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REVIEW

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Legal approaches to promoting parental compliance with childhood immunization recommendations

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ABSTRACT

Rates of vaccine-preventable diseases have increased in the United States in recent years, largely due to parental refusals of recommended childhood immunizations. Empirical studies have demonstrated a relationship between nonvaccination rates and permissive state vaccine exemption policies, indicating that legal reforms may promote higher immunization rates. This article reviews relevant data and considers the legal landscape. It analyzes federal and state Constitutional law, concluding that religious and personal belief exemptions to school-entry vaccine mandates are not constitutionally required. It identifies public health, bioethical, and policy considerations relevant to the choice among legal approaches employed by states to promote parental compliance. The article describes a range of legal tools that may help promote parental cooperation with immunization recommendations.

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Introduction

Prior to the introduction of the measles vaccine in the United States in 1963, rates of infection as high as one half million persons annually were reported in the U.S.[1] Those rates plummeted after the vaccine became available nationwide, dropping even more precipitously after adoption of a two-dose regimen in the early 1990s.[2] Rates in the United States fell to well below 100 cases per year in eight of the nine years between 2002–2010.[3] Yet, the number of cases climbed to 667 in 2014.[4] That year, the Centers for Disease Control and Prevention ("CDC") announced that the number of reported cases of measles for the first five months of 2014 in the United States was the highest since measles elimination was documented in 2000.[5]

Rates of infection for other vaccine-preventable diseases, such as pertussis, have increased in recent years in the United States as well.[6] For example, the CDC reported an average of 175,000 cases of pertussis in the United States per year, or approximately 150 cases per 100,000 persons in the population, from 1940–1945, prior to the introduction of the whole-cell pertussis vaccine.[7] Those rates dropped throughout the century, to a low of 2,900 cases per year, or 1 case per 100,000, in the 1980s.[7] Yet, the rates have risen since that decade. The CDC identified 48,277 pertussis cases in the United States in 2012, the highest rate since 1955.[8]

In recent years, studies have revealed that intentional nonvaccination and undervaccination have contributed to the recent increased rates of infection from these diseases in the United States.[9-12] For example, a review of studies published between 2000 to 2015 concluded that the majority of people who developed measles during the periods studied were unvaccinated.[9] The analysis of a subset of data revealed that most unvaccinated individuals were vaccine-eligible, and that a substantial proportion (70.6%) of unvaccinated persons had refused vaccinations by invoking state laws that permit exemption from vaccine requirements due to religious or philosophical objections.[9] The researchers also reviewed studies published between 1977 and 2015 pertaining to pertussis outbreaks and concluded that intentional nonvaccination or undervaccination was a substantial factor in those outbreaks for which such detailed information is available.[9] There are other factors cited as well in the literature as contributing to the rise in the incidence of pertussis.[14-15] Yet, multiple studies reveal that intentional nonvaccination clearly constitutes one component of the larger picture.[9-13]

Parents who refuse vaccinations for their children are often influenced by misleading characterizations of vaccine risks promulgated on the internet and in the media.[16-19] Adverse effects from the CDC-recommended vaccinations occur rarely.[20] For example, severe allergic reactions occur in about one case per million doses.[21] The risks of these vaccinations are exceedingly small in relation to the benefits.[2] Yet, increasing numbers of parents have sought exemptions from vaccination requirements, which has, in turn, contributed to unprecedented increases in exemptions rates,[11,22-23] lower vaccination rates, and a higher risk of contracting vaccine preventable diseases.[9-12,24-26] These trends also place at greater risk persons who cannot be vaccinated for medical reasons, those who are too young to be fully vaccinated, and others for whom vaccines do not provide complete protection. High vaccination rates within a community help protect such persons from infection due to a phenomenon known as "herd immunity" or "community immunity."[27-29] The CDC defines community immunity as existing when "a sufficient proportion of a population is immune to an infectious disease

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(through vaccination and/or prior illness) to make its spread from person to person unlikely," providing "[e]ven individuals not vaccinated (such as newborns and those with chronic illnesses)" with "some protection because the disease has little opportunity to spread within the community."[30]

Recent studies reveal relationships between the rise in the incidence of vaccine-preventable diseases and various trends and patterns of nonvaccination.[11,25,31-35] Legal policies governing exemptions from mandatory immunization requirements affect nonvaccination rates, with broader and more easily-accessible exemptions generally related to higher rates of nonvaccination and infection.[10-11,13,23,26,36-39] Below, we identify the legal considerations relevant to the government's authority to regulate parental compliance with vaccine policies and a range of ways to use the law to promote parental compliance.

