



What is ‘confidence’ and what could affect it?: A qualitative study of mothers who are hesitant about vaccines



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ABSTRACT

Background: Public confidence in immunization is critical to maintaining high vaccine-coverage rates needed to protect individuals and communities from vaccine-preventable diseases. Recent attention has been placed on factors influencing confidence in vaccination in the US and globally, but comprehensive understanding of what drives or hinders confidence in childhood vaccination is yet to be reached. As such, assessing parents' confidence in childhood vaccination and the ways in which educational materials affect confidence is needed.

Objective: We sought to (1) learn how mothers who are hesitant about vaccination characterize confidence in health-related products for young children, including the recommended vaccines; (2) gain insights on what influences vaccine confidence beliefs; and (3) assess whether short, education materials affect parental confidence in childhood vaccinations.

Methods: Eight moderator-lead focus groups (n = 61), stratified by socioeconomic status, were undertaken with mothers of children 5 years of age or less who are hesitant about vaccines. Four of the groups were held in the Philadelphia, PA area and four were held in the San Francisco/Oakland, CA area. Three educational material pairs, each consisting of a 2–3 min video and an infographic poster about an immunization-related topic, were reviewed and assessed for influence on confidence.

Results: Qualitative data analysis was used to identify overarching themes across the focus groups. Themes, insights, and illustrative quotes were identified and provided for each of the major discussion areas: primary health concerns for young children; confidence beliefs and perceptions, including for recommended vaccines; facilitators and barriers to confidence; and reactions to the educational materials. **Conclusions:** Results provide helpful insights into how mothers who are hesitant about vaccines perceive confidence in childhood vaccines and health-related products, suggestions for how to improve confidence, and support for the value and use of short videos as part of vaccination education efforts. Findings can aid those developing vaccination education materials and resources designed to foster vaccine confidence.

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1. Introduction

Childhood immunization rates in the United States remain high and stable, with the Centers for Disease Control and Prevention's (CDC) 2015 National Immunization Survey indicating more than 90% of 19–35 month-old children were up to date on vaccination against polio; hepatitis B; measles, mumps, and rubella; and varicella [1]. Parent acceptance of vaccination recommendations is critical to maintaining the high coverage rates needed to protect

individuals and communities from vaccine-preventable diseases, but hesitancy may be a threat to continued success. The percentage of U.S. pediatricians encountering parents seeking to refuse a recommended childhood vaccination increased from 75% in 2006 to 87% in 2013 [2,3], while 13% of parents in a 2010 national survey reported following an alternative schedule [4]. Recently published studies suggest 5.5–27% of U.S. parents have delayed recommended vaccinations and 3.6%–15% have declined recommended vaccinations [5]. Parent vaccine hesitancy has also been documented outside the U.S. [6–10].

Parents delaying and declining recommended childhood vaccinations, or using alternative schedules, has generated efforts to identify the factors associated with parents' reluctance or unwillingness to adhere to recommended childhood immunization

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schedules, despite the readily available vaccination services (i.e., vaccine hesitancy) [6,9,11,12]. One factor of great interest is vaccine-related confidence [7], which has been defined as the trust that parents or healthcare providers have in recommended vaccines, in the provider(s) who administer them, and in the process that leads to vaccine licensure and recommendations [8,13]. In its recent assessment of parent vaccine confidence in the U.S., the National Vaccine Advisory Committee (NVAC) noted that, to be successful, immunization programs need to instill, build, and maintain high confidence in vaccines and recommended vaccinations [13]. According to NVAC, when parents have high confidence, they have little or no hesitation about children receiving recommended vaccinations.

The report highlighted that efforts have been made to identify relationships between parents' vaccine confidence and their adherence to immunization recommendations, as well as measures to assess parents' vaccine-related confidence. A World Health Organization (WHO) Strategic Advisory Group of Experts (SAGE) 2015 report identified confidence as one of three domains related to vaccine hesitancy [8], and recent studies have supported that association. For example, studies have found U.S. parents who comply with vaccination recommendations have higher confidence ratings than parents who have not followed the schedule [14–17]. More recent efforts have focused on developing vaccination confidence measures or scales, either to gauge public or parents' faith and trust in recommended vaccines [14,18] or to help identify parents at risk for delaying or declining recommended vaccinations [19,20]. In general, studies have found most parents have moderately high vaccine confidence. Weiner et al.'s survey of 200 first-time expectant mothers who were in their second or third trimester of pregnancy found 81.4% were confident in the effectiveness of routine childhood vaccines, 78.4% were confident in the value of routine childhood vaccines, and 73.5% were confident in the safety of routine childhood vaccines [17]. In Cacciatore et al.'s 2016 study, which used six vaccination confidence-related measures in a survey of parents of young children, found average ratings of around 7.0 on a 1–10 scales (where '1' represented no confidence and '10' represented complete confidence) [14].

However, as the NVAC report noted, vaccine confidence is a relatively new concept in understanding vaccine acceptance or its relationship to vaccine hesitancy. To date, studies have conceptualized confidence primarily in terms of trust, and studies that have operationalized confidence have primarily used single items that ask respondents how confident they are in safety, effectiveness, and/or benefits [15–17], or used multi-item scales that primarily rely on attitudinal and belief measures as proxies for confidence [5,19–21]. Importantly, there does not appear to be published research that has examined the concept of confidence relative to parents who are hesitant about vaccines, explored how they define confidence or what considerations shape their confidence, and whether vaccine-related information can positively influence confidence. The objectives of this study were thus three-fold: (1) learn how mothers who are hesitant about vaccines characterize confidence when it comes to health-related products for their young children, including recommended childhood vaccines; (2) gain insights into the factors and considerations that influence or affect their vaccine confidence beliefs; and (3) assess whether short, vaccine education materials, each focusing on a different topic, could affect their confidence in childhood vaccinations. A number of studies have used qualitative research, particularly focus groups and in-depth interviews, to gain insights into parents' beliefs and perceptions regarding childhood vaccines, but to date, none have primarily focused on the concept of confidence or assessed whether efforts to increase parents' knowledge of how vaccines foster immunity, how vaccines support herd immunity, or how perceptions of vaccine safety affect confidence-related beliefs.

