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HPV Vaccine Decision-Making and Acceptance: Does Religion Play a Role?

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Abstract

We conducted a web-based survey among 476 white, Black, and Hispanic parents or caregivers with daughter(s) between the ages of 9–17 to better understand how religion influences HPV vaccine acceptance. Catholic parents were more likely than nonaffiliated parents to have already vaccinated their daughters (vs. being undecided) (OR = 3.26, 95% CI = 1.06, 10.06). Parents with frequent attendance at religious services were more likely than parents who do not attend services to have decided against vaccination (vs. being undecided) (OR = 2.92, 95% CI = 1.25, 6.84). Directions for research and implications for interventions are addressed.

Keywords

HPV vaccine; Religion; Vaccine acceptance; Cancer prevention

Introduction

Human papillomavirus (HPV) is the most common sexually transmitted infection in the US and can lead to the development of genital warts and cervical cancer (Dunne et al. 2007). In 2006, the US Food and Drug Administration (FDA) approved a quadrivalent vaccine for

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HPV for use among females ages 9–26. This vaccine is protective against some types of HPV (types 6, 11, 16, 18) that are related to cervical cancer and genital warts. Another vaccine has also been recently approved to prevent cervical cancer among females ages 10–25. As vaccination should ideally occur prior to the onset of sexual activity, The Advisory Committee for Immunization Practices (ACIP) recommends routine HPV vaccination for girls 11–12 years of age, with 'catch-up' vaccination for females 13–26 years of age.

Uptake of the HPV vaccine has been suboptimal. The Centers for Disease Control and Prevention reported that as of 2008, 37.2% of teenage girls had initiated vaccination but only 17.9% had completed the full three-dose series (Centers for Disease Control and Prevention [CDC] 2008). Widespread uptake of the vaccine will require understanding factors that influence parental vaccine acceptance and decisions. In our prior analyses, we found that attitudes and subjective norms toward the HPV vaccine were strongly associated with parental decision-making and acceptance of the vaccine (Allen et al. 2010). In this manuscript, we examine the association between religion and parental vaccine decisions, specific vaccine beliefs, and religious norms related to HPV vaccination.

There can be no doubt that religion is an important sociocultural influence in the US (Gallup Poll 2008; Benjamins 2006a, b). The 2008 American Religious Identification Study (ARIS) found that four out of five US adults identify with a specific religious denomination, with most self-identifying as Catholic (~25%) or 'Other Christian' (~50%) (e.g., Protestant) (Kosmin and Keysar 2009). The majority of US adults report that their religion is a 'very important' part of their lives (56%) and are members of a church or synagogue (63%) (Gallup Poll 2008). In addition, 31% of US adults report attending religious services at least once a week, with 11% attending almost every week, and 13% attending about once a month (Gallup Poll 2008).

In addition to general influences on behavior, religion has also been found to be influential in shaping vaccine decisions. For example, parents who file vaccine exemptions on the basis of religious or personal beliefs are able to delay or refuse childhood immunizations that are mandated for school entry (Etkind et al. 1992; Salmon et al. 1999; Kulig et al. 2002; Kennedy and Gust 2008). Currently, 48 out of 50 states allow some form of religious exemption for mandatory vaccinations (Salmon et al. 2005; Omer et al. 2006). Estimates of the prevalence of nonmedical exemptions are low (~1–2%), though rates are as high as 15–18% in some geographic communities or clusters (Omer et al. 2006, 2008).

Though not well-studied, religion may play an even greater role when it comes to influencing vaccine decision-making for sexually transmitted infections like HPV than for other vaccines. To our knowledge, only one large study among a random sample of US households has been conducted, with results suggesting that religious denomination and attendance at religious services are associated with HPV vaccine acceptance (Constantine and Jerman 2007). Other studies have not found these associations, though several of these studies were conducted outside of the US and, therefore, may not be comparable (Lenselink et al. 2008; Brabin et al. 2006), and some used racially/ethnically homogeneous or convenience samples (Lenselink et al. 2008; Bernat et al. 2009). Given these mixed findings,

more research is needed to better understand whether religion plays a role in HPV vaccine decision-making.

