# Arizona Health Care Cost Containment System


**Biennial Report of**

**IMMUNIZATION COMPLETION RATES**

**BY 24 MONTHS OF AGE**

To the Governor, the President of the Senate
and the Speaker of the House of Representatives

March 2004

*Anthony D. Rodgers*
*Director*

*For questions or comments about this report, contact:*
*Rochelle Tigner*
*Quality Improvement Manager, Clinical Quality Management*
*Division of Health Care Management, AHCCCS*
*(602) 417-4683*
*rttigner@ahcccs.state.az.us*

**Arizona Health Care Cost Containment System (AHCCCS)**
**IMMUNIZATION COMPLETION RATES BY 24 MONTHS OF AGE**
**Contract Year Ending September 30, 2003**

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EXECUTIVE SUMMARY

## Background

This is the tenth assessment of the immunization status of children at 24 months of age by the Arizona Health Care Cost Containment System (AHCCCS). This study measures immunization completion rates among selected children enrolled in AHCCCS who turned 2 years old during the contract year ending (CYE) September 30, 2003. The assessment includes children eligible under Medicaid (Title XIX of the Social Security Act) and KidsCare (Title XXI), the State Child Health Insurance Program.

The Centers for Disease Control and Prevention (CDC) recommend that all children be immunized for 11 diseases before 2 years of age. Several of the vaccinations are combined into one "shot." This report includes measurements of immunization for 10 childhood diseases, generally using the following vaccines: diphtheria, tetanus, and acellular pertussis (DTaP); inactivated poliovirus (IPV); measles, mumps and rubella (MMR); Haemophilus influenza type b (Hib); hepatitis B virus (HBV), and varicella zoster virus (VZV). Another vaccine, pneumococcal conjugate (PCV), was added to the recommended childhood immunization schedule by the CDC in 2001, but completion rates were not measured for this report because of limited supply since its introduction.

## Methodology

To conduct this assessment, AHCCCS identified a representative random sample of children who were continuously enrolled during CYE 2003 and who turned 2 years old during the measurement year (that is, born on or between October 1, 2000, and September 30, 2001). The sample was stratified by AHCCCS-contracted health plan (Contractor) and by county.

Data initially were obtained from the Arizona State Immunization Information System (ASIIS), an automated registry. When an incomplete record or no record was found in ASIIS for a particular child, the case was sent to the appropriate Contractor for further data collection. Health Services Advisory Group (HSAG), an external quality review organization, was utilized to coordinate data collection, and to aggregate and analyze results.

## Overall Findings

The final sample size consisted of 7,181 children enrolled in AHCCCS. This number included 6,321 Medicaid-eligible children enrolled with seven acute-care Contractors and two programs operated by the Department of Economic Security (DES), the Comprehensive Medical and Dental Program (CMDP) and the Division of Developmental Disabilities (DDD). The final sample also included 860 KidsCare members enrolled with acute-care Contractors. Completion rates for the Medicaid, KidsCare and combined groups are as follows:

**Summary of Immunization Completion Rates by 24 months of Age,**
**Contract Year Ending September 30, 2003**

| | DTaP (4 doses) | IPV (3 doses) | MMR (1 dose) | HIB (2 doses) | HBV (3 doses) | VZV (1 dose) | 4:3:1 Series | 4:3:1:2:3 Series |
|---|---|---|---|---|---|---|---|---|
| Medicaid | 76.1% | 89.1% | 91.4% | 81.5% | 81.2% | 75.5% | 73.3% | 58.6% |
| KidsCare | 80.6% | 92.3% | 92.9% | 84.2% | 84.9% | 80.6% | 77.6% | 64.8% |
| **Total** | **76.7%** | **89.4%** | **91.5%** | **81.8%** | **81.6%** | **76.1%** | **73.8%** | **59.3%** |
| Previous Total (CYE 2001) | 81.2% | 87.9% | 89.8% | 83.7% | 80.7% | 77.5% | 78.4% | 65.4% |

Compared with the previous measurement period, total rates of completed immunizations for two vaccinations ─ IPV and MMR ─ showed statistically significant improvement. These rates increased by 1.5 percent and 1.7 percent, respectively. There was no statistically significant change in the rate of HBV vaccination. Rates of completion for three individual vaccines showed statistically significant decreases. The greatest decline was for DTaP, which was 4.5 percentage points below the previous level, while the Hib rate declined by 1.9 percent and the rate for VZV declined by 1.4 percent.

The declines in individual vaccine rates negatively affected rates of completion for two immunization series measured. The series that includes three vaccines ─ DTaP, IPV and MMR, known as the 4:3:1 series ─ declined by 4.6 percent. The series that includes five vaccines ─ DTaP, IPV, MMR, Hib and HBV, known as the 4:3:1:2:3 series ─ declined 6.1 percent from the previous rate. Both decreases were statistically significant. It should be noted that the rate for an immunization series is not an average of the individual vaccination rates, but a measurement of the number of children who had all of the required doses of each vaccine in the series by 24 months of age.

AHCCCS has established Minimum Performance Standards that Contractors must achieve for individual and combined series of immunizations. These standards also provide a benchmark for overall performance. In CYE 2003, AHCCCS overall rates fell short of the Minimum Performance Standards for two individual vaccinations, DTaP and Hib, and both immunization series.

**Combined Medicaid and KidsCare Immunization Rates**
**Compared with AHCCCS Minimum Performance Standards, CYE 2003**

| | DTaP (4) | IPV (3) | MMR (1) | Hib (2) | HBV (3) | VZV (1) | 4:3:1 Series | 4:3:1:2:3 Series |
|---|---|---|---|---|---|---|---|---|
| All children, CYE 2003 | 76.7% | 89.4% | 91.5% | 81.8% | 81.6% | 76.1% | 73.8% | 59.3% |
| **Minimum Performance Standard*** | **82%** | **88%** | **88%** | **85%** | **81%** | **73%** | **78%** | **67%** |

* The AHCCCS Minimum Performance Standards apply to both CYE 2001 and CYE 2003

**Analysis and Conclusions**

Primarily as a result of the decrease in DTaP vaccination, overall rates of completed immunizations among 2-year-old children declined from the previous measurement period. The two Contractors that achieved the Minimum Performance Standard for DTaP immunization for their combined Medicaid and KidsCare members also were the only two health plans to meet the AHCCCS standards for the 4:3:1 and 4:3:1:2:3 series of immunizations.

It must be noted that unprecedented shortages of several childhood vaccines in 2001 and 2002 have limited the ability of health care providers and managed care organizations to achieve immunization goals. A shortage of DTaP vaccine began in January 2001 and lasted until July 2002. During that time, the CDC recommended to health care providers that children receive the first three doses of the vaccine (at 2, 4 and 6 months of age) and that the fourth dose, usually given between 15 and 18 months of age, be deferred. After the shortage was declared officially over, the CDC said that supplies of the vaccine still were not sufficient to vaccinate all children, including children whose fourth doses were deferred during the shortage.[1]

Since children in this study were born between October 2000 and September 2001, some of them may not have been fully vaccinated with DTaP because their health care providers did not have the vaccine at the time the children were seen for other immunizations or chose to defer the fourth dose of DTaP. A CDC survey of immunization providers in early 2002 found that 30 percent had problems maintaining an adequate supply of DTaP and 19 percent had no DTaP vaccine for periods ranging from less than a week to more than a month.[3] Subsequently, parents may not have taken their children back to receive "make-up" doses in a timely manner.

While supplies of most childhood vaccines have returned to normal, the lingering effects of shortages probably influenced the overall immunization rates reported here. These effects may not have been as great on completion rates among children covered under KidsCare. Parents of many of those children pay a premium for coverage and may be more likely to ensure that their children receive covered benefits such as immunizations, even when a return visit to their health care provider is required for a "catch-up" dose of vaccine.

It should be noted that poor performance by one Contractor, which accounted for one-third of the entire sample, significantly contributed to the decline in overall rates. Excluding this Contractor's results, the overall rate for the 4:3:1 series among children enrolled under Medicaid was 76.1 percent, and the overall rate for the 4:3:1:2:3 series among that group was 64.8 percent.

Still, most AHCCCS Contractors maintained or improved immunization rates. For their total population sampled (Medicaid and KidsCare), eight of nine Contractors met or exceeded the AHCCCS Minimum Performance Standards for MMR and VZV immunization. Six Contractors achieved the Minimum Performance Standards for IPV and HBV immunization, and five achieved the standard for Hib immunization. As noted, two Contractors achieved the Minimum Performance Standards for both immunization series and for each individual vaccination.

The current AHCCCS rates also compare favorably with national averages. Completion rates for DTaP, IPV, MMR, HBV and VZV among AHCCCS members enrolled under Medicaid exceed the means reported by the National Committee for Quality Assurance (NCQA) for Medicaid plans in 2002. The NCQA Hib and immunization series rates are based on a different number of doses and are not comparable with AHCCCS rates.

AHCCCS Contractors must continue aggressive outreach efforts to encourage parents to complete immunizations for their children. Contractors also should ensure that health care professionals providing immunizations to their members report all vaccinations to the Arizona State Immunization Information System (ASIIS). This automated registry is a key tool in helping providers determine the immunization status of children they are seeing, so that opportunities to vaccinate are not missed. This is especially important when children receive immunizations at multiple sites and parents do not have current immunization records.

AHCCCS will require corrective action plans from Contractors that have not met Minimum Performance Standards for the most recent measurement period. Contractors that fail to show improvement may be subject to sanctions.

**References**

[1] United States General Accounting Office. Childhood Vaccines: Ensuring an Adequate Supply Poses Continuing Challenges. September 2002. Available at: http://www.gao.gov/new.items/d02987.pdf. Accessed January 23, 2004

[2] United States General Accounting Office. Childhood Vaccines: Challenges in Preventing Future Shortages. September 2002. Available at: http://www.gao.gov/new.items/d021105t.pdf. Accessed January 23, 2004

[3] D. Mason [ddm1@cdc.gov]. Feedback to Projects on the Impact of Vaccine Supply Shortages in Provider Practices, e-mail, July 25, 2002.

