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ORIGINAL PAPER

Denver Religious Leaders' Vaccine Attitudes, Practices, and Congregational Experiences

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Abstract

Religious vaccine exemptions are widely available in America and increased in the past decade for unclear reasons. Religious leaders strive to influence their congregants' attitudes and practices. We sought to describe Denver religious leaders' vaccine attitudes, practices, and congregational experiences using a cross-sectional online survey. The response rate was 33% (109/334). Most respondents were Protestant, White, male, parents; 42% believed the Bible contained themes supportive of vaccination, 25% were vaccine hesitant, and only 10% had addressed vaccines in their congregations. Vaccine-hesitant religious leaders' attitudes and practices differed from those of non-hesitant leaders. Study implications and future research avenues are discussed.

Keywords Religion · Vaccine · Vaccine exemption · Vaccine hesitancy · Religious leader

Introduction

Vaccination is one of the most important public health advances in the last century (Koppaka 1999). Traditionally, major religions have supported vaccination (Grabenstein 2013), but the number of religious vaccine exemptions among American Kindergartners increased in the past decade (Omer et al. 2012; Larson et al. 2014).

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Today, religious exemption laws exist in 46 states and the District of Columbia for Kindergartners (Mellerson et al. 2018), and many exemptions are considered "easy" to obtain (Omer et al. 2012). Religious objections to vaccination have been studied in minor sects within Christianity, Judaism, and other faiths (Grabenstein 2013). However, at least one recent study suggests this increase in religious vaccine exemptions is present more broadly in both religious private and public secular schools (Lai et al. 2014). An improved understanding of how religious faith and vaccination beliefs intertwine could help explain immunization coverage data and increase vaccine uptake among children of religious individuals.

We know little about religious leaders' (RLs) vaccine attitudes and congregational experiences, although many are influential in their congregations and strive to affect the attitudes and practices of their congregants. This influence may extend to vaccine acceptance, as was seen in 2013 when a Texas church experienced a measles outbreak following its pastor's comments about childhood vaccines (Wallace et al. 2013; Stengle 2013). Thus, religious leaders may be a key informant for public health workers and vaccine advocates seeking to understand religious vaccine exemption rates nationwide. Our primary objective was to describe Denver RLs' attitudes, practices, and congregational experiences with childhood vaccines. A secondary objective was to identify vaccine-hesitant religious leaders (VHRLs) and compare them with non-hesitant RLs.

Methods

This exploratory cross-sectional, mixed-mode survey of Denver county RLs was approved by the Colorado Multi-Institutional Review Board. Participating religious organizations (ROs) were selected using the 2010 United States Religion Census data for Denver, Colorado, which were collected by the Association of Statisticians of American Religious Bodies (Grammich et al. 2010). This census surveyed individuals from 236 religious traditions and denominations, providing information on the number of congregations and adherents for each tradition in every county in the USA. A map of ROs with available contact information was generated via the Association of Religion Data Archives (ARDA) public website and cross-checked for accuracy (ARDA 2017). Eligible ROs had at least one current religious leader, defined as a Head, Associate, or Children's Pastor/Rabbi/Imam, community elder, or equivalent. Eligible ROs also had a working phone number or e-mail address and were located in Denver county. Ineligible ROs were closed, in transition without a RL, had incorrect or missing contact information, or were located outside Denver county.

Survey Design

The primary study outcome was RLs' attitudes, practices, and congregational experiences with childhood vaccines. Attitudes toward childhood vaccines were measured using a validated vaccine hesitancy scale called the Parent Attitudes about

