

Kindergarten Immunization Coverage Survey

School Year 2014-2015



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Executive Summary

Overview

The Kansas Certificates of Immunizations (KCI) and other immunization records for children enrolled in a kindergarten class in Kansas public and private schools during the 2014-2015 school year were collected and immunization coverage was evaluated for all required and recommended vaccines. Vaccination coverage levels were calculated for children at the time of school entry (i.e., on the first day of school for the 2014-2015 academic year) and 30 days following school entry. Children who were between the ages of five and seven years on the first day of the school year were included in the study. In total, there were 389 schools, 349 public and 40 private, included in the analysis, which consisted of a representative sample of 9,219 students.

Vaccination Coverage for Kansas Kindergarteners

The statewide coverage levels at school entry for all vaccinations required for school entry (DTaP5, Polio4, MMR2, Var2, and HepB3) were above 85%, with HepB3 having the highest coverage at 96.7%. DTaP4 and HepB3 were the only vaccinations to meet the Healthy People 2020 goal of at least 95% coverage for kindergarten immunizations. The complete series for all five required vaccinations (5-4-2-2-3) had a coverage level of 82.7% at school entry. Vaccination coverage levels for most immunizations increased after the first 30 days of school. Children enrolled in private schools had higher coverage levels than children enrolled in public schools throughout Kansas for all required vaccines; the difference was statistically significant for DTaP, Polio, MMR, Hib, and PCV vaccinations.

The 105 Kansas counties were grouped into three categories based on population density, and coverage levels were compared among these groups. Sparsely Populated counties had the highest coverage level for all vaccines (DTaP5, Polio4, MMR2, Var2, HepB3, Hib3, PCV4, and HepA2) as well as the vaccine series (5-4-2-2-3). HepA2 was the only vaccine which showed no significant difference in coverage levels between urban and moderately populated counties at school entry. Twelve counties had $\geq 95\%$ coverage for all five required vaccinations and eleven were sparsely populated counties (Appendix 2).

Exemptions and Exclusion Policies

While a majority of schools (71.6%) had a policy in place to allow children time to get caught up on immunizations, 16.7% of schools did not have any grace period policies in place and 11.6% required children be up-to-date (UTD) on the first day of school. Among public schools, the most common grace period policy was to give children 90 days to become UTD (18.3%), while the most common practice among private schools was to not have a grace period policy in place (19.1%) or to require children to be UTD on the first day of school (18.1%). Schools which excluded children from attendance who were not UTD had significantly higher immunization coverage when compared to schools which did not exclude non-UTD children; significant

differences were seen in all five required vaccines and the 5-4-2-2-3 vaccine series both at school entry and 30 days after school entry

Background

The Kansas Kindergarten Immunization Coverage Assessment is an annual survey conducted by the Kansas Department of Health and Environment (KDHE) to assess vaccination coverage among kindergarten students. The population for this study included kindergarten students between the ages of five and seven years on the first day of the academic year and enrolled in either a public or private school in Kansas.

The Advisory Committee for Immunization Practices (ACIP) recommends children by 5 years of age receive (Table 1):

- 5 doses of diphtheria, tetanus, and acellular pertussis vaccine (DTaP5)
- 3 doses of hepatitis B vaccine (HepB3)
- 3 doses of *Haemophilus influenzae* type b vaccine (Hib3)
- 2 doses of measles, mumps, and rubella vaccine (MMR2)
- 4 doses of pneumococcal conjugate vaccine (PCV4)
- 4 doses of polio vaccine (Polio4)
- 2 doses of hepatitis A vaccine (HepA2)

DTaP was first licensed in 1996. By 1998 ACIP recommended administration of DTaP instead of the diphtheria, tetanus and whole cellular pertussis (DTP) vaccine for immunization due to fewer reactions¹. Kansas requires all children entering kindergarten have five doses of DTaP, with proof of immunization provided to school prior to first day of attendance². Four doses of DTaP is acceptable if the fourth dose was given on or after the child's fourth birthday. Hepatitis B vaccine was first licensed in 1981 and by 1991 ACIP recommended administration of this vaccine to all infants. In 2004 Kansas required all children entering kindergarten have three doses of hepatitis B vaccine. Measles, mumps, and rubella vaccine was first licensed in 1971, two doses of this vaccine was recommended for all school-aged children by 1989. Kansas requires children to receive two doses prior to entering kindergarten. Polio vaccine was first licensed in 1955 and later that year doses were distributed throughout the United States. Kansas requires all children entering school to have four doses of polio vaccine. Three doses are acceptable if the third dose was given on or after the child's fourth birthday. Varicella vaccine was first licensed in 1995. By 2006 ACIP recommended a two-dose varicella vaccine for all children. Kansas requires children entering kindergarten to have two doses of varicella vaccination. Hepatitis A vaccine was first licensed in 1995 and in 2006 ACIP recommended administration of this vaccine to all children³. In 2009 Kansas required those in childcare have two doses of hepatitis A vaccine; however, it is not required for entry into kindergarten. *Haemophilus influenzae* type B vaccine was first licensed in 1985. In 1991 ACIP recommended it

¹ Preventing Tetanus, Diphtheria, and Pertussis Among Adolescents: Use of Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccines Recommendations of the Advisory Committee on Immunization Practices (ACIP)

² Immunization Action Coalition. State Information State mandates on immunization

³ Epidemiology and Prevention of Vaccine-Preventable Diseases. 13th ed.

for infants beginning at two months of age. Hib3 is not required for entry into kindergarten. Pneumococcal conjugate vaccine was first licensed in 1977. In 2000, it was licensed for use in infants and by 2010 ACIP recommended for infants starting at two months of age, however, Kansas does not require PCV4 for kindergarten entry.

Table 1: ACIP Birth to 6 Years Immunization Recommendations

		Requirement for School	Number of Doses	Healthy People 2020 Coverage Goals
DTaP5	Diphtheria, Tetanus, Pertussis	Yes	5	95%
DTaP4*			4	
HepB3*	Hepatitis B		3	
MMR2*	Measles, Mumps, Rubella		2	
Polio4	Polio		4	
Polio3*			3	
Var2*	Varicella	Yes (or history of disease)	2	
5-4-2-2-3	DTaP5, Polio4, MMR2, Var2, Hep3			
HepA2	Hepatitis A	Recommended	2	85%
Hib3	<i>Haemophilus influenzae</i> type b		3	90%
PCV4	Pneumococcal conjugate vaccine		4	

In the state of Kansas, two legal alternatives to required vaccination are permissible, medical and religious exemptions.⁴ To receive a medical exemption, a physician must annually sign a form stating the reason for exemption and from which vaccine(s) the child is exempt. To receive a religious exemption, a parent or guardian must write a statement explaining that the child is an adherent of a religious denomination whose religious teachings are opposed to such tests or inoculations. Additionally, a separate statute (K.S.A. 72-5211a) allows schools to exclude students from school who do not have the required vaccinations or an acceptable exemption. However, it is entirely up to each school board as to whether or not to enforce this statute until a child comes into compliance for required vaccinations.

⁴ Statute 72-5209: Same; certification of completion required, alternatives; duties of school boards. (a) In each school year, every pupil enrolling or enrolled in any school for the first time in this state, and each child enrolling or enrolled for the first time in a preschool or day care program operated by a school, and such other pupils as may be designated by the secretary, prior to admission to and attendance at school, shall present to the appropriate school board certification from a physician or local health department that the pupil has received such tests and inoculations as are deemed necessary by the secretary by such means as are approved by the secretary. Pupils who have not completed the required inoculations may enroll or remain enrolled while completing the required inoculations if a physician or local health department certifies that the pupil has received the most recent appropriate inoculations in all required series. Failure to timely complete all required series shall be deemed non-compliance. (b) As an alternative to the certification required under subsection (a), a pupil shall present: (1) An annual written statement signed by a licensed physician stating the physical condition of the child to be such that the tests or inoculations would seriously endanger the life or health of the child, or (2) a written statement signed by one parent or guardian that the child is an adherent of a religious denomination whose religious teachings are opposed to such tests or inoculations. (c) On or before May 15 of each school year, the school board of every school affected by this act shall notify the parents or guardians of all known pupils who are enrolled or who will be enrolling in the school of the provisions this act and any policy regarding the implementation of the provisions of this act adopted by the school board. (d) If a pupil transfers from one school to another, the school from which the pupil transfers shall forward with the pupil's transcript the certification or statement showing evidence of compliance with the requirements of this act to the school to which the pupil transfers.

Methods

Immunization Coverage Analysis

Sampling and Data Collection

Each Kansas public and private school with a kindergarten class received a letter requesting participation in this study. These letters, co-signed by the Secretary of KDHE and the Commissioner of the Kansas State Department of Education (KSDE), specified the number of records requested based upon a simple random sampling methodology and kindergarten enrollment population. This sampling was used to ensure adequate sample size for each Kansas County. Sampling weights were calculated based on county size, enrollment, and school type (public or private). Schools were assigned to one of three groups:

- Schools that sent 30 vaccination records selected at random
- Schools that sent all vaccination records
 - For schools with less than 30 kindergarten students
- Schools that sent no vaccination records

These record requests could include exemptions based on how records were requested to be selected. Participating schools submitted Kansas Certificates of Immunizations (KCI) or any other form of paper vaccination records, including printouts from computerized record keeping programs, to KDHE. All personal identifiers were removed from each record, except date of birth, to ensure confidentiality. This sampling methodology is different from assessments prior to the 2014-2015 school year, so data from previous years cannot be utilized for comparison. To be included in analysis, data had to be received by cut-off date indicated on the participation letter; additionally, data was not be utilized if date of birth was missing or date of vaccine administration was illegible.

