

Immunization Rates In Child Care Group Settings

2016 Reporting Period



Background

On Jan. 26, 2002, the Pennsylvania Department of Health (PADOH) finalized requirements for reporting immunization histories of children in child care group settings (CCGS). This regulation went into effect March 27, 2002, and requires the following:

- 1) Infants and children, two months through five years of age, enrolled in a child care group setting for more than 60 days must have completed immunization records (the Child Health Assessment (CY-51) form can serve as the completed immunization record);
- 2) Each child enrolled in a child care group setting should be immunized in accordance with the current Recommended Childhood Immunization Schedule by the Centers for Disease Control and Prevention's (CDC) Advisory Committee on Immunization Practices and deemed approved by the Department and published in the Pennsylvania Bulletin on January 26, 2002; and
- 3) The immunization status of each enrolled child should be summarized and reported on an annual basis to the Department of Health, at the time prescribed by the Department, and on the form provided by the Department.

Survey Design and Data Collection

The purpose of this study is to estimate various immunization coverage rates for children ages 2 months to 59 months who attend a CCGS in Pennsylvania. This goal has been undertaken as a sample survey with the following design details.

As stated previously, the population of interest for this study is children ages 2 months to 59 months who attend a CCGS in Pennsylvania. It is important to note that this population does not extend to all Pennsylvania children in this age group. Because a listing of such children does not exist from which to draw a sample, cluster sampling was employed. This means that, instead of selecting individual children, CCGS were selected and an individual child immunization summary was gathered for each child at the selected CCGS.

In January 2016, a dataset of 4,598 CCGS (day care centers and group day care homes) located throughout Pennsylvania was obtained from the Pennsylvania Department of Human Services. This dataset was the sampling frame for the project. In order to ensure that CCGS were selected from each health district as well as Allegheny and Philadelphia counties, the data were stratified by those geographies. This means that each of these mutually exclusive geographies (strata) has its own sample size calculated and selected, and analyses can be generated for each geography individually.

For each stratum, sample sizes were calculated according to the following methodology:

Initial Sample Size (n)

$$n = \frac{Np(1 - p)}{(N - 1) \left(\frac{d^2}{z^2} \right) + p(1 - p)}$$

Where:

N = population of children (estimated from previous CCGS projects)

p = prior estimate of the proportion of immunized children. Because this study investigates various immunizations, the conservative value 0.50 was chosen.

d = level of precision (chosen at 5%)

z = confidence level (chosen at 95%)

Response Rate Adjustment

The initial sample sizes are then divided by the estimated response rate for each stratum. This inflates the sample size to account for potential non-response. These response rates were calculated based on previous CCGS results.

Design Effect Adjustment

Although cluster sampling is more efficient in terms of time and resources, it is less efficient in terms of statistical variation. This is the case because we are sampling clusters of children at CCGS, and these clusters of children are more likely to be similar compared to randomly selected children without clustering. In order to compensate for this, the sample sizes are then multiplied by a design effect. For this year's project, a design effect of 2.5 was used. This design effect is conservative and is recommended by CDC.

Population to Cluster Adjustment

The above calculations and adjustments result in a sample size for the number of children to be sampled, but, as stated previously, we are sampling clusters of children at CCGS. To ascertain the number of clusters needed, the population sample size is divided by the stratum-specific average number of children per CCGS. This final calculation produces the number of primary sampling units for each stratum (**Chart 1**). This number of primary sampling units was then randomly selected for each stratum.