There are several mechanisms by which religion may influence HPV vaccine decisions. We considered constructs central to the theory of reasoned action (TRA), including beliefs and subjective norms (Ajzen and Fishbein 1980). Religious practices and teachings may influence beliefs about the acceptability of certain health behaviors (Benjamins and Brown 2004; Schiller and Levin 1988), including receipt of the HPV vaccine. For example, some denominations believe in abstaining from sex until marriage. Because HPV is a sexually transmitted infection, parents may perceive that vaccinating their daughter is unnecessary, morally inappropriate, or condones sexual activity. More frequent attendance at religious services may result in stronger religious beliefs or stricter adherence to their denominational beliefs and may increase parental exposure to subjective norms (pertaining here to religious norms or the social influence of one's place of worship) that may influence acceptance of HPV vaccination.

To better understand the role of religion in influencing HPV vaccine acceptance, we conducted a cross-sectional investigation among a national sample of white, Black, and Hispanic parents to explore associations between religion and vaccine decisions, beliefs, and norms. Specifically, we examined (1) religious denomination (the specific religious subgroup with whom a person identifies or is affiliated with, e.g., Catholic, Protestant), and (2) frequency of attendance at religious services (an indicator of religious involvement) (Benjamin 2006b).

Methods

Recruitment and Setting

Data were collected in collaboration with Knowledge Networks, Inc. (KN) (Menlo Park, CA), a national research company that has expertise in Internet-based surveys. Using multistage probability sampling and random digit dialing methodology, KN recruits a large, nationally representative panel that serves as potential research participants. A number of research studies have been published using Knowledge Network panels and methodology (Harris et al. 2009; Baker et al. 2003). All panel members are provided with free Internet service and a WebTV as needed to facilitate study participation.

Individuals eligible to participate: (1) self-identified as Black, Hispanic, or white and (2) had at least one daughter(s) between the ages of 9–17 for whom they were the primary caregiver (referred to in this paper as parents). Parents with only sons were not eligible because while clinical trials were underway, the vaccine was not recommended for boys or men when the study was conducted. A random sample of potentially eligible panelists was identified and invited to participate in the online survey. Interested participants then reviewed the online consent form and completed a brief screener to assess eligibility. Nonrespondents were sent electronic mail reminders and up to three phone calls to encourage participation. Nonwhite parents were oversampled in an effort to achieve approximate balance across racial/ethnic groups. A total of 563 out of 836 potential participants consented to participate (mean across racial/ethnic groups = 67%; 74% whites, 70% Hispanics, 61% Blacks). Among those who

consented, 85% were still eligible after completing the screener (n = 476). Details on the sampling schema and recruitment procedures are provided elsewhere (Allen et al. 2010).

Data Collection and Measures

Data collection took place between September 2007 and January 2008 through an online self-administered survey. The protocol was approved by the Institutional Review Board at the Harvard School of Public Health, Boston, Massachusetts. All parents who participated in the survey provided demographic information including race, ethnicity, age, income, education level, and gender.

Religious Factors—To assess *religious denomination*, all parents were asked the open-ended question, 'What is your religion?' For these analyses, responses were grouped as: (1) Protestant; (2) Catholic; (3) Other Christian; (4) non-affiliated. Religions not classified (5% of parents) were not included in the analyses because of very small sample sizes (e.g., Buddhists, Muslims). The second question asked about frequency of attendance at religious services (*religious attendance*). Participants were asked: 'How often do you attend religious services?' (rarely or never; few times a year; 1–3 times a month; once a week; more than once a week). Similar to prior studies and based on the distribution of responses (Whooley et al. 2002), participants were categorized in tertiles: (1) 'does not attend': rarely/never attend; (2) 'moderate attendance': attends a few times a year or 1–3 times a month; (3) 'frequent attendance': attends at least once a week or more than once a week.

Vaccine Decision—Parents were asked whether they had ever heard of HPV vaccine before taking the survey and whether their daughter(s) had received three doses of the vaccine. Among those whose daughter(s) had not received three doses of the HPV vaccine, participants were asked: 'How likely is it that you will try to get the HPV vaccine for your daughter in the next 12 months?' Based on these questions, responses were categorized as: (1) 'decided against'; (2) 'undecided'; (3) 'intend to vaccinate'; (4) 'already vaccinated'.

