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Communicating Vaccination Information on Facebook Utilizing the Health Belief Model

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Communicating Vaccination Information on Facebook

Utilizing the Health Belief Model

by

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Table of Contents

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Abstract

The 2014 Disney measles outbreak brought the issue of vaccinations to the forefront of health communication across all mediums, including social media sites. While the US is considered to have one of the more successful vaccination rates globally, there remain supporters of an anti-vaccination movement and regions of the country with alarming rates of parents choosing not to vaccinate their children. This content analysis study of Facebook first identified the current trend of more activity amongst those who do not support the use of vaccines than those supporting vaccines. The user generated content was also evaluated for the use of mobilizing information to better understand how the social media site is utilized during an outbreak along with utilizing the Health Belief Model to identify misconceptions about vaccinations in order to establish more effective health campaigns during future outbreaks.

Keywords: vaccine, Facebook, health communication, Health Belief Model, Motivating Information

Communicating Vaccination Information on Facebook

Utilizing the Health Belief Model

In December of 2014 a measles outbreak occurred at California's Disney amusement park infecting 147 individuals from seven US states ("Measles Cases and Outbreaks," 2015). Measles is considered to be one of the most infectious diseases and can spread uncontrollably fast through a susceptible population. The virus has been traced as far back as the ninth century, but it was not until 1963 that a vaccine was developed ("Measles History," 2014). Before the vaccine was available it was estimated that in the US alone approximately four million people were infected with measles each year, about 50,000 were hospitalized and up to 500 people died annually (Wescott, 2015). Once available, the vaccine was found to be impressively successful with eliminating the spread of the virus. With mass adoption by parents to vaccinate their children, measles was considered to be eradicated in the US in 2000 ("Measles History," 2014). Compared to the global struggle where each day an average of 400 die from measles, the US has for the most part been successful at limiting the number of deaths caused by the disease ("Eliminating Measles," 2015). How then, with such a success rate, are we still experiencing outbreaks and threatened by the spread of such a virus? The answer perhaps, lies in the decisions taken by millions American parents who are choosing not to immunize their children against vaccine-preventable diseases.

One major setback for the mass adoption of vaccinations and resurgence of the anti-vaccination movement was the publication of the unverified results of the Wakefield et al. (1989) study which claimed a link between the MMR (Measles Mumps Rubella) vaccine to the onset of Autism. While the study was later retracted and the *British Medical Journal* outlined Wakefield's false data to attribute the MMR-Autism link, the original publication fueled the

mistrust of vaccinations once again and rise of measles cases (Holton, Weberling, Clarke, & Smith, 2012). Many critics blame the media and journalists for publicizing the initial study with no regard to the consequences and without providing parents with a source to direct their vaccination concerns to (Clarke, 2011). Almost three decades later, public health organizations are still battling the theories and misconceptions about the use of vaccinations that are prevalent (Heldman, Schindelar, & Weaver, 2013).

Recently, Buchanan and Beckett (2014) and Rochman (2013) have attributed some of the perpetuation of anti-vaccination information to social media sites, such as Facebook, as it has become a source of news for many Americans. Recent events such as the 2014 Disney outbreak have led to the resurgence of the vaccine debate in the US where it is becoming evident that even though parents have the right to choose, many are stressing that vaccinating your child is a social responsibility to ensure achieving herd immunity, where vaccination levels are high enough to prevent the transmission of the disease to those who cannot be vaccinated (e.g., those having weak immune systems). However, the debate is strong and continues to be a viral topic on Facebook where content is solely user generated (Buchanan & Beckett, 2014). Previous research, for example Buchanan and Beckett (2014), indicates that while there is a surplus of anti-vaccination information being shared on Facebook, there has not been any analysis that depicts parental use of Facebook as a news source for finding and sharing vaccination information during an outbreak of a vaccine preventable disease.

In addition, through the history of health communication an important factor of reporting potential health risks has been the use of motivating information to provide the public with a call to action for risk reduction behavior (Clarke, 2011). However, despite findings indicating that the public are now finding a majority of their news on their Facebook newsfeeds (Oeldorf-Hirsch

& Sundar, 2015), there has yet to be any research to indicate if motivating information is prevalent in Facebook news posts. Since the features of Facebook promote user generated content through the comments function of the site, it would be interesting to know if parents who are seeking and sharing vaccination news on Facebook are utilizing the site as a source to provide other parents with motivating information or simply as an outlet to share personal opinions on the topic.

This study explores the content of vaccinations on Facebook during the 2014 Disney measles outbreak to showcase what information was most prevalent in the time following an outbreak. The current study identifies which side, pro- or anti-vaccination, is most active on Facebook during the time of the outbreak, and then identifies the reasons that users indicated that they support or are against the mass adoption of vaccines using the health belief model (Rosenstock, 1974). The study will also highlight if Facebook users are providing readers with motivation information in order for other users to make informed decisions about vaccinations. By having a better understanding of what information is being shared during a major outbreak in an online user generated forum, which this study will examine through the scope of the health belief model, future health campaigns can be better suited to address misconceptions about immunization and produce more effective communication tools to increase public safety.

Literature Review

The Measles Virus

The World Health Organization (WHO) website explains that

Measles is one of the most infectious diseases known to humankind and an important cause of death and disability among children worldwide. Those unvaccinated against the disease are at risk of severe health complications such as pneumonia, diarrhea,

encephalitis (a dangerous infection of the brain causing inflammation), and blindness.

The disease can be fatal. ("Measles," 2015, para. 2)

Measles is a highly contagious virus that can spread by coughing, sneezing, close personal contact, or direct contact with fluids from an infected person. In addition, it is also contagious in the air or on infected surfaces for up to two hours and can be transmitted from person to person up to four days prior to symptoms appearing, and up to four days after the rash is visible on the infected person. According the WHO, "the disease remains one of the leading causes of death among young children globally" ("Measles Fact Sheet," 2015, para 2).