Childhood Vaccines Survey Tool, or PACV (Opel et al. 2011a, b). In prior work, the PACV has correlated with percent days underimmunized (Opel et al. 2011a, b), future vaccination status in primary care settings (Opel et al. 2013; Williams et al. 2016), and likelihood of influenza vaccine uptake in the emergency room (Strelitz et al. 2017). The PACV was adapted for this study with input from its creator (Douglas J. Opel): for RLs without children, questions including language such as "your child" or "my child" were modified to "a child." Personal beliefs and practices, as well as congregational experiences with childhood vaccines, were assessed using a series of novel questions based on the Health Belief Model (Becker 1974), a systematic review by the World Health Organization (WHO) Strategic Advisory Group of Experts Working Group on Vaccine Hesitancy (Jarrett et al. 2015), and the WHO European bureau's Guide to Tailoring Immunization Programs (WHO 2013). Questions also explored parental tendencies to use various sources of information for making vaccine decisions as modeled in prior work (Kennedy et al. 2011; Jones et al. 2012; Harmsen et al. 2013). Response options included four-point Likert scales of agreement (Strongly Agree, Agree, Disagree, Strongly Disagree) and use (Often, Sometimes, Rarely, Never), as well as discrete values (Yes, No, Don't Know). For questions with discrete answers, many regarding congregational experiences with vaccines, free-text boxes were provided to allow respondents to include details. The survey instrument is available upon request.

Demographic information collected included age in years, sex, primary language (English, Spanish, or Other), race/ethnicity (Asian, Black, Hispanic, Pacific Islander or Native American, White, Other), marital status (Single, Married, Divorced, Widow(er)), parental status, religious affiliation (16 most common traditions, plus "Other"), length of service as a RL, RO average attendance, RO predominant ethnicity, RO predominant socioeconomic status (SES), and RO percentage of children. RLs who were parents were also queried about their youngest child's vaccination schedule (Alternative, Recommended) and influenza vaccine receipt in the prior year (Yes, No, Don't Know).

Survey Administration

ROs with available phone numbers were called up to three times each; one RL from each RO was invited to participate. If the RO did not answer, a message was left using a standard telephone script that explained the purpose of the study and invited a RL to contact the principal investigator (JW) to discuss participation. If consented by phone, RLs received an e-mail with a personalized survey link on the same day, followed by reminder e-mails every 1–2 weeks (up to a total of 5 e-mails over 8 weeks) until survey completion. Introductory e-mails contained a consent reminder, advised participants of the survey, and included contact information for the study's principal investigator. The survey was opened on August 1, 2016, and it was closed on December 31, 2016, after all ROs had been contacted 3 times by phone and at least 2 weeks after each RL had received a final e-mail reminder to complete the survey. If phone calls to a RO went unanswered but the RO's website listed a contact e-mail address, introductory and follow-up e-mails were sent per protocol. If phone calls to a RO went unanswered and no additional contact

information was available, recruitment efforts stopped. Responses were recorded using Research Electronic Data Capture (REDCap) hosted at the University of Colorado Denver (Harris et al. 2009). Respondents who fully completed a survey were entered into a random drawing to receive one of ten $200 incentives for their RO.

Analytic Methods

Descriptive statistics were generated for all survey items. Demographic items were collapsed due to low numbers for primary language (English, Other), race/ethnicity (White, Black, Hispanic, Other), length of service as a RL (<10 years, ≥ 10 years), relationship status (Married, Single, Other), religious tradition (Buddhism, Catholicism, Judaism, Orthodox Christianity, Protestant Christianity, Unity Church, Other), congregation size (<100 or ≥ 100 individuals), congregation percent children ($<10\%, \geq 10\%$), congregation predominant race/ethnicity (White, Black, Hispanic, Other), and congregation predominant socioeconomic status (Low, Medium/High). Vaccine hesitancy (VH) was calculated as previously described (Opel et al. 2011a, b), with a PACV score ≥ 50 qualifying as vaccine hesitant.

Responses for personal practices regarding vaccination were collapsed for vaccine information sources (Often, Sometimes/Rarely/Never), support for Colorado vaccine exemption laws (Agree, Disagree), and agreement with vaccination messages (Agree, Disagree). Proportional responses were compared using Chi-square or Fisher exact tests as appropriate, and means were compared using *t* tests or analysis of variance (ANOVA) as appropriate. Ripley's K function was applied as previously described to the geographic distribution of responding RLs' organizations and compared to the result for the distribution of non-responding ROs to determine whether respondents and non-respondents were similarly clustered in Denver (Dixon 2002). Analyses were performed using *R* (R core team; Vienna, Austria). A p value of ≤ 0.05 was considered significant.

