1. Competency
Applies relevant principles of population health for improving immunization rates.

2. Learning Objectives
By the end of this module you will be able to:

- Use specific examples to show how immunization is a population-based health strategy.
- Explain the concept of herd immunity (also called community immunity) in non scientific terms.
- Explain, using examples, why vaccine-preventable diseases return when immunization coverage decreases.
- Explain how immunization registries can benefit not only individuals but also populations.
- Present the case for the importance of having a highly immunized healthcare work force.
- Identify barriers (economic, educational and social factors) to immunization uptake

3. Introduction
Vaccines not only prevent disease in an individual but also prevent disease in the population. The epidemiology triangle is used to understand herd immunity and the importance of immunization rates in population health.

4. Definitions
- Endemic: A disease restricted or peculiar to a locality or region
- Epidemic: A disease affecting or tending to affect an atypically large number of individuals within a population, community, or region at the same time
- Epidemiology: The study of the incidence, distribution, and control of disease in a population
- Immunization rate: The percentage of individuals in a targeted population who have received recommended vaccines
- Morbidity: A disease state or symptom
- Mortality: Death
- Mortality Rate: The number of deaths in a given time or place.
- Pandemic: A disease occurring over a wide geographic area and affecting an exceptionally high proportion of the population
5. Epidemiological Triangle

The epidemiology triangle illustrates the balance between three elements. Changes in any one of the following elements of the triangle can influence the occurrence of disease by increasing or decreasing the host's risk for disease.

5.1 Environment
- Climate
- Presence of animal hosts, vectors
- Water Quality

5.2 Agent
- Physical e.g., noise, radiation, vibration
- Chemical e.g., gas, liquid, solids that can poison or kill people
- Biological e.g., viruses, bacteria

5.3 Host
- Age
- Genetic predisposition
- Behaviour
  - Travel
  - Migration
  - Patterns of person to person contact
- Immune Status
  - Immunization reduces the host's susceptibility to the agent and therefore changes the epidemiology of the disease.
  - Immunization also has an effect on the population

6. Population Health

The health of a population, measured by health status indicators; it is influenced by physical, biological, social and economic factors in the environment, and by factors such as personal health behaviour and health care services.

6.1 Herd Immunity

For disease that is spread from person to person, if a high enough proportion of the population is immunized, transmission may be interrupted in the community. This provides protection to those who are not themselves immunized. This indirect protection is often call community or herd immunity.
6.2 Immunization of Health Care Workers

Immunizing health care providers protects:
- the health care provider from exposure to communicable disease in the workplace;
- the health of patients;
- family and community contacts outside the workplace.

There is an opportunity in each health care workplace to review the immunization status of all newly hired health care providers and to offer required vaccines. The employer and employee should keep immunization records and records of laboratory test results.

6.3 Immunization Rates

The goal of population health strategies is to have high immunization rates. An immunization rate is the percentage of individuals in a targeted population who have received recommended vaccines. Although no vaccine offers 100% protection, the spread of disease from person to person is much higher in those who remain un-vaccinated.

- Monitoring Immunization Rates

Immunization registries are confidential, population-based, computerized systems for maintaining information about vaccinations. Immunization registries can benefit not only individuals but also populations. An immunization registry allows for immunization coverage assessment which is an indicator of the population's susceptibility to vaccine preventable diseases. To ensure registries are up to date, community immunization providers should report childhood immunizations to public health.

- Barriers to Immunization Rates

Table 1 identifies the possible client, provider and system barriers to immunizations.

<table>
<thead>
<tr>
<th>Table 1: Barriers to Immunization Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Client Factors</strong></td>
</tr>
<tr>
<td>• Several studies have identified socio-economic factors as barriers, including lower parental education level, single parent families, larger families, and mothers without prenatal care</td>
</tr>
<tr>
<td>• Lack of knowledge of immunization schedule</td>
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<tr>
<td>• Concerns about vaccine safety</td>
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</tbody>
</table>
• Results of Decreasing Immunization Rates

Table 2: Results of Decreasing Immunization Rates

<table>
<thead>
<tr>
<th>Country</th>
<th>Event/Year</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia:</td>
<td>Socioeconomic instability late 1980’s</td>
<td>157,000 case of diphtheria, 5,000 deaths</td>
</tr>
<tr>
<td>Italy:</td>
<td>Pertussis vaccine optional (1992)</td>
<td>Fewer than 40% of children &lt;5 years are vaccinated, 25% have pertussis by age 5, One in 850 cases lead to death in children &lt;1 year</td>
</tr>
<tr>
<td>Canada:</td>
<td>Rubella outbreak in Ontario, 2005</td>
<td>305 cases in a religious community in Ontario, in which a number of cases were in unimmunized individuals</td>
</tr>
<tr>
<td>United Kingdom:</td>
<td>Failure to maintain high measles immunization rates (2006)</td>
<td>Uptake of MMR vaccine in UK fell from 92% in mid-1990s, to 82% in 2003, In 2006, “the number of measles cases have risen to their highest levels in nearly 20 years”, 1 death in 2006 – the first measles fatality in 14 years</td>
</tr>
</tbody>
</table>

7. Summary
Immunization is one of the miracles of this century. Maintaining high immunization rates in the population will decrease the incidence of disease in the population. Barriers to immunizations need to be addressed to prevent decreasing immunization rates and emergence of disease.

8. Activities
Make a list of “system” barriers in your practice that may reduce the immunization uptake.

9. Required Reading
Part 3 - Recommended Immunizations - Immunization of Adults (pages 96 - 104)

10. References


11. Quiz

Question #1
Which one of the following best describes “endemic”.

A. The study of the incidence, distribution, and control of diseases in a population
B. A disease restricted or peculiar to a locality or region
C. A disease affecting or tending to affect an atypically large number of individuals within a region at the same time
D. A disease occurring over a wide geographic area and affecting an exceptionally high proportion of the population

Question #2
The Epidemiological Triangle illustrates the balance between the environment, the agent and the host.

A. True
B. False

Question #3
Herd immunity is when a small number of the population or community at risk is resistant to the effects of specific disease-causing organisms or agents.

A. True
B. False
12. Quiz Answers

Question #1
Answer: B
Endemic is described as “A disease restricted or peculiar to a locality or region”.

Question #2
Answer: True
Changes in the environment, agent or host can influence the occurrence of disease by increasing or decreasing the host’s risk for disease.

Question #3
Answer: False
Herd Immunity is the resistance of a group to a pathogen due to the immunity of a large proportion of the group to that pathogen.