2. Methods

2.1. Participants and data collection

This qualitative study used eight, two-hour, moderator-led focus groups with mothers of children 5-years old or younger who are hesitant about childhood vaccination. The focus groups took place in two metropolitan areas - Philadelphia, Pennsylvania, and San Francisco/Oakland, California in April and May 2016. This bi-coastal approach was used since within short distances (10–20 miles) there was access to diverse populations of varying socioeconomic backgrounds in urban and suburban settings. The San Francisco area also includes Marin County, an area affected by the 2014–2015 Disneyland-related measles outbreak and recognized for sub-optimal MMR vaccination rates. Mothers and female guardians, often the primary health-care decision makers for their children, were recruited through the focus group facilities where the discussions took place. The facilities used contact and household databases to recruit participants in line with the overall recruitment strategy. The recruitment strategy was (1) all participants had either delayed or declined a recommended vaccination for their child or provided responses to a short screening survey that indicated they were hesitant about vaccines; (2) four of the focus groups [two in San Francisco, two in Philadelphia] involved participants who had household incomes of \$75,000 a year or more [i.e., higher socioeconomic status (HSES)] and four of the groups [two in Oakland, two in Philadelphia] involved participants who had household incomes under \$75,000 a year [i.e., lower SES (LSES)]; (3) all participants reported being the primary healthcare decision-maker in their family; and (4) there was diversity with respect to race/ethnicity and years of formal education. The number of focus groups was based on having two higher and two lower SES groups in each city and available budget. A professional moderator led the groups, which were also recorded, using a discussion guide. All participants consented and received an honorarium of \$85–\$125 depending on location (e.g., higher in San Francisco). The study protocol received IRB exempt designation on March 18, 2016 (protocol #6851).

2.2. Focus group topics and structure

The focus group moderator's guide had four major discussion sections: (1) health issues and concerns pertaining to children 5 years old and younger, including questions related to parents' definitions and perceptions of confidence in health products and vaccines; (2) confidence considerations, including questions around factors that fostered or inhibited parent confidence, how one's vaccine confidence related to vaccination behaviors, and what could build or instill confidence; (3) vaccination-related confidence, including a series of questions related to childhood vaccine safety and efficacy; and (4) exposure to three paired sets of education materials, with each set consisting of a two to three-minute long video and an infographic poster. The video and infographic dyads were not created in tandem; rather, they were executions of the same broader concept (e.g., herd immunity). Materials used positively-framed messages (e.g., vaccines keep you healthy not vaccine-preventable diseases kill you). The videos were selected from ones available on YouTube, while the infographics came from sources that provided vaccine-related education and information materials. The education materials used were: **Set A** - "Vaccine Safety in Context," a "white board" animated video that provided information on the likelihood of a variety of risks, from minor vaccine adverse reactions to infectious diseases (<https://www.youtube.com/watch?v=NaGndICPT8I&t=3s>) [22], and a CDC infographic called "The Journey of Your Child's Vaccine," which described the

safety testing process (www.cdc.gov/vaccines/parents/infographics/journey-of-child-vaccine.html) [23]; **Set B** - “Vaccines and Herd Immunity,” an animated video that showed how vaccines fostered community protection and the relationship between vaccine coverage and herd immunity (https://www.youtube.com/watch?v=CPcC4oGB_o8&t=20s) [24], and the third portion of a herd immunity infographic created by MLive.com (http://www.mlive.com/news/index.ssf/2014/12/how_do_vaccinations_work_the_s.html) [25]; and **Set C** - “How Vaccines Work,” an animated video that illustrated how vaccines work in the human immune system to protect people from disease (<https://www.youtube.com/watch?v=IXMc15dA-vw>) [26], and the first portion of an infographic created by MLive.com (www.mlive.com/news/index.ssf/2014/12/how_do_vaccinations_work_the_s.html) [27]. After exposure to a set of materials, participants were taken through a series of closed and open-ended questions to gauge their understanding of the main messages and whether the materials affected their confidence in childhood vaccines. The order the material sets were presented was rotated across focus groups.

2.3. Data analysis

Transcripts from the focus groups were systematically reviewed, assessed, and discussed by the first two co-authors. An inductive approach that incorporated the principles of grounded theory was used to analyze the data. The first two co-authors independently reviewed the transcripts to identify and code unique themes as well as quotes that illustrated or represented each theme. After individual coding, the results were discussed to identify patterns and associations in the data. Agreement between coders was generally high. When there was disagreement, transcripts were reviewed and comments were further discussed until agreement was reached. In the final stage, tables summarizing the themes and illustrative quotes or comments were created and reviewed again to foster consistency and consensus. The focus throughout was on identifying how participants defined confidence, factors they associated with confidence and lack of confidence, reasons for having or not having confidence in recommended childhood vaccines, and potential ways to increase their confidence.

3. Results

Sixty-one women participated in the focus group discussions, with six to nine participants per group. As [Table 1](#) shows, the research involved a demographically diverse group of mothers and female guardians who are hesitant about vaccines. Almost all indicated that they had delayed and/or declined at least one recommended childhood vaccination. In the LSES group, 55% reported having Medicare, Medicaid or Medi-Cal as their insurance provider and 65% reported social service aid.

3.1. Confidence and health-related items for young children

As [Table 2](#) shows, in the context of health-related items for children, familiarity, naturalness, and family experience were common to the products associated with high confidence. Vaccines, mainstream medicine, government, pharmaceutical companies, new products, and processed foods were associated with low confidence. For the low confidence products, participants often referenced their uncertainty regarding how the products worked, the need or value of the product, distrust of the product (e.g., safety concerns), and lack of understanding regarding how they worked (e.g., vaccines). Overall, perceptions were similar across the groups, though participants in LSES groups cited lower prices and generic

Table 1
Participants' demographic characteristics.

