

Religious Vaccine Exemptions in Kindergartners: 2011–2018

Joshua T.B. Williams, MD,^{a,c} John Rice, PhD,^{b,f} Matt Cox-Martin, PhD,^f Elizabeth A. Bayliss, MD, MSPH,^{d,g} Sean T. O'Leary, MD, MPH^{c,e,f}

abstract

BACKGROUND: Forty-five states permit religious exemptions to school immunization laws; 15 allow personal belief exemptions. Updated religious exemption estimates are lacking, and it is unclear if personal belief exemption availability impacts religious exemption rates. We aimed to (1) update religious exemption trends in kindergartners, (2) compare states' proportions of kindergartners with religious exemptions by personal belief exemption availability, and (3) describe whether the proportion of kindergartners with religious exemptions changed in Vermont after it eliminated personal belief exemptions in 2016.

METHODS: We analyzed Centers for Disease Control and Prevention data on exemptions for children entering kindergarten from 2011 to 2018, including 295 state-years in our final analysis. Using a quasi-binomial regression analysis, we compared mean proportions of kindergartners with religious exemptions in states allowing both nonmedical exemptions against states with religious exemptions only, adjusting for policy strength and school year.

RESULTS: States with religious and personal belief exemptions were one-fourth as likely to have kindergartners with religious exemptions as states with religious exemptions only (risk ratio 0.25; 95% confidence interval 0.16–0.38). After Vermont's policy change, the mean proportion of kindergartners with a religious exemption increased from 0.5% to 3.7%. States were significantly more likely to have kindergartners with religious exemptions during the 2017–2018 school year compared with the 2011–2012 school year ($P = .04$).

CONCLUSIONS: Religious exemption rates appear to be associated with personal belief exemption availability, may be subject to a replacement effect on personal belief exemption elimination, and are increasing. Researchers and policy makers should confirm findings with individual-level studies and reconsider the purpose and nature of religious exemption laws.

^aDepartment of Pediatrics, Denver Health Medical Center, Denver, Colorado; ^bDepartment of Biostatistics and Informatics, School of Public Health, and ^cDepartments of Pediatrics, ^dFamily Medicine, and ^ePediatric Infectious Diseases, School of Medicine, University of Colorado Denver, Aurora, Colorado; ^fAdult and Child Consortium for Health Outcomes Research and Delivery Science, Aurora, Colorado; and ^gInstitute for Health Research, Kaiser Permanente Colorado, Denver, Colorado

Drs Williams and O'Leary conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript; Drs Rice and Cox-Martin performed the data analysis, contributed to the Methods section of the initial manuscript, and reviewed and revised the manuscript; Dr Bayliss critically reviewed the manuscript for important intellectual content and assisted with manuscript revisions; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

DOI: <https://doi.org/10.1542/peds.2019-2710>

Accepted for publication Sep 26, 2019

Address correspondence to Joshua T.B. Williams, MD, Department of Pediatrics, Denver Health Medical Center, 301 W 6th Ave, MC #1911, Denver, CO 80204. E-mail: joshua.williams@dhha.org

WHAT'S KNOWN ON THIS SUBJECT: Forty-five states permit religious exemptions from school vaccination laws. Fifteen states allow personal belief exemptions. From 2005 to 2013, religious exemption rates among American kindergartners tripled in states with religious exemptions only, plateauing during the 2013–2014 through 2015–2016 school years.

WHAT THIS STUDY ADDS: This updated study of state-level exemption data for the 2011–2012 through 2017–2018 school years shows how states' religious exemption rates differ by personal belief exemption availability, may experience a replacement effect after personal belief exemption elimination, and are increasing.

