Immunization

Following years of increasing coverage, progress towards full immunization of all two-year-olds has stalled since 2004, standing at 81 percent in 2013.

Importance

Diseases that once spread quickly and killed thousands are now largely controlled by vaccines. Vaccines are given early in life, because many of the diseases they prevent are more common, and more deadly, among infants and small children. Protecting children against severe illnesses leads to positive outcomes beyond improved physical health, including improved school attendance and reduced family stress. Additionally, childhood immunization is an important step in maintaining high vaccination levels within the population, which prevent outbreaks of such diseases. It is unlikely that an individual who is immunized against a disease will transmit it to someone else. Thus, vaccination protects not only the child receiving the vaccine, but also others in the child’s community, including those who, for health reasons, cannot be vaccinated. For this reason, most schools require that children be fully immunized at enrollment.

The Centers for Disease Control and Prevention (CDC) recommends immunizing children against most vaccine-preventable diseases by the time they are two years old. The CDC’s immunization schedule for children recommends four doses of the diphtheria, tetanus, and pertussis (DTP) vaccine, three or more doses of polio vaccine, one or more doses of the measles-mumps-rubella (MMR) vaccine, three or more doses of the Haemophilus influenzae type b (Hib) vaccine (or, for certain brands, four or more doses), the hepatitis B vaccine, and the varicella (chickenpox) vaccine. The DTP, polio, MMR, and Hib vaccines are collectively referred to as the combination, or 4:3:1 series. Since 2002, the CDC has also tracked a combination series that includes all of the vaccines listed above (called the 4:3:1:3:1 series). Prior to 2009, the CDC did not track whether the brand of Hib vaccine received required three or four doses for a complete run. Because of this, newer and older data may not be comparable. As of 2013, 13 states had achieved a vaccination coverage rate of 80 percent or more for the 4:3:1:3 series among children aged 19-35 months, meeting a Healthy People 2020 objective.

Trends
Between 1994 and 2004, the proportion of children ages 19 to 35 months receiving the combined series (4:3:1) vaccines increased from 69 to 83 percent. Since that time, however, there has been no progress, with the 2011 rate at 82 percent. The proportion of children who received all of the vaccinations in the combined series 4:3:1:3:1, increased markedly in the early years of this decade, from 66 percent in 2002 to 77 percent in 2006; since then, progress on this rate has also stagnated. In 2010, the first year that the CDC tracked whether children were receiving the appropriate number of doses for the brand of Hib vaccine that they received, only 62 percent received the full 4:3:1:3* series, while only 59 percent received the full 4:3:1:3*:3:1 series. However, by 2011 these proportions had increased greatly, and by 2013 were 77 and 74 percent, respectively. (Figure 1)

**Differences by Race/ Hispanic Origin[7]**

In 2013, black children were less likely to be fully vaccinated than white children (69 versus 79 percent for the 4:3:1:3* series; 68 versus 75 percent for the 4:3:1:3*:3:1 series). The share of children who received the combined series of vaccines (4:3:1:3*), ranged from 69 to 79 percent by race and Hispanic origin. Meanwhile, the proportion of these groups receiving the 4:3:1:3*:3:1 series ranged between 68 and 77 percent. (Appendix 1)

**Differences by Poverty Status**

Children in families with incomes below the poverty level are less likely than those with families with incomes at or above the poverty level to receive the combined-series vaccination (4:3:1:3*) (71 versus 80 percent, respectively, in 2013). Children in families with incomes below the poverty level are also less likely to receive the 4:3:1:3*:3:1 series: 69 versus 77 percent. (Figure 2)
Differences by Type of Immunization

Vaccination rates for the hepatitis B vaccine, first recommended in the 1990s, increased rapidly between 1994 and 2013, from 37 to 91 percent. In addition, rates for varicella (chickenpox) vaccines, also first recommended in the 1990s, have climbed steadily, from 26 percent in 1997 (the first year for which data are available), to 91 percent in 2013. Rates of receipt of other vaccines have also risen since the early 1990s. (Appendix 1) In 2013, national immunization rates of children ages 19-35 months for MMR, polio, chickenpox, and hepatitis B vaccines each met or exceeded 90 percent, the Healthy People 2020 targets. However, only 83 percent had received the recommended doses of the DTP vaccine, and only 82 percent had received the recommended doses of the Hib vaccine. (Figure 3)

State and Local Estimates

2013 data for states are available for the combined series and individual vaccinations from the National Immunization Survey.

State-level estimates are also available at the Kids Count Data Center

International Estimates

International estimates for 2000Â through 2013 for countries and territories can be found from UNICEF's Immunization Survey.