Results

There were 439 registered ROs in Denver county per 2010 census data on the ARDA website, with an estimated 304,759 adherents. One hundred and five ROs were excluded due to closure, transitional status without a presiding RL, or incorrect/unavailable contact information. The response rate—defined as the number of ROs with a RL who fully completed the survey divided by all eligible ROs—was 33% (109/334). Ripley's K function analyses suggested no difference in response rate by geographic area within Denver county. Ten RLs began the survey but did not complete it, and 25 ROs refused participation (14 Protestant, 7 Catholic, and 1 Buddhist, Jewish, Orthodox Christian, and "Other"), with most RLs citing a lack of time. Responding RLs were predominantly English-speaking White males who had served for >10 years in Protestant Christian ROs with predominantly middle- and upper-class congregants; the majority were married and had children (Table 1).

Table 1 Demographic data for Denver religious leaders and religious organizations

Characteristic	Responding RLs % (*n*)	Eligible ROs % (*n*)
Mean age in years ± SD	55 ± 13	
Male gender	79 (86)	
English primary language	97 (106)	
Race/ethnicity		
White	75 (82)	
Black	11 (12)	
Hispanic	5 (5)	
Other	9 (10)	
Length of service as religious leader		
< 10 years	21 (23)	
≥ 10 years	79 (86)	
Relationship status		
Married	79 (86)	
Single	15 (16)	
Other	6 (7)	
Parent status		
Yes	76 (83)	
No	24 (26)	
Religious tradition*		
Buddhism	2 (2)	4 (13)
Catholicism	11 (12)	8 (28)
Judaism	2 (2)	4 (12)
Orthodox Christianity	4 (4)	3 (11)
Protestant Christianity	73 (80)	72 (241)
Anglican	3 (2)	
Baptist	15 (12)	
Episcopal	6(5)	
Evangelical free or non-denominational	14 (11)	
Lutheran	10 (8)	
Mennonite	3 (2)	
Methodist	12 (10)	
Other and independent	18 (15)	
Pentecostal	1 (1)	
Presbyterian	9 (7)	
Seventh-day Adventist	3 (2)	
United church of Christ	6 (5)	
Unity church	2 (2)	1 (3)
Other	6 (7)	8 (26)
Congregation size (individuals)		
< 100	54 (59)	
≥ 100	46 (50)	
Congregation percent children		

Table 1 (continued)

Characteristic	Responding RLs % (*n*)	Eligible ROs % (*n*)
< 10%	30 (33)	
≥ 10%	70 (76)	
Congregation predominant race/ethnicity		
White	62 (68)	
Black	13 (14)	
Hispanic	5 (5)	
Other	20 (22)	
Congregation predominant SES		
Low	10 (11)	
Medium/High	90 (98)	

Baseline data for eligible ROs only available for religious tradition

*$P = 0.77$ for Fisher's test comparing responding RLs to eligible ROs

Of respondents, 94% ($n = 102$) were head/associate pastors or an equivalent; three Youth Pastors, two Deacons, and two other lay leaders participated. Table 1 also provides all eligible ROs' faith traditions for comparative purposes; additional data for eligible ROs—e.g., ethnicity, socioeconomic status, size, etc.—were not available on the ARDA website. Fisher's exact test suggested response rates did not differ by faith tradition ($P = 0.77$).

Vaccine Attitudes

RLs' mean PACV score was 37 ± 19, and 25% were vaccine hesitant ($n = 27$; 12 Catholic, 8 Protestant, 2 Orthodox, 2 Jewish, 3 Other). There was no difference in mean PACV score across traditions ($P = 0.56$), although the study was underpowered to detect a difference. Of RLs, 42% ($n = 46$) agreed their primary religious text contained themes supportive childhood vaccines; 34% ($n = 37$) disagreed, and the remainder were unsure. 83% of RLs ($n = 90$) agreed a person should get a vaccine to protect those who cannot get a vaccine. Half of RLs ($n = 59$) said their RO would consider partnering with a healthcare worker in the future regarding childhood vaccination. When shown Colorado's philosophical and religious vaccine exemption laws verbatim, roughly half of RLs agreed with the existence of the religious ($n = 59$) and philosophical ($n = 53$) exemption laws. Only 29% ($n = 32$) of RLs agreed with getting a vaccine with fetal cell origins, while 48% ($n = 53$) disagreed and 22% ($n = 24$) were unsure.