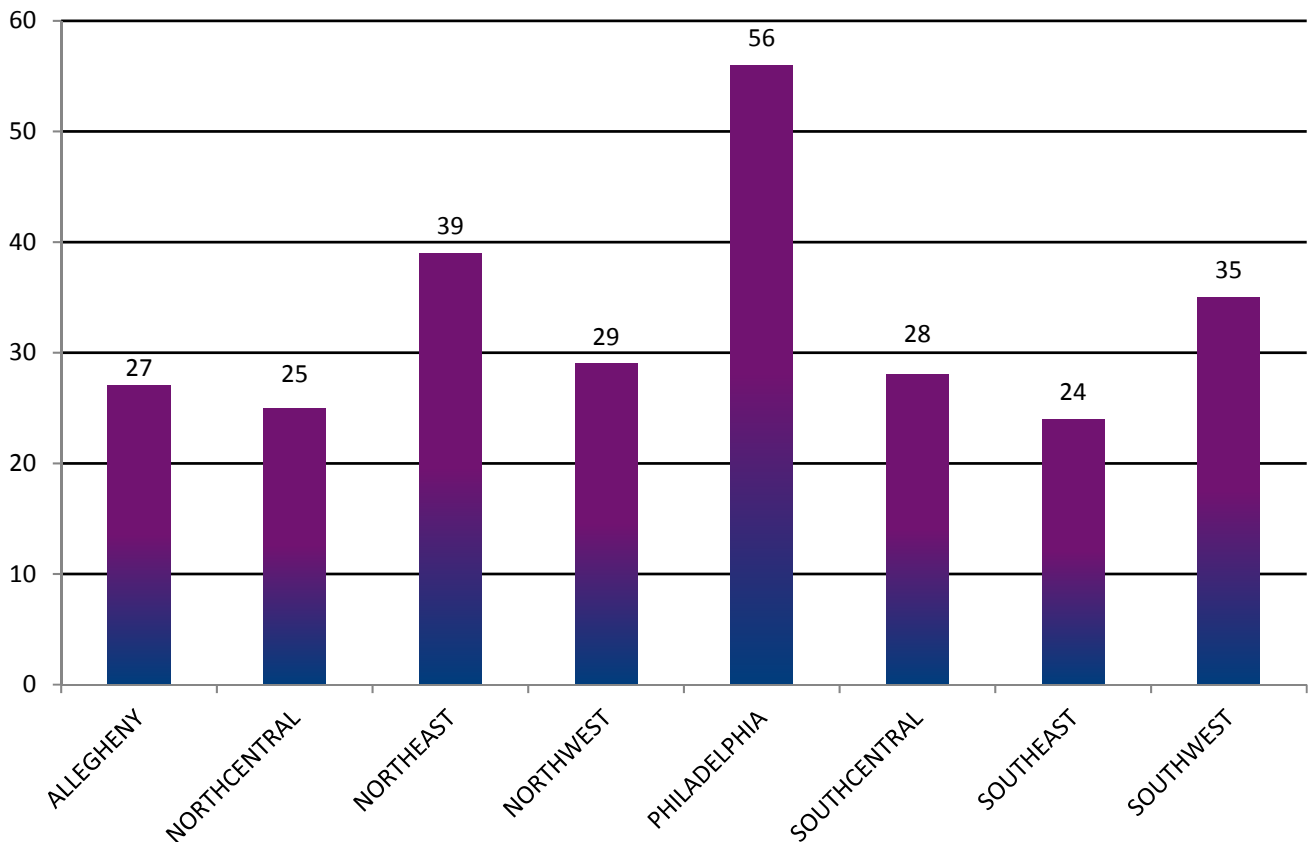


Chart 1
Primary Sampling Units Selected by Stratum

All child immunization summaries were collected onsite by PADOH, division of immunizations and district nursing staff, as well as Allegheny and Philadelphia County Health Department staff, at CCGS throughout the state using a standard data collection form created by the Bureau of Health Statistics and Registries (BHSR) [Attachment 1]. After recording, the data was entered into a multi-user database created by BHSR and housed on a secure network drive. The database was equipped with data validation rules to ensure quality.

Supplemental Sample

Throughout the project, survey staff encountered selected CCGS that should not actually be included in the sampling frame. Statewide, 16 selected CCGS fit this description. Of those 16, eight (50 percent) were closed, seven (~43.8 percent) did not serve children within the project’s age requirement (generally after-school programs), and one (~6.2 percent) was a duplicate. All exclusions were investigated by the survey staff, reported to the BHSR statistical analyst via the data collection database, and investigated and confirmed by the analyst to not belong in the sampling frame. Once confirmed, the analyst issued supplemental sample to the requesting staff via the data collection database. This thorough investigation process is necessary because falsely excluding CCGS that belong in the sampling frame introduces bias into the survey.

Analyses and Results

The overall survey response rate was 100 percent. A total of 8,123 immunization summaries were collected and recorded from 263 CCGS throughout the state. Of those 8,123 summaries, nine (~0.1 percent) had invalid dates of birth and were excluded from the analyses. The remaining 8,114 immunization summaries were included in the analyses. **Table 1** shows detailed information on selected sites, responding sites, response rates and immunization summaries collected by stratum.

District	Selected Sites	Responding Sites	Response Rate	Immunization Summaries
ALLEGHENY	27	27	100.0%	1,031
NORTHCENTRAL	25	25	100.0%	682
NORTHEAST	39	39	100.0%	1,181
NORTHWEST	29	29	100.0%	914
PHILADELPHIA	56	56	100.0%	1,345
SOUTHCENTRAL	28	28	100.0%	892
SOUTHEAST	24	24	100.0%	1,011
SOUTHWEST	35	35	100.0%	1,058
STATEWIDE	263	263	100.0%	8,114

Table 1
Response Rates and Immunization Summaries by Stratum

Weighting

The 8,114 immunization summaries were then weighted in two steps. Weighting is done because each immunization summary represents more than itself in the overall population being studied. Each immunization summary is assigned a weight according to its stratum. The initial weight is calculated as the inverse of the probability of CCGS selection in the given stratum. Next, each weight is adjusted to account for nonresponse by dividing the initial weight by the response rate for the stratum. This adjustment yields the final weight for each stratum. The formula for the final weights for each stratum is given below:

$$final\ weight = \left(\frac{n}{N}\right)^{-1} / R$$

Where:

n = number of selected CCGS in stratum

N = total CCGS in stratum

R = stratum response rate

Exemptions

Pennsylvania allows for children to be exempt from immunization requirements for medical, philosophical or religious reasons. Due to the low number of exemptions reported in the results, estimates are only available for all ages at the statewide level. Estimates are presented with 95% confidence intervals in parenthesis: Medical exemptions were estimated at 0.1 percent (0.0% - 0.2%), philosophical exemptions were estimated at 0.4 percent (0.2% - 0.5%), and religious exemptions were estimated at 0.2 percent (0.1% - 0.4%).

Coverage Rate Estimates

Once weighted, each immunization summary is assigned to a single age group using Jan. 1, 2016, as the measurement date. A single measurement date is required to assign consistent age groups because immunization summaries were collected over several months. The 8,114 weighted immunization summaries were then analyzed according to the immunization requirements established by the Division of Immunizations (**Table 2**).

VACCINES	AGE GROUPS				
	2-3 months	4-5 months	6-18 months	19-35 months	36-59 months
DTaP	1 or more	2 or more	3 or more	4 or more	4 or more
Polio	1 or more	2 or more	2 or more	3 or more	3 or more
Hib	1 or more	2 or more	3 or more	4 or more	4 or more
HepB	1 or more	2 or more	2 or more	3 or more	3 or more
MMR	----	----	----	1 or more	1 or more
Varicella	----	----	----	1 or more	1 or more
Pneumococcal	1 or more	2 or more	3 or more	4 or more	4 or more
Influenza	----	----	1 or more	1 or more	1 or more
HepA	----	----	1 or more	2 or more	2 or more
Rotavirus	1 or more	2 or more	2 or more	2 or more	2 or more

Table 2
Number of Vaccine Doses Needed To Be Fully Immunized by Age Group

Immunization coverage rates were estimated for each vaccine dose, the 4:3:1:3:3:1 series, the 4:3:1:3:3 series, the 4:3:1 series, as well as being up-to-date for the commonwealth of Pa. and the eight strata (**Tables 3 - 11**). Please see the **Definitions** section (page 16) for details on immunizations and series. The qualifications for being up-to-date for each age group are the requirements noted above in **Table 2**. All survey analyses were performed using SAS Proc Survey Means.

