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Centers for Disease Control and Prevention's School Vaccination Assessment: Collaboration With US State, Local, and Territorial Immunization Programs, 2012–2018

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Abstract

Objectives.—To describe the ongoing collaboration of the Centers for Disease Control and Prevention's (CDC's) school vaccination assessment with state, local, and territorial immunization programs to provide data to monitor school entry vaccination.

Methods.—Departments of health and education partner to collect data from public school, private school, and homeschooled kindergartners in the 50 US states, the District of Columbia, 2 cities, and the US territories. Immunization programs submit vaccination coverage and exemption data to the CDC, and the CDC reports these data annually via multiple sources.

Results.—Among the 50 states and the District of Columbia, the number of programs using a census for vaccination coverage data increased from 39 to 41 during the school years 2012–2013 to 2017–2018 (which for most states was August or September through May or June), and the number using a census to collect exemption data increased from 40 to 46. The number of states that reported sharing their local-level vaccination coverage data online increased from 11 in 2012–2013 to 31 in 2017–2018.

Conclusions.—Coverage data can be used to address undervaccination among kindergartners to work with communities and schools that are susceptible to vaccine-preventable diseases. As more states publish local-level data online, access to improved data provides the public more valuable information. (*Am J Public Health*. 2020;110:1092–1097. doi:10.2105/AJPH.2020.305643)

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CONTRIBUTORS

All authors contributed to writing, interpretation of findings, and reviewing drafts of this article.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to disclose.

HUMAN PARTICIPANT PROTECTION

Institutional review board approval was not needed because school vaccination coverage surveillance is considered nonresearch by Centers for Disease Control and Prevention ethics reviewers.

Vaccinating school-aged children prevents the spread of vaccine-preventable diseases, increases life expectancy, and reduces health care costs.¹⁻³ State and local jurisdictions establish local vaccination requirements for school entry to ensure that students are protected. School vaccination requirements may be based on the recommendations of the Advisory Committee on Immunization Practices (ACIP) or state or local priorities.⁴ The Centers for Disease Control and Prevention (CDC) collaborates with state and local immunization programs to monitor school vaccination coverage and exemptions among kindergartners. State and local jurisdictions also use this and other school vaccination assessment activities to ensure that school entry vaccination requirements are met and students are protected.⁵

State and local immunization programs funded by the CDC are required to annually report kindergarten vaccination coverage and exemptions.⁶ Since 1994, the CDC has periodically published vaccination coverage data for kindergartners.^{7,13} Multiyear, national, and state-level school vaccination coverage and exemption data are publicly available on the CDC's SchoolVaxView Web site.¹⁴ In recent years, the CDC has worked with immunization programs to improve the quality of data collection methods and dissemination. We describe the methods used to monitor school vaccination coverage and exemptions among kindergartners across the United States.

METHODS

State and local immunization programs collect kindergarten vaccination coverage and exemptions using a variety of data collection methods. Coverage is defined as the percentage of students who have received the state-required number of vaccine doses; an exemption is a legal process for opting out of a vaccination required for school enrollment or continued attendance. An exemption is a temporary or permanent exception for 1 or more vaccines and is not a vaccination status. Sixty-four immunization programs receive federal funding to collect school vaccination data, of which not all report to the CDC. Two city immunization programs report voluntarily.

Estimates presented annually in the *Morbidity and Mortality Weekly Report (MMWR)* include coverage, exemptions, and grace period and provisional enrollment data reported for public, private, and some homeschooled kindergartners in the 50 US states, the District of Columbia; Houston, Texas; New York City; and the US territories. Estimates reported separately by select US cities are included in estimates for their respective states. Estimates for US territories are not included in the national estimates. The coverage estimates reported annually by the CDC represent coverage for vaccinations required at school entry according to each state's requirements.

Some state policies allow a grace period, provisional enrollment, or both for students not up-to-date for required vaccinations. An official grace period typically applies to all students in a state and is a set period of days during which a child can attend school without either a record of complete vaccination or an exemption from vaccination requirements. Provisional enrollment allows a child to attend school while completing a catch-up vaccination schedule according to the ACIP-recommended minimal time intervals between doses. Provisional

enrollment periods can also be referred to as “in-process,” “in-progress,” “temporarily in-compliance,” “conditional enrollment,” or some other state-specific term.