**Arizona Health Care Cost Containment System (AHCCCS)**
**IMMUNIZATION COMPLETION RATES BY 24 MONTHS OF AGE:**
**Contract Year Ending September 30, 2003**

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## I. INTRODUCTION

### Background

Prevention of disease is the most cost-effective approach to health care. There are a number of ways to prevent infectious diseases, such as isolation of infected persons or eradication of the disease altogether. But, as people become increasingly mobile, it is almost impossible to isolate them. And, despite attempts to eliminate several infectious diseases, many continue to exist. Thus, immunization of children and adults against life-threatening diseases has been one of the major achievements of medicine in the 20th century, and one of the most cost-effective health care interventions.[1,2]

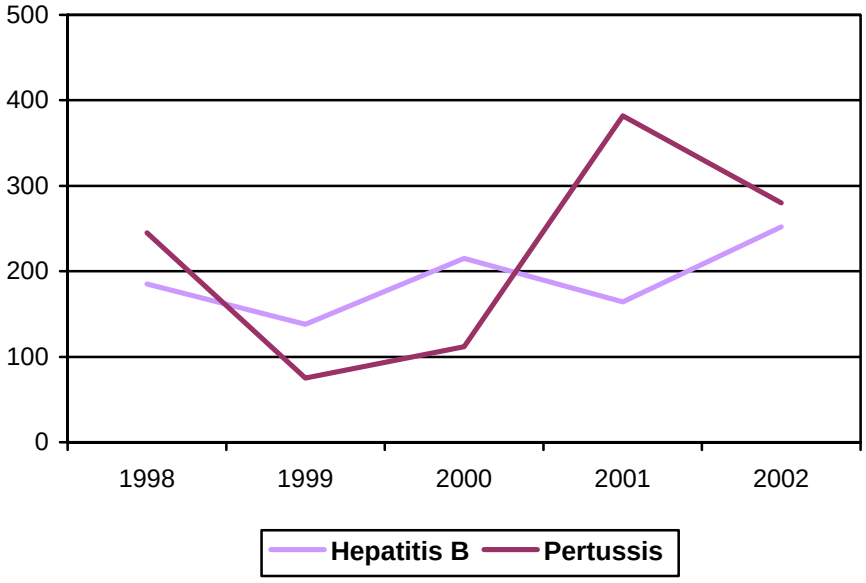
Monitoring of immunization rates is critical to identifying undervaccinated populations and increasing coverage levels in order to prevent outbreaks of disease. This study measures immunization completion rates among selected children enrolled in the Arizona Health Care Cost Containment System (AHCCCS) who turned 2 years old during the contract year ending (CYE) September 30, 2003. The assessment includes children eligible under Medicaid (Title XIX of the Social Security Act) and KidsCare (Title XXI), the State Child Health Insurance Program.

AHCCCS requires that children and adolescents be vaccinated according to the most current Recommended Childhood Immunization Schedule, published by the Centers for Disease Control and Prevention (CDC). The CDC recommends that all children be immunized for 11 diseases before 2 years of age. Several of the vaccinations are combined into one "shot." The current schedule recommends immunization against diphtheria, tetanus, pertussis (also known as whopping cough), poliomyelitis, hepatitis B, Haemophilus influenza type b, measles, mumps, rubella, pneumococcal disease and varicella (also known as chicken pox). Vaccination for hepatitis A also is recommended in selected high-risk areas, including Maricopa County, Arizona.

This report includes measurements of immunization for 10 childhood diseases, generally using the following vaccines: diphtheria, tetanus, and acellular pertussis (DTaP); inactivated poliovirus (IPV); measles, mumps and rubella (MMR); Haemophilus influenza type b (Hib); hepatitis B virus (HBV), and varicella zoster virus (VZV). Another vaccine, pneumococcal conjugate (PCV), was added to the recommended childhood immunization schedule by the CDC in 2001, but completion rates were not measured for this report because of limited supply since its introduction. Hepatitis A immunization also was not studied because it is not recommended as a routine vaccination in all areas of the state.

Immunization levels of 90 percent are, in general, sufficient to prevent circulation of viruses and bacteria that cause many diseases.[3] Monitoring immunization levels is important, as decreased rates likely will result in outbreaks of disease. Several vaccine-preventable diseases, including hepatitis B infection and pertussis, already pose a problem in Arizona. The following shows the number of cases of these diseases reported annually from 1998 through 2002. In addition, more than 100 cases of invasive pneumococcal disease were reported in both 2001 and 2002.[4]

**Pertussis and Hepatitis B Cases in Arizona, 1998 – 2002**




Source: Arizona Department of Health Services, Infectious Disease Epidemiology Section

Unnecessary fears and misconceptions about the safety of childhood vaccines have prevented some children from being fully immunized. All vaccines carry a risk of adverse effects on those who receive them, but this risk is minimal compared with the serious health risks and possibility of death posed by different diseases. In 1998, the most recent year for which mortality information is available, diphtheria, tetanus, pertussis, mumps, Hib and varicella accounted for 73 deaths nationally among all age groups. During that year, 1,668 deaths (all ages) were attributed to hepatitis B.[5]

**AHCCCS and Healthy People Goals**

AHCCCS has established long-range goals for Contractors to achieve in immunizing 2-year-old members. These goals are based on objectives set by the United States Department of Health and Human Services (DHHS) in *Healthy People 2000 and Healthy People 2010. Healthy People 2000* objectives include a rate of 90 percent for completion of individual vaccinations and the traditional DTaP, IPV and MMR series, known as the 4:3:1 series. In addition to these objectives, *Healthy People 2010* has set a goal that 80 percent of children ages 19 to 35 months receive the full series of five recommended vaccines (4 DTaP, 3 polio, 1 MMR, 3 Hib, and 3 HBV).

To ensure that Contractors make progress toward Healthy People objectives, AHCCCS has established Minimum Performance Standards and Goals for immunizations. These standards are part of the AHCCCS contract with health plans (Contractors) and provide attainable thresholds for Contractors to reach each year. A Minimum Performance Standard is the lowest expected level of performance by Contractors. If a Contractor has already met or exceeded the AHCCCS Minimum Performance Standard for any indicator, it must strive to meet the current Goal for the indicator. Contractors that have already achieved or exceeded the Goal for any performance indicator must strive to meet the Benchmark, which is based on a *Healthy People* objective.

**AHCCCS Performance Standards for Immunization, CYE 2003**

| Indicator | Minimum Performance Standard | Goal | Benchmark |
|---|---|---|---|
| Immunization of two-year-olds 4:3:1 series | 78% | 82% | 90% |
| Immunization of two-year-olds 4:3:1:2:3 series | 67% | 73% | 90% |
| Immunization of two-year-olds | | | |
| DTaP - 4 doses | 82% | 85% | 90% |
| Polio - 3 doses | 88% | 90% | 90% |
| MMR - 1 dose | 88% | 90% | 90% |
| Hib - 2 doses | 85% | 90% | 90%* |
| HBV - 3 doses | 81% | 87% | 90% |
| Varicella - 1 dose | 73% | 80% | 90% |

* The Healthy People 2010 objective for this series includes 3 doses of Hib; the AHCCCS standard is based on two doses.

## II. PURPOSE OF THE STUDY

Arizona places a high priority on childhood immunizations to prevent disease and death. In 1993, the Arizona Legislature enacted a bill that required an assessment and a written report describing the immunization status of 2-year-olds enrolled in the AHCCCS program be submitted annually to the Governor and Legislature. In 2003, this requirement was changed to a biennial report. This study is the tenth such assessment.

The results reported here also are used to evaluate Contractor performance in relation to the contractual standards established by AHCCCS, and to identify potential areas for improving the immunization status of 2-year-old members.

## III. QUALITY INDICATORS

This immunization study is based on Health Plan Employer Data and Information Set (HEDIS®) criteria for measuring childhood immunizations. All quality indicators are based on identical denominator criteria (i.e., children eligible for the study). Quality indicators are listed below with a description of the numerator criteria.

1. DTaP/DT Immunization Rate

Numerator: The number of children in the denominator who received four DTaP (diphtheria, tetanus and acellular pertussis) vaccinations or an initial DTaP vaccination followed by at least three DT or individual diphtheria and tetanus shots by their second birthdays

2. IPV Immunization Rate

Numerator: The number of children in the denominator who received at least three inactivated poliovirus vaccinations by their second birthdays

3. MMR Immunization Rate

Numerator: The number of children in the denominator who received at least one measles, mumps and rubella vaccination on or between their first and second birthdays

4. Hib Immunization Rate

Numerator: The number of children in the denominator who received at least two* Haemophilus influenza type b vaccinations by their second birthdays, with at least one of them falling on or between the first and second birthdays

5. HBV Immunization Rate

Numerator: The number of children in the denominator who received at least three hepatitis B virus vaccinations by their second birthdays, with at least one of them falling on or between six months of age and and two years of age

6. VZV Immunization Rate

Numerator: The number of children in the denominator who received at least one varicella vaccination on or between their first and second birthdays

7. Traditional 4:3:1 Combination

Numerator: The number of children in the denominator who received four DTaP/DT vaccinations, three IPV vaccinations, and one MMR vaccination by their second birthdays

8. HEDIS 2001 Combination #1 (4:3:1:2:3)

Numerator: The number of children in the denominator who received four DTaP/DT vaccinations, three IPV vaccinations, one MMR vaccination, two* Hib vaccinations and three HBV vaccinations by their second birthdays

9. HEDIS 2001 Combination #2 (4:3:1:2:3:1)

Numerator: The number of children in the denominator who received four DTaP/DT vaccinations, three IPV vaccinations, one MMR vaccination, two* Hib vaccinations, three HBV vaccinations and one VZV vaccination by their second birthdays

Any vaccines administered after 24 months of age were not included in the numerator. In addition to the six primary vaccines, single doses of combined vaccines; i.e., Tetra-immune (TETRA), which combines DTaP and Hib in a single immunization, and COMVAX, which combines Hib and HBV together, were counted as the appropriate primary vaccines.