Personal Practices

When asked about primary sources for vaccine information, RLs most often asked doctors (67/109), followed by religious texts, organizations, or leaders (22/109), and

medical books or brochures (15/109). Of all RLs, 76% ($n=83$) had children. When making vaccine decisions for their children, 82% ($n=68$) of RLs described their role as very important, 75% ($n=62$) acknowledged their co-parent's role as very important, and 60% viewed their child's doctor as very important. Few RLs attributed importance to the thoughts of their friends or extended family members. For their youngest child, 78% ($n=65$) of RLs followed a recommended vaccination schedule, 19% ($n=16$) followed an alternative vaccine schedule, and 2% ($n=2$) refused all vaccines. In the prior year, 48% of RL parents ($n=40$) vaccinated their youngest child against influenza, 37% refused ($n=31$) influenza vaccination, and the remainder were unsure.

Congregational Experiences

Eighteen percent of all RLs ($n=20$) knew a child who was not immunized for a religious reason, the most commonly cited reason being faith in divine healing or protection from disease (7/20; 4 Protestant, 1 Catholic, 1 Jewish, and 1 Other). Over 25% of RLs ($n=30$) had been asked about vaccines by a congregant, although nearly all (29/30) were asked infrequently (defined as once per quarter or less). Congregant questions explored RLs' personal opinions of vaccines (10/30), vaccine safety or autism concerns (9/30), and official religious teachings on vaccines (5/30). Only 10% of RLs ($n=11$) had formally spoken about vaccines in a sermon, derasha, khutbah, or equivalent, and all did so infrequently (11/11). When preaching, RLs delivered messages about the need to get vaccines to protect those who could not get them (4/11), as well as the need to thoroughly research vaccines before making a personal decision (3/11). Only one RL listed vaccination as a requirement for entry into his RO's Sunday School. Experiences from congregational schools (e.g., parochial schools, Jewish day schools, etc.) were not mentioned.

Comparison of VHRLs to Non-hesitant RLs

Vaccine attitudes, personal practices, and congregational experiences of VHRLs were compared to non-hesitant RLs. VHRLs had statistically significant differences in all domains (Table 2). Notably, VHRLs were less likely to agree to participate in future vaccine-related partnerships involving their ROs (8% vs 44%; $P<0.001$).

Discussion

This pilot study is the first of which we are aware to quantify American religious leaders' attitudes, personal practices, and congregational experiences with childhood vaccines. Respondents disagreed over religious texts' support for vaccination, 25% were vaccine hesitant, and few discussed vaccines within their ROs, all doing so infrequently.

Christian clergy—and Protestant ministers, specifically—accounted for nearly all study participants, but they disagreed over whether their sacred texts contained

Table 2 Comparison of vaccine attitudes, practices, and experiences between vaccine-hesitant religious leaders (VHRLs) and RLs who were not vaccine hesitant (non-VHRLs)

