

Retrospective Vaccination Coverage Survey

2010-2011 Results (School Year 2014-2015)



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Abbreviations

CI	Confidence interval
HP2020	Healthy People 2020
KCI	Kansas Certificate of Immunizations
KDHE	Kansas Department of Health and Environment
KSDE	Kansas State Department of Education
UTD	Up to date

Vaccine Abbreviations

DTaP4	4 doses of diphtheria, tetanus toxoids, and acellular pertussis vaccines including diphtheria and tetanus toxoids (DTaP/DT) vaccine
HepA2	2 doses of hepatitis A vaccine
HepB3	3 doses of hepatitis B vaccine
Hib3	3 doses of <i>Haemophilus influenzae</i> type b vaccine
MMR1	1 dose of measles, mumps, and rubella vaccine
PCV4	4 doses of pneumococcal conjugate vaccine
Polio3	3 doses of polio vaccine
Var1	1 dose of varicella vaccine
4-3-1-3-3	DTaP4 – Polio3 – MMR1 – Hib3 – HepB3
4-3-1-3-3-1-4	DTaP4 – Polio3 – MMR1 – Hib3 – HepB3 – Var1 – PCV4

Executive Summary

Overview

The Kansas Certificates of Immunizations (KCIs) and other vaccination records for children enrolled in a kindergarten class in Kansas public and private schools during the 2014-2015 school year were collected and vaccination coverage was evaluated for all recommended vaccines. Retrospective vaccination coverage levels were calculated for children at 24 months of age and 35 months of age. 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.

Coverage at 24 and 35 Months of Age

The statewide coverage levels at 24 months of age for all vaccines required for school entry in Kansas (DTaP4, Polio3, MMR1, Var1, and HepB3) were at or above 80%, with Polio3 having the highest coverage at 92%. Polio3 and HepB3 were the only vaccinations to meet the Healthy People 2020 (HP2020) goal of at least 90% coverage for children at 24 months of age. Coverage for the 4-3-1-3-3 vaccine series and the comprehensive 4-3-1-3-3-1-4 vaccine series were at 71% and 62%, respectively, for children at 24 months of age.

Vaccination coverage levels for all vaccines and both vaccine series (4-3-1-3-3 and 4-3-1-3-3-1-4) increased significantly when the children reached 35 months of age. Vaccination coverage levels for all vaccines required for school entry in Kansas (DTaP4, Polio3, MMR1, Var1, and HepB3) except for DTaP4 were at or above the HP2020 goal of 90% at 35 months. Among children at the age of 35 months, Polio3 remained the vaccine with the highest coverage at 94%. The two vaccine series measured in this study (4-3-1-3-3 and 4-3-1-3-3-1-4) increased to 79% and 70% respectively.

Vaccination Coverage Stratified by County Population Density Group

The 105 Kansas counties were grouped into three categories based on population density and coverage levels were compared among these groups. Sparsely populated (≤ 19.9 persons per square mile) counties had significantly higher coverage levels for all vaccines (DTaP4, Polio3, MMR1, Hib3, HepB3, Var1, PCV4, and HepA2) as well as the two vaccine series (4-3-1-3-3 and 4-3-1-3-3-1-4) when compared to urban counties. With the exception of Var1, sparsely populated counties had significantly higher coverage levels for all vaccines among children 24 months of age compared to moderately populated counties. At 35 months of age, children in sparsely populated counties had significantly higher vaccination coverage rates for all vaccines and the 4-3-1-3-3-1-4 vaccine series when compared to moderately populated urban counties.

Five counties met HP2020 coverage goals for all vaccines (DTaP4, Polio3, MMR1, Hib3, HepB3, Var1, PCV4, and HepA2) and vaccine series (4-3-1-3-3 and 4-3-1-3-3-1-4) for children at 35 months of age. All counties meeting HP2020 goals were sparsely populated. Fifty counties met HP2020 goals for the five vaccinations required for school entry in the state of Kansas (DTaP4, Polio3, MMR1, Var1, and HepB3). Of the counties meeting HP2020 goals for the five vaccinations required for entry into kindergarten, 40 (80%) were sparsely populated, 9 (18%) were moderately populated, and 1 (2%) was urban.

Retrospective Vaccination Coverage Survey 2010-2011 Results (School Year 2014-2015)

Introduction

Objective

This study was conducted to estimate the vaccination coverage levels of Kansas children at 24 months and 35 months of age.

Study Population

The study population included all Kansas kindergarten students who were between the ages of five and seven years on the first day of the 2014-2015 academic year enrolled in either a public or private school. Children who were home schooled or attended other special schools were not included in this analysis.

Study Design

A stratified, simple systematic random sampling design was utilized for this study, with each county and school type representing the strata. The characteristics of interest, or outcome variables, were the percentages of children who were fully immunized against diphtheria, tetanus, pertussis, polio, measles, mumps, rubella, *Haemophilus influenzae* type b, hepatitis A virus, hepatitis B virus, varicella, and pneumococcal disease. Vaccination coverage was retrospectively assessed for these children at 24 months and at 35 months of age.