Data Collection

The data collection and submission process is summarized in Figure 1. Parents, guardians, or health care providers present documentation of students’ vaccinations and exemptions to schools via shot cards, medical records, or the Immunization Information System, depending on state and local regulations. State or local immunization programs receive school-level or school district-level data from a census of all schools with kindergartners; a random sample of schools, students, or both; or a census of Immunization Information System records of students whose parents consented to schools sharing vaccination data. Immunization programs submit aggregated vaccination coverage and exemption data to the CDC via a Web-based system. The annual school vaccination assessment has expanded in recent years to collect information about data-sharing practices, homeschooling, and grace period or provisional enrollment. Once the data submission process is complete, the CDC cleans and analyzes the data and then offers feedback to each immunization program. The CDC provides technical assistance to improve the quality of the data collected. States may consult the CDC for help with designing questionnaires, creating specialized data collection tools, and selecting samples of schools to be included in the assessment or for validating self-reported data from a census of schools.

Some states had been reporting vaccination compliance with school requirements, rather than vaccination coverage. A student could be compliant by providing documentation of complete vaccination history, having a medical or nonmedical exemption, being within a grace period, or being provisionally or conditionally enrolled. When the CDC identified results as reflecting compliance rather than coverage, the program was advised to provide coverage data. When corrections were not possible, results were excluded from the data tables published on SchoolVaxView.

Variation in Data Collection Methods

Data collection methods vary by immunization program and school type, and some immunization programs have changed their methods over time. Each immunization program determines collection methods based on state requirements, laws, and mandates. The annual school vaccination assessment questionnaire, developed by the CDC with input from immunization programs, assesses the methods used for the current year’s vaccination coverage and exemptions. Methods used include a census or a representative sample of kindergartners. A census is an attempt to collect data from all schools and all students. A census of kindergartners is preferred to assess exemptions because exemptions are rare events that cluster geographically and large samples may be needed to yield estimates with adequate statistical precision. In some cases, a complete census was not possible; a census with a response rate of less than 90% of the known population of kindergartners is defined as voluntary response. Some states have kindergarten enrollment data only from the schools that report coverage and exemption data and cannot estimate the number of kindergartners missing from the denominator, which gives the appearance of a 100% response.

A representative sample includes stratified 1-stage cluster samples, stratified 2-stage cluster samples, and simple random samples. For 1- or 2-stage cluster samples, schools are randomly selected and either all students in selected schools are assessed (1 stage) or a random sample of students within the selected schools are assessed (2 stage). Most samples are stratified by school type (public or private). Some are stratified by county or other geographic area. Different survey methods may be used for each school type within a jurisdiction.

The CDC encourages data validation if vaccination status is determined without the use of an Immunization Information System or a school-based electronic immunization database and by someone other than a school nurse. Data are validated by assessing coverage from a sample of schools and comparing it to the assessment data submitted by those schools.

Only 6 states collect homeschool data, and collection methods vary across states. For the 2017–2018 school year (which for most states was August or September 2017 through May or June 2018), California included data for 18 independent study schools and 8 virtual schools in public school data and data for homeschools with 6 or more students in private school data. The private school data refer to the number of students reported annually on the Private School Affidavit to the California Department of Education.¹⁵ North Dakota reported some homeschool data separately. Oregon reported some homeschool data separately; children enrolled in public online homeschools were included in the public school data. Pennsylvania included all homeschooled students in their public school data. Utah included some homeschooled students in public and private school data. Vermont included homeschooled students in their public and private school data if the students were enrolled in 1 or more classes at a school; homeschooled children who were exclusively homeschooled were not subject to vaccination requirements and were not included in these estimates.

Immunization programs collect and report exemption data to the CDC in various ways (Table 1): the number of kindergartners exempt from 1 or more vaccines, the number of kindergartners exempt from all vaccines, the number exempt by type (medical, religious, or philosophical), the number of vaccine exemptions (rather than kindergartners with an exemption from 1 or more vaccines), or the number of kindergartners exempt by vaccine (e.g., measles, mumps, and rubella vaccine [MMR] exemption, 1-dose varicella exemption).

School vaccination assessment dates vary across immunization programs and school types. Several states report the vaccination status of kindergartners as of the first day of school or a set time frame following the first day, such as 14 days after school starts. Others report status as of December 31, or another set date, whereas some collect data from schools on a rolling basis. Immunization programs that collect data on a rolling basis report the last date data were received from a school.

Variation in School Entry Requirements

School entry vaccine requirements vary across states by required vaccines, number of doses, allowable exemptions, acceptable documentation of vaccination, deadlines for submitting documentation, and policies that allow undervaccinated students to attend school.

