## Module 2

### Balancing Individual and Community Claims: Establishing State Vaccination Policies

**Four Key Questions to Always Ask Yourself**
- What is the ethical question?
- What are the relevant facts?
- Who or what could be affected by the way the question gets resolved?
- What are the relevant ethical considerations?

<table>
<thead>
<tr>
<th>Ethical Considerations Relevant to This Module*</th>
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<tbody>
<tr>
<td><strong>Respect for Persons</strong></td>
<td>Under what circumstances, and to what extent, should we respect an individual’s choice not to be vaccinated (or not to have his or her children vaccinated)?</td>
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<tr>
<td><strong>Harms and Benefits</strong></td>
<td>What are the risks and benefits of vaccination for individuals?</td>
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<td>What are the risks and benefits of vaccination for the larger community?</td>
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<tr>
<td><strong>Fairness</strong></td>
<td>Is it ever fair to allow some individuals not to be vaccinated, recognizing that they will receive protection from a disease because others take on the burden of getting the vaccine?</td>
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<td></td>
<td>Are some reasons for opting out of vaccination more acceptable than others?</td>
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<tr>
<td><strong>Responsibility</strong></td>
<td>What responsibilities do individuals have to their community?</td>
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</table>

*Bold items are emphasized in this module.*

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See the Introduction
For more information about the four key questions, see the Introduction, page 5.

See Module 1
Students are introduced to the four key questions and ethical considerations in Module 1. Modules 2–6 assume this prior knowledge. We strongly recommend that you complete Module 1 first with your students, before starting any of the other modules.
At a Glance

ISSUES EXPLORED

- What are the best ways to balance respect for individual choices with community needs?
- Should individuals be permitted to opt out of vaccination initiatives that promote community well-being? If so, which exemptions should be allowed?

Purpose and Rationale

Policies that tie public school entry to certain vaccinations can be highly controversial. While the policies have contributed to the elimination or great reduction of most vaccine-preventable illnesses in the United States, some people oppose them. It’s important to recognize and protect individual freedoms and choices. States should, for example, protect parental autonomy to the extent possible as they develop vaccine policies and build community consensus for vaccination programs. At the same time, it’s important to safeguard the health of individuals and the community as a whole. To understand the issues related to vaccination policies, it is essential to grasp the concept of community immunity—the protective effects against disease that result when a critical percentage of a population is immunized—and to know that community health is threatened when immunization levels drop below a certain threshold.

This module can be used in conjunction with units on the immune system, the nature of infectious disease, and microbiology (bacteria and viruses). The Day 1 case study could be used to introduce any of those other units. The module can be expanded to include students’ researching different diseases and vaccines or how pathogens and vaccines interact with the immune system.

Overview

In this module, students wrestle with the tensions among respect for persons, fairness, and community well-being. A case study involving the attempts of a county and a school board to enforce a vaccination policy opens the module. Students examine some of the facts behind the debate about vaccination policies: the contributions vaccination has made to public health, the potential risks associated with vaccines, the reasons people might not be vaccinated, and the different types of exemptions that states allow to their public school vaccination policies. On Day 2, a simulation introduces the concept of community (or herd) immunity and its protective effect on large groups. Examples of the consequences of using coercion and force to vaccinate, or of
adopting vaccination policies that allow large numbers of citizens to opt out of vaccination, reinforce what’s at stake in resolving questions related to vaccination policies. As a final assessment, students make recommendations for their state’s school vaccination policy, justifying their positions with scientific information and ethical considerations.

**Learning Objectives**

Students will

- recognize the inherent tension between respecting an individual’s choice not to be vaccinated and the need for widespread vaccination to ensure the health of the entire community;
- apply the ethical consideration of fairness to circumstances in which individuals who do not bear any potential burdens of vaccination still benefit from community immunity; and
- describe under what circumstances, if any, students believe vaccination should be mandatory and what justifiable exceptions there might be.

**Major Concepts**

- Vaccines have greatly reduced the incidence of infectious diseases (including childhood transmissible diseases).
- Everyone in the community is protected from outbreaks if a large percentage of members of the community are vaccinated (community immunity).
- This means that a small number of people can remain unvaccinated without risking the community’s health overall. Even though they have not themselves been vaccinated, they will directly benefit because of community immunity.
- Once the number of people vaccinated falls below a certain threshold, the disease regains a foothold and all unvaccinated individuals in the community are at higher risk of contracting the disease.
- Public health policies must strive to balance the rights of individuals to make their own choices with the needs of the larger community.
- U.S. states permit different types of exemptions—medical, religious, and philosophical (personal belief)—to their mandatory vaccination policies. However, they vary in how they enforce their policies and in how easy it is for people to opt out.
- Because of recent outbreaks of vaccine-preventable illnesses such as measles, people all over the country are debating how to handle citizens’ requests to opt out in a way that respects the right of individuals to make their own choices, is fair, and protects the health of community members.

**Assessment Outcome**

Students will apply key bioethical concepts to developing and justifying a recommendation for a state vaccination policy.

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**Note**

People have many reasons for not being vaccinated—some better than others. Bioethicists sometimes refer to people who choose not to bear any of the potential burdens of vaccination but who still benefit from community immunity as “free riders.” Although this module does not use that term, it does raise fairness questions about gaining the benefits of vaccination without being vaccinated.
Key Science Knowledge*

- Community (herd) immunity
- Epidemic
- Information about specific diseases
- Interpreting data
- Nature of infectious disease
- Vaccines: impacts, benefits, and risks
- Vaccines and immunologic memory
- Viruses and bacteria

*Bold items are explicitly addressed in this module.

Teaching Sequence Preview

Day 1—Exploring Vaccines: Students are introduced to this module’s main question: Under what circumstances, if any, should a state grant exemptions to its school vaccination policy? Students read a newspaper article about a real controversy involving mandated vaccination in a school system in Maryland. They air their initial views and then consider some of the factual information relevant to the question. Students are divided into groups and proceed through several stations where there’s background information on vaccine-preventable diseases, vaccine benefits and risks, and the types of exemptions states allow.

Day 2—Community Immunity: As part of their exploration of key facts and scientific concepts, students participate in a classroom simulation that demonstrates the concept of community immunity. They collect data about the disease spread under two conditions. In the first, everyone in the community is susceptible, and the disease spreads readily. In the second, a majority of people are immune—enough to protect many of those who are not. Students learn that it is possible to protect susceptible individuals if their proportion in a community is small, but if a large proportion is susceptible, public health is severely compromised. The concept of community immunity is central to students’ ability to assess the fairness of the recommendations they develop later for their state’s public health department.