To cite: Williams JTB, Rice J, Cox-Martin M, et al. Religious Vaccine Exemptions in Kindergartners: 2011–2018. *Pediatrics*. 2019;144(6):e20192710

School-entry mandatory vaccination laws are a cornerstone of American public health.¹ Major religions support vaccination, but religious exemptions to vaccines required for school entry are available in 45 states and Washington, District of Columbia.^{2,3} Fifteen states permit personal belief exemptions, also known as philosophical exemptions; all states and Washington, District of Columbia, offer medical exemptions for children with contraindications to vaccination.³ Previous multiyear assessments of data on exemptions for children entering kindergarten suggest that religious exemption rates tripled from 2005 to 2013 among kindergartners in states with religious exemptions only, plateauing during the 2013–2014 through 2015–2016 school years.^{4–6} High nonmedical exemption rates correlate with increased rates of vaccine-preventable diseases, especially when exempted children cluster in insular communities.^{7–9} Recent outbreaks of measles and varicella within religious communities with high exemption rates have demonstrated these risks, renewing attention to the role of religious exemptions in the spread of vaccine-preventable diseases.^{10,11} Professional organizations, including the American Academy of Pediatrics, have intensified calls for their elimination, and 2 states, New York and Maine, have recently banned them.^{3,11} However, previous longitudinal analyses of religious exemptions in kindergartners ended with data from the 2015–2016 school year and were limited in scope to states with religious exemptions only, missing the opportunity to describe how religious exemptions differ in states with or without an alternative personal belief exemption.^{4–6} Also, Vermont eliminated its personal belief exemption in 2016, providing an opportunity to compare religious exemption rates before and after.¹

Thus, we sought to update and enhance existing multiyear

longitudinal studies of religious exemption data in American kindergartners by analyzing trends for the 2011–2012 through 2017–2018 school years. In addition to providing updated national estimates of religious exemption rates in kindergartners, we sought to compare states' proportions of kindergartners with religious exemptions by personal belief exemption availability and to observe whether the proportion of exempted kindergartners differed in Vermont before and after its 2016 policy change.

METHODS

We performed a cross-sectional, retrospective, state-level analysis of publicly available aggregated data from the Centers for Disease Control and Prevention yearly vaccine reports for kindergartners (2011–2012 through 2017–2018 school years).^{12–18} We chose this time frame to extend and provide meaningful comparisons to a previous study of exemption data for kindergartners from 2011–2012 through 2015–2016.⁶ For each report, states provide estimates of the proportion of children with medical and nonmedical (ie, religious and/or personal beliefs) exemptions as well as the proportion of kindergartners who are up to date on several vaccines of interest (eg, measles, mumps, and rubella; diphtheria, tetanus, and acellular pertussis; and varicella). States use different approaches to calculate these proportions, including censuses, 1- or 2-stage cluster surveys, simple random sampling, or mixed designs. However, most states use censuses and sample >80% of their kindergartners, so sampling variability in their estimates should be minimal. Therefore, we assumed these measurements were taken without error in our analyses.

We calculated the incidence proportion of kindergartners with religious vaccine exemptions for each state-year from these reported proportions. For states with religious exemptions only, the reported nonmedical exemption incidence proportion equaled the incidence proportion of religious exemptions. For states with religious and personal belief exemptions, we calculated the religious exemption proportion by dividing the state's number of children with religious exemptions by the overall number of children with nonmedical exemptions and multiplied by the nonmedical exemption proportion.

Because the exemption process is heterogeneous, we accounted for the strength of state exemption policies (ie, whether it was “easy,” “medium,” or “difficult” for parents to claim an exemption) on the basis of standards previously reported by Omer et al.⁶ We chose this adjustment because previous studies suggest that nonmedical exemption rates decrease when exemption policies are more difficult to obtain.^{5,19} Because many states revised their exemption laws during the study period, we recoded exemption law strengths for each state every year with published exemption law summaries.^{1,6} We did not include Mississippi and West Virginia because they did not allow nonmedical exemptions. We also excluded Arizona, which allowed personal belief exemptions only in kindergarten. California eliminated nonmedical exemptions in 2015; we excluded state-years after this change. As noted, Vermont eliminated philosophical exemptions in 2016. In total, we considered 357 state-years for inclusion, excluding 62 state-years for a lack of separate reporting of nonmedical exemptions, a lack of religious exemptions, or a lack of data. There were 295 state-years in the final analysis.