Current law regulating childhood vaccination requirements

In 1855, Massachusetts became the first state to mandate that children be inoculated against a communicable disease (smallpox) as a condition for entering public school.[40] States proceeded slowly in adopting similar policies, with most expansion occurring in the second half of 20th century.[41] By 1963, twenty states conditioned entry to public school on evidence that children had been immunized against specific diseases.[42] By 1980, all fifty states and the District of Columbia adopted school vaccination policies, as scientific developments led to safer and more effective vaccines for an increasing number of diseases.[42] Today, all states require a series of vaccinations prior to public primary and secondary school entry, although there exist some variations among states in the specific requirements.[43-44] Almost all states require similar vaccinations prior to entry to private schools and day care centers.[43] Because immunization policy in the United States focuses primarily on children, state laws regarding vaccinations prior to entry to public and private colleges and universities are substantially more variable and less comprehensive.[44]

Across the states, there are three types of legal exemptions to vaccination requirements: medical exemptions, religious exemptions, and personal belief or philosophical exemptions. All fifty states allow parents to exempt their children from certain vaccinations if the parents can provide certification by a licensed physician documenting that specified vaccines are medically contraindicated for that particular child.[16] Parental concerns about the health effects of vaccines (or a particular vaccine) for children *generally* are not sufficient to qualify the child for a medical exemption. The child for which an exemption is sought must have a health condition or prior adverse vaccine reaction rendering administration of the vaccine to that child medically unsafe.

Forty-seven states currently provide some form of religious exemption.[45] Mississippi, West Virginia, and California do not provide such exemptions. Courts have upheld the constitutionality of all three state policies, although California's policy is new, and thus, court challenges are still undergoing appeal.[46-48] Religious exemptions in the remaining forty-seven states vary, particularly with respect to the ease with which they can be obtained.[11,22-23,40,49] In some jurisdictions, parents merely need to check a box on a form to request an exemption.[16,23] In other states, such as New York, the scrutiny is intense, and much litigation has ensued as parents try to prove that their views are indeed religious in nature (rather than the product of secular, medical, philosophical, or moral considerations).[50-51]

As of October 2017, seventeen states have "philosophical" or "personal belief" exemptions,[45] down from twenty-two states in 2012.[52] These exemption policies allow parents to opt out of vaccinating their children if they certify that immunization, for example, "conflicts with … [the] philosophical beliefs of the parent or guardian,"[53] and is contrary to their "personal beliefs."[54] The objections need not be religiously-based.[55] As in the case of religious exemptions, the ease of obtaining such accommodations varies across states. Some commentators have used the phrase "exemptions of convenience" to refer to some philosophical exemptions because it is easier for parents to check a box requesting an exemption than to obtain the immunizations. Thus, some parents may exercise the exemption option even in the absence of deeply-held views opposing vaccination.[16] Some states, such as Oregon and Washington, have tightened the philosophical exemption requirements in response to high rates of nonvaccination, requiring parents to become better informed about the benefits and risks of childhood vaccinations through consultation with a health care professional before exercising the exemption option.[56-57]

Tightening or elimination of exemptions to vaccine laws constitutes one response to recent trends in nonvaccination. To explore this option, we consider federal and state constitutional law and whether either requires that states offer religious or philosophical exemptions to mandatory vaccination laws.

Federal constitutional law

The legal framework justifying mandatory vaccination statutes involves a balancing of constitutional rights with state authority to regulate conduct. The legal justification for mandatory vaccination policies was first announced in the landmark 1905 U.S. Supreme Court case of *Jacobson v. Massachusetts*,[58] which remains good law today.[17] The Supreme Court held that the government has the authority to restrict the liberty of adult citizens by compelling vaccination in order to prevent the spread of a life-threatening contagious disease. The Court emphasized that "persons and property are subjected to all kinds of restraints and burdens in order to secure the general comfort, health, and prosperity of the state."[58]

In this case, Jacobson claimed a violation of his *liberty*, referred to in this case by the Court as "the greatest of all rights."[58] Jacobson was not able to pursue a claim that the vaccination law infringed his religious freedom under the Free Exercise Clause of the First Amendment, because First Amendment claims against states have been actionable only since 1940.[59] There have been substantial shifts in First Amendment law throughout, and subsequent to, the 20th Century.[60-62] The case that defines today's applicable standard is *Employment Division v. Smith*, decided by the U.S. Supreme Court in 1990.[63] In *Smith*, the Court held that "an individual's religious beliefs [do not] excuse him from compliance with an otherwise valid law prohibiting conduct that the State is free to regulate."[63] In other words, as long as a law is generally applicable

and neutral on its face—that is, not directed specifically at religious practices or religious minorities—a state is not required to provide a religious exemption under the First Amendment.