Day 3—Vaccines, Ethics, and Social Policy: Having gathered relevant data and been introduced to the key scientific concept of community immunity, students take into account major ethical considerations that should inform their final recommendations. They explore issues of fairness, respect for persons, harms and benefits, and responsibility to one’s community as they develop a recommendation for what they believe their own state policy should be. They also consider respect for persons in the context of two historical vaccination cases. In one, a mandatory-vaccination policy was enforced with police powers, and in the other, the use of vaccines was optional. Students provide a justification for their recommendation that incorporates key scientific and ethical considerations, and they reflect on how their views may have changed since Day 1.
## In Advance

### Copies, Equipment, and Materials

<table>
<thead>
<tr>
<th>Activity</th>
<th>Photocopies and Transparencies</th>
<th>Equipment and Materials</th>
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<tbody>
<tr>
<td><strong>Day 1</strong></td>
<td></td>
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<tr>
<td>1</td>
<td>• 1 transparency of Master 2.1 <strong>for the class</strong>&lt;br&gt;• 1 copy of Master 2.1 <strong>for each student</strong></td>
<td>1 overhead projector (optional) and 1 LCD projector and computer with Internet connection (optional) <strong>for teacher use</strong></td>
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<tr>
<td>2</td>
<td>• 1 copy of Masters 2.2 and 2.7 <strong>for each student</strong>&lt;br&gt;Set up stations in different areas of the classroom before class. Make two versions of each station to minimize crowding:&lt;br&gt;• 2 copies of Master 2.3 <strong>for the class</strong>&lt;br&gt;• 2 copies of Master 2.4 <strong>for the class</strong>&lt;br&gt;• 2 copies of Master 2.5 <strong>for the class</strong>&lt;br&gt;• 2 copies of Master 2.6 <strong>for the class</strong></td>
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<td><strong>Day 2</strong></td>
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<td>3</td>
<td>• 1 transparency of Master 2.8 <strong>for the class</strong>&lt;br&gt;• 1 copy of Master 2.8 <strong>for each student</strong>&lt;br&gt;• Master 2.9, copied and cut so that you have enough for 65% of students to have Vaccinated cards and 35%, Susceptible cards</td>
<td>• 1 overhead projector (optional) <strong>for teacher use</strong>&lt;br&gt;• 1 red and 1 green index card (3 x 5 inch) <strong>for each student</strong></td>
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<tr>
<td>4</td>
<td>1 copy of Master 2.10 <strong>for each student</strong></td>
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<tr>
<td><strong>Day 3</strong></td>
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<tr>
<td>5</td>
<td>1 copy of Master 2.11 <strong>for each student</strong></td>
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<td>6</td>
<td>1 copy of Master 2.12 <strong>for each student</strong></td>
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<tr>
<td>7</td>
<td>1 copy of Master 2.13 <strong>for each student</strong></td>
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Masters

Master 2.1: Get Kids Vaccinated or Else
Master 2.2: Gathering the Facts—Vaccines
Master 2.3: Station 1—Vaccine-Preventable Diseases
Master 2.4: Station 2—Vaccine Risks
Master 2.5: Station 3—The Measles Graph
Master 2.6: Station 4—Exemptions
Master 2.7: Key Questions
Master 2.8: Community Immunity Data Sheet
Master 2.9: Vaccination Status Cards
Master 2.10: Community Immunity Reflection
Master 2.11: Opting Out of a Vaccine—Variables to Consider
Master 2.12: Vaccination Policies Contrasted
Master 2.13: Vaccination Policy Letter Assignment

Teacher Support Materials*

Master 2.2 Answer Key
Master 2.7 Answer Key
Master 2.10 Answer Key
Autism and the MMR Vaccine
Disease Occurrence Before and After Vaccine Development
Deaths from Vaccine-Preventable Diseases**
U.S. Vaccination Rates for Selected Vaccines, by Poverty Level**
U.S. Vaccination Rates for Selected Vaccines, by State**
Recommended Childhood Immunization Schedule**
Vaccination Policy Assignment Rubric
Extension (Optional): Responsibility Prompts and Scenarios

*Available only online at

** Includes a series of questions (and answers) for further reflection.
Day 1: Exploring Vaccines

Purpose

Day 1 introduces students to a key ethical tension: balancing respect for individual choices with the need to protect the community. When is it acceptable to compel someone to do something in the name of public health, or to object to participating in a public health measure? Students begin with an article (Master 2.1) about an incident where a school system threatened legal action, including fines, to get parents to comply with the state’s vaccination policy.

The article leads into the main ethical question of the module: Under what circumstances, if any, should a state grant exemptions to its school vaccination policy?

Day 1 focuses students’ attention on two of this supplement’s four key questions for bioethical inquiry: What is the ethical question? and What are the relevant facts?

Activity 1: Setting Vaccination Policies—What Is the Ethical Question?

Estimated Time: 10 minutes

Procedure

1. Give each student a copy of Master 2.1: Get Kids Vaccinated or Else. Present the introductory case on the master, about vaccination and Maryland schools.

Depending on your class, you may wish to project the story while reading it aloud with students or provide silent reading time.

More on the Web

As an alternative, you may wish to show CNN video clips of the same case. Go to the CNN Web site (http://www.cnn.com) and search on “Maryland vaccines or else 2007.” If you have trouble locating the clips, please see Tips, Updates, and Corrections online at http://science.education.nih.gov/supplements/bioethics/guide.

Intro: Vaccines or Else!—(90 seconds). CNN reporter talks with health officials and with parents waiting in line to have children vaccinated.

Longer: Get Kids Vaccines or Be Jailed—(6 minutes). CNN’s Tony Harris talks with two people with opposing views on mandatory vaccinations for children.

Note

If time is limited, students could read Master 2.1 for homework the previous night.
2. Elicit initial reactions from students and allow them to briefly share their thoughts. Do they agree with the Maryland county’s officials, that parents who refuse to have their children vaccinated should be jailed?

Encourage a wide range of opinions—if you find that only one side of the issue is being promoted, ask students to name a different view. Explain that it need not be their view but that it’s important to be aware of all the views that a range of people might have about this issue. You might want to point out to students that sometimes it may be legal but not ethical to force people to be immunized. Tell students they will revisit their positions later in the module.

3. Remind students of the helpfulness of the four key questions for approaching a bioethical issue and examining it more deeply:

- What is the ethical question?
- What are the relevant facts?
- Who or what could be affected by the way the question gets resolved?
- What are the relevant ethical considerations?

4. Ask students to share the ethical questions they think the article raises.

5. Write their questions on the board or on a large piece of paper. The list should include one of the main ethical questions of this module: Under what circumstances, if any, should a state grant exemptions to its school vaccination policy?

If students mention that question, highlight it as the one that will be the focus of the next few activities. If they don’t, add it to the list, and highlight it. Related ethical questions may include the following:

- Should vaccination be mandatory for public school attendance?
- If so, how should the state enforce the mandatory policy?
- Should exemptions be permitted? If so, what type of exemptions should be permitted?
- What process should parents go through to get an exemption?

6. Tell students that during this module, they should think about what the vaccination policy should be in their own state. At the end of the module, they will make a recommendation to their state’s public health department.

This is a situation in which an individual’s decision may have an impact on the greater public health. Determining fair, effective, and respectful vaccination policies is a real challenge in the United States and globally—a problem that state legislatures, state public health departments, and school committees are wrestling with. In this module, students will be asked to wrestle with it, too. They will form their position after they have gathered the relevant facts, identified
the key stakeholders, and taken into account the most relevant ethical considerations.

7. Make clear to students that this module will focus mostly on diseases that traditionally occur in childhood and that are readily transmitted between people.

“Childhood diseases” refers to diseases commonly acquired by children, who may build up immunity and get the disease only once (such as chickenpox). It does not refer to diseases such as strep throat or colds.

This module focuses on the vaccines that are currently mandated for public school entrance. It does not address vaccines that might be used in the future or that are currently being considered, such as the human papilloma virus (HPV) vaccine.

8. As a lead-in to the next activity, ask students to list briefly what kind of information they need to answer the ethical question.