Our dependent variable of interest was the religious exemption

incidence proportion for a single state in a given year. We performed univariable analyses by year, calculating mean religious exemption proportions by state policy availability, school year, and exemption policy strength; we calculated robust SEs to account for correlation within states. Because our outcome variable was a proportion between 0 and 1, standard linear regression techniques were not appropriate. Therefore, we performed a quasi-binomial regression analysis with SEs adjusted for correlation within states.²⁰ We chose a log link function to provide estimates of risk ratios rather than odds ratios. Because we used aggregated (state-level rather than individual-level) data, our risk ratios were ratios of mean proportions, or mean population risks, rather than individual risks. We included exemption policy availability (religious only versus religious and personal beliefs), exemption policy strength (easy versus medium and difficult), and school year (treated as a categorical variable) as covariates. All analyses were conducted with R version 3.4.4 (The R Foundation, Vienna, Austria).

RESULTS

In unadjusted analyses, states with religious and personal belief exemptions had a significantly lower mean proportion of kindergartners with religious exemptions (0.41%; 95% confidence interval [CI] 0.28%–0.53%) compared with states with religious exemptions only (1.63%; 95% CI 1.30%–1.97%). This phenomenon was stable for each school year during the study period (Fig 1). In adjusted analyses, states with religious and personal belief exemptions were one-fourth as likely to have kindergartners with religious exemptions compared with states with religious exemptions only (risk ratio 0.25; 95% CI 0.16–0.38). After Vermont eliminated personal belief

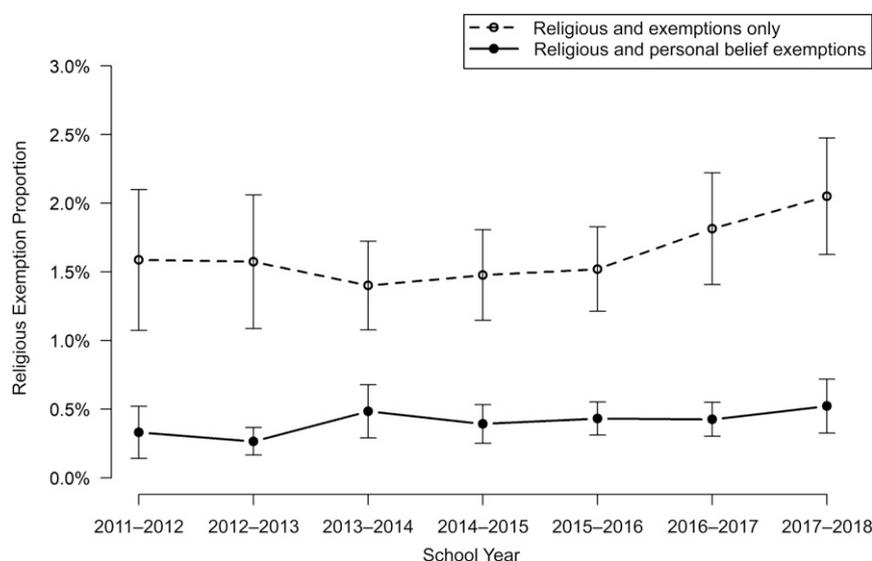


FIGURE 1

Mean proportions of kindergartners with religious exemptions with 95% CIs (2011–2018), comparing mean proportions in states with religious exemptions only against proportions in states with religious and personal belief exemptions.

exemptions in 2016, the mean proportion of kindergartners with religious exemptions increased from 0.5% (2011–2012 through 2015–2016) to 3.7% (2016–2017 through 2017–2018). Overall, the mean proportion of Vermont kindergartners with any nonmedical exemption decreased from 5.7% to 3.7%. Using 2011–2012 as a reference year, states were more likely to have kindergartners with religious exemptions during the 2017–2018 school year ($P = .04$). Compared with states with easy exemption policies, states with medium or difficult policies were equally likely to have kindergartners with religious exemptions (Table 1).

DISCUSSION

In this retrospective analysis of data on religious exemptions for American kindergartners, we found that states with religious and personal belief exemptions were significantly less likely to have kindergartners with religious exemptions than were states with religious exemptions alone. Next, we observed that Vermont's mean proportion of kindergartners with

religious exemptions increased sevenfold after its elimination of personal belief exemptions, suggesting a replacement effect. Finally, relative to the 2011–2012 school year, we found that states were more likely to have kindergartners with religious exemptions in the 2017–2018 school year.