History of the Virus and Vaccine

The measles virus was identified first in the ninth century by the Persians. It was not until 1912 that it was a nationally notifiable disease in the United States where all health care providers and laboratories were required to report any cases. For the first decade of reporting, there were an average of 6,000 measles related deaths reported in each year ("Measles History," 2014). From 1953 to 1963 there were an estimated three to four million people infected with the virus each year, until the first vaccine was developed by John F. Enders in 1963 ("The Vaccine," 2015). By 1978 it was apparent that the vaccine was effective, and the United States Center for Disease Control (CDC) was confident that the measles virus would be completely eliminated from the US by 1982. Although it was not eliminated completely, in 1981 there were 80% less cases reported than the previous year due to the administration of the MMR vaccine. When another outbreak occurred among school-aged children in 1989, a second dose of the MMR vaccine was administered. Then in 2000 the CDC declared that measles had been eliminated from the US with no continuous transmission occurring for over 12 consecutive months ("Measles History," 2014). Worldwide, the measles vaccine was attributed to reducing the

number of deaths caused by the virus by 79% between 2000 and 2014 ("Measles Fact Sheet,"

2014).

Unfortunately, the elimination of measles from the US was short lived with 216

confirmed cases between 2001 and 2003 ("Epidemiology of Measles," 2004). Then in 2014, the

CDC reported a record of 668 measles cases across 27 U.S. states including two prominent

outbreaks, one of 383 cases in a large unvaccinated Amish community in Ohio, and the second

being the December 2014 outbreak at California's Disney amusement park where by February

2015, 125 cases were confirmed ("Measles Cases and Outbreaks," 2015). The Disney outbreak

was specifically alarming since of the 125 cases, only 35% of the infected were actually at the

amusement park and an alarming 45% were not vaccinated ("Measles Cases and Outbreaks,"

2015; "Measles History," 2015). While there were 12 infants who were too young to receive the

MMR vaccine, the remaining 67% of those not vaccinated were by parental choice (Zipprich et

al., 2015). The Disney outbreak led to a social debate within the US amongst the public and

specifically parents that while vaccination is a choice it can also be considered a social

responsibility to have your children vaccinated in order to protect the public, especially children

who are not old enough yet to receive the MMR vaccine.

The Anti-Vaccination Movement

Globally the opposition to vaccinations dates as far back as 1853 when England enacted

the Vaccination Act in an effort to reduce the transmission of smallpox (Tafuri et al., 2013). With

the belief that vaccination was an infringement on civil liberties, especially when administering

them conflicted with religious beliefs, the anti-vaccination movement was born (Blume, 2005).

With the boom in vaccine science combined with the increase in awareness of the effectiveness

of the vaccines to protect the well-being of children, and the reduction of mortality due to

infectious diseases, the momentum of anti-vaccine ideologies subsided from the 1940s to 1980s

(Poland & Jacobson, 2011). Unfortunately, the success of vaccination is also one of the

attributing factors that led to the demise of the public understanding and acceptance of them.

With fewer visible outbreaks of infectious diseases combined with more vaccines being

administered to children, questions started to surface about the necessity for the vaccinations,

fueling the anti-vaccination movement again in the 1970s (Poland & Jacobson, 2011).

There have been numerous justifications and claims made by anti-vaccination promoters

and parents as to why one should not vaccinate children, ranging from spiritual to the possible

health effects they may have, to even claiming a government conspiracy (Buchanan & Beckett,

2014; Davies, Chapman, & Leask, 2002; Serpell & Green, 2006; Tafuri et al., 2013). The CDC

has acknowledged that some of the most common misconceptions about vaccine safety include

the lack of efficacy, lack of research, risk for autism spectrum disorders, and the lack of necessity

(Buchanan & Beckett, 2014). There was a stigma before recent events that measles was

considered to be an ancient disease (Buchanan & Beckett, 2014). Since many parents in the

recent decades were never exposed to the virus and had not witnessed the massive outbreaks that

occurred before the vaccine was developed, they believed there was no need for the vaccine

(Buchanan & Beckett, 2014). Some parents are unaware that the effectiveness of vaccines

actually diminish over time and are nervous about vaccines being irreversible, therefore choosing

to delay or refuse the vaccinations (Serpell & Green, 2006). Other anti-vaccination claims

include the number of vaccinations that are recommended "overload" the immune system, one's

own immune system is stronger than the chemicals in the vaccination, vaccines are the cause of

more apparent social disorders such as Attention Deficit Disorder (ADD) or violent behavior,

political and economic conspiracy theories where larger profits are generated for the government

and medical professionals, and even claims of totalitarianism and genocide (Davies et al., 2002;

Tafuri et al., 2013). While some may believe that such claims against immunization are extreme,

the fact remains that they are out there, with conviction, with an online audience. With the aid of

an online community, no other anti-vaccination movement has been as controversial or perpetual

since the Wakefield et al. (1998) study as it unnerved parents about the safety of not just the

MMR vaccine, but on all vaccines (Tafuri et al., 2013).

The Wakefield et al. Study of MMR Vaccination

One major event that continues to fuel the anti-vaccination movement was the unverified

Wakefield et al. (1998) publication in the British medical journal, *The Lancet,* which suggested a

link between the MMR vaccine and the development of autism in young children (Wakefield et

al., 1998; White, 2012)**.** This study focused on 12 children who had developmental disorders

along with enterocolitis, which is inflammation of the colon or intestines. Nine of those children

had officially been diagnosed with autism. Medical histories were examined where parents

noted that the symptoms started to appear shortly after their children received the Measles

Mumps and Rubella (MMR) vaccination. Wakefield et al. (1998) suggested in the report that the

autism was a result of the MMR vaccine which caused damage to the intestinal lining, leading to

enterocolitis, which then permitted the gut-derived peptides to the brain and caused the abnormal

development of the child's brain due to one of the ingredients, Thimerosal, a mercury-based

preservative that was added to the multi-dose injection to prevent germ and bacteria growth.

These findings were communicated in a press release with recommendations that children

receive the MMR vaccines separately instead of in one combined injection until further research

on the MMR-autism link was conducted. The article ultimately led to the public doubting the

safety of the vaccine, resulting uptake of MMR vaccines, and the reappearance of measles in the

United Kingdom (Holton et al. 2012; White, 2012).

In 2004, after no other studies could support a link between MMR and autism, 10 of the 13 authors of the original study issued a retraction of their initial findings. In 2006 the UK General Medical Council (GMC) formally accused Dr. Wakefield of failing to attain an ethical review board for the published study and for failing to disclose that he had received monetary compensation from a lawyer representing several children whose families were involved in an autism-related litigation against MMR manufacturers. In 2010 Dr. Wakefield's medical license was terminated and *The Lancet* retracted the original 1998 article (Clarke, 2011; Holton et al, 2012).