**Activity 2:**
**Gathering the Relevant Facts**

Estimated Time: 35–45 minutes

**Procedure**

1. Reinforce the importance of gathering relevant facts in order to better understand the context of the ethical question.

2. Give each student a copy of Master 2.2: Gathering the Facts—Vaccines.

   ![See Teacher Support Materials](http://science.education.nih.gov/supplements/bioethics/teacher)

   An answer key for Master 2.2 is available online at http://science.education.nih.gov/supplements/bioethics/teacher. Additional information about disease occurrence and vaccine development, deaths from vaccine-preventable diseases, vaccination rates by poverty level and in different states, vaccinations currently recommended for public school entry, and concerns related to vaccines and autism is also available there.

3. Divide students into small groups of three or four. Explain that they will discuss Master 2.2 in their groups but should record their own answers on their copies of the master.
4. **Point out the four stations that each group will visit as students work to complete Master 2.2.**

Most large classes will need duplicates of the stations to minimize crowding. Place two copies of the following masters at the appropriate station:

- **Master 2.3:** Station 1—Vaccine-Preventable Diseases
- **Master 2.4:** Station 2—Vaccine Risks
- **Master 2.5:** Station 3—The Measles Graph
- **Master 2.6:** Station 4—Exemptions

5. **Allow each group to spend 5 to 10 minutes at each station—depending on the time you have—and tell them when to move on to a new station.** Encourage students to divide up the reading at each station, if necessary. This may be especially helpful for Master 2.3.

6. **After students have cycled through all four stations, reassemble the class.**

7. **Give each student a copy of Master 2.7: Key Questions, and ask them to record the main ethical question on it.**

Note that this sheet serves as a place for students to collect the main ideas for their final papers. Today (Day 1), they look at the ethical question and relevant facts. On Day 2, they will consider stakeholders and continue to gather facts. On Day 3, they will examine the ethical considerations.

8. **Before you begin to debrief the stations, ask students to record the main points from the discussion in the “What Are the Relevant Facts?” section of Master 2.7.**

9. **Debrief Station 1—Vaccine-Preventable Diseases.**

Students should record these important points, as well as any others raised during the discussion:

- **The risks of getting particular diseases vary.**
- **The risk of suffering harm when one has the disease varies.** (For example, How likely are you to have a negative outcome?)
- **The magnitude of harm caused by the disease also varies.** (For example, What is the worst thing that could happen to you?)
- Childhood diseases were once common in the United States, but they are largely unknown today because of widespread vaccination.
You may wish to highlight the dangers of a disease such as smallpox. Students may have differed in how they interpreted the relative danger of each of the diseases. Those details are not as important as the general idea that the diseases vary in how dangerous they are, how likely it is that a person will get the disease without the vaccine, and what the health impacts of the disease are.

10. Ask for a show of hands of how many people have had, or know someone who has had, smallpox, measles, mumps, rubella (German measles), diphtheria, pertussis (whooping cough), polio, or varicella (chickenpox).

Very few students should raise their hands, allowing you to make the following point: These diseases are unfamiliar because of the success of vaccines and programs that involved vaccinating whole populations.

11. Debrief Station 2—Vaccine Risks.

Students should record this important point: The risk of harm from vaccines is extremely low. In fact, it is much lower than the risk of harm from getting a disease.

Vaccines are very safe and effective, but there are some risks associated with them. Sometimes, if there is a high risk of great harm from the disease, individuals might be willing to incur a lesser but still high risk of significant harm from the vaccine. The smallpox vaccine is one that has a high risk of great harm relative to other vaccines, but because the disease itself has an even higher risk of even greater harm, the vaccine may be worth getting.

12. Debrief Station 3—The Measles Graph.

Two main trends shown in the graph include a drop-off in numbers of cases of measles after the vaccine was widely introduced and a small increase in cases in 1990. Students should record two important points, as well as any others raised during the discussion:

- Vaccines are largely responsible for reducing how many people get childhood diseases such as measles.
- Sometimes outbreaks occur because vaccinated individuals haven’t developed an appropriate immune response (“vaccine failure”) or because people have not been vaccinated for a variety of reasons.
13. Ask students to share possible reasons why people might not have been vaccinated.

Students may bring up
- no access to vaccines (lack of health insurance, no health clinic nearby);
- religious or cultural objections;
- concern about vaccine safety and side effects;
- believing that the disease no longer exists;
- too young to be vaccinated; and
- medical reasons (for example, allergic reactions to vaccine components).

14. Debrief Station 4—Exemptions, and review the difference between exemptions and opting out.

An “exemption” provides permission not to act as a policy requires. The term “opting out” means choosing to go against the policy. You can legally opt out if you have a legal exemption.

All 50 states have mandatory vaccination policies for school entry and ongoing attendance. Many allow parents to opt out, but these states differ in the types of exemption they permit and in the process parents must go through to get an exemption.

- **Medical.** To use this type of exemption, a person must obtain a medical document, signed by a physician, stating that a vaccination would be harmful. This can be the case when a child is allergic to some vaccine components or has a weakened immune system, such as occurs during cancer treatment. All states allow medical exemptions.

- **Religious.** State laws vary widely. Some require proof of belonging to a particular religion that has written views against vaccination. As of 2007, all states except Mississippi and West Virginia allowed religious exemptions.

- **Philosophical (personal belief).** This is a very broad category. States that allow this exemption tend to require specific proof of the person’s beliefs, such as a written statement signed by a witness. In some of these states, individuals must object to all vaccines to use this exemption. Some states simply require a parent’s signature on a preprinted form for a child to be exempt. Parents who are concerned about risks of vaccines can sometimes use this category to opt out of vaccination programs.

States also differ in how strictly they enforce these mandatory policies. Remind students that Maryland was threatening to send unwilling parents to jail.
Closure

Ask students to reflect on these questions: Are some reasons for wanting to opt out of vaccination more acceptable than others? For example, is refusing a vaccination because of fears about health risks as acceptable—or as unacceptable—as refusing because of fears of needles?

Note that students looked at some of the relevant facts during Day 1’s activities. Share with students that Day 2 will explore who might be affected by vaccine policies and introduce an important scientific concept related to ethical considerations.

Wrap up the discussion by telling students that this has been a good start at airing the issues and that there will be a chance to think about these issues in more depth. Let them know that whether or not they end up holding the same views later in this module, they will probably have more reasons for their position.