Immunization programs aggregate vaccination coverage and exemption data at the state level, and the CDC reports exemption data as the number of kindergartners exempt from 1 or more vaccines. Some states are unable to report exemptions by child and instead report exemptions by vaccine or total number of exemptions, which could count individual children more than once. Although definitions of exemptions vary by state law, medical exemptions refer to a medical contraindication to a vaccine; religious exemptions are an objection to a vaccination for religious reasons; and philosophical, or personal belief exemptions, are an objection to a vaccination for reasons other than religion.

As of the 2017–2018 school year, most states require 2 doses of MMR. Alaska, New Jersey, and Oregon require 2 doses of measles, 1 dose of mumps, and 1 dose of rubella vaccines. Georgia, New York, New York City, North Carolina, and Virginia require 2 doses of measles and mumps and 1 dose of rubella vaccines. Iowa requires 2 doses of measles and 2 doses of rubella vaccines. Most states require 5 doses of diphtheria toxoid, tetanus toxoid, and acellular pertussis vaccine (DTaP) for school entry. Illinois, Maryland, Virginia, and Wisconsin require 4 doses. Nebraska requires 3 doses. Kentucky requires 5 or more but reports 4 or more doses of DTaP. (Pertussis vaccination coverage might include some diphtheria toxoid, tetanus toxoid, and pertussis vaccine [DTP] vaccinations if administered in another country or by a vaccination provider who continued to use DTP after 2000.)

Federal laws require states to allow students to attend school in special circumstances, which may supersede state vaccination requirements. For example, when a student receives special education services under the Individuals with Disabilities Education Act, these are documented in an Individualized Education Plan.¹⁶ By law, a student must receive services documented in their Individualized Education Plan. In addition, the McKinney–Vento Homeless Assistance Act requires that students experiencing homelessness have access to public education regardless of vaccination status.¹⁷

RESULTS

Data collection methods reported by 50 states and the District of Columbia from the 2012–2013 through the 2017–2018 school years are summarized in Table 2. The number of states using a census to collect vaccination coverage data increased from 39 to 41 during this period (Table 2). Most states used the same method to collect both vaccination coverage and exemption data. The number of states using a census to collect exemption data increased from 40 to 46 over this period. One state reported using a mix of methods for vaccination coverage data collection during the 2012–2013 school year, 2 states reported using a mix of methods for vaccination coverage data, and 1 state for vaccine exemption data during the 2013–2014 school year.

The number of states that reported sharing their local-level vaccination coverage data online increased over this period (Figure 2). During the 2012–2013 school year, 10 of the 50 states and the District of Columbia reported sharing local-level coverage data online; this increased to 31 states for the 2017–2018 school year.

Five states reported vaccination compliance during the 2012–2013 school year. There is no evidence of any program currently reporting compliance in place of coverage. Two states reported vaccination coverage and exemption data stratified by public, private, and homeschool type for the 2015–2016 through 2017–2018 school years. Twenty-eight states reported data on grace period or provisional enrollment for the 2017–2018 school year, up from 27 during the 2016–2017 school year.

DISCUSSION

To our knowledge, this report is the most comprehensive overview of state and CDC kindergarten vaccination and exemption assessment methods to date. School vaccination assessment was initiated to measure vaccination coverage and exemption levels for kindergartners in the United States. In recent years, the system has improved, with 46 states using a census to assess exemptions, up from 40 in 2012–2013. The CDC recommends assessing a census of all schools with kindergartners if the quality of the data reported is adequate; most immunization programs use this method to collect both vaccination coverage and exemption data.

A census is preferred because this provides the best representation and programmatically useful local-level coverage and exemption data. In addition, exemptions are rare events that tend to cluster geographically, requiring large sample sizes to achieve adequate statistical precision to interpret the results. The CDC recommends that states using self-reported data conduct validation surveys to assess the adequacy of the reported data. State differences in data collection methods affect data quality and comparability. A recent study reported variation in the vaccination data available for kindergartners across the 50 states and the District of Columbia and urged uniform reporting criteria.¹⁸ With the CDC's technical assistance, states that were found to have reported compliance modified their methods and now collect and report vaccination coverage data to the CDC.

Many states allow a grace period or provisional enrollment, which can affect school enforcement of vaccination requirements. Policies for grace periods and provisional enrollment vary by state and school district. The CDC encourages immunization programs to collect and report data on the proportion of kindergartners who are legally attending school but are neither fully vaccinated with all required vaccines nor exempt. Collecting grace period and provisional enrollment information helps programs identify schools with high rates or large numbers of undervaccinated students where interventions may improve vaccination coverage. Immunization programs, health care providers, departments of education, and schools can work together to use local-level data to improve vaccination coverage, as seen in California when MMR vaccination coverage increased from 92.6 in 2014–2015 to 96.9 in 2017–2018.¹⁴ California also eliminated personal belief exemptions and initiated interventions to better enforce the conditional admission criteria.^{19, 20}

Researchers can also use national-level data in their examinations of state policies, as did a 2018 study that evaluated trends in exemption rates in the United States.²¹ The CDC encourages immunization programs to collect and submit vaccination, exemption, and grace period and provisional enrollment data for all school types to have the best representation for

coverage and exemptions. The CDC aims to collect more data about homeschooled kindergartners in future school assessments, if possible. The CDC will continue to work with immunization programs to improve school vaccination assessment data methods.