Beliefs About the HPV Vaccine—We first asked at what age vaccination against HPV should start (response options: earlier than age 9; 9–10; 11–12; 13–14; 15–16; 17–18; 19 or older; or never) (Brabin et al. 2006). We also assessed parental beliefs about the appropriate recipients of the vaccine (all girls; all boys; all boys and girls; anyone who is sexually active; or no one), adapted from a prior measure (Kahn et al. 2003).

Religious Norms—Participants were first asked how much their place of worship would approve or disapprove of their daughter getting the HPV vaccine (definitely would approve; probably would approve; I don't know; probably would not approve; definitely would not approve; not applicable). Participants were then asked how much the opinion of their place of worship influenced their decision about getting their daughter vaccinated against HPV (very much; somewhat; not very much; not at all; not applicable). In accordance with TRA, scores on these items were multiplied, with higher scores indicating stronger norms.

Statistical Analysis

Parents were the unit of recruitment (weighted and unweighted, $n = 476$). Ninety-two parents had more than one daughter in the sample. Of these, 22 had made different decisions regarding vaccination for different daughters. To account for this variability clustered with parent, daughters were the unit of analysis (unweighted, $n = 581$; weighted, $n = 579$).

Post-stratification (or 'case') weights, which correct the sample distribution to reflect the US population according to the 2008 Current Population Survey, were applied for age, education, census region, metropolitan residence, and Internet access (y/n). Taylor series expansion was used to calculate standard errors, required due to the clustering of survey responses within parent. A sensitivity analysis removing fathers (unweighted, $n = 47$; weighted, $n = 36$) did not change results, so they were retained.

Descriptive statistics were used to characterize sociodemographic characteristics of the sample. The outcome 'vaccine decision' had four categories; therefore, bivariate and multivariate analyses were computed using multinomial logistic regression. Bivariate and multivariate linear regression was used to assess relationships between religious norms (modeled as outcome) with religious denomination and religious attendance. The Rao-Scott chi-squared statistic was computed to assess associations between beliefs about the HPV vaccine (outcome) in relation to religious denomination and religious attendance. Each analysis was conducted using all available (nonmissing) data so sample sizes may be different for each analysis. Analyses were conducted using SAS statistical software (SAS version 9.1) in 2009–2010. Due to small cell counts, adjusted relationships were not available for all variables. All reported *N* and % values reflect the probability-reweighted sample unless otherwise noted.

Results

Sociodemographic and religious characteristics of the sample of parents are provided in Table 1. The majority of respondents (92.4%) were female. Thirteen parents had three daughters in the sample, 79 parents had two daughters in the sample, and 384 parents had one daughter in the sample.

Religious Denomination

Bivariate relationship between religious denomination and vaccine decisions is presented in Table 2. Catholic parents were more likely to have already vaccinated their daughters than to be undecided compared to nonaffiliated parents (OR = 3.34, 95% CI = 1.16, 9.59). This relationship remained significant in multivariate analysis (OR = 3.26, 95% CI = 1.06, 10.06), controlling for race, age, and education (see Table 3).

With respect to beliefs, parental beliefs about preferred age of vaccination varied by religious denomination (Rao-Scott chi-squared $P = 0.01$, data not shown). When asked who should receive the vaccine, Protestant parents were more likely to prefer that no one be vaccinated compared to other parents. Other Christian parents preferred that their daughters be vaccinated at older ages compared to other parents.

Catholic parents had more negative religious norms compared to nonaffiliated parents (P = 0.04, results not shown), on average. This association did not remain significant in multivariate analyses, adjusting for race, age, and education (P = 0.10, results not shown).

Religious Attendance

Bivariate associations between religious attendance and vaccine decision are presented in Table 2. Compared to parents who do not attend religious services, parents with moderate attendance were more likely to have already vaccinated their daughters than be undecided (OR = 3.09, 95% CI = 1.13, 8.43). Parents who reported frequent attendance were more likely to have decided against vaccination than be undecided (OR = 3.05, 95% CI = 1.41, 6.58). These relationships remained significant in multivariable analyses (moderate attendance OR = 3.07, 95% CI = 1.16, 8.11; frequent attendance OR = 2.92, 95% CI = 1.25, 6.84), adjusting for race, age, and education (see Table 3).

