

Measles Outbreak Associated with a Church Congregation: A Study of Immunization Attitudes of Congregation Members

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SYNOPSIS

Objectives. Although measles has not been endemic in the U.S. since 1997 due to high vaccination coverage, recent U.S. measles outbreaks have been associated with individuals and groups who have refused vaccination for philosophical, cultural, or religious reasons. One such outbreak occurred in Indiana among a group of church members in May and June of 2005. Our objectives were to: (1) determine attitudes and beliefs of church leaders and members regarding vaccinations and the outbreak experience, (2) describe reasons for vaccine acceptance and nonacceptance, and (3) assess the feasibility of a knowledge and attitudes study in the context of a vaccine-preventable disease outbreak.

Methods. We conducted a focus group with church leaders and families and held 12 structured household interviews with church members directly and indirectly involved in the outbreaks.

Results. A combination of safety concerns, personal experience, and religious beliefs contributed to vaccination refusal among a subgroup of church members. While the experience with measles disease did not necessarily translate into a more positive perception of vaccines, most families that refused vaccination would accept some future vaccines under unique circumstances, such as disease presence in the community or if vaccination could be delayed until a child was older.

Conclusions. Lessons learned from this outbreak experience can inform future outbreak investigations elsewhere. Maintaining open communication with parents who refuse immunizations, as well as working with their trusted social networks, can help public health professionals facilitate alternative means of disease control during a vaccine-preventable disease outbreak in the community.

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Measles disease, while still a cause of considerable morbidity and mortality internationally, is no longer endemic in the U.S.^{1,2} Of the 37 confirmed measles cases in the U.S. in 2004, 33 (89%) were either directly imported from abroad or epidemiologically linked to an imported case.³ Measles vaccination coverage for U.S. children has consistently been above 90% in recent years, helping to limit the size of outbreaks associated with an imported case.^{4,5} However, outbreaks have been associated with groups that refuse vaccination for philosophical, cultural, or religious reasons.⁶⁻⁸

One such outbreak occurred in May and June of 2005, when an unvaccinated 17-year-old female returned from philanthropic work in Romania and became the source of an outbreak among a church congregation.⁹ While the disease burden and economic impact of this outbreak have been described elsewhere,¹⁰ a better understanding of the vaccine attitudes and beliefs of church members and how those beliefs were impacted by the congregation's outbreak experience could help inform future outbreak investigations among unvaccinated groups. Therefore, the objectives of this follow-up study were to: (1) determine attitudes and beliefs of church members and leaders regarding vaccinations and the outbreak experience, (2) describe reasons for vaccine acceptance and nonacceptance, and (3) assess the feasibility of a knowledge and attitudes study in the context of a vaccine-preventable disease outbreak.

METHODS

This study used a combination of focus group and telephone interviews with families directly and indirectly involved in the outbreak. This mixed-method approach was chosen, in part, to offer flexibility in the community setting, as well as to take advantage of the complementary strengths of each method in tailoring questions that were most appropriate for the specific community involved.¹¹

Part 1: Focus group

We conducted a focus group discussion to help us gain an in-depth understanding of the experiences of families and church leaders directly involved in the outbreak. The group discussion was also used to tailor the follow-up interview questions and methodology to the community involved to collect relevant, culturally sensitive data. A convenience sample of two church leaders and four adult church members ($n=6$) took part. The adult church members represented three households that had experienced measles cases in the outbreak, either directly or as parents of pediatric cases,

and were invited by church leaders to participate in the discussion. Two researchers led the discussion while a third took notes. Questions were asked using a semi-structured moderator's guide developed by Centers for Disease Control and Prevention (CDC) staff. Question areas included: church advice and involvement regarding health issues; vaccine knowledge, attitudes, and beliefs; relationship with the health-care system; outbreak experiences; changes in families' vaccine beliefs after the outbreak; and the church's response to the outbreak.