Data Analysis

Total population included children with date of birth on the vaccination record that met age requirements for inclusion. Data was weighted, point estimates of coverage levels, and 95% confidence intervals (95% CI) were analyzed for:

1. Vaccinations required for school
 - DTaP5, Polio4, MMR2, HepB3 and Var2
2. Vaccinations recommended for school
 - Hib3, PCV4 and HepA2
3. Healthy People 2020 (HP2020) objectives
 - DTaP4 and Polio3

If a child had a fourth dose of DTaP on or after the fourth birthday, he/she was considered UTD for DTaP5 school requirement. Additionally, a child was considered UTD for Polio4 if he/she had a third dose of the vaccine on or after their fourth birthday. Furthermore, children who indicated history of varicella disease were not included in

the analysis for varicella vaccine coverage. This methodology was utilized due to the date of disease not being consistently recorded. Vaccination exemptions were classified as medical or religious.

Analyses were performed at school entry and stratified by school type, county population density and differences in sampling ratios between counties. Sample weights were calculated using the number of kindergartners enrolled in a county and the number of records analyzed for that county. Each county was categorized based on population densities, and for the purpose of this analysis, grouped into “urban” (≥ 150 persons per square mile), “moderately populated” (20-149.9 persons per square mile), and “rural” (≤ 19.9 persons per square mile) ([Appendix 1](#)).

Vaccination coverage level estimates were compared among these groups.

Exemption and Exclusion Policy Analysis

Data Collection

Each Kansas public and private school with a kindergarten class received a letter requesting participation in this study. These letters, co-signed by the Secretary of KDHE and the Commissioner of the KSDE, requested schools to complete a form or online survey listing:

- Total number of kindergarten students enrolled
- Total number of kindergarten students with exemptions to vaccination by type (religious or medical)
 - Students with exemption to all vaccines
 - Students with exemption, who have one or more vaccinations

Additionally, schools were asked to complete a two-question survey assessing exclusion policies and procedures.

Data Analysis

Exemption data was collected on the total number of kindergarten students enrolled who had any type of exemption and were classified by type (religious or medical). All exemptions were analyzed by school type (public or private) and county population density group (rural, moderately populated, or urban).

School policy data was collected regarding enforcement of K.S.A. 72-5211a and policies were stratified by school type.

Data regarding school exclusion policies were linked with vaccination records from corresponding schools utilized in the coverage assessment analysis. Point estimates of coverage levels and 95% CIs at school entry were calculated for the coverage assessment analysis and were stratified by school exclusion policy. For schools that reported no exclusion policy in place, reasons were assessed.

Results

Coverage Assessment Analysis

Data Collection

Letters of invitation to participate in the coverage assessment and provide vaccination records were sent to 414 Kansas schools; 354 public and 69 private schools, in 105 counties in Kansas. Twenty-five schools (6.0%) did not respond, did not respond in time, or provided unusable data. The remaining 389 (94.0%) schools (349 public and 40 private) from 102 Kansas counties responded to the data request and were included in analysis. A total of 9,219 vaccination records from the 389 schools were included in analysis, which equated to one record representing 4.3 students enrolled in participating schools.

The sample population for the 2014-2015 school year distribution across Kansas was 32.6% in rural counties, 50.1% in moderately populated counties, and 17.3% in urban counties. After weighting, the number of records included in the analysis were:

Rural: 3,008 (12.1%) Moderately populated: 4,618 (32.9%) Urban: 1,593 (55.0%)

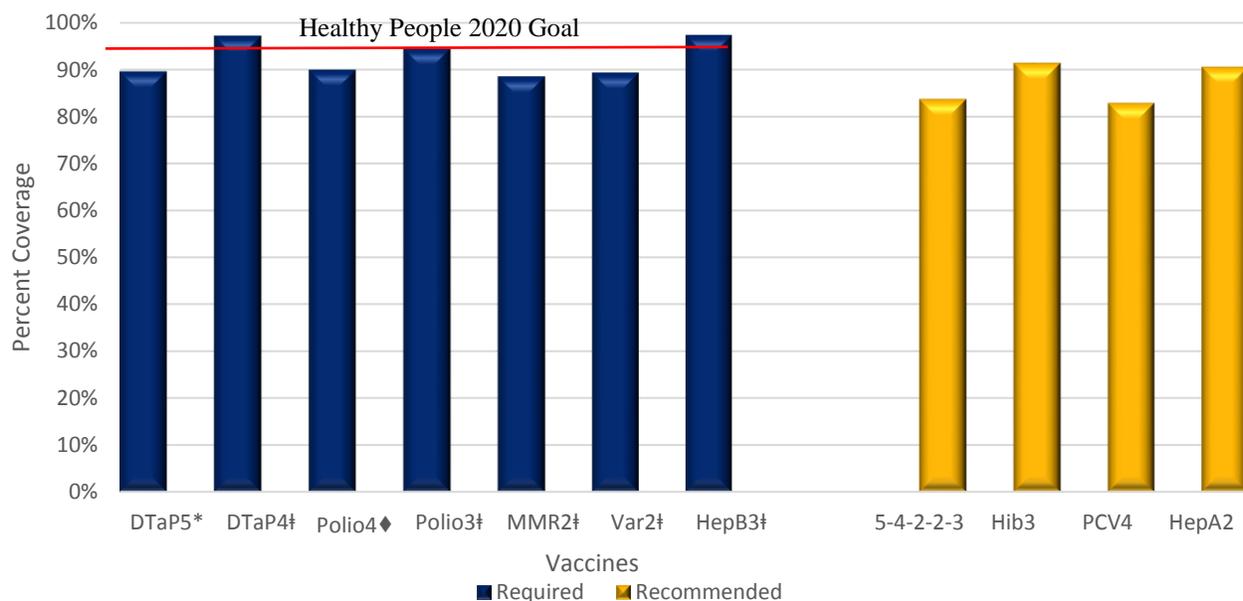
Kindergarten Immunization Coverage

Statewide Immunization Coverage

The immunization coverage levels at school entry of all required vaccinations (DTaP5, Polio4, MMR2, Var2, and HepB3) were above 88%, with HepB3 having the highest coverage of any vaccination. The complete series for all five required vaccinations (5-4-2-2-3) had a coverage level of 83.7% at school entry. MMR2 had the lowest coverage among required vaccinations with 88.4% of children fully vaccinated at school entry. Of the vaccinations not required for school entry, PCV4 had the lowest coverage with 82.9% of kindergartners fully vaccinated at school entry. HP2020 goals establish a 95% immunization coverage target for DTaP4, Polio3, MMR2, HepB3, and Var2. Statewide coverage for DTaP4 (97.1%) and HepB3 (97.2%) exceeded this HP2020 goal (Figure 1). Maps of vaccine exemptions by county are in [Appendix 3](#).

Vaccination coverage was assessed 30 days after the start of school to measure changes, if any, in coverage rates. An increase of approximately 2% was observed for DTaP5, Polio4, MMR2, Var2, and the 5-4-2-2-3 vaccine series (Figure 2). A negligible increase of 0.3% and 0.1% was observed for HepA2 and HepB3, respectively. No change was observed for Hib3, and PCV4 coverage 30 days after school entry.

Figure 1: Statewide vaccination coverage levels of kindergarten students at school entry by vaccine, Kansas, 2014-2015

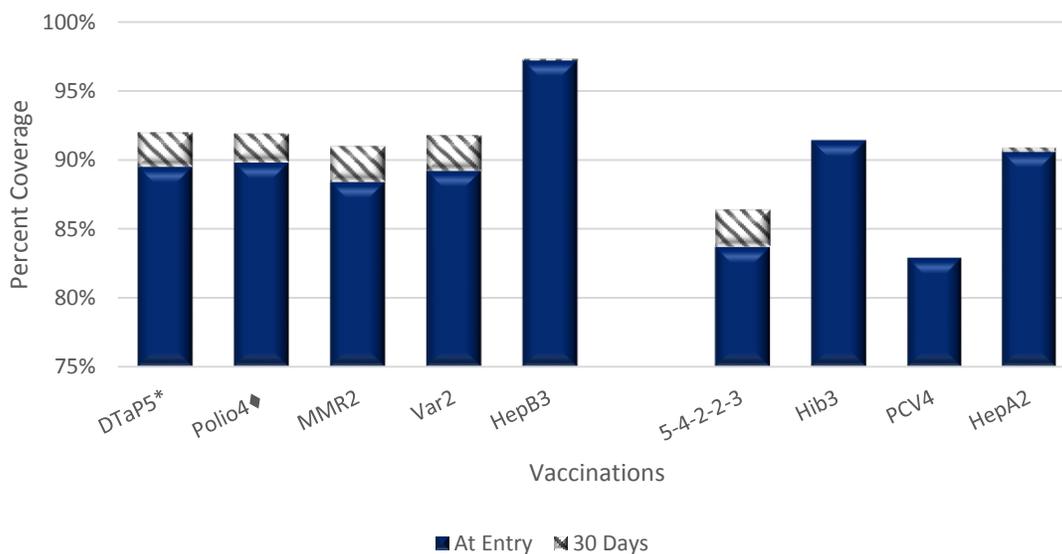


*5 doses of DTaP or 4 doses if the fourth is administered on or after the fourth birthday.

