NCQA seeks comments on proposed updates to the HEDIS Health Plan Adult Immunization Status (AIS) measure.

AIS assesses whether adults 19 years and older are up-to-date on influenza, tetanus, diphtheria and acellular pertussis, herpes zoster and pneumococcal vaccines. Commercial and Medicaid plans report rates for adults 19–65 years of age; Medicare plans report rates for adults 66 and older. NCQA is seeking comments to understand whether updates to this measure would be appropriate.

Regarding the pneumococcal rate, the Advisory Committee on Immunization Practices (ACIP) updated pneumococcal immunization recommendations to state that PCV13 is no longer routinely recommended for adults 65 and older, but that it may be given based on shared decision making. ACIP noted that the incidence of pneumococcal disease is at historically low levels, but that PCV13 may still be beneficial for some older adults. ACIP continues to recommend PPSV23 vaccination for all older adults. NCQA seeks comments on whether to update the pneumococcal rate based on this new guidance. Specifically, we seek comments on the following:

- **Pneumococcal immunization rate**: propose to assess the percentage of members age 66 and older at the start of the measurement period who were administered at least one dose of the PPSV23 vaccine at or after age 60.

Regarding the composite rate, the current measure assesses the percentage of the total recommended number of immunizations, per clinical guidelines according to age, that were administered as indicated (i.e., the sum of the individual vaccines administered divided by the sum of the individual vaccines required). NCQA seeks comments on the usability of the composite rate as constructed for evaluating adult immunization performance among health plans.

Supporting documents include the draft measure specification and evidence workup.

NCQA acknowledges the contributions of the Adult Immunization Measurement Advisory Panel, the Geriatric Measurement Advisory Panel and the Technical Measurement Advisory Panel.

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**Adult Immunization Status (AIS)**

**SUMMARY OF CHANGES TO HEDIS MEASUREMENT YEAR 2020**

- Revised the numerator requirements for Rate 4: Immunization Status-Pneumococcal.
- Removed value sets for pneumococcal conjugate 13 immunization.

**Description**

The percentage of members 19 years of age and older who are up to date on recommended routine vaccines for influenza, tetanus and diphtheria (Td) or tetanus, diphtheria and acellular pertussis (Tdap), zoster and pneumococcal.

**Measurement Period**

January 1–December 31.

**Clinical Recommendation Statement**

The Advisory Committee on Immunization Practices recommends annual influenza vaccination and tetanus, diphtheria and acellular pertussis (Tdap) and/or tetanus and diphtheria (Td) vaccine, herpes zoster vaccine and the 13-valent pneumococcal conjugate vaccine (PCV13) and the 23-valent pneumococcal polysaccharide vaccine (PPSV23) for adults at various ages.

**References**


**Characteristics**

- **Scoring**: Proportion.
- **Type**: Process.
- **Item count**: Person.
- **Stratification**
  1. Commercial: 19– 65*
  2. Medicaid: 19–65
  3. Medicare: 66+

*Note that “Commercial” plans can be identified via the “Private Health Insurance” Direct Reference Code.
**Risk adjustment**

None.

**Improvement notation**

A higher rate indicates better performance.

**Guidance**

**Allocation:**
The member was enrolled with a medical benefit throughout the Participation Period.

**Requirements:**

- The composite is based on a model that looks at the number of immunizations that were administered or contraindicated due to history of anaphylactic reaction or encephalopathy following vaccination (numerator) out of the possible number of immunizations needed to be administered to members, per clinical guideline recommendations for the age group (denominator).

- For commercial and Medicaid plan members 19–65 years of age, Denominator 5 is determined by summing Denominators 1–3. Numerator 5 is determined by summing Numerators 1–3.

- For Medicare plan members 66 years of age and older, Denominator 5 is determined by summing Denominators 1–4. Numerator 5 is determined by summing Numerators 1–4.

**Note:** The tables provide an example of how a commercial, Medicaid and Medicare plan with three members at different ages would calculate the composite rate.

Shaded boxes indicate the number of recommended vaccinations for the member based on their age and the checkmarks indicate whether the immunization was administered.

**Figure 1: Example of calculation for composite rate**

<table>
<thead>
<tr>
<th><strong>Vaccines</strong></th>
<th><strong>Member A Age 70</strong></th>
<th><strong>Member B Age 68</strong></th>
<th><strong>Member C Age 66</strong></th>
<th><strong>MEDICARE PLANS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza</td>
<td></td>
<td>✓</td>
<td></td>
<td>Composite Rate: 7 immunizations provided; 12 immunizations needed = 58%</td>
</tr>
<tr>
<td>Td or Tdap</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zoster</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Vaccines</strong></th>
<th><strong>Member A Age 64</strong></th>
<th><strong>Member B Age 50</strong></th>
<th><strong>Member C Age 19</strong></th>
<th><strong>COMMERCIAL/MEDICAID PLANS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>Composite Rate: 4 immunizations provided; 8 immunizations needed = 50%</td>
</tr>
<tr>
<td>Td or Tdap</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zoster</td>
<td></td>
<td>✓</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Pneumococcal</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>
**Definitions**

**Participation**
The identifiers and descriptors for each organization’s coverage used to define members’ eligibility for measure reporting. Allocation for reporting is based on eligibility during the Participation Period.

