ADULT AND ADOLESCENT IMMUNIZATION UPDATE

BELINDA VAIL, MD, MS, FAAFP

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Belinda Vail, MD, MS, FAAFP, is Professor and Chair of the Department of Family Medicine at the University of Kansas School of Medicine. Dr. Vail graduated from and received her residency training from the University of Kansas School of Medicine. She later completed a fellowship in Executive Leadership in Academic Medicine, Drexel University in Philadelphia, PA and a fellowship at the AAFP National Institute for Program Director Development in Leawood, KS. Her clinical practice includes procedures and maternity and inpatient care, and she teaches students in all four years of medical school, nurse practitioner students, and residents during her clinical activities. She is the co-module director of the innovative Capstone module—the culmination of the first two years of the medical school curriculum. She is also an active didactic teacher in the school of medicine and in the residency program. Dr. Vail is medical director for Community Living Opportunities, a residential facility for developmentally disabled adults, and participates in oversight for the Department of Corrections. She is a core lecturer for several CME programs for the American Academy of Family Physicians and was the director of the National Board Review Course for 15 years. A member of AOA, the Gold Humanism Society, and the Delp Society, her awards include the Rainbow Award for Heroes in Medicine, the Jayhawk Award for lifetime achievement in mentoring, The Glendon Cox Leadership Award, the Women in Medicine Marjorie Sirridge Award, the Kansas Academy of Family Medicine Exemplary Teacher Award, The Nason Family Award for Excellence in Teaching in Family Medicine, and the University of Kansas Bohan Award for Teaching.
Learning Objectives

- Recall the ACIP recommended vaccines for adolescents and adults
- Discuss the schedule needed for those individuals who are under-vaccinated
- Describe the individuals who require added vaccines
- Know the contraindications for vaccines
Good News

- There were no major changes to the immunization schedules this year.
- Most changes were in formatting of the schedules.
Reminder of Childhood Vaccines

- Children now should be immunized by age 5 with:
  - Diphtheria, tetanus, acellular pertussis (DTaP)—5 doses
  - Inactivated poliovirus (IPV)—4 doses
  - Haemophilus influenzae B (Hib)—4 doses
  - Pneumococcal conjugate (PCV13)—4 doses
  - Hepatitis B (HepB)—3 doses
  - Hepatitis A (HepA)—2 doses
  - Rotavirus (RV1 or R5)—2 or 3 doses
  - Influenza (IIV or LAIV)—2 doses then yearly
  - Measles, mumps, rubella (MMR)—2 doses
  - Varicella (VAR)—2 doses
Table 1 Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger
United States, 2019

These recommendations must be read with the Notes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars in Table 1. To determine minimum intervals between doses, see the catch-up schedule (Table 2). School entry and adolescent vaccine age groups are shaded in gray.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Birth</th>
<th>1 mo</th>
<th>2 mos</th>
<th>4 mos</th>
<th>6 mos</th>
<th>9 mos</th>
<th>12 mos</th>
<th>15 mos</th>
<th>18 mos</th>
<th>19-23 mos</th>
<th>2-3 yrs</th>
<th>4-6 yrs</th>
<th>7-10 yrs</th>
<th>11-12 yrs</th>
<th>12-15 yrs</th>
<th>16 yrs</th>
<th>17-18 yrs</th>
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<tbody>
<tr>
<td>Hepatitis B (HepB)</td>
<td>1st dose</td>
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<tr>
<td>Rota virus (RV1 and RV5) (2-dose series)</td>
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<td>2nd dose</td>
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<td>Diphtheria, tetanus, &amp; acellular pertussis</td>
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<tr>
<td>Haemophilus influenza type b (Hib)</td>
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<tr>
<td>Pneumococcal conjugate (PCV13)</td>
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<td>Inactivated poliovirus (IPV; &lt;18 yrs)</td>
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<td>Annual vaccination 1 or 2 doses</td>
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<td>Measles, mumps, rubella (MMR)</td>
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<td>Meningococcal (MenACWY-D ≥9 mos; MenACWY-CRM ≥2 mos)</td>
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<td>Annual vaccination 1 dose only</td>
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<td>Meningococcal B</td>
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<td>Annual vaccination 1 dose only</td>
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<td>Annual vaccination 1 or 2 doses</td>
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<tr>
<td>Haemophilus influenza type b (Hib)</td>
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<td>Annual vaccination 1 dose only</td>
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<td>Annual vaccination 1 or 2 doses</td>
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</tbody>
</table>