Extension (Optional)

See Teacher Support Materials

Additional vaccine information and questions for further reflection are available online at http://science.education.nih.gov-supplements/bioethics/teacher. Students can review this information and add relevant facts to their notes.
**Organizer for Day 1: Exploring Vaccines**

### Activity 1: Setting Vaccination Policies: What Is the Ethical Question?
**Estimated Time: 10 minutes**

- Give each student a copy of **Master 2.1**. Introduce the story on the master, and elicit initial reactions to it from students.  
  - Page 2-7, Steps 1–2
- Review the four key questions for approaching a bioethical issue (see the *Exploring Bioethics* poster), and ask students, “What ethical questions does the story raise?”  
  - Page 2-8, Steps 3–4
- Display students’ questions, and ensure that they include this one: Under what circumstances, if any, should a state grant exemptions to its school vaccination policy? Tell students that they will be making a recommendation to their state’s public health department about the state’s vaccination policy.  
  - Page 2-8, Steps 5–6
- Explain that this module focuses on diseases that traditionally occur in childhood and are readily transmitted between people.  
  - Page 2-9, Step 7
- As a lead-in to Activity 2, ask students what other kinds of information they need to answer the ethical question.  
  - Page 2-9, Step 8

### Activity 2: Gathering the Relevant Facts
**Estimated Time: 35–45 minutes**

- Reinforce the importance of gathering relevant facts when considering an ethical question, and give each student a copy of **Master 2.2**.  
  - Page 2-9, Steps 1–2
- Divide students into groups of three or four. Ask them to work with their group as each student fills in **Master 2.2**.  
  - Page 2-9, Step 3
- Point out the four stations you made from **Masters 2.3–2.6**. Allow each group to spend 5 to 10 minutes at each station.  
  - Page 2-10, Steps 4–5
- Reassemble the class, give each student a copy of **Master 2.7**, and ask them to record the main ethical question and the relevant facts on it.  
  - Page 2-10, Steps 6–8
- Debrief Station 1. Ask, “How many people have had, or know someone who has had, these diseases?” Students should record important points on **Master 2.2**.  
  - Page 2-10, Steps 9–10
- Debrief Stations 2 and 3. Ask why people might not be vaccinated.  
  - Page 2-11, Steps 11–13
- Debrief Station 4. Review the difference between exemptions and opting out.  
  - Page 2-12, Step 14
- **Closure**: Ask students to reflect on these questions: Are some reasons for wanting to opt out of vaccination more acceptable than others? Is refusing a vaccination because of fears about health risks as acceptable—or as unacceptable—as refusing because of fears of needles?  
  - Page 2-13
- **Extension**: See vaccine information and questions online.  
  - Page 2-13

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**Involves copying a master**
Day 2: Community Immunity

Purpose

On Day 2, students participate in a simulation where they explore the concept of community immunity and these key questions: What are the relevant facts? Who or what could be affected by the way the state vaccination policy is defined?

The introductory activity provides some background and context for students and sets the stage for delving into the ethical issues surrounding mandatory vaccination. The disease transmission simulation builds on an activity found in *Emerging and Re-emerging Infectious Diseases*, a National Institutes of Health curriculum supplement developed by the Biological Sciences Curriculum Study.

The simulation demonstrates the spread of a transmissible disease through a community under two conditions. In the first, everyone is susceptible, and the disease spreads readily. In the second, enough individuals are immune that they have a protective effect, preventing some susceptible individuals from becoming infected. Students note that individuals who do not bear any potential risks of vaccination can still benefit when a sufficiently large percentage of the community is vaccinated. When too many people are not immune, though, the disease can quickly reintroduce itself, and the well-being of members of the community will again be threatened.

Day 2 closes with a discussion of the simulation as well as of the key stakeholders: people who could be affected by a state vaccination policy for public school admission.

Activity 3: Simulating Community Immunity

Estimated Time: 15 minutes

Procedure

1. Introduce the simulation by explaining that it will model an important scientific concept related to immunization—community immunity—and highlight some of the ethical considerations that mandatory vaccination raises.

The simulation demonstrates why people might choose not to be vaccinated and addresses the possible implications of their actions for the greater community.
2. **Share the overall procedure and ground rules with students.**
   This simulation shows the spread of a hypothetical disease in a population. There will be two rounds:
   - Round One—everyone is susceptible to the disease.
   - Round Two—a majority of the people in the community are immune, but some are susceptible for various reasons.

   After each day, students will be asked to hold up their green or red cards and record the numbers on their copy of *Master 2.8: Community Immunity Data Sheet*.

   **Ground rules**
   - Students are “infectious” for one “day” only.
   - When they are infectious, they infect two other students.
   - The index (first) case will tag two individuals sitting nearby, who will then become sick.
   - Anyone who is infected gets sick and remains sick.
   - In each day that follows, anyone who is newly sick (has just been tagged) tags two additional people.
   - Vaccinated students cannot tag anyone.

3. **Give each student a copy of Master 2.8, and note the “0%” (vaccinated) column for Round 1 on the transparency of Master 2.8.**

4. **Give a red and a green card to each student, and tell them that green means they’re healthy and red means they’re infected and sick.**

5. **Announce the beginning of Round 1. Note that in this round, everyone is susceptible to the disease.**

6. **Designate one student to be the index case. Tell that student to hold up his or her red card. Ask everyone else to hold up their green cards. This is Simulation Day 1. On the transparency, record one person as infected on Day 1.**

7. **Tell the index student to tag two people he or she can reach from a seated position.** Now three people are infected.

8. **Ask all students to hold up their cards. This is Simulation Day 2. On the transparency, record the total number infected (three) on Day 2. The three sick students hold up their red cards, and the rest of the class holds up green cards.**

9. **Continue the simulation. The two students who were tagged in Simulation Day 2 are now infectious, and each tags two more students. The index case is infected but does not tag anyone (that is, the person is no longer infectious).**
10. Ask all students in the class to hold up their cards. This is Simulation Day 3. On the transparency, record the total number infected (seven) under Day 3. The seven infected people hold up their red cards, and the rest of the class holds up green cards.

11. Continue the simulation until the remainder of the class is infected.

12. Ask everyone who was susceptible but didn’t get the disease to stand up. All students should remain seated.

13. Ask students to record the class data on their copies of Master 2.8.

14. Briefly discuss with the class their observations of what happens when everyone in a population is susceptible and no one is immune. (A disease spreads quickly through the population.)

15. Introduce Round 2, in which some individuals will be immune. In addition to the individuals who will be immune, others will be susceptible for different reasons. A few people are so susceptible that they will die if infected and will not be able to spread the disease.

16. Give each student one of the cards you made from Master 2.9: Vaccination Status Cards, and tell students to keep their vaccination status information private. Give about 65 percent of the students Vaccinated cards and the rest, Susceptible cards. For a class of 20, hand out 13 Vaccinated and 7 Susceptible cards. For 30 students, it’s 20 Vaccinated and 10 Susceptible.

17. Announce the beginning of Round 2, and tell students that 65 percent of the students are vaccinated in this round.

18. Designate one student to be the index case. Tell that student to hold up his or her red card.

19. Ask the other students to hold up their green cards. This is Simulation Day 1. On the transparency, record one person as infected on Day 1.

20. Tell the index student to tag two people he or she can reach from a seated position. If students are susceptible, they will become infected. If they are vaccinated, they will not.

21. Ask all students to hold up their green or red cards. This is Simulation Day 2. On the transparency, record the number infected on Day 2.

22. Tell the students who were tagged in Simulation Day 2 and who were susceptible that they are now infectious and should tag two more students. Tell the students who were not susceptible that they cannot tag anyone else. The index case is infected but does not tag anyone.

Tip from the Field
Be sure that the student you choose to be the index case and some students immediately surrounding the index case receive Susceptible cards.
23. Ask all students to hold up their cards. On the transparency, record the number of people infected under Day 3. Students who will die if they become infected should be recorded as infected if they are tagged, and they should not tag anyone else.

24. Continue until the disease stops spreading. Some of the susceptible people should not get sick because of the presence of vaccinated people.

25. Ask students to record the Round 2 class data on their copies of Master 2.8.

26. In a whole-class discussion, ask students to describe their observations about how the disease spread in Round 2 compared with Round 1. Briefly discuss what happens when enough students are immune to prevent the spread of the disease throughout the population: many susceptible people will be protected.