Despite the retractions and the obvious flaws in the study, the damage had already been done. The news from Wakefield's initial press conference suggesting the Autism link to the MMR vaccine instantly spread through the world and fueled the anti-vaccination movement to include even outspoken celebrities such as Jenny McCarthy (Kata, 2012). With content going viral through media coverage and over the Internet, there was an overall increase in interest and concern about the safety of vaccines, the rise of new anti-vaccination interest groups, and a lower rate of administered vaccinations which declined as much as 30% in some regions, and unfortunately the UK had 18 times the number of reported cases and the first measles-related death (Clarke, 2011; Holton et al., 2012). The US similarly saw a dramatic increase in some regions of the country where the number of children ages 19 to 35 months that were not vaccinated estimated to reach as high as 36.9% by 2001 in 20 of the most unvaccinated counties across the country (Smith et al., 2004; Tafuri et al., 2014). Naturally as the possible Autism link made headlines around the world parents were much more hesitant to vaccinate their children, resulting in a direct correlation between news reporting and the declining vaccination rates and

an increaseing number of measles outbreaks.

Media Coverage Affects Vaccination Rates

The media have been, and continue to be, a vital source of information of health issues, and how they report on those issues has a major impact on how the public respond (Davies et al., 2002). After the *Lancet* retracted the Wakefield et al. (1998) study there was criticism of the media in how they reported the original publication and the effects that their journalistic styles had on the public's perception of the study and so-called findings. Concerns about publicizing the article without any supportive medical evidence and the failure to provide parents with mobilizing information were two suggested factors for the rise of measles cases after 1998 (Hoffman, 2006; Holton et al., 2012; White, 2012).

White's (2012) content analysis study found a direct correlation between the number of newspapers articles published about the MMR vaccine after the release of the Wakefield et al. (1998) study and the number of laboratory-confirmed measles cases in the UK. The number of measles cases rose after Wakefield's study was printed from 75 to peaking at 450 cases in 2003, which was the same year a docudrama of the Wakefield et al. (1998) study aired on British television. The number of measles cases continued to rise in 2006 to 764, then peaking to 1,446 in 2008, the same time period where there was a slight increase in news reports. By August 2011 the number of confirmed cases was back down to 836. White (2012) also analyzed the frames used in the 2,650 articles from 1998 to 2011 and concluded that the media failed to explain the underlying science of the initial study to the public in order for the public to provide the necessary and informed action about vaccinating their children.

Other studies, for example Holton et al. (2012) and Offit and Coffin (2006), have supported the findings that the media initially reported more about the claims of the single study

suggesting an MMR-autism link rather than evidence against the link which lead to the mistrust

of the vaccine despite that the Wakefield et al. (1998) study stated that they generated only a

hypothesis of the Autism-MMR link and could not "prove a causal association" (Holton et al.,

2012, p. 691). Offit and Coffin (2006) argued that news reports of the potential Autism-MMR

link were "more interesting than informative" (p. 3), often providing emotional stories from

parents who believed their children were harmed by the MMR vaccine. In addition, the media

failed to provide parents and the public the necessary information and direction to address their

concerns about the vaccinations, or mobilizing information (Hoffman, 2006; Holton et al., 2012).

The news media highlight specific health stories and have the ability to influence public

perception of important topics that may affect their well-being (Offit & Coffin, 2006). However,

sensitive topics in the health field can be sensationalized, making it more imperative to provide

readers with the necessary tools to make informed decisions. In terms of health behavior and

reporting, these tools can and should be communicated in the form of mobilizing information

(Hoffman, 2006).

Mobilizing Information: A Missed Necessity in Communicating Health Issues

Mobilizing information (MI) is specific "calls to action" in news reports or stories that

provide the receivers messages to "act on existing attitudes and adopt health-protective or

enhancing behaviors" (Clarke, 2011, p. 609). MI is utilized in three different ways:

identificational, where names and contact information for specific people or groups who are

knowledgeable about the topic at hand can be reached (e.g., medical professionals, specialists, or

support groups); locational, such as a time and/or place of a specific activity (e.g., where to go to

get a vaccination); and tactical, which is an explicit or implicit instruction to adopt a certain

behavior (e.g., contact your health professional to see if your immunizations are up to date;

Holton et al., 2012; Tanner et al., 2009).

When the media provide mobilizing information it serves as a source for the public to first become aware that there is an issue that may affect them. MI then aides the public in becoming aware of the strategies that can assist them in addressing that issue. And finally, MI has the potential to motivate the public to take action, in this case, talk to a medical professional about vaccinating your children. Health officials argue that because of the lack of mobilizing information in news coverage of the Wakefield et al. (1998) study, parents and other individuals were unable to make informed decisions about vaccinations (Clarke, 2011). The media have the power and responsibility to provide a holistic view of the vaccine debate and have the readers' attention to direct them to the best possible source for further information. However, those responsibilities have not been fulfilled at alarming rates with traditional media in the past (Clarke, 2011).

Clarke's (2011) content analysis study of UK and US news articles from 1998 to 2006 found that only 16% of 279 British and US articles provided mobilizing information. Of that 16%, 1.43% directed readers to a government website to learn more about vaccine safety; 2.5% urged readers to speak to their healthcare provider about their vaccine-related questions; 6.5% provided names of vaccines that did not contain or no longer contained thimerosal, which was one of the most questionable ingredients of the MMR vaccine; and 11.5% contained the names of vaccines that did still contain thimerosal. Overall it was found that articles from the US were more likely to mention at least one example of motivating information (37%) compared to the British newspapers where only 8.3% did (Clarke, 2011). Other studies have supported Clarke's findings of the lack of MI provided in the news reporting of the vaccination controversy. The Holton et al. (2012) content analysis of global media coverage from 1998 to 2011 found that of

the 281 sample of printed news articles, only 26% provided MI and only 30% of those articles

included tactics. The concept that less than half of the information provided in print media to

readers included MI for further investigation from a reputable source is alarming. This past

research is also significant in how it foreshadows the content that is prevalent on more modern

news sources, such as the Internet.

Studies such as Hoffman (2006) and Tanner, Friedman, Koskan, and Barr (2009) have

focused on studying online content and found that even though the ability to provide MI may be

easier than in traditional media, such as providing weblinks to outside sources, MI was still only

present in less than half of the sites studied. The fact that MI is still missing proposes that the

sources consumers are using to obtain their news and information are still failing to provide the

necessary support for the readers to make informed decisions. These findings also suggest the

importance of understanding where consumers are seeking and finding their health information

as a shift from print to online media is at the forefront.