Legend:
- **Yellow**: Range of recommended ages for all children
- **Green**: Range of recommended ages for catch-up immunization
- **Purple**: Range of recommended ages for certain high-risk groups
- **Blue**: Range of recommended ages for non-high-risk groups that may receive vaccine, subject to individual clinical decision making
- **Gray**: No recommendation
<table>
<thead>
<tr>
<th>Vaccine</th>
<th>19–21 years</th>
<th>22–26 years</th>
<th>27–49 years</th>
<th>50–64 years</th>
<th>≥65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza inactivated (ILV) or Influenza recombinant (RIIV)</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Influenza live attenuated (LAIV)</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Tdap or Td)</td>
<td>1 dose Tdap, then Td booster every 10 yrs</td>
<td>1 dose Tdap, then Td booster every 10 yrs</td>
<td>1 dose Tdap, then Td booster every 10 yrs</td>
<td>1 dose Tdap, then Td booster every 10 yrs</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td>1 or 2 doses depending on indication (if born in 1957 or later)</td>
<td>1 or 2 doses depending on indication (if born in 1957 or later)</td>
<td>1 or 2 doses depending on indication (if born in 1957 or later)</td>
<td>1 or 2 doses depending on indication (if born in 1957 or later)</td>
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<tr>
<td>Varicella (VAR)</td>
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<td>2 doses (if born in 1980 or later)</td>
<td>2 doses (if born in 1980 or later)</td>
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<td>No recommendation</td>
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<tr>
<td>Zoster recombinant (RZV) (preferred)</td>
<td>2 doses</td>
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<td>2 doses</td>
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<td>No recommendation</td>
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<tr>
<td>Zoster live (ZVL)</td>
<td>2 doses</td>
<td>2 doses</td>
<td>2 doses</td>
<td>2 doses</td>
<td>No recommendation</td>
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<tr>
<td>Human papillomavirus (HPV) Female</td>
<td>2 or 3 doses depending on age at initial vaccination</td>
<td>2 or 3 doses depending on age at initial vaccination</td>
<td>2 or 3 doses depending on age at initial vaccination</td>
<td>2 or 3 doses depending on age at initial vaccination</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Male</td>
<td>2 or 3 doses depending on age at initial vaccination</td>
<td>2 or 3 doses depending on age at initial vaccination</td>
<td>2 or 3 doses depending on age at initial vaccination</td>
<td>2 or 3 doses depending on age at initial vaccination</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Pneumococcal conjugate (PCV13)</td>
<td>1 dose</td>
<td>1 dose</td>
<td>1 dose</td>
<td>1 dose</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
<td>1 or 2 doses depending on indication</td>
<td>1 or 2 doses depending on indication</td>
<td>1 or 2 doses depending on indication</td>
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<td>No recommendation</td>
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<tr>
<td>Hepatitis A (HepA)</td>
<td>2 or 3 doses depending on vaccine</td>
<td>2 or 3 doses depending on vaccine</td>
<td>2 or 3 doses depending on vaccine</td>
<td>2 or 3 doses depending on vaccine</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Hepatitis B (HepB)</td>
<td>2 or 3 doses depending on vaccine</td>
<td>2 or 3 doses depending on vaccine</td>
<td>2 or 3 doses depending on vaccine</td>
<td>2 or 3 doses depending on vaccine</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Meningococcal A, C, W, Y (MenACWY)</td>
<td>1 or 2 doses depending on indication, then booster every 5 yrs if risk remains</td>
<td>1 or 2 doses depending on indication, then booster every 5 yrs if risk remains</td>
<td>1 or 2 doses depending on indication, then booster every 5 yrs if risk remains</td>
<td>1 or 2 doses depending on indication, then booster every 5 yrs if risk remains</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Meningococcal B (MenB)</td>
<td>2 or 3 doses depending on vaccine and indication</td>
<td>2 or 3 doses depending on vaccine and indication</td>
<td>2 or 3 doses depending on vaccine and indication</td>
<td>2 or 3 doses depending on vaccine and indication</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Haemophilus influenzae type b (Hib)</td>
<td>1 or 3 doses depending on indication</td>
<td>1 or 3 doses depending on indication</td>
<td>1 or 3 doses depending on indication</td>
<td>1 or 3 doses depending on indication</td>
<td>No recommendation</td>
</tr>
</tbody>
</table>