## IV. METHODOLOGY

AHCCCS retained Health Services Advisory Group (HSAG), an external quality review organization, to assist with this assessment. HSAG has provided services for this study since 1993.

* Current HEDIS specifications require three Hib vaccinations by a child's second birthday; AHCCCS has continued to measure two doses of Hib to establish performance trends for individual Contractors.

**Study Sample**
AHCCCS identified the study group by defining a representative, stratified random sample of children enrolled with each Contractor, accounting for distribution of members by county. Sample selection was calculated for each Contractor to provide a 99-percent confidence level and 5-percent confidence interval. The sample consisted of children whose second birthdays occurred between October 1, 2002, and September 30, 2003 (that is, born on or between October 1, 2000, and September 30, 2001), and who had at least 12 months of continuous enrollment prior to, and including, their second birthdays. One gap in enrollment of 31 days or less in the 12-month period was allowed.

**Data Collection**
Data initially were obtained from the Arizona State Immunization Information System (ASIIS), an automated registry maintained by the Arizona Department of Health Services (ADHS). AHCCCS provided ASIIS with two database files containing the sample cases of Medicaid and KidsCare children. ASIIS staff searched the immunization registry by first name, last name, and date of birth and cross-matched the AHCCCS sample against patients in the registry. ADHS then provided to HSAG all immunization data for those patients for whom matches existed in the registry.

HSAG calculated immunization completion rates by Contractor, based on the ASIIS data. Of the combined Medicaid and KidsCare samples, 27.3 percent of AHCCCS members had a complete record in ASIIS (for purposes of this study, a complete record included all doses in the 4:3:1:2:3:1 series of vaccinations). By individual Contractor, rates of completion by ASIIS data ranged from 11.8 percent to 33.6 percent (Table 1).

HSAG sorted those members with incomplete or no records found in ASIIS by Contractor. HSAG then created an Excel spreadsheet for each Contractor, listing their members with incomplete or no records and including any vaccination data that was obtained from ASIIS for each child. HSAG sent each Contractor its data file with instructions for collecting additional data. AHCCCS allowed Contractors to use two sources of data: medical records and administrative (claims) information, in accordance with HEDIS methodology. Data were returned by Contractors in the Excel format to HSAG for analysis.

**Excluded Cases**
The original sample of children enrolled in AHCCCS under Medicaid consisted of 6,977 members. This included 153 members (2.2 percent) who had been enrolled with Family Health Plan of Northeastern Arizona (NEAZ), which no longer has a contract with AHCCCS, effective October 1, 2003. This health plan did not respond to AHCCCS' request to collect data for this assessment; thus, those members were excluded from the final sample.

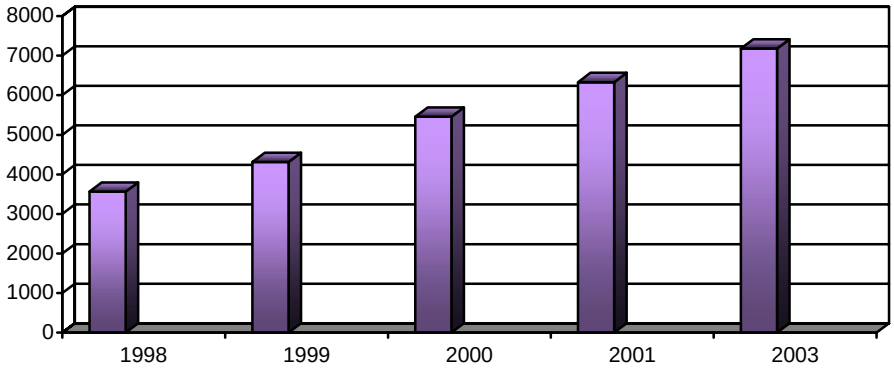
In addition, the original sample included 399 members (5.7 percent) who had been enrolled with CIGNA Community Choice, which chose not to continue its contract with AHCCCS as of October 1, 2003. CIGNA was not able to collect complete data; thus, 399 members who had been enrolled with the health plan also were excluded from the study. However, the exclusion of CIGNA members did not affect overall results.

Another 104 members were excluded from the study for the following reasons: 102 children were excluded because their medical records indicated parental refusal or contraindication to vaccination, and two children were excluded because it was later discovered that they did not turn 2 years old between October 1, 2002, and September 30, 2003. Final sample sizes by individual Contractor ranged from 142 to 2,125 children.

From the initial KidsCare sample of 966 members, five NEAZ members and 94 CIGNA members were excluded. In addition, five children were excluded because their records indicated parental refusal or contraindication to vaccination, and two were excluded because they did not turn 2 years old between October 1, 2002, and September 30, 2003. Final sample sizes by individual Contractor for the KidsCare group ranged from 15 to 287 children.

As seen below, the total sample size for the AHCCCS immunization assessment has grown considerably in the last few years. Due to overall growth in AHCCCS enrollment, the number of cases included in the immunization assessment has doubled since 1998.

**AHCCCS Immunization Assessment of 2-Year-Old Members**
**Final Sample Size***




* Includes both Medicaid and KidsCare members in CYE 2001 and CYE 2003

**Data Analysis**

Once data collection was finalized, HSAG managed the database and performed analysis using *Stata* statistical software. *Stata* statistical code was developed to generate vaccine-specific and combined immunization rates for the initial AHCCCS immunization report. The computer code has been updated annually to address changes in immunization recommendations and new vaccines.

The primary analysis provided results on the percentage of 2-year-old members that were age-appropriately immunized by 24 months for each of HEDIS quality indicator (DTaP, IPV, MMR, Hib, HBV, VZV and the combined series rates). Additional analysis was conducted to identify missed opportunities for DTaP vaccination. Because of vaccine shortages and delays in shipping product during the time that children in the sample should have received immunizations, HSAG also performed analysis of the immunization completion rates of these children beyond their second birthdays.

## V. RESULTS

### Overall Findings

The final sample size consisted of 7,181 children enrolled in AHCCCS. This number included 6,321 Medicaid-eligible children enrolled with seven acute-care Contractors and two programs operated by the Department of Economic Security (DES), the Comprehensive Medical and Dental Program (CMDP) and the Division of Developmental Disabilities (DDD). AHCCCS also measured immunization completion rates among 860 KidsCare members enrolled with acute-care Contractors. Completion rates for the Medicaid, KidsCare and combined groups are as follows:

**Summary of Immunization Completion Rates by 24 months of Age, Contract Year Ending September 30, 2003**

| | DTaP (4 doses) | IPV (3 doses) | MMR (1 dose) | HIB (2 doses) | HBV (3 doses) | VZV (1 dose) | 4:3:1 Series | 4:3:1:2:3 Series |
|---|---|---|---|---|---|---|---|---|
| Medicaid | 76.1% | 89.1% | 91.4% | 81.5% | 81.2% | 75.5% | 73.3% | 58.6% |
| KidsCare | 80.6% | 92.3% | 92.9% | 84.2% | 84.9% | 80.6% | 77.6% | 64.8% |
| **Total** | **76.7%** | **89.4%** | **91.5%** | **81.8%** | **81.6%** | **76.1%** | **73.8%** | **59.3%** |
| Previous Total (CYE 2001) | 81.2% | 87.9% | 89.8% | 83.7% | 80.7% | 77.5% | 78.4% | 65.4% |

Compared with the previous measurement period (CYE 2001), total rates of completed immunizations for two vaccinations ─ IPV and MMR ─ showed statistically significant improvement. These rates increased by 1.5 percent and 1.7 percent, respectively. There was no statistically significant change in the rate of HBV vaccination. Rates of completion for three individual vaccines showed statistically significant decreases. The greatest decline was for DTaP, which was 4.5 percentage points below the previous level, while the Hib rate declined by 1.9 percent and the rate for VZV declined by 1.4 percent.

The declines in individual vaccine rates negatively affected rates of completion for two immunization series measured. The series that includes three vaccines ─ DTaP, IPV and MMR, known as the 4:3:1 series ─ declined by 4.6 percent. The series that includes five vaccines ─ DTaP, IPV, MMR, Hib and HBV, known as the 4:3:1:2:3 series ─ declined 6.1 percent from the previous rate. Both decreases were statistically significant. It should be noted that the rate for an immunization series is not an average of the individual vaccination rates, but a measurement of the number of children who had all of the required doses of each vaccine in the series by 24 months of age.

Individual vaccine and combined series rates for the current measurement period, by Contractor, for all members are presented in Tables 2A and 2B.

**Children enrolled in AHCCCS under Medicaid**

Among Medicaid-eligible children, rates of completed immunizations for IPV (89.1 percent) and MMR (91.4 percent) showed statistically significant improvement, with increases of 1.4 percent and 1.7 percent, respectively. There was no statistically significant change in the rate of HBV vaccination (81.2 percent). Rates of completion for DTaP (76.1 percent), Hib (81.5 percent) and VZV (75.5 percent) declined from the previous period, with decreases ranging from 1.6 percent to 4.9 percent. These decreases were statistically significant.

The 4:3:1 series (73.3 percent) and the 4:3:1:2:3 series (58.6 percent) also declined, by 4.8 percent and 6.5 percent, respectively. These changes were statistically significant. Individual vaccine and combined series rates for the current and previous measurement periods, by Contractor, for children covered under Medicaid are presented in Tables 3A and 3B.

**Children enrolled in AHCCCS under KidsCare**

Among children covered under KidsCare, rates of completed immunizations for IPV (92.3 percent), MMR (92.9 percent) and HBV (84.9 percent) showed statistically significant improvement. Increases ranged from 2.7 percent to 5.0 percent. There were no statistically significant changes in rates of completion for DTaP (80.6 percent), Hib (84.2 percent) and VZV (80.6 percent) vaccination.

Rates for the 4:3:1 series (77.6 percent) and the 4:3:1:2:3 series (64.8 percent) did not show statistically significant changes. Individual vaccine and combined series rates for the current measurement period, by Contractor, for children covered under KidsCare are presented in Tables 4A and 4B.