27. Then, discuss the reasons for why some students were susceptible. Ask all the students who were susceptible but didn’t get the disease to stand up and read aloud the information on their vaccination status cards.

**ACTIVITY 4: Discussing the Simulation**

Estimated Time: 30 minutes

**PROCEDURE**

1. Debrief the community immunity activity with students by asking them how the course of the disease differed in the different rounds.

2. Develop a working definition of the concept of community immunity.

**Community immunity:** When a critical percentage of a population is immune to a particular transmissible disease (in this case, through vaccination), the disease can no longer circulate in the community.

You may want to draw on the following points as the class develops the definition:

- The concept of community immunity applies only to diseases that are readily transmissible between people. It does not apply to diseases, such as tetanus, that are not transmissible between people.
- As the simulation illustrated, when community immunity is achieved, the chances that a nonvaccinated person gets a disease are greatly diminished. There are vastly fewer people from whom an unvaccinated person can contract a virus.
• While an unvaccinated person’s chances of contracting a disease are greatly diminished, the risk is not entirely eliminated. If an unvaccinated child happens to come in contact with a virus, he or she is vulnerable to the disease. This means that parents who opt out of vaccinating their children reduce overall community immunity and may place their own children at risk of contracting an illness.

3. **Ask students what happened to susceptible people in each round.**
   Note that some susceptible people were protected in Round 2 by high levels of vaccination in the community even though they took no risks of vaccination themselves.

4. **Remind students that even though unvaccinated individuals are, of course, more susceptible to the risks of acquiring diseases, this activity highlights an important fairness consideration in sharing the benefits and the risks of vaccines across a wider community.**

5. **Ask students additional questions to deepen and extend the discussion of the simulation.** Possible discussion questions include
   - What do you think would happen if the number of vaccinated individuals was increased or decreased even more?
   - What does the simulation reveal about protecting the most vulnerable members of the population—babies too young to be vaccinated and people who don’t have good access to health care?
   - Are vaccination programs designed to protect the individual, the community, or both?

6. **Ask students how characteristics of the vaccine and the disease might affect community immunity.** Tell students that the proportion of people in a community that must be vaccinated for community immunity to be effective varies depending on the characteristics of the vaccine and the disease, including mode of transmission, how infectious the disease is, and how effective the vaccine is. (See table below.)

### Percentage of Community That Must Be Vaccinated for Community Immunity to Work

<table>
<thead>
<tr>
<th>Disease</th>
<th>Community Immunity Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphtheria</td>
<td>85%</td>
</tr>
<tr>
<td>Measles</td>
<td>83–94%</td>
</tr>
<tr>
<td>Mumps</td>
<td>75–86%</td>
</tr>
<tr>
<td>Pertussis</td>
<td>94%</td>
</tr>
<tr>
<td>Polio</td>
<td>80–86%</td>
</tr>
<tr>
<td>Rubella</td>
<td>85%</td>
</tr>
<tr>
<td>Smallpox</td>
<td>85%</td>
</tr>
</tbody>
</table>


**Note**

If students bring up the limitations of the simulation, ask them to name as many limitations as they can think of. Students may offer a range of answers:

- It doesn’t model immunity due to prior exposure.
- Individuals do not recover; they stay sick.
- Individuals infect only two people in each round.
- It doesn’t model risks of the vaccine.
7. **Ask students to take out Master 2.7.** Have them add a sentence about **community immunity in their “relevant facts” section.** For example, community immunity occurs when a large percentage of the population is vaccinated. It can prevent diseases from becoming widespread and protects those who cannot be or choose not to be vaccinated. Students may also add information about the threshold levels of vaccination required.

8. **Ask students who the potential key stakeholders are when considering this ethical question:** Under what circumstances, if any, should a state grant exemptions to its school vaccination policy? Now that students have considered some of the individuals in the simulation who were susceptible, they can begin to think about those individuals or groups that could be affected by how the ethical question is resolved.

9. **Have students add potential stakeholders to Master 2.7 as they are discussed in class.**

Students should identify the following potential stakeholders:

- the school,
- parents,
- students,
- teachers,
- the medical community,
- the larger civic community,
- the school board, and
- the state public health department.

This simulation also reinforced that within the larger civic community, other stakeholders might exist, such as individuals

- too young to be vaccinated,
- with medical reasons for not being vaccinated,
- with religious reasons for not being vaccinated,
- who have concerns about the risks of being vaccinated,
- with limited access to vaccines,
- who are vaccinated, and
- who are vaccinated but who have not built an adequate immune response.
**Closure**

Recap for students that the simulation highlighted how choosing whether or not to be vaccinated for a transmissible disease affects a larger group.

The concept of community immunity will be important for students to consider as they craft their final policy recommendations. It is a scientific concept, but it relates to important ethical considerations as well.

**Raise one of the most important ethical considerations in closing:**
How fair is it for someone to benefit from the protective effect of community immunity if he or she has chosen not to assume any risks of vaccination?

**Homework**

Distribute Master 2.10: Community Immunity Reflection, review the questions on it, and ask students to complete it for homework. They will need to refer to their data from Master 2.8.

**Teaching Strategies**

You may wish to ask students to graph the data from the simulation.

**Extension (Optional)**

**More on the Web**

An online community immunity simulator is available at the National Institutes of Health Office of Science Education Web site: [http://science.education.nih.gov/supplements/nih1/diseases/activities/activity4.htm](http://science.education.nih.gov/supplements/nih1/diseases/activities/activity4.htm). Students can use it to see what happens when they manipulate variables related to the spread of a disease in a population.
### Organizer for Day 2: Community Immunity

**Activity 3: Simulating Community Immunity**  
Estimated Time: 15 minutes

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Introduce the simulation, including the overall procedure and ground rules. Page 2-15, Steps 1–2</td>
</tr>
<tr>
<td>2.</td>
<td>Give one copy of Master 2.8 to each student, and project a transparency of it. Page 2-16, Step 3</td>
</tr>
<tr>
<td>3.</td>
<td>Give a red and a green card to each student, and tell them what the colors mean. Page 2-16, Step 4</td>
</tr>
<tr>
<td>4.</td>
<td>Announce the beginning of Round 1, and note that everyone is susceptible. Page 2-16, Step 5</td>
</tr>
<tr>
<td>5.</td>
<td>Designate one student to be the index case. Tell that student to hold up his or her red card. Ask everyone else to hold up their green cards. This is Simulation Day 1. On the transparency, record one person as infected under Day 1.</td>
</tr>
<tr>
<td>6.</td>
<td>Tell the index student to tag two people he or she can reach from a seated position. Page 2-16, Step 7</td>
</tr>
<tr>
<td>7.</td>
<td>Ask all students to hold up their red or green cards. Record the total number infected (three) under Day 2. Page 2-16, Step 8</td>
</tr>
<tr>
<td>8.</td>
<td>The two students who were tagged on Simulation Day 2 are now infectious, and each tags two more students. The index case is infected but does not tag anyone. Page 2-16, Step 9</td>
</tr>
<tr>
<td>9.</td>
<td>Ask all students to hold up their colored cards. On the transparency, record the total number infected (seven) under Day 3. Continue until all are infected. Page 2-17, Steps 10–11</td>
</tr>
<tr>
<td>10.</td>
<td>Ask everyone who was susceptible but didn’t get the disease to stand up. Tell students to record the class data on their copies of Master 2.8. Page 2-17, Steps 12–13</td>
</tr>
<tr>
<td>11.</td>
<td>Briefly discuss with the class students’ observations of what happens when everyone in a population is susceptible and no one is vaccinated or immune (a disease spreads quickly through the population). Page 2-17, Step 14</td>
</tr>
<tr>
<td>12.</td>
<td>Introduce Round 2, in which some individuals will be immune. Page 2-17, Step 15</td>
</tr>
<tr>
<td>13.</td>
<td>Give each student a card from Master 2.9, and tell students to keep their vaccination status private. Page 2-17, Step 16</td>
</tr>
<tr>
<td>14.</td>
<td>Tell students that 65 percent of them are vaccinated in Round 2. Designate one student to be the index case, and ask that student to hold up his or her red card. Page 2-17, Steps 17–18</td>
</tr>
<tr>
<td>15.</td>
<td>Ask everyone else to hold up their green cards. On the transparency, record one person as infected under Day 1. Page 2-17, Step 19</td>
</tr>
<tr>
<td>16.</td>
<td>Tell the index student to tag two people he or she can reach from a seated position. Page 2-17, Step 20</td>
</tr>
<tr>
<td>17.</td>
<td>Ask students to hold up their green or red cards. On the transparency, record the number infected under Day 2. Page 2-17, Step 21</td>
</tr>
</tbody>
</table>
Tell only the students who were tagged on Day 2 and who were susceptible that they are now infectious and may tag two more students.