♦4 doses of Polio or 3 doses if 3rd is administered on or after the fourth birthday

‡ Healthy People 2020 objective

Figure 1: Statewide vaccination coverage levels of kindergarten students 30 days after school entry by vaccine, Kansas, 2014-2015



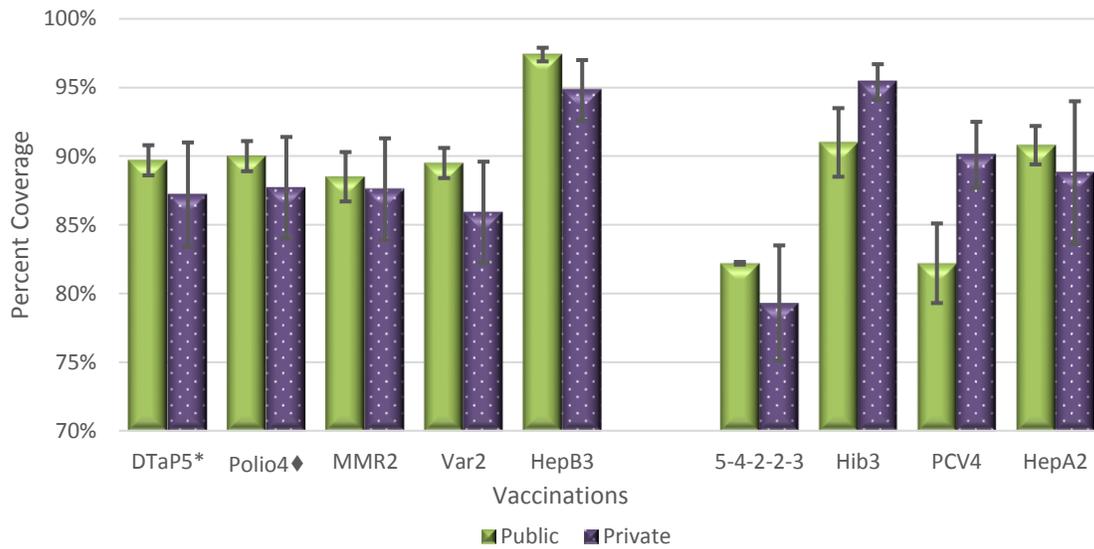
*5 doses of DTaP or 4 doses if the fourth is administered on or after the fourth birthday.

♦4 doses of Polio or 3 doses if 3rd is administered on or after the fourth birthday

Immunization Coverage Stratified by School Type (Public vs. Private)

Differences were observed in vaccination coverage levels among kindergartners enrolled in public versus private schools (Figure 3). When compared to children enrolled in private schools, students in public schools had proportionally higher vaccination coverage for all required vaccinations. Alternatively, children in private schools had significantly higher vaccination coverage for Hib3 and HepA2. There were no other significant differences in vaccination coverage observed between school types.

Figure 3: Vaccination coverage levels of kindergarten students at school entry by vaccine and school type, Kansas 2014-2015



*5 doses of DTaP or 4 doses if the fourth is administered on or after the fourth birthday.

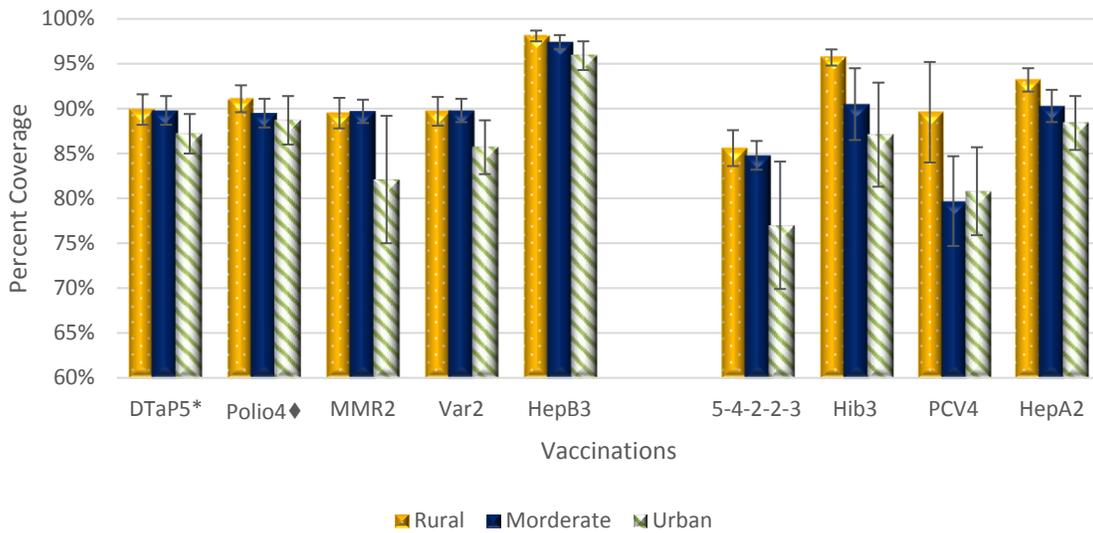
♦4 doses of Polio or 3 doses if 3rd is administered on or after the fourth birthday

Immunization Coverage Stratified by County Population Density Group

After counties were stratified by population densities and coverage levels assessed, differences in immunization rates were observed (Figure 4). Compared to kindergartners in urban counties, students in rural counties had significantly higher coverage for:

- All recommended vaccinations
 - Hib3
 - PCV4
 - HepA2

Figure 4: Vaccination coverage levels for kindergarten students, by vaccine and county population density group, Kansas, 2014-2015



*5 doses of DTaP or 4 doses if the fourth is administered on or after the fourth birthday
 ♦4 doses of Polio or 3 doses if 3rd is administered on or after the fourth birthday

Exemption and School Policy Analysis

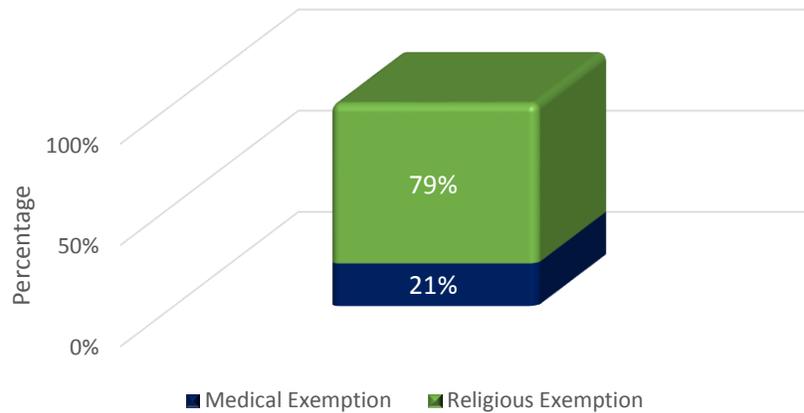
Data Collection

Of the 816 schools invited to participate, 764 (93.6%); 666 public and 98 private, responded to the request for information regarding exemption data. These responding schools represented 102 of the 105 Kansas counties and were included in the analysis.

Kindergarten Exemptions

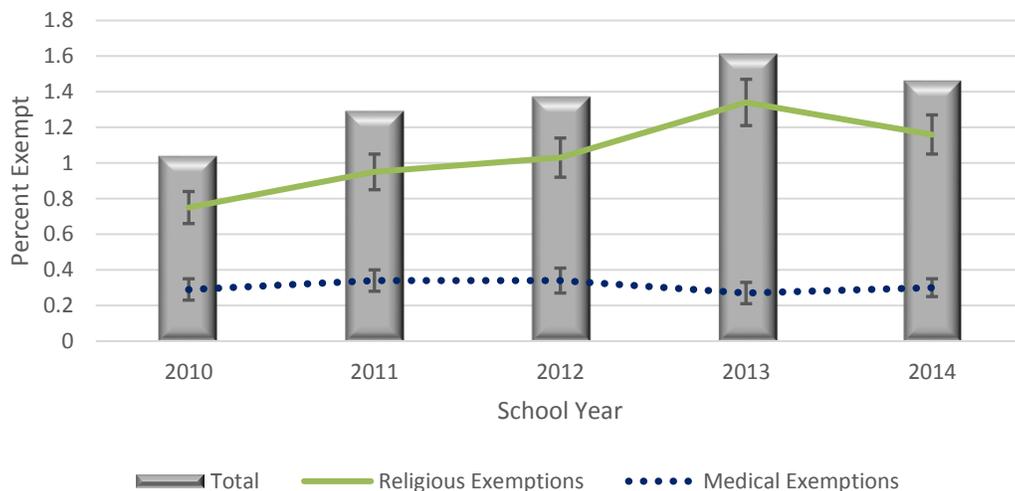
During the 2014-2015 school year, 542 (1.5%) kindergartners from the responding schools reported having an exemption. Of the exemptions reported, 430 (79.3%) were categorized as religious and 112 (20.7%) as medical (Figure 5).