Commonwealth of Pa.					
VACCINES	AGE GROUPS				
	2-3 months	4-5 months	6-18 months	19-35 months	36-59 months
Up-to-date	91.3 ± 6.0	75.2 ± 9.1	39.9 ± 4.0	33.1 ± 3.4	32.6 ± 3.7
4:3:1:3:3:1	-----	-----	-----	84.8 ± 2.4	89.4 ± 2.0
4:3:1:3:3	-----	-----	-----	85.7 ± 2.4	90.0 ± 1.9
4:3:1	-----	-----	-----	87.7 ± 2.2	93.1 ± 1.5
1 DTaP	95.1 ± 5.2	93.6 ± 5.6	98.9 ± 0.7	99.0 ± 0.5	99.1 ± 0.4
2 DTaP	-----	86.2 ± 7.3	96.5 ± 1.3	98.6 ± 0.6	98.7 ± 0.4
3 DTaP	-----	-----	92.0 ± 2.0	97.5 ± 0.7	98.3 ± 0.5
4 DTaP	-----	-----	-----	89.1 ± 2.2	94.5 ± 1.4
1 Polio	95.1 ± 5.2	91.8 ± 6.1	98.2 ± 1.0	98.5 ± 0.7	98.9 ± 0.4
2 Polio	-----	84.8 ± 7.5	95.7 ± 1.5	98.0 ± 0.7	98.3 ± 0.5
3 Polio	-----	-----	-----	96.4 ± 0.9	96.6 ± 0.8
1 Hib	95.1 ± 5.2	92.6 ± 5.9	98.8 ± 0.7	98.6 ± 0.6	98.6 ± 0.5
2 Hib	-----	84.5 ± 7.8	96.1 ± 1.5	97.8 ± 0.8	97.4 ± 0.8
3 Hib	-----	-----	86.6 ± 2.7	95.8 ± 1.1	96.0 ± 1.2
4 Hib	-----	-----	-----	76.1 ± 3.8	84.6 ± 2.5
1 HepB	94.8 ± 5.2	94.6 ± 5.2	98.5 ± 0.8	98.7 ± 0.6	98.6 ± 0.6
2 HepB	-----	92.8 ± 5.5	97.7 ± 1.0	97.8 ± 0.8	98.0 ± 0.7
3 HepB	-----	-----	-----	95.9 ± 1.0	95.8 ± 0.9
1 MMR	-----	-----	-----	96.9 ± 0.8	98.2 ± 0.5
1 Varicella	-----	-----	-----	95.8 ± 0.9	97.6 ± 0.7
1 PCV	95.1 ± 5.2	93.6 ± 5.4	98.6 ± 0.8	98.4 ± 0.7	98.0 ± 0.7
2 PCV	-----	83.9 ± 7.5	95.6 ± 1.4	97.9 ± 0.8	97.1 ± 0.9
3 PCV	-----	-----	91.0 ± 2.1	97.0 ± 0.8	96.0 ± 1.0
4 PCV	-----	-----	-----	89.4 ± 1.7	90.7 ± 1.7
1 Influenza	-----	-----	54.8 ± 4.1	49.2 ± 3.8	42.4 ± 3.9
1 HepA	-----	-----	67.2 ± 3.5	92.3 ± 1.5	93.9 ± 1.4
2 HepA	-----	-----	-----	74.0 ± 2.7	89.0 ± 1.8
1 Rotavirus	91.3 ± 6.0	89.2 ± 6.3	92.9 ± 2.1	93.2 ± 1.4	89.8 ± 1.7
2 Rotavirus	-----	77.9 ± 8.7	89.4 ± 2.6	91.0 ± 1.7	87.2 ± 1.9

Table 3
Estimated Immunization Coverage Rates By Age Group
(95% Confidence Interval)

Northcentral District					
VACCINES	AGE GROUPS				
	2-3 months	4-5 months	6-18 months	19-35 months	36-59 months
Up-to-date	75.0 ± 28.6	44.4 ± 38.8	32.6 ± 11.3	9.1 ± 5.9	19.4 ± 5.2
4:3:1:3:3:1	-----	-----	-----	86.6 ± 7.2	89.4 ± 4.8
4:3:1:3:3	-----	-----	-----	86.6 ± 7.2	89.7 ± 4.5
4:3:1	-----	-----	-----	88.2 ± 7.2	93.0 ± 3.6
1 DTaP	87.5 ± 24.8	88.9 ± 16.8	97.8 ± 3.1	100.0 - 1.6	99.2 ± 1.1
2 DTaP	-----	66.7 ± 33.9	94.6 ± 5.2	100.0 - 1.6	99.0 ± 1.2
3 DTaP	-----	-----	87.0 ± 10.1	98.9 ± 2.2	98.4 ± 1.5
4 DTaP	-----	-----	-----	89.2 ± 6.5	93.8 ± 3.5
1 Polio	87.5 ± 24.8	88.9 ± 16.8	97.8 ± 3.1	100.0 - 1.6	99.0 ± 1.2
2 Polio	-----	66.7 ± 33.9	94.6 ± 5.2	100.0 - 1.6	98.4 ± 1.6
3 Polio	-----	-----	-----	97.8 ± 2.5	96.9 ± 2.2
1 Hib	87.5 ± 24.8	88.9 ± 16.8	97.8 ± 3.1	100.0 - 1.6	99.2 ± 1.1
2 Hib	-----	55.6 ± 26.5	93.5 ± 6.1	100.0 - 1.6	98.7 ± 1.3
3 Hib	-----	-----	62.0 ± 9.7	95.7 ± 3.5	96.9 ± 1.7
4 Hib	-----	-----	-----	34.4 ± 10.0	82.9 ± 5.7
1 HepB	100.0 - 37.5	88.9 ± 16.8	97.8 ± 3.1	100.0 - 1.6	98.7 ± 1.3
2 HepB	-----	66.7 ± 33.9	96.7 ± 3.6	100.0 - 1.6	98.7 ± 1.3
3 HepB	-----	-----	-----	97.3 ± 3.6	96.4 ± 1.8
1 MMR	-----	-----	-----	94.6 ± 4.4	99.2 ± 1.1
1 Varicella	-----	-----	-----	95.2 ± 4.4	99.0 ± 1.2
1 PCV	87.5 ± 24.8	88.9 ± 16.8	97.8 ± 3.1	100.0 - 1.6	99.0 ± 1.2
2 PCV	-----	66.7 ± 33.9	94.6 ± 5.2	100.0 - 1.6	98.7 ± 1.3
3 PCV	-----	-----	85.9 ± 9.6	98.9 ± 2.2	97.7 ± 1.5
4 PCV	-----	-----	-----	92.5 ± 4.4	92.2 ± 4.3
1 Influenza	-----	-----	48.9 ± 16.6	41.9 ± 11.8	27.4 ± 6.2
1 HepA	-----	-----	65.2 ± 12.8	93.0 ± 4.0	94.8 ± 2.5
2 HepA	-----	-----	-----	78.0 ± 7.7	90.7 ± 4.4
1 Rotavirus	75.0 ± 28.6	88.9 ± 16.8	94.6 ± 3.9	94.1 ± 4.2	88.1 ± 5.5
2 Rotavirus	-----	55.6 ± 26.5	89.1 ± 7.4	94.1 ± 4.2	86.3 ± 5.7