National Goals

Through its Healthy People 2020 initiative, the federal government has set several national goals to increase the percentage of children who have received vaccines. For example, the 2020 goal is for 80 percent of children ages 19-35 months to be immunized against DTP, polio, MMR, Hib, hepatitis B, varicella, and PCV.

More information is available here. (Goals IID 7-11)
What Works to Make Progress on This Indicator

The Centers for Disease Control and Prevention lists strategies for increasing both child and adult immunization rates.

Also, see Child Trends` LINKS database (“Lifecourse Interventions to Nurture Kids Successfully”), for reviews of many rigorously evaluated programs, including the following which have been shown to be effective:

- Home Visiting Program for Working-Class Mothers and Their Infants
- Healthy Steps for Young Children
- Parents as Teachers
- Health Care Program for First-Time Adolescent Mothers and their Infants
- Community Mothers’ Programme
- Early Intervention Program for Adolescent Mothers
- My Baby U

Related Indicators

- Well-Child Visits
- Health Care Coverage

Definition

Combined Series (4:3:1:3) Vaccine: includes 4 or more doses of diphtheria and tetanus toxoids and the pertussis vaccine (DTaP), 3 or more doses of the poliovirus vaccine, 1 or more doses of a measles-mumps-rubella vaccine, and 3 or more doses of series of Haemophilus influenzae type b vaccine (Hib). Combined Series (4:3:1:3*), is the same as above, except that instead of 3 or more doses of Hib, it is 3 or more or four or more doses of Hib vaccine, depending on the brand.

Combined Series (4:3:1:3:1) Vaccine: includes those doses listed above for combined series (4:3:1:3), plus three or more doses of hepatitis B vaccine (HepB), and one or more doses of varicella. Combined Series (4:3:1:3*:3:1) is defined as above, except that instead of 3 or more doses of Hib, it is 3 or more, or four or more doses of Hib vaccine, depending on the brand.

Vaccines and the common names of the diseases they protect against:

- Tetanus: lockjaw
- Pertussis: whooping cough
- Haemophilus influenzae type b: Hib Disease
- Varicella: chickenpox

For further information about children’s immunizations, including definitions and recommendations, please visit the CDC’s “Parents Guide to Childhood Immunizations”.

The current Recommended Childhood and Adolescent Immunization Schedules, published by the CDC, are available online.

Data Sources
Data for 2003-2013: Centers for Disease Control and Prevention, National Immunization Program, NIS data, tables, Jan-Dec. /www.cdc.gov/vaccines/stats-surv/imz-coverage.htm#nis


Raw Data Source
National Immunization Survey
http://www.cdc.gov/nchs/nis.htm

Appendix 1Â - Percentage of Children, 19-35 Months of Age, Who Have Been Vaccinated, by Selected Characteristics: Selected Years,Â 1994-2013

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined series (4:3:1:3)¹</td>
<td>69</td>
<td>74</td>
<td>76</td>
<td>79</td>
<td>78</td>
<td>76</td>
<td>77</td>
<td>78</td>
<td>81</td>
<td>83</td>
<td>82</td>
<td>82</td>
<td>76</td>
<td>77</td>
<td>78</td>
<td>81</td>
<td>83</td>
<td>82</td>
<td>82</td>
</tr>
<tr>
<td>Combined series (4:3:1:3)²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race and Hispanic Origin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White, non-Hispanic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black, non-Hispanic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic³</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian, non-Hispanic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td><em>American Indian or Alaska, non-Hispanic</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>70</td>
<td>69</td>
</tr>
</tbody>
</table>

Poverty Status

| Below Poverty | 58 | 70 | 72 | 71 |
| At or Above Poverty | 64 | 78 | 79 | 80 |

Location of Residence

| Combined series | - | - | - | - | - | 66 | 73 | 76 | 76 | 77 | 76 | 70 | 75 | 77 | 76 | 78 |
| Combined series | - | - | - | - | - | - | - | - | - | - | 59 | 71 | 72 | 75 |

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>White, non-Hispanic</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>59</td>
<td>71</td>
</tr>
<tr>
<td><em>Black, non-Hispanic</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>58</td>
<td>66</td>
</tr>
<tr>
<td><em>Hispanic</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>58</td>
<td>62</td>
</tr>
<tr>
<td><em>Asian, non-Hispanic</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>63</td>
<td>77</td>
</tr>
<tr>
<td><em>American Indian or Alaska, non-Hispanic</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>67</td>
<td>69</td>
</tr>
</tbody>
</table>

Poverty Status

| Below Poverty | 56 | 67 | 68 | 69 |
| At or Above Poverty | 61 | 74 | 75 | 77 |