Subsequent legal developments have created a complex pattern of principles affecting the availability of relief for Free Exercise claims.[64-68] Yet, despite these developments and changes in the law regulating adults' rights to refuse medical treatment, there are no indications that the U.S. Supreme Court would retreat from the principles announced in *Jacobson* if deciding it today.[17] No decisions have expressly undercut its authority, and the U.S. Supreme Court has cited *Jacobson* with approval dozens of times, including in recent decades.[17]

Today's mandatory vaccination policies typically target children. The Supreme Court has recognized repeatedly that the government's authority to regulate the lives of children far exceeds its authority to intervene in the lives of adults.[69] Parents have substantial discretion in the upbringing of their children.[70-71] Yet, the state's authority to protect children's welfare and promote the good of society through regulating the lives of children is quite broad. Expansive laws mandating compulsory education and restricting child labor provide important examples of governmental exercise of that authority.[17]

For example, courts can and do override parental health care decisions that endanger children's welfare, despite broad parental authority to make such decisions for their children.[72] The U.S. Supreme Court's 1944 decision in *Prince v. Massachusetts* underscores that, while parents are legally permitted to make unwise decisions for themselves—even sacrificing their own health in the service of their beliefs—they are not authorized to sacrifice their children's well-being in the name of such principles.[73] Although the majority of states incorporate language in their civil child maltreatment statutes permitting deference to parents who prefer "spiritual" over conventional responses to their children's medical problems, most statutes authorize state intervention when failure to provide conventional treatment places the child's health at serious risk.[17,72,74-78]

Are any categories of exemptions from vaccine mandates constitutionally required? The government typically does not coerce persons to subject themselves to serious health risks either to obtain a personal health benefit or to protect the welfare of others, especially when doing so is not absolutely necessary to achieve the same ends. Thus, exemptions for persons for whom vaccination is medically contraindicated are probably constitutionally required. Fortunately, if all or almost all persons healthy enough to tolerate the inoculations are vaccinated, herd immunity reduces the likelihood that medically-vulnerable individuals will be exposed to the disease.[28-29]

While the constitutional status of religious exemptions to vaccination requirements has not been resolved by the U.S. Supreme Court, the Court has identified "compulsory vaccination laws" as the type of statute that would be treated deferentially if challenged as a violation of religious freedom.[63] Indeed, there is frequently-cited commentary in several important Supreme Court precedents expressing support for mandatory vaccination policies.[60,73,79-81] Furthermore, thus far, no court has held that religious exemptions are constitutionally required. It is even less likely that the Constitution protects philosophical objections to vaccinations when there is no religious component to the claim.[17] Parents have discretion in the upbringing of their children, yet, that discretion can be limited by the government. Converging legal authority indicates that mandatory vaccination laws represent—at least thus far—the quintessential example of such a limitation. It is repeatedly identified by courts as such.

In sum, federal constitutional law does not require either religious or personal belief exemptions to mandatory childhood vaccination requirements. Federal law, however, *permits* states to provide such exemptions, if state legislatures determine that doing so is consistent with the state's policy goals.

State constitutional law

State constitutional law provides another avenue for those who oppose strict school immunization requirements. These state constitutional issues relate primarily to claims of rights to education, freedom of religion, and parental authority.