First, this study enhances our understanding of how vaccine exemption policies influence state-reported vaccine exemption data. Two recent longitudinal analyses of nonmedical exemption data for kindergartners found that states offering both religious and personal belief exemptions had higher overall rates of nonmedical exemptions than did states with religious exemptions alone.^{6,19} However, authors in the first study did not report religious exemption rates separately by state,⁶ and authors in the second study restricted their analyses of religious exemptions to states with religious exemptions only.¹⁹ Thus, both studies did not examine how religious exemption rates differ according to the availability of personal belief exemptions. We augment these

TABLE 1 Mean Unadjusted Incidence Proportions of Religious Exemptions, Reported as Percentages With 95% CIs by State Policy Availability, Study Year, and State Policy Difficulty, and Adjusted Risk Ratios With 95% CIs for Comparisons of Interest

Religious Exemption Incidence Proportion Comparisons	Unadjusted Mean Proportion (95% CI) %	Adjusted Risk Ratio (95% CI)
State policy availability ^a		
Religious exemption only	1.63 (1.30–1.97)	(Reference)
Religious and personal belief exemptions	0.41 (0.28–0.53)	0.25 (0.16–0.38)
School year		
2011–2012	1.25 (0.84–1.66)	(Reference)
2012–2013	1.20 (0.81–1.59)	0.97 (0.84–1.13)
2013–2014	1.10 (0.84–1.36)	0.93 (0.84–1.18)
2014–2015	1.13 (0.86–1.40)	0.95 (0.75–1.19)
2015–2016	1.17 (0.92–1.43)	0.99 (0.79–1.24)
2016–2017	1.42 (1.07–1.76)	1.15 (0.89–1.49)
2017–2018	1.70 (1.31–2.08)	1.31 (1.01–1.69)
State policy difficulty		
Easy	1.22 (0.53–1.91)	(Reference)
Medium	1.21 (0.92–1.50)	0.83 (0.49–1.40)
Difficult	1.37 (0.88–1.87)	0.89 (0.51–1.58)

^a As of the 2017–2018 school year, states that did not offer religious or personal belief exemptions included the following: California, Mississippi, and West Virginia. States that offered personal belief exemptions included the following: Arkansas, Arizona, Colorado, Idaho, Louisiana, Maine, Michigan, Minnesota, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Texas, Utah, Washington, and Wisconsin. Missouri permitted personal belief exemptions for child care facilities but not public schools. Statutes in Louisiana and Minnesota did not explicitly recognize religion as a reason for claiming an exemption, although the nonmedical exemption's language may have encompassed religious beliefs; historically, Louisiana has reported religious exemptions separately, whereas Minnesota has not. Arizona did not permit religious exemptions for children entering kindergarten.

findings by demonstrating that states with both nonmedical exemption policies are significantly less likely to have kindergartners with religious exemptions than were states with religious exemptions only. Put differently, state-level religious exemption rates appear to be a function of personal belief exemption availability, decreasing significantly when states offer a personal belief exemption alternative.

The suggestion of a replacement effect in Vermont after its 2016 legislative change provides further evidence of the impact of policy availability on religious exemption rates. Previous studies document a vaccine exemption replacement effect in other settings after analogous policy changes. In 2016, California eliminated all nonmedical exemptions.¹ Delamater et al²¹ studied the rate of medical exemptions in California before and after the legislative change, finding that medical exemptions decreased in

the first year after the change. However, by the second year, medical exemption rates rose, and geographic analyses showed that the areas with rising medical exemption rates coincided with areas that previously had high rates of nonmedical exemptions. The authors did not study individual-level behavior, but they suggested that their results were evidence of a replacement effect, whereby parents obtained medical exemptions for their children in the absence of an alternative. We hypothesize a similar effect with Vermont's 2016 change. Although our study was also not at the individual level, at least 2 small individual-level studies suggest that parents claim religious exemptions in the absence of a personal belief alternative.^{22,23} Furthermore, it is interesting to note that Vermont ranked 48th out of 50 in state religiosity in the year before its policy change.²⁴ Ultimately, additional work at the individual level must confirm this hypothesis. Regardless, the overall proportion of Vermont kindergartners with