**Legend:**
- **Yellow:** Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection.
- **Purple:** Recommended vaccination for adults with an additional risk factor or another indication.
- **Gray:** No recommendation.
1. Which of the following is true regarding vaccinations

A. The minimum interval for the first 2 shots in all the childhood vaccines if 4 weeks

B. There are only 2 series that need to be restarted if the interval between the shots is too long

C. If the interval between shots is too short, the shot must be given again

D. The ACIP and the FDA agree on all vaccinations
1. Which of the following is true regarding vaccinations

A. The minimum interval for the first 2 shots in all the childhood vaccines if 4 weeks

B. There are only 2 series that need to be restarted if the interval between the shots is too long

C. *If the interval between shots is too short, the shot must be given again*

D. The ACIP and the FDA agree on all vaccinations
General Caveats

- Recommended vaccinations come from the Advisory Committee on Immunization Practices (ACIP) at the CDC.
- Most information needed is in the footnotes of the Immunization Schedules available at www.CDC.org but they will also quickly answer emailed questions.
- **No series needs to be restarted.**
- Minimum intervals are important—there are no “maximum” intervals.
  - Most are 4 weeks but some are 8 weeks to 1 year.
- Vaccines given short of the minimal interval will not count and will need to be repeated.
2. Which of the following vaccines is optional at the 11-12 visit?

A. HPV
B. Hepatitis A
C. Flu
D. Meningococcal
E. Tdap
2. Which of the following vaccines is optional at the 11-12 visit?

A. HPV  
B. *Hepatitis A*  
C. Flu  
D. Meningococcal  
E. Tdap
Early Adolescence (Ages 11-12)

- All healthy fully immunized
  - Human papillomavirus (HPV)
  - Meningococcal
  - Tdap
  - Annual flu

- Catch up vaccines: check to make sure they are completed
  - Hepatitis A and B
  - MMR and Varicella

- Recommended for those at high risk
  - Haemophilus influenzae (Hib)
  - Pneumococcal conjugate (PCV13)
  - Pneumococcal polysaccharide (PPSV23)
  - Inactivated poliovirus (IPV)
  - Meningococcal B
HPV

- Primary cause of cervical cancer and major cause of head and neck cancers
- 2 dose series: ages 9-14
  - 2 doses 5 months apart
- 3 dose series: ages 15-26
  - 0, 1-2, 6 months
  - Minimum interval dose 2-3 is 12 weeks
  - Minimum interval dose 1-3 is 5 months
- Lots of counseling recommendations:
  - Don’t offer the option of giving
  - Include in standing orders
Late Adolescence (Ages 16-18)

- Standard Vaccines
  - Meningococcal 2\textsuperscript{nd} dose
  - Annual flu
- Individual decision making
  - Meningococcal B
- Continued catch up and high risk is the same as young adolescents
Meningococcal Vaccines

- Meningococcal A,C,W,Y (MenACWY-CRM, Menactra, Menveo)
  - 2 dose series at ages 11-12 and 16
  - After age 16 only one is needed
  - Give to 1st year college students who live in residential housing or to military recruits, if not previously given

- Meningococcal B (MenB-4C, Bexsero, Trumenba)
  - May be given based on preference ages 16-23 (preferred 16-18)
  - 2 dose series (Bexsero 1 month apart; Trumenba 6 months apart; they are not interchangeable)
3. An 18 year old is in for a check up prior to college. His parents did not want him to have vaccines as a child. What would be the appropriate way to administer Hepatitis B vaccine?

A. 2 doses of Twinrix
B. 3 doses of Twinrix
C. 2 doses of Recombivax HB
D. 3 doses of Heplisav
E. He should not be vaccinated for Hepatitis B
3. An 18 year old is in for a check up prior to college. His parents did not want him to have vaccines as a child. What would be the appropriate way to administer Hepatitis B vaccine?