Location of Residence

<p>| Combined series | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 59 | 72 | 72 | 72 |</p>
<table>
<thead>
<tr>
<th>Individual Vaccines</th>
<th>Remaining Areas inside MSA</th>
<th>Outside MSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTP/DT/DTaP (4 doses or more)</td>
<td>76 78 81 84 83 82 82 82 85 86 85 85 84 84 85 83 83</td>
<td>60 71 72 76</td>
</tr>
<tr>
<td>Polio (3 doses or more)</td>
<td>83 88 91 91 90 90 89 90 92 92 92 93 94 93 94 93 93</td>
<td>58 70 72 73</td>
</tr>
<tr>
<td>Measles-Mumps-Rubella</td>
<td>89 90 91 92 92 91 91 92 93 93 92 92 92 90 92 91 92</td>
<td></td>
</tr>
<tr>
<td>Hib (3 doses or more)</td>
<td>86 91 91 93 94 93 93 93 94 94 93 93 91 84 90 94 93 93</td>
<td></td>
</tr>
<tr>
<td>Hib (3 or 4 doses, depending on brand)</td>
<td>- - - - - - - - - - - - - - - - - - - -</td>
<td>55 67 80 81 82</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>37 68 82 87 88 90 89 90 92 92 93 93 93 94 92 92 91 90 91</td>
<td></td>
</tr>
<tr>
<td>Varicella (Chickenpox)</td>
<td>- - - - 43 58 68 76 81 85 88 88 89 90 91 91 90 91 90 91</td>
<td></td>
</tr>
</tbody>
</table>

"-" Indicates no data available.

Notes: Final estimates of data from the National Immunization Survey include an adjustment for children with missing immunization provider data. Poverty status is based on family income and family size using Bureau of the Census poverty thresholds. Children missing information about poverty status were omitted from analysis by poverty level. In 2000, 14.2 percent of all children, 17.9 percent of Hispanic, 12.1 percent of non-Hispanic white, and 16.1 percent of non-Hispanic black children were missing information about poverty status and were omitted.

1 The 4:3:1:3 combined series measures the number of children who have received 4 key immunizations: 4 or more doses of diphtheria, tetanus, and pertussis vaccine, 3 or more doses of polio vaccine, 1 or more doses of a measles-containing vaccine, and 3 or more doses of Haemophilus influenzae type b vaccine (Hib). 2009 data are affected by a shortage of Hib vaccine that occurred between December 2007 and September 2009.

2 The 4:3:1:3* combined series is similar to the 4:3:1:3 combined series, but only includes children who received 4 or more doses of the Hib vaccine if required for the particular brand of vaccine that they received.

3 Persons of Hispanic origin may be of any race.

4 Location of residence defined as located in or out of a metropolitan statistical area, and, if in, in or out of a central city. More information available at: [http://www.cdc.gov/nchs/nis/notice.htm](http://www.cdc.gov/nchs/nis/notice.htm).

5 The 4:3:1:3::3:1 combined series measures the number of children who have received 6 key immunizations: 4 or more doses of diphtheria, tetanus, and pertussis vaccine (DTP), 3 or more doses of polio vaccine, 1 or more doses of a measles-containing vaccine, 3 or more doses of Haemophilus influenzae type b vaccine (Hib), three or more doses of hepatitis B vaccine (HepB), and one or more doses of varicella. 2009 data are affected by a shortage of Hib vaccine that occurred between December 2007 and September 2009.

6 The 4:3:1:3*:3:1 combined series is similar to the 4:3:1:3::3:1 combined series, but only includes children who received 4 or more doses of the Hib vaccine if required for the particular brand of vaccine that they received.
7 Diphtheria and tetanus toxoids and pertussis vaccine, diphtheria and tetanus toxoids, and diphtheria and tetanus toxoids and acellular pertussis vaccine.

8 Haemophilus influenzae type b vaccine (Hib). 2009 data are affected by a shortage of Hib vaccine that occurred between December 2007 and September 2009.

9 Data collection for Varicella began in July 1996.


[a] Asterisks in the name of a vaccination series indicates that children were only included as fully vaccinated with the Hib vaccine if they got 4 doses, if so required by the brand of vaccine that they received.

Endnotes


A marked dip in 2009 was likely due to a shortage of Hib vaccine and a recommendation to defer the Hib vaccine booster dose administered at age 12–15 months. More information is available here: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5824a5.htm

Hispanics may be any race. Estimates of whites, blacks, Asians, and American Indian or Alaska Natives in this report do not include Hispanics.

Suggested Citation:


Last updated: September 2014