Characteristics	VHRLs % (*n*)	Non-VHRLs % (*n*)	*P*
Mean PACV Score ± SD	66 ± 10	28 ± 10	< 0.01*
If parent, vaccine schedule for youngest child			
Recommended	38 (8)	92 (57)	
Alternative	62 (13)	8 (5)	< 0.01*
If parent, gave flu shot to youngest child in 2016			
Yes	7 (2)	46 (38)	
No/Don't Know	93 (25)	54 (44)	< 0.01*
RLs' attitudes to Colorado vaccine exemption laws			
Support religious exemptions†	70 (19)	49 (40)	0.04*
Support philosophical exemptions†	74 (20)	40 (49)	< 0.01*
RLs' experiences with vaccines in congregation			
Know a child unimmunized for religious reasons	30 (8)	15 (12)	0.09
Asked about vaccines by a congregant	56 (15)	18 (15)	< 0.01*
Spoken about vaccines to congregation	15 (4)	9 (7)	0.46
RLs' primary sources of vaccine information			
Doctors	26 (7)	73 (60)	< 0.01*
Internet	15 (4)	2 (2)	0.03*
Other religious leaders	7 (2)	5 (4)	0.64
Other religious organizations	11 (3)	2 (2)	0.10
Religious texts	19 (5)	9 (7)	0.17
RLs' agreement with vaccine messages			
Primary religious text supports vaccination	19 (5)	50 (41)	< 0.01*
Vaccinate to protect those who can't get vaccines	48 (13)	94 (77)	< 0.01*

*Indicates statistical significance at the $p < 0.05$ level

†One-tailed Fisher's exact tests. All others two-tailed

themes supportive of vaccination. Protestantism is the second largest form of Christianity, having roots in a sixteenth-century European schism from Catholicism. Protestants belong to numerous denominations—e.g., Lutherans, Methodists, or Presbyterians—and are the most populous religious group in America (Alper and Sandstrom 2016). Protestants emphasize the authority of the Bible, its collection of sacred books, and faith in Jesus, who they affirm to be God. While all books of the Bible predate vaccination, prior work has identified themes favoring vaccine acceptance in their verses (Grabenstein 2013). Many passages emphasize social justice and a duty to community, such as 1 Corinthians 10:24: "No one should seek their own good, but the good of others." Christian exhortations to anticipate and pursue the welfare of others resonate with public health goals of vaccination. However, this resonance is indirect, and other textual concerns may concern Christian RLs. Specifically, many Christians are anti-abortion due to Biblical texts, and several vaccines are produced from cell lines with remote fetal origins (Carson and Flood 2017). While no further abortions have occurred to continue these cell lines, Christians

may be concerned about the implications of using a vaccine made from fetal cells. This is supported by our study data, in which only 29% of RLs agreed with getting a vaccine made from fetal cells, while the remainder disagreed or were unsure. While the Catholic church has gone to great lengths to study such vaccines and ultimately recommend their use, the ethical principles of informal or formal cooperation in historical acts are nuanced principles that are foreign to most lay Christians and may also be unfamiliar for clergy (Carson and Flood 2017). Ultimately, these examples of the complexity of textual interpretation underlie why it is not surprising that only two in five Christian clergy agreed the Bible contained themes supportive of vaccination. Further qualitative studies of RLs' vaccine attitudes are needed to explore leaders' textual concerns in depth. The small number of participants from other faith traditions precludes discussion about their understandings of their sacred texts' positions toward vaccines.

We found that one in four Denver RLs was vaccine hesitant. This is comparable to baseline rates of vaccine hesitancy identified in parents from the general population outside of Seattle (15–25%) in whom the PACV was validated (Opel et al. 2011a, b; Opel et al. 2013). One in five RL parents used alternative vaccination schedules, and under half reported vaccinating their youngest child against influenza in the 2015–2016 season. Prior work has estimated that 13–19% of American families use alternative vaccination schedules (Dempsey et al. 2011; Gust et al. 2008), and the Centers for Disease Control and Prevention (CDC) calculated national influenza vaccine coverage at 59.3% for the 2015–2016 season (Srivastav et al. 2016). Thus, Denver religious leaders appear to be as vaccine hesitant as the general public in both validated survey scores and reported practices. The etiology of this hesitancy is likely multifactorial. In our study, most RLs cited doctors and medical brochures as key information sources for making vaccine decisions. However, VHRLs were less likely to seek physician advice, more likely to search the internet, and less likely to believe their primary religious text supported vaccination. The impact of the internet on the spread of vaccine misinformation is well understood (Smith 2017), and the complexity of textual support for vaccines is aforementioned. The concept of divine protection from disease may also increase clergy (and congregant) vaccine hesitancy, as shown in our data as the top reason RLs cited for children unvaccinated on religious grounds. Thus, while vaccine hesitancy in RLs may be due in part to religious considerations, secular considerations may be equally or more influential. Other findings have noted this tension, citing the lack of "properly theological" objections to vaccination (Grabenstein 2013) and the widespread perceived compatibility of vaccines with religious beliefs worldwide (Larson et al. 2016). Ultimately, we must remember that clergy are people, too, weighing doctor recommendations, cultural narratives, and personal experiences in the balance, just like their lay congregations. Further work is needed to understand the complex interplay of this information that influences religious leaders as they make—and assist others in making—vaccine decisions.