The annual school vaccination assessment includes questions about local-level kindergarten vaccination coverage and exemption data sharing for the most recent school year. Local-level data sharing is one of the strengths of this system. Increased data sharing at the local level is important for outbreak response, media inquiries, and research initiatives. In addition, publicly sharing local data makes information about the risk of vaccine-preventable diseases available to parents and communities. National data dissemination includes annual publication in the *MMWR* and on the SchoolVaxView Web site that serves as a resource for stakeholders.⁸⁻¹⁴ Data at the local level inform programmatic activities to increase vaccination coverage and guide applied research studies.

Limitations

This system is subject to several limitations. First, vaccination coverage and exemption data are not comparable across states each year. Each state has different methods, collection specifications, assessment dates, acceptable documentation, school vaccination policies, vaccine and dose requirements, exemption application processes, and available resources. Second, immunization programs lack vaccination data for select kindergartners, such as most homeschooled kindergartners and kindergartners in schools that do not report vaccination assessment data to their respective states. The CDC began requesting data on homeschooled kindergartners in the 2014–2015 school year, and reporting on this group remains low, with only 2 states reporting these data separately in the 2017–2018 school year.

Third, data are not always comparable across years within a state because of changes in methods over time. Fourth, schools that self-report data may not have trained staff to assess or input data and could have possible data entry errors. Fifth, the definitions and policies surrounding grace periods and provisional enrollments vary across jurisdictions. Sixth, the medians of the state estimates reported annually in the *MMWR* and on the SchoolVaxView Web site do not account for differences in kindergarten population size across states.

Public Health Implications

Immunization programs collaborate with the CDC to improve data collection methods and dissemination each year. These improvements have led to increased confidence in reporting, as have more comprehensive data-cleaning processes and, in recent years, adjustments made for underreporting by school type. There is a better understanding of methods across states and a standardized reporting of vaccination coverage.

Each year, the CDC provides technical assistance to immunization programs to improve the quality of school entry vaccination surveillance. State, territory, and selected local area MMR, DTaP, and varicella vaccine coverage and medical and nonmedical exemption estimates and national medians are published annually in the CDC's *MMWR* and the SchoolVaxView Web site. By collecting and reporting data on states that share their local-level data online, the CDC encourages other states to do the same. Sharing local-level data

allows immunization programs to work with communities and schools that are susceptible to vaccine-preventable diseases.

Furthermore, the CDC is now collecting and reporting data on provisional enrollment and grace periods. This is a significant step toward understanding and decreasing undervaccination among kindergartners. Access to reliable data regarding kindergarten vaccination coverage and exemption rates at the local level is important. These data can be used to increase coverage with required vaccinations by identifying schools where there are high proportions of children who have neither coverage nor exemptions documented before outbreaks happen. Additionally, immunization programs use their data for routine program planning to address undervaccination through enforcement of policy, laws, and requirements.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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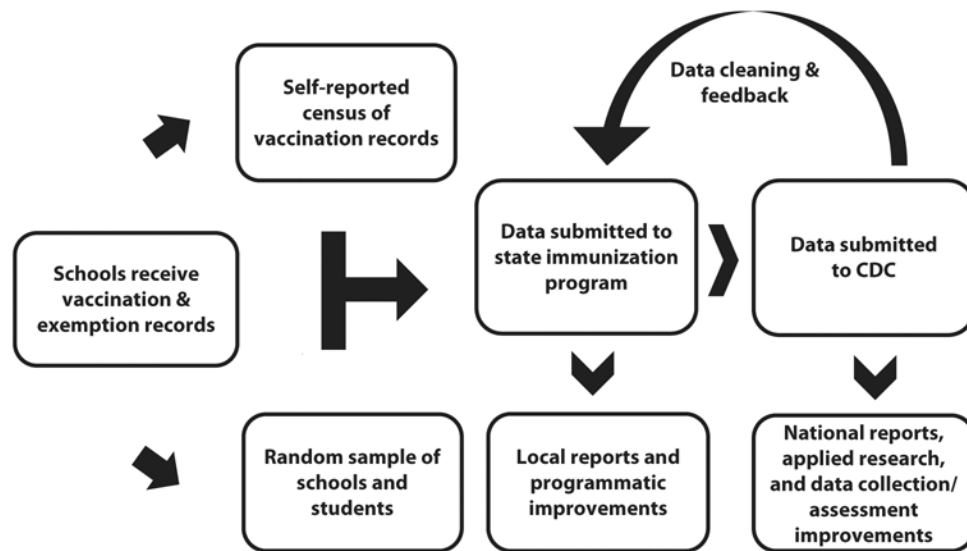