Figure 5: Percentage of exemptions by exemption type, Kansas 2014-2015



The percentage of kindergarten students which reported an exemption decreased from 1.6% in the 2013-2014 school year to 1.5% in 2014-2015. This decrease was not significant; however, rates remain higher than 2010-2011 through 2012-2013 academic years for statewide vaccine exemptions (Figure 6). It was also observed that religious exemptions insignificantly decreased, from 1.3% in 2013-2014 academic year to 1.2% in 2014-2015, while not a significant increase. Alternatively, medical exemption levels have not significantly changed since the 2010-2011 school year; remaining at approximately 0.3%.

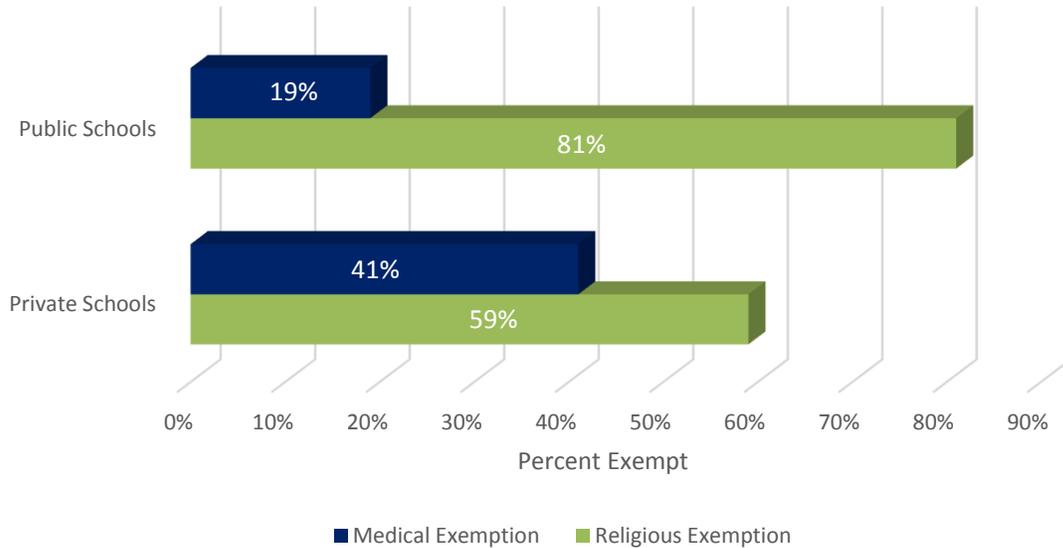
Figure 6: Exemption rates among kindergarten students, by exemption type and year, Kansas 2010-2014



When stratified by school type, a higher proportion of overall exemptions as well as religious exemptions were observed among public schools. Private schools had a higher proportion of medical exemptions among their

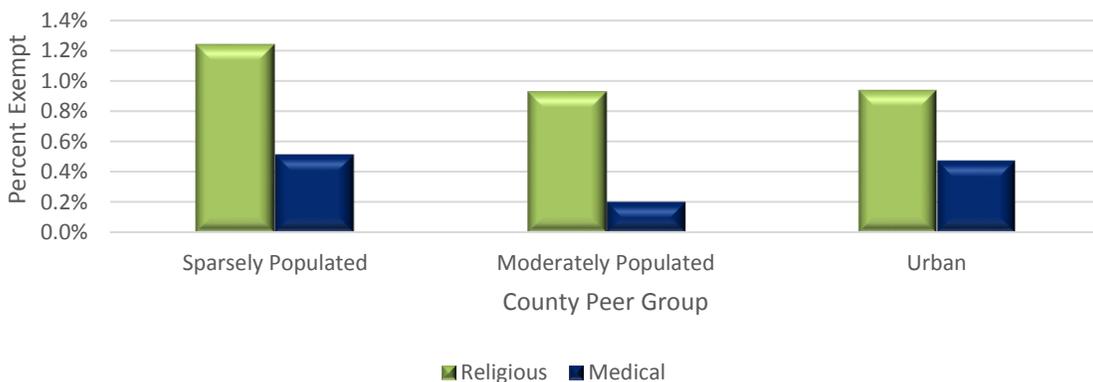
students compared to public schools, 41.0% vs 19.1% respectively (Figure 7). Alternatively, public schools had a higher proportion of religious exemptions compared to private schools, 80.9% vs 59.0% respectively.

Figure 7: Percentage of exemptions by exemption and school type, Kansas 2014-2015



Vaccination exemption was stratified by county density group to identify trends. Rural counties had the highest percent of kindergarten students with religious exemptions at 1.24% (Figure 8). However, urban counties had nearly double the proportion of medical exemptions at 0.40% compared to other county types. Conversely, moderately populated counties had the lowest percent of kindergarten students with a medical exemption at 0.20%, over half the rate of urban and rural counties (0.51% and 0.47%, respectively). When examined by county, religious exemptions were most prevalent in the southern half of Kansas while medical exemptions greater than 0.1% were sparse and spread throughout. Maps of vaccine exemptions by county are in [Appendix 4](#).

Figure 8: Percentage of total population of kindergarten student with exemption by county population density group and exemption type, Kansas, 2014-2015



School Exclusion Policy

Schools were surveyed about policies for excluding non-UTD students.

Of the 764 schools included in analysis, 748 (97.9%) indicated their school’s exclusion policy:

- 531 (71.0%) schools indicated they had an exclusion policy
- 170 (23.7%) schools indicated they did not have an exclusion policy
- 47 (6.3%) schools indicated they were unsure of their school’s exclusion policy

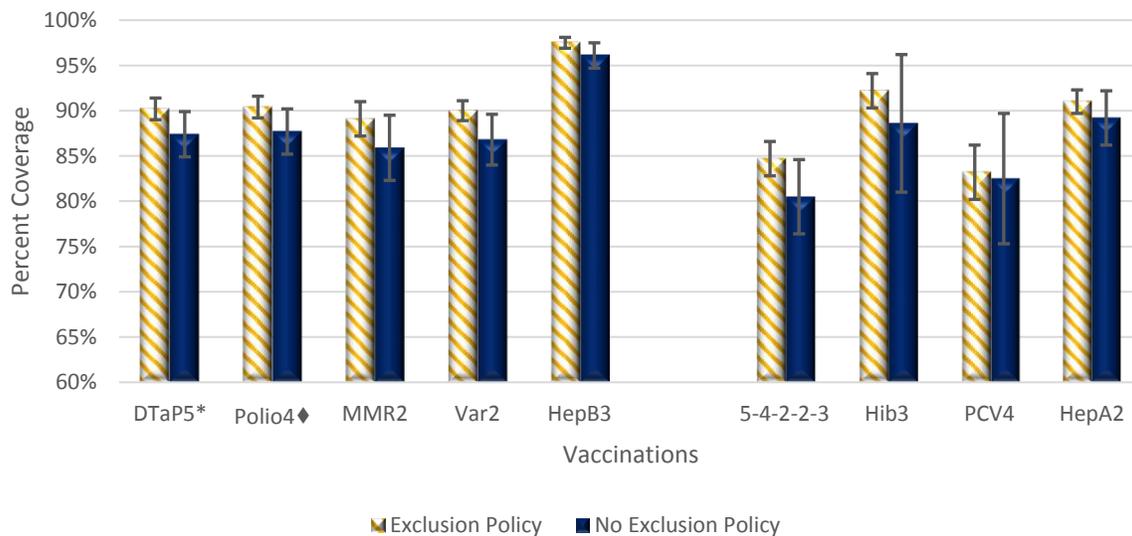
Of the 748 schools who responded about their exclusion policy, 656 were public schools and 92 were private.

When stratified by school type, 490 (74.7%) of public schools indicated exclusion of non-UTD students versus 41 (44.6%) of private schools.

Vaccination Coverage Stratified by School Exclusion Policy

There were 378 of the 748 schools also provided vaccination records for the coverage assessment; a majority, 224 (59.3%) schools, reported a policy for exclusion of non-UTD children. When vaccination coverage was stratified by exclusion status, it was observed that compared to schools that did not exclude, schools that reported an exclusion policy had proportionally higher vaccination coverage levels for every vaccine examined (Figure 9).

Figure 92: Vaccination coverage of kindergarten students by vaccine and school exclusion policy, Kansas, 2014-2015



*5 doses of DTaP or 4 doses if the fourth is administered on or after the fourth birthday
 ♦4 doses of Polio or 3 doses if 3rd is administered on or after the fourth birthday

Discussion

All vaccinations required for school entry were above 88% coverage for Kansas kindergartners for the 2014-2015 school year. DTaP4 and HepB3 were the only vaccinations that met the HP2020 goal of at least 95% coverage. Coverage levels for DTaP5, Polio4, MM2, Var2, and the 5-4-2-2-3 series each increased approximately 2% in the 30 days following the start of school. No increases in vaccination coverage for Hib3 or PCV4 were noted. However, these vaccines are not being required for school may not be consistently documented on vaccination records causing an underreporting of true coverage levels.

Vaccination coverage levels between types of school (public vs private) and counties (rural vs moderately populated vs urban) were compared to determine if there was a difference in rates. Children in private schools had significantly higher vaccination coverage levels for Hib3 and PCV4. To further explore what may be affecting these levels; estimates were compared among counties of different population densities. Compared to urban counties, rural counties had significantly higher vaccination coverage levels for all recommended vaccinations (Hib3, HepA2 and PCV4). These differences indicate that counties with higher school population density, such as urban schools with an average of 51 kindergarten students per school, tend to have lower vaccination coverage compared to rural schools which have an average of 27 kindergarten students per school; especially for recommended vaccinations.