Parental beliefs regarding preferred age of vaccination varied according to religious attendance (Rao-Scott chi-squared P = 0.02, data not shown). Parents who attended services frequently preferred older ages for vaccination compared to parents who never attend religious services. Parental beliefs regarding who should be vaccinated also varied by religious attendance (Rao-Scott chi-squared P = 0.02, data not shown). Parents who frequently attend religious services were more likely to say no one should be vaccinated compared to other parents.

Parents who frequently attended religious services also had more negative religious norms about HPV vaccination, compared to parents who do not attend services (P = 0.03, data not shown). This association did not remain significant when adjusting for race, age, and education (P = 0.06, data not shown).

Discussion

We found that compared with parents who reported no religious affiliation, Catholic parents were more than three times likely to have vaccinated their daughters (vs. being undecided). Parents from Protestant and Other Christian religious denominations reported more negative beliefs about HPV vaccination compared to Catholic and nonaffiliated parents. Specifically, Protestant parents were more likely than other parents to express opposition to HPV vaccination, and Other Christian parents were more likely to prefer that HPV vaccination occurs at older ages (19 years+).

These findings are fairly consistent with several prior studies. In one study among California-based parents, Catholics were more likely to support HPV vaccination, while other Christians, those reporting no religion, and Born-again or Evangelical Christians were less likely to support vaccination (Constantine and Jerman 2007). In another large US-based study (n = ~1,500), Bernat et al. (2009) found that ‘Born-again’ Protestants and Catholics had lower levels of HPV vaccine acceptance than Protestants and Catholics who were not ‘Born-again’, though this was not significant in adjusted analyses (Barnack et al. 2010). Several studies have reported lower HPV vaccine acceptance and more negative attitudes among parents who strongly identify with religious views that prohibit sex before marriage

or adhere to beliefs about monogamy and abstinence (Brabin et al. 2006; Marlow et al. 2009; McCaffery et al. 2003; Katz et al. 2009). Parental concerns that HPV vaccination will contribute to sexual promiscuity, which is not condoned by most religious traditions, have also been reported (Constantine and Jerman 2007; Marlow et al. 2009a, b). Taken together, this study contributes to the evidence that religious denomination and beliefs may influence HPV vaccine acceptance.

Moreover, attendance at religious services may affect vaccine decisions. We found that parents who frequently attended religious services were more likely to have *decided against* HPV vaccination compared with nonattendees. Parents with frequent attendance at religious services also held more negative beliefs toward HPV vaccination, including preferring that HPV vaccination occurs at older ages or not at all, compared to other parents in the sample. Paradoxically, however, our data also suggest that compared with nonattendees, parents with moderate attendance at religious services were more likely to have already vaccinated their daughters (vs. being undecided).

To our knowledge, two prior studies have investigated the association between attendance at religious services and HPV vaccination (Constantine and Jerman 2007; Barnack et al. 2010). These studies also found that parents with more frequent attendance had lower acceptance or intentions to vaccinate their daughter against HPV. However, while our study found that parents with moderate attendance were more likely to support vaccination, prior studies found higher support of vaccination among those who never or rarely attended religious services. These findings may reflect differences in the composition of the study samples or in methods of defining and/or measuring frequency of attendance at religious services. It is also possible that an interaction is occurring between religious denomination and frequency of attendance, though we did not have the power to investigate this possibility.

While these findings suggest that religious institutions influence on HPV vaccine acceptance and decisions, limitations must be noted. Several denominations had very small numbers that precluded them from being in these analyses. In some cases, these responses were dropped when they could not be combined with other responses in a meaningful way. This study was not large enough to permit investigation into between-group differences using more specific religious categories or distinctions (e.g., Evangelical vs. Mainline Protestants). If such differences exist, it would be important to identify them so that interventions or health messages could address them. More research is needed to elucidate the mechanisms of religious effect that are potentially amenable to intervention. Longitudinal studies are also needed to confirm the cross-sectional associations observed here. This sample was drawn from a national online panel of individuals selected by random digit dialing; so, we recognize the potential for selection bias. Finally, given our moderate sample size, we were not able to control for all relevant confounders.

Despite limitations, this research adds to the literature on religion and vaccination and expands the knowledge of sociocultural correlates with HPV vaccine acceptability. This study is one of the few quantitative, population-based studies in the US to investigate this association and does so among a racially/ethnically diverse population. Our sample is fairly

representative of the US population in terms of religious affiliation when compared with data from ARIS (Kosmin and Keysar 2009).