FIGURE 1—. School Vaccination Assessment Data Collection and Submission Process: United States

Note. CDC = Centers for Disease Control and Prevention. Schools receive vaccination and exemption records in the form of shot cards, parent records, or documentation accessed via the Immunization Information System. Immunization programs collect vaccination data from either a self-reported census or a random sample of schools or students.

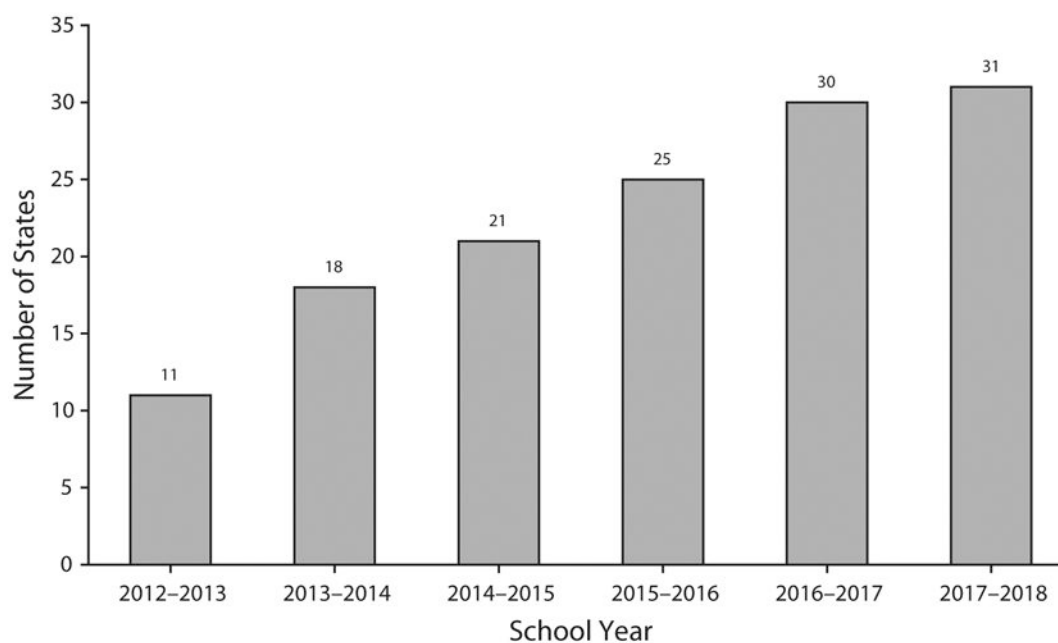


FIGURE 2—. States Sharing Local-Level Coverage Data Online: United States and Washington, DC, 2012-2013 to 2017-2018 School Years

Source. SchoolVaxView (<http://www.cdc.gov/vaccines/imz-managers/coverage/schoolvaxview/index.html>).

TABLE 1—

How States Collect and Report School Exemption Data: United States and Washington, DC, 2017-2018
School Year

Exemption	No. of States (%) ^a
Exempt from 1	46 (90)
Exempt from all	22 (43)
Exempt by type	
Medical	51 (100)
Religious	47 (92)
Philosophical	17 (33)
Exempt by vaccine	28 (55)

^aDetailed state-specific table can be found in Tables A-C (available as a supplement to the online version of this article at <http://www.ajph.org>).

TABLE 2—

Distribution by Sample Type for Vaccination Coverage and Exemptions (Medical and Nonmedical): United States, 2012-2013 to 2017-2018 School Years

Sample Type	School Year No.						
	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	
Coverage							
Census	39	39	41	41	41	41	41
Sample	11	9	10	10	9	9	9
Mix of methods	1	2	...	...	...	...	...
Not conducted	...	1	...	...	1	1	1
Exemptions							
Census	40	41	44	44	45	46	46
Sample	10	8	7	7	5	4	4
Mix of methods	...	1	...	...	...	...	...
Not conducted	1	1	...	...	1	1	1

Note. Study population was n = 51.