Demographic	N (%)
<i>Race</i>	
White/Caucasian	23 (37.8%)
African American	26 (42.6%)
Hispanic/Latino	5 (8.2%)
Other	5 (8.2%)
Not reported	2 (3.2%)
<i>Age</i>	
18–35	34 (55.7%)
36–45	20 (32.8%)
46–56	7 (11.4%)
<i>Education</i>	
High school or less	6 (9.8%)
Vocational/technical	7 (11.4%)
Some college	12 (19.7%)
College graduate	25 (41.0%)
Post-graduate	11 (18.0%)
<i>Household income</i>	
Under \$35,000	14 (23.0%)
\$35,000–\$49,000	8 (13.1%)
\$50,000–\$74,000	10 (16.4%)
\$75,000–\$99,000	5 (8.2%)
Over \$100,000	16 (26.2%)
Not reported	8 (13.1%)

medical products as items they had low confidence in, while participants from HSES mentioned processed food and recalled products.

There was also much consistency among participants on factors cited or mentioned as linked to high and low confidence. Overall, when asked to define confidence or indicate what gave them high confidence, participants equated confidence with trust, knowledge, control, safety, and effectiveness, with certainty also being a common theme. Participants often linked confidence with having a high degree of certainty that the product would work and that no side or adverse effects would happen. As with certainty, participants consistently indicated trust, particularly trust their child's physician, was necessary for them to be confident. Overall, the same themes arose across all focus groups, though some from HSES also noted confidence in health-related products for children was higher when it matched what they already believed, or if their physician was perceived to give the product to their own child. Most factors associated with little or no confidence were also consistent regardless of SES. Overall, the most common themes were not having enough information, not believing a product would work as promised, fear or concern of adverse reactions, and perceptions that those recommending the product were motivated by financial gain. Some women from LSES also cited a bad personal experience as diminishing their confidence, while some women from HSES said they were less confident about new products.

3.2. Vaccine-related confidence

As [Table 3](#) shows, participants had a modest number of reasons for being confident in recommended childhood vaccination, and many reasons for having little or no confidence. When it came to confidence, familiarity with the vaccine and satisfaction with one's research regarding the vaccine were the most frequently cited reasons for high confidence. Women from HSES also cited trusting their child's healthcare provider and severity of the disease. Conversely, the lack of such factors were linked with having little or no confidence in vaccines. For instance, the most commonly mentioned factors were not having enough time to learn about a vaccination or make a vaccination decision, lacking information about issues that they were concerned about (e.g., vaccine ingredients), uncertainty about how vaccines interacted with a child's immune

Table 2
Participants' perspectives on confidence and health-related products for young children.

Participant group	Domains and key themes Perspective	Illustrative quotes
Lower SES	<p>Health-related items associated with low confidence</p> <ul style="list-style-type: none"> • Vaccines, recommended vaccinations, the childhood immunization schedule • Flu vaccine • New or newer medicines, treatments, vaccines • Pharmaceutical/drug companies • Mainstream or traditional medicine • Government recommendations • Lower prices/generic medical products • Less experienced physicians and healthcare providers • Prescription medicines • Over-the-counter medicines (e.g., cough medicines, fever reducers) 	<p>“With the flu shot there's definitely a lack of confidence. I know so many people who've gotten sick as soon as they got it. So I don't have any confidence in this vaccine.”</p> <p>“I don't have confidence in the government who's making the vaccine recommendations at all. It reminds me of the Tuskegee airmen. I don't trust the government at all.”</p> <p>“You get what you pay for. Low-income families get discounted care. They only give you a portion of the care that you could potentially need. Of course they are going to give you the discounted medication, the discounted care, discounted doctors that will work for less.”</p>
Higher SES	<ul style="list-style-type: none"> • Vaccines, recommended vaccinations, the childhood immunization schedule • Flu vaccine • New or newer medicines, treatments, vaccines • Pharmaceutical/drug companies • Mainstream or traditional medicine • Hepatitis vaccine • Processed food • Multivitamins • Some types of sunscreens • Products or brands that have been recalled <p>Health-related items associated with high confidence</p> <ul style="list-style-type: none"> • Natural and organic products • Home remedies/products and approaches passed down or used by previous generations • Homeopathic remedies • Vitamins • Products produced from vegetables • Older/more experienced physicians, healthcare providers 	<p>“I feel like I am hesitant with vaccines for children because of all the side effects. Also, my thing with the flu vaccine is that you can get the flu from getting it.”</p> <p>“The vaccine stuff – if we all have certain experiences in life and your gut is telling you this (vaccinations) is too much at once for your child you should probably follow your gut.”</p> <p>“I think some of the vaccines, like hep B is not something I'm concerned about my child getting. So there are some vaccines where I feel like the disease isn't something my child could get.”</p> <p>“I really don't understand the flu vaccine.”</p>
Lower SES	<ul style="list-style-type: none"> • Natural and organic products • Home remedies/products and approaches passed down or used by previous generations • Homeopathic remedies • Vitamins • Probiotics • Food choices 	<p>Illustrative quotes</p> <p>“Basic things, hand washing, eating a well-balanced diet, getting good sleep. I like just the basic things like peppermint, eucalyptus oil. I think basic things because you've never heard a kid getting autism off of eating peppermint.”</p> <p>“Personally I like the humidifier for my child at night because it helps him sleep. In the winter he gets a little bit of croup... You've got to basically let them breathe fresh air or take them to the ER for some steroids”</p> <p>“I told my kids' doctor, whatever I was vaccinated for back in the '70 s, that's what you vaccinate my kids for. Nothing new. I don't want anything new because I don't know what this is.”</p>
Higher SES	<ul style="list-style-type: none"> • Natural and organic products • Home remedies/products and approaches passed down or used by previous generations • Homeopathic remedies • Vitamins • Probiotics • Food choices 	<p>“I think I'm pretty confident in the food choices, that kind of stuff. I feel like that's something where it's easier for me to find the truth.”</p> <p>“One thing I think is back to common sense and the gut feeling. I don't necessarily think it has to be so progressive. It's a lot of what would your grandma do?”</p> <p>“I give my son a lot of probiotics and multivitamins. I used to give him fish oil.”</p> <p>“My family is really into natural. We spend a lot of time with the natural treatments instead of pharmaceutical care, homeopathic remedies, and eating healthier, organic and trying to stay away from processed food.”</p>
Lower SES	<p>Factors associated with having confidence/high confidence</p> <ul style="list-style-type: none"> • Trust • Belief that the product will work or perform as expected • Previous, positive personal experience (e.g., with a product) • Strong belief in effectiveness or likelihood it will work • Product has been on market/used for many years • Having all the information one wants or needs, with information coming from trusted sources and/or personal research • Control/having options or choices • Certainty about something/being sure regarding value or outcome • Being comfortable 	<p>Illustrative quotes</p> <p>“I have to trust the product.”</p> <p>“The benefits are going to outweigh the risks.”</p> <p>“My trust factor comes to me having a choice. I can trust you when you give me a choice. When you tell me something is mandatory then I want to know what is the ulterior motive to that.”</p> <p>“I think all the old school shots. When we were little, all the old school ones that have been on the market for a long time and have proven themselves.”</p> <p>“To be sure or to know or to feel completely okay with everything, have all of your questions answered, all your bases covered and know that this is what you want to do not based on what someone else is telling you but based on the proof that you have and maybe their information and what you feel.”</p>
Higher SES	<ul style="list-style-type: none"> • Trust • Belief that the product will work or perform as expected • Previous, positive personal experience (e.g., with a product) • Strong belief in effectiveness or likelihood it will work • Product has been on market/used for many years • Product is safe/doesn't have side effects • Having all the information one wants or needs, with information coming from trusted sources and/or personal research • Control/having options or choices • The recommendation and/or product “makes sense,” is “the truth” • Belief that doctor or healthcare provider would give product to their own children 	<p>“Confidence comes mores so with trust. I'd like to say it would be more factual based, but it's probably more of a trust thing.”</p> <p>“I trust that it's not going to harm my child.”</p> <p>“I like success rates. I want to know, you put this out here. How long has it been out? How many people have successfully taken this? What's the percentage of it actually being effective?”</p> <p>“It helps to have a provider or physician that you can trust. Not one that's just following the government guidelines.”</p> <p>“Just that it's true. Something is true and you know it to be true and you're confident in it. If you're wary, you're not so confident.”</p> <p>“I feel that what they are saying, they (doctor) would give that to their own child. If I have confidence I feel like they would give the product to their children.”</p>