This is among the first studies to examine the influence of religious norms in particular. Several other studies have reported that vaccine approval by important others and the perception that vaccination is a social norm are associated with vaccine acceptability (Dempsey et al. 2006; Kahn et al. 2009). Though our findings were null, future studies with larger sample sizes should continue to examine the social influences of religious leaders and congregation members on HPV vaccination and decision-making.

Findings suggest that religious factors should be considered in the development of interventions. Developing educational campaigns that will be acceptable to various religious groups will require a delicate balance between informing parents that the virus can be transmitted through sexual activity, without condoning premarital sexual activity. Our findings suggest that religious institutions should be explored as potential settings for disseminating information about the HPV vaccine. It will be important for practitioners and researchers to engage in discussions with religious leaders and congregants so they can better understand specific concerns about the vaccine. This will enable the formulation of educational messages that are compatible with religious beliefs. Finally, given the central role healthcare providers play in influencing vaccine decision-making, it will be important for providers to be prepared to address vaccine concerns among parents with strong religious beliefs.

This research indicates that there are several promising areas of research related to understanding the role of religion in influencing HPV vaccine decisions. Religion is a complex, multidimensional concept, and we have only assessed two aspects here. More facets of religion should also be examined in future research, including the importance of religion to one's life, specific religious beliefs or teachings that may influence vaccine decisions, and other aspects of religious involvement including prayer and spirituality.

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References

1. Gallup Poll. 2008 Available at http://www.gallup.com/poll/1690/Religion.aspx.
2. Ajzen, I.; Fishbein, M. Understanding attitudes and predicting social behavior. Englewood Cliffs, NJ: Prentice-Hall; 1980.
3. Allen JD, Othus MK, Shelton RC, Li Y, Norman N, Tom L, et al. Parental decision making about the HPV vaccine. Cancer Epidemiology, Biomarkers and Prevention. 2010; 19(9):2187–2198.
4. Baker L, Wagner TH, Singer S, Bundorf MK. Use of the Internet and e-mail for health care information: Results from a national survey. Journal of the American Medical Association. 2003; 289:2400–2406. [PubMed: 12746364]
5. Barnack JL, Reddy DM, Swain C. Predictors of parents' willingness to vaccinate for human papillomavirus and physicians' intentions to recommend the vaccine. Women's Health Issues. 2010; 20:28–34. [PubMed: 20123174]
6. Benjamins MR. Religious influences on trust in physicians and the health care system. The International Journal of Psychiatry in Medicine. 2006a; 36(1):69–83. [PubMed: 16927579]