AHCCCS has established Minimum Performance Standards that Contractors must achieve for individual and combined series of immunizations. These standards also provide a benchmark for overall performance. In CYE 2003, AHCCCS overall rates fell short of the Minimum Performance Standards for two individual vaccinations, DTaP and Hib, and both immunization series.

**Combined Medicaid and KidsCare Immunization Rates**
**Compared with AHCCCS Minimum Performance Standards, CYE 2003**

| | DTaP (4) | IPV (3) | MMR (1) | Hib (2) | HBV (3) | VZV (1) | 4:3:1 Series | 4:3:1:2:3 Series |
|---|---|---|---|---|---|---|---|---|
| All children, CYE 2003 | 76.7% | 89.4 % | 91.5% | 81.8% | 81.6% | 76.1% | 73.8% | 59.3% |
| **Minimum Performance Standard** | **82%** | **88%** | **88%** | **85%** | **81%** | **73%** | **78%** | **67%** |

## VI. ANALYSIS

Primarily as a result of the decrease in completed DTaP vaccination, overall rates of completed immunization series among 2-year-old children declined from the previous measurement period. The two Contractors that achieved the Minimum Performance Standard for DTaP immunization for their combined Medicaid and KidsCare members, Pima Health System and Phoenix Health Plan, also were the only two health plans to meet the AHCCCS standards for the 4:3:1 and 4:3:1:2:3 series of immunizations.

A shortage of DTaP vaccine began in January 2001 and lasted until July 2002. During that time, the CDC recommended to health care providers that children receive the first three doses of the vaccine (at 2, 4 and 6 months of age) and that the fourth dose, usually given between 15 and 18 months of age, be deferred. After the shortage was declared officially over, the CDC said that supplies of the vaccine still were not sufficient to vaccinate all children, including children whose fourth doses were deferred during the shortage.[6] Since children in this study were born between October 2000 and September 2001, some of them may not have been fully vaccinated with DTaP because their health care providers chose to defer the fourth dose or did not have the vaccine at the time the children were seen. A survey of immunization providers in early 2002 found that 30 percent had problems maintaining an adequate supply of DTaP and 19 percent had no DTaP vaccine for periods ranging from less than a week to more than a month.[7] Subsequently, parents may not have taken their children back for any deferred doses in a timely manner.

Shortages and delays in shipping affected other vaccines during this time. For example, two of three manufacturers of Hib vaccine reported delays of up to 60 days in shipping that product. Shortages of MMR and varicella vaccine also occurred in 2002. However, these vaccines require only one dose by 24 months of age, making catch-up efforts easier, and the shortages did not last as long as the DTaP shortage.

While supplies of most childhood vaccines have returned to normal, the lingering effects of shortages probably influenced the overall immunization rates reported here. These effects may not have been as great on completion rates among children covered under KidsCare. Parents of many of those children pay a premium for coverage and thus may be more likely to ensure that their children receive covered benefits such as immunizations, even when a return visit to their health care provider is required for a "catch-up" dose of vaccine.

Contractor rates would have improved dramatically if those children who had gotten three doses of DTaP had received the fourth dose by their second birthdays. An analysis of possible "missed opportunities" for DTaP vaccination shows that the completion rate for this vaccine among children enrolled under Medicaid would have increased to 92.9 percent if these members had received just one more dose, compared with the actual completion rate of 76.1 percent. The rate for KidsCare members would have increased to 96.6 percent if these members had received one more dose, compared with the actual completion rate of 80.6 percent. Analyses of missed opportunities for DTaP completion by Contractor is presented in Tables 5A and 5B.

Additional analysis performed for this study shows that rates of completed immunization for both the Medicaid and KidsCare groups improved markedly when doses given after the second birthday were counted. The following table shows the increases in immunization rates between 24 months of age and September 30, 2003.

**Comparison of AHCCCS Immunization Rates at 24 Months and as of September 30, 2003**

| Immunizations | Medicaid (Title XIX) Rates* | | KidsCare (Title XXI) Rates | |
|---|---|---|---|---|
| | 24 Months | Sept 30, 2003 | 24 Months | Sept 30, 2003 |
| 4 DTaP | 76.5 | 84.4 | 80.6 | 89.1 |
| 3 IPV | 89.4 | 91.2 | 92.3 | 93.7 |
| 1 MMR | 91.6 | 93.3 | 92.9 | 94.7 |
| 2 Hib | 81.8 | 84.2 | 84.2 | 85.6 |
| 3 HBV | 81.8 | 82.9 | 84.9 | 85.1 |
| 1 VZV | 75.1 | 80.1 | 80.6 | 85.2 |
| 4:3:1 Series | 73.8 | 82.1 | 77.6 | 86.5 |
| 4:3:1:2:3 Series | 59.3 | 66.5 | 64.8 | 72.2 |

*Includes 6,021 Medicaid members enrolled with acute-care Contractors; does not include children enrolled in CMDP and DDD.

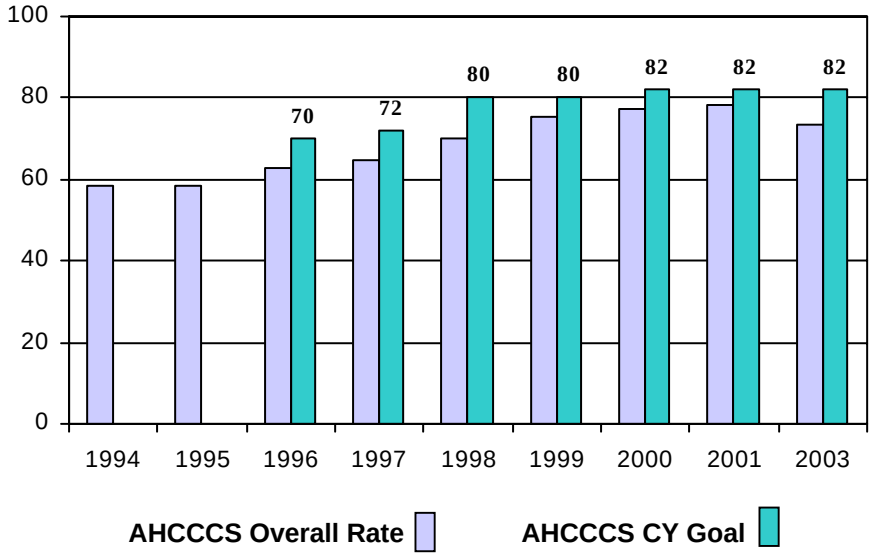
By September 30, 2003, the 4:3:1 series rate for children enrolled in the seven acute-care health plans under Medicaid improved to 82.1 percent, and the rate for the 4:3:1:2:3 series increased to 66.5 percent. Likewise, rates for KidsCare members also improved when doses given through September 30, 2003, were included. This shows that a significant number of children who were not fully immunized by 24 months of age received the doses of vaccine necessary to bring them up to date in the months following their second birthdays.

For their total population sampled (Medicaid and KidsCare), eight of nine Contractors met or exceeded the AHCCCS Minimum Performance Standards for MMR and VZV immunization by 24 months of age. Six Contractors achieved the Minimum Performance Standards for IPV and HBV immunization, and five achieved the standard for Hib immunization. As noted, two Contractors achieved the Minimum Performance Standards for both immunization series; these health plans also met all AHCCCS standards for each individual vaccination.

It also should be noted that the performance of one Contractor, Arizona Physicians IPA, which accounted for one-third of the entire sample, contributed to the decline in overall rates. This Contractor's rates for DTaP and Hib decreased by 5.8 percent and 11.5 percent, respectively, from the previous period. Excluding APIPA's's results, the overall rate for the 4:3:1 series among children enrolled under Medicaid was 76.1 percent, and the overall rate for the 4:3:1:2:3 series among that group was 64.8 percent.

Since AHCCCS began assessing the immunization status of two-year-old members in 1993, rates of completion have increased significantly. The 4:3:1 series completion rate for Medicaid-eligible children has increased from 46.3 percent to the highest level of 78.1 percent in CYE 2001. While this series represents less than half the total vaccine doses currently recommended by the CDC, it is an important indicator of long-term trends. The following graph shows the progress made overall toward meeting AHCCCS goals for the 4:3:1 immunization series.

**Annual Trend in DTaP, IPV and MMR (4:3:1) Series, Percentage Rates for CYE 1994 through CYE 2001)**




Note: AHCCCS goals were not established for CYE 1994 and CYE 1995

The current AHCCCS rates compare favorably with national Medicaid averages. Completion rates for DTaP, IPV, MMR, HBV and VZV among AHCCCS members enrolled under Medicaid exceed the HEDIS verages reported by the National Committee for Quality Assurance (NCQA) for Medicaid plans in 2002.[8] The 2002 HEDIS rates for Hib and the combined immunization series rates are based on a different number of doses and are not comparable with AHCCCS rates; however, the 2001 HEDIS rates for the immunization series are comparable. The national averages do not include all Medicaid managed care plans, as reporting is voluntary.

**Comparison of AHCCCS, National Medicaid and Overall Arizona Immunization Rates**

| Immunization | AHCCCS CYE 2003 Total Rates | HEDIS National Medicaid Averages[1] | National Immunization Survey, Arizona[2] |
|---|---|---|---|
| DTaP | 76.7% | 69.9% | 75.3 |
| IPV | 89.4 % | 77.0% | 90.8 |
| MMR | 91.5% | 84.0% | 91.0 |
| HBV | 81.6% | 74.0% | 94.3 |
| VZV | 76.1% | 73.4% | 73.3 |
| 4:3:1:2:3 Series | 59.3% | 58.7% | n/r |

[1] HEDIS rates for individual vaccines are based on 2002 measurements; the HEDIS rate for the 4:3:1:2:3 series is based on 2001 measurements.

[2] The National Immunization Survey covers the year ending June 30, 2003.