**Participation Period**
The Measurement Period.

**Exclusions**

**Exclusions**
Exclude members with any of the following:
- Active chemotherapy any time during the Measurement Period.
- Bone marrow transplant any time during the Measurement Period.
- History of immunocompromising conditions, cochlear implants, anatomic or functional asplenia, sickle cell anemia and HB-S disease or cerebrospinal fluid leaks any time during the member’s history through the end of the Measurement Period.
- In hospice or using hospice services during the Measurement Period.

**Rate 1: Immunization Status—Influenza (Population Criteria 1)**

**Initial Population 1**
Members 19 years of age and older at the start of the Measurement Period who also meet the criteria for Participation.

**Exclusions 1**
Members in the Initial Population 1 who meet Exclusions criteria.

**Denominator 1**
The Initial Population 1, minus Exclusions.

**Numerator 1**
Members in Denominator 1 who received an influenza vaccine on or between July 1 of the year prior to the Measurement Period and June 30 of the Measurement Period, or who had a prior influenza virus vaccine adverse reaction any time before or during the Measurement Period.

**Rate 2: Immunization Status—Td/Tdap (Population Criteria 2)**

**Initial Population 2**
Same as the Initial Population 1.

**Exclusion 2**
Same as Exclusions 1.

**Denominator 2**
Same as Denominator 1

**Numerator 2**
- Members in Denominator 2 who received at least one Td vaccine or one Tdap vaccine between nine years prior to the start of the Measurement Period and the end of the Measurement Period, or
- Members in Denominator 2 with a history of at least one of the following contraindications any time before or during the Measurement Period:
  - Anaphylaxis due to Tdap vaccine, anaphylaxis due to Td vaccine or its components.
  - Encephalopathy due to Tdap or Td vaccination (post-tetanus vaccination encephalitis, post-diphtheria vaccination encephalitis, post-pertussis vaccination encephalitis).
### Rate 3: Immunization Status—Zoster (Population Criteria 3)

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Population 3</strong></td>
<td>Members 50 years and older at the start of Measurement Period who also meet the criteria for Participation.</td>
</tr>
<tr>
<td><strong>Exclusion 3</strong></td>
<td>Members in Initial Population 3 who meet the Exclusions criteria.</td>
</tr>
<tr>
<td><strong>Denominator 3</strong></td>
<td>The Initial Population 3, minus Exclusions.</td>
</tr>
<tr>
<td><strong>Numerator 3</strong></td>
<td>Members in Denominator 3 who received at least one dose of the herpes zoster live vaccine or two doses of the herpes zoster recombinant vaccine at least 28 days apart, any time on or after the member’s 50th birthday before or during the Measurement Period, or who had a prior adverse reaction caused by the zoster vaccine or its components any time before or during the Measurement Period.</td>
</tr>
</tbody>
</table>

### Rate 4: Immunization Status—Pneumococcal (Population Criteria 4)

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Population 4</strong></td>
<td>Members 66 years and older at the start of the Measurement Period who also meet the criteria for Participation.</td>
</tr>
<tr>
<td><strong>Exclusion 4</strong></td>
<td>Members in the Initial Population 4 who meet the Exclusions criteria.</td>
</tr>
<tr>
<td><strong>Denominator 4</strong></td>
<td>The Initial Population 4, minus Exclusions.</td>
</tr>
<tr>
<td><strong>Numerator 4</strong></td>
<td>Members in Denominator 4 who were administered both the 13-valent pneumococcal conjugate vaccine and the 23-valent pneumococcal polysaccharide vaccine at least 12 months apart, with the first occurrence on or after the age of 60 before or during the Measurement Period, or prior pneumococcal vaccine adverse reaction any time before or during the Measurement Period.</td>
</tr>
</tbody>
</table>

### Rate 5: Immunization Status—Composite

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Population 5</strong></td>
<td>Members 19 years of age and older at the start of the Measurement Period who also meet the criteria for Participation.</td>
</tr>
<tr>
<td><strong>Exclusion 5</strong></td>
<td>Members in the Initial Population 5 who meet the Exclusions criteria.</td>
</tr>
<tr>
<td><strong>Denominator 5</strong></td>
<td>The sum of Denominators 1–4.</td>
</tr>
<tr>
<td><strong>Numerator 5</strong></td>
<td>The sum of Numerators 1–4.</td>
</tr>
</tbody>
</table>