nonmedical exemptions decreased after its 2016 legislative change. This finding aligns with aforementioned studies that showed lower overall nonmedical exemption rates in states with religious exemptions only, and vaccine advocates will likely interpret this as a public health victory.^{6,19} In the last year, 10 other states have enacted or proposed legislation to eliminate nonmedical exemptions, and policy makers in other states could consider Vermont's experience as an instructive example when considering policy changes to decrease exemption rates.²⁵ However, further studies are needed to determine if sudden apparent increases in religious vaccine exemption rates may stigmatize religious groups or alienate religious leaders who support vaccination.

Third, our data suggest that religious exemptions may be rising again. Whereas previous longitudinal studies of religious exemptions suggested a plateau as of the 2015–2016 school year,⁶ our up-to-date results show an increase for the 2017–2018 school year, most prominently in states with religious exemptions only. Although the increase is not surprising in light of recent outbreaks, it is curious when considering the simultaneous decrease in Americans' religious affiliations. A 2014 survey found that 22.8% of Americans reported no religious affiliation, up from 16.1% in 2007.²⁴ It may be that insular religious groups are growing more rapidly than secular communities or that they are increasingly falling victim to vaccine misinformation. Yet, the rise of religious exemptions in an increasingly secular society also questions whether the religious exemption category can still serve its intended purpose. Religious vaccine exemptions originated >80 years ago and were formalized in the 1960s to exempt children from specific religious groups whose official teachings prohibited vaccination.^{26,27}

Today, all major religions support vaccination, and fewer Americans are religious.^{2,24} In contrast, Americans are increasingly spiritual, with 27% of Americans self-identifying as such in 2014, up from 19% in 2007.²⁴ Whereas definitions of religion emphasize adherence to official teachings and traditions, definitions of spirituality emphasize one's individual experience of the divine and individual interpretations of sacred texts or traditions.²⁸ Thus, laws formalized in the 1960s may be increasingly outdated in an increasingly secular and spiritual society that prioritizes individual experience over dogmatic adherence to teachings. Future work is needed that explores the rise in religious exemptions at the individual level, differentiating religious from spiritual concerns.

This study has limitations. First, in 16 state-years, states did not report the number of children with exemptions but reported the number of exemptions for each vaccine, which could count some children more than once. In these instances, reported proportions were calculated by using lower-bound estimates of individual vaccine exemption rates. Second, individual states collected data using a variety of methods. Although this

could have resulted in varying precision among reported exemption proportions, the impact of this on our results should be minimal because ~75% of states performed censuses with at least 80% of children counted. Next, our adjusted analyses included state policy type availability, exemption policy strength, and school year only. We did not adjust for state religiosity because of a lack of data on this for all years except 2014. We did not adjust for race, income, education, and population density (though other longitudinal analyses of kindergartner exemption data have done so⁴⁻⁶) because state-reported proportions represent aggregated data, and the interpretation of effects estimated from models including such covariates could be problematic. Finally, because we used state-level data and our risk ratios are estimates of population-level risks, we cannot make individual-level conclusions about parents' vaccine-related behaviors regarding religious exemptions.

CONCLUSIONS

State-reported kindergarten religious exemption rates differ by policy availability, may be subject to a replacement effect on personal

belief exemption elimination, and were increasing as of the 2017–2018 school year. Furthermore, religious exemptions may be an increasingly problematic or outdated exemption category, and researchers and policy makers must work together to determine how best to balance a respect for religious liberty with the need to protect public health. Researchers should study individual-level behaviors to determine why religious exemption rates might change with personal belief exemption availability, document whether parents choose religious exemptions in the absence of a personal belief alternative, and differentiate religious from spiritual concerns. Policy makers must engage key stakeholders to discuss exemption laws and determine the viability of religious exemptions as an independent exemption category. This important work will help school vaccine exemption laws evolve in our rapidly changing society, ensuring they remain a cornerstone of public health for decades to come.