Education is not protected under the federal Constitution.[82] However, every state refers to education in its Constitution.[83] Most of these provisions do not explicitly provide for a right or access to education. Rather, they speak to a given state's obligation to provide education, with some explicitly stating the state must provide "free schools." This language does not create a strong foundation for attacking school immunization requirements.[84] In a lawsuit challenging California's SB277—the statute that eliminated California's personal belief exemption—plaintiffs claimed that SB277 violated their children's right to education.[48] The claim was rejected by the court. In *Whitlow v. California,* Judge Sabrow explained that:

> The right of education, fundamental as it may be, is no more sacred than any of the other fundamental rights that have readily given way to a State's interest in protecting the health and safety of its citizens, and particularly, school children.[48]

This language reveals that recognition of a right to education, and even reference to that right as possibly fundamental, does not prevent the state from enacting regulation necessary to make the school a safe environment.[85] To the contrary, one might argue that safety, including protective measures to avoid the spread of contagious diseases within the school setting, is a precondition for an adequate education and that states are obliged to take these steps when safe vaccines can prevent or reduce this risk.[85] California and other states have upheld state immunization requirements on this basis when challenged under the state right to education.[86-88] And indeed, even where the most rigorous tests of constitutional scrutiny are applied, courts have upheld state immunization laws.[47-48]

At the state level, there have been other legislative developments aimed at providing individuals with greater protections for religious exercise (such as, state religious freedom restoration acts),[65] which could open the door to challenges to a state's mandatory vaccination requirement in the absence of a religious exemption.[89] To date, however, no such challenges have been litigated.

In addition, parental rights advocates in some states have successfully promoted the passage of "parental rights acts."[90] While these statutes may weaken the state's authority to intervene in parental decisions regarding their children's health care in most instances, they are unlikely to have an impact on

challenges to vaccination laws.[91] Unlike most medical decisions, parental choices regarding vaccinations required prior to school entry are in place to promote the collective safety of all students. The role of childhood vaccinations in promoting the public health distinguishes this form of medical intervention from those aimed solely at the health of an individual child.

Promoting parental compliance with childhood immunization recommendations: Potential avenues of policy reform

States have considerable constitutional leeway to impose requirements for childhood vaccines. In choosing the legal mechanisms to respond to nonvaccination trends, several considerations are relevant: compatibility with constitutional limitations on state power; social values; bioethical principles; political feasibility; cost and efficiency; and effectiveness.

States pass and retain religious and personal belief exemptions in order to achieve certain policy goals. Respect for individual autonomy in health care decisionmaking[92] and parental discretion in childrearing are core values within our society.[17] In addition, our traditions promote tolerance of diversity in personal secular and religious beliefs.[93-94] For these reasons, states typically try to obtain compliance with vaccination policies through methods that restrict parental authority and discretion as minimally as possible, even where more restrictive methods would be constitutionally permissible. Furthermore, from a pragmatic standpoint, voluntary cooperation avoids the need for costly enforcement methods.[95] Political feasibility plays a role in which measures are used to promote immunization compliance; many proposed laws relating to childhood vaccinations have not been adopted because of insufficient political support.[52] The costs of enforcement and limitations of public resources lead to considerations regarding efficiency.

Societal and bioethical values are critical to our analysis. It is important to incorporate into any legal framework principles respecting personal decisional autonomy,[96] parental discretion in childrearing, and diversity of religious, cultural, and philosophical values. Furthermore, there are practical benefits to achieving voluntary cooperation. Children benefit if conflict between their parents and the state regarding decisions affecting their welfare are minimized. Therefore, in the context of childhood vaccination, we recommend a policy preference *for the least coercive approach that is feasible and effective*. Such a preference helps best strike the balance among the needs to protect the public's health, the well-being of the children for whom vaccinations are recommended, and the interests of parents to make decisions about their children's healthcare.

Depending upon the nature and strength of parental objections to vaccines, different legal interventions may be needed in order to promote their cooperation with vaccination schedules. For example, Hagood and Herlihy distinguish among Vaccine Rejector parents, Vaccine Resistant parents, and Vaccine Hesitant parents.[97] "Vaccine Rejectors" tend to be rigidly opposed to vaccinations and unwilling to consider information in opposition to their beliefs. They strongly believe that vaccines cause more harm than good, or that vaccines are part of "a conspiracy involving governments, health organizations and pharmaceutical companies."[97] "Vaccine Resistant" parents may be more willing to consider information about the safety and efficacy of vaccines, although they are frequently worried about the number or effects of vaccines on their children.[97] "Vaccine Hesitant" parents comprise the final group, and are likely the most persuadable. Tightening procedural requirements for exemptions—especially by adding an educational component—may be effective with Vaccine Hesitant parents, in that this approach facilitates access to education by health care providers who can correct misconceptions. Financial and other incentives, together with education, may change the calculus for Vaccine Resistant parents. By contrast, Vaccine Rejector parents will be unlikely to respond to anything short of mandates or direct coercion.

