude objects. *Journal of Social Issues*, 25(4), 41-78.
- Wicker, A. W. (1971). An examination of the "other variables" explanation of attitude-behavior inconsistency. *Journal of Personality and Social Psychology*, 19(1), 18.
- Williams, K. C. (2012). Fear appeal theory. *Research in Business and Economics Journal*, 5, 1-21.
- Wilson, C. B., & Marcuse, E. K. (2001). Vaccine safety–vaccine benefits: science and the public's perception. *Nature Reviews Immunology*, 1(2), 160-165.
- Wilson, K., Mills, E.J., Norman, G. & G. Tomlinson. (2005). Changing attitudes towards polio vaccination: a randomized trial of an evidence-based presentation versus a presentation from a polio survivor. *Vaccine*, 23, 3010–3015.
- Wilson, T. (2000). Factors influencing the immunization status of children in a rural setting. *Journal of Pediatric Health Care*, 14(3), 117-121.
- Winterbottom, A., Bakker, H.L., Conner, M. & A. Mooney. (2008). Does narrative information bias individual's decision making? A systematic review. *Social Science and Medicine*, 67(12), 2079-2088.
- Wirtz, J. G., & Kulpavaropas, S. (2014). The Effects of Narrative and Message Framing on Engagement and Eating Intention Among a Sample of Adult Hispanics. *Journal of Nutrition Education and Behavior*, 46(5), 396-400.
- Witt, M. D., Seaberg, E. C., Darilay, A., Young, S., Badri, S., Rinaldo, C. R., ... Thio, C. L. (2013). Incident hepatitis C virus infection in men who have sex with men: a prospective cohort analysis, 1984–2011. *Clinical Infectious Diseases*, 57(1), 77–84.

- Witte, K. (1992). Putting the fear back into fear appeals: The extended parallel process model. *Communication Monographs*, 59(4), 329-349.
- Witte, K. (1994). Fear control and danger control: A test of the extended parallel process model (EPPM). *Communications Monographs*, 61(2), 113-134.
- Witte, K. (1996). Predicting risk behaviors: Development and validation of a diagnostic scale. *Journal of Health Communication*, 1(4), 317-342.
- Witte, K., & Allen, M. (2000). A meta-analysis of fear appeals: Implications for effective public health campaigns. *Health Education & Behavior*, 27(5), 591-615.
- Witte, K., & Morrison, K. (2000). Examining the influence of trait anxiety / repression-sensitization on individuals' reactions to fear appeals. *Western Journal of Communication*, 64(1), 1-27.
- Witte, K., Berkowitz, J. M., Cameron, K. A., & McKeon, J. K. (1998). Preventing the spread of genital warts: Using fear appeals to promote self-protective behaviors. *Health Education & Behavior*, 25(5), 571-585.
- Witte, K., Meyer, G., & Martell, D. (2001). *Effective health risk messages: A step-by-step guide*. Sage.
- Witte, K., Meyer, G., Bidol, H., Casey, M. K., Kopfman, J., Maduschke, K., ... & Robbins, S. (1996). Bringing order to chaos: Communication and health.
- Wolfe, R. M., & Sharp, L. K. (2005). Vaccination or immunization? The impact of search terms on the internet. *Journal of Health Communication*, 10(6), 537-551.
- Wood, N. & McIntyre, P. (2008). Pertussis: review of epidemiology, diagnosis, management and prevention. *Paediatric Respiratory Reviews*, 9(3), 201-212.
- Yang, Z. J. (2012). Too scared or too capable? Why do college students stay away from the H1N1 vaccine?. *Risk Analysis*, 32(10), 1703-1716.
- Yawn, B. P., Xia, Z., Edmonson, L., Jacobson, R. M., & Jacobsen, S. J. (2000). Barriers to immunization in a relatively affluent community. *The Journal of the American Board of Family Practice*, 13(5), 325-332.
- Zaichkowsky, J. L. (1994). The personal involvement inventory: Reduction, revision, and application to advertising. *Journal of Advertising*, 23(4), 59-70.

- Zanna, M. P., Olson, J. M., & Fazio, R. H. (1980). Attitude–behavior consistency: An individual difference perspective. *Journal of Personality and Social Psychology*, 38(3), 432.
- Zebregs, S., van den Putte, B., Neijens, P., & de Graaf, A. (2015). The differential impact of statistical and narrative evidence on beliefs, attitude, and intention: a meta-analysis. *Health Communication*, 30(3), 282-289.
- Zimmerman, R. K., Wolfe, R. M., Fox, D. E., Fox, J. R., Nowalk, M. P., Troy, J. A., & Sharp, L. K. (2005). Vaccine criticism on the world wide web. *Journal of Medical Internet Research*, 7(2).
- Zuckerman, M., & Reis, H. T. (1978). Comparison of three models for predicting altruistic behavior. *Journal of Personality and Social Psychology*, 36(5), 498.

APPENDIX A

MESSAGES

Statistical

Influenza (flu) is an infection of the nose, throat, and lungs caused by influenza viruses.

