Infectious Diseases Important Definitions

- An infectious disease is an illness resulting from the presence of a pathogenic biological organism in a host organism
- A communicable disease is an infectious disease that is spread from one human to another
- All communicable diseases are infectious diseases, but not all infectious diseases are communicable

Test your knowledge

Are these diseases communicable?

- Rabies?
  - NO
- Measles?
  - YES
- Zika?
  - YES
- Legionella
  - NO
- Salmonella?
  - YES
- Malaria?
  - NO

Chain of Infection
Infectious Agents

- Bacteria: Salmonella, Cholera, Pertussis, Legionella, Staph, TB, Bacterial Meningitis, Botulism, Syphilis, Tetanus, Anthrax, Plague, Norovirus, Diphtheria, Tularemia, GAS, Hansen’s Disease, Leptospirosis, Listeria, Lyme Disease
- Viruses: Measles, Mumps, Varicella, Influenza, MERS, SARS, Ebola, WNV, HIV, Zika, Hepatitis, common cold
- Parasites: Malaria, Babesiosis, Giardia, Cryptosporidium, Toxoplasmosis, Malaria
- Fungus: Histoplasmosis, Blastomycosis
- Protozoa: Cyclosporiasis
- Rickettsiae: Ehrlichia, Anaplasmosis, RMSF, Typhus Fever
- Protozoa: Creutzfeldt-Jakob Disease

Reportable Infectious Agents

- Bacteria: Salmonella, Cholera, Pertussis, Legionella, Staph, TB, Bacterial Meningitis, Botulism, Syphilis, Tetanus, Anthrax, Plague, Norovirus, Diphtheria, Tularemia, GAS, Hansen’s Disease, Leptospirosis, Listeria, Lyme Disease
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- Protozoa: Creutzfeldt-Jakob Disease

What Diseases Should be Under Surveillance?

- Cause serious morbidity and/or mortality
- Have the potential to affect additional people beyond the initial case
- Can be controlled or prevented with an intervention
- Cause outbreaks or unusual increases in a disease
- Is an unusual case/cluster

Reservoirs: Place where Organism Lives & Multiplies

Environmental

- Human
- Animal

Chain of Infection

Direct: Contact or Droplet Spread
Indirect: Airborne, Vector-borne or Vehicle-borne
In General Terms, Uses of Surveillance

- Generate hypotheses, stimulate research
- Evaluate control and prevention measures
- Monitor long-term changes/trends in infectious agents
- Detect changes in health practices
- Facilitate planning

Day-to-Day Uses of Communicable Disease Surveillance

- Identify cases for investigation and follow-up
- Estimate magnitude of the problem
- Detect sudden increases in disease-Outbreak detection

Building Block of Surveillance

All surveillance starts with the single case that is brought to the attention of public health by a laboratory, HCP or other party and who’s risk factors are investigated by the LHD CD investigator.
After notification ...

Information to Know Before Interviewing the Case

- Infectious Agent: Is it viral, bacterial? Serotypes
- Case Definition: Exact lab results needed and if clinical presentations are important; are there sub-classifications
- How is it transmitted?
- What is the Incubation Period?
- What is the Period of Communicability? And who did they possibly expose?
- Possible Reservoirs
- Occurrence: Where did they travel?
- Who is susceptible (e.g. unvaccinated close contacts)
- What control measures are required? (food handlers, health care workers, close contacts)
- What prevention messages to discuss (hand hygiene, vaccinations recommended, prophylaxis)

Important resource @ dph.partner.illinois.gov
Communicable Disease Control Community

Alerts Notify IDPH Staff whenever a Class 1a or Certain 1b Disease is entered
Control of Cases/Contacts

• Specified in the Rules & Regulations for each Disease

• Examples:
  – Cryptosporidiosis: Household contacts and other close contacts with the case who have diarrhea should be tested
  – Measles: Susceptible contacts (not vaccinated or given IG within 6 days after exposure), shall be excluded from school, workplace, childcare facility or other facility until 21 days after the onset of the last reported measles case.
  – STEC: Foodhandler are restricted from work until diarrhea ceases for at least 24 hours and two consecutive negative stool specimens are obtained.

Notification & investigation can also involve Situations Requiring Prophylaxis of Contacts
Top 10 Disease Investigated during 2015 in Illinois (total cases = 112,369)

<table>
<thead>
<tr>
<th>Disease</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norovirus</td>
<td>17,414</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>13,798</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>6,075</td>
</tr>
<tr>
<td>E. coli</td>
<td>5,942</td>
</tr>
<tr>
<td>Shigella flexneri</td>
<td>5,194</td>
</tr>
<tr>
<td>Haemophilus influenzae</td>
<td>4,220</td>
</tr>
<tr>
<td>Mycoplasma pneumoniae</td>
<td>3,819</td>
</tr>
<tr>
<td>Salmonella enteritidis</td>
<td>3,325</td>
</tr>
<tr>
<td>Pneumococcus pneumoniae</td>
<td>2,507</td>
</tr>
<tr>
<td>Cryptosporidium</td>
<td>1,912</td>
</tr>
</tbody>
</table>

Note: These are not all confirmed cases, but represents the volume of work by LHDs to determine this.