With the permission of participants, the focus group was tape-recorded for transcription purposes. Group participation was voluntary, and participants were not reimbursed for their time. The discussion took approximately 90 minutes. All focus group members were given the opportunity to speak. One researcher transcribed the recording and analyzed the transcript for relevant themes using Nvivo qualitative analysis software.¹²

Part 2: Interviews of outbreak and comparison households

Themes that emerged from the focus group discussion were also used to create a structured interview instrument. At the suggestion of church leaders and health department personnel, the questions were formatted to be given as either a face-to-face or telephone interview, depending on the respondent's preference. Researchers reviewed the interview instrument for content, clarity, and length before it was administered.

Eleven households were directly involved in the outbreak.¹⁰ Of those households, one was never associated with the church, one was no longer associated with the church at the time of the study, and one was unavailable at the time of the study due to travel. In addition, two households took part in the focus group but not the interviews.¹ Therefore, six households with measles were interviewed. An additional convenience sample of six church households that did not directly experience measles in the outbreak but were aware of the outbreak served as a comparison group. Church leaders made initial contacts with all 12 of these households.

After the initial contacts were made, researchers contacted all 12 study households by telephone to introduce the study. None of the contacted households refused participation. Participants were given the choice of being interviewed by telephone or in person; one comparison participant chose to be interviewed in person while the rest chose telephone interviews. Respondents were told that all answers would remain confidential, that their names would never be associated with their responses, and that any reports would

contain only aggregate data. Two researchers conducted the interviews using the same standardized call script and interview questions. Interviews took about 15–20 minutes to complete. At the conclusion of each interview, respondents were given contact information for researchers in case they had any questions or concerns later.

Interview questions were divided into four sections: vaccination status, health-care use, vaccine attitudes and beliefs, and demographics. Questions were primarily closed-ended with multiple response options, but the instrument did include open-ended follow-up questions. Responses were entered into a Microsoft® Access database.¹³ We calculated frequencies of each response, stratified by outbreak status (measles household or comparison household without measles). Because this was a descriptive study with a small number of participating households, without the statistical power to conduct tests of association, the analysis was descriptive. Because most measles households experienced multiple measles cases and only one

interview was done per household, the household was determined to be the unit of analysis.¹⁰ In households with multiple measles cases among children, parents were instructed to answer the interview questions on behalf of the youngest child. Similarly, respondents in comparison households were asked to answer on behalf of their youngest child; if there were no children in the household, respondents were the subject of the interview.

RESULTS

Part 1: Focus group

Several themes emerged from the focus group, including vaccine safety concerns, impact of unvaccinated adults on the outbreak, neutrality of the church regarding vaccination, differing impressions of health-care professionals during the outbreak, changes in families' vaccine beliefs after the outbreak, and the proactive nature of the church's response to the outbreak; these are highlighted in greater detail in the Figure.

Figure. Focus group discussion themes

<i>Discussion themes</i>	<i>Specific topics or examples raised by participants</i>
Vaccine safety concerns	<ul style="list-style-type: none"> • Autism or developmental delay • Difficulty reconciling scientific data with personal experience • Children receive vaccines when they are perceived as too young or vulnerable to side effects • Individual vs. public risk perspectives • Media influence on vaccine safety beliefs
Impact of unvaccinated adults on outbreak	<ul style="list-style-type: none"> • Subgroup of adults that didn't get measles as a child, but also was not subject to MMR vaccine laws in school • Confusion by some adults about their own immunization status led to anxiety
Church's neutrality regarding vaccines	<ul style="list-style-type: none"> • No previous advice regarding immunizations • Following outbreak, church recommended travel vaccines before going on overseas mission trips
Differing impressions of health-care professionals during the outbreak	<ul style="list-style-type: none"> • Positive impression of the state and local health departments • Less positive impression of interactions with some individual doctors and hospitals due to doctors' unfamiliarity with measles
Changes in families' vaccine beliefs after the outbreak	<ul style="list-style-type: none"> • Related to the severity of personal experience and were not influenced by the severity of another family's experience
Proactive nature of church's response	<ul style="list-style-type: none"> • Worked well with the health department • Canceled some activities (especially those involving children) • Restricted church services to people who were certain that they were up-to-date for measles vaccination • Notified all members of the changes to services due to the outbreak • Credited the local health department for being proactive and approachable • Used the CDC website as an information source
Recommendations	<ul style="list-style-type: none"> • Better education of doctors and hospital staff in considering a measles diagnosis • Up-to-date vaccination before church-sponsored overseas mission work • Good communication with the health department