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Table 2 (continued)

Participant group	Domains and key themes	
	Perspective	Illustrative quotes
Lower SES	<p>Factors associated with little or no confidence</p> <ul style="list-style-type: none"> • Not having enough information/getting only “one-sided information” • Product doesn’t work/isn’t perceived to work • Product isn’t perceived to have value or be needed • Product isn’t perceived to be safe • Fear or concern about adverse reactions • Lack of control/not having options or choice • Perception or belief that those recommending have a financial interest • Skepticism regarding claims • A bad experience/knowing someone who had a bad experience 	<p>“Being unsure. Not having enough information.”</p> <p>“I don’t know what that is. I don’t know what you’re really giving me. I don’t know if it’s a placebo. If don’t know if it’s something that you’re giving me to see what is going to show up in 10 or 15 years.”</p> <p>“My child’s health is very important to me. If my child’s healthy without all those shots then so be it. That makes me confident.</p> <p>“When it comes to vaccinations, I don’t think doctors are two-sided. I believe they only will tout the benefits but they won’t tell you, even though I think they know, the negative stuff; they won’t ever talk about it. That makes me distrust them.”</p> <p>“It was because my four-year-old had a bad experience with the flu shot that I didn’t get my two-year-old the shot.”</p>
Higher SES	<ul style="list-style-type: none"> • Not having enough information/getting only “one-sided information” • Product doesn’t work/isn’t perceived to work • Product isn’t perceived to have value or be needed • Product isn’t perceived to be safe • Fear or concern about adverse reactions • Lack of control/not having options or choice • Perception or belief that those recommending have a financial interest • A product or recommendation being new or recent • Changing information or recommendations • Product recalls 	<p>“Just not believing that that’s going to work for you or your family. Not believing their claims.”</p> <p>“My delay and my confidence is really based on so many things that have changed in regards to vaccination. One year, they’re good and then 10 years from now it comes like you shouldn’t have taken this. Down to you see commercials where they’ve got people suing for (harm) the baby powder (may have caused).”</p> <p>“Don’t just tell me there is a schedule. Tell me why the schedule is the way it is. What’s the rationale for what you’re asking us to do?”</p>

system (particularly when the child was very young), and belief that the vaccine could cause the illness (e.g., flu vaccine). Safety was frequently mentioned and encompassed a range of concerns, from wanting to avoid any type of vaccine reactions to concern about long-term harm or consequences. Many women from LSES were hesitant to get their children a vaccine that they believed had questionable effectiveness and believed could cause a short-term reaction, with flu vaccination often cited as an example. Many from HSES said their confidence in vaccines was diminished by not knowing how vaccines worked or the rationale for the immunization schedule.

Along with identifying reasons for having high or low confidence, the study elicited factors that would or could make hesitant parents more confident. As Table 3 shows, a number of items were put forward, with SES not appearing to produce many differences. Overall, most of the factors cited fell into three broad categories: (1) information, including and pertaining to why vaccines are needed, vaccine ingredients, short and longer-term side effects, and getting information sooner (e.g., before a well-child visit); (2) doctors and healthcare providers being empathetic to and understanding their vaccine questions, concerns, and fears; and (3) providing parents more control over timing and scheduling of recommended vaccinations. Participants from HSES also mentioned reducing the role of profit or financial incentives related to vaccinations.