Table 4
Estimated Immunization Coverage Rates By Age Group
(95% Confidence Interval)

Northeast District					
VACCINES	AGE GROUPS				
	2-3 months	4-5 months	6-18 months	19-35 months	36-59 months
Up-to-date	90.0 ± 10.4	85.7 ± 16.5	44.7 ± 9.5	38.5 ± 9.1	36.6 ± 11.7
4:3:1:3:3:1	-----	-----	-----	85.3 ± 4.7	93.0 ± 2.9
4:3:1:3:3	-----	-----	-----	85.9 ± 4.3	93.3 ± 2.9
4:3:1	-----	-----	-----	87.0 ± 4.3	94.7 ± 2.2
1 DTaP	95.0 ± 10.2	100.0 - 14.3	99.0 ± 1.4	97.8 ± 1.6	98.8 ± 1.0
2 DTaP	-----	95.2 ± 9.5	98.6 ± 1.7	97.8 ± 1.6	98.6 ± 1.1
3 DTaP	-----	-----	97.1 ± 2.0	97.2 ± 1.6	98.6 ± 1.1
4 DTaP	-----	-----	-----	89.8 ± 3.6	95.8 ± 1.8
1 Polio	95.0 ± 10.2	100.0 - 14.3	97.1 ± 2.3	97.5 ± 1.5	98.6 ± 1.0
2 Polio	-----	95.2 ± 9.5	96.6 ± 2.5	97.2 ± 1.8	98.4 ± 1.1
3 Polio	-----	-----	-----	95.3 ± 2.0	97.5 ± 1.4
1 Hib	95.0 ± 10.2	100.0 - 14.3	98.1 ± 2.3	97.5 ± 1.5	98.8 ± 1.0
2 Hib	-----	95.2 ± 9.5	97.6 ± 2.5	97.5 ± 1.5	98.1 ± 1.3
3 Hib	-----	-----	89.9 ± 6.3	95.8 ± 2.0	97.7 ± 1.4
4 Hib	-----	-----	-----	75.9 ± 7.3	87.7 ± 4.0
1 HepB	90.0 ± 10.4	100.0 - 14.3	98.6 ± 1.7	97.5 ± 1.5	98.8 ± 1.0
2 HepB	-----	95.2 ± 9.5	97.1 ± 1.9	97.5 ± 1.5	98.8 ± 1.0
3 HepB	-----	-----	-----	96.1 ± 2.0	97.7 ± 1.4
1 MMR	-----	-----	-----	94.7 ± 2.4	98.2 ± 1.6
1 Varicella	-----	-----	-----	94.2 ± 2.7	98.1 ± 1.5
1 PCV	95.0 ± 10.2	100.0 - 14.3	97.6 ± 2.2	97.5 ± 1.5	98.6 ± 1.0
2 PCV	-----	95.2 ± 9.5	97.6 ± 2.2	97.5 ± 1.5	98.4 ± 1.1
3 PCV	-----	-----	94.2 ± 2.5	96.1 ± 1.9	97.5 ± 1.3
4 PCV	-----	-----	-----	88.6 ± 3.8	91.1 ± 3.1
1 Influenza	-----	-----	65.4 ± 6.7	54.8 ± 10.7	48.0 ± 13.1
1 HepA	-----	-----	69.2 ± 8.9	88.6 ± 3.4	88.3 ± 3.4
2 HepA	-----	-----	-----	72.3 ± 5.2	82.7 ± 3.8
1 Rotavirus	90.0 ± 10.4	90.5 ± 13.8	93.8 ± 3.0	91.1 ± 2.8	92.1 ± 2.4
2 Rotavirus	-----	85.7 ± 16.5	91.3 ± 4.1	89.2 ± 3.3	89.7 ± 2.7

Table 5
Estimated Immunization Coverage Rates By Age Group
(95% Confidence Interval)