MMR = measles-mumps-rubella

CDC = Centers for Disease Control and Prevention

Part 2: Interviews of outbreak and comparison households

All 12 households that were approached for participation agreed to be interviewed. Eight of the 12 interview respondents were parents who answered on behalf of a child aged 18 or younger, and only one adult with measles was interviewed. Table 1 shows selected demographic characteristics of interview respondents and subjects, stratified by measles status in the outbreak.

Vaccine attitudes and beliefs. In general, outbreak households recognized the importance of vaccines, yet had concerns or doubts about their safety and necessity (Table 2). Most agreed that travel outside the U.S. was a reason to receive all recommended vaccines and that vaccination is important to stop the spread of disease in a community. However, there was less agreement that children should receive all recommended vaccines and that childhood vaccines in general and the

Table 1. Demographic characteristics of interview respondents stratified by outbreak involvement

Survey question ^a	Outbreak household ^b (n=6)	Comparison household (n=6)
Seen a medical doctor in past year for any reason		
Yes	2	6
No	4	0
(If no) Would go to medical doctor in case of emergency		
Yes	4	N/A
No	0	N/A
Seen any of the following in the past year		
Chiropractor	3	0
Naturopath	0	1
Homeopath	0	0
Average age in years (range)	15 (4–49)	35 (8–66)
Respondent highest level of schooling		
Associate's degree/some college	2	0
Bachelor's degree	4	3
Postgraduate degree	0	3
Number of children in household		
0	0	3
1–2	0	1
3–6	4	2
7–10	2	0
Health insurance		
Yes	5	5
Respondent gender		
Male	2	4
Subject gender		
Male	1	5
Type of school		
Public	0	0
Private	1	3
Homeschool	3	0
Daycare	1	0
Adult not in school	1	3
Vaccine exemption (if in school ^c or daycare; n=8)		
Yes, religious exemption	2	0
Yes, medical exemption	0	0
No	3	3

^aAll questions unless otherwise indicated refer to the subject of the interview; parents answered questions on behalf of subjects younger than age 18.

^b"Outbreak household" refers to church households that directly experienced one or more measles cases; "comparison household" refers to church households that were aware of the outbreak but did not directly experience measles cases.

^cIncludes homeschool

N/A = not applicable

Table 2. Selected vaccine attitudes and beliefs of respondents stratified by outbreak involvement

Survey question ^a	Outbreak household ^b (n=6)	Comparison household (n=6)
I/my child should receive all recommended vaccines		
Agree	2	6
Disagree	3	0
No opinion/not applicable	1	0
Medical professionals in charge of vaccines have my/my child's best interest at heart		
Agree	4	6
Disagree	2	0
No opinion/not applicable	0	0
Recommended childhood vaccines are safe		
Agree	2	6
Disagree	2	0
No opinion/not applicable	2	0
Measles vaccine is safe		
Agree	2	5
Disagree	2	0
No opinion/not applicable	2	1
It is important to vaccinate children to prevent the spread of disease in my community		
Agree	4	6
Disagree	1	0
No opinion/not applicable	1	0
People should have the right to refuse vaccination		
Agree	6	5
Disagree	0	0
No opinion/not applicable	0	1
I have access to all the information I need to make a good decision about vaccines		
Agree	6	5
Disagree	0	0
No opinion/not applicable	0	1
I would be willing to keep myself/my child out of work/school during an outbreak in the community instead of being vaccinated		
Agree	5	1
Disagree	0	4
No opinion/not applicable	1	1
I would be willing to keep my family quarantined during a disease outbreak instead of being vaccinated		
Agree	4	2
Disagree	1	3
No opinion/not applicable	1	1
I/my child should receive all vaccines if traveling to a foreign country		
Agree	4	6
Disagree	1	0
No opinion/not applicable	1	0
If I do not vaccinate my child, he/she may get a serious disease ^c		
Agree	2	3
Disagree	1	0
No opinion/not applicable	2	0
If I vaccinate my child, he/she may have a serious side effect ^c		
Agree	4	1
Disagree	1	0
No opinion/not applicable	0	2
If I vaccinate my child, he/she may have a learning disability ^c		
Agree	4	1
Disagree	0	1
No opinion/not applicable	1	1