Ask students to hold up their cards. Record the number infected under Day 3.

Continue until the disease stops spreading.

Ask students to record the class data on their copies of **Master 2.8**.

In a whole-class discussion, ask students to describe their observations about how the spread of disease in Round 2 compares with Round 1. Briefly discuss what happens when enough students are immune to prevent the spread of the disease throughout the population (many susceptible people will be protected).

Discuss why some students were susceptible. Ask students who were susceptible but didn’t get the disease to read their **Master 2.9** cards aloud.

**Activity 4: Discussing the Simulation**

Estimated Time: 30 minutes

<table>
<thead>
<tr>
<th>Step</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Develop a working definition of the concept of community immunity.</td>
</tr>
<tr>
<td>2</td>
<td>Ask students what happened to susceptible people in each round.</td>
</tr>
<tr>
<td>3</td>
<td>Remind students that even though unvaccinated individuals are more susceptible to the risks of getting the disease, this activity highlighted an important fairness consideration in sharing the benefits and risks of vaccines across a wider community.</td>
</tr>
<tr>
<td>4</td>
<td>Ask students additional questions to deepen and extend the discussion of the simulation, including, How might characteristics of the vaccine and the disease affect community immunity?</td>
</tr>
<tr>
<td>5</td>
<td>Ask students to take out <strong>Master 2.7</strong>. Have them add a sentence about community immunity in their “relevant facts” section.</td>
</tr>
<tr>
<td>6</td>
<td>Ask students who the potential stakeholders are when considering the ethical question, Under what circumstances, if any, should a state grant exemptions to its school vaccination policy? Have students record potential stakeholders on <strong>Master 2.7</strong>.</td>
</tr>
<tr>
<td>7</td>
<td><strong>Closure</strong>: Recap for students that the simulation highlighted how choosing whether to be vaccinated affects a larger group. Raise one of the most important ethical considerations in closing: How fair is it for people to benefit from the protective effect of community immunity if they have chosen not to assume any risks of vaccination?</td>
</tr>
<tr>
<td>8</td>
<td><strong>Homework</strong>: Distribute <strong>Master 2.10</strong>, review the questions on it, and ask students to complete it for homework. They will need to refer to their data from <strong>Master 2.8</strong>.</td>
</tr>
<tr>
<td>9</td>
<td><strong>Extension (optional)</strong>: Students can use an online community immunity simulator.</td>
</tr>
</tbody>
</table>

**Fairness**

*Involves making a transparency*
**Day 3: Vaccines, Ethics, and Social Policy**

**Purpose**

Day 3 gives students the opportunity to consider the core ethical considerations related to mandatory vaccination policies for school entry and to make a justified argument for their own policy recommendations. Students focus on one of the four key questions: What are the relevant ethical considerations? They use their prior knowledge as they develop and justify their positions. This module focuses on the considerations of fairness, respect for persons, and the extent of responsibility individuals should have to their communities.

**Activity 5: Discussing Ethical Considerations—Fairness and Responsibility**

**Estimated Time: 15 minutes**

**Procedure**

1. Introduce the day by telling students they will be focusing on this key question: What are the relevant ethical considerations? In particular, they will explore two ethical considerations: fairness and respect for persons. They then will develop a vaccination policy for their state, including reasons for their position, which they complete as homework.

2. Ask students to take out their homework (Master 2.10) and Master 2.7.

3. As a review, ask individual students to share their own definitions of community immunity from Master 2.10 and how the data from the simulation illustrate the concept.

4. Tell students that they will first examine the ethical consideration of fairness, and then briefly review what fairness means.

**Fairness**

When considering fairness, people must determine whether benefits, resources, risks, and costs are distributed equitably. Sometimes, what is fair is described as giving each person an equal amount of something. Other times, it’s described as providing according to each person’s need or to each person’s merit or contribution.

**Fairness:** Sharing benefits, resources, risks, and costs equitably.
5. Divide students into pairs, and ask them to discuss the ideas about fairness they recorded in their homework (on Master 2.10). Give them 3 to 5 minutes for this step.

6. Reconvene the class. Use the following story and questions about Bob to engage students in a discussion of fairness.

Bob and three of his friends rent a car and go driving. They run out of gas. To get to a gas station, two people must push the car and one person must steer. Bob knows that it takes only two people to push the car, so he decides to relax in the back seat while the others push and steer the car to the gas station.

- Is it fair for Bob to opt out of helping his friends get the car to the gas station?
- Suppose Bob has a broken foot, which makes it difficult for him to push or steer the car (since he cannot fit in the driver's seat with his cast). Is it fair for Bob to opt out of helping his friends get the car to the gas station?

7. Ask students, “How fair is it for someone to benefit from the protective effect of community immunity if he or she has chosen not to assume any risks of vaccination?” Ask how the Bob story is similar to or different from the scenario in which someone who has not been vaccinated receives that protective effect.

Students should see that in both cases, the individual benefits from the actions of others yet assumes few risks (individuals who are not vaccinated still run the risk of getting the disease, though the risk is much lower when community immunity is achieved). In both cases, individuals may have stronger or weaker reasons for “opting out.” In the case of community immunity, a whole community may be put at risk, whereas in Bob’s case, only he and his friends are involved. Students may have other ideas as well.

8. Have the pairs share the ideas they just discussed with the whole class, and ask students to record the main ideas under “Fairness” on Master 2.7.

9. Give each student a copy of Master 2.11: Opting Out of a Vaccine—Variables to Consider, and briefly review the five variables and the smallpox example.

The variables on Master 2.11 are scientific ones. Others to consider, such as religious background and beliefs, are not addressed on the master.

10. Remind students that these variables were introduced on Day 1 and that students will now explore the implications of these variables for issues of fairness. Ask students, “Are some reasons for wanting to opt out of a vaccine more acceptable than others?”
11. Read the scenarios at the bottom of Master 2.11 to the students and tell them that these represent some common reasons for opting out of a vaccine.