ABBREVIATION

CI: confidence interval

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

Copyright © 2019 by the American Academy of Pediatrics

FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose.

FUNDING: Supported with unrestricted fellowship funding from the Denver Health Medical Center Ambulatory Care Services and Department of Pediatrics.

POTENTIAL CONFLICT OF INTEREST: The authors have indicated they have no potential conflicts of interest to disclose.

REFERENCES

1. Bednarczyk RA, King AR, Lahijani A, Omer SB. Current landscape of nonmedical vaccination exemptions in the United States: impact of policy changes. *Expert Rev Vaccines*. 2019;18(2):175–190
2. Grabenstein JD. What the world's religions teach, applied to vaccines and immune globulins. *Vaccine*. 2013;31(16): 2011–2023
3. National Conference of State Legislatures. States with religious and philosophical exemptions from school immunization requirements. 2019. Available at: www.ncsl.org/research/health/school-immunization-exemption-state-laws.aspx. Accessed August 12, 2019
4. Omer SB, Pan WK, Halsey NA, et al. Nonmedical exemptions to school immunization requirements: secular trends and association of state policies

- with pertussis incidence. *JAMA*. 2006; 296(14):1757–1763
5. Omer SB, Richards JL, Ward M, Bednarczyk RA. Vaccination policies and rates of exemption from immunization, 2005–2011. *N Engl J Med*. 2012;367(12): 1170–1171
 6. Omer SB, Porter RM, Allen K, Salmon DA, Bednarczyk RA. Trends in kindergarten rates of vaccine exemption and state-level policy, 2011–2016. *Open Forum Infect Dis*. 2017;5(2): ofx244
 7. Atwell JE, Van Otterloo J, Zipprich J, et al. Nonmedical vaccine exemptions and pertussis in California, 2010. *Pediatrics*. 2013;132(4):624–630
 8. Omer SB, Enger KS, Moulton LH, et al. Geographic clustering of nonmedical exemptions to school immunization requirements and associations with geographic clustering of pertussis. *Am J Epidemiol*. 2008;168(12):1389–1396
 9. Phadke VK, Bednarczyk RA, Salmon DA, Omer SB. Association between vaccine refusal and vaccine-preventable diseases in the United States: a review of measles and pertussis. *JAMA*. 2016; 315(11):1149–1158
 10. Gostin LO, Ratzan SC, Bloom BR. Safe vaccinations for a healthy nation: increasing US vaccine coverage through law, science, and communication. *JAMA*. 2019;321(20): 1969–1970
 11. AAP News. Elimination of non-medical vaccine exemptions ranked top priority at Annual Leadership Forum. 2019. Available at: <https://www.aappublications.org/news/2019/03/16/alfresolutions031619>. Accessed August 12, 2019
 12. Centers for Disease Control and Prevention (CDC). Vaccination coverage among children in kindergarten–United States, 2011–12 school year [published correction appears in *MMWR Morb Mortal Wkly Rep*. 2012;61(48):994]. *MMWR Morb Mortal Wkly Rep*. 2012; 61(33):647–652
 13. Seither R, Shaw L, Knighton CL, Greby S, Stokley S; Centers for Disease Control and Prevention (CDC). Vaccination coverage among children in kindergarten–United States, 2012–13 school year. *MMWR Morb Mortal Wkly Rep*. 2013;62(30):607–612
 14. Seither R, Masalovich S, Knighton CL, et al; Centers for Disease Control and Prevention (CDC). Vaccination coverage among children in kindergarten–United States, 2013–14 school year. *MMWR Morb Mortal Wkly Rep*. 2014;63(41): 913–920
 15. Seither R, Calhoun K, Knighton CL, et al. Vaccination coverage among children in kindergarten–United States, 2014–15 school year. *MMWR Morb Mortal Wkly Rep*. 2015;64(33):897–904
 16. Seither R, Calhoun K, Mellerson J, et al. Vaccination coverage among children in kindergarten–United States, 2015–16 school year. *MMWR Morb Mortal Wkly Rep*. 2016;65(39):1057–1064
 17. Seither R, Calhoun K, Street EJ, et al. Vaccination coverage for selected vaccines, exemption rates, and provisional enrollment among children in kindergarten–United States, 2016–17 school year. *MMWR Morb Mortal Wkly Rep*. 2017;66(40):1073–1080
 18. Mellerson JL, Maxwell CB, Knighton CL, et al. Vaccination coverage for selected vaccines and exemption rates among children in kindergarten–United States, 2017–18 school year. *MMWR Morb Mortal Wkly Rep*. 2018;67(40):1115–1122
 19. Shaw J, Mader EM, Bennett BE, et al. Immunization mandates, vaccination coverage, and exemption rates in the United States. *Open Forum Infect Dis*. 2018;5(6):ofy130
 20. McCullagh P, Nelder JA. *Generalized Linear Models*, 2nd ed. New York, NY: Chapman and Hall; 1989
 21. Delamater PL, Pingali SC, Buttenheim AM, et al. Elimination of nonmedical immunization exemptions in California and school-entry vaccine status. *Pediatrics*. 2019;143(6):e20183301
 22. Reich J. “I have to write a statement of moral conviction. Can anyone help?” Parents’ strategies for managing compulsory vaccination laws. *Sociol Perspect*. 2018;61(2):222–239
 23. Reiss DR. Thou shalt not take the name of the Lord thy God in Vain: use and abuse of religious exemptions from school immunization requirements. *Hastings Law J*. 2014;65:1551–1602
 24. Pew Research Center. America’s changing religious landscape. 2015. Available at: <https://www.pewforum.org/2015/05/12/americas-changing-religious-landscape/>. Accessed March 20, 2019
 25. AAP News. Update on top 10 resolutions adopted at Annual Leadership Forum. 2019. Available at: <https://www.aappublications.org/news/2019/07/02/alf070219>. Accessed September 18, 2019
 26. Fowler W. Principal provisions of smallpox vaccination laws and regulations in the United States. *Public Health Rep*. 1941;56(5):167–189
 27. Colgrove J. *State of Immunity*, 1st ed. Berkeley, CA: University of California Press; 2006
 28. Koenig H. *Medicine, Religion, and Health: Where Science and Spirituality Meet*, 1st ed. Conshohocken, PA: Templeton Press; 2008