^aAll questions unless otherwise indicated refer to the subject of the interview; parents answered questions on behalf of subjects younger than age 18.

^b"Outbreak household" refers to church households that directly experienced one or more measles cases; "comparison household" refers to church households that were aware of the outbreak but did not directly experience measles cases.

^cAsked only if interview subject was a child (n=8)

measles vaccine in particular are safe. Most believed that childhood vaccinations may cause serious side effects or learning disabilities. All believed in the right to refuse vaccines, but were open to alternatives such as quarantine or staying out of school or work during an outbreak. All reported that they had access to enough information on vaccination.

The comparison group was more positive regarding vaccine safety and necessity. All thought that they should receive all recommended vaccines as well as travel vaccines, and all agreed that vaccines in general and measles vaccine in particular are safe. All thought that vaccination was important for preventing disease in the community, yet most also agreed that people should have the right to refuse vaccination. The majority felt that they had access to enough information on vaccines.

Outbreak experiences. Most outbreak households reported that the experience did not change their opinion of vaccines (Table 3). All but one household

described the illness they experienced as not serious. All also knew someone outside of the household with measles in the recent outbreak, and the majority said that they knew someone outside of the household with a serious case. Most households reported getting some type of information on measles or the outbreak from the Internet, the health department, or a church leader, and several also received information from the media or a doctor.

Half of the comparison households reported that the experience made their opinion of vaccines more positive, while half reported that the experience did not change their opinion of vaccines; however, one of the households clarified that their opinion of vaccines was already very high. All of the comparison households knew somebody with measles in the recent outbreak, and all but one reported knowing someone with a serious case of measles. The Internet, media, and health department were the most commonly listed sources of information on the outbreak for comparison households.

Table 3. Outbreak experiences stratified by outbreak involvement

Survey question ^a	Outbreak household ^b (n=6)	Comparison household (n=6)
How serious was your/your child's measles illness?		
Serious	1	0
Not serious	4	0
Missing	1	0
Not ill in recent outbreak	0	6
Did you know others outside the household with measles in the recent outbreak?		
Yes	6	6
No	0	0
(If yes) How serious was illness in others?		
Serious	4	5
Not serious	2	1
How did you receive information about the outbreak? (Check all that apply.)		
Internet	5	3
Spoke to a health department	4	3
Spoke to pastor or church leader	3	2
Received written materials	3	2
Media	2	3
Spoke to a doctor or nurse	2	2
Spoke to an alternative health-care provider	1	0
Other	1	2
Did not receive information	0	0
How did the outbreak change your opinion of vaccines?		
Made more positive	2	3
Made more negative	0	0
No change	4	3

^aAll questions unless otherwise indicated refer to the subject of the interview; parents answered questions on behalf of subjects younger than age 18.

^b“Outbreak household” refers to church households that directly experienced one or more measles cases; “comparison household” refers to church households that were aware of the outbreak but did not directly experience measles cases.