Vaccination coverage was measured for single vaccines and combinations of vaccines according to the recommended vaccination schedule for children by 24 months of age.¹ Vaccination coverage levels were assessed for all kindergartners of the 2014-2015 academic year which met the inclusion criteria. The coverage levels refer to the point in time at which these children turned 24 months old, between September 2, 2010, and September 1, 2011, and the point in time at which these children turned 35 months old, between October 2, 2011 and October 1, 2012.

Methods

Sampling Techniques

To ensure an adequate sample size in each county and to maximize the efficiency of the sampling process, a probability sample was selected using a simple systematic random sampling technique. Sampling weights were calculated based on county and school type (public and private). The sampling methodology utilized for vaccination coverage in the 2014-2015 school year assessment was different from the sampling methodology used in previous years. The difference in sampling methodology prevents the accurate comparison of data from the 2014-2015 school year to any data published in previous Retrospective Vaccination Coverage Survey reports.

¹ The Recommended Immunization Schedule used, as reference for ages and immunization in this paper was the schedule approved by the Advisory Committee on Immunization Practices (ACIP), the American Academy of Pediatrics (AAP) and the American Academy of Family Physicians (AAFP) for the year 2012.

Data Collection

All Kansas public and private schools with a kindergarten class received a letter, co-signed by officials representing the Kansas Department of Health and Environment (KDHE) and the Kansas State Department of Education (KSDE), requesting their participation in the survey. The letters sent specified the number of records required to generate estimates of county-specific coverage levels and outlined the process of randomly selecting a probability sample of records. This sample of records did not differentiate between students with an exemption and students without an exemption. The study coordinator at each school (typically the school nurse) was instructed to randomly select kindergarten records based on the calculated sampling ratio for their county and school type. Schools were assigned to one of three groups: schools that send 30 vaccination records selected at random, schools that send all of the available vaccination records, and schools that do not submit any vaccination records. The schools that were assigned to the second group had a total kindergarten enrollment with fewer than 30 students. Therefore, no school was asked to send more than 30 vaccination records.

The schools could submit Kansas Certificates of Immunizations (KCIs) or any other form of paper vaccination record, including printouts from computerized record keeping programs. The study coordinators were instructed to remove all personal identifiers from paper records, except date of birth, to ensure confidentiality. Copies of the requested vaccination records were forwarded to KDHE.

Data Analysis

Consistent with previous studies, children who had a date of birth recorded on the KCI or other data source and were the appropriate age for the analysis were included in the denominator. Point estimates of coverage levels and 95% confidence intervals (95% CI) for DTaP4, Polio3, MMR1, Hib3, HepB3, Var1, PCV4, and HepA2 vaccines, the 4-3-1-3-3 series, and the 4-3-1-3-3-1-4 series were calculated at 24 and 35 months of age. Children were considered up-to-date (UTD) for single vaccination series if, at 24 months of age, he or she had received at least four doses of DTaP (DTaP4), three doses of polio (Polio3), one dose of measles, mumps, and rubella (MMR1), three doses of *H. influenzae* type b (Hib3), three doses of hepatitis B (HepB3), one dose of varicella (Var1) vaccine, four doses of pneumococcal conjugate (PCV4), or two doses of hepatitis A (HepA2). A child was considered up-to-date for the 4-3-1-3-3 series if he or she was up-to-date for DTaP4, Polio3, MMR1, Hib3, and HepB3 vaccinations and up-to-date for the 4-3-1-3-3-1-4 series if he or she was up-to-date for DTaP4, Polio3, MMR1, Hib3, HepB3, Var1, and PCV4 vaccinations.

The coverage levels produced by this analysis were compared to the HP2020 goals for childhood vaccination among children by age 19 to 35 months. These goals include having 90% vaccine coverage for DTaP4, Polio3, MMR1, Hib3, HepB3, Var1, and PCV4, 85% coverage for HepA2, and 80% coverage for the vaccine series (4-3-1-3-3-1-4). The results from this survey were compared with the results from the 2010 National Immunization Survey (NIS).^{2,3} Data for the population-based NIS are collected by the Centers for Disease Control and Prevention (CDC) through a telephone survey of randomly selected households. For accuracy, healthcare providers of children included in the survey are contacted by mail.

Analyses were performed using weighted data, and the analyses accounted for the complex sample design effect due to the stratification process and differences in sampling ratios between counties and

² <http://www.cdc.gov/vaccines/stats-surv/nis/default.htm#nis>

³ Children in the 2010 NIS were born between January 2008 and June 2010

school type.⁴ Sample weights were calculated using the number of kindergartners enrolled in a county in private or public schools and the number of records analyzed for that county.

The 105 counties were categorized based on population densities, and for the purpose of this analysis, counties were grouped into “urban” (≥ 150 persons per square mile), “moderately populated” (20-149.9 persons per square mile), and “sparsely populated” (≤ 19.9 persons per square mile) (Appendix 1). Vaccination coverage level estimates were compared among these groups.

Results

Data Collection

Letters of invitation to participate in the coverage assessment were sent to 414 Kansas schools; of these, 345 were public schools and 69 were private. These schools were asked to provide vaccination records for a specific number of students. Twenty-five schools did not respond or did not respond in time to be included in the analysis. The remaining 389 schools (349 public and 40 private) from 102 Kansas counties responded to the data request and were included in the analysis. This corresponds to a school participation of 94%. A total of 9,219 vaccination records from the 389 schools were included in the analysis, which is equivalent to one child selected for every 4.3 enrolled.