Health Information Seeking Online

While we see and hear medical studies and reports through traditional media, TV,

newspaper and radio, there is no greater source for information in today's world than the Internet

(Tafuri et al., 2013). The main concern in regards to the popularity of news seekers utilizing

Web 2.0 for their health information is that the information is no longer sourced solely by doctors

and professionals of the field. Instead, content is being produced by the public, patients, parents

of patients, and is being shared across the web instantaneously (Tafuri et al., 2013). During the

H1N1 2009 outbreak, a Pew Research News Internet Index study found that about 50% of the

American public search the Internet for information about the flu virus and about 25% of their

study's respondents indicated that they felt that the Internet was a better source for flu

information than television (Allen, 2009; Biswas, 2013). This indicates an important shift of

where consumers are seeking out their information from traditional media to more instant

sources of communication, such as the Internet.

According to the Pew Research Center (2014), approximately 87% of Americans use the

Internet. An earlier Pew Research survey conducted in August and September of 2012 found that

72% of Internet users had done an online search for health information within the past year. The

same study found that 77% of those searches began at an online search engine such as Google,

Yahoo, or Bing (Fox & Duggan, 2013). Davies, Chapman, and Leask (2002) found that when

entering the search term "vaccination" into seven leading search engine sites, 43% of the top ten

results led the searcher to an anti-vaccination website. Despite one third of these sites claiming

to be non-partisan in the vaccination debate, only 15% provided any information supporting the

adoption of vaccines (Davies et al., 2002). It is evident that if a parent is seeking information

about vaccinations, they are not only likely to search online for the information, but will also

come across anti-vaccination claims within their first search experience.

Facebook as a News Source?

One major source for the sharing of both pro- and anti-vaccination information on the

Internet is social media sites such as Facebook. Facebook is currently the leading social media

site in the world with 936 million worldwide daily users in 2015, which is up 17% from the

previous year ("Company Info/Facebook Newsroom," 2015). Not only are 64% of U.S. adults

on Facebook, but half of those users are obtaining news information from this specific social

media site which ends up to be about 30% of the American public (Holcomb et al., 2013). In

addition, social network users are more likely to stumble upon current events news through their

Facebook newsfeed than they are to actively search for news content (Oeldorf-Hirsch & Sundar,

2015). With a significant portion of Facebook users utilizing the site as a news source, it is imperative to understand what content about vaccinations is being shared and how are users responding to that content.

The Buchanan and Beckett (2014) content analysis of Facebook found that of the 30 sites analyzed in an August 2012 search of "vaccine," 50% were classified as pro-vaccination, 7% neutral, and 43% were anti-vaccination. Additionally, their study found that there was indeed less activity on the Facebook pages that were pro-vaccine rather than those that were not. It was also found that even posts that dispelled some of the vaccination myths generated less interest, no matter how valid, by Facebook followers. The authors suggested that Facebook not only allows the misinformation of vaccination to persist but that it is also an attributing factor to parents deciding not to vaccinate their children (Buchanan & Beckett, 2014). These findings indicate the importance of identifying and understanding the reasons that parents are voicing their anti-vaccination beliefs online since the nature of Facebook makes those comments prevalent to their network of friends, continuing the ability for those messages to persist in that user's online community. Looking at the user comments and identifying their reasoning for or against the use of vaccinations through the scope of the health belief model will help identify areas in which future communication about vaccines can be more effective.

The Health Belief Model

The health belief model (HBM) was developed by Irwin Rosenstock, Mayhew Derryberry, and Barbara Carriger in the 1950s to explain why the public did not participate in free tuberculosis screenings (Neifeld Wheeler, 2010). The HBM has become one of the most widely used theories in health communication to explain and predict the adoption of health behaviors. The HBM outlines four psychosocial factors that will predict if a person will adopt a

specific health preventative practice: first is perceived susceptibility, what is the perceived risk or likelihood that they will get the virus; second is the perceived seriousness of the virus which indicates (in this case) the parent's assessment of the virus if the child were to get it; third is perceived benefits, what is the likelihood that vaccinating their child will reduce the chance of them getting the virus; and the final factor is perceived barriers, which identifies the costs that may be greater than adopting the suggested behavior whether that be convenience, financial cost or even social pressures (Briones, Nan, Madden, & Waks, 2012; Smith et al., 2012). These psychosocial factors assist in targeting what, if any, inconsistencies the public are communicating with their reasoning for not adopting the specific health preventative behavior in question. It was believed, and still is today, that efforts to prevent epidemics with the adoption of vaccinations will be more effective through communication campaigns once the reasons why parents choose not to vaccinate are identified (Briones et al., 2012; Smith et al., 2012).

       Smith et al. (2011) analyzed the data provided by the 2009 National Immunization Survey through the scope of the HBM and concluded that parents' main reason for deciding to delay or refuse a vaccine to their children was because their children were ill at the time of the scheduled appointment. An important takeaway from this finding suggested that it was vital for medical providers and clinics to have and utilize a recall system in place to remind the parents to bring the child back for their missed doses. Additionally, compared to parents who only delayed vaccination, parents who altogether refused to vaccinate their children did so for reasons such as their belief that there are too many shots, concerns of the autism link, vaccine effectiveness or side effects, or they had heard negative reports about vaccines in the media (Smith et al., 2011). These findings indicate topics that future vaccine campaigns need to improve on in order to decrease the number of unvaccinated children. By utilizing the HBM not only can

misconceptions about vaccinations be identified, but also other complications that may be

hindering parents from vaccinating their children that could easily be addressed, such as the

recall system mentioned above.