Vaccination coverage levels were also compared among schools based on the exemption policies to determine if excluding children not UTD for required vaccinations affected coverage. It was observed that schools with policies to exclude had proportionally higher coverage levels for every vaccine analyzed compared to schools without an exemption policy. This indicates exclusion policies may be an effective incentive for students to become UTD prior to the start of school.

Exemptions for vaccination were analyzed and 1.5% of kindergartners reported an exemption, of which the majority were classified as religious. This is the first academic year since 2010-2011 that total and religious exemption rates have decreased; however, this decrease is not significant at only 0.1%. Exemption rates are of particular importance because when children are exempt from vaccination or not up to date they are at risk for contracting vaccine preventable diseases (VPDs) and subsequently spreading the disease to other unimmunized or under-immunized individuals (e.g., infants) or other high-risk persons. Therefore, it is important that the numbers of exempt and under-immunized school-aged children remain low. By having greater vaccination coverage, there is an increase in herd immunity, which leads to lower disease incidence and limits the size of VPD outbreaks. However, due to unvaccinated and under-immunized individuals, the United States has experienced increased incidence of disease. In 2012 there was an increase in the number of pertussis cases throughout the United States. Kansas experienced a statewide outbreak in 2012 with 887 cases a large increase compared to the 145 cases reported in 2011.

Limitations

A limitation of this study is that vaccinations recommended for school-aged children are not required for school entry and may not be consistently reported on the vaccination record, creating a possible underreporting of coverage for Hib3, HepA2, and PCV4. Additionally, school personnel reported the number of exempt students in their school in aggregate. Therefore, KDHE was unable to verify exemptions reported. Finally, no descriptive data was collected about sex, race, or ethnicity.

While history of varicella disease may have been marked on the KCI or other vaccination record, date of disease was rarely given. Without knowing the date of disease, it cannot be definitively determined that the disease took place before the first scheduled dose of varicella containing vaccine. Children with marked history of disease, regardless of number of varicella vaccinations were not included in analysis for varicella coverage. Of the 9,219 records analyzed, 43 (0.5%) were recorded as having disease history and removed from varicella coverage analysis.

Strengths

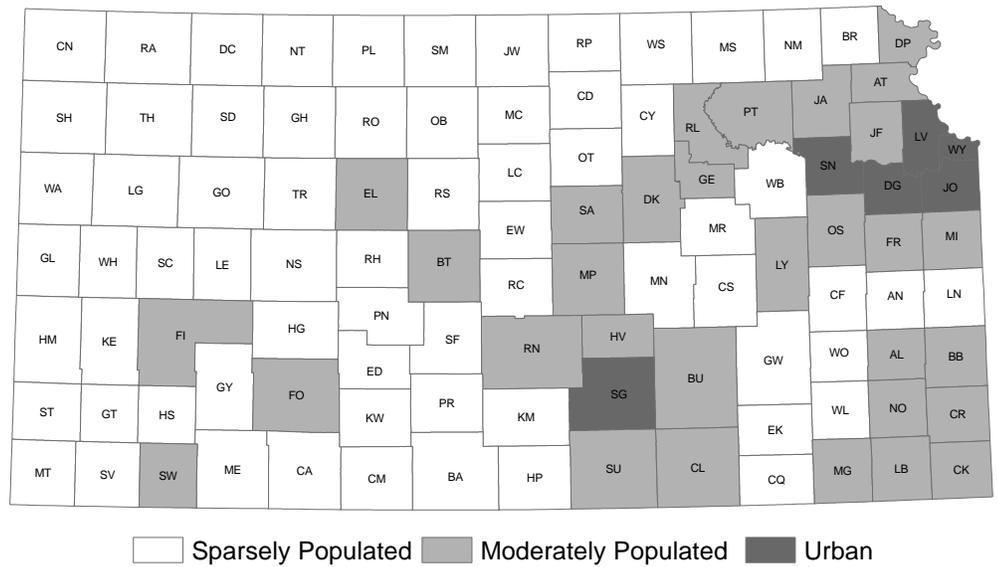
Despite the limitations, this annual vaccination survey provided a good estimation of vaccination coverage for kindergarten children enrolled in public and private schools in Kansas. This document allows state and local officials to identify counties and regions with low vaccine coverage levels to focus implementation of enhanced vaccination delivery methods and educational campaigns that can aid in Kansas achieving national vaccination coverage metrics. This study also had a high response percentage in terms of survey participation. This included response levels among schools that received requests for vaccination records (94.0%) and schools that received requests for exemption data (93.6%).

Appendix 1: Kansas counties categorized based on population density, 2010

Sparsely Populated	
Anderson	Marshall
Barber	Meade
Brown	Mitchell
Chase	Morris
Chautauqua	Morton
Cheyenne	Nemaha
Clark	Ness
Clay	Norton
Cloud	Osborne
Coffey	Ottawa
Comanche	Pawnee
Decatur	Phillips
Edwards	Pratt
Elk	Rawlins
Ellsworth	Republic
Gove	Rice
Graham	Rooks
Grant	Rush
Gray	Russell
Greeley	Scott
Greenwood	Sheridan
Hamilton	Sherman
Harper	Smith
Haskell	Stafford
Hodgeman	Stanton
Jewell	Stevens
Kearny	Thomas
Kingman	Trego
Kiowa	Wabaunsee
Lane	Wallace
Lincoln	Washington
Linn	Wichita
Logan	Wilson
Marion	Woodson

Moderately Populated	
Allen	Jackson
Atchison	Jefferson
Barton	Labette
Bourbon	Lyon
Butler	McPherson
Cherokee	Miami
Cowley	Montgomery
Crawford	Neosho
Dickinson	Osage
Doniphan	Pottawatomie
Ellis	Reno
Finney	Riley
Ford	Saline
Franklin	Seward
Geary	Sumner
Harvey	

Urban
Douglas
Johnson
Leavenworth
Sedgwick
Shawnee
Wyandotte



Persons per Square Mile in Peer Groups
 Sparsely Populated = ≤ 19.9
 Moderately Populated = 20 – 149.9
 Urban = ≥ 150.0

Appendix 2: Average school immunization coverage levels for children at school entry for Kansas counties, 2014-2015 (percentages) §

COUNTY	DTaP5*	Polio4♦	MMR2	Var2	HepB3	5-4-2-2-3	Hib3	PCV4	HepA2
STATEWIDE	88%	89%	88%	88%	97%	83%	90%	82%	91%
ALLEN	96%	93%	96%	95%	97%	90%	95%	94%	86%
ANDERSON	90%	91%	91%	91%	96%	88%	95%	88%	88%
ATCHISON	94%	95%	94%	93%	100%	90%	98%	97%	93%
BARBER	98%	100%	94%	94%	98%	94%	98%	92%	94%
BARTON	93%	92%	90%	92%	98%	89%	98%	95%	96%
BOURBON	89%	84%	84%	80%	97%	78%	98%	74%	78%
BROWN	98%	98%	98%	98%	98%	97%	98%	95%	90%
BUTLER	93%	92%	95%	96%	98%	89%	99%	88%	89%
CHASE	67%	71%	67%	67%	79%	67%	79%	71%	71%
CHAUTAUQUA	92%	95%	87%	87%	97%	85%	97%	79%	95%
CHEROKEE	87%	85%	85%	85%	99%	81%	92%	85%	85%
CHEYENNE	93%	89%	89%	89%	100%	86%	96%	100%	96%
CLARK	81%	81%	81%	84%	100%	81%	100%	94%	91%
CLAY	95%	93%	98%	98%	98%	93%	95%	90%	93%
CLOUD	84%	82%	84%	84%	98%	82%	87%	91%	84%
COFFEY	80%	85%	78%	78%	94%	78%	89%	83%	81%
COMANCHE	100%	97%	100%	100%	97%	97%	100%	90%	93%
COWLEY	88%	86%	88%	86%	99%	82%	93%	95%	90%
CRAWFORD	82%	83%	83%	86%	96%	79%	93%	86%	70%
DECATUR	81%	81%	81%	81%	97%	81%	97%	94%	78%
DICKINSON	90%	89%	91%	88%	96%	84%	98%	90%	89%
DONIPHAN	96%	92%	92%	96%	96%	88%	96%	94%	96%
DOUGLAS	84%	84%	85%	83%	94%	80%	86%	77%	73%
EDWARDS	100%	100%	100%	97%	97%	94%	100%	88%	97%
ELK	76%	85%	76%	76%	100%	76%	94%	94%	88%
ELLIS	96%	94%	96%	94%	98%	89%	90%	95%	54%
ELLSWORTH	87%	90%	87%	86%	99%	86%	94%	88%	81%
FINNEY	92%	92%	92%	90%	99%	89%	95%	98%	88%
FORD	89%	90%	88%	88%	99%	86%	95%	92%	89%
FRANKLIN	93%	92%	95%	95%	99%	90%	95%	94%	90%
GEARY	92%	88%	90%	91%	96%	85%	94%	95%	86%
GOVE	87%	90%	87%	85%	97%	82%	95%	85%	87%
GRAHAM	97%	97%	97%	97%	100%	97%	100%	97%	100%
GRANT	97%	87%	93%	93%	97%	87%	97%	97%	93%
GRAY	82%	82%	79%	82%	97%	72%	89%	92%	89%
GREELEY‡									
GREENWOOD	90%	85%	85%	85%	100%	83%	100%	95%	88%
HAMILTON	100%	100%	100%	100%	100%	100%	100%	97%	97%
HARPER	86%	91%	88%	85%	98%	82%	88%	86%	86%
HARVEY	76%	76%	90%	90%	86%	71%	78%	92%	71%
HASKELL	90%	92%	92%	90%	98%	88%	96%	96%	90%
HODGEMAN‡									
JACKSON	89%	90%	91%	90%	98%	88%	91%	93%	89%