3.3. Education materials and confidence

None of the videos or infographic posters used in the study clearly positively affected parents’ confidence levels, nor were there any materials that resonated the same across groups. Most, however, had elements or components that appeared to have the potential to positively affect confidence levels. Table 4 summarizes the key findings for the three sets of educational materials. In general, the short videos were received more favorably than the infographics, with most participants stating the videos did a better job of showing the concepts because of the use of animation, colors, sounds, and familiar analogies. Some noted that the infographics were boring and failed to hold their attention.

Overall, the vaccine safety-related materials (set A) resonated best, with many participants indicating the content was well-matched to their specific interests (e.g., providing numbers, including the probability of various events happening), was easy to understand, and held their attention. Many, however, also found an example that was meant to be humorous – a reference to the percentage of people who believed in zombies – to be belittling and condescending. Comments related to the other videos and materials suggested that educational efforts to increase parents’ confidence need to be mindful and that (1) animation can be perceived as “childish” or “for children” if the approach is overly simplistic; (2) use of everyday objects (e.g., gummi bears) to explain a scientific concept may appeal to some but seem condescending to others; (3) parents generally responded favorably to the creativity used in the videos to explain concepts like how vaccines work or herd immunity; and (4) video explanations can cause some confusion or introduce new questions. For example, the video on how vaccines work prompted additional questions about how the immune system works and the necessity of vaccines.

4. Discussion and conclusions

While there has been much interest in the concept of vaccine confidence, published studies to date have primarily used surveys to ask parents and others to indicate a level of confidence in the safety, effectiveness, or value of recommended childhood vaccinations [5,15–17,19–21]. While those studies have found relatively high confidence levels, they have not provided insights into how parents’ may define confidence or what factors may reduce or increase vaccine-related confidence. The findings obtained here add helpful depth, as well as reaffirm themes found in previous qualitative studies with parents of young children [28–31]. First, the themes surfaced here suggest that while trust is a major component of confidence, parents’ vaccine confidence also encompasses having a sense of control, familiarity and experience, satisfaction with one’s knowledge, and a high degree of certainty regarding the outcome. Instilling or strengthening parents’ confidence in vaccines, whether during a physician conversation or through education materials, would benefit from recognizing or

Table 3
Participants' perspectives on confidence and vaccines for young children.

Participant group	Domains and key themes Perspective	Illustrative quotes
Lower SES	<p>Reasons for low or no confidence in childhood vaccines</p> <ul style="list-style-type: none"> • Not having enough time to learn, do research, make a decision • Lack of information/lack of “balanced information” (e.g., information that equally mentions benefits and risks) • Concerns or uncertainty regarding vaccines and children’s immune system • Concern vaccines could cause autism or other long-term health issues, including asthma, allergies • Not perceived or believed to be safe • Belief that the vaccine caused the illness (e.g., flu vaccine) • Uncertainty/lack of knowledge regarding vaccine ingredients • Lack of control over number of, scheduling of, or use of combination vaccinations • Fear of adverse reactions, including fever, arm swelling, fussiness • Not perceived or believed to be effective • Unfamiliarity/lack of personal experience with the vaccine • Other information they have seen or heard 	<p>“They try to rush you. I need to know what you’re giving my child. What are the side effects? Some of the vaccines you really don’t know until it’s time for your child to get them.”</p> <p>“They get a fever, (then) they don’t want to eat. Then the fever starts to get higher and higher and they’re (doctors) are like ‘that’s normal.’ No, that’s not normal. My child didn’t have a fever before she got that shot.”</p> <p>“Give the child’s body an opportunity to develop to a certain point before it has to combat anything that you’re giving that’s a strain of something.”</p> <p>“I don’t really have confidence in any of them. I’ve read about kids who have never had any vaccinations and they’re thriving and healthy and the parents do a lot of preventative stuff.”</p> <p>“It just seems that it’s pushed on you. That you don’t have any say. It’s just this is it, this is what you have to do regardless of what you think.”</p> <p>“My thing was the combination of all these different shots. What are the side effects of taking all these different vaccines?”</p> <p>“For me, it’s like if you have five shots and they all have the same side effect. Does that increase your risk of getting the side effect and how do you know which one caused the side effect?”</p>
Higher SES	<ul style="list-style-type: none"> • Not having enough time to learn, do research, make a decision • Lack of information/lack of “balanced information” (e.g., information that equally mentions benefits and risks) • Concerns or uncertainty regarding vaccines and children’s immune system • Concern vaccines could cause autism or other long-term health issues, including asthma, allergies • Not perceived or believed to be safe • Belief that the vaccine caused the illness (e.g., flu vaccine) • Uncertainty/lack of knowledge regarding vaccine ingredients • Lack of control over number of, scheduling of, or use of combination vaccinations • Lack of information about how vaccines work • Belief that the disease is not that serious or severe • Not perceived or believed to be effective • Concerns about when vaccines are given/number administered at a visit • Age at which vaccinations are given/small body size of infants and toddlers • Physicians and healthcare providers are perceived to have financial incentives or motives to encourage vaccination 	<p>“If the ‘cons’ (associated with vaccines) were revealed... if my primary care physician was able to just be 100 percent with me about the benefits and the negative side effects. I think that it would allow me to make a more confident choice versus me feeling like they are just pushing it. As a mom, I have to protect and control.”</p> <p>“People have confidence if it works against the certain disease it’s supposed to prevent but where my confidence breaks down in what are the other side effects or maybe unintended consequences?”</p> <p>“Maybe if they provide us with the information of how effective it is. Some facts and statistics. Don’t just say come in and you need to get this shot and that’s it.”</p> <p>“The more they (the health care system and government) use fear I think the more people push back. So I think there needs to be more open conversation about it instead of demanding.”</p> <p>“My concerns lie more so with the lack of really fully knowing what I think I’m not knowing and what the public doesn’t know and it’s not trusting the drug administration and pharmaceutical companies, the toxins and the ingredients that are actually put into these vaccinations.”</p> <p>“I think the younger a child is the more high risk vaccination is. It just is very alarming at how young they start these vaccines... If I can delay it a few more months and build up her immune system a little more to handle that is may have less impact on her negatively.”</p> <p>“They (doctors and healthcare providers) are making ridiculous amounts of money and it’s not going to change anytime soon by any means. Anytime you put money and gain involved in there then obviously you start to doubt it’s (the recommendation’s) validity.”</p>
Lower SES	<p>Reasons for having higher confidence in childhood vaccines</p> <ul style="list-style-type: none"> • Familiarity/personal experience (e.g., they received as kids) • Recommendation and/or information comes from a source or person that is trusted • Satisfied that they have done their research/had time to do research or get educated • Personal experience with vaccine preventable diseases 	<p>Illustrative quotes</p> <p>“I have confidence in the basic vaccines, the ones that most of us have done before and we were fine.”</p> <p>“I think all the old school shots. When we were little, all the old school ones that have been on the market for a long time and proven themselves.”</p> <p>“They [someone who is confident] did all their research on it and talked to as many people as possible to know this is the best product for their child.”</p> <p>“I have done some research and from my personal experiences and people that have been around me and the literature I’ve read, I feel comfortable in the majority of vaccines that are recommended for my children.”</p>
Higher SES	<ul style="list-style-type: none"> • Familiarity/personal experience (e.g., they received as kids) • Recommendation and/or information comes from a source or person that is trusted • Satisfied that they have done their research/had time to do research or get educated • Evidence of effectiveness or value • Good relationship with healthcare provider/HCP takes time to answer questions and address concerns • Vaccine protects against a disease or illness perceived to be severe • Healthcare provider had their children vaccinated or receive the vaccine 	<p>“Some of the other things that make me confident too, if I’ve taken it myself. If I’ve had the flu vaccination in my time.”</p> <p>“I look at measles, mumps, and rubella as one’s that tried and true. It’s been around. Then these newer ones, it’s like do we really know because we haven’t been using it long enough to really, really know.”</p> <p>“Confidence, especially in this medical day would be having years and years of studies. So that’s why I’m not having confidence. Some of these shots are ten years old.”</p> <p>“If someone got vaccinated for whopping cough and they were around a whole bunch of people with whooping cough and they didn’t get it, I guess you could say that they have confidence in it.”</p> <p>“I think research not funded by the companies that profit from the vaccines. It has to be done by a different group, maybe an advocacy group.”</p> <p>“Certain vaccines, it’s like these are deadly things. Like meningitis. You get sick and you’re dead in two weeks.”</p> <p>“The doctor would give then vaccine to their child. If I have confidence, I feel like they would give it to their offspring. If I don’t think they would, then I don’t have confidence.”</p>