12. Give students 2 to 3 minutes to discuss one or more of the scenarios with their partners. Ask them to think about and weigh the relevant ethical considerations, the concept of community immunity, and the five scientific variables.

13. Debrief the scenarios during a whole-class discussion. Say to students, “According to Joy’s religious beliefs, she should not receive any medical interventions—including vaccinations. Is this a good reason for opting out of the smallpox vaccine? Why or why not?”

Some students might say it’s a good reason, because respect for persons requires that we not interfere with an individual’s ability to live in accord with their most foundational beliefs. Others might say it isn’t, because the harms of not achieving community immunity are too great.

14. Ask students, “Greg does not like needles and refuses to receive the smallpox vaccine—is that a good reason for opting out of the vaccine? Why or why not?”

Most students are likely to say it’s not a good reason, because the harms of not achieving community immunity are far greater than the minor harm Greg would suffer from the needle stick. Emphasize that this is not a good reason for opting out.

15. Ask students, “Sue does not have insurance and she cannot afford to get the vaccine—is this a good reason not to get vaccinated? Why or why not?”

16. Ask students, “John lives in a rural community and it is difficult to get to a clinic to get the vaccine—is this a good reason not to get vaccinated? Why or why not?”

• This question and the previous one about insurance both address issues related to access to vaccines. Some students may think that lack of access is an acceptable reason not to be vaccinated.

• Some students might add that everyone has a right to health care, so it is the state’s responsibility to provide the vaccine. If the state does not live up to its responsibility, then the individual has an acceptable reason not to be vaccinated.

• Other students might point out that it is in everyone’s health interest to make vaccines available to the uninsured. This is an interesting point, but it will take the discussion away from the main question, Are some reasons for wanting to opt out from a vaccine better (more acceptable) than others?
17. Share with students that because of the success of worldwide vaccination programs, smallpox no longer occurs naturally.

18. Briefly mention that although the ethical consideration of harms and benefits have been raised in this module and are important, the focus is on fairness and respect for persons. The questions related to harms and benefits in this module are, What are the risks and benefits of vaccination for individuals? What are the risks and benefits of vaccination for the larger community? Students learned about the risks and benefits of vaccines for individuals on Day 1. On Day 2, the disease simulation emphasized the possible harms to members of the community when vaccination levels are low in the community. Although the module presents a lot of overlap among ethical considerations, it emphasizes the interplay between respect for persons and fairness.

19. Ask students what “Other Considerations” they can think of to include in Master 2.7. Be sure to mention the concept of responsibility to the community if students don’t. You can pursue the consideration of responsibility by doing the second optional extension activity on page 2-31.

Activity 6: Discussing Ethical Considerations—Respect for Persons

Estimated Time: 20 minutes

Procedure

1. Direct students’ attention to the ethical consideration of respect for persons. Note that respect for persons needs to be balanced with fairness concerns when considering vaccination policy issues. You may wish to represent this graphically with a diagram of a balance or scale, with fairness on one side and respect for persons on the other.

2. Ask students to record the following question on Master 2.7 under “Respect for Persons”: Under what circumstances and to what extent should we respect an individual's choice not to be vaccinated?


Respect for persons: Not treating someone as a mere means to a goal or end, such as the goal of achieving immunity within the community. This is often a matter of not interfering with a person’s ability to make and carry out decisions. In some cases, it is also a matter of enabling a person to make choices or supporting the person in the choices he or she makes.
4. Divide the class into pairs, and give each student a copy of Master 2.12: Vaccination Policies Contrasted.

5. Tell students that the stories in Master 2.12 are examples of approaches to vaccination policies that differ in their emphasis on respect for persons.

6. Ask each member of the pair to read a different story, and give them time to read. One story describes vaccination against smallpox in Boston around the year 1900; the other describes an outbreak of measles in Ireland in 2000.

7. Elicit initial reactions to the stories. Have students summarize what they read to their partners. Have pairs discuss whether the stories demonstrated respect for persons and if so, how.

8. Draw a line on a transparency or the board and tell students to imagine that the line represents a range of possible policies.

   At the far right, label the line “state force,” and at the far left, label the line “let individuals decide.” In the middle of the line, write “state requires vaccination with some permissible exemptions.”

9. Ask students where on the line they would place each example (Boston—Smallpox, Dublin—Measles) and why.

10. Ask students to describe the role of the state and the role of respect for persons in each case.

    The case of a measles outbreak in Ireland provides an example of the state allowing wide latitude for individual choice. The case of smallpox in Boston demonstrates the issues raised by the use of a policy that sought to vaccinate the larger community. Although the policy did not advocate force, force was used.

11. Ask students where on the line they would put the Maryland policy described at the beginning of the module, as well as their own state’s current policy.

12. Transition to asking students questions about respect for persons and vaccination policy in general.

    Put the following questions on the transparency or board:
    • How much of a role should the state play in deciding whether people should be vaccinated?
    • How coercive or forceful should the state be in implementing a vaccination policy?
13. Note that the Boston and Dublin examples represent extremes. In crafting their own policy recommendations, students should be aware of possible policy options between the extremes.

For example, it is possible to craft policies that allow individuals to opt out of vaccination while requiring evidence of a strong commitment to opting out and proof that the individuals understand the consequences. Fewer people opt out in states that require parents to take more steps before being granted an exemption.

**Activity 7:**
Introducing the Final Assessment

Estimated Time: 10 minutes, plus time to write policy

**Procedure**

1. Tell students that now they are ready to craft and justify a policy recommendation to their state public health department.

   An appropriate policy depends on the characteristics of the disease and vaccine in question. As students learned on Day 1, diseases and vaccines vary widely. In their policy statements, students will only consider the vaccines currently recommended by their state.

2. Introduce the assessment task by distributing Master 2.13: Vaccine Policy Letter Assignment.

3. Tell students they will be taking a position on the ethical question as it applies to vaccination for currently mandated vaccines for public school enrollment in their state:

   Under what circumstances, if any, should a state grant exemptions to its school vaccination policy?

   Emphasize that it’s important for students to take into account ethical considerations and accurate supporting scientific information when making their recommendations.

   *Note*

   This question assumes that everyone is vaccinated unless exempt.

   See Teacher Support Materials

   You may wish to go over your expectations with students before they get started. A rubric to help you assess student understanding is available online at http://science.education.nih.gov/supplements/bioethics/teacher.

4. Remind students of the three different types of exemptions—medical, religious, and philosophical—used in the United States.
5. Tell students that their policies should address each of these types of exemptions and clearly state the kinds of exemptions that should be permitted, under what circumstances, and why.

6. Ask students to reflect on the following questions as they prepare to write their own policy recommendations: Are all reasons for opting out of vaccinations equally acceptable? Are some reasons more acceptable than others? What are the pros and cons of different policies?