A. 2 doses of Twinrix

**B. 3 doses of Twinrix**

C. 2 doses of Recombivax HB

D. 3 doses of Heplisav

E. He should not be vaccinated for Hepatitis B
Catching Up

■ Hepatitis A
  ▪ Anyone at risk or anyone who desires it

■ Hepatitis B
  ▪ Adolescents 11-15 may receive 2 doses (at least 4 months apart) of **Recombivax HB**
  ▪ Adolescents ≥ 18 may receive 2 doses (at least 4 weeks apart) of **Heplisav-B**
  ▪ Adolescents ≥ 18 may receive 3 doses (0, 1, and 6 months) of the combined HepB and HepA vaccine: **Twinrix**
  ▪ Adolescents ≥ 18 may receive 3 doses (0, 1, and 6 months) of **Engerix-B** or **Recombivax HB**
Catching Up

- **MMR**
  - 2 doses at least 4 weeks apart

- **Varicella**
  - 2 doses
  - Ages 7-12 recommended interval 3 months
  - Ages ≥ 13 recommended interval 4-8 weeks
  - Maximum age for using MMRV is 12
Adult Immunizations
Adult Immunizations

- Recommended for all
  - **Influenza** yearly
  - **Tdap** (once) then **Td** every 10 years
  - MMR – 1 or 2 doses if born after 1957
  - Varicella – 2 doses if born after 1980
  - HPV (up to age 27 for females and age 22 for males)
  - **Zoster** at age 50 (or 60)
  - **PCV13** and **PPSV23** at age 65

- Recommended for high risk at any age
  - PCV 13 and PPSV23
  - Hepatitis A and B
  - Meningococcal and Meningococcal B
  - Hib
4. Which of the following should not get a flu shot?

A. A 45 year old who is allergic to eggs
B. A 29 year old who developed Guillain-Barre on month after receiving the flu vaccine 2 years ago
C. A 32 year old with HIV
D. 23 year old pregnant woman
E. 16 year old with a cough
4. Which of the following should not get a flu shot?

A. A 45 year old who is allergic to eggs

B. A 29 year old who developed Guillain-Barre on month after receiving the flu vaccine 2 years ago

C. A 32 year old with HIV

D. 23 year old pregnant woman

E. 16 year old with a cough
Flu Update

- **Egg allergy**
  - Can receive any of the vaccines
  - Should be given in the physician’s office

- **LAIV (live nasal vaccine) – only for ages ≤ 49**
  - Should not be used for anyone who has had a severe reaction to any flu vaccine
  - Do not use in adolescents who are receiving aspirin or salicylates
  - Do not use in immunocompromised, HIV, or pregnancy
  - Avoid in renal, heart, lung, liver disease, diabetes, or alcoholism

- **New vaccine being investigated that will be a one time vaccine**
Social Determinants of Health

- Receipt of flu vaccine influenced by:
  - Structural social determinants
    - Age, gender, marital status, education, ethnicity, socio-economic status, social and cultural values
  - Intermediary determinants
    - Housing-place of residence, behavioral beliefs, social influences, previous vaccine experiences, perceived susceptibility, sources of information, and perceived health status
  - Healthcare system related factors accessibility,
    - Affordability, knowledge and attitudes about vaccination, and physicians’ advice
Tdap/Td Update

- One dose of Tdap at 11-12
- Switch back to Td at ~ 21 (every 10 years)
- Give in every pregnancy (27-36 weeks)
- Give to close caregivers of a child who have not received it (i.e. the father) – but only once
Catching Up

- **MMR** need 1 dose unless:
  - Proof of vaccination
  - Laboratory evidence of immunity
  - Born before 1957 (except health care workers—need 2) [≥ 62]

- **Varicella** need 2 doses 4-8 weeks apart unless:
  - Proof of vaccination with 2 doses
  - Diagnosis of varicella or zoster
  - Laboratory evidence of immunity
  - Born before 1980 (except health care workers and pregnant women) [≥ 39]

- **HPV**
  - Females through age 26 and males through age 21 (can give through 26)
  - In October 2018 the FDA approved Gardasil 9 for ages 27-45

- **Hepatitis A or B**
  - Anyone who would like protection (or at risk)
Hepatitis A – Special Populations

- Hepatitis A indicated for
  - Travelers
  - Close contact with international adoptee
  - Chronic liver disease
  - Homelessness (new)
  - Men who have sex with men
  - Drug users (injection or not)
  - Clotting factor disorder
  - Laboratory workers exposed to Hepatitis A

- 2 doses at least 6 months apart. Give the first as soon as possible
Hepatitis B – Special Populations

- Hepatitis B is indicated for:
  - Hepatitis C virus infection
  - Chronic liver disease
  - Patients with Diabetes (recommended up to age 60)
  - Sexual exposure risk
  - HIV infection
  - Injection drug use
  - Incarcerated persons
  - Percutaneous or mucosal risk for exposure to blood
  - Travel to countries with high or intermediate endemic Hepatitis B