Vaccination Coverage at Age 24 and 35 Months

Statewide Vaccination Coverage

By 24 months of age, the vaccination coverage levels for DTaP4, Polio3, MMR1, Hib3, HepB3, and Var1 were all at or above 80%, with Polio3 having the highest coverage of any vaccination. HepA2 had the lowest vaccination coverage level at 40.1%. The vaccination coverage levels for 4-3-1-3-3 and 4-3-1-3-3-1-4 were 71.1% and 63.0%, respectively. Only HepB3 and Polio3 met the HP2020 goal of 90%. Vaccination coverage rates increased significantly for all vaccines (DTaP4, Polio3, MMR1, Hib3, HepB3, Var1, PCV4, and HepA2) and vaccine series (4-3-1-3-3 and 4-3-1-3-3-1-4) by the time the children reached 35 months of age with both MMR1 and Var1 also exceeded the HP2020 goal of 90%. The 4-3-1-3-3 series increased to 79.2%, and the 4-3-1-3-3-1-4 series had reached 70.9% coverage. The vaccination coverage estimate for HepA2 had the lowest with coverage of 70.9% by 35 months (Figure 1).

National Immunization Survey (NIS) Coverage at 19-35 Months of Age

Comparison of Kansas NIS results for vaccination coverage at 19-35 months of age with results from the current retrospective study, for 35-month-olds, showed significantly higher PCV4 coverage and significantly lower HepA2 coverage when measured in the Kansas NIS when compared to the Kansas retrospective study. Kansas NIS also showed significantly higher coverage of the 4-3-1-3-3-1-4 vaccine series when compared to the coverage in the Kansas retrospective study (Table 1).⁵ The other vaccination estimates (DTaP4, Polio3, MMR1, Hib3, HepB3, and Var1) did not vary significantly between the two surveys. The coverage levels measured by the retrospective study were significantly higher for the DTaP4, MMR1, HepB3, Var1, and HepA2 than for the US National immunization coverage measured by NIS but were significantly lower for the Hib3, PCV4, and the 4-3-1-3-3-1-4 series. There were no significant differences in vaccination coverage between US national and Kansas NIS coverage levels.

⁴ Complex survey design effect was accounted for by using the SAS Procedure PROC SURVEYFREQ.

⁵ <http://www.cdc.gov/vaccines/imz-managers/coverage/nis/child/data/tables-2009.html>

Figure 1: Vaccination coverage levels by vaccine at 24 and 35 months of age, Kansas 2010-2011

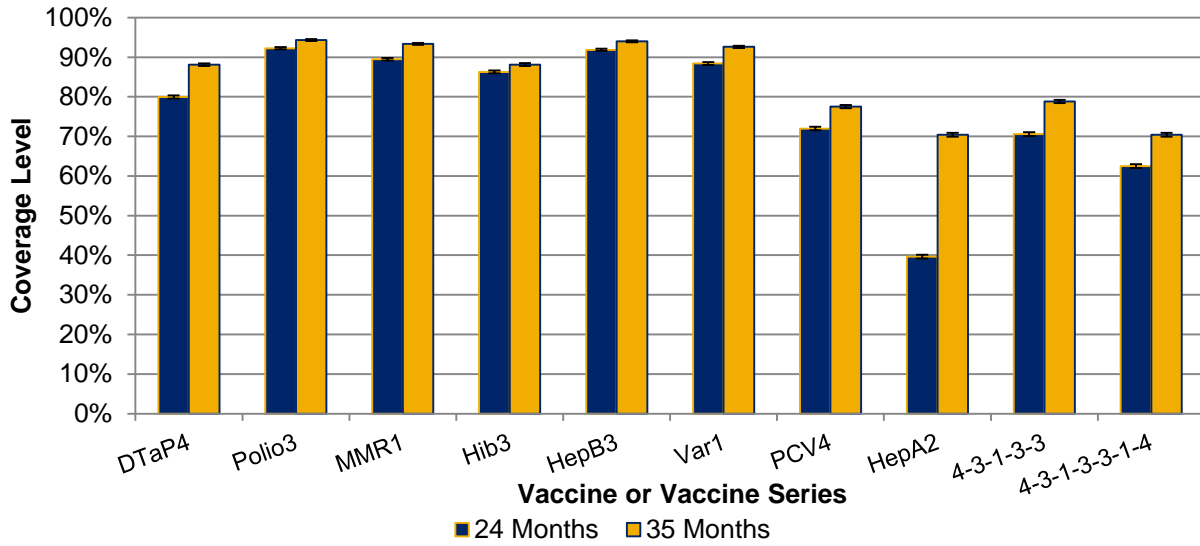


Table 1: Comparison of vaccination coverage rates as measured by the Kansas retrospective study and the National Immunization Survey