7. Benjamins MR. Religious influences on preventive health care use in a nationally representative sample of middle-age women. Journal of Behavioral Medicine. 2006b; 29(1):1–16. [PubMed: 16397821]
8. Benjamins MR, Brown C. Religion and preventative health care utilization among the elderly. Social Science and Medicine. 2004; 58:109–118. [PubMed: 14572925]
9. Bernat DH, Harpin SB, Eisenberg ME, Bearinger LH, Resnick MD. Parental support for the human papillomavirus vaccine. Journal of Adolescent Health. 2009; 45(5):525–527. [PubMed: 19837360]
10. Brabin L, Roberts SA, Farzaneh F, Kitchener HC. Future acceptance of adolescent human papillomavirus vaccination: A survey of parental attitudes. Vaccine. 2006; 24(16):3087–3094. [PubMed: 16500736]
11. Centers for Disease Control and Prevention [CDC]. National, state, and local area vaccination coverage among adolescents aged 13–17 years–United States. Morbidity and Mortality Weekly Report. 2008; 58(36):997–1001.
12. Constantine NA, Jerman P. Acceptance of human papillomavirus vaccination among Californian parents of daughters: A representative statewide analysis. Journal of Adolescent Health. 2007; 40(2):108–115. [PubMed: 17259050]
13. Dempsey AF, Zimet GD, Davis RL, Koutsky L. Factors that are associated with parental acceptance of human papillomavirus vaccines: A randomized intervention study of written information about HPV. Pediatrics. 2006; 117:1486–1493. [PubMed: 16651301]
14. Dunne EF, Unger ER, Sternberg M, McQuillan G, Swan DC, Patel SS, et al. Prevalence of HPV infection among females in the United States. Journal of the American Medical Association. 2007; 297(8):813–819. [PubMed: 17327523]
15. Etkind P, Leh S, Macdonald P, Silva E, Peppe J. Pertussis outbreaks in groups claiming religious exemptions to vaccinations. American Journal of Diseases of Children. 1992; 146:173–176. [PubMed: 1733146]
16. Harris KM, Schonlau M, Lurie N. Surveying a nationally representative internet-based panel to obtain timely estimates of influenza vaccination rates. Vaccine. 2009; 27:815–818. [PubMed: 19059447]
17. Kahn JA, Ding L, Huang B, et al. Mothers' intention for their daughters and themselves to receive the human papillomavirus vaccine: A national study of nurses. Pediatrics. 2009; 123(6):1439–1445. [PubMed: 19482752]
18. Kahn JA, Rosenthal SL, Hamann T, Bernstein DI. Attitudes about HPV in young women. International Journal of STD and AIDS. 2003; 14(5):300–306. [PubMed: 12803935]
19. Katz ML, Reiter PL, Heaner S, Ruffin MT, Post DM, Paskett ED. Acceptance of the HPV vaccine among women, parents, community leaders, and healthcare providers in Ohio Appalachia. Vaccine. 2009; 27(30):3945–3952. [PubMed: 19389447]
20. Kennedy AM, Gust DA. Measles outbreak associated with a church congregation: A study of immunization attitudes of congregation members. Public Health Reports. 2008; 123(2):126–134. [PubMed: 18457065]
21. Kosmin BA, Keysar A. American Religious Identification Survey: Summary report (March 2009). 2009 Available at http://livinginliminality.files.wordpress.com/2009/03/aris_report_2008.pdf.
22. Kulig JC, Meyer CJ, Hill SA, Handley CE, Lichtenberger SM, Myck SL. Refusals and delay of immunization within Southwest Alberta: Understanding alternative beliefs and religious perspectives. Canadian Journal of Public Health. 2002; 93:109–112. [PubMed: 11963513]
23. Lenselink CH, Gerrits MM, Melchers WJ, Massuger LF, van Hamont D, Bekkers RL. Parental acceptance of human papillomavirus vaccines. European Journal of Obstetrics, Gynecology, and Reproductive Biology. 2008; 137(1):103–107.
24. Marlow LA, Waller J, Evans RE, Wardle J. Predictors of interest in HPV vaccination: A study of British adolescents. Vaccine. 2009a; 27(18):2483–2488. [PubMed: 19368790]
25. Marlow LA, Wardle J, Foster AS, Waller J. Ethnic differences in human papillomavirus awareness and vaccine acceptability. Journal of Epidemiology and Community Health. 2009b; 63(12):1010–1015. [PubMed: 19762455]

26. McCaffery K, Forrest S, Waller J, Desai M, Szarewski A, Wardle J. Attitudes towards HPV testing: A qualitative study of beliefs among Indian, Pakistani, African- Caribbean and white British women in the UK. British Journal of Cancer. 2003; 88(1):42–46. [PubMed: 12556957]

27. Omer SB, Enger KS, Moulton LH, Halsey NA, Stokley S, Salmon DA. Geographic clustering of nonmedical exemptions to school immunization requirements and associations with geographic clustering of pertussis. American Journal of Epidemiology. 2008; 168:1389–1396. [PubMed: 18922998]

28. Omer SB, Pan WKY, Halsey NA, Stokley S, Moulton LH, Navar AM, et al. Nonmedical exemptions to school immunization requirements: Secular trends and association of state policies with pertussis incidence. Journal of the American Medical Association. 2006; 296(14):1757–1763. [PubMed: 17032989]

29. Salmon DA, Haber M, Gangarosa EJ, Phillips L, Smith NJ, Chen RT. Health consequences of religious and philosophical exemptions from immunization laws. Journal of the American Medical Association. 1999; 282(1):47–53. [PubMed: 10404911]

30. Salmon DA, Sapsin JW, Teret S, Jacobs RF, Thompson JW, Ryan K, et al. Public health and the politics of school immunization requirements. American Journal of Public Health. 2005; 95(5): 778–783. [PubMed: 15855452]