7. Share additional information about philosophical exemptions. Be sure to emphasize the fifth bullet below: states that add extra steps to opting out have fewer people doing so.
   - Many states have considered bills to allow more exemptions (12 states in 2003 and 8 in 2004).
   - Thirteen of the states that offer religious (but not philosophical) exemptions lack any authority to deny an exemption request—they must give exemption to whoever asks.
   - Some states have adopted philosophical exemptions because individuals who don’t belong to organized religious groups (and therefore can’t get the documents allowing them a religious exemption) may still have religious beliefs. Individuals who object to vaccinations for reasons besides religious ones may also be able to use these exemptions.
   - States differ in how difficult they make it for people to get an exemption. For example, in some states, people who request a religious exemption must provide an affidavit affirming that vaccination conflicts with “tenets and practices of the church or religious denomination of which the applicant is a member.” In other states, they simply have to declare that they have a religious objection. Likewise, in some states, people requesting a philosophical exemption must sign a form describing the benefits of vaccination, whereas in other states, they need only provide a written statement that they object to vaccination.
   - States that add extra steps to opting out have fewer people doing it. Therefore, some policymakers are now encouraging states to require people to take extra steps to ensure that exemptions are not granted too readily.

8. Review the questions on Master 2.13 to be sure students understand them.

**Closure**

Mention the idea of balancing respect for persons, fairness, and responsibility to the community, identifying this as a key ethical theme of this module. Ask students how their understanding of this topic has deepened as they explored relevant facts, stakeholders, and ethical considerations.
Teaching Strategies

You may want to ask students to reflect in writing about whether their understanding has deepened and, if so, how. This written reflection could also be incorporated into the final assessment.

Final Assessment

For homework, have each student write a policy recommendation to the state public health department. This can also be in the form of a speech or a newspaper letter to the editor. Students should take a position on permitting religious and philosophical objections to the currently recommended vaccinations. Within the recommendations, students should clearly articulate information relevant to their decisions (including community immunity), as well as an ethical justification relating their positions to the concepts of respect for individual choices, harms and benefits, fairness, and responsibilities to the greater community.

Extensions (Optional)

1. Generate or research additional examples of vaccine policies to place along the continuum.

2. Explore the concept of responsibility more deeply with students.

See Teacher Support Materials

The Responsibility Prompts and Scenarios, available online at http://science.education.nih.gov/supplements/bioethics/teacher, may be helpful to you here.

3. At the end of Activity 7, you can deepen and extend the discussion by asking students more questions:

   • Should vaccinations ever be mandatory, with no exceptions? If so, does this require the state to provide them for free? If the state is providing vaccines, the taxpayers are ultimately paying for them.
   • What if people are willing to be vaccinated but can’t for any number of reasons (cost, language barriers, limited access to health care, not receiving information about vaccination)? Should the state give them the vaccine?
   • Who should be responsible for the medical care of individuals who get sick because they chose not to be vaccinated?
   • Which is more important: ensuring that children avoid the harm of illness or respecting parents’ authority to not vaccinate their children?
   • What kinds of strategies are acceptable for enforcing vaccination mandates?
   • Could a mandatory vaccination policy backfire, stoke public resentment, and cause an increased number of vaccination refusals?

Note

You can also ask students to share their policy recommendations with one another or with the class.
### Activity 5: Discussing Ethical Considerations—Fairness and Responsibility

**Estimated Time:** 15 minutes

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tell students they will now focus on the key question, What are the relevant ethical considerations? They will develop a vaccination policy for their state as homework.</td>
</tr>
<tr>
<td>2</td>
<td>Ask students to take out their Day 2 homework (<strong>Master 2.10</strong>) and <strong>Master 2.7</strong>. Ask them to share their definitions of community immunity from <strong>Master 2.10</strong> and how the data from the simulation illustrate the concept.</td>
</tr>
<tr>
<td>3</td>
<td>Tell students that they will examine fairness. Briefly review what it means.</td>
</tr>
<tr>
<td>4</td>
<td>Divide students into pairs. Ask them to discuss the ideas about fairness they wrote on <strong>Master 2.10</strong> for 3 to 5 minutes.</td>
</tr>
<tr>
<td>5</td>
<td>Reconvne the class. Engage students in a discussion of fairness.</td>
</tr>
<tr>
<td>6</td>
<td>Have the pairs share their ideas about fairness with the whole class. Ask students to record the main ideas under “Fairness” on <strong>Master 2.7</strong>.</td>
</tr>
<tr>
<td>7</td>
<td>Give each student a copy of <strong>Master 2.11</strong>, and briefly review the five variables (introduced on Day 1) and the smallpox example.</td>
</tr>
<tr>
<td>8</td>
<td>Students will now explore the variables and fairness. Ask, “Are some reasons for wanting to opt out of a vaccine more acceptable than others?”</td>
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<tr>
<td>9</td>
<td>Read to students the four scenarios on <strong>Master 2.11</strong>.</td>
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<tr>
<td>10</td>
<td>Give students 2 to 3 minutes to discuss one or more of the scenarios with their partners. Ask them to consider the relevant ethical considerations, the concept of community immunity, and the five scientific variables.</td>
</tr>
<tr>
<td>11</td>
<td>Reconvne the class, and debrief the scenarios together.</td>
</tr>
<tr>
<td>12</td>
<td>Tell students, “Thanks to vaccinations, smallpox no longer occurs naturally.”</td>
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<tr>
<td>13</td>
<td>Remind students that this module focuses on fairness and respect for persons. Ask them what “Other Considerations” to include in <strong>Master 2.7</strong>.</td>
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</table>

### Activity 6: Discussing Ethical Considerations—Respect for Persons

**Estimated Time:** 20 minutes

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Note that respect for persons needs to be balanced with fairness concerns when considering vaccination policy issues.</td>
</tr>
<tr>
<td>2</td>
<td>Ask students to record this question on <strong>Master 2.7</strong> under “Respect for Persons”: Under what circumstances and to what extent should we respect an individual’s choice not to be vaccinated? Briefly review what respect for persons means.</td>
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<tr>
<td>3</td>
<td>Divide the class into pairs. Give each student a copy of <strong>Master 2.12</strong>, and explain that the stories depict approaches that differ in their emphasis on respect for persons.</td>
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</table>
Ask each member of the pair to read a different story now.  

In a whole-class discussion, elicit initial reactions to the stories.

Draw a line to represent a range of possible policies. Ask where on the line students would place each example (smallpox, measles) and why.

Ask students to describe the roles of the state and respect for persons in each case, and then where on the line Maryland’s and their own state’s vaccination policies should go.

Ask students questions about respect for persons and vaccination policy in general.

Tell students that the examples represent extremes and that there are policy options between those extremes.

**Activity 7: Introducing the Final Assessment**

*Estimated Time: 10 minutes, plus time to write policy*

Tell students that they are ready to craft and to justify a policy recommendation to their state public health department.

Give each student a copy of **Master 2.13**. Remind students to include ethical considerations and scientific information in their recommendations.

Review these three exemptions: medical, religious, and philosophical. Tell students to address each one in their policies.

Ask students to reflect on these questions as they prepare to write their own policy recommendations: Are all reasons for opting out of vaccinations equally acceptable? What are the pros and cons of different policies?

Share additional information about philosophical exemptions. Emphasize that fewer people opt out in states that add extra steps to the process.

Review the questions on **Master 2.13**.

**Closure**: Mention the idea of balancing respect for persons and responsibility to the community. Ask students how their understanding of this topic has deepened.

**Homework and Final Assessment**: Have each student write a policy recommendation to the state public health department, referring to **Master 2.13**. The recommendation can also be in the form of a speech or a newspaper letter to the editor.

**Extensions (optional):**

1. Generate or research additional examples of vaccine policies.
2. Explore the concept of responsibility more deeply with students, possibly referring to the Responsibility Prompts and Scenarios, available online.
3. At the end of Activity 7, deepen and extend the discussion by asking students more questions.