Northwest District					
VACCINES	AGE GROUPS				
	2-3 months	4-5 months	6-18 months	19-35 months	36-59 months
Up-to-date	100.0 - 16.7	69.6 ± 20.1	34.4 ± 7.6	20.6 ± 5.1	23.0 ± 5.6
4:3:1:3:3:1	-----	-----	-----	85.3 ± 4.9	91.1 ± 3.3
4:3:1:3:3	-----	-----	-----	86.5 ± 4.3	91.1 ± 3.3
4:3:1	-----	-----	-----	87.3 ± 3.9	93.0 ± 2.3
1 DTaP	100.0 - 16.7	100.0 - 13.0	99.5 ± 1.0	98.0 ± 1.9	98.6 ± 1.2
2 DTaP	-----	87.0 ± 13.7	96.9 ± 2.3	98.0 ± 1.9	96.9 ± 1.6
3 DTaP	-----	-----	90.8 ± 5.4	96.8 ± 2.5	96.5 ± 1.5
4 DTaP	-----	-----	-----	88.1 ± 3.8	94.4 ± 1.8
1 Polio	100.0 - 16.7	100.0 - 13.0	98.5 ± 1.8	98.0 ± 1.9	97.4 ± 1.4
2 Polio	-----	87.0 ± 13.7	95.9 ± 2.4	98.0 ± 1.9	96.5 ± 1.5
3 Polio	-----	-----	-----	96.8 ± 2.5	95.5 ± 1.8
1 Hib	100.0 - 16.7	100.0 - 13.0	99.5 ± 1.0	98.0 ± 1.9	98.4 ± 1.2
2 Hib	-----	87.0 ± 13.7	96.9 ± 2.3	98.0 ± 1.9	95.8 ± 2.3
3 Hib	-----	-----	74.9 ± 9.2	94.8 ± 3.0	95.3 ± 3.0
4 Hib	-----	-----	-----	63.1 ± 6.0	82.4 ± 5.0
1 HepB	100.0 - 16.7	100.0 - 13.0	99.5 ± 1.0	98.4 ± 1.8	97.9 ± 1.3
2 HepB	-----	95.7 ± 7.5	98.5 ± 1.7	98.0 ± 1.9	97.2 ± 1.3
3 HepB	-----	-----	-----	96.4 ± 2.5	94.8 ± 2.2
1 MMR	-----	-----	-----	94.4 ± 3.1	98.1 ± 1.6
1 Varicella	-----	-----	-----	93.7 ± 3.2	98.4 ± 1.2
1 PCV	100.0 - 16.7	100.0 - 13.0	99.5 ± 1.0	97.2 ± 2.0	97.7 ± 1.4
2 PCV	-----	87.0 ± 14.4	96.9 ± 2.3	96.4 ± 2.2	94.8 ± 2.1
3 PCV	-----	-----	90.3 ± 5.6	95.6 ± 2.6	93.0 ± 3.1
4 PCV	-----	-----	-----	87.7 ± 4.1	87.6 ± 4.5
1 Influenza	-----	-----	50.8 ± 9.2	43.3 ± 7.8	34.3 ± 6.5
1 HepA	-----	-----	73.3 ± 6.8	90.9 ± 3.7	93.0 ± 2.8
2 HepA	-----	-----	-----	71.8 ± 7.8	87.3 ± 4.2
1 Rotavirus	100.0 - 16.7	87.0 ± 11.2	92.8 ± 4.0	87.7 ± 3.1	81.9 ± 5.3
2 Rotavirus	-----	78.3 ± 18.1	89.7 ± 4.4	86.5 ± 3.9	78.6 ± 5.5

Table 6
Estimated Immunization Coverage Rates By Age Group
(95% Confidence Interval)

Southcentral District					
VACCINES	AGE GROUPS				
	2-3 months	4-5 months	6-18 months	19-35 months	36-59 months
Up-to-date	100.0 - 27.3	68.0 ± 20.9	39.1 ± 9.7	30.1 ± 8.3	20.9 ± 5.6
4:3:1:3:3:1	-----	-----	-----	83.2 ± 9.1	86.5 ± 10.0
4:3:1:3:3	-----	-----	-----	83.9 ± 9.0	86.8 ± 9.9
4:3:1	-----	-----	-----	85.7 ± 8.6	89.6 ± 8.9
1 DTaP	100.0 - 27.3	92.0 ± 10.4	99.5 ± 1.1	98.6 ± 1.5	99.0 ± 1.1
2 DTaP	-----	76.0 ± 16.2	96.2 ± 3.0	98.2 ± 1.7	98.5 ± 1.2
3 DTaP	-----	-----	91.8 ± 5.3	97.1 ± 2.0	98.0 ± 1.7
4 DTaP	-----	-----	-----	86.7 ± 7.9	91.3 ± 8.6
1 Polio	100.0 - 27.3	84.0 ± 17.4	98.9 ± 1.6	98.9 ± 1.3	99.0 ± 1.1
2 Polio	-----	72.0 ± 16.7	94.6 ± 3.3	98.2 ± 1.6	98.5 ± 1.2
3 Polio	-----	-----	-----	97.5 ± 1.8	97.2 ± 1.5
1 Hib	100.0 - 27.3	88.0 ± 15.9	99.5 ± 1.1	98.9 ± 1.3	98.0 ± 1.4
2 Hib	-----	72.0 ± 20.8	96.2 ± 3.0	98.2 ± 1.5	97.2 ± 1.7
3 Hib	-----	-----	85.9 ± 7.4	95.0 ± 3.4	95.7 ± 2.7
4 Hib	-----	-----	-----	75.6 ± 9.5	84.7 ± 9.6
1 HepB	100.0 - 27.3	88.0 ± 15.9	98.9 ± 1.4	98.9 ± 1.3	98.5 ± 1.3
2 HepB	-----	88.0 ± 15.9	98.4 ± 1.7	98.2 ± 1.6	97.5 ± 2.0
3 HepB	-----	-----	-----	96.1 ± 2.4	95.4 ± 3.6
1 MMR	-----	-----	-----	96.1 ± 2.6	97.2 ± 1.9
1 Varicella	-----	-----	-----	95.3 ± 2.2	97.2 ± 1.7
1 PCV	100.0 - 27.3	92.0 ± 10.4	99.5 ± 1.1	98.9 ± 1.3	98.0 ± 1.4
2 PCV	-----	76.0 ± 16.2	95.7 ± 3.2	98.2 ± 1.6	97.5 ± 1.7
3 PCV	-----	-----	90.8 ± 5.1	97.5 ± 1.8	96.7 ± 2.1
4 PCV	-----	-----	-----	90.0 ± 5.7	90.8 ± 4.8
1 Influenza	-----	-----	56.5 ± 11.6	44.8 ± 7.8	29.5 ± 7.4
1 HepA	-----	-----	64.1 ± 9.4	92.1 ± 2.8	94.4 ± 2.5
2 HepA	-----	-----	-----	75.6 ± 6.8	90.3 ± 3.5
1 Rotavirus	100.0 - 27.3	88.0 ± 15.9	92.9 ± 4.3	93.2 ± 3.3	89.6 ± 3.5
2 Rotavirus	-----	72.0 ± 20.8	88.6 ± 5.8	90.7 ± 3.3	87.0 ± 4.3

Table 7
Estimated Immunization Coverage Rates By Age Group
 (95% Confidence Interval)