A continuum of legal tools

Because autonomy is a core value in American health and family law, we organize the policy options on a continuum of potential or perceived coerciveness. Gostin, Burris, and Lazzarini observe that "[w]here purely voluntary strategies fail" in the context of essential public health measures, the availability of a "graded series of less restrictive alternatives" to promote compliance and use of the least restrictive alternative "that will accomplish the public health goal," best strikes the balance between such goals and our legal and ethical values.[95] The Nuffield Council on Bioethics suggest that: "The range of options available to government and policy makers can be thought of as a ladder of interventions, with progressive steps from individual freedom and responsibility towards state intervention as one moves up the ladder. In considering which 'rung' is appropriate for a particular public health goal, the benefits to individuals and society should be weighed against the erosion of individual freedom."[98]

We use the term *coerciveness* to delineate the degree of restriction of free choice that the policy response introduces. The different forms of legal influence that constitute steps on the continuum can be characterized as: *use of force*, *mandates (via criminal penalties or conditioned access to benefits), cost-internalization, mandated transparency, procedural tightening, positive incentives, and persuasion through education*. We address some of the options within these categories below.

Ordering vaccination over parental objection

The *use of force* to vaccinate a child is arguably the most coercive form of intervention in that it eliminates free choice and the opportunity to oppose or prevent the vaccination. It is therefore more coercive than conditioning school entry upon compliance with vaccination requirements. Courts have ordered forced vaccinations on rare and unusual occasions. For example, in 1990 the city of Philadelphia faced a measles outbreak that centered on two churches whose members did not believe in vaccination (or modern medicine generally). Nine children died from measles during the outbreak, and ultimately a judge ordered vaccination of the children of the church members over parental objections.[99]

Criminalizing nonvaccination

A *mandate* burdens choice fairly heavily, while not eliminating it completely. It requires that persons engage in affirmative conduct—

in this case, vaccination of children—accompanied by a threat of deleterious consequences for noncompliance. Thus, for our purposes, it refers to *the imposition of formal legal consequences, such as penalties, or the conditioning of receipt of otherwise ordinarily-available benefits, opportunities, or privileges, on compliance with the mandate, in order to achieve the target result* (that is, the vaccination of children). This category alone encompasses a broad spectrum in the level of coerciveness, and criminalization is one option, as in *Jacobson*. Criminal sanctions for nonvaccination are atypical in the U.S., however. In rare cases, parents have been sanctioned criminally for violating mandatory school attendance laws when they didn't vaccinate their children.[100–101]

Conditioning access to services on compliance with vaccination policies

Another mechanism for accomplishing a mandate is the conditioning of benefits, opportunities, or privileges, such as access to public or private services, on compliance with state requirements to vaccinate. School-entry vaccination requirements fall within this category. This approach is universally applied in the United States, across the fifty states and District of Columbia, through school immunization requirements. Limited quarantine policies exist as well, in conjunction with school-entry vaccination programs, whereby those students who are granted exemptions and are unvaccinated lose the opportunity to attend school temporarily during an outbreak of a vaccine-preventable disease.[102] This practice was recently examined and held constitutional in a U.S. Court of Appeals case.[103] Scaling back the availability of exemptions would likely further reduce rates of nonvaccination, while rendering immunization policies more coercive in that the most commonly-used "escape valve" would be eliminated.

Imposing costs on nonvaccinators

Cost-internalization creates a legal regime in which one who engages in behavior that places others at risk of harm—such as parental refusal to vaccinate children—must bear the financial costs of any harm ultimately caused by that conduct.[104–105] Such an approach is arguably less coercive than the preceding approaches in that it does not *directly* interfere with one's freedom to refuse or one's ability to take advantage of important services and benefits. Rather, it allows people to "purchase" the option not to comply. The degree to which such costs are disincentives will likely vary with people's financial means. Costs can be imposed through tort liability, whereby, for example, parents who choose not to vaccinate can be sued if their choice harms another.[104–105] Costs can also be imposed on those who do not vaccinate via a no-fault mechanism which levies general taxes for the purpose of spreading the costs that nonvaccination imposes on the public.[106] Other methods exist as well, such as higher health insurance premiums for the unvaccinated or costs imposed on unvaccinated persons if their choice leads to an outbreak.[106]