	Kansas Retrospective Study 35-month-olds % (95% CI)	Kansas NIS [§] 19-35-month-olds % (95% CI)	United States NIS [§] 19-35-month-olds % (95% CI)
DTaP4	88.1 (87.8-88.5)	87.6 (82.5 - 92.7)	84.6 (83.6 - 85.6)
Polio3	94.4 (94.1-94.6)	92.6 (88.3 - 96.9)	93.9 (93.3 - 94.5)
MMR1	93.3 (93.1-93.6)	91.0 (86.6 - 95.4)	91.6 (90.8 - 92.4)
Hib3	88.2 (87.8-88.5)	92.1 (87.7 - 96.5)	94.0 (93.4 - 94.6)
HepB3	94.0 (93.8-94.2)	93.8 (90.4 - 97.2)	91.1 (90.4 - 91.8)
Var1	92.6 (92.3-92.9)	89.6 (84.9 - 94.3)	90.8 (90.1 - 91.5)
PCV4	77.5 (77.1-78.0)	85.5 (80.1 - 90.9)	84.4 (83.4 - 85.4)
HepA2	70.4 (69.9-70.9)	60.8 (52.6 - 69.0)	52.2 (50.8 - 53.6)
4-3-1-3-3-1-4 series	70.4 (70.0-70.9)	79.0 (72.8 - 85.2)	73.3 (72.1 - 74.5)

[§]Based on 2010 NIS, children aged 19-35 months of age

Vaccination Coverage Stratified by County Population Density Group

Vaccination coverage was also analyzed at the county level. All vaccination coverage levels are listed by county in Appendix 2. Assessments were completed to determine the number of counties which met vaccine-specific HP2020 goals for vaccination coverage of 19-35-month-old children. Of the 102 Kansas counties included in the analysis, 98 (96%) counties met the HP2020 goal for MMR1 among 35-month-old children (Table 2). Five (5%) counties met the HP2020 goals for all vaccinations, including the 4-3-1-3-3-1-4 vaccine series. All five of these counties were sparsely populated counties, with fewer than 20.0 persons per square mile.

Fifty counties met the HP2020 goals for all five vaccines required for kindergarten entry (DTaP4, Polio3, MMR1, Var1, and HepB3) (Table 2). Of the fifty counties meeting these HP2020 goals, forty were sparsely populated counties, nine moderately populated counties, and one urban county. Only five counties met all the HP2020 immunization goals, constituting 0.6% of the 2011 birth cohort.

Table 2: Number of counties and percentage of 2011 birth cohort reaching Healthy People 2020 goal, by vaccine, Kansas 2010-2011

Vaccine	# of Counties (n=102)	% of 2011 Birth Cohort*
DTaP4	52	33.6%
Polio3	96	97.2%
MMR1	98	99.2%
Hib3	84	63.5%
HepB3	97	98.2%
Var1	92	95.1%
PCV4	26	4.1%
HepA2	12	2.1%
4-3-1-3-3-1-4	42	15.3%
Required Kindergarten Vaccines	50	33.5%
All HP2020 Goals	5	0.6%

* 2011 birth cohort includes all live births between January 1, 2009 and December 31, 2009

Counties were classified based on their population densities, and coverage levels were compared among the three categories: sparsely populated, moderately populated, and urban. Sparsely populated counties had significantly higher coverage levels in children at 24 months of age compared to urban counties for all vaccines (DTaP4, Polio3, MMR1, Hib3, HepB3, Var1, PCV4, and HepA2) and the 4-3-1-3-3-1-4 vaccine series. Sparsely populated counties also saw significantly higher coverage rates when compared to moderately populated counties for the 4-3-1-3-3-1-4 vaccine series and all vaccines except for Var1. Moderately populated counties had significantly higher coverage levels in 24-month-old children when compared to urban counties for six vaccines (Polio3, MMR1, Hib3, HepB3, Var1, and HepA2). Urban counties saw significantly higher coverage of DTaP4 and PCV4 among 24-month-old children when compared to coverage levels in moderately populated counties. There was no significant difference detected between coverage of the 4-3-1-3-3-1-4 vaccine series when comparing moderately populated counties and urban counties (Figure 2).

Vaccination coverage levels calculated for the same population of children at 35 months of age were stratified for each population density category. While all vaccines (DTaP4, Polio3, MMR1, Hib3, HepB3, Var1, PCV4, and HepA2) and the 4-3-1-3-3-1-4 vaccination series saw statistically significant increases in coverage at 35 months of age, HepA2 saw the greatest increase in coverage among all three county population density groups. Greater increases in vaccination coverage were seen in moderately populated and urban counties (Table 3).