Uses of Surveillance

- Identify cases for investigation and follow-up
- Estimate magnitude of the problem
- Determine geographic distribution of disease
- Detect sudden increases in disease-Outbreak detection

I-NEDSS AVR Canned Reports

Most used daily is the 1a & 1b alert report

I-NEDSS AVR is Used to Analyze Data

Example of Legionella Daily Report looking for exposure details by serogroup
Example of Scheduled report for GAS looking for clusters in residential facilities

Example of scheduled report to lab for Zika testing approval

Example of regional Weekly Alert Report

Surveillance data also inform policy decision, most notably vaccination recommendations

H1N1 & mumps provide additional examples

- Surveillance data were used during the H1N1 epidemic of 2009 to target scarce vaccination supplies to areas hardest hit
  - also gave us the muscle need to push forward with an import from the vital records electronic system
  - Also demonstrated flexibility with ELR data to switch on reporting and transition to potentially reportable

University related mumps outbreaks in 2015 lead to a proposed change in documentation requirement for college students, requiring documentation of two doses

Mumps outbreak at University of Illinois leads to call for re-immunization
Uses of Surveillance

- Identify cases for investigation and follow-up
- Estimate magnitude of the problem
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What constitutes an OUTBREAK

- The occurrence of illness in a person or a group of epidemiologically associated persons, with the rate of frequency clearly in excess of normal expectations (IDPH Communicable Disease Rules and Regulations)
- Number of cases indicating presence of an outbreak is disease specific
  - Foodborne Outbreak: Two or more persons (usually in separate households) associated in time and place
  - Waterborne Outbreaks: Cluster of illness in which two or more persons (usually in separate households) associated in time and place

What constitutes an OUTBREAK

- Non-foodborne/Non-waterborne:
  - Measles: One case
  - Varicella: Five or more cases linked by time and place
  - Mumps: Three or more lab confirmed epi-linked cases
  - Group A Streptococcus non-invasive: 10 epi-linked lab confirmed with onsets in a 10 day period
  - Scabies: One case of HCP dx Norwegian (crusted) scabies or TWO or more symptomatic persons epi-linked with at least 2 skin scraping +
  - MRSA: Two or more lab confirmed cases in a community setting (School, Daycare, Sports Team, Correctional Facility) during a 14-day period with an apparent epi-link
  - Hand, Foot and Mouth Disease: 10 epi-linked persons with clinically compatible illness with onsets within a 10-day period
- 10 additional definitions
**Foodborne 2015 Final Outbreak Data**

- Sixty-one foodborne outbreaks were reported involving 857 persons with 52 hospitalizations and one fatality. There were also six secondary cases.
- Three other waterborne outbreaks occurred involving 68 persons with 33 hospitalizations and 12 fatalities.
- The most frequent location of preparation and food consumption was in restaurants.
- The lowest number of foodborne outbreaks occurred in December.
- The most common type of pathogens causing outbreaks were norovirus and Salmonella.

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**Cluster Database**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Cluster Database</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person-to-person</td>
<td>●</td>
</tr>
<tr>
<td>Environmental</td>
<td>●</td>
</tr>
<tr>
<td>Animal</td>
<td>●</td>
</tr>
</tbody>
</table>

**SEDRIC Dashboard**

Outbreak Dashboard: helps investigators quickly view major summary data and allows them to view comparisons between outbreak-related cases and historical background cases.

**Maps**

Maps: Visual tools in SEDRIC allow investigators to visualize the geographic spread of disease outbreaks in time and space.

**REDCap**

(REsearch Electronic Data Capture)
IDPH Outbreak Reporting System (ORS)

Exposure → Illnesses → Report within 24 hours

Report within 24 hours

Step 1: Reporting Health Department Information

IDPH Outbreak Reporting System (ORS)
Surveillance data used for education of providers
example: Rabies, potential human exposure

- 15% of rabies PEP unnecessary
- Improper timing of rabies PEP in 1/3 of cases
- Improper location for injections in 1/3 of cases
- Given properly in 43% of cases

Diseases Requiring Environmental Control Measures

- Examples: outbreaks of legionellosis, leptospirosis, histoplasmosis, cryptosporidiosis, arboviruses
- PH Response
  Recommendations on how to decrease exposure to organism and prevent further cases
Histoplasmosis, Macon County 2001

Leptospirosis, Lake Springfield, 1998

Opportunities for Involvement from Emergency Preparedness & Response

- Support your Communicable Disease staff
- Implement NIMS during large outbreaks
- Educate providers on reporting compliance
- Write-up after-action reports
- Use a CD scenario as an exercise
- Ask questions and review data
- Ensure 24/7 coverage
Limitations of Surveillance System

- Underreporting
  - Negative attitude about reporting
  - Lack of knowledge
  - Misconceptions
- Lack of Representativeness of Reported Cases
- Lack of Timeliness
- Inconsistency of Case Definitions
- Changes in Case Definitions
- Change in Surveillance Practices (e.g. ELR)

Example of artificial increases due to ELR & Changes in Case Definition for Hepatitis C

Biases

- Increases or decreases in testing due insurance coverage or treatment practices
- Increases as testing sensitivity improves
- Increases due to media attention

What’s Up in the Future for Infectious Disease Surveillance in Illinois?

- Electronic Case Reporting
  - IDPH, along with EPIC and Northshore, is involved in a ASTHO pilot
- Bi-Directional Exchange
  - XDROs, TB, Syphilis, Measles, Ebola
- Expanding use of Hospital Data from Syndromic Feed
  - Overdoes reporting and linkage with PMP
  - Illinois Violent death reporting system
  - Patient tracking for emergency response situations
  - Influenza monitoring
  - Visit related to emerging diseases (Zika, Ebola, MERS)

HEPCATT (HEPATITIS COMMUNITY ALLIANCE TO TEST AND TREAT)
1970 Surgeon General Statement

• “it was time to close the book on infectious diseases, declare the war against pestilence won, and shift national resources to such chronic problems as cancer and heart disease”