COUNTY	DTaP5*	Polio4♦	MMR2	Var2	HepB3	5-4-2-2-3	Hib3	PCV4	HepA2
STATEWIDE	88%	89%	88%	88%	97%	83%	90%	82%	91%
JEFFERSON	90%	91%	88%	88%	99%	86%	98%	94%	92%
JEWELL	76%	76%	76%	76%	94%	76%	94%	71%	88%
JOHNSON	86%	86%	88%	86%	95%	81%	82%	89%	75%
KEARNY	91%	87%	93%	93%	98%	87%	93%	93%	83%
KINGMAN	76%	81%	76%	74%	89%	69%	92%	76%	76%
KIOWA	93%	93%	93%	96%	100%	89%	93%	89%	96%
LABETTE	89%	87%	87%	87%	98%	84%	91%	93%	86%
LANE	100%	95%	100%	100%	100%	95%	100%	100%	95%
LEAVENWORTH	95%	94%	95%	94%	97%	89%	94%	94%	86%
LINCOLN	88%	84%	88%	88%	100%	84%	98%	96%	94%
LINN	86%	87%	87%	86%	97%	78%	93%	86%	87%
LOGAN	87%	87%	87%	87%	100%	87%	100%	100%	97%
LYON	84%	91%	80%	82%	98%	79%	97%	91%	88%
MARION	87%	90%	82%	85%	99%	76%	96%	87%	88%
MARSHALL	95%	94%	93%	91%	99%	87%	98%	99%	96%
MCPHERSON	92%	91%	92%	91%	96%	87%	39%	71%	34%
MEADE	95%	97%	95%	95%	100%	95%	100%	100%	95%
MIAMI	87%	85%	87%	89%	95%	80%	71%	92%	68%
MITCHELL	99%	97%	99%	94%	99%	93%	96%	97%	89%
MONTGOMERY	81%	81%	82%	82%	92%	76%	86%	81%	77%
MORRIS	90%	94%	94%	94%	94%	77%	94%	97%	81%
MORTON	92%	95%	93%	90%	100%	88%	100%	100%	90%
NEMAHA	76%	85%	78%	76%	99%	72%	98%	94%	91%
NEOSHO	92%	97%	92%	92%	98%	88%	94%	85%	42%
NESS	86%	86%	86%	86%	100%	71%	100%	100%	100%
NORTON	93%	93%	90%	83%	100%	80%	98%	95%	98%
OSAGE	87%	89%	83%	86%	97%	79%	92%	81%	86%
OSBORNE	88%	100%	81%	88%	100%	81%	100%	88%	100%
OTTAWA	92%	95%	92%	92%	99%	91%	100%	96%	95%
PAWNEE	95%	93%	93%	93%	100%	93%	100%	95%	95%
PHILLIPS	89%	93%	89%	87%	100%	85%	98%	96%	91%
POTTAWATOMIE	86%	84%	84%	82%	95%	81%	92%	86%	88%
PRATT	94%	97%	94%	94%	97%	94%	95%	97%	92%
RAWLINS	88%	84%	92%	92%	96%	84%	92%	96%	92%
RENO	94%	93%	93%	93%	98%	88%	97%	93%	89%
REPUBLIC	94%	94%	94%	91%	96%	91%	96%	89%	91%
RICE	88%	91%	89%	85%	98%	82%	87%	88%	76%
RILEY	88%	88%	88%	86%	96%	82%	93%	82%	84%
ROOKS	97%	97%	100%	97%	98%	95%	97%	100%	97%
RUSH	87%	90%	84%	84%	100%	81%	94%	100%	81%
RUSSELL	93%	90%	95%	95%	98%	88%	95%	95%	85%
SALINE	90%	91%	90%	90%	98%	84%	96%	96%	87%
SCOTT	90%	100%	87%	87%	100%	87%	100%	100%	97%
SEDGWICK	88%	88%	88%	87%	97%	82%	94%	92%	83%
SEWARD	91%	88%	90%	89%	99%	87%	92%	92%	84%
SHAWNEE	85%	89%	80%	83%	97%	76%	95%	91%	90%

COUNTY	DTaP5*	Polio4♦	MMR2	Var2	HepB3	5-4-2-2-3	Hib3	PCV4	HepA2
STATEWIDE	88%	89%	88%	88%	97%	83%	90%	82%	91%
SHERIDAN	92%	92%	88%	88%	100%	88%	100%	100%	100%
SHERMAN	93%	100%	90%	90%	100%	83%	100%	97%	93%
SMITH	96%	96%	96%	96%	100%	96%	100%	92%	96%
STAFFORD	91%	91%	91%	89%	98%	87%	91%	91%	85%
STANTON‡									
STEVENS	77%	80%	77%	73%	100%	70%	93%	100%	90%
SUMNER	84%	84%	81%	81%	96%	76%	89%	87%	74%
THOMAS	86%	88%	86%	85%	98%	85%	97%	96%	91%
TREGO	97%	97%	93%	97%	100%	93%	100%	97%	90%
WABAUNSEE	90%	90%	90%	90%	99%	90%	96%	96%	90%
WALLACE	63%	63%	63%	63%	100%	63%	100%	63%	100%
WASHINGTON	93%	93%	91%	89%	100%	89%	98%	98%	93%
WICHITA	100%	100%	100%	97%	100%	97%	100%	94%	94%
WILSON	96%	100%	96%	95%	99%	93%	99%	92%	91%
WOODSON	97%	97%	97%	97%	100%	90%	100%	93%	90%
WYANDOTTE	90%	93%	90%	90%	96%	84%	81%	93%	78%

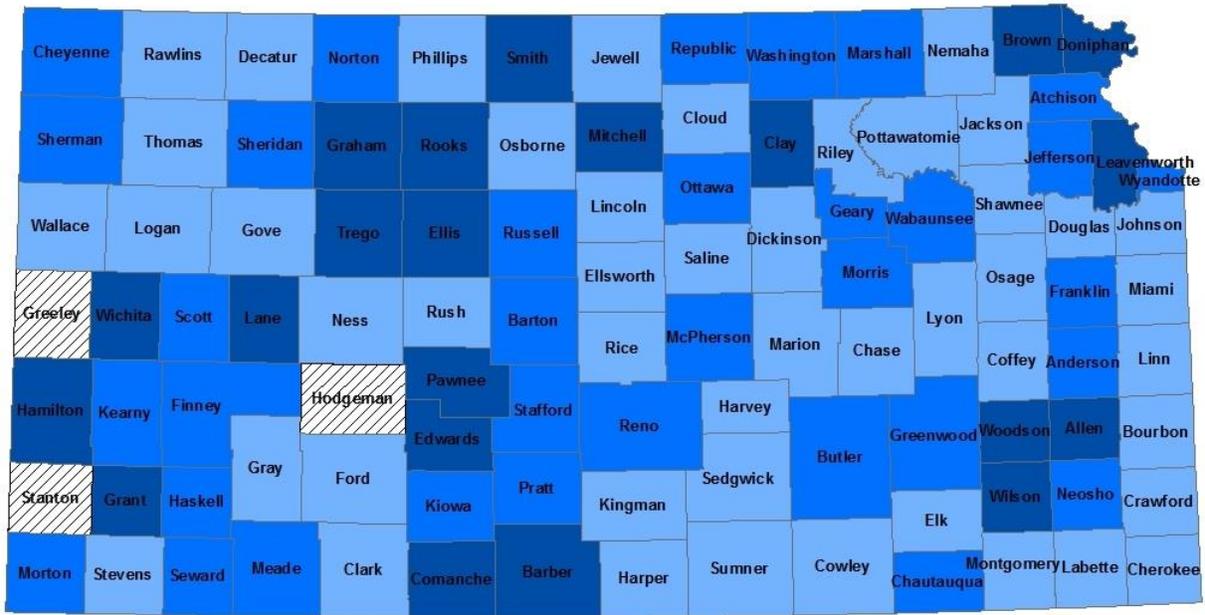
§ Due to Hib3, HepA2, and PCV4 not being required for school entry, these vaccines may not consistently be reported on the immunization record, thus decreasing coverage levels for the individual vaccines. This is evident for several counties that have extremely low levels for the Hib3, HepA2 and PCV4 coverage levels.

*5 doses of DTaP or 4 doses if the fourth is administered on or after the fourth birthday.