Southeast District					
VACCINES	AGE GROUPS				
	2-3 months	4-5 months	6-18 months	19-35 months	36-59 months
Up-to-date	88.9 ± 22.1	70.0 ± 24.4	44.4 ± 7.8	33.1 ± 7.5	30.5 ± 8.9
4:3:1:3:3:1	-----	-----	-----	85.2 ± 6.0	87.4 ± 4.8
4:3:1:3:3	-----	-----	-----	86.2 ± 6.2	88.4 ± 4.7
4:3:1	-----	-----	-----	88.1 ± 5.6	92.4 ± 3.3
1 DTaP	88.9 ± 22.1	85.0 ± 18.0	98.0 ± 2.2	99.0 ± 1.1	99.4 ± 0.9
2 DTaP	-----	80.0 ± 21.2	95.4 ± 3.5	98.7 ± 1.3	99.2 ± 1.0
3 DTaP	-----	-----	92.3 ± 5.0	97.7 ± 1.4	98.9 ± 1.0
4 DTaP	-----	-----	-----	89.7 ± 5.5	93.9 ± 3.3
1 Polio	88.9 ± 22.1	85.0 ± 18.0	96.9 ± 3.0	97.7 ± 1.8	98.9 ± 1.1
2 Polio	-----	80.0 ± 21.2	94.4 ± 4.2	97.4 ± 1.8	98.5 ± 1.2
3 Polio	-----	-----	-----	95.8 ± 2.1	96.2 ± 2.3
1 Hib	88.9 ± 22.1	85.0 ± 18.0	98.0 ± 2.2	98.4 ± 1.3	98.7 ± 1.3
2 Hib	-----	80.0 ± 21.2	94.9 ± 4.2	97.1 ± 1.7	97.3 ± 1.9
3 Hib	-----	-----	90.3 ± 6.0	95.5 ± 2.6	95.8 ± 3.0
4 Hib	-----	-----	-----	81.0 ± 9.9	85.3 ± 5.9
1 HepB	88.9 ± 22.1	90.0 ± 15.1	97.4 ± 2.2	98.7 ± 1.2	99.2 ± 1.0
2 HepB	-----	90.0 ± 15.1	96.4 ± 2.5	98.1 ± 1.3	98.5 ± 1.1
3 HepB	-----	-----	-----	96.8 ± 1.8	95.8 ± 1.7
1 MMR	-----	-----	-----	98.4 ± 1.4	98.7 ± 1.0
1 Varicella	-----	-----	-----	97.1 ± 1.7	97.3 ± 1.8
1 PCV	88.9 ± 22.1	85.0 ± 17.1	98.0 ± 2.2	98.4 ± 1.6	98.3 ± 1.3
2 PCV	-----	75.0 ± 21.8	94.4 ± 3.8	97.7 ± 1.7	97.5 ± 1.5
3 PCV	-----	-----	91.3 ± 5.1	97.4 ± 1.7	96.2 ± 1.9
4 PCV	-----	-----	-----	89.4 ± 3.9	91.2 ± 4.1
1 Influenza	-----	-----	63.8 ± 7.0	48.2 ± 9.3	41.1 ± 9.3
1 HepA	-----	-----	63.8 ± 7.6	92.0 ± 3.8	93.5 ± 3.6
2 HepA	-----	-----	-----	74.3 ± 6.8	88.6 ± 4.9
1 Rotavirus	88.9 ± 22.1	85.0 ± 17.1	89.8 ± 5.6	93.9 ± 2.8	89.5 ± 3.3
2 Rotavirus	-----	70.0 ± 24.4	87.2 ± 6.5	91.3 ± 3.6	87.8 ± 3.9

Table 8
Estimated Immunization Coverage Rates By Age Group
 (95% Confidence Interval)

Southwest District					
VACCINES	AGE GROUPS				
	2-3 months	4-5 months	6-18 months	19-35 months	36-59 months
Up-to-date	94.7 ± 10.4	79.2 ± 13.2	35.8 ± 9.1	21.9 ± 6.6	17.8 ± 6.1
4:3:1:3:3:1	-----	-----	-----	77.8 ± 6.1	90.6 ± 2.9
4:3:1:3:3	-----	-----	-----	78.7 ± 6.3	91.0 ± 2.7
4:3:1	-----	-----	-----	82.3 ± 5.8	93.7 ± 2.2
1 DTaP	94.7 ± 10.4	100.0 - 12.5	100.0 - 1.5	99.4 ± 0.8	99.0 ± 0.9
2 DTaP	-----	91.7 ± 9.1	99.0 ± 1.4	99.1 ± 1.0	99.0 ± 0.9
3 DTaP	-----	-----	94.1 ± 4.1	98.5 ± 1.3	97.9 ± 1.0
4 DTaP	-----	-----	-----	84.4 ± 5.3	96.2 ± 1.4
1 Polio	94.7 ± 10.4	100.0 - 12.5	99.5 ± 0.8	99.4 ± 0.8	98.5 ± 0.9
2 Polio	-----	83.3 ± 11.2	98.5 ± 1.4	99.1 ± 0.9	98.1 ± 1.0
3 Polio	-----	-----	-----	96.7 ± 1.9	96.4 ± 1.7
1 Hib	94.7 ± 10.4	95.8 ± 7.8	100.0 - 1.5	99.1 ± 1.0	99.0 ± 0.9
2 Hib	-----	83.3 ± 11.2	99.0 ± 1.4	98.5 ± 1.3	97.9 ± 1.1
3 Hib	-----	-----	81.4 ± 8.4	95.8 ± 2.3	96.6 ± 1.6
4 Hib	-----	-----	-----	68.0 ± 7.5	79.2 ± 8.9
1 HepB	94.7 ± 10.4	100.0 - 12.5	99.5 ± 1.0	98.5 ± 1.5	98.1 ± 1.1
2 HepB	-----	95.8 ± 8.5	99.5 ± 1.0	97.3 ± 1.7	97.7 ± 1.0
3 HepB	-----	-----	-----	94.6 ± 2.4	95.8 ± 1.6
1 MMR	-----	-----	-----	96.4 ± 2.1	96.9 ± 1.6
1 Varicella	-----	-----	-----	95.2 ± 2.4	96.9 ± 1.5
1 PCV	94.7 ± 10.4	100.0 - 12.5	98.0 ± 1.7	98.8 ± 1.1	96.2 ± 2.0
2 PCV	-----	91.7 ± 9.1	97.5 ± 1.8	98.5 ± 1.2	95.2 ± 2.2
3 PCV	-----	-----	92.6 ± 3.9	97.9 ± 1.7	94.1 ± 2.3
4 PCV	-----	-----	-----	88.6 ± 3.6	90.8 ± 3.5
1 Influenza	-----	-----	57.8 ± 10.6	35.0 ± 7.5	25.4 ± 6.8
1 HepA	-----	-----	59.3 ± 7.3	90.4 ± 2.9	95.6 ± 2.4
2 HepA	-----	-----	-----	64.1 ± 5.7	89.3 ± 3.0
1 Rotavirus	94.7 ± 10.4	100.0 - 12.5	97.1 ± 2.3	95.8 ± 2.4	93.1 ± 2.8
2 Rotavirus	-----	91.7 ± 9.1	95.1 ± 3.2	93.4 ± 2.3	90.8 ± 3.1