Religious Vaccine Exemptions in Kindergartners: 2011–2018

Joshua T.B. Williams, John Rice, Matt Cox-Martin, Elizabeth A. Bayliss and Sean T. O'Leary

Pediatrics 2019;144;

DOI: 10.1542/peds.2019-2710 originally published online November 4, 2019;

Updated Information & Services	including high resolution figures, can be found at: http://pediatrics.aappublications.org/content/144/6/e20192710
References	This article cites 21 articles, 2 of which you can access for free at: http://pediatrics.aappublications.org/content/144/6/e20192710#BIBL
Subspecialty Collections	This article, along with others on similar topics, appears in the following collection(s): Infectious Disease http://www.aappublications.org/cgi/collection/infectious_diseases_sub Vaccine/Immunization http://www.aappublications.org/cgi/collection/vaccine:immunization_sub Advocacy http://www.aappublications.org/cgi/collection/advocacy_sub Federal Policy http://www.aappublications.org/cgi/collection/federal_policy_sub
Permissions & Licensing	Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: http://www.aappublications.org/site/misc/Permissions.xhtml
Reprints	Information about ordering reprints can be found online: http://www.aappublications.org/site/misc/reprints.xhtml

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN®



PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Religious Vaccine Exemptions in Kindergartners: 2011–2018

Joshua T.B. Williams, John Rice, Matt Cox-Martin, Elizabeth A. Bayliss and Sean T. O'Leary

Pediatrics 2019;144;

DOI: 10.1542/peds.2019-2710 originally published online November 4, 2019;

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/144/6/e20192710>

Pediatrics is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. Pediatrics is owned, published, and trademarked by the American Academy of Pediatrics, 345 Park Avenue, Itasca, Illinois, 60143. Copyright © 2019 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 1073-0397.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN®