Reasons for acceptance and nonacceptance of vaccines. Only one of the six interview subjects in the outbreak households was vaccinated with the measles-mumps-rubella (MMR) vaccine, and this was done after the outbreak (Table 4). The reasons cited most often for not receiving measles-containing vaccine included: a preference for naturally acquired infection, advice from an alternative health-care provider, media, personal religious objections to vaccination, the belief that vaccines are unsafe or unnecessary, and a fear of getting the disease from the vaccine. The same reasons were cited most often when respondents were asked about vaccines in general. Four of the six outbreak households reported that they would consider some or all recommended vaccines in the future; reasons for receiving these vaccines in the future included disease presence in the community and the ability to delay vaccination until a child was older.

Four of the six comparison subjects were vaccinated for measles before the outbreak; the two who were not vaccinated before the outbreak were adults who had had measles as children, before MMR vaccine was widely recommended. Among the vaccinated comparison subjects, reasons for vaccination included doctor recommendation, school requirement, and illness prevention.

DISCUSSION

A focus group was used in the context of a church-based measles outbreak to provide a more in-depth understanding of the vaccine attitudes and beliefs of members, as well as their experience with the outbreak. In turn, several of the themes raised in the focus group discussion were reinforced in structured interviews with outbreak and comparison households, including vaccine safety concerns among church members and the role of perceived disease severity in shaping vaccine attitudes and beliefs after an outbreak in the community.

While the results of this study are not generalizable due to the small number of households involved in the outbreak, several of the lessons learned from these families may be useful in future outbreaks among families that refuse vaccination. First, families and church leaders we spoke with in the focus group emphasized the importance of open and clear communication, especially between the church and the state and local health departments. Second, they highlighted the proactive role that the church community took in using its existing social network to help control the spread of measles, for instance by canceling activities involving children and restricting other activities to members

who were fully vaccinated. Third, focus group participants also advocated for better education of doctors and hospital staff in considering a measles diagnosis, a suggestion that has been made previously in the context of a measles outbreak in a boarding school.¹⁴

While the church was the common link among cases, there was no formal advice regarding vaccination from the church before the outbreak. Instead, vaccine refusal was attributed to a combination of personal religious beliefs and safety concerns among a subgroup of church members; lack of access to health services was not a barrier to vaccination for this population. This suggests an opportunity for health-care providers to proactively address vaccine safety concerns among these families as well as alternatives such as a delayed or modified vaccination schedule or vaccines under special circumstances (i.e., international travel or an active local outbreak).¹⁵ This is especially important given that several families involved in the outbreak homeschooled their children or had vaccine exemptions; therefore, they were not subject to laws that require vaccination for school entry. Exemption to vaccination places individuals at increased risk of vaccine-preventable disease.^{16–18} Vaccine safety concerns and low perceived susceptibility and severity of vaccine-preventable diseases have been associated with nonmedical vaccine exemptions,¹⁹ and it has also been suggested that homeschooling families may be more concerned about vaccine safety than non-homeschooling families.²⁰ Few states have a mechanism for tracking immunization rates among their homeschooling families,²¹ and further research is needed to identify the vaccine beliefs and behaviors, as well as the vaccine education needs, of these families.

It was unexpected that most of the outbreak households said that the experience did not make their opinion of vaccines more positive; however, additional research is needed to confirm and further explain these results. Several of these families were willing to consider certain vaccines in the future, and most reported that they would accept quarantine during any future disease outbreak in the community. This suggests that alternative means of disease control may be successful options for families that are unwilling to vaccinate.