Symptoms of the flu may include: fever, cough, sore throat, runny or stuffy nose, body aches, headache, chills, fatigue, vomiting and diarrhea.

People as far as 6 feet away from an infected person who coughs or sneezes can catch the

flu. Your child can contract the flu from an infected person who does not look or feel sick.

Influenza is very common. In the United States, up to 63 million people (one out of five)

get the flu each year. Each year more than 200,000 people in the U.S. are hospitalized due

to flu complications. Experts estimate that approximately 36,000 Americans die from flu-

related complications each year. This is roughly equal to the number of women expected

to die from breast cancer each year.

Children under 5 years old are more likely than adults or older children to be hospitalized

due to the flu. Each year in the United States, about 20,000 children age five or younger

are hospitalized for flu-related complications such as pneumonia. During the 2012-2013

influenza season, 171 flu-related child deaths in the United States were reported to the

CDC. 90% of these deaths occurred in children who had not received a flu vaccination.

More than half of these children were healthy with no known chronic diseases or medical

conditions.

When we hear these disturbing statistics about childhood influenza, it often leaves us

wondering, "Is there something I can do to prevent this from happening to my child?" Did

you know that flu vaccination **reduces your child's risk of hospitalization due to flu**

by 60%? Immunizing your child against the flu is the most important thing you can do to protect your child from the flu. Yearly flu vaccination is generally recommended for those **6 months of age and older**. Flu vaccines are produced using strict safety measures, and over the years, millions of flu vaccines have been given in the United States. It is easy to discuss the flu vaccine with your health care provider if you have any questions or concerns.

Flu vaccines are available each season from around September to February. These shots are typically available for **\$0-\$15**. You can vaccinate your child by making an appointment with your child's doctor or through walk-in appointments at health departments, pharmacies, drugstores, or urgent care clinics.

*Sources:

Centers for Disease Control and Prevention (CDC) - <http://www.cdc.gov>

US Department of Health and Human Services - www.flu.gov

Narrative

Mia was an affectionate, playful three-year-old with a kind heart. She had a love for the outdoors and animals and always knew who needed a hug or friendly smile.

On Wednesday January 28, Mia seemed quieter than usual. Her smiley demeanor was absent. After taking a long nap, Mia began to show signs that she was feeling ill. A nurse determined that Mia had the flu. Mia was given anti-viral medication in the hope that it would lessen the severity of the illness, and her parents were told to keep her hydrated.

That Friday, Mia's fever spiked and she began to vomit. Mia's pediatrician reassured her parents that these symptoms were a normal part of the flu. Throughout the weekend, Mia had trouble holding down fluids. On Monday morning, Mia's parents scheduled another doctor's appointment for later that day.

After Mia was bathed and dressed for the doctor's office, she laid down in her parents' bed to rest and watch TV. She was found lifeless 15 minutes later. Mia's parents immediately began to administer CPR. Forty-five minutes later in the emergency room, doctors were able to get her heart started. For 12 hours, doctors tried to fully revive her, but the damage to her system was too great. Mia died later that evening. The autopsy revealed influenza that had worsened into pneumonia. Mia had not been vaccinated against the flu.

When we hear of tragic deaths like Mia's, it often leaves us wondering, "Is there something I can do to prevent this from happening to my child?" Did you know that flu vaccination **reduces your child's risk of hospitalization due to flu by 60%**?

Immunizing your child against the flu is the most important thing you can do to protect your child from the flu. Yearly flu vaccination is generally recommended for those **6 months of age and older**. Flu vaccines are produced using strict safety measures, and over the years, millions of flu vaccines have been given in the United States. It is easy to discuss the flu vaccine with your health care provider if you have any questions or concerns.

Flu vaccines are available each season from around September to February. These shots are typically available for **\$0-\$15**. You can vaccinate your child by making an appointment with your child's doctor or through walk-in appointments at health departments, pharmacies, drugstores, or urgent care clinics.

*Source: True story from www.familiesfightingflu.org

Control

Although viruses have played a key role in shaping the history of life on our planet, many people do not know what a virus looks like or how it works.

A virus is a tiny bundle of genetic material called DNA or RNA. The DNA or RNA wears a coat of protein to protect it. This is called the viral coat or capsid. In some viruses, such as influenza, there is an extra layer surrounding the protein coat. This is a lipid membrane called the envelope. The envelope may have built up carbohydrates and proteins on the outside that help the virus particles "catch a ride" on host cells. Host cells found in plants, animals, or humans are necessary in order for viruses to reproduce.

Viruses tend to be picky about what kind of cells they enter. For example, plant viruses are not equipped to enter animals.

Viruses come in a variety of shapes. A common shape is polyhedral (multi-sided). If you've ever looked closely at a cut gem, like the diamond in an engagement ring, you've seen an example of a polyhedral shape. Unlike the diamond in a ring, a virus does not come to a point, but is shaped similarly all around. Other viruses are shaped like ovals,

rectangles with rounded corners, skinny sticks, or looped string. Still others are more complex.