(continued on next page)

Table 3 (continued)

Participant group	Domains and key themes	
	Perspective	Illustrative quotes
Lower SES	<p>Factors that could increase confidence in childhood vaccines</p> <ul style="list-style-type: none"> • More information, including about why vaccines are needed, how they work, and the basis for the timing of vaccinations • “Unbiased” or “independent” research and information on safety and/or effectiveness of vaccines • More information on vaccine ingredients, including what they are and why they are in the vaccine • More information on longer-term reactions/more specific information on vaccine reactions and side effects • Doctors, healthcare providers being willing to recognize and understand parent concerns • Getting vaccine information sooner/earlier (e.g., weeks or months in advance of a well-child visit) • Greater flexibility in vaccination schedule/parents having more options or control over timing of vaccinations • Vaccines that had fewer side effects (e.g., didn't cause fever) • More information, evidence, or statistics showing the effectiveness of vaccines. 	<p>“I think the more information you get the better you'll understand vaccines and it make you more comfortable.”</p> <p>“Tell us what are the percentages of people who are getting sick and not getting sick because of the vaccines.”</p> <p>“Something that would make me more confident is honesty and openness about vaccines as far as the risks, the side effects and being truthful about the real necessity of it and not just trying to make it seem like it's a necessity when it's not for some of this stuff.”</p> <p>“(I want) a full ingredient list with possible side effects for each.”</p> <p>“I feel like more information should be public and more accessible and we shouldn't have to go digging for (information on) ingredients. At the end of day, it's a business. They might not be as concerned about your kid as you are.”</p> <p>“Doctors being better about listening to questions and concerns instead of just requiring vaccines and being pushy.”</p> <p>“A more spread out schedule or delayed start. As soon as you have the baby they want you to get so many shots back to back. That's concerning because my baby is just here. She doesn't have much of an immune system.”</p> <p>“If the vaccine was effective at preventing the disease and had no side effects.”</p> <p>“If they supported more options for alternative scheduling as opposed to me going to my doctor and saying I would like to do this differently and this is the schedule I propose and then receiving their judgment or reaction.”</p> <p>“Years of study that show that they work and what they are made with. (Information about the) Numbers of people who have gotten the illness compared to how many people have gotten the vaccination.”</p>
Higher SES	<ul style="list-style-type: none"> • More information, including about why vaccines are needed, how they work, ingredients and the basis for the timing of vaccinations • Unbiased or independent research and information on safety and/or effectiveness • More information on vaccine ingredients, including what they are and why they are in the vaccine • More information on longer-term reactions/more specific information on vaccine reactions and side effects • Doctors, healthcare providers being willing to recognize and understand parent concerns • Safer or more “natural” ingredients in vaccines • Reduce the role of profit and/or financial incentives or motives for recommending or encouraging vaccinations 	<p>“I think articulating the timeline of this is why we're increasing the number of vaccines. This is why this schedule is recommended. Just providing some context for why they seemed to have changed so much from when we were young.”</p> <p>“More research and more non-profit involvement.”</p> <p>“Independent studies and then not having them mandated by laws. I feel that once they are mandated the companies have less of an incentive to invest in that vaccine and continue improving it.”</p> <p>“More research about all the ingredients and all the side effects. You look at other medicines that have commercials on TV and you see all medicines have side effects. But they tell you all the other side effects.”</p> <p>“I'd like to see a more holistic side to these vaccines. I know they say there are very small amounts of mercury and very small amounts of formaldehyde that don't actually harm the body. Could they not put those in there at all?”</p> <p>“I would have more confidence in vaccines if the federal government were more nuanced about their stance. I feel like they just say vaccines are safe for everyone. There are side effects to vaccines. Be more upfront about that. Be more upfront about what the risks are.”</p> <p>“(If money were less of a factor for vaccine companies and healthcare providers) It would sound like we are doing it for a good thing. We aren't doing it for money. We are doing it for a good thing. We want you to be healthy.”</p>

addressing these factors, particularly if the vaccine or recommendation is relatively new. Similarly, the validity of efforts to measure parent vaccine confidence may increase if they include items that assess these dimensions.