N/r = not reported

As seen in the last column above, AHCCCS total immunization rates, except for HBV, are similar to immunization-completion rates for all 2-year-olds in Arizona, as indicated by the most recent National Immunization Survey (NIS) data reported by the CDC.[9]

## VII. CONCLUSIONS AND RECOMMENDATIONS

Despite disappointing results for overall immunization-completion rates by 24 months of age, 2-year-olds enrolled in AHCCCS appear to receive vaccinations at the same rate as other Arizona children their age and as their counterparts nationally. Moreover, a significant number of children included in this assessment received the vaccinations necessary to bring them up to date in the months following their second birthdays.

DTaP continues to be the primary vaccine limiting AHCCCS overall immunization rates among 2-year-olds. AHCCCS Contractors must continue or improve monitoring activities to determine when children are lacking a fourth DTaP dose, and focus efforts on encouraging parents and primary care providers to ensure that this immunization is completed. This task is clearly challenging when vaccine shortages exist, but Contractors must find ways to remind and recall parents of children whose vaccinations have been deferred.

In addition to DTaP, Contractors must focus on ensuring that 2-year-old members receive all the necessary doses of Hib. Children should receive three doses of this vaccine by 24 months. In the future, AHCCCS standards will reflect current recommendations for Hib vaccination.

Improvements in these two areas are achievable. This is evidenced by the fact that two Contractors have rates of DTaP completion well above 80 percent and five Contractors have Hib completion rates ranging from approximately 86 percent to 94 percent.

The two Contractors that achieved all the AHCCCS Minimum Performance Standards for immunizations have reported consistent and sustained outreach efforts concentrated on ensuring that parents know exactly what vaccinations are needed by their children, as well as advising providers of assigned members' immunization status. Both Contractors have staff dedicated to improving rates of all well-child services, including immunizations, and both use telephone outreach to educate parents. One Contractor, with a relatively small membership, has an outreach worker make home visits to follow up with parents of all newborns. During these visits, Contractor staff educate and assess the immunization status of all children in the home. The other Contractor also reports focusing efforts on tracking those children who were not able to receive all doses of vaccine during the shortages and ensuring that providers recalled those children when the vaccine was available. These Contractors also use the ASIIS registry and AHCCCS Tracking Forms, which are completed by providers at well-child visits, to monitor whether members' immunizations are up to date.

All AHCCCS Contractors should adopt as policy the most current *Standards for Pediatric Immunization Practices* from the CDC, as some health plans have done, and ensure that these strategies are implemented by providers. These standards, which are included as Appendix A, are designed to help eliminate barriers and missed opportunities that impede completed immunizations.

Specific recommendations to improve immunization-completion rates among 2-year-olds enrolled in AHCCCS include the following:

- Contractors should ensure that health care professionals providing immunizations to their members report all vaccinations to the Arizona State Immunization Information System (ASIIS). With complete reporting, this automated registry could be a valuable tool in helping providers determine the immunization status of children they are seeing at any visit, so that opportunities to vaccinate are not missed. This is especially important when children receive immunizations at multiple sites and parents do not have current immunization records. Use of ASIIS to check patients' immunization status should prevent the need for them to return for vaccinations.
- Contractors should conduct practice-based assessments of immunization rates and provide feedback to physicians and office staff. These assessments could be tied to incentives for practices that meet immunization-completion standards.
- Contractors should aggressively pursue reminder and recall efforts. Mail and telephone reminders to parents and providers have been found to be effective in improving immunization-completion rates.[10]
- Contractors should continue member education to overcome parental complacency or fears regarding vaccination. Clearly explain the potential consequences of not having children fully immunized, including seizures, meningitis, hearing impairment and even death due to infectious diseases. Appendix B delineates the clinical manifestations and complications of the infectious diseases discussed in this report, as well as a comparison of the risk associated with each vaccine versus the risk of the disease itself.
- Contractors should target outreach activities to certain groups or geographic areas. NIS data indicate that Native American, African American and Hispanic children are likely to have lower immunization coverage levels, compared with non-Hispanic white children.[11] Additionally, monitoring coverage in specific geographic areas, such as at the county level, may help Contractors target interventions to increase immunization and prevent outbreaks of disease.

AHCCCS will require corrective action plans from Contractors that have not met Minimum Performance Standards for the most recent measurement period. Contractors that fail to show improvement may be subject to sanctions.

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# Table 1

## Complete Records in the Arizona State Immunization Information System (ASIIS), by Contractor: All Members, (Medicaid and KidsCare)

**For the Contract Year Ending September 30, 2003**

| AHCCCS Contractor | Final Sample Size | Complete Records Found in ASIIS | Percent of Complete Records Found in ASIIS |
|---|---|---|---|
| Maricopa Health Plan | 468 | 55 | 11.8 |
| | 379 | 42 | 11.1 |
| Pima Health System | 192 | 50 | 26.0 |
| | 107 | 33 | 30.8 |
| Arizona Physicians IPA | 2,412 | 603 | 25.0 |
| | 2,079 | 517 | 24.9 |
| Phoenix Health Plan | 663 | 223 | 33.6 |
| | 663 | 154 | 23.2 |
| Mercy Care Plan | 2,109 | 696 | 33.0 |
| | 1,533 | 510 | 33.3 |
| University Family Care | 265 | 73 | 27.5 |
| | 212 | 43 | 20.3 |
| Health Choice Arizona | 772 | 248 | 32.1 |
| | 630 | 108 | 17.1 |
| DES/CMDP | 158 | 23 | 14.6 |
| | 148 | 17 | 11.5 |
| DES/DDD | 142 | 20 | 14.1 |
| | 166 | 17 | 10.2 |
| **TOTAL** | **7,181** | **1,991** | **27.7** |
| PREVIOUS TOTAL* | 6,371 | 1,517 | 23.8 |

NOTES:
A record was considered complete if the child had at least four DTaP doses, three IPV doses, 1 MMR dose, 2 Hib doses, three HBV doses and 1 VZV dose (4:3:1:2:3:1 series) by 24 months of age.
Previous totals and percentages include two Contractors that are not included in the current results, Family Health Plan of Northeastern Arizona and CIGNA Community Choice.

# Table 2A

## Immunization Completion Rates by 24 Months of Age, by Contractor: Individual Vaccines, All Members (Medicaid and KidsCare)

**For the Contract Year Ending September 30, 2003**

| AHCCCS Contractor | Final Sample Size | Percent Immunizations Completed | | | | | |
|---|---|---|---|---|---|---|---|
| | | 4 DTaP | 3 IPV | 1 MMR | 2 Hib | 3 HBV | 1 VZV |
| Maricopa Health Plan | 468 | 78.2 | 94.0* | 93.8* | 84.2 | 86.5* | 86.3* |
| Pima Health System | 192 | 89.6* | 96.9* | 97.9* | 92.7* | 91.1* | 92.7* |
| Arizona Physicians IPA | 2,412 | 72.7 | 86.5 | 89.3* | 73.9 | 77.5 | 72.7* |
| Phoenix Health Plan | 663 | 85.8* | 93.8* | 94.7* | 94.6* | 90.9* | 80.2* |
| Mercy Care Plan | 2,109 | 77.4 | 90.4* | 92.1* | 86.2* | 81.6* | 75.5* |
| University Family Care | 265 | 74.3 | 90.9* | 92.1* | 88.7* | 86.4* | 81.1* |
| Health Choice Arizona | 772 | 78.8 | 89.8* | 92.6* | 87.4* | 84.6* | 74.4* |
| DES/CMDP | 158 | 74.1 | 87.3 | 93.7* | 76.6 | 75.3 | 77.2* |
| DES/DDD | 142 | 63.4 | 77.5 | 80.3 | 73.9 | 62.7 | 69.7 |
| **TOTAL** | **7,181** | **76.7** | **89.4** | **91.5** | **81.8** | **81.6** | **76.1** |

NOTES:
* Denotes that Contractor met or exceeded the AHCCCS Minimum Performance Standard for this indicator.
Total immunization rates for all members were not previously reported by individual Contractor.

## Table 2B

## Immunization Completion Rates by 24 Months of Age, by Contractor: Vaccine Series, All Members (Medicaid and KidsCare)

**For the Contract Year Ending September 30, 2003**

| AHCCCS Contractor | Final Sample Size | DTaP, IPV & MMR (4:3:1) | DTaP, IPV, MMR, Hib & HBV (4:3:1:2:3) |
|---|---|---|---|
| Maricopa Health Plan | 468 | 74.6 | 63.3 |
| Pima Health System | 192 | 88.5* | 80.2* |
| Arizona Physicians IPA | 2,412 | 69.3 | 48.6 |
| Phoenix Health Plan | 663 | 84.2* | 78.3* |
| Mercy Care Plan | 2,109 | 75.0 | 62.2 |
| University Family Care | 265 | 71.3 | 61.1 |
| Health Choice Arizona | 772 | 76.3 | 66.3 |
| DES/CMDP | 158 | 67.7 | 44.9 |
| DES/DDD | 142 | 59.2 | 44.4 |
| **TOTAL** | **7,181** | **73.8** | **59.3** |

NOTES:
* Denotes that Contractor met or exceeded the AHCCCS Minimum Performance Standard for this indicator.
Total immunization rates for all members were not previously reported by individual Contractor.