Mandating transparency

Mandated transparency focuses on publicizing information regarding nonvaccination, such as identifying children who are unvaccinated or publishing rates of vaccination of individual schools or localities. This tool empowers those at risk of harm because of the behavior of others, allowing those at risk to avail themselves of some measure of self-protection.[107] It functions somewhat like sex-offender registries in enabling various forms of self-protection in response to information. The stigmatizing impact of such publication and social pressure for compliance are also likely to exert influence on those who might otherwise avoid vaccination. We are not aware of any jurisdiction that uses identification of individuals to encourage compliance. A less stigmatizing method presently in use in some states, such as California, permits publication of rates of immunization in particular schools, preschools, and daycares.[108]

Procedural tightening and exemption petitions

Research reveals that in jurisdictions where the procedures to obtain exemptions to vaccination policies are more rigorous, tighter, or complex, exemption rates are lower, and vaccination rates are higher.[22-23,109–110] This category of interventions may be referred to as *procedural tightening*. Greater procedural complexity is not necessarily coercive, especially if that complexity leads to a more accurate result in determining the appropriateness of an exemption under the state's substantive standards. For example, some states require parents claiming a religious exemption to detail and explain their religious reasons (and some subject the explanation to an evaluation of sincerity).[17] States have also required notarization of exemption letters, or annual renewal of exemptions.[17] Recently, several states added an educational requirement to their personal belief exemption, requiring parents to discuss risks and benefits of immunization and the diseases with a doctor before the granting of exemption.[17,111]

None of these policies already in effect in some jurisdictions imposes insurmountable barriers for most parents. These steps serve several purposes. First, as noted, some enhance the accuracy of the process by requiring documentation and evidence that will assist state actors in determining whether the exemption request satisfies state substantive requirements. Second, some steps support informed decisionmaking. Finally, additional procedural steps require those who seek exemptions to affirmatively demonstrate their commitment, weeding out parents for whom seeking an exemption might be following a "path of least resistance."

Providing positive incentives for vaccination

The term *incentive* used here refers to *the offering of positive benefits or privileges as a reinforcement or reward* for parental compliance with the vaccine recommendations. Conditioning certain incentives on compliance can be coercive to the extent that individual choice is influenced by the positive consequences that follow the desired behavior. This is one of the least coercive categories of legal tools and is in effect under current federal health policies in the U.S. For example, §2713 (2) of the Patient Protection and Affordable Care Act (the ACA) requires insurers to fully cover recommended vaccines, relieving patients of the expense of vaccination.[112] The Vaccines for Children (VFC) program, which began in 1994, covers vaccines

for children who could not otherwise afford them (e.g., children on Medicaid, underinsured children, Native American or Alaskan children).[113] Creation of additional incentives for vaccination may also encourage this preferred behavior.

Persuading through education

Finally, the term *persuasion*, as used here, focuses on *interventions that strive to change attitudes and minds*.[92] In this context, persuasion could strive to convince parents that vaccinating their children is the right decision based on the available scientific evidence.[86] Such policies are not designed to coerce. They try to use information, logic, and reason to empower an individual to make wise choices. This approach exists in the U.S., but is generally offered by nongovernmental groups. For example, the Vaccine Education Center of the Children's Hospital of Philadelphia[114] and the American Academy of Pediatrics disseminate and encourage dissemination of accurate information regarding immunizations to various groups.[115] Legal agencies could become more involved in vaccine education as well. For example, legislation requiring incorporation of a module about immunization in public school classes could provide children with important information that may have an impact on their future behavior.

Conclusion

As rates of vaccine preventable diseases increase, the costs and risks nonvaccination imposes on society become less tolerable. The decisions among methods of policy reform in contexts where the public's health is endangered can best be guided by balancing competing values and interests relevant to governmental interference in personal autonomy. Freedom of choice may, at times, conflict with promotion of the health of our population, particularly the health of those who are very young or medically vulnerable. Making use of the available legal tools to improve childhood immunization rates can help protect children's health, reduce social costs, and protect the larger community from the burden of preventable diseases.

Disclosure of potential conflicts of interest

In accordance with Taylor & Francis policy and her ethical obligation as a researcher, Dorit Rubinstein Reiss reports that her family owns stock in GSK, a vaccine manufacturer. She has disclosed those interests fully to Taylor & Francis and her co-author.

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