Table 9
Estimated Immunization Coverage Rates By Age Group
(95% Confidence Interval)

Allegheny County					
VACCINES	AGE GROUPS				
	2-3 months	4-5 months	6-18 months	19-35 months	36-59 months
Up-to-date	88.9 ± 12.7	92.9 ± 10.2	59.4 ± 12.0	44.4 ± 10.5	39.1 ± 11.0
4:3:1:3:3:1	-----	-----	-----	88.5 ± 4.8	90.0 ± 6.3
4:3:1:3:3	-----	-----	-----	89.6 ± 4.7	90.7 ± 6.0
4:3:1	-----	-----	-----	92.0 ± 4.0	94.0 ± 3.9
1 DTaP	96.3 ± 7.7	100.0 - 10.7	100.0 - 1.3	99.4 ± 0.9	99.2 ± 1.0
2 DTaP	-----	96.4 ± 7.3	98.3 ± 2.1	98.2 ± 2.3	99.0 ± 1.4
3 DTaP	-----	-----	95.0 ± 3.5	97.0 ± 3.2	97.7 ± 3.1
4 DTaP	-----	-----	-----	92.9 ± 3.9	94.5 ± 4.0
1 Polio	96.3 ± 7.7	96.4 ± 7.3	99.6 ± 0.8	99.1 ± 1.0	99.2 ± 1.0
2 Polio	-----	96.4 ± 7.3	98.3 ± 2.1	97.3 ± 2.7	98.7 ± 1.8
3 Polio	-----	-----	-----	97.0 ± 2.7	96.5 ± 3.4
1 Hib	96.3 ± 7.7	100.0 - 10.7	99.6 ± 0.8	98.5 ± 1.8	98.5 ± 2.3
2 Hib	-----	96.4 ± 7.3	97.9 ± 2.1	97.0 ± 3.4	96.0 ± 5.2
3 Hib	-----	-----	90.8 ± 5.9	95.9 ± 3.8	95.0 ± 6.5
4 Hib	-----	-----	-----	76.9 ± 6.8	79.2 ± 8.4
1 HepB	96.3 ± 7.7	100.0 - 10.7	99.2 ± 1.6	98.2 ± 2.8	97.0 ± 4.4
2 HepB	-----	100.0 - 10.7	98.3 ± 3.2	97.3 ± 3.8	96.5 ± 4.8
3 HepB	-----	-----	-----	95.9 ± 3.8	95.0 ± 5.0
1 MMR	-----	-----	-----	97.0 ± 2.2	98.2 ± 1.9
1 Varicella	-----	-----	-----	95.6 ± 2.7	97.5 ± 1.9
1 PCV	96.3 ± 7.7	100.0 - 10.7	99.6 ± 0.9	97.6 ± 2.3	97.0 ± 4.5
2 PCV	-----	96.4 ± 7.3	97.5 ± 2.7	96.7 ± 3.3	95.2 ± 7.1
3 PCV	-----	-----	94.1 ± 4.1	95.9 ± 3.4	95.0 ± 7.0
4 PCV	-----	-----	-----	91.1 ± 6.1	91.0 ± 9.1
1 Influenza	-----	-----	65.7 ± 10.7	59.2 ± 9.8	48.1 ± 10.7
1 HepA	-----	-----	86.2 ± 7.4	95.9 ± 3.6	95.5 ± 3.8
2 HepA	-----	-----	-----	86.1 ± 5.2	90.0 ± 6.6
1 Rotavirus	88.9 ± 12.7	96.4 ± 7.1	94.1 ± 7.4	92.0 ± 7.0	89.2 ± 11.4
2 Rotavirus	-----	92.9 ± 10.2	90.8 ± 9.9	90.8 ± 7.6	88.2 ± 12.1

Table 10
Estimated Immunization Coverage Rates By Age Group
 (95% Confidence Interval)