Figure 2: Kansas vaccination coverage levels for 24-month-old children, by vaccine and county population density group, Kansas 2010-2011

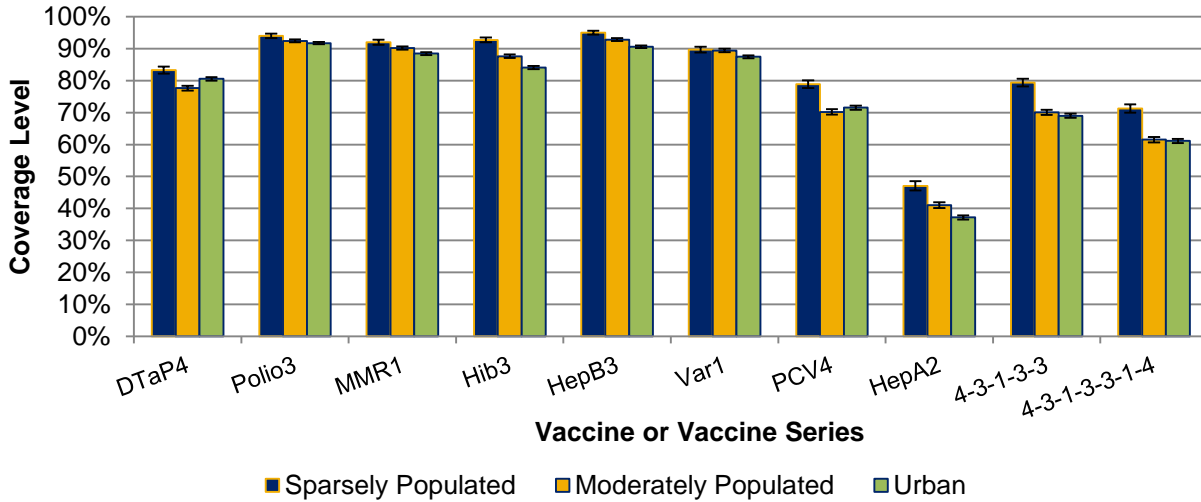
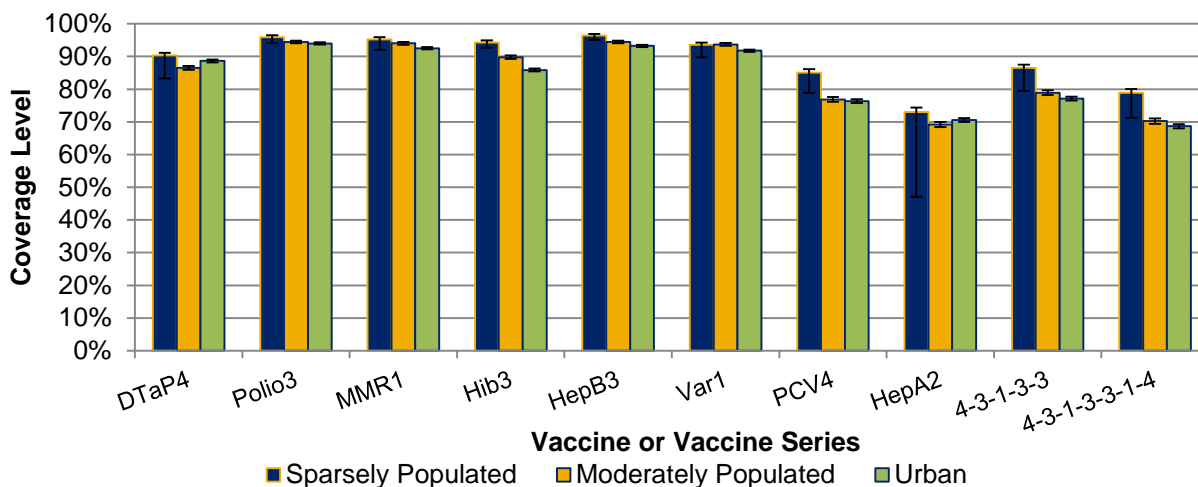


Table 3: Percent increase in vaccination coverage levels of Kansas children between 24 and 35 months of age, by vaccine and county population density group, Kansas 2010-2011

	Sparsely Populated (n=3008) % (95% CI)	Moderately Populated (n=4618) % (95% CI)	Urban (n=1593) % (95% CI)
DTaP4	7.0%	8.8%	8.1%
Polio3	1.9%	2.0%	2.2%
MMR1	3.2%	3.8%	4.1%
Hib3	1.6%	2.1%	1.8%
HepB3	1.4%	1.6%	2.7%
Var1	3.8%	4.2%	4.3%
PCV4	6.2%	6.6%	4.8%
HepA2	26.0%	28.2%	33.4%
4-3-1-3-3-1-4	7.1%	8.9%	8.1%

Sparsely populated counties had significantly higher vaccination coverage levels in 35-month-old children for all vaccines (DTaP4, Polio3, MMR1, Hib3, HepB3, Var1, PCV4, and HepA2) and the 4-3-1-3-3-1-4 vaccine series when compared to vaccination coverage levels among 35-month-old children in urban counties. Sparsely populated counties also saw significantly higher vaccination coverage in 35-month-old children for the 4-3-1-3-3-1-4 vaccine series and all but one vaccine (Var1) when compared to coverage rates in 35-month-old children in moderately populated counties. When compared to urban counties, moderately populated counties saw significantly higher vaccination coverage in 35-month-old children for four of the eight vaccines (MMR1, Hib3, HepB3, and Var1) as well as the 4-3-1-3-3-1-4 vaccine series. Urban counties had significantly higher coverage rates for DTaP4 and HepA2 when compared to moderately populated counties (Figure 3).