### Data Criteria (Element Level)

**Value Sets:**
- Device, Applied: Cochlear Implant Device (2.16.840.1.113883.3.464.1004.1521)
- Diagnosis: Anatomic or Functional Asplenia (2.16.840.1.113883.3.464.1004.1477)
- Diagnosis: Cerebrospinal Fluid Leak (2.16.840.1.113883.3.464.1004.1448)
- Diagnosis: Cochlear Implant Diagnosis (2.16.840.1.113883.3.464.1004.1520)
- Diagnosis: Immunocompromising Conditions (2.16.840.1.113883.3.464.1004.1502)
- Diagnosis: Sickle Cell Anemia and HB S Disease (2.16.840.1.113883.3.464.1004.1373)
- Encounter, Performed: Chemotherapy Encounter (2.16.840.1.113883.3.464.1004.1519)
• Encounter, Performed: Hospice Encounter (2.16.840.1.113883.3.464.1004.1761)
• Immunization, Administered: Adult Influenza Immunization (2.16.840.1.113883.3.464.1004.1913)
• Immunization, Administered: Herpes Zoster Live Immunization (2.16.840.1.113883.3.464.1004.1915)
• Immunization, Administered: Herpes Zoster Recombinant Immunization (2.16.840.1.113883.3.464.1004.1916)
• Immunization, Administered: Influenza Virus LAIV Immunization (2.16.840.1.113883.3.464.1004.1974)
• Immunization, Administered: Pneumococcal Conjugate 13 Immunization (2.16.840.1.113883.3.464.1004.1919)
• Immunization, Administered: Pneumococcal Polysaccharide 23 Immunization (2.16.840.1.113883.3.464.1004.1921)
• Immunization, Administered: Td Immunization (2.16.840.1.113883.3.464.1004.1923)
• Immunization, Administered: Tdap Immunization (2.16.840.1.113883.3.464.1004.1791)
• Intervention, Order: Hospice Intervention (2.16.840.1.113883.3.464.1004.1762)
• Intervention, Performed: Hospice Intervention (2.16.840.1.113883.3.464.1004.1762)
• Procedure, Performed: Adult Influenza Vaccine Procedure (2.16.840.1.113883.3.464.1004.1914)
• Procedure, Performed: Bone Marrow Transplant (2.16.840.1.113883.3.464.1004.1325)
• Procedure, Performed: Chemotherapy Procedure (2.16.840.1.113883.3.464.1004.1500)
• Procedure, Performed: Cochlear Implant (2.16.840.1.113883.3.464.1004.1447)
• Procedure, Performed: Herpes Zoster Live Vaccine Procedure (2.16.840.1.113883.3.464.1004.1917)
• Procedure, Performed: Herpes Zoster Recombinant Vaccine Procedure (2.16.840.1.113883.3.464.1004.1918)
• Procedure, Performed: Influenza Virus LAIV Vaccine Procedure (2.16.840.1.113883.3.464.1004.1973)
• Procedure, Performed: Pneumococcal Conjugate 13 Vaccine Procedure (2.16.840.1.113883.3.464.1004.1920)
• Procedure, Performed: Pneumococcal Polysaccharide 23 Vaccine Procedure (2.16.840.1.113883.3.464.1004.1922)
• Procedure, Performed: Td Vaccine Procedure (2.16.840.1.113883.3.464.1004.1924)
• Procedure, Performed: Tdap Vaccine Procedure (2.16.840.1.113883.3.464.1004.1792)

Direct Reference Codes:
• Diagnosis: Adverse reaction caused by zoster vaccine (disorder) (SNOMEDCT Code 451291000124104)
• Diagnosis: Anaphylaxis due to diphtheria and tetanus vaccine (SNOMEDCT Code 428281000124107)
• Diagnosis: Anaphylaxis due to tetanus, diphtheria and acellular pertussis vaccine (disorder) (SNOMEDCT Code 428291000124105)
• Diagnosis: Influenza virus vaccine adverse reaction (disorder) (SNOMEDCT Code 420113004)
• Diagnosis: Pneumococcal vaccine adverse reaction (disorder) (SNOMEDCT Code 293116002)
• Diagnosis: Post diphtheria vaccination encephalitis (disorder) (SNOMEDCT Code 192711008)
• Diagnosis: Post pertussis vaccination encephalitis (disorder) (SNOMEDCT Code 192712001)
• Diagnosis: Post tetanus vaccination encephalitis (disorder) (SNOMEDCT Code 192710009)
• Participation: MEDICAID (SOP Code 2)
• Participation: MEDICARE (SOP Code 1)
Participation: PRIVATE HEALTH INSURANCE (SOP Code 5)
Patient Characteristic Birthdate: Birth date (LOINC Code 21112-8)

Data Elements for IDSS Reporting

Organizations that submit data to NCQA must provide the following data elements in a specified file.