In our study, few RLs reported formally discussing vaccines within their communities, and all did so infrequently. We are unaware of any other reports of the frequency with which American RLs discuss vaccines in their communities. RLs play an important role in promoting other health habits in their communities

(Anshel and Smith 2014), and they can be influential vaccination advocates. One study of oral polio vaccination in Nigeria reported discussing vaccines with religious leaders increased subsequent odds of vaccination in the community fourfold (Nasiru et al. 2012). African American churchgoers in metropolitan Atlanta were more likely to receive the influenza vaccine when they did not encounter negative vaccine attitudes in their congregations (Boggavarapu et al. 2014). Measles, mumps, and rubella vaccine uptake increased dramatically in a Somali community in Minnesota following engagement with Muslim faith leaders after a measles outbreak (Hall et al. 2017). These public health victories are encouraging for vaccine advocates, but such partnerships are often only prompted by disease outbreaks. We suggest a more proactive approach in which public health workers and RLs partner to promote vaccination in their communities at regular intervals in pursuit of community welfare. While we do not mean to suggest clergy should preach about vaccines monthly, public health officials could encourage clergy to address vaccines around the time school begins or prior to influenza season. It is noteworthy that while few RLs formally discussed vaccines in our study, those who did most commonly spoke about the social justice of vaccination and the need to get vaccines to protect others who could not get them. Such vaccine promotion by RLs contributed to the decline of smallpox in Christian communities in nineteenth century England (Jones 1834; Williams and Nussbaum 2018), and it has increased vaccine uptake in Kiryas Yoel Jewish communities in twenty-first-century New York (personal communication, Alan Werzberger, MD; Hudson Valley Health Coalition 2015). Community-based participatory research and dialogue with interfaith groups are important next steps to understanding RLs' perceptions of their role in vaccine promotion and how best public health officials can partner with them.

There are several limitations to this work. The original work validating the PACV was done among young mothers with infant children, whereas most respondents in this study were older fathers. Second, our response rate creates potential for non-responder bias, especially if respondents felt negatively about vaccines and were more likely to take our survey. Importantly, there was no difference in response rate by faith tradition, which suggests the faith traditions in our sample population accurately reflected the percentages among eligible ROs in Denver. Third, the study was performed in a single, urban geographic area that may not be representative of other American communities, and there were few respondents from non-Christian traditions. Fourth, our choice to call religious leaders and then send an e-mail with the survey link upon contact may have lowered our response rate. Finally, this study only accounted for RO attrition since the 2010 US Religion Census as there was not a systematic way to account for the addition of new ROs.

Despite these limitations, this pilot study provides novel insights that highlight the need for further inquiry among and partnership with religious leaders and faith communities. Future studies will deepen our understanding of RLs' vaccine attitudes and decision-making processes with qualitative insights, acquire data in additional geographic areas, and explore best practices for partnering with RLs to promote vaccine uptake.

Conclusions

Denver Protestant religious leaders disagreed about thematic support for vaccination in the Bible, and they were vaccine hesitant on levels comparable to the general population. Few formally discussed vaccines with their congregants, and all did so infrequently. Further research will develop a more nuanced understanding of religious leaders' Biblical concerns, vaccine attitudes, perceived duty to discuss vaccines, and preferred methods to partner with public health officials.

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Compliance with Ethical Standards

Conflicts of interest The authors declare that they have no conflicts of interest.

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