While there has been a wealth of studies completed utilizing the HBM in regards to

vaccination adoption rates, there is a lack of analyzing the HBM with current media trends such

as social media. One study that did exemplify HBM was the Briones, Nan, Madden and Waks

(2012) content analysis of YouTube, a site that gets over two billion views per day, using the

HBM to examine the information that is provided about the human papillomavirus (HPV)

vaccine. The YouTube study was a comparison to previous studies by Ache and Wallace (2008)

and Keelan et al. (2007) that were completed five years prior shortly after the founding of

YouTube and approval of the vaccine, to determine if there were any changes in the overall tone

about the HPV vaccine within the site. What Briones et al. (2012) found was a shift towards

more negative attitudes about the HPV vaccine with the increase in consumer content versus

content provided by news or medical professional. By analyzing the content with the HBM they

identified that one-third of the videos suggested low efficiency of the vaccine, high physical risks

associated with the vaccine, and lack of information about the risks of acquiring the virus

without the use of the vaccine, in addition to the lack of motivating information present. A

significant finding of this study was the indication that content on YouTube has shifted to be

more user generated as the overall tone has changed to being more counteractive to the adoption

of the vaccine. This implies that the public is utilizing social media sites such as YouTube to

voice their concerns with a large audience about the use of vaccines, a concept that should be

analyzed with the world's most popular social media site, Facebook.

As previous studies have indicated (Buchanan & Beckett, 2014) there is an abundant

amount of user generated content on Facebook about the use of vaccinations, with a majority of

the content being inaccurate. As of yet there have not been any studies analyzing the content of

Facebook through the scope of the HBM. Doing so would help determine not only what activity

is more prominent on Facebook, anti or pro-vaccination, but what perceptions, if any, are being

communicated through the user comments. This information will help suggest future campaign

topics in an effort to increase vaccine adoption rates and decrease the spread of vaccine-

preventable diseases.

In addition, it has been determined that health communication is most effective with the

use of mobilizing information in order to ensure that readers are provided with some take-away

to obtain valid information and make informed decisions. The nature of Facebook allows users

to share not only information easily, but also makes it extremely simple to provide other users

with motivating information with the use of weblinks. However, there haven't been any studies

determining if users are taking advantage of these features by providing motivating information

to each other, or if users are simply utilizing Facebook to vent their concerns to a larger public.

Understanding the use of MI, especially in user generated content, will help us understand the

nature of the information being communicated on Facebook in regards to vaccinating children.

It will help clarify if parents are utilizing Facebook to vent their opinions about vaccines, or if

they are trying to provide helpful and useful information from their own experiences that may

assist other parents with making informed decisions about vaccinating.

The current study is an analysis of user generated content on Facebook after the 2014

Disney measles outbreak through the scope of the HBM. The research questions outlined below

will first decipher what type of information a parent is most likely to find on Facebook post-

outbreak, supporting or refuting the use of vaccinations. The user generated content will be

examined to decipher first of all what tone is most prevalent in the comments, pro- or anti-vaccination, along with what additional motivating information the users, comparatively on both sides of the debate, are providing to other readers, an aspect that has not yet been analyzed on Facebook. Finally, through the scope of the HBM the self-reported content will be analyzed to better understand what, if any, inconsistencies are being communicated about the use of vaccinations during a time of increased awareness of vaccine preventable diseases being transmitted.

The information obtained from these research questions will shed light on what the current Facebook community is saying about the adoption of vaccines. The content will help us better understand how parents are communicating an important heath topic with each other through this social medium, and if they are utilizing Facebook as a method to provide other parents with the necessary tools to make informed decisions about their child's health. Secondly, the answers from these research questions will identify topics that need to be better communicated to the public about the safety of vaccinations for increased adoption rates.

Research Questions

RQ1. After a measles outbreak, are Facebook posts on vaccine-related pages and user-generated comments supporting the use of vaccinations, against the use of vaccinations, or neutral?

RQ2. How does the frequency of mobilizing information differ from supporters to refuters of vaccine adoption in user comments on Facebook posts after the Disney measles outbreak?

RQ3. Are there differences between supporters and refuters of vaccine adoption in communicating different types of motivating information; identificational, locational, or tactical

supporting their viewpoint on vaccinations?

RQ4. Are the Facebook user comments conveying the four factors of the HBM: perceived susceptibility, perceived seriousness, perceived benefits and perceived barriers?

Methods

This is a content analysis study of the information provided on Facebook about vaccines in the US. After the recent Disney outbreak, there has been increased pressure from pro-vaccinators urging other parents to support vaccination to gain herd immunity for the good of the general population of the US. However, there is no current research during or after a major outbreak that illustrates what and how much information is being shared and viewed over Facebook.

From a new Facebook user account, to prevent that prior search history influences search results, a search using the keyword "vaccine" was performed in the newsfeed to identify the top sites. The term "sites" refers to Facebook pages and the term "posts" refers to original content posted on Facebook by the site itself or shared by that site for its followers to see. The term "comment" refers to the replies that the original posts received from Facebook users.

Analyzed content of original posts for this study was limited from December 28, 2014 to May 8, 2015 as the time surrounding the Disney Measles outbreak, giving two weeks after the last reported case on April 24, 2015 ("U.S. Measles Multi-state Outbreak," 2015). This limited time was only for the original posts; user comments and shares will be analyzed through June 2015 since users can continue to comment on posts long after the original post. Sites reviewed were limited to those discussing human vaccines. Analyzed content is also limited to posts and comments discussing vaccines and the current Disney outbreak which included, but was not limited to, updates on measles outbreaks attributed to a visit to Disney, general information about

vaccines, health communication campaigns both for and against the use of vaccines, information about legislation concerning the use of vaccines, history about vaccine, personal stories referencing vaccines, and so on.

To answer the research questions identified above, the posts analyzed during the allotted time frame of the top three sites were classified as anti-, pro-, or neutral to vaccinations based on the nature of each post. To be classified as an anti- or pro- post there had to be some identifiable information within the post, for example information about why vaccines are harmful, that did not support the use of vaccines. For the post to be classified as pro-vaccines the post could provide positive insights to the use of vaccines, warnings against not vaccinating, or even a general update on how vaccines have helped specific communities where they have been administered. If there was no clear indication either way that the post either refuted or supported the use of vaccines, it was classified as neutral.

 Each comment of those posts was also classified as anti-, pro-, or neutral based on the self-reported information in the comment, same as how the posts were classified. However, if a user commented that they simply "agreed" to the post, then the nature of the post as anti- or pro- reflected on how their comment was classified. For example, if the post stated "all vaccines should be banned" and a user commented with "agree," the post's anti-vaccination classification would be the same for this user's comment. If the user simply used an emoticon, tagged another user in the comment, or simply commented that the post was "so sad" with no identifiable information about their viewpoint, it was classified as neutral.