♦4 doses of Polio or 3 doses if 3rd is administered on or after the fourth birthday

‡ No data available

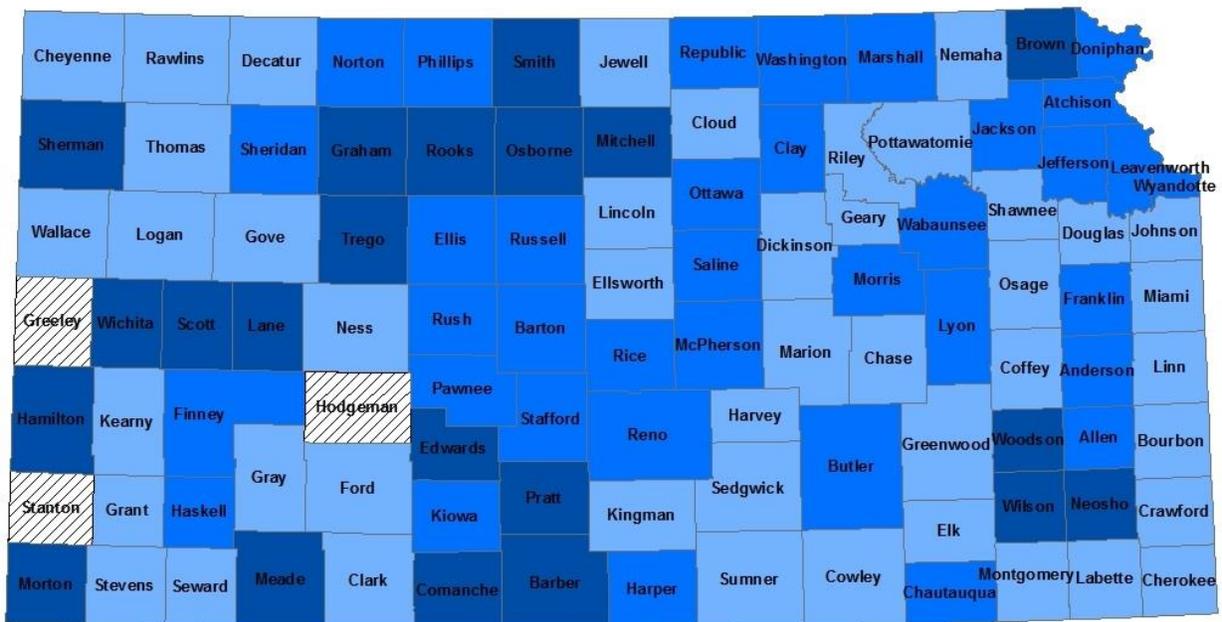
Appendix 3: Maps of immunization levels by county, 2014-2015 Kindergarten Survey
DTaP5 Coverage for Kindergarten Survey, 2014-2015



No Data
 Less than 90%
 90% to 94%
 95% or Greater

5 doses of DTaP or 4 doses if the fourth is administered on or after the fourth birthday

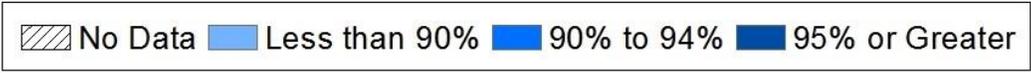
Polio4 Coverage for Kindergarten Survey, 2014-2015



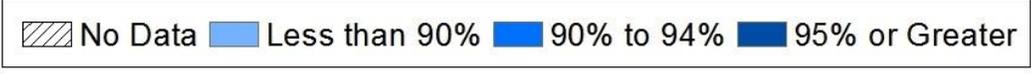
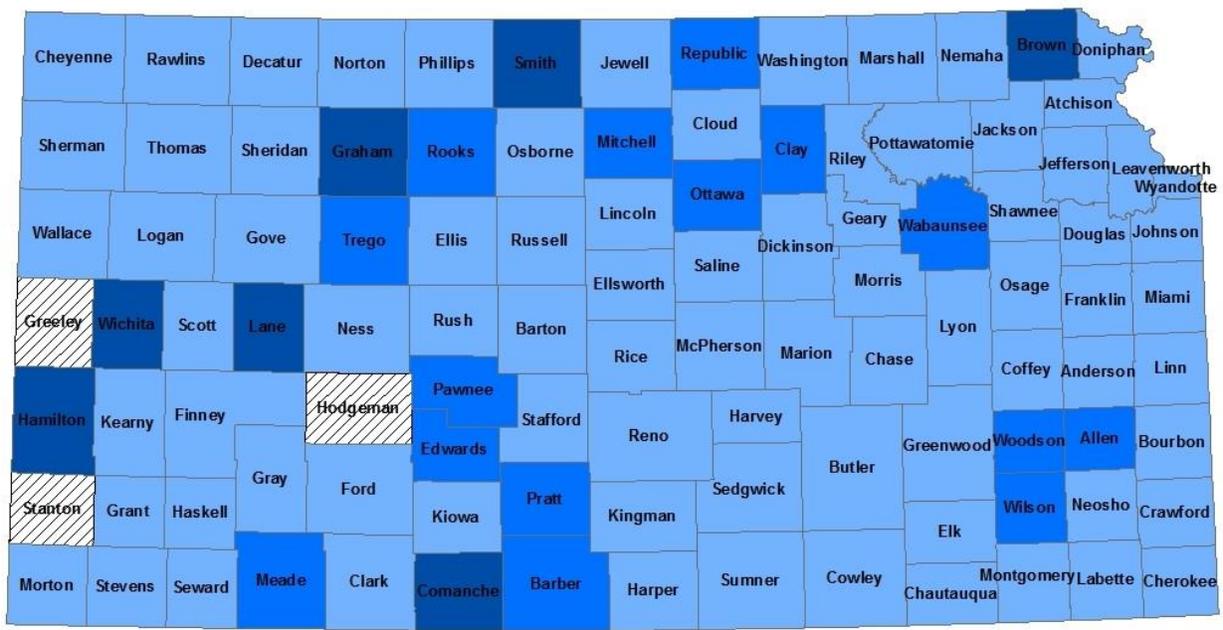
No Data
 Less than 90%
 90% to 94%
 95% or Greater

MMR2 Coverage for Kindergarten Survey, 2014-2015

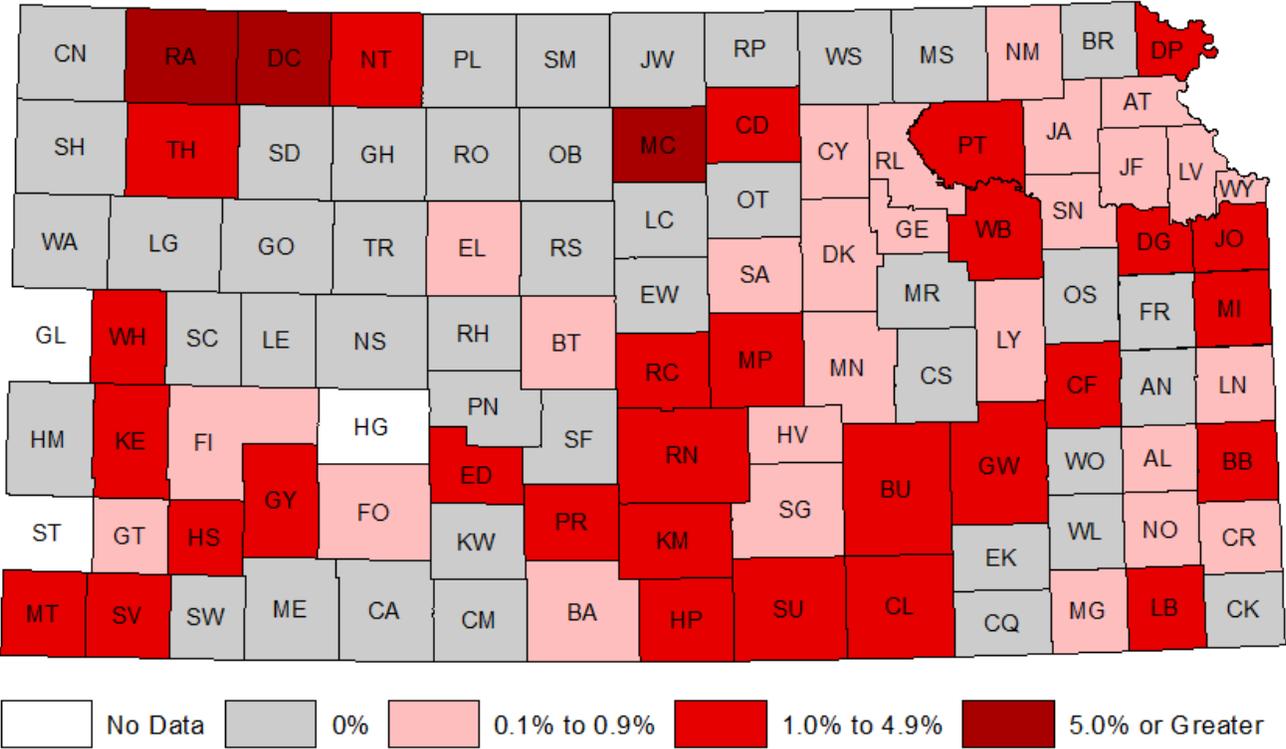
HepB3 Coverage for Kindergarten Survey, 2014-2015



5-4-2-2-3 Coverage for Kindergarten Survey, 2014-2015



Percent of Kindergartners with a Religious Exemption by County, 2014-2015



Appendix 5: CDC's 2012 Advisory Committee on Immunization Practices (ACIP) Recommendations <http://www.cdc.gov/mmwr/preview/mmwrhtml/su6201a2.htm>