**Table AIS-A: 1/2/3 Metadata Elements for Adult Immunizations Status**

<table>
<thead>
<tr>
<th>Metadata ID</th>
<th>Metadata Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>MeasurementYear</td>
<td>Measurement year</td>
</tr>
<tr>
<td>CollectionMethod</td>
<td>Data collection methodology (electronic clinical data)</td>
</tr>
</tbody>
</table>

**Table AIS-B: 1/2 Data Elements for Adult Immunizations Status (Medicaid and Commercial)**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Data Element</th>
<th>Data Source Logic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immunization Status: Influenza</td>
<td>Initial population</td>
<td>Report by data source</td>
</tr>
<tr>
<td>Immunization Status: Td/Tdap</td>
<td>Exclusions</td>
<td>Report by data source</td>
</tr>
<tr>
<td>Immunization Status: Zoster</td>
<td>Denominator</td>
<td>Summed over data sources</td>
</tr>
<tr>
<td></td>
<td>Numerator</td>
<td>Report by data source</td>
</tr>
</tbody>
</table>

**Table AIS-B:3 Data Elements for Adult Immunizations Status (Medicare)**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Data Element</th>
<th>Data Source Logic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immunization Status: Influenza</td>
<td>Initial population</td>
<td>Report by data source</td>
</tr>
<tr>
<td>Immunization Status: Td/Tdap</td>
<td>Exclusions</td>
<td>Report by data source</td>
</tr>
<tr>
<td>Immunization Status: Zoster</td>
<td>Denominator</td>
<td>Summed over data sources</td>
</tr>
<tr>
<td>Immunization Status: Pneumococcal</td>
<td>Numerator</td>
<td>Report by data source</td>
</tr>
</tbody>
</table>
Adult Immunization Status (AIS)  
Measure Workup

**Topic Overview**

**Importance**

Vaccines are recommended for adults to prevent serious diseases. Routine vaccination against influenza, tetanus, diphtheria and pertussis is recommended for all adults, while vaccines for herpes zoster and pneumococcal disease are recommended for older adults (Kim et al. 2019).

**Health Importance and Prevalence**

### Influenza vaccine

The influenza vaccine protects against influenza, a serious disease that can lead to hospitalization and death (Centers for Disease Control and Prevention [CDC] 2016a). It is characterized by a variety of symptoms related to the nose, throat and lungs that can range in severity (CDC 2015a). Flu viruses spread mainly by droplets made when people with flu cough, sneeze or talk (CDC 2016a). Flu season in the United States can start as early as October and last as late as May; peak influenza activity occurs most frequently in January and February (CDC 2015a). Although anyone can get the flu, people 65 and older, pregnant women, young children and those with chronic conditions are at higher risk of developing serious complications (CDC 2016a).

The impact of influenza is variable because influenza seasons can vary in severity. The CDC estimates that since 2010, yearly influenza cases have ranged from 9.2–35.6 million; influenza-related hospitalizations, from 140,000–710,000; and influenza-related deaths, from 12,000–56,000 (CDC 2017a). Deaths associated with influenza are typically higher in older adults. In an analysis based on the 2010–2011 and 2012–2013 flu seasons, 71%–85% of deaths from influenza were among adults 65 and older (Grohskopf et al. 2016).

### Td/Tdap vaccine

There are 11 combination vaccines licensed in the U.S. that protect against tetanus and diphtheria; 8 combinations also protect against pertussis. Tetanus results in painful muscle spasms that can cause fractures, difficulty breathing, arrhythmia and death (CDC 2015b).

Diphtheria can present as a respiratory or cutaneous disease (CDC 2016c). Complications include myocarditis, which can lead to heart failure, and neuritis, which may temporarily paralyze motor nerves. Death occurs in 5%–10% of cases (CDC 2015c).

Pertussis, also known as whooping cough, is a respiratory infection characterized by a prolonged cough; it is highly communicable, transmitted via respiratory droplets from coughing or sneezing. This infection can also lead to secondary pneumonia, the most common cause of pertussis-related deaths (CDC 2015d).

Due to vaccines, tetanus and diphtheria are now uncommon. On average, there were 29 reported cases of tetanus per year from 1996–2009, and nearly all were among people who had never received a tetanus vaccine or were not up to date on their booster shots (CDC 2013). In the past decade, fewer than 5 diphtheria cases were reported to the CDC, although the disease is more prevalent in other countries: In 2014, 7,321 cases of diphtheria were reported.
to the World Health Organization, and there are likely many more unreported cases (CDC 2016b).

Pertussis is much more prevalent today than tetanus and diphtheria, even though vaccines offer protection against the disease. Before the vaccine was introduced in the 1940s, there were about 200,000 cases of pertussis annually (CDC 2015d). Since widespread use of the vaccine, pertussis cases have decreased by 80% (CDC 2015d). However, pertussis cases have been increasing since the 1980s; currently, there are 10,000–40,000 pertussis cases and up to 20 deaths reported each year (CDC 2015d). Pertussis is usually milder in children, adolescents and adults than in infants and young children who may not be fully immunized. Older adults are often the source of infection for infants and children (CDC 2015d).