# Table 3A

## Immunization Completion Rates by 24 Months of Age, by Contractor: Individual Vaccines, Members covered under Medicaid

**For the Contract Year Ending September 30, 2003**

| AHCCCS Contractor | Final Sample Size | Percent Immunizations Completed | | | | | |
|---|---|---|---|---|---|---|---|
| | | 4 DTaP | 3 IPV | 1 MMR | 2 HIB | 3 HBV | 1 VZV |
| Maricopa Health Plan | 398 | 78.4 | 93.7* | 93.7* | 84.2 | 86.4* | 85.9* |
| | 318 | 80.2 | 88.7 | 90.2 | 84.9 | 80.5 | 86.8 |
| Pima Health System | 177 | 89.3* | 96.6* | 98.3* | 92.1* | 90.4* | 92.7* |
| | 92 | 92.4 | 94.6 | 94.6 | 87.0 | 89.1 | 90.2 |
| Arizona Physicians IPA | 2,125 | 71.7 | 85.9 | 89.0* | 71.1 | 76.4 | 71.8 |
| | 1,728 | 77.5 | 86.0 | 88.6 | 82.6 | 80.2 | 74.3 |
| Phoenix Health Plan | 565 | 84.6* | 93.3* | 94.0* | 93.8* | 90.8* | 78.8* |
| | 558 | 86.4 | 90.5 | 92.8 | 90.0 | 86.2 | 76.3 |
| Mercy Care Plan | 1,854 | 77.7 | 90.5* | 92.3* | 86.4* | 81.9* | 75.3* |
| | 1,280 | 83.8 | 91.1 | 90.9 | 84.2 | 82.7 | 78.5 |
| University Family Care | 228 | 72.4 | 89.5* | 91.7* | 86.8* | 85.1* | 80.3* |
| | 177 | 87.0 | 93.8 | 92.7 | 88.7 | 88.1 | 81.9 |
| Health Choice Arizona | 674 | 78.2 | 89.5* | 92.6* | 87.1* | 84.9* | 73.7* |
| | 531 | 82.7 | 87.4 | 88.3 | 85.1 | 78.2 | 72.3 |
| DES/CMDP | 158 | 74.1 | 87.3 | 93.7* | 76.6 | 75.3 | 77.2* |
| | 148 | 64.9 | 71.6 | 81.1 | 67.6 | 65.5 | 76.4 |
| DES/DDD | 142 | 63.4 | 77.5 | 80.3 | 73.9 | 62.7 | 69.7 |
| | 165 | 68.5 | 71.5 | 78.8 | 66.7 | 62.4 | 73.9 |
| **TOTAL** | **6,321** | **76.1** | **89.1** | **91.4** | **81.5** | **81.2** | **75.5** |
| PREVIOUS TOTAL | 5,363 | 81.0 | 87.7 | 89.7 | 83.8 | 80.8 | 77.1 |

NOTES:
* Denotes that Contractor met or exceeded the AHCCCS Minimum Performance Standard for this indicator.
Shaded rows include previous results (CYE 2001).
Previous total and percentages include two Contractors that are not included in the current results, Family Health Plan of Northeastern Arizona and CIGNA Community Choice.

# Table 3B

## Immunization Completion Rates By 24 Months of Age, by Contractor: Vaccine Series, Members covered under Medicaid

**For the Contract Year Ending September 30, 2003**

| AHCCCS Contractor | Final Sample Size | DTaP, IPV & MMR (4:3:1) | DTaP, IPV, MMR, Hib & HBV (4:3:1:2:3) |
|---|---|---|---|
| Maricopa Health Plan | 398 | 74.4 | 63.1 |
| | 318 | 77.7 | 64.5 |
| Pima Health System | 177 | 88.7* | 79.7* |
| | 92 | 89.1 | 78.3 |
| Arizona Physicians IPA | 2,125 | 68.4 | 47.3 |
| | 1,728 | 74.6 | 62.4 |
| Phoenix Health Plan | 565 | 82.8* | 77.2* |
| | 558 | 83.5 | 74.2 |
| Mercy Care Plan | 1,854 | 75.5 | 62.6 |
| | 1,280 | 80.7 | 65.6 |
| University Family Care | 228 | 68.9 | 57.9 |
| | 177 | 83.0 | 72.3 |
| Health Choice Arizona | 674 | 75.7 | 65.7 |
| | 531 | 80.6 | 67.4 |
| DES/CMDP | 158 | 67.7 | 44.9 |
| | 148 | 62.8 | 47.3 |
| DES/DDD | 142 | 59.2 | 44.4 |
| | 165 | 63.6 | 45.4 |
| **TOTAL** | **6,321** | **73.3** | **58.6** |
| PREVIOUS TOTAL | 5,363 | 78.1 | 65.1 |

NOTES:

* Denotes that Contractor met or exceeded the AHCCCS Minimum Performance Standard for this indicator.

Shaded rows include previous results (CYE 2001).

Previous total and percentages include two Contractors that are not included in the current results, Family Health Plan of Northeastern Arizona and CIGNA Community Choice.

# Table 4A

## Immunization Completion Rates By 24 Months of Age, by Contractor: Individual Vaccines, Members covered under KidsCare

**For the Contract Year Ending September 30, 2003**

| AHCCCS Contractor | Final Sample Size | Percent Immunizations Completed | | | | | |
|---|---|---|---|---|---|---|---|
| | | 4 DTaP | 3 IPV | 1 MMR | 2 HIB | 3 HBV | 1 VZV |
| Maricopa Health Plan | 70 | 77.1 | 95.7* | 94.3* | 84.3 | 87.1* | 88.6* |
| Pima Health System | 15 | 93.3* | 100.0* | 93.3* | 100.0* | 100.0* | 93.3* |
| Arizona Physicians IPA | 287 | 80.1 | 91.3* | 91.3* | 73.5 | 85.7* | 79.1* |
| Phoenix Health Plan | 98 | 92.9* | 96.9* | 99.0* | 99.0* | 91.8* | 88.8* |
| Mercy Care Plan | 255 | 74.9 | 89.4* | 91.0* | 85.1* | 79.2 | 77.3* |
| University Family Care | 37 | 86.5* | 100.0* | 100.0* | 100.0* | 94.6* | 86.5* |
| Health Choice Arizona | 98 | 82.7* | 91.8* | 92.9* | 89.8* | 82.7* | 78.6* |
| **TOTAL** | **860** | **80.6** | **92.3** | **92.9** | **84.2** | **84.9** | **80.6** |

NOTES:
* Denotes that Contractor met or exceeded the AHCCCS Minimum Performance Standard for this indicator.
Immunization rates for KidsCare members were not previously reported by individual Contractor.

# Table 4B

## Immunization Completion Rates By 24 Months of Age, by Contractor: Vaccine Series, Members covered under KidsCare

**For the Contract Year Ending September 30, 2003**

| AHCCCS Contractor | Final Sample Size | DTaP, IPV & MMR (4:3:1) | DTaP, IPV, MMR, Hib & HBV (4:3:1:2:3) |
|---|---|---|---|
| Maricopa Health Plan | 70 | 75.7 | 64.3 |
| Pima Health System | 15 | 86.7* | 86.7* |
| Arizona Physicians IPA | 287 | 76.0 | 58.2 |
| Phoenix Health Plan | 98 | 91.8* | 84.7* |
| Mercy Care Plan | 255 | 71.4 | 58.8 |
| University Family Care | 37 | 86.5* | 81.1* |
| Health Choice Arizona | 98 | 80.6* | 70.4* |
| **TOTAL** | **860** | **77.6** | **64.8** |

NOTES:
* Denotes that Contractor met or exceeded the AHCCCS Minimum Performance Standard for this indicator.
Immunization rates for KidsCare members were not previously reported by individual Contractor.

# Table 5A

## Potential Missed Opportunities in DTaP Completion Rates, by Contractor: Members Covered under Medicaid

**For the Contract Year Ending September 30, 2003**

| AHCCCS Contractor | Final Sample Size | DTaP Complete (4 Doses) | | 3 DaTP Doses | | Potential Completion Rate | |
|---|---|---|---|---|---|---|---|
| | | # | % | # | % | # | % |
| Maricopa Health Plan | 398 | 312 | 78.4 | 70 | 17.6 | 382 | 96.0 |
| Pima Health System | 177 | 158 | 89.3 | 12 | 6.8 | 170 | 96.0 |
| Arizona Physicians IPA | 2,125 | 1,524 | 71.7 | 410 | 19.3 | 1,934 | 91.0 |
| Phoenix Health Plan | 565 | 478 | 84.6 | 51 | 9.0 | 529 | 93.6 |
| Mercy Care Plan | 1,854 | 1,441 | 77.7 | 303 | 16.3 | 1,744 | 94.1 |
| University Family Care | 228 | 165 | 72.4 | 52 | 22.8 | 217 | 95.2 |
| Health Choice Arizona | 674 | 527 | 78.2 | 102 | 15.1 | 629 | 93.3 |
| DES/CMDP | 158 | 117 | 74.1 | 30 | 19.0 | 147 | 93.0 |
| DES/DDD | 142 | 90 | 63.4 | 32 | 22.5 | 122 | 85.9 |
| **TOTAL** | **6,321** | **4,812** | **76.1** | **1,062** | **16.8** | **5,874** | **92.9** |

# Table 5B

## Potential Missed Opportunities in DTaP Completion Rates, by Contractor: Members Covered under KidsCare

**For the Contract Year Ending September 30, 2003**

| AHCCCS Contractor | Final Sample Size | DTaP Complete (4 Doses) | | 3 DaTP Doses | | Potential Completion Rate | |
|---|---|---|---|---|---|---|---|
| | | # | % | # | | Size | # |
| Maricopa Health Plan | 70 | 54 | 77.1 | 13 | 18.6 | 67 | 95.7 |
| Pima Health System | 15 | 14 | 93.3 | 14 | 6.7 | 15 | 100.0 |
| Arizona Physicians IPA | 287 | 230 | 80.1 | 38 | 13.2 | 268 | 93.4 |
| Phoenix Health Plan | 98 | 91 | 92.9 | 5 | 5.1 | 96 | 98.0 |
| Mercy Care Plan | 255 | 191 | 74.9 | 52 | 20.4 | 243 | 95.3 |
| University Family Care | 37 | 32 | 86.5 | 5 | 13.5 | 37 | 100.0 |
| Health Choice Arizona | 98 | 81 | 82.7 | 11 | 11.2 | 92 | 93.9 |
| **TOTAL** | **860** | **693** | **80.6** | **138** | **16.0** | **831** | **96.6** |

APPENDIX A

# Revised Standards for Child and Adolescent Immunization Practices

## Availability of Vaccines

### 1. Vaccination Services Are Readily Available

All health care professionals who provide primary care to children and adolescents should always include routinely recommended vaccines as a part of the care that they deliver in the medical home. For some children and adolescents, the main contact with the health care system is not in a primary care provider's office; therefore, opportunities for vaccination may be missed. Thus, specialists and health care professionals in settings such as schools and school health clinics, sports physical clinics, family planning clinics, sexually transmitted disease clinics, and substance abuse treatment centers should assess each patient's vaccination status and either offer indicated vaccines or refer for vaccination if necessary. Information on vaccines administered outside the primary care setting should be communicated to the primary care provider.