Philadelphia County					
VACCINES	AGE GROUPS				
	2-3 months	4-5 months	6-18 months	19-35 months	36-59 months
Up-to-date	90.9 ± 17.7	70.0 ± 26.2	11.4 ± 5.0	37.6 ± 7.0	47.7 ± 6.3
4:3:1:3:3:1	-----	-----	-----	85.0 ± 4.3	90.9 ± 2.8
4:3:1:3:3	-----	-----	-----	85.8 ± 3.9	91.3 ± 2.7
4:3:1	-----	-----	-----	88.3 ± 3.7	94.4 ± 1.8
1 DTaP	100.0 - 27.3	100.0 - 30.0	99.0 ± 1.4	99.5 ± 0.8	98.9 ± 0.8
2 DTaP	-----	100.0 - 30.0	94.6 ± 4.3	99.2 ± 0.9	98.5 ± 0.8
3 DTaP	-----	-----	84.7 ± 5.0	97.3 ± 1.9	97.9 ± 1.0
4 DTaP	-----	-----	-----	88.6 ± 3.8	95.8 ± 1.7
1 Polio	100.0 - 27.3	100.0 - 30.0	99.0 ± 1.4	99.2 ± 0.9	99.2 ± 0.7
2 Polio	-----	100.0 - 30.0	94.6 ± 4.3	98.9 ± 1.1	98.3 ± 1.0
3 Polio	-----	-----	-----	96.7 ± 2.1	96.7 ± 1.3
1 Hib	100.0 - 27.3	100.0 - 30.0	99.0 ± 1.4	99.5 ± 0.8	98.3 ± 0.8
2 Hib	-----	100.0 - 30.0	94.1 ± 4.4	98.9 ± 1.3	97.7 ± 1.1
3 Hib	-----	-----	84.7 ± 5.2	97.0 ± 2.2	95.8 ± 1.7
4 Hib	-----	-----	-----	84.5 ± 4.8	87.5 ± 3.2
1 HepB	100.0 - 27.3	100.0 - 30.0	99.0 ± 1.4	99.5 ± 0.7	98.5 ± 0.9
2 HepB	-----	100.0 - 30.0	98.5 ± 1.7	97.3 ± 1.9	97.6 ± 1.4
3 HepB	-----	-----	-----	94.0 ± 3.1	95.5 ± 2.1
1 MMR	-----	-----	-----	97.3 ± 1.8	98.3 ± 1.0
1 Varicella	-----	-----	-----	96.2 ± 2.2	97.6 ± 1.3
1 PCV	100.0 - 27.3	100.0 - 30.0	99.0 ± 1.4	99.5 ± 0.8	98.1 ± 0.9
2 PCV	-----	90.0 ± 19.4	93.6 ± 4.3	98.9 ± 1.1	97.6 ± 1.2
3 PCV	-----	-----	85.1 ± 5.4	96.7 ± 2.1	96.0 ± 1.4
4 PCV	-----	-----	-----	88.3 ± 3.7	90.1 ± 2.3
1 Influenza	-----	-----	11.9 ± 5.2	53.4 ± 6.0	57.1 ± 6.0
1 HepA	-----	-----	58.9 ± 6.8	94.3 ± 2.4	96.3 ± 1.8
2 HepA	-----	-----	-----	68.9 ± 5.8	92.2 ± 2.1
1 Rotavirus	90.9 ± 17.7	80.0 ± 22.9	95.5 ± 2.9	94.3 ± 2.3	90.3 ± 3.2
2 Rotavirus	-----	70.0 ± 26.2	88.6 ± 5.0	91.6 ± 3.4	85.7 ± 4.0

Table 11
Estimated Immunization Coverage Rates By Age Group
(95% Confidence Interval)

Definitions

Age groups - Reflects the age of the child as of Jan. 1, 2016.

- 4:3:1:3:3:1 - Four or more doses of any diphtheria and tetanus toxoids and pertussis vaccines including: diphtheria, tetanus toxoids, and any acellular pertussis vaccine (DTaP/DTP/Td); three or more doses of any poliovirus vaccine; one or more doses of measles-mumps-rubella vaccine; three or more doses of Haemophilus influenza type b vaccine; three or more doses of hepatitis B vaccine; and one or more doses of varicella vaccine
- 4:3:1:3:3 - Four or more doses of any diphtheria and tetanus toxoids and pertussis vaccines including: diphtheria, tetanus toxoids, and any acellular pertussis vaccine (DTaP/DTP/Td); three or more doses of any poliovirus vaccine; one or more doses of measles-mumps-rubella vaccine; three or more doses of Haemophilus influenza type b vaccine; and three or more doses of hepatitis B vaccine
- 4:3:1 - Four or more doses of any diphtheria and tetanus toxoids and pertussis vaccines including: diphtheria, tetanus toxoids, and any acellular pertussis vaccine (DTaP/DTP/Td); three or more doses of any poliovirus vaccine; and one or more doses of measles-mumps-rubella vaccine
- 1 DTaP - One or more doses of any diphtheria and tetanus toxoids and pertussis vaccines, including diphtheria and tetanus toxoids, and any acellular pertussis vaccine (DTaP/DTP/Td)
- 2 DTaP - Two or more doses of any diphtheria and tetanus toxoids and pertussis vaccines, including diphtheria and tetanus toxoids, and any acellular pertussis vaccine (DTaP/DTP/Td)
- 3 DTaP - Three or more doses of any diphtheria and tetanus toxoids and pertussis vaccines, including diphtheria and tetanus toxoids, and any acellular pertussis vaccine (DTaP/DTP/Td)
- 4 DTaP - Four or more doses of any diphtheria and tetanus toxoids and pertussis vaccines, including diphtheria and tetanus toxoids, and any acellular pertussis vaccine (DTaP/DTP/Td)
- 1 Polio - One or more doses of any poliovirus vaccine
- 2 Polio - Two or more doses of any poliovirus vaccine
- 3 Polio - Three or more doses of any poliovirus vaccine
- 1 Hib - One or more doses of Haemophilus influenza type b vaccine
- 2 Hib - Two or more doses of Haemophilus influenza type b vaccine
- 3 Hib - Three or more doses of Haemophilus influenza type b vaccine
- 4 Hib - Four or more doses of Haemophilus influenza type b vaccine
- 1 HepB - One or more doses of hepatitis B vaccine
- 2 HepB - Two or more doses of hepatitis B vaccine
- 3 HepB - Three or more doses of hepatitis B vaccine
- 1 MMR - One or more doses of measles-mumps-rubella vaccine
- 1 Varicella - One or more doses of varicella vaccine or documentation of disease
- 1 PCV - One or more doses of pneumococcal conjugate vaccine
- 2 PCV - Two or more doses of pneumococcal conjugate vaccine
- 3 PCV - Three or more doses of pneumococcal conjugate vaccine
- 4 PCV - Four or more doses of pneumococcal conjugate vaccine
- 1 Influenza - One or more doses of influenza vaccine
- 1 HepA - One or more doses of hepatitis A vaccine
- 2 HepA - Two or more doses of hepatitis A vaccine
- 1 Rotavirus - One or more doses of rotavirus vaccine
- 2 Rotavirus - Two or more doses of rotavirus vaccine