Herpes zoster vaccine

The herpes zoster vaccine protects against herpes zoster, commonly known as shingles. Herpes zoster is a painful skin rash caused by reactivation of the varicella zoster virus (CDC 2016c). After a person recovers from primary infection of varicella (chickenpox), the virus stays inactive in the body and can reactivate years later. Most people typically only have one episode of herpes zoster, but second or third episodes are possible. People with compromised immune systems are at higher risk of developing herpes zoster (CDC 2016c).

The most common complication of herpes zoster is post-herpetic neuralgia (PHN) (CDC 2016c), severe, debilitating pain at the site of the rash that has no treatment or cure. Herpes zoster can also lead to serious complications of the eye, pneumonia, hearing problems, blindness, encephalitis or death (CDC 2016c). In the U.S., there are 1 million new cases of herpes zoster each year; 1 of every 3 people will be diagnosed with herpes zoster in their lifetime (CDC 2016c). A person’s risk for developing herpes zoster increases sharply after age 50 (CDC 2016c). As people age, they are more likely to develop PHN; it rarely occurs in people under 40, but can be seen in a third of untreated adults 60 and older (CDC 2016c).

Between 1% and 4% of adults with herpes zoster are hospitalized for complications, and an estimated 96 deaths each year are directly caused by the virus (CDC 2016c). The vaccine can reduce the risk of developing herpes zoster and PHN.

Pneumococcal vaccine

Vaccines protect against pneumococcal disease, which is a common cause of illness and death in older adults and in persons with certain underlying conditions. The major clinical syndromes of pneumococcal disease include pneumonia, bacteremia and meningitis, with pneumonia being the most common (CDC 2015e). Pneumonia symptoms generally include fever, chills, pleuritic chest pain, cough with sputum, dyspnea, tachypnea, hypoxia, tachycardia, malaise and weakness.

There are an estimated 400,000 cases of pneumonia in the U.S. each year and a 5%–7% mortality rate, although it may be higher among older adults and adults in nursing homes (CDC 2015f; Janssens and Krause 2004).

Bacteremia, a blood infection, is another complication of pneumococcal disease (CDC 2015f). Approximately 30% of patients with pneumonia also have bacteremia, and 12,000 patients have bacteremia without pneumonia each year (CDC 2015f). Bacteremia has a 20% mortality rate among all adults and a 60% mortality rate among older adults.

Pneumococcal disease causes 3,000–6,000 cases of meningitis each year (CDC 2015f). Meningitis symptoms may include headache, lethargy, vomiting,
Irritability, fever, nuchal rigidity, cranial nerve signs, seizures and coma. Meningitis has a 22% mortality rate among adults (CDC 2015f).