The findings suggest that vaccine-related information does and can play a significant role on parents' confidence, but leveraging information to increase confidence, particularly among parents who are hesitant, requires more work than many likely imagine. First, the content of education materials needs to be aligned with the interests, concerns, and assumptions of parents who are hesitant. Focus groups with women from higher SES indicated that for some, confidence in health-related products for children was higher when it matched what they already believed, suggesting that motivated reasoning comes into play [32]. In these cases, providing vaccine information sooner (e.g., as beliefs are forming), may be an effective strategy. In addition, this study suggests mothers who are hesitant have much interest in the purpose and safety of vaccine ingredients, how vaccines work with a child's immune system, and information on the likelihood of reactions. Second, the results suggest there is value in using creativity and short videos to illustrate concepts like herd immunity, the immune sys-

tem, and the risks of diseases and vaccines. Third, and in line with much previous research, it is likely that a portfolio of materials will be needed, particularly since the interests and concerns of parents who are hesitant vary.

The qualitative nature of this study means its findings are not generalizable, with another limitation being the cities used in the study. The findings may not be representative nationally or of parents in San Francisco, Oakland, or Philadelphia. The materials used in the study, while intended to effectively educate parents about common vaccine questions, were not purposively designed to strengthen confidence, and as such, it is possible a more concerted effort to increase confidence would have prompted more positive responses. Given the structure of this study, it is also possible that discussions that occurred prior to engagement with the educational materials could have influenced, or primed, participants' reactions to the materials in the context of vaccine confidence. That said, this study's findings support the value of future research that assesses more refined vaccine confidence measures as well as the effectiveness of short videos for increasing confidence. Finding ways to determine and increase parents' confidence are essential as more question the need and value of childhood vaccines. Similar

Table 4
Participants' responses to vaccine education materials.

Educational material focus	Approaches and elements that positively resonated with participants	Approaches and elements that negatively resonated with participants
How vaccines work video and infographic	<ul style="list-style-type: none"> Overall, many participants thought the use of animation to explain how vaccines worked was appealing The content and information provided in the video generally provoked positive thoughts about the benefits of vaccination Many participants expressed desire for video like this as a model (i.e., animated demonstration of health topic) to explain other health-related topics 	<ul style="list-style-type: none"> While participants found video appealing, they also said it did not increase their confidence in vaccines Many indicated that the overall presentation of video and poster were "too childish" for adults Video appeared to negatively influence some from lower SES groups' beliefs about why to vaccinate Some participants from lower SES expressed concerns about using military metaphors to explain and illustrate the immune system
Herd immunity video and infographic	<ul style="list-style-type: none"> Most participants indicated both the video and poster visuals aided in their understanding concept of herd immunity Many participants stated that they appreciated the simplified video presentation of complex topic Overall, most participants indicated that the video and print materials were relatable and connected with their lives, with some indicating they positively affected their confidence in vaccines Many participants from the higher SES groups reported the theme of social responsibility positively resonated with them 	<ul style="list-style-type: none"> Both the video and poster were seen by many as providing too much technical information, in some cases causing confusion about the herd immunity concept Many participants in higher SES groups said they found the video's tone patronizing Some participants from lower SES said they could not relate to the on-screen person who did the white-board animation Some participants indicated that the materials did not increase their vaccine confidence because gummy bears were used to illustrate the herd immunity concepts
Vaccine safety video and infographic	<ul style="list-style-type: none"> The video and poster were often characterized as informative, with some noting they increased their confidence in vaccines In general, participants found the poster to be very helpful in describing the vaccine safety system and liked that it provided a list of resources for learning more After viewing, some from lower SES commented that they now perceived vaccines as safer than contracting the diseases vaccines prevent Some from lower SES found the analogies used in the video to be amusing and easily understood 	<ul style="list-style-type: none"> Both the video and poster lead some to further question vaccine experts, safety testing, the schedule, and statistics presented Some perceived the video as using scare tactics to encourage vaccination Some perceived the video's tone to be offensive (e.g., patronizing, condescending, or belittling) Some from higher SES said the video tried to make them feel guilty for having concerns or hesitation about vaccines Many from higher SES stated that the analogies used to put different risks into context involved inappropriate or poor comparisons

research with first-time expectant mothers or adults regarding their own vaccination behaviors could add to our understanding.

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Conflicts of interest

None declared.

Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.vaccine.2017.09.007>.