31. Schiller PL, Levin JS. Is there a religious factor in health care utilization? A review. Social Science and Medicine. 1988; 27(12):1369–1379. [PubMed: 3070763]

32. Whooley MA, Boyd AL, Gardin JM, Williams DR. Religious involvement and cigarette smoking in young adults: The CARDIA study (Coronary Artery Risk Development in Young Adults) study. Archives of Internal Medicine. 2002; 162(14):1604–1610. [PubMed: 12123404]

Table 1

Sociodemographic and religious characteristics of parents (N = 476)

Sociodemographic characteristics	*N* (%)
Race	
White	223 (47)
Black	143 (30)
Hispanic	110 (23)
Age	
18–29	23 (5)
30–44	315 (66)
45–59	137 (29)
60+	1 (0.1)
Income	
<$25,000	117 (25)
$25,000–$49,999	131 (28)
$50,000–$74,999	96 (20)
$75,000+	132 (28)
Education	
HS or less	132 (28)
Some college	183 (38)
BA+	161 (34)
Healthcare paid for by	
Private	308 (65)
Public	95 (20)
None	17 (4)
Other	70 (15)
Vaccine decision[*]	
Decided against	127 (22)
Undecided	182 (32)
Intend to vaccinate	168 (29)
Already vaccinated	80 (14)
Not categorized	21 (4)
Religious characteristics	
Religious attendance	
Does not attend	152 (32)
Moderate attendance	137 (29)
Frequent attendance	180 (38)
Not categorized	7 (1)
Religious denomination	
Protestant	134 (28)
Catholic	79 (17)

Sociodemographic characteristics	*N* (%)
Other Christian	98 (21)
Nonaffiliated	140 (30)
Not categorized	25 (5)

* This category is reported by daughter because the decision can vary by daughter within parent

Percentages may not add up to 100% because of rounding

Table 2

Bivariate relationships from multinomial logistic regression between decision status and religious denomination (weighted, *n* = 527 daughters) and religious attendance (weighted, *n* = 555 daughters)

	Undecided	Decided against OR (95% CI)	Intend OR (95% CI)	Already vaccinated OR (95% CI)
Religious denomination				
Nonaffiliated	(ref)	(ref)	(ref)	(ref)
Protestant		2.01 (0.81, 5.06)	0.74 (0.35, 1.58)	1.67 (0.57, 4.90)
Catholic		1.45 (0.42, 4.99)	1.60 (0.74, 3.46)	3.34 (1.16, 9.59)*
Other Christian		1.87 (0.73, 4.78)	0.65 (0.29, 1.42)	1.84 (0.55, 6.18)
Religious attendance				
Does not attend	(ref)	(ref)	(ref)	(ref)
Moderate attendance		1.08 (0.42, 2.79)	1.33 (0.68, 2.60)	3.09 (1.13, 8.43)*
Frequent attendance		3.05 (1.41, 6.58)**	0.53 (0.27, 1.04)	1.41 (0.54, 3.73)

*$P < 0.05$

**$P < 0.01$

Table 3

Adjusted results for multinomial logistic regression models: (1) religious denomination (weighted, $n = 527$ daughters) and (2) religious attendance (weighted, $n = 555$ daughters) with the outcome decision status

	Undecided	Decided against OR (95% CI)	Intend OR (95% CI)	Already Vaccinated OR (95% CI)
Results for model (1)				
Religious denomination				
Nonaffiliated	(ref)	(ref)	(ref)	(ref)
Protestant		2.03 (0.78, 5.31)	0.79 (0.36, 1.71)	1.67 (0.58, 4.82)
Catholic		1.26 (0.34, 4.70)	1.68 (0.74, 3.74)	3.26 (1.06, 10.06)*
Other Christian		1.93 (0.71, 5.26)	0.67 (0.30, 1.49)	1.88 (0.55, 6.38)
Results for model (2)				
Religious attendance				
Does not attend	(ref)	(ref)	(ref)	(ref)
Moderate attendance		1.04 (0.40, 2.71)	1.36 (0.67, 2.74)	3.07 (1.16, 8.11)*
Frequent attendance		2.92 (1.25, 6.84)**	0.53 (0.27, 1.04)	1.42 (0.54, 3.73)

All models control for race, age, and education

* $P < 0.05$

** $P < 0.01$