To measure the activity on Facebook for both supporters and opponents of vaccination, the number of likes, shares, and comments for the original posts were recorded. To monitor any shifts in overall tone from the posts and comments, their dates have also been recorded.

To identify motivating information within Facebook posts and comment, the content within the original post and the comments of the post was screened for identificational, locational, and tactical information. Identificational information refers to comments that present names or contact information for specific people or groups who are knowledgeable about the topic at hand that can be reached (e.g., medical professionals, specialists, or support groups). Locational information, such as a time and/or place of a specific activity (e.g., where to go to get a vaccine or time of online chat forum with a specialist), if present in the comment was recorded. Tactical information is identified as an explicit or implicit instruction to adopt a certain behavior (e.g., contact your health professional to see if your immunizations are up to date) in the user's comments.

The four HBM factors were categorized only for the self-reported information provided in the comments and were coded as seen in the example below. If the user reports in their comment the likelihood that they or their child will get a vaccine preventable disease it was recorded that the user presented perceived susceptibility. If the intensity of the user's perceived susceptibility can be recorded as high or low, that was reported as well, unless it was unclear or not distinguishable, which then it has been recorded as unclear. If the user depicts the seriousness of the disease if their child were to contract it in their comment, it was recorded as self-reported perceived seriousness. To measure the severity of the user's self-reported perceived seriousness it was recorded if their perception of the seriousness of the disease was low, high, or unclear. It was recorded if the user does or does not report what benefits their child will receive if they were to get the vaccination(s). If they have mentioned benefits those specific self-reported benefits were recorded. If the user reported barriers that have kept them from vaccinating their children, for example perceived cost of getting the vaccine that has been

recorded as perceived barriers. The specific barrier(s) they indicate were also reported to see if there are any common obstacles identified in Facebook's content.

Table 1

Coding Example to Evaluate the Health Belief Model's Factors: Susceptibility, Seriousness, Perceived Benefits, and Perceived Barriers

User indicates perceived suscepti-bility	Perceived suscepti-bility is high	Perceived suscepti-bility is low	Perceived suscepti-bility is unsure	User indicates perceived serious-ness	Perceived serious-ness is high	Perceived serious-ness is low	Perceived serious-ness is unsure	User indicates perceived benefits	Perceived benefits are:	User indicates perceived barriers	Perceived barriers are:
1	1	0	0	1	1	0	0	1	Avoiding vaccine preventable disease	1	Chemicals in vaccine

A sample of the coding was done prior to coding all Facebook posts and comments within the target dates. An intracoding reliability was tested by coding two Facebook posts and its comments from the sample, then coded a second time two days later to ensure that results are the same. The Scott's Pi analysis indicated that the intracoding was 92% or higher in agreement across all variables. All coding was done using the attached codebook (see Appendix) and recording results in an Excel spreadsheet.

Results

From the three Facebook pages that were reviewed, National Vaccination Information Center, Gavi, the Vaccine Alliance, and vactruth.com, 2830 user comments were recorded from a total of 144 posts to answer the research questions that were previously outlined. Each of the three sites, according to their "about sections" on the pages held a different position on the use of vaccines.

The National Vaccine Information Center Facebook page identifies that it is neither solely for nor against vaccine use. They indicate that their purpose is to "support the availability of all preventive health care options, including vaccination, and the right of consumers to make

educated, voluntary health care choices" (National Vaccine Information Center, 2015). They had 140,065 likes to their page, and of the 46 posts to their page during the allotted time for this study 41 of them did not support the use of vaccines, 5 posts were neutral, and there were no posts providing information in support of vaccines. A majority of the posts (72%) were political in nature regarding upcoming legislation in different states around the country were voting on exemptions and waivers for children's vaccinations.

Gavi, the Vaccine Alliance is an international organization that not only promotes the use of vaccines but strives to increase vaccination rates around the globe, focusing on third world countries. With 35,398 likes, the page had 36 posts within the time frame of the content analysis, with all of the posts (100%) supporting the use of vaccinations. Most of the posts (69%) were health communication campaigns discussing the benefits and effectiveness of vaccinations in the regions they worked such as the reduced infection rates of vaccine-preventable diseases.

The final Facebook page, vactruth.com, has it outlined very clearly in their "about" section that they do not support the use of vaccinations and that it is not a page for anyone who supports the use of vaccines to follow. This page had 77,593 likes and 61 posts within the allotted time, with almost all posts (98%) during the designated time frame not supporting the use of vaccines. A majority of the posts were either a health communication campaign (26%) discussing the dangers of vaccines or a personal story (26%) where it highlighted an injury or death attributed to a vaccination.

RQ1: After a measles outbreak, are Facebook posts on vaccine-related pages and user-generated comments supporting the use of vaccinations, against the use of vaccinations, or neutral?

Table 2

Percentages of Facebook User Comments That Support, Do Not Support, or Were Neutral in Opinion on Vaccine Use

Opinion on Vaccine Use	*n*	*%*
Support	92	3
Do not Support	1301	46
Neutral or Unspecified	1442	51

The results showed that only 3% of the 2830 comments supported the use of vaccines, 46% clearly did not support the use of vaccines, and 51% of the comments were either neutral or did not provide information to indicate if the user was pro or against the use of vaccinations (see Table 2). The neutral comments reflect an overwhelming number of users making general comments such as "so sad," tagging other people in the comments, or the use of emoticons. Despite the higher percentage of neutral comments, it is still clear that the user-generated comments on Facebook are still largely not in support of the use of vaccines.

RQ2. How does the frequency of mobilizing information differ from supporters to refuters of vaccine adoption in user comments on Facebook posts after the Disney measles outbreak?

Table 3

Percentages of Facebook User Comments That Utilized Mobilizing Information Based on Their Vaccine Standpoint

Facebook Users	*N*	*n* Used MI	Percentage Used MI
Vaccine Supporters	92	5	5
Vaccine Non-Supporters	1301	75	6

Overall across all comments, mobilizing information was only present in 4% of the user comments. Of the comments that indicated the support of vaccine use, only 5% showcased any MI. Those clearly opposing vaccine use also had a low use of MI in just 6% of the overall comments (see Table 3). Therefore, users and parents are not utilizing the functional abilities of Facebook to provide MI to other users which suggests that they are instead using the site more so as a tool to vent about their beliefs and experiences about the topic at hand. The results also indicate that there is not significant difference in the use of MI between non-supporters and supporters of vaccines.