## Financial Importance and Cost-Effectiveness

Administration of the influenza, Tdap/Td, herpes zoster and pneumococcal vaccines can decrease overall health care costs by preventing severe disease and hospitalization.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Influenza vaccine</strong></td>
<td>Influenza is an important cause of outpatient medical visits and worker absenteeism among adults. The average annual burden of seasonal influenza among adults 18–49 includes approximately 5 million illnesses, 2.4 million outpatient visits, 32,000 hospitalizations and 680 deaths (Grohskopf et al. 2016). A study in 2016 estimated that the cost-effectiveness ratio of the influenza vaccine was approximately $100,000 per quality-adjusted life year (Xu et al 2016). The study also suggested that influenza immunization leads to the most cost savings during moderate or severe influenza seasons.</td>
</tr>
<tr>
<td><strong>Tdap/Td vaccine</strong></td>
<td>Administering the Tdap vaccine to adults helps prevent the spread of pertussis to infants and prevents such hospitalizations; in 2010, the average cost of hospitalizing an infant with pertussis was $16,339, an increase from $12,377 in 2000 (Davis 2014). Because there has been a rise in pertussis over the past several decades in the U.S., studies have evaluated the cost-effectiveness of providing Tdap immunizations to adults. One study found that providing a dose of Tdap to people at age 11 or 12, as currently recommended, and again at age 21, could reduce outpatient visits for pertussis by 4% and hospitalizations for pertussis by 5%; costs per quality-adjusted life years saved would be $204,556 (Kamiya et al. 2016). Another study found that vaccinating all adults 2—64 at least once with Tdap is cost-effective (&lt;$50,000 per quality-adjusted life years) if pertussis incidence in adults is greater than 120 cases per 100,000 people (Lee et al. 2006). McGarry et al. found that vaccinating all adults ages 65 and older with Tdap is a cost-effective intervention and would prevent 97,000 cases of pertussis annually—from the payer perspective, it would provide a net cost savings of $44.8 million (2014).</td>
</tr>
<tr>
<td><strong>Herpes zoster vaccine</strong></td>
<td>In 2004, a systematic literature review estimated that total medical costs in the U.S. from zoster were 1.9 billion (Panatto et al., 2015). A CDC study estimated that vaccination with the recombinant zoster vaccine, compared with no vaccination, cost $31,000 per quality adjusted life year, on average, for immunocompetent adults 50 and older. The number of people needed to be vaccinated with the recombinant zoster vaccine to prevent one case of zoster ranged from 11-17 and to prevent one case of PHN ranged from 70–187 (Dooling et al., 2018). A study of the cost-effectiveness of the live herpes zoster vaccine among people at 50, 60 and 70 years found that vaccination at age 60 would prevent the most cases (26,147 cases per 1 million people), compared with vaccination at 50 or 70 (Hales et al. 2014). It also found that live zoster vaccination at 60 costs $86,000 per quality-adjusted life year, compared with $37,000 at 70 and $287,000 at 50 (Hales et a. 2014).</td>
</tr>
<tr>
<td><strong>Pneumococcal vaccine</strong></td>
<td>Pneumococcal infections result in significant health care costs each year. Geriatric patients with pneumonia require hospitalization in nearly 90% of cases, and their average length of stay is twice that of younger adults (Janssens and Krause 2004). Pneumonia in the older adult population is associated with high acute-care costs and an overall impact on total direct medical costs and mortality during and after an acute episode (Thomas et al.</td>
</tr>
</tbody>
</table>
Total medical costs for Medicare beneficiaries during and one year following a hospitalization for pneumonia were found to be $15,682 higher than matched beneficiaries without pneumonia (Thomas et al. 2012). It was estimated that in 2010, the total annual excess cost of hospital-treated pneumonia in the fee-for-service Medicare population was approximately $7 billion (Thomas et al. 2012).

Pneumococcal vaccines have been shown to be highly effective in preventing invasive pneumococcal disease. When comparing costs, outcomes and quality adjusted life years, immunization with recommended pneumococcal vaccines was found to be more economically efficient than no vaccination, with an incremental cost-effectiveness ratio of $25,841 per quality-adjusted life year gained (Chen et al. 2014).

### Supporting Evidence

**Influenza vaccine**

ACIP recommends routine annual influenza vaccination for all people 6 months of age and older (Grohskopf et al. 2017). For people 19 and older, any age-appropriate inactivated influenza vaccine (IIV) formulation or recombinant influenza vaccine (RIV) formulation are acceptable options. ACIP notes that live attenuated influenza vaccine (LAIV) should not be used during the 2017–2018 season for any population. Vaccination should occur before the onset of influenza activity in the community, ideally by the end of October; however, vaccination efforts should continue throughout flu season into February and March (Grohskopf et al. 2017). People who have a history of severe allergic reaction (e.g., anaphylaxis) to any component of the vaccine should not receive the influenza vaccine (CDC 2017b).

**Tdap/Td vaccine**

ACIP recommends that all adults 19 and older who have not yet received a dose of Tdap receive a single dose (ACIP 2012; ACIP 2011). Tdap should be administered regardless of the interval since the last tetanus or diphtheria toxoid-containing vaccine. ACIP also recommends administering a dose of Tdap to women during each pregnancy, irrespective of the patient’s prior history of receiving Tdap, to maximize the maternal antibody response and passive antibody transfer to the infant (ACIP 2013). For women not previously vaccinated with Tdap, if Tdap is not administered during pregnancy, it should be administered immediately postpartum (ACIP 2013).

Adults 19 and older should receive a decennial Td vaccine booster, beginning 10 years after receipt of the Tdap vaccine (Kretsinger et al. 2006). People who have a history of severe allergic reaction (e.g., anaphylaxis) to any component of the Tdap or Td vaccine should not receive it. Tdap is contraindicated for adults with a history of encephalopathy (e.g., coma or prolonged seizures) not attributable to an identifiable cause within seven days of administration of a vaccine with pertussis components (CDC 2017b).

**Herpes zoster vaccine**

There are currently two types of zoster vaccines recommended for older adults: the zoster vaccine live (ZVL) and a recombinant zoster vaccine (RZV). The ZVL is a 1-dose vaccine licensed for immunocompetent adults 50 and older; ACIP recommends ZVL for immunocompetent adults 60 and older. ZVL vaccine coverage for adults 60 and older has increased each year since ACIP first recommended it in 2008 (Dooling et al. 2018).