### 2. Vaccinations Are Coordinated With Other Health Care Services and Provided in a Medical Home When Possible

Ideally, vaccines should be given as part of comprehensive health care. In primary care settings, vaccination services should be coordinated with routine well-care visits and other visits. Patients who are vaccinated in other settings should be encouraged to receive subsequent vaccines in their primary care setting. Patients without a primary care provider should be assisted with identifying one.

### 3. Barriers to Vaccination Are Identified and Minimized

Barriers to receiving vaccines include delays in scheduling appointments, requiring a well-care visit, long waiting periods in the office, and lack of culturally and age-appropriate educational materials. A physical examination, although an important part of well care, should not be required before administering vaccines: simply observing the patient and questioning about the patient's health status, immunization history, and vaccine contraindications are sufficient. In addition, vaccination-only visits should be available. Health care professionals should seek advice from parents/guardians and patients to identify ways to make vaccination services easier to use.

### 4. Patient Costs Are Minimized

Out-of-pocket costs—including vaccine, administration, and office visit fees — should be as low as possible for all patients, and no child or adolescent should be denied vaccination because of inability to pay. Resources should be identified to keep patient vaccination costs as low as possible. Free vaccine is available through some public programs, although health care professionals who offer these vaccines may charge a reasonable administration fee. Sources of publicly funded vaccines include the Vaccines for Children Program (VFC), Public Health Service Section 317 grants to states, and state or local programs. Children and adolescents should be screened for their eligibility to receive vaccines through these programs. Vaccinations provided through VFC or Section 317 grants may not be denied because of an inability to pay the administration fee, and health care professionals should ensure that parents/guardians and patients are aware of this requirement (applies to all vaccines purchased using Centers for Disease Control and Prevention [CDC] contracts, regardless of the setting—private or public—in which the vaccines are administered).

To minimize costs for patients, health plans and insurance plans should include the provision and administration of all routinely recommended vaccines as a covered benefit for all children and adolescents. Furthermore, to minimize costs for health care professionals, purchasers and health plans should reimburse health care professionals adequately for delivering vaccines, including the time required for vaccine administration and for communication about vaccine benefits and risks. The CDC maintains a web page about VFC at http://www.cdc.gov/nip/vfc.

**Assessment of Vaccination Status**

**5. Health Care Professionals Review the Vaccination and Health Status of Patients at Every Encounter to Determine Which Vaccines Are Indicated**

Health care professionals should review the vaccination status of all patients at all health care visits to minimize the number of missed opportunities to vaccinate. This review should determine whether the patient has received any vaccinations elsewhere or is at high risk for disease or undervaccination. This information should be documented in the patient's chart and preventive health summary. Health care professionals who do not offer vaccinations should refer patients to a primary care provider for needed vaccinations.

**6. Health Care Professionals Assess for and Follow Only Medically Accepted Contraindications**

Withholding vaccinations because of medical concerns that are not contraindications results in missed opportunities for prevention. Health care professionals should ask about any condition or circumstance that might indicate that a vaccination should be withheld or delayed and about previous adverse events temporally associated with any vaccination. Health care professionals should support their decisions about what constitutes a contraindication or deferral for each vaccine by consulting the Guide to Contraindications to Vaccinations published by the CDC (available at: http://www.cdc.gov/nip/recs/contraindications.pdf); the harmonized recommendations of the ACIP, the AAP, and the AAFP (available at: http://www.cdc.gov/nip/recs/child-schedule.htm#Printable); the AAP's *Red Book* and other relevant recommendations; Vaccine Information Statements; and manufacturers' package inserts. Contraindications and deferrals should be documented in the medical record.

**Effective Communication About Vaccine Benefits and Risks**

**7. Parents/Guardians and Patients Are Educated About the Benefits and Risks of Vaccination in a Culturally Appropriate Manner and in Easy-to-Understand Language**

Health care professionals should allow sufficient time with parents/guardians and adolescent patients to discuss the benefits of vaccines, the diseases that they prevent, any known risks from vaccines, the immunization schedule and the need to receive vaccines at the recommended ages, and the importance of bringing the patient's hand-held vaccination record to each health care visit. Health care professionals should encourage parents/guardians and adolescent patients to take responsibility for ensuring that the patient is fully vaccinated.

For all commonly used childhood vaccines, all health care professionals are required by federal law to give a Vaccine Information Statement (VIS) to vaccine recipients or their parents/guardians at each visit. A VIS is a vaccine-specific, 2-page information sheet, produced by the CDC, that describes the benefits and risks of a vaccine. If necessary, health care professionals should supplement the VIS with oral explanations or other written materials that are culturally and linguistically appropriate. Health care professionals should review written materials with patients and their parents/guardians and address questions and concerns.

Health care professionals should encourage parents/guardians and adolescent patients to inform the health care professional of adverse events after the vaccine to be administered and explain how to obtain medical care, if necessary. (See Standard 13 for a description of the Vaccine Adverse Events Reporting System [VAERS]). General vaccination information for health care professionals, parents, and members of the public may be obtained by calling the CDC National Immunization Information Hotline at 1-800-232-2522 (English) or 1-800-232-0233 (Spanish). Information about vaccine risk communication for health care professionals can be found at http://www.cdc.gov/nip/vacsafe/research/peds.htm and in the latest edition of the *Red Book*. VISs are available in English and numerous other languages from state health departments and at http://www.cdc.gov/nip/publications/VIS/default.htm and http://www.immunize.org. Recommendations for national standards for culturally and linguistically appropriate services in health care may be found at http://www.omhrc.gov/omh/programs/2pgprograms/finalreport.pdf.

**Proper Storage and Administration of Vaccines and Documentation of Vaccinations**

**8. Health Care Professionals Follow Appropriate Procedures for Vaccine Storage and Handling**

Vaccines should be handled and stored as recommended in the manufacturers' package inserts; the expiration date for each vaccine should be noted. Temperatures at which vaccines are stored and transported should be monitored and recorded twice daily. Summary information about vaccine storage and handling procedures are also available from state and local health departments and the CDC. Health care professionals should monitor vaccine inventory and undertake efforts to reduce wastage and loss. CDC-recommended storage and handling procedures are available from the CDC by calling 404-639-8222.

**9. Up-to-Date, Written Vaccination Protocols Are Accessible at All Locations Where Vaccines Are Administered**

To promote the safe and effective use of vaccines, health care professionals should maintain written protocols that detail the following: vaccine storage and handling; the recommended vaccination schedule, vaccine contraindications, and administration techniques; treatment and reporting of adverse events; vaccine benefit and risk communication; and vaccination record maintenance and accessibility. These protocols should be consistent with established guidelines, reviewed frequently, and revised as needed to ensure that they remain up-to-date.

**10. People Who Administer Vaccines and Staff Who Manage or Support Vaccine Administration Are Knowledgeable and Receive Ongoing Education**

Health care professionals or others who administer vaccinations should be knowledgeable and receive continuing education in vaccine storage and handling; the recommended vaccine schedule, contraindications, and administration techniques; treatment and reporting of adverse events; vaccine benefit and risk communication; and vaccination record maintenance and accessibility. With appropriate training and in accordance with state law/regulation/policy, people other than physicians and nurses may administer vaccines. In addition, other staff should receive training and continuing education related to their specific roles and responsibilities that affect vaccination services.

The CDC sponsors distance-based training opportunities (eg, satellite broadcasts, web-based training, videotapes, self-administered print materials) for health care professionals. Information about training is available at http://www.cdc.gov/nip/ed.

**11. Health Care Professionals Simultaneously Administer as Many Indicated Vaccine Doses as Possible**

Administering vaccines simultaneously (at the same visit), in accordance with recommendations from the ACIP, the AAP, and the AAFP, is safe, effective and indicated. Although the immunization schedule provides age flexibility for administering certain vaccine doses, simultaneous administration decreases the number of visits needed and the potential for missed doses and enables earlier protection. When indicated vaccines are not simultaneously administered, arrangements should be made for the patient's earliest return to receive the needed vaccination(s). Additional information on the safety of simultaneous vaccination may be found at http://www.cdc.gov/nip/vacsafe/research/simultaneous.htm.

**12. Vaccination Records for Patients Are Accurate, Complete, and Easily Accessible**

Vaccination records for patients should be recorded on a standard form in an easily accessible location in the medical record to facilitate rapid review of vaccination status. Accurate record keeping helps to ensure that only needed vaccinations are given. As required by federal law (42 US Code 300aa-25), health care professionals should ensure that records contain the following information for each vaccination: the date of administration, the vaccine manufacturer and lot number, the signature and title of the person administering the vaccine, and the address where the vaccine was given. Vaccine refusal should also be documented.

The medical record maintained by the primary care provider should document all vaccines received, including those received at a specialist's office or in another health care setting. When a health care professional who does not routinely care for a patient vaccinates that patient, the patient's primary care provider should be informed.

All vaccinations administered should be reported to state or local immunization registries, where available, to ensure that each patient's vaccination history remains accurate and complete. Registries also may be useful for verifying the vaccination status of new patients, determining which vaccines are needed at a visit, printing official records, and providing reminders and recalls to parents, guardians, and patients.

Health care professionals should ensure that each patient has a hand-held vaccination record that documents each vaccine received, including the date and the name of the health care professional who administered the vaccine. Health care professionals should encourage parents/guardians and adolescent patients to bring the patient's hand-held record to each health care visit so that it can be updated.

The CDC maintains an Immunization Registry Clearinghouse. Information about this clearinghouse is available at http://www.cdc.gov/nip/registry/.

**13. Health Care Professionals Report Adverse Events After Vaccination Promptly and Accurately to the Vaccine Adverse Events Reporting System (VAERS) and Are Aware of a Separate Program, the National Vaccine Injury Compensation Program (VICP)**

Health care professionals should promptly report all clinically significant adverse events after vaccination to the VAERS even if the health care professional is not certain that the vaccine caused the event. Health care professionals should document in detail the adverse event in the patient's medical record as soon as possible. Providers should be aware that parents/guardians and patients may report to VAERS and that if they choose to do so, they are encouraged to seek the help of their health care provider.