- 3 shot series (including with Twinrix) or 2 shot series with Heplisav-B (cytosine-phosphate-guanine 1018 oligodeoxynucleotide adjuvant -- not in pregnancy)
Immunocompromised

- Live vaccines (MMR, VAR, LAIV, ZVL) are contraindicated
- In HIV, give MMR and VAR when CD4 count is > 200
- Hib
  - If not previously given, 1 shot for asplenia (anatomical or functional including sickle cell).
  - If elective splenectomy, give 14 days before surgery
Special Situations for Meningococcal Vaccine

- **MenACWY**: give every 5 years if risk continues
  - Anatomical or functional asplenia
  - HIV
  - Persistent complement component deficiency
  - Eculizumab use
  - Microbiologists who are exposed
  - Travel to endemic countries

- **MenB**
  - Anatomical or functional asplenia
  - Persistent complement component deficiency
  - Eculizumab (Soliris) use—for paroxysmal nocturnal hemoglobinuria
  - Microbiologists who are exposed
5. Which of the following vaccines is contraindicated in pregnancy?

A. Tdap
B. Meningococcal B
C. Shingles (Zostavax)
D. Pneumococcal PPSV23
E. Influenza
5. Which of the following vaccines is contraindicated in pregnancy?

A. Tdap
B. Meningococcal B
C. *Shingles* (*Zostavax*)
D. Pneumococcal PPSV23
E. Influenza
Pregnancy

- **Contraindicated:** live vaccines
  - LAIV—live nasal flu vaccine
  - MMR
  - Varicella
  - Live zoster vaccine (Varivax)

- **Delay**
  - Zoster (Shingrix)
  - HPV
  - Meningococcal B (unless benefit outweighs potential risk)
Pneumococcal Vaccines

- Age 65 give **PCV13** (if not previously received) and **PPSV23** one year later (give PPSV23 at least 5 years after last PPSV23)

- Chronic medical conditions through age 64
  - Chronic heart, lung, liver disease, diabetes, smoking, alcoholism
  - Give one dose **PPSV23** (repeat at age 65)

- Cerebrospinal fluid lead or cochlear implant
  - One dose **PCV13** then one dose **PPSV23** at least 8 weeks later (repeat PPSV23 at age 65)
Special Pneumococcal Cases

- Immunocompromising conditions
  - Congenital or acquired immunodeficiency
  - Complement deficiencies
  - Phagocytic disorders
  - HIV
  - Chronic renal failure
  - Nephrotic syndrome
  - Leukemia, lymphoma Hodgkin disease
  - Generalized malignancy
  - Iatrogenic immunosuppression (drug or radiation therapy)
  - Solid organ transplant
  - Multiple myeloma
  - Anatomical or functional asplenia (including sickle cell and other hemoglobinopathies)

- PCV13 then 8 weeks later give PPSV23, then 5 years later repeat PPSV23, then PPSV23 at age 65
Zoster Vaccine

- **Age 50**
  - RZV (Shingrix) 2 doses 2-6 months apart (at least 4 weeks)

- **Age 60**
  - Give RZV if not previously given
  - Alternatively use ZVL (Zostavax) one dose—live vaccine
Worldwide Social Determinants

- Low income countries have an unequal burden of disease and inconsistent vaccine supply
- Indicators of increased vaccination rates
  - Better housing
  - Higher household income
  - Higher parental education (particularly maternal)
  - Certain religious affiliations (Christian > Muslim)
  - Urban living
  - Confidence in government
  - Transportation
- Indicators of decreased vaccination rates
  - War and migration
  - Female sex
  - Presence of traditional healers
Factors in the U.S.

- In the United States, disparities in income that have affected immunization rates led to the establishment of the Vaccines for Children program.
- Similar factors for low income families
  - Access, transportation
  - Parental education
  - Immigration
- Anti-vaccination movement
  - Safety concerns
  - Philosophical issues
  - Lack of education
  - Misinformation and the internet
  - Religious beliefs
  - Alternative medicine
  - Civil liberty concerns
Countering Anti-Vaccination

- Consistent message
- Information on consequences of not vaccinating
- Standing orders for nurses
- Education
- Persistence
- Ethics of refusing to see???
Questions?
References