RQ3. Are there differences between supporter and refuters of vaccine adoption in communicating different types of motivating information; identificational, locational, or tactical supporting their viewpoint on vaccinations?

Table 4

Percentages of Facebook User Comments, Based on Their Vaccine Standpoint, and Their Use of the Three Types of Motivating Information

Type of MI	Users Who Support Vaccine Use ($N = 92$)		Users Who Do Not Support Vaccine Use ($N = 1301$)	
	n	%	*n*	%
Identificational	4	80	40	53
Locational	0	0	5	7
Tactical	1	20	29	40

Of the five vaccine-supporting comments that presented any MI to other users, four (80%) of the comments were identificational, none were locational, and only one (20%) was tactical. Of the 75 comments showcasing MI by those not supporting the use of vaccines, 40

(53%) of the comments were identificational MI, 5 (7%) were locational, and 29 (40%) were

tactical MI (see Table 4).

These results indicate that Facebook users are still not utilizing the functional tools of the

site to provide other users with the necessary information to make informed decisions in the form

of motivating information. Overall there is a low percentage of MI present across both

supporters and refuters of vaccine use with no statistical significance based on their viewpoint.

When used, both groups utilized identificational MI the most with links to online information

about the topic at hand by a professional in that field. The higher number of tactical MI

presented by vaccine refuters is likely from a large number of comments from posts on the

National Vaccine Information Center page that highlighted pending legislation of vaccine

exemptions where the comments directly suggest that other users contact their local

representative and provided a direct link to do so.

RQ4. Are the Facebook user comments conveying the four factors of the HBM: perceived

susceptibility, perceived seriousness, perceived benefits and perceived barriers?

Table 5

Percentages of Facebook User Comments That Showcased the Four Factors of the Health Belief
Model (N = 2830)

HBM Factors	*n*	*%*
Susceptibility	77	3
Seriousness	69	2
Benefits	36	1
Barriers	405	14

Out of the 2830 user comments that were analyzed, users provided significant information for classification within the four factors of the health belief model in only 587 comments with 405 of them emphasizing barriers to vaccinating. Only 3% alluded to the susceptibility of acquiring a vaccine-preventable disease, 2% mentioned the seriousness of disease if they were to get it, 1% mentioned benefits of getting the vaccines, and 14% indicated their barriers to getting the vaccines (see Table 5).

Table 6

Top Barriers Indicated by Facebook User Comments for Not Supporting Vaccine Use

HBM Barriers	*n*	*%*
Developing a Vaccine Related Illness	200	49
Financial Conspiracy	93	23
Chemicals and/or Ingredients of Vaccines	87	21
Inefficiency of Vaccines	24	6
Too Many Vaccines	21	5
Vaccines Interfere with Natural Immunity	16	4

Note. Totals of frequency do not equal 405 and percentages do not equal 100 because users sometimes identified multiple barriers within one comment.

The barriers that users highlighted the most as to reasons for not supporting the use of vaccinations were vaccine related illness or death, chemicals or ingredients of vaccines, financial conspiracy, government conspiracy, too many vaccines, and interference with natural immunity (see Table 6). Overall 49% of users who indicated barriers for not participating in the suggested vaccination schedule indicated that it was because of the fear of possibly developing some type of side effect (e.g., autism, epilepsy, or possibly even death) from vaccines, and some (16%) eluded to a personal experience of a family member who has had such a side effect. Other fears regarding the vaccines themselves arose as barriers such as the ingredients of the vaccines (being

of aborted human fetuses or the chemicals used) at 21%, claims that the vaccines just are not

efficient (6%), too many vaccines are administered to children (5%), and the belief that vaccines

either interfered or were not as strong as a person's natural immunity (4%) were indicated in this

study. Other barriers that were indicated frequently were the belief of financial conspiracy

(23%) where "big pharma" was accused of collecting significant financial gains for administered

vaccines and even for health services of those who experienced any side effects from the

vaccines. Government conspiracy, including the ideology of forced population control, made up

9% of the barriers indicated by users as to reasons why they do not support the use of

vaccinations.

In the context of user-generated content on Facebook, the HBM was only useful in

indicating the popular barriers that users attributed to not supporting the use of vaccinations.

This is largely due to the lack of content provided in the comments, especially the 51% that were

identified to being "neutral" in their vaccination beliefs.

Discussion

Previous research indicated a shift towards anti-vaccination information becoming more

prevalent online with increased user generated content, a notion that was confirmed with this

study. Of the three Facebook sites that were analyzed in the current study, anti-vaccine

sentiments in the user generated content were 14-times more prevalent than those that supported

the use of vaccines. This alarming observation suggests that if this trend were to continue,

Facebook users would be exposed mainly to content deterring them from vaccinating themselves

and/or their children. Despite that this study cannot directly identify if other users utilize the

information they collect from Facebook to make their vaccination decision, it can be implied that

the overwhelming negative feedback by users about use of vaccines could make them second-

guess future vaccination decisions.

The justifications that were highlighted through the HBM bring light to areas of communication that need to be enhanced in order to increase the trust and use of vaccines in the coming years. While the Autism link and vaccine-related illness or possibly even death is still the primary rationale for parents choosing not to vaccinate their children, other justifications such as distrust for medical professionals and governmental agencies due to financial gains are becoming much more prevalent. This highlights new topics that health campaigns need to identify, address, and reevaluate their future communication tactics with the general public about the use of vaccines. If parents fear the intentions of the medical professionals that they typically trust with the well-being of their children, vaccine adoption rates within the US may continue to decrease. Unfortunately, parents and other online users are not able to find the pertinent information to make an informed decision on vaccinations from Facebook content any more than they can from other online news sources.

Facebook's easy sharing features have the potential to be a vital tool for users to disseminate information that they deem important to a large online audience, however, the current study found that those features are still not being utilized. Despite Holcomb et al.'s (2013) findings that 30% of American's are using Facebook as their news source, the current study highlights that Facebook is primarily still being thought of and utilized as it was intended to be, a "social" communication tool, by the majority and has not yet been adopted by the masses as news source. The comments that were analyzed showcased that users are utilizing Facebook for the most part to communicate their own personal beliefs and experiences with a large online audience.