Figure 3: Vaccination coverage levels of 35-month-old children in Kansas, by vaccine and county population density group, Kansas 2010-2011



Discussion

All individual vaccinations required for school entry were above 80% coverage at 24 months of age. The greatest increase in coverage between 24 and 35 months of age was HepA2 with a 30.8% increase in coverage. This increase is likely due to ACIP’s recommendation for initiation of the HepA2 series between 12 and 23 months with the second dose given 6 to 18 months later. Of the vaccines required for entry into kindergarten, DTaP4 had the lowest coverage with only 80.0% up-to-date at 24 months. The DTaP vaccine series had an increase of 8.1% in coverage between 24 and 35 months if age,

Vaccine coverage is of great public health importance. By having greater vaccination coverage this provides protection for persons who are not able to be vaccinated by disrupting chains of infection and slowing the spread of disease resulting in lower disease incidence and smaller vaccine preventable disease outbreaks. However, due to unvaccinated and under-vaccinated individuals, the United States has experienced increased incidence in diseases that were previously present at low levels. 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. Between December 2014 and February 2015, a total of 125 measles cases had been confirmed in United States as a part of an outbreak that began in California. Among the 110 cases, 96 (87.3%) were either unvaccinated or had unknown vaccination status.⁶

Limitations

A limitation of this study is Hib3, HepA2, and PCV4 are not required for school entry and may not be consistently reported on the vaccination record, thus the coverage estimates for these vaccines as well as the 4-3-1-3-3 and 4-3-1-3-3-1-4 vaccine series may be artificially low. No descriptive data are collected about sex, race, or ethnicity.

⁶ Centers for Disease Control and Prevention. Measles Outbreak – California, December 2014-February 2015. MMWR 2015; 64(06): 153-4

A child was determined to be UTD for varicella vaccination if the child had received at least one dose of the varicella containing vaccine. While history of varicella disease may be marked on the KCI or other vaccination record, date of disease is rarely given. Given that the date of disease is unknown, it cannot be definitively determined that the disease took place before the first scheduled dose of varicella containing vaccine. Individuals who did not receive the varicella vaccine due to history of disease could not be counted as immune or UTD at 24 and 35 months. It is possible that the denominator for this equation includes children who had history of varicella disease before the scheduled first dose of varicella at 12 months. Of the 9,219 records analyzed, 29 (0.3%) were recorded as having disease history with no history of vaccination.

Strengths

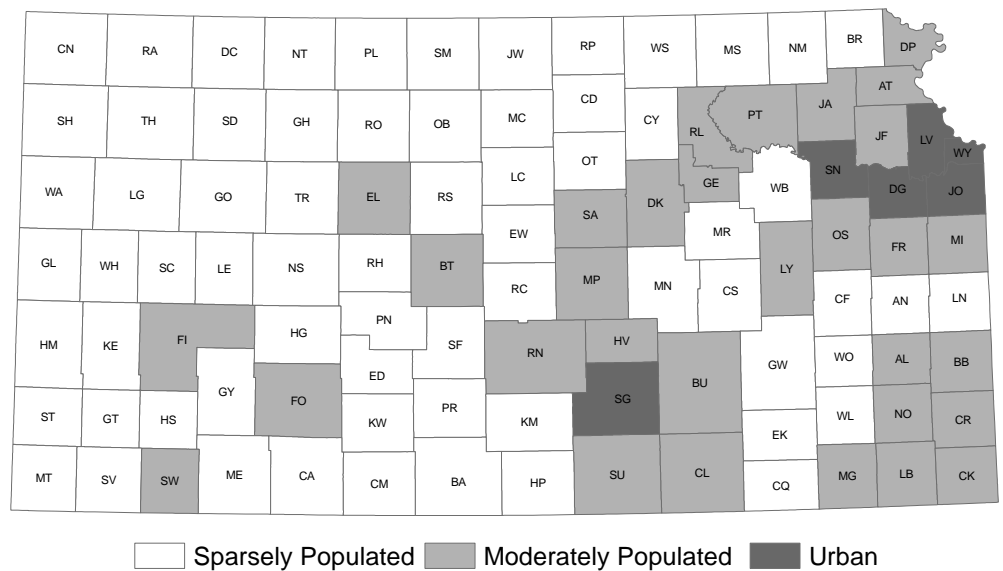
Despite the limitations, the retrospective vaccination survey provides a good estimation of the vaccination coverage levels for 24 and 35-month-old children in Kansas. It allows state and local officials to identify counties and regions with low vaccine coverage levels in order to focus on these areas and implement enhanced vaccination delivery methods and educational campaigns that can aid in Kansas achieving the HP2020 goal of 90% vaccination coverage. The study also had a higher response rate than in previous years, with 94% of schools responding to the request for vaccination records (94%).