References

- Hill HA, Elam-Evans LD, Yankey D, Singleton JA, Dietz V. Vaccination coverage among children aged 19–35 months - United States, 2015. *MMWR Morbidity and Mortality Weekly Report* 2016;65:1065–71.
- Hough-Telford C, Kimberlin DW, Aban I, Hitchcock WP, Almquist J, Kratz R, et al. Vaccine delays, refusals, and patient dismissals: a survey of pediatricians. *Pediatrics* 2016;138.
- American Academy of Pediatrics. Periodic survey #66 pediatricians' attitudes and practices surrounding the delivery of immunizations. Available from: https://www.aap.org/en-us/professional-resources/Research/Pages/PS66_Executive_Summary_PediatriciansAttitudesandPracticesSurroundingtheDeliveryofImmunizationsPart2.aspx.
- Dempsey AF, Schaffer S, Singer D, Butchart A, Davis M, Freed GL. Alternative vaccination schedule preferences among parents of young children. *Pediatrics* 2011;128:848–56.
- Gilkey MB, McRee AL, Magnus BE, Reiter PL, Dempsey AF, Brewer NT. Vaccination confidence and parental refusal/delay of early childhood vaccines. *PLoS One* 2016;11:e0159087.
- McIntosh ED, Janda J, Ehrich JH, Pettoello-Mantovani M, Somekh E. Vaccine hesitancy and refusal. *J Pediatrics* 2016;175(248–9):e1.
- Larson HJ, Cooper LZ, Eskola J, Katz SL, Ratzan S. Addressing the vaccine confidence gap. *Lancet* 2011;378:526–35.
- MacDonald NE. Sage working group on vaccine hesitancy. Vaccine hesitancy: definition, scope and determinants. *Vaccine* 2015;33:4161–4.
- Thomson A, Watson M. Vaccine hesitancy: A vade mecum v1.0. *Vaccine* 2016;34:1989–92.
- Marti M, de Cola M, MacDonald NE, Dumolard L, Duclos P. Assessments of global drivers of vaccine hesitancy in 2014-Looking beyond safety concerns. *PLoS One* 2017;12:e0172310.
- Roberts JR, Thompson D, Rogacki B, Hale JJ, Jacobson RM, Opel DJ, et al. Vaccine hesitancy among parents of adolescents and its association with vaccine uptake. *Vaccine* 2015;33:1748–55.
- Salmon DA, Dudley MZ, Glanz JM, Omer SB. Vaccine hesitancy: causes, consequences, and a call to action. *Vaccine* 2015;33(Suppl 4):D66–71.
- Assessing the state of vaccine confidence in the United States: Recommendations from the national vaccine advisory committee: approved by the national vaccine advisory committee on June 9, 2015 [corrected]. *Public health reports* 2015; 130: 573–95.
- Cacciatore MA, Nowak G, Evans NJ. Exploring the impact of the US measles outbreak on parental awareness of and support for vaccination. *Health Affairs* 2016;35:334–40.
- Kennedy A, Basket M, Sheedy K. Vaccine attitudes, concerns, and information sources reported by parents of young children: results from the 2009 HealthStyles survey. *Pediatrics* 2011;127(Suppl 1):S92–9.
- McCauley MM, Kennedy A, Basket M, Sheedy K. Exploring the choice to refuse or delay vaccines: a national survey of parents of 6- through 23-month-olds. *Academic Pediatrics* 2012;12:375–83.
- Weiner JL, Fisher AM, Nowak GJ, Basket MM, Gellin BG. Childhood immunizations: first-time expectant mothers' knowledge, beliefs, intentions, and behaviors. *Am J Preventive Med* 2015;49:S426–34.
- Larson HJ, de Figueiredo A, Xiaohong Z, Schulz WS, Verger P, Johnston IG, et al. The state of vaccine confidence 2016: global insights through a 67-country survey. *EBioMedicine* 2016;12:295–301.
- Gilkey MB, Magnus BE, Reiter PL, McRee AL, Dempsey AF, Brewer NT. The vaccination confidence scale: a brief measure of parents' vaccination beliefs. *Vaccine* 2014;32:6259–65.
- Gilkey MB, Reiter PL, Magnus BE, McRee AL, Dempsey AF, Brewer NT. Validation of the vaccination confidence scale: a brief measure to identify parents at risk for refusing adolescent vaccines. *Academic Pediatrics* 2016;16:42–9.
- Opel DJ, Taylor JA, Zhou C, Catz S, Myaing M, Mangione-Smith R. The relationship between parent attitudes about childhood vaccines survey scores and future child immunization status: a validation study. *JAMA Pediatrics* 2013;167:1065–71.

- [22] Linda.com. How Risky are Vaccines? [Video]. Available from: <https://www.youtube.com/watch?v=NaGndICPT8I&t=3s>; YouTube; 2015.
- [23] Centers for disease control and prevention. The Journey of Your Child's Vaccine. Available from: <http://www.cdc.gov/vaccines/parents/infographics/journey-of-child-vaccine.html>; National center for immunization and respiratory diseases.
- [24] ExSciEd. Vaccines, Herd immunity, and gummi bears- oh my! [Video]. Available from: https://www.youtube.com/watch?v=CpC4oGB_o8&t=20s; YouTube; 2013.
- [25] MLive. Why does my choice matter to others? [online]. How do vaccinations work? The science of immunizations. Available from: http://www.mlive.com/news/index.ssf/2014/12/how_do_vaccinations_work_the_s.html2014.
- [26] NOVA. Immunity and vaccines explained PBS [video]. Available from: <https://www.youtube.com/watch?v=IXMc15dA-vw>; YouTube; 2014.
- [27] MLive. How do vaccines work?. How do vaccinations work? The science of immunizations. Available from: http://www.mlive.com/news/index.ssf/2014/12/how_do_vaccinations_work_the_s.html2014.
- [28] Benin AL, Wisler-Scher DJ, Colson E, Shapiro ED, Holmboe ES. Qualitative analysis of mothers' decision-making about vaccines for infants: the importance of trust. *Pediatrics* 2006;117:1532–41.
- [29] Brunson EK. How parents make decisions about their children's vaccinations. *Vaccine* 2013;31:5466–70.
- [30] Dube E, Vivion M, Sauvageau C, Gagneur A, Gagnon R, Guay M. Nature does things well, why should we interfere?: vaccine hesitancy among mothers. *Qualitative Health Res* 2016;26:411–25.
- [31] Saada A, Lieu TA, Morain SR, Zikmund-Fisher BJ, Wittenberg E. Parents' choices and rationales for alternative vaccination schedules: a qualitative study. *Clin Pediatrics* 2015;54:236–43.
- [32] Epley N, Gilovich T. The mechanics of motivated reasoning. *J Econ Perspectives* 2016;30:133–40.