Within health communication, MI has been identified as a critical tool to assist with

informed decision making, yet has been largely absent in the reporting of vaccination information through print and online journalism. It was hoped that in a more user generated content setting, such as Facebook, that the use of MI would be much more prevalent in order to provide other users with important and influential information, however that was not the case. In fact, compared to Clarke's (2011) study of online vaccination articles that showed 16% provided MI, Facebook users are lagging significantly with less than 6% of overall comments providing weblinks or some type of direct content to assist other users in their vaccine-related decision making. This suggests that despite Facebook being the most largely utilized social media site in the world with an audience of over 900 million people, for the most part it continues to be a forum for people to vent their frustrations on varied topics, such as vaccinations, instead of capitalizing on its ability to share valued information and educate a global audience.

Limitations of this study include the time limitations, its validity to only Facebook users who have posted comments publicly, and the ever changing online trends. This study only reviews the content posted and shared on Facebook during six months. While the purpose is to analyze the content during a measles outbreak, there is a great amount of information that had been shared on Facebook prior to the Disney outbreak and still exists for users to read. In future studies of Facebook content, pages belonging to popular news sources should also be reviewed as there were no status updates on the current outbreak discussed on the pages analyzed during this study. Another limitation to studying Facebook content is the ability for a page to delete user-generated comments to their page, or users even deleting their own posts that may have been part of an online dialogue. Additionally, this study focuses only on the information provided on Facebook and does not include the parents who seek information from their pediatricians, their social networks, or an online search including Google. This study also

included global content instead of focusing on pages intended for only US users, which would

have been more relevant to the Disney outbreak that happened within the US. Despite Facebook

being the top social media site in the world today, there is no saying what site, app, or other

technological trend will go viral in the future that may include an entirely new set of online

practices and features. Future studies analyzing user content should also omit comments that do

not provide any content for results, such as tagging another person or using an emoticon. The

findings of this study showed that over 50% of user comments were neutral to the use of

vaccinations, primarily because of the lack of content provided in the comments. By focusing

more on usable content within the coding perhaps the findings, such as use of MI, may have

provided more statistically significant results. Finally, this study does not show the validity of

the information about vaccinations present on Facebook. That information was deliberately

omitted due to the fact that it would not be likely that information in anti-vaccination posts and

comments would correlate with the information provided by the CDC, WHO, or the medical

professionals as users posting are contenders of that information.

Future research of vaccination information should include practices of parents on whether

they are seeking information about vaccinations, where they are most likely to collect

information from, who are their biggest influences, and what sources they feel are most

trustworthy. Other future research should include a more holistic analysis of online information

about vaccination by also examining other social media sites such as Twitter and online searches

of Google and Yahoo. Future health communication content analysis studies should also be

designed to omit user comments that do not provide sufficient information in order to answer a

research question, for example the comments that tag another user, use emoticons, or lack usual

content. This will provide more targeted results that will hopefully better answer future research

questions.

This study clearly depicts that the information that users, including parents, are most likely to find on Facebook is overwhelmingly not in support of the use of vaccinations and is more so content of personal beliefs rather than information that other users can utilize for making their own vaccine decisions (MI).

In addition, the health belief model has the potential to be a valuable tool in analyzing the user-generated content on Facebook in regards to public health issues such as vaccinations. However, the content needs to be more highly screened for comments that provide actual content rather than emoticons that do not allude to the users beliefs or perceptions. The HBM did, however, highlight the main barriers for future health campaigns to address, including the still very-popular belief that vaccines cause major illnesses or even death. The second-most highlighted barrier indicated by the users that should be taken into consideration for future campaigns was the financial conspiracy theories about vaccines, one that has not been largely highlighted in previous studies.

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Appendix: Codebook

Unit of Analysis: Facebook Pages

Section 1: Viewpoint of Facebook Pages

   1. From the "about" section of the Facebook page, does the viewpoint of the page support

   the use of vaccinations? Yes / No

   2. From the "about" section of the Facebook page, is the viewpoint of the page against the

   use of vaccinations? Yes / No

Magnitude of Interest of Facebook Page:

   1.   Number of likes: _____

Section 2: Viewpoint of Facebook Posts

   1.   The date of the Facebook post is: _____

   2.   Does the Facebook post include information about vaccinations? Yes / No

   3.   Overall does the viewpoint of the Facebook post support the use of vaccinations? Yes /

   No

   4.   Overall is the viewpoint of the Facebook post against the use of vaccinations? Yes / No

Section 3: Nature of Facebook Post:

   1. Is the Facebook post a status update about the Disney outbreak? Yes / No

   2. Is the Facebook post a health communication campaign? Yes / No

   3. Is the Facebook post an event promotion? Yes / No

4. Is the Facebook post information about public services & opportunities for citizens? Yes /

No

5. Is the Facebook post life storytelling? Yes / No

6. Other: _____

Section 4: Magnitude of Interest of Facebook Post

1. Number of likes: ____

2. Number of comments: _____

3. Number of shares: _____

Section 5: Viewpoint of Facebook comments

1. The date of the Facebook comment is: _____

2. Overall does the viewpoint of the Facebook comment support the use of vaccinations?

Yes / No

3. Overall is the viewpoint of the Facebook comment against the use of vaccinations? Yes /

No

Section 6: Motivating Information

1. Is identificational information, where names or contact information for specific people or

groups who are knowledgeable about the topic at hand can be reached (i.e. medical professionals,

specialists, or support groups) present in the Facebook user's comment? Yes / No

2. Is locational information, such as a time and/or place of a specific activity (i.e. where to go to

get a vaccine or time of online chat forum with a specialist) present in the Facebook user's

comment? Yes / No

3. Is tactical information, such as an explicit or implicit instruction to adopt a certain behavior

(i.e. contact your health professional to see if your immunizations are up to date) present in the

Facebook user's comment? Yes / No

Section 7: Health Belief Model

1. Does the user indicate their perceived susceptibility, or the likelihood that they will get

the virus, in their comment? Yes / No

A. If so, is the likelihood indicated as (low / high / or unsure) in their comment?

2. Does the user indicate the perceived seriousness of the disease if their child were to get

it? Yes / No

A. If so, is the seriousness indicated as (low / high / or unsure) in their comment

3. Does the user indicate what the perceived benefits will be for their child to receive the

vaccine?

A. If so, what benefits do they indicate?_____

4. Does the user indicate perceived barriers, such as inconvenience or cost, that have

prohibited them from having their child(ren) vaccinated? Yes / No

A. If so, what barriers did they

indicate?_____