The National Vaccine Injury Compensation Program (VICP) is a no-fault system that compensates people of any age for injuries or conditions that may have been caused by a vaccine recommended by the CDC for routine use in children. Health care professionals should be aware of the VICP to address questions from parents/guardians and patients.

Because VAERS and VICP are separate programs, a report of an event to VAERS does not result in the submission of a compensation claim to VICP. A brief description and contact information for both programs is provided on each VIS for those vaccines covered by the National Childhood Vaccine Injury Act. Information about VAERS, as well as guidance about how to obtain and complete a VAERS form, can be found at http://www.vaers.org or by calling 1-800-822-7967. Information about the VICP is available at http://www.hrsa.gov/osp/vicp or by calling 1-800-338-2382.

**14. All Personnel Who Have Contact With Patients Are Appropriately Vaccinated**
Health care professionals and other personnel who have contact with patients should be appropriately vaccinated. Offices and clinics should have policies to review and maintain the vaccination status of staff and trainees. ACIP recommendations for vaccinating health care workers are available at ftp://ftp.cdc.gov/pub/publications/mmwr/rr/rr4618.pdf.

**Implementation of Strategies to Improve Vaccination Coverage**

**15. Systems Are Used to Remind Parents/Guardians, Patients, and Health Care Professionals When Vaccinations Are Due and to Recall Those Who Are Overdue**
Evidence demonstrates that reminder/recall systems improve vaccination coverage. Patient reminder/recall interventions inform individuals that they are due (reminder) or overdue (recall) for specific vaccinations. Patient reminders/recalls can be mailed or communicated by telephone; an autodialer system can be used to expedite telephone reminders. Patients who might be at high risk for not complying with medical recommendations, for example, those who have missed previous appointments, should receive more intensive follow-up. Similarly, provider reminder/recall systems alert health care professionals when vaccines are due or overdue. Notices should be placed in patient charts or communicated to health care professionals by computer or other means. Immunization registries can facilitate automatic generation of reminder/recall notices.

**16. Office- or Clinic-Based Patient Record Reviews and Vaccination Coverage Assessments Are Performed Annually**
Evidence shows that assessments are most effective in improving vaccination coverage in a practice when they combine chart reviews to determine coverage with the provision of results to health care professionals and staff. Effective interventions also may incorporate incentives or compare performance with a goal or a standard. Coverage should be assessed regularly so that reasons for low coverage are identified and addressed. For assistance in conducting vaccination coverage assessments, health care professionals should contact their state or local immunization program.

**17. Health Care Professionals Practice Community-Based Approaches**
No community is optimally protected against vaccine-preventable diseases without high vaccination coverage levels. Therefore, health care professionals should consider the needs of the community (especially underserved populations), as well as those of their patients. Community-based approaches may involve working with partners, including public health departments, managed care organizations, other service providers such as the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), advocacy groups, schools, and service organizations to determine community needs and develop vaccination services that address these needs.

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APPENDIX B

| DISEASE | CLINICAL FEATURES | COMPLICATIONS |
|---|---|---|
| **Diphtheria** | Cold-like symptoms, such as sore throat, anorexia, and low-grade fever. Respiratory obstruction may occur. Eventually the tonsils and soft palate will be covered with a bluish-white membrane | The most common complications are myocarditis (characterized by abnormal cardiac rhythms, which can lead to death), and neuritis (affects motor nerves, secondary pneumonia and respiratory failure may result from paralysis of the diaphragm). Other complications include otitis media (ear infection) and respiratory insufficiency due to airway obstruction, especially in infants. Death rate is up to 20 percent among children younger than 5 years. |
| **Tetanus** | Lockjaw, stiffness of the neck, difficulty swallowing, rigid abdominal muscles, fever, hypertension, and tachycardia. Complete recovery can take months. | Laryngospasm (spasm of the vocal chords and/or muscles of respiration, which may result in difficulty breathing), fractures of the spine or long bones due to sustained contractions and convulsions, hyperactivity of the autonomic nervous system (may lead to hypertension and/or abnormal heart rhythm), nosocomial infection (related to long hospitalization), pulmonary embolism, and aspiration pneumonia. Death occurs in about 11 percent of cases. |
| **Pertussis** | Cold-like symptoms (first stage), coughing spells that end in a high-pitched whoop, and may result in cyanosis in which the patient turns blue (second stage). Vomiting and exhaustion usually follow coughing episodes. | Seizures, encephalopathy, secondary bacterial pneumonia resulting in death occurs in approximately 12 percent of infants younger than six months. Neurologic complications also are more common among infants. Other complications include otitis media, anorexia, dehydration and pressure injuries due to severe coughing. |
| **Poliomyelitis (polio)** | Response to infection is highly variable and may consist of minor, non-specific illness, including sore throat and fever, nausea, vomiting, abdominal pain, constipation, or diarrhea; or influenza-like illness. Other forms include stiffness of the neck, back and/or legs, and paralytic illness. | Nonparalytic aseptic meningitis, flaccid paralysis (diminished deep tendon reflexes). Death rate ranges from 2 percent to 75 percent, depending on age and severity of the illness. |

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| **Measles** | Rash, fever, cough, runny nose, Koplik's spots (blue-white spots on the buccal mucosa), cold-like symptoms, anorexia, diarrhea, generalized lymphadenopathy and conjunctivitis (eye infection) | Diarrhea, otitis media, pneumonia, and encephalitis. subacute sclerosing panencephalitis (SSPE), a rare degenerative central nervous system disorder is believed to be caused by persistent measles virus infection of the brain. Measles during pregnancy can result in premature labor, spontaneous abortion and low birth weight Death occurs in 0.2 percent of cases, with the risk of death higher in young children. |
| **Mumps** | Non-specific illness consisting of low-grade fever, headache, malaise, myalgia; parotitis (manifested as ear ache and tenderness of the jaw) | Central nervous system involvement (meningitis or encephalitis); orchitis (testicular inflamaation), oophoritis (ovarian inflammation), myocarditis, pancreatitis, and hyperglycemia. Less common complications are deafness, arthralgia, arthritis and nephritis. Death occurs in 1 to 3 in 10,000 cases. |
| **Rubella** | Low-grade fever, malaise, swollen glands and upper respiratory infection prior to a rash; conjunctivitis, testalgia or orchitis | Abortion (both surgical and spontaneous); gastronintestinal, cerebral or intrarenal hemorrhage; encephalitis; arthralgia and arthritis occur frequently in adults. Congenital rubella syndrome (CRS) includes deafness, blindness and mental retardation in newborns. |
| **Haemophilus influenza type b (Hib)** | Meningitis (infection of the membranes covering the brain, including fever, decreased mental status and stiff neck), epiglottitis (infection and swelling of the tissue that covers the larynx during swallowing, and may cause life-threatening airway obstruction), pneumonia, otitis media, arthritis, cellulitis (rapidly progressing skin infection that usually involves the face, head or neck), osteomyelitis (bone infection) and pericarditis (infection of the sac covering the heart) | Meningitis, epiglottitis, pneumonia, arthritis, cellulitis, osteomyelitis and bacteremia. Others experience hearing impairment or neurologic sequelae, and death occurs in 2 to 5 percent of cases. |
| **Hepatitis B (HBV)** | Malaise, anorexia, nausea, vomiting, right upper quadrant abdominal pain, fever, headache, myalgias, skin rashes, arthralgias, arthritis and dark urine, progressing to jaundice, tenderness and enlargement of the liver; fatigue may persist for weeks or months | Chronic infection and malaise/fatigue for weeks and /or months, chronic hepatitis, cirrhosis of the liver, liver failure and carcinoma. Up to 4,000 people in the United States die each year from hepatitis B-related cirrhosis and up to 1,500 die from related liver cancer. |
| **Varicella (VZV - also known as Chicken Pox)** | Fever, malaise, rash (with lesions on mucous membranes that may rupture and become purulent before drying and crusting over), and pruritus (itching) . Herpes Zoster (shingles) occurs when the VZV reactivates. | Secondary bacterial infection, pneumonia, central nervous system symptoms (aseptic memingitis, encephalitis) and Reye's syndrome. If a woman develops varicella within five days of delivery, the neonate has a 30 percent chance of death. |

## Risk of Complications from Disease vs. Risk of Adverse Reactions from Vaccines

No vaccine is perfectly safe or effective. Approximately 10,000 cases of adverse health effects

are reported to the CDC through the Vaccine Adverse Event Reporting System (VAERS) each year. Research is under way by the U. S. Public Health Service to better understand which vaccine adverse events are truly caused by vaccines (or are coincidental to their administration) and how to reduce the already low risk of serious vaccine-related injury.

Children are far more likely to be injured by a vaccine-preventable disease than by the vaccine. Still, some parents refuse to have their children immunized because of the possibility of adverse reaction to a vaccine. Below is a comparison of risks from disease and risks from vaccines.

| **Risk from Disease vs. Risk from Vaccines** | |
|---|---|
| **Disease** | **Vaccine** |
| Diphtheria<br>Death: 1 in 20<br><br>Tetanus<br>Death: 3 in 100<br><br>Pertussis<br>Pneumonia: 1 in 8<br>Encephalitis: 1 in 20<br>Death: 1 in 200 | DTaP<br>Fever greater than 101°: 3 to 5 in 100<br>Swelling at injection site: 2 to 29 in 100 |
| Measles<br>Pneumonia: 1 in 20<br>Encephalitis: 1 in 2,000<br>Death: 1 in 3,000<br><br>Mumps<br>Encephalitis: 1 in 300<br><br>Rubella<br>Congenital Rubella Syndrome: 1 in 4 if mother is infected early in pregnancy | MMR<br>Encephalitis or severe allergic reaction: 1 in 1 million |

Source: Centers for Disease Control and Prevention, Epidemiology and Prevention of Vaccine-Preventable Diseases, Seventh Edition (second printing), January 2003