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: Vaccination coverage levels of children 35 months of age for Kansas counties 2010-2011*§

COUNTY	DTaP4	Polio3	MMR1	Hib3	HepB3	Var1	PCV4	HepA2	4-3-1-3-3	4-3-1-3-3-1-4
STATEWIDE	88%	94%	93%	88%	94%	93%	78%	70%	79%	70%
ALLEN	83%	93%	94%	93%	95%	92%	79%	72%	80%	73%
ANDERSON	85%	94%	93%	94%	93%	93%	82%	61%	83%	78%
ATCHISON	90%	96%	94%	95%	98%	95%	83%	71%	87%	80%
BARBER	94%	100%	96%	98%	98%	94%	92%	67%	94%	90%
BARTON	92%	97%	96%	98%	98%	96%	93%	81%	90%	88%
BOURBON	86%	97%	94%	97%	95%	84%	75%	35%	82%	62%
BROWN	95%	100%	98%	97%	98%	95%	83%	52%	88%	73%
BUTLER	91%	97%	96%	97%	95%	97%	86%	69%	87%	79%
CHASE	75%	79%	79%	79%	75%	79%	63%	54%	71%	58%
CHAUTAUQUA	85%	97%	85%	97%	97%	87%	82%	51%	82%	79%
CHEROKEE	83%	96%	93%	90%	96%	92%	79%	62%	74%	63%
CHEYENNE	93%	96%	100%	96%	100%	100%	89%	75%	86%	82%
CLARK	94%	97%	97%	97%	100%	97%	88%	78%	94%	88%
CLAY	90%	93%	95%	95%	95%	93%	90%	71%	85%	80%
CLOUD	87%	96%	93%	84%	98%	93%	82%	82%	78%	73%
COFFEY	81%	91%	93%	87%	93%	93%	76%	61%	78%	72%
COMANCHE	97%	97%	100%	100%	97%	100%	93%	83%	93%	87%
COWLEY	86%	94%	93%	89%	95%	91%	81%	67%	82%	74%
CRAWFORD	86%	93%	90%	92%	93%	92%	65%	57%	77%	57%
DECATUR	97%	97%	97%	97%	97%	97%	72%	75%	97%	72%
DICKINSON	93%	96%	95%	97%	96%	95%	86%	70%	89%	80%
DONIPHAN	92%	100%	96%	94%	96%	100%	92%	62%	82%	78%
DOUGLAS	80%	90%	90%	82%	91%	89%	69%	61%	70%	60%
EDWARDS	94%	100%	97%	100%	94%	94%	94%	76%	88%	85%
ELK	82%	97%	97%	91%	97%	97%	76%	70%	79%	73%
ELLIS	94%	97%	97%	90%	97%	96%	50%	85%	84%	45%
ELLSWORTH	91%	97%	96%	94%	97%	93%	80%	81%	87%	71%
FINNEY	88%	97%	95%	93%	98%	94%	84%	80%	83%	77%
FORD	84%	92%	95%	91%	94%	93%	80%	76%	82%	75%
FRANKLIN	89%	95%	95%	94%	95%	95%	84%	73%	85%	81%
GEARY	82%	93%	94%	91%	94%	95%	79%	72%	77%	71%
GOVE	90%	95%	92%	92%	97%	79%	82%	69%	85%	69%
GRAHAM	91%	100%	97%	100%	100%	97%	91%	82%	91%	88%
GRANT	90%	90%	97%	90%	97%	97%	93%	77%	83%	80%
GRAY	79%	92%	93%	86%	94%	92%	77%	66%	76%	69%
GREELEY‡										
GREENWOOD	80%	88%	90%	98%	98%	90%	80%	71%	76%	71%
HAMILTON	100%	100%	100%	100%	100%	97%	88%	88%	100%	88%
HARPER	89%	94%	91%	86%	94%	92%	80%	71%	82%	76%
HARVEY	70%	78%	92%	77%	83%	93%	68%	64%	66%	59%
HASKELL	92%	92%	98%	96%	96%	90%	80%	78%	90%	75%
HODGEMAN‡										
JACKSON	85%	94%	93%	90%	93%	91%	84%	73%	80%	76%
JEFFERSON	92%	97%	98%	97%	97%	97%	85%	73%	88%	81%