In October 2017, the Food and Drug Administration approved the RZV for adults 50 and older. In January 2018, ACIP published a guideline recommending RZV for immunocompetent adults 50 and older, irrespective of prior receipt of varicella vaccine or ZVL (Dooling et al. 2018). RZV is a two-
dose series; the second dose should be given 2–6 months after the first dose. If the second dose of RZV is given less than four weeks after the first, the second dose should be repeated; if the second dose is more than six months after the first dose, the vaccine series need not be restarted although individuals may be at higher risk for zoster. ZVL remains a recommended vaccine for immunocompetent adults 60 and older (Dooling et al. 2018). Patients with a severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component should not receive either zoster vaccine (Dooling et al. 2018).

**Pneumococcal vaccine**

There currently are two licensed pneumococcal vaccines in the U.S.: the 13-valent pneumococcal conjugate vaccine (PCV13) and the 23-valent pneumococcal polysaccharide vaccine (PPSV23) (Kobayashi et al. 2015; Matanock et al. 2019). In November 2019, ACIP published new recommendations for pneumococcal vaccination stating that a dose of PCV13 is no longer routinely recommended for adults 65 and older, but that it may be provided based on shared clinical decision-making (Matanock et al. 2019). The rationale for this change is that the incidence of PCV13-type pneumococcal disease is at historically low levels for older adults due to indirect effects from pediatric PCV13 use, but that PCV13 vaccination for some older adults may still be beneficial. ACIP continues to recommend that immunocompetent adults age 65 and older who have not been previously vaccinated routinely receive one dose of PPSV23 at age 65 and older. Adults who have certain at-risk conditions and received a dose of PPSV23 before age 65 years should receive one additional dose of PPSV23 at age 65 or older, at least 5 years after the previous PPSV23 dose (Matanock et al. 2019).

For adults 19 and older who are immunocompromised or have functional or anatomic asplenia, cerebrospinal fluid leaks or cochlear implants, ACIP continues to recommend PCV13 and PPSV23 at least eight weeks apart (Matanock et al. 2019).

Adults should not receive either vaccine if they have had a severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component. Adults should not receive the PCV13 vaccine if they have had severe allergic reaction after any diphtheria-toxoid–containing vaccine (CDC 2017b).

**Gaps in Care**

Healthy People 2020, which provides science-based, 10-year national objectives for improving the health of all Americans, recommends increasing the percentage of adults who are vaccinated against influenza, zoster and pneumococcal disease (U.S. Department of Health and Human Services 2017). Estimates of national vaccination coverage are available through the National Health Interview Survey (NHIS), in which a sample of adults self-report receipt of vaccines. In 2015, 45% of adults 19 and older reported that they received the influenza vaccine during the 2014–2015 flu season, well below the Healthy People 2020 target of 70% (Williams et al. 2017).

64% of adults 65 and older reported having ever received the PPSV23 vaccine and/or the PCV13 vaccine, which is below the Healthy People 2020 target of 90% (Williams et al. 2017). Although there is no corresponding Healthy People 2020 goal for routine Tdap or Td vaccination among adults, only 23% of adults 19 and older responding to the 2015 NHIS reported receiving the Tdap vaccine within the past 10 years, and 62% reported receiving any tetanus toxoid-containing vaccination during the past 10 years (Williams et al. 2017).

In 2015, 31% of adults ages 60 and older reported ever receiving the herpes zoster vaccine (Williams et al. 2017). Although zoster vaccination coverage meets the Healthy People 2020 target of 30% coverage, 70%
of adults are not receiving this recommended vaccination due to factors that include vaccine shortages shortly after licensure (Hurley et al. 2010), complications in storing the vaccine and cost to consumers (Hurley et al. 2010).

Barriers to adult vaccination in general include provider and patient lack of knowledge and awareness of the importance of vaccines, missed opportunities for vaccination and operational and systemic barriers (e.g., cost, lack of access to immunization records) (Ventola 2016; Tan 2015). Having health insurance coverage and a usual place for health care is associated with higher vaccination coverage (Williams et al. 2017).

There are evidence-based practices for improving adult vaccination coverage: Health care providers can routinely assess patients’ vaccination history and offer needed vaccines to adults, implement reminder-recall systems, use standing-order programs and analyze practice- or provider-specific vaccination rates (Williams et al. 2017). In addition, providing easy access and convenience for adult vaccination within and outside of the health care setting is important for increasing adult vaccine uptake (Ventola 2016). Health care providers can offer walk-in visits or extended hours specifically for vaccination (Ventola 2016). Influenza vaccines are commonly offered at retail pharmacies; offering other types of adult vaccines at retail pharmacies could potentially increase uptake (Ventola 2016). Leveraging health information technology to share immunization data among patients, providers, pharmacies, retail clinics and public health agencies and registries is a key strategy for tracking patients’ immunization history and keeping them up to date on vaccines (America’s Health Insurance Plans 2015).