Viruses can be 10,000 times smaller than bacteria and cannot be seen by using a normal light microscope. There are some virus-like organisms even smaller than viruses. For example, scientists in the 1970s discovered simpler and smaller particles called viroids.

They are believed to be a more primitive version of ordinary viruses. Some viroids don't even have a viral coat. They are merely small strings of plain, or "naked," RNA.

Agricultural researchers found they caused problems in potatoes, tomatoes, and some fruit trees.

Viruses are the most abundant living entity in aquatic environments. They are essential to regulating saltwater and freshwater ecosystems. Most of these viruses are essential to recycling carbon and stimulating fresh bacterial and algal growth in the marine environment. These viruses are harmless to plants and animals.

Some viruses cause no harm to their host and enter and exit host cells unnoticed. Other viruses can cause illness. A few examples of illnesses caused by viruses are the common cold and influenza.

*Source: www.microbeworld.org

Combined

Mia was an affectionate, playful three-year-old with a kind heart. She had a love for the outdoors and animals and always knew who needed a hug or friendly smile.

On Wednesday January 28, Mia seemed quieter than usual. Her smiley demeanor was absent. After taking a long nap, Mia began to show signs that she was feeling ill. A nurse determined that Mia had the flu. Mia was given anti-viral medication in the hope that it would lessen the severity of the illness, and her parents were told to keep her hydrated. That Friday, Mia's fever spiked and she began to vomit. Mia's pediatrician reassured her parents that these symptoms were a normal part of the flu. Throughout the weekend, Mia had trouble holding down fluids. On Monday morning, Mia's parents scheduled another doctor's appointment for later that day.

After Mia was bathed and dressed for the doctor's office, she laid down in her parents' bed to rest and watch TV. She was found lifeless 15 minutes later. Mia's parents immediately began to administer CPR. Forty-five minutes later in the emergency room, doctors were able to get her heart started. For 12 hours, doctors tried to fully revive her, but the damage to her system was too great. Mia died later that evening. The autopsy revealed influenza that had worsened into pneumonia. Mia had not been vaccinated against the flu.

When we hear tragic stories like Mia's, it can cause us to question our knowledge of common infectious diseases such as influenza and how these diseases may affect our children. Influenza (flu) is an infection of the nose, throat, and lungs caused by influenza viruses. Symptoms of the flu include: fever, cough, sore throat, runny or stuffy nose, body aches, headache, chills, fatigue, vomiting and diarrhea. People as far as 6 feet away

from an infected person who coughs or sneezes can catch the flu. Your child can contract the flu from an infected person who does not look or feel sick.

Influenza is very common. In the United States, up to 63 million people (one out of five) get the flu each year. Each year more than 200,000 people in the U.S. are hospitalized due to flu complications. Experts estimate that approximately 36,000 Americans die from flu-related complications each year. This is roughly equal to the number of women expected to die from breast cancer each year.

Children under 5 years old are more likely than adults or older children to be hospitalized due to the flu. Each year in the United States, about 20,000 children age five or younger are hospitalized for flu-related complications such as pneumonia. During the 2012-2013 influenza season, more than 170 flu-related child deaths in the United States were reported to the CDC. More than half of these children were healthy with no known chronic diseases or medical conditions. 90% of these deaths occurred in children who had not received a flu vaccination.

When we hear these disturbing statistics about childhood influenza, it often leaves us wondering, "Is there something I can do to prevent this from happening to my child?" Did you know that flu vaccination **reduces your child's risk of hospitalization due to flu by 60%**? Immunizing your child against the flu is the most important thing you can do to protect your child from the flu. Yearly flu vaccination is generally recommended for those **6 months of age and older**. Flu vaccines are produced using strict safety measures, and over the years, millions of flu vaccines have been given in the United States. It is easy to

discuss the flu vaccine with your health care provider if you have any questions or concerns.

Flu vaccines are available each season from around September to February. These shots are typically available for **\$0-\$15**. You can vaccinate your child by making an appointment with your child's doctor or through walk-in appointments at health departments, pharmacies, drugstores, or urgent care clinics.

*Sources:

Centers for Disease Control and Prevention (CDC) - <http://www.cdc.gov>

US Department of Health and Human Services - www.flu.gov

True story from www.familiesfightingflu.org

BIOGRAPHICAL SKETCH

Sarah Hall grew up in Urbandale, Iowa. After completing a B.A. in English: Creative Writing from Brigham Young University, she moved to Africa to do volunteer work for a year and a half. After returning, she decided to enter the nonprofit sector. She then received her Master of Public Administration from Brigham Young University. Sarah worked in the nonprofit sector for several years as Executive Director of Empower Playgrounds, Marketing Director of Utah County Crisis Line, and Mexico Expedition Coordinator for A Child's Hope Foundation. Sarah also co-founded several nonprofits, such as Sowers of Hope and MicroBusiness Mentors. She is grateful to have had the opportunity to attend Arizona State University for her Ph.D. in Global Health. Sarah currently teaches full-time at Utah Valley University in the Department of Public and Community Health.