COUNTY	DTaP4	Polio3	MMR1	Hib3	HepB3	Var1	PCV4	HepA2	4-3-1-3-3	4-3-1-3-3-1-4
STATEWIDE	88%	94%	93%	88%	94%	93%	78%	70%	79%	70%
JEWELL	88%	94%	94%	94%	94%	88%	82%	47%	88%	71%
JOHNSON	90%	93%	93%	81%	91%	91%	75%	76%	75%	69%
KEARNY	89%	91%	96%	93%	93%	93%	80%	70%	85%	78%
KINGMAN	87%	90%	92%	90%	87%	84%	74%	60%	81%	66%
KIOWA	100%	100%	100%	93%	100%	100%	89%	79%	93%	89%
LABETTE	88%	95%	94%	88%	95%	94%	79%	65%	84%	75%
LANE	85%	100%	100%	95%	100%	100%	90%	90%	85%	85%
LEAVENWORTH	88%	95%	95%	93%	97%	95%	83%	72%	82%	76%
LINCOLN	94%	96%	92%	96%	96%	96%	92%	84%	90%	88%
LINN	87%	93%	91%	91%	92%	89%	77%	61%	79%	69%
LOGAN	100%	100%	100%	100%	100%	100%	97%	89%	100%	97%
LYON	89%	97%	95%	95%	98%	97%	85%	70%	86%	80%
MARION	93%	97%	96%	96%	99%	96%	84%	57%	87%	73%
MARSHALL	97%	97%	96%	97%	97%	93%	95%	81%	92%	86%
MCPHERSON	94%	97%	96%	39%	95%	95%	32%	48%	38%	32%
MEADE	92%	97%	100%	97%	100%	100%	92%	78%	92%	89%
MIAMI	87%	94%	92%	71%	90%	92%	65%	70%	65%	62%
MITCHELL	94%	96%	99%	94%	96%	92%	84%	80%	92%	77%
MONTGOMERY	80%	87%	90%	83%	90%	90%	71%	60%	71%	63%
MORRIS	84%	90%	94%	90%	84%	90%	81%	74%	77%	74%
MORTON	85%	98%	97%	93%	97%	90%	72%	68%	80%	65%
NEMAHA	90%	97%	98%	98%	95%	96%	87%	67%	87%	78%
NEOSHO	47%	98%	97%	92%	98%	97%	42%	79%	40%	37%
NESS	100%	86%	100%	100%	100%	100%	100%	100%	86%	86%
NORTON	98%	98%	93%	98%	98%	90%	95%	85%	93%	83%
OSAGE	84%	94%	92%	90%	94%	90%	77%	63%	78%	68%
OSBORNE	94%	100%	100%	100%	100%	94%	100%	69%	94%	94%
OTTAWA	96%	100%	100%	100%	99%	100%	91%	88%	95%	88%
PAWNEE	93%	100%	95%	100%	100%	95%	93%	90%	93%	90%
PHILLIPS	91%	98%	100%	98%	100%	98%	87%	85%	87%	81%
POTTAWATOMIE	88%	94%	92%	90%	92%	90%	83%	69%	81%	75%
PRATT	87%	92%	94%	92%	97%	94%	84%	79%	87%	84%
RAWLINS	80%	88%	96%	88%	84%	96%	84%	80%	72%	72%
RENO	89%	95%	94%	95%	95%	93%	86%	62%	85%	79%
REPUBLIC	87%	96%	94%	96%	94%	91%	91%	77%	85%	83%
RICE	77%	91%	85%	80%	94%	83%	71%	57%	66%	59%
RILEY	91%	97%	97%	92%	94%	94%	80%	66%	78%	71%
ROOKS	92%	100%	98%	97%	98%	98%	93%	82%	88%	85%
RUSH	90%	97%	97%	87%	100%	97%	81%	87%	87%	74%
RUSSELL	83%	95%	88%	93%	95%	88%	80%	75%	80%	75%
SALINE	88%	98%	94%	95%	96%	96%	82%	83%	81%	75%
SCOTT	93%	100%	97%	100%	100%	97%	97%	83%	93%	93%
SEDGWICK	89%	95%	91%	91%	94%	90%	77%	64%	81%	69%
SEWARD	88%	95%	93%	90%	95%	93%	71%	76%	79%	65%
SHAWNEE	89%	96%	94%	94%	95%	95%	86%	78%	85%	80%
SHERIDAN	96%	100%	100%	100%	100%	100%	96%	88%	96%	96%

COUNTY	DTaP4	Polio3	MMR1	Hib3	HepB3	Var1	PCV4	HepA2	4-3-1-3-3	4-3-1-3-3-1-4
<i>STATEWIDE</i>	88%	94%	93%	88%	94%	93%	78%	70%	79%	70%
SHERMAN	93%	100%	97%	100%	97%	93%	87%	70%	90%	80%
SMITH	92%	100%	100%	96%	100%	96%	96%	80%	92%	88%
STAFFORD	83%	94%	91%	91%	96%	91%	79%	72%	83%	79%
STANTON‡										
STEVENS	97%	97%	100%	93%	97%	97%	87%	83%	90%	77%
SUMNER	85%	91%	90%	88%	93%	90%	69%	60%	80%	65%
THOMAS	94%	96%	93%	97%	95%	92%	86%	78%	91%	82%
TREGO	93%	100%	97%	100%	97%	100%	87%	93%	90%	83%
WABAUNSEE	91%	99%	97%	96%	97%	96%	87%	81%	89%	82%
WALLACE	100%	100%	100%	100%	100%	100%	100%	50%	100%	100%
WASHINGTON	89%	100%	98%	96%	100%	96%	78%	76%	89%	76%
WICHITA	97%	100%	100%	100%	100%	97%	91%	82%	97%	88%
WILSON	92%	97%	96%	96%	97%	95%	80%	72%	91%	80%
WOODSON	93%	97%	97%	97%	100%	93%	90%	63%	93%	87%
WYANDOTTE	88%	95%	95%	79%	95%	96%	71%	70%	66%	57%

* Based on the retrospective survey for the school year starting 2014.

§ Due to Hib3 and PCV4 not being required for school entry, these vaccines may not consistently be reported on the vaccination record, thus decreasing coverage levels for the individual vaccines, as well as the 4-3-1-3-3 and 4-3-1-3-3-1-4 series. This is evident for several counties that have low coverage levels for the 4-3-1-3-3 and 4-3-1-3-3-1-4 series as well as low Hib3 and PCV4 coverage levels.

‡ No data available