A final objective was to test the methodology of a rapid knowledge, attitude, and belief assessment in the context of a vaccine-preventable disease outbreak. The interview instrument benefited from tailoring after the focus group discussion, and it worked well both in person and on the phone, with outbreak and comparison households, and with both adults and children (with parents answering on their behalf) as the interview subjects. The mixed-method approach also helped with

Table 4. Reasons for acceptance and nonacceptance of vaccines stratified by outbreak involvement

Survey question ^a	Outbreak household ^b (n=6)	Comparison household (n=6)
Ever vaccinated for measles		
Yes, before outbreak	0	4
Yes, after outbreak	1	0
No	5	2
Main reason for vaccinating for measles (Choose one.)		
Doctor recommended/part of schedule	0	2
Required for school/daycare	0	1
Prevent illness	0	1
Prevent measles during outbreak	0	0
Other	1	0
Not vaccinated	5	2
Reasons for not receiving measles vaccine (Choose all that apply.)		
Prefer natural infection	3	0
Advice from an alternative health-care provider	3	0
Media	3	0
Vaccines are not safe	3	0
Personal/religious objections	2	0
Vaccines are not necessary	2	0
Fear of getting disease from vaccine	2	0
Advice from a doctor or nurse	1	0
Advice from church leaders	0	0
It is difficult to get to the doctor's office	0	0
Vaccines are too expensive	0	0
Had measles in the past	0	2
Other	2	0
Reasons for not receiving all recommended vaccines (Choose all that apply.)		
Media	4	N/A
Vaccines are not safe	4	N/A
Vaccines not necessary for health	4	N/A
Personal/religious objections	3	N/A
Prefer natural infection	3	N/A
Advice from an alternative health-care provider	3	N/A
Fear of getting disease from the vaccine	2	N/A
Personal experience	1	N/A
Advice from a doctor or nurse	1	N/A
Advice from church leaders	0	N/A
It is difficult to get to the doctor's office	0	N/A
Vaccines are too expensive	0	N/A
Would consider other vaccines in future?		
Yes	4	N/A
No	1	N/A
Does not apply (adult)	1	N/A
(If yes) Reasons for receiving recommended vaccines in the future (Choose all that apply.)		
Disease present in the community	3	N/A
Could wait until child was older	3	N/A
Advice from a doctor or nurse	1	N/A
Advice from an alternative health-care provider	1	N/A
More information on vaccine ingredients	1	N/A
Advice from church leaders	1	N/A
Advice of health department	1	N/A
Fewer shots given at a time	1	N/A
Other	1	N/A

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^b"Outbreak household" refers to church households that directly experienced one or more measles cases; "comparison household" refers to church households that were aware of the outbreak but did not directly experience measles cases.

N/A = not applicable

data interpretation; for example, issues like vaccine safety concerns that were raised in the focus group were reinforced by interview data. The methods used can be tailored to be culturally appropriate and done within time and resource constraints.

Limitations

This study was subject to several limitations. The sample size was small (one focus group and 12 household interviews), so we were limited to a descriptive analysis of the data. Similarly, because of the qualitative nature of the focus group data, the small sample size, and the convenience sampling of comparison households, results were not generalizable beyond the community being studied. However, we included eight of the 11 households involved in the outbreak, which represented 31 of the 34 measles cases in this outbreak. Therefore, despite small numbers, we were able to meet the study objectives, which were to describe the beliefs and experiences of church members involved in the outbreak and test the study's feasibility in the context of a vaccine-preventable disease outbreak. Finally, while we asked about beliefs and behaviors before and after the outbreak, the data were cross-sectional and were gathered several weeks after the outbreak ended.

CONCLUSION

Despite these limitations, we were able to demonstrate the feasibility of a mixed-method study of the attitudes and beliefs of families involved in a measles outbreak. The study was useful in gaining in-depth insight into the attitudes and beliefs of community members regarding vaccination and their outbreak experience, especially regarding the importance of open communication with health officials and proactive involvement of the church in helping to control the spread of disease.

Although this was a descriptive study, our results suggest that the outbreak households' experience with measles did not change their opinion of vaccines. This information can be useful in interpreting outbreak investigation data, as well as suggesting approaches for preventing or controlling outbreaks of vaccine-preventable diseases in other communities with members who refuse some or all vaccination for personal or religious reasons. The methods used in this descriptive study can be adapted to meet the needs of other communities to better understand their vaccine and vaccine-preventable disease beliefs and behaviors in the context of a vaccine-preventable disease outbreak.

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