FIGURE 1. Recommended immunization schedule for persons aged 0 through 6 years — United States, 2012 (for those who fall behind or start late, see the catch-up schedule [Figure 3])

Vaccine ▼	Age ►	Birth	1 month	2 months	4 months	6 months	9 months	12 months	15 months	18 months	19–23 months	2–3 years	4–6 years
Hepatitis B ¹	HepB	HepB	HepB			HepB		HepB					
Rotavirus ²				RV	RV	RV ²							
Diphtheria, tetanus, pertussis ³				DTaP	DTaP	DTaP	See footnote ³		DTaP				DTaP
<i>Haemophilus influenzae</i> type b ⁴				Hib	Hib	Hib ⁴		Hib					
Pneumococcal ⁵				PCV	PCV	PCV		PCV				PPSV	
Inactivated poliovirus ⁶				IPV	IPV			IPV					IPV
Influenza ⁷								Influenza (yearly)					
Measles, mumps, rubella ⁸								MMR		See footnote ⁸			MMR
Varicella ⁹								VAR		See footnote ⁹			VAR
Hepatitis A ¹⁰								Dose 1 ¹⁰				HepA series	
Meningococcal ¹¹								MCV4 — See footnote ¹¹					

This schedule includes recommendations in effect as of December 23, 2011. Any dose not administered at the recommended age should be administered at a subsequent visit, when indicated and feasible. The use of a combination vaccine generally is preferred over separate injections of its equivalent component vaccines. Vaccination providers should consult the relevant Advisory Committee on Immunization Practices (ACIP) statement for detailed recommendations, available online at <http://www.cdc.gov/vaccines/pubs/adp-list.htm>. Clinically significant adverse events that follow vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS) online (<http://www.vaers.hhs.gov>) or by telephone (800-822-7967).

1. Hepatitis B (HepB) vaccine. (Minimum age: birth)

- At birth:**
 - Administer monovalent HepB vaccine to all newborns before hospital discharge.
 - For infants born to hepatitis B surface antigen (HBsAg)-positive mothers, administer HepB vaccine and 0.5 mL of hepatitis B immune globulin (HBIG) within 12 hours of birth. These infants should be tested for HBsAg and antibody to HBsAg (anti-HBs) 1 to 2 months after receiving the last dose of the series.
 - If mother's HBsAg status is unknown, within 12 hours of birth administer HepB vaccine for infants weighing ≥2,000 grams, and HepB vaccine plus HBIG for infants weighing <2,000 grams. Determine mother's HBsAg status as soon as possible and, if she is HBsAg-positive, administer HBIG for infants weighing ≥2,000 grams (no later than age 1 week).

Doses after the birth dose:

- The second dose should be administered at age 1 to 2 months. Monovalent HepB vaccine should be used for doses administered before age 6 weeks.
 - Administration of a total of 4 doses of HepB vaccine is permissible when a combination vaccine containing HepB is administered after the birth dose.
 - Infants who did not receive a birth dose should receive 3 doses of a HepB-containing vaccine starting as soon as feasible (Figure 3).
 - The minimum interval between dose 1 and dose 2 is 4 weeks, and between dose 2 and 3 is 8 weeks. The final (third or fourth) dose in the HepB vaccine series should be administered no earlier than age 24 weeks and at least 16 weeks after the first dose.
- 2. Rotavirus (RV) vaccines.** (Minimum age: 6 weeks for both RV-1 [Rotarix] and RV-5 [Rota Teq])
- The maximum age for the first dose in the series is 14 weeks, 6 days; and 8 months, 0 days for the final dose in the series. Vaccination should not be initiated for infants aged 15 weeks, 0 days or older.
 - If RV-1 (Rotarix) is administered at ages 2 and 4 months, a dose at 6 months is not indicated.
- 3. Diphtheria and tetanus toxoids and acellular pertussis (DTaP) vaccine.** (Minimum age: 6 weeks)
- The fourth dose may be administered as early as age 12 months, provided at least 6 months have elapsed since the third dose.
- 4. *Haemophilus influenzae* type b (Hib) conjugate vaccine.** (Minimum age: 6 weeks)
- If PRP-OMP (PedvaxHIB or Comvax [HepB-Hib]) is administered at ages 2 and 4 months, a dose at age 6 months is not indicated.
 - Hiberix should only be used for the booster (final) dose in children aged 12 months through 4 years.
- 5. Pneumococcal vaccines.** (Minimum age: 6 weeks for pneumococcal conjugate vaccine [PCV]; 2 years for pneumococcal polysaccharide vaccine [PPSV])
- Administer 1 dose of PCV to all healthy children aged 24 through 59 months who are not completely vaccinated for their age.
 - For children who have received an age-appropriate series of 7-valent PCV (PCV7), a single supplemental dose of 13-valent PCV (PCV13) is recommended for:
 - All children aged 14 through 59 months
 - Children aged 60 through 71 months with underlying medical conditions.
 - Administer PPSV at least 8 weeks after last dose of PCV to children aged 2 years or older with certain underlying medical conditions, including a cochlear implant. See *MMWR* 2010;59(No. RR-11), available at <http://www.cdc.gov/mmwr/pdf/rr/rr5911.pdf>.
- 6. Inactivated poliovirus vaccine (IPV).** (Minimum age: 6 weeks)
- If 4 or more doses are administered before age 4 years, an additional dose should be administered at age 4 through 6 years.
 - The final dose in the series should be administered on or after the fourth birthday and at least 6 months after the previous dose.

7. Influenza vaccines. (Minimum age: 6 months for trivalent inactivated influenza vaccine [TIV]; 2 years for live, attenuated influenza vaccine [LAIV])

- For most healthy children aged 2 years and older, either LAIV or TIV may be used. However, LAIV should not be administered to some children, including 1) children with asthma, 2) children 2 through 4 years who had wheezing in the past 12 months, or 3) children who have any other underlying medical conditions that predispose them to influenza complications. For all other contraindications to use of LAIV, see *MMWR* 2010;59(No. RR-8), available at <http://www.cdc.gov/mmwr/pdf/rr/rr5908.pdf>.
- For children aged 6 months through 8 years:
 - For the 2011–12 season, administer 2 doses (separated by at least 4 weeks) to those who did not receive at least 1 dose of the 2010–11 vaccine. Those who received at least 1 dose of the 2010–11 vaccine require 1 dose for the 2011–12 season.
 - For the 2012–13 season, follow dosing guidelines in the 2012 ACIP influenza vaccine recommendations.

8. Measles, mumps, and rubella (MMR) vaccine. (Minimum age: 12 months)

- The second dose may be administered before age 4 years, provided at least 4 weeks have elapsed since the first dose.
 - Administer MMR vaccine to infants aged 6 through 11 months who are traveling internationally. These children should be revaccinated with 2 doses of MMR vaccine, the first at ages 12 through 15 months and at least 4 weeks after the previous dose, and the second at ages 4 through 6 years.
- 9. Varicella (VAR) vaccine.** (Minimum age: 12 months)
- The second dose may be administered before age 4 years, provided at least 3 months have elapsed since the first dose.
 - For children aged 12 months through 12 years, the recommended minimum interval between doses is 3 months. However, if the second dose was administered at least 4 weeks after the first dose, it can be accepted as valid.

10. Hepatitis A (HepA) vaccine. (Minimum age: 12 months)

- Administer the second (final) dose 6 to 18 months after the first.
- Unvaccinated children 24 months and older at high risk should be vaccinated. See *MMWR* 2006;55(No. RR-7), available at <http://www.cdc.gov/mmwr/pdf/rr/rr5507.pdf>.
- A 2-dose HepA vaccine series is recommended for anyone aged 24 months and older, previously unvaccinated, for whom immunity against hepatitis A virus infection is desired.

11. Meningococcal conjugate vaccines, quadrivalent (MCV4). (Minimum age: 9 months for Menactra [MCV4-D], 2 years for Menveo [MCV4-CRM])

- For children aged 9 through 23 months 1) with persistent complement component deficiency; 2) who are residents of or travelers to countries with hyperendemic or epidemic disease; or 3) who are present during outbreaks caused by a vaccine serogroup, administer 2 primary doses of MCV4-D, ideally at ages 9 months and 12 months or at least 8 weeks apart.
- For children aged 24 months and older with 1) persistent complement component deficiency who have not been previously vaccinated; or 2) anatomic/functional asplenia, administer 2 primary doses of either MCV4 at least 8 weeks apart.
- For children with anatomic/functional asplenia, if MCV4-D (Menactra) is used, administer at a minimum age of 2 years and at least 4 weeks after completion of all PCV doses.
- See *MMWR* 2011;60:72–6, available at <http://www.cdc.gov/mmwr/pdf/wk/mm6003.pdf>, and Vaccines for Children Program resolution No. 6/11-1, available at <http://www.cdc.gov/vaccines/programs/vfc/downloads/resolutions/06-11/1mering-mcv.pdf>, and *MMWR* 2011;60:1391–2, available at <http://www.cdc.gov/mmwr/pdf/wk/mm6040.pdf>, for further guidance, including revaccination guidelines.

This schedule is approved by the Advisory Committee on Immunization Practices (<http://www.cdc.gov/vaccines/recs/acip>), the American Academy of Pediatrics (<http://www.aap.org>), and the American Academy of Family Physicians (<http://www.aafp.org>).

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