Health care disparities

There are racial and ethnic disparities in adult vaccination coverage. The 2015 NHIS survey found that White adults were more likely to have received the influenza vaccine (47%) than Blacks (37%) and Hispanics (33%) (Williams et al. 2017). Tdap and Td booster vaccination coverage was higher for White adults 19 and older than Black, Hispanic and Asian adults (Williams et al. 2017). Similarly, pneumococcal vaccination coverage and zoster vaccination coverage was higher for White older adults than for Black, Hispanic and Asian older adults (Williams et al. 2017). Racial and ethnic disparities in pneumococcal vaccination and herpes zoster vaccination coverage widened from 2014–2015 due to increases in vaccination coverage for older White adults (Williams et al. 2017).

Vaccination coverage also varies by age for influenza and Tdap/Td. In the 2015 NHIS survey, older adults were more likely to report receiving the influenza vaccine; 32% of adults 19–49 reported receiving the flu vaccine, compared with 49% of adults 50–64 and 74% of adults 65 and older (Williams et al. 2017); however, adults 65 and older were less likely to report having received the Td or Tdap vaccine than adults 19–64 (Williams et al. 2017).

References

ACIP 2012. “Updated Recommendations for Use of Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis Vaccine in Adults 65 Years and Older.” Centers for Disease Control and Prevention (CDC) MMWR Recomm Rep 61:468–70. https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6125a4.htm

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### Guidelines & Recommendations

**Table 1: Routine Adult Immunizations: Recommendations from the CDC ACIP**

<table>
<thead>
<tr>
<th>Vaccine Recommendation Date &amp; Title</th>
<th>ACIP Recommendation</th>
<th>Contraindications (CDC 2017)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza (Grohskopf et al. 2017)</td>
<td>ACIP recommends routine annual influenza vaccination for all people ages six months and older. Vaccination should occur before the onset of influenza activity in the community, ideally by the end of October; however, vaccination efforts should continue throughout flu season into February and March.</td>
<td>Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component</td>
</tr>
<tr>
<td>Td/Tdap (ACIP 2013; ACIP 2012)</td>
<td>ACIP recommends that all adults ages 19 years and older who have not yet received a dose of Tdap should receive a single dose. Tdap should be administered regardless of interval since last tetanus or diphtheria toxoid-containing vaccine. Adults should receive a decennial booster with Td beginning 10 years after receipt of Tdap. Pregnant women should receive a dose of Tdap during each pregnancy irrespective of the patient’s prior history of receiving Tdap. If Tdap is not administered during pregnancy, Tdap should be administered immediately postpartum.</td>
<td>Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component Tdap: Encephalopathy (e.g., coma, decreased level of consciousness, or prolonged seizures) not attributable to another identifiable cause within seven days of administration of a previous dose of a vaccine with pertussis components</td>
</tr>
</tbody>
</table>
Zoster (Dooling et al. 2018)

ACIP recommends the two-dose recombinant zoster vaccine (RZV) for use in immunocompetent adults aged 50 and older, irrespective of prior receipt of varicella vaccine or zoster vaccine live (ZVL). ZVL remains a recommended vaccine for prevention of herpes zoster in immunocompetent adults aged 60 and older.

Contraindications (CDC 2017)

RZV and ZVL: Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component
ZVL: Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, long-term immunosuppressive therapy or patients with HIV infection who are severely immunocompromised)
ZVL: pregnancy

Pneumococcal (Matanock et al. 2019)

Immunocompetent vaccine-naïve adults 65 and older: a dose of PCV13 may be provided based on shared clinical decision-making; a dose of PPSV23 is routinely recommended.

Immunocompetent adults 65 and older with certain at-risk conditions who previously received PPSV23: a dose of PCV13 may be provided based on shared clinical decision-making at least a year after first dose of PPSV23; an additional dose of PPSV23 at age 65 or older, at least 5 years after the previous PPSV23 dose, and at least 1 year after PCV13 dose (if given), is routinely recommended.

Immunocompromised vaccine-naïve adults 19 and older: ACIP recommends a dose of PCV13 followed by a dose of PPSV23 at least eight weeks later.

PPSV23: Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component
PCV13: Severe allergic reaction after a previous dose of PCV13 or any diphtheria-toxoid–containing vaccine or to a component of a vaccine (PCV13 or any diphtheria-toxoid–containing vaccine)

*ACIP is chartered as a federal advisory committee to provide expert external advice and guidance to the director of CDC on use of vaccines and related agents for the control of vaccine-preventable diseases in the civilian population of the United States. Recommendations for routine use of vaccines in children and adolescents are harmonized to the greatest extent possible with recommendations made by the American Academy of Pediatrics, the American Academy of Family Physicians (AAFP), and the American College of Obstetricians and Gynecologists. Recommendations for routine use of vaccines in adults are reviewed and approved by the American College of Physicians, AAFP, the American College of Obstetricians and Gynecologists and the American College of Nurse-Midwives. ACIP recommendations adopted by the CDC director become agency guidelines on the date published in the Morbidity and Mortality Weekly Report (MMWR).

References (Guidelines)

