Disease Surveillance

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Objectives

- Describe purpose of disease surveillance
- Identify data sources & methods used
- Discuss attributes of effective surveillance program
- Participate in outbreak detection exercise

- Poll question

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Surveillance is

"Systematic ongoing collection, collation, and analysis of data and the timely dissemination of information to those who need to know so that action can be taken"

- World Health Organization

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Purposes of Surveillance

- Monitor magnitude of diseases in community
- Identify populations at highest risk
- Develop appropriate interventions
- Improve understanding of specific diseases
- Identify outbreaks

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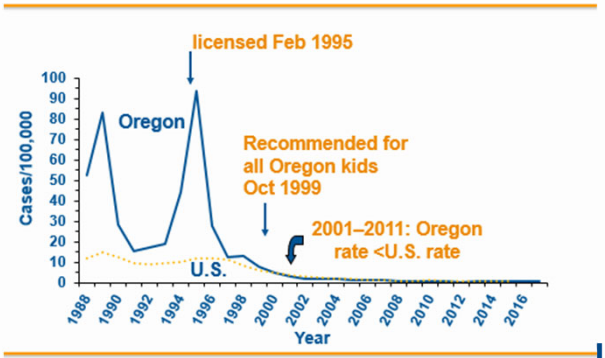
Monitor Magnitude of Disease

Impact of prevention measure: hepatitis A vaccination



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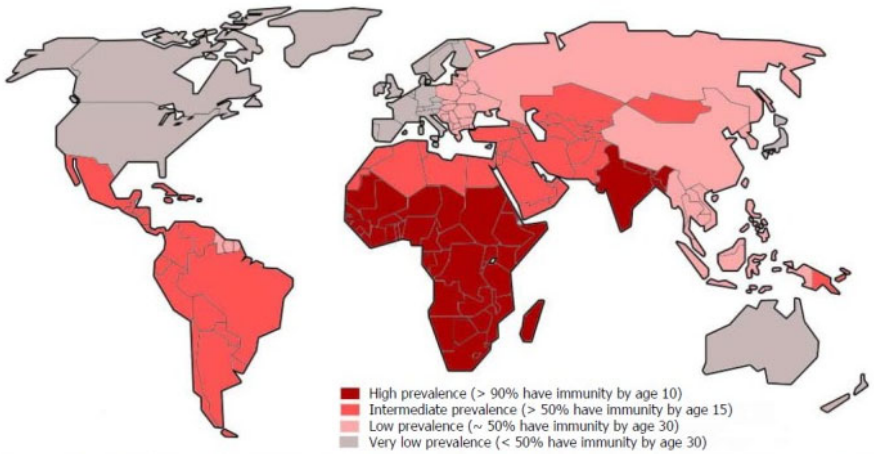
Identify Those at Highest Risk

Prevalence of hepatitis A virus by region



Source: Jacobsen KH. Globalization and the Changing Epidemiology of Hepatitis A Virus. Cold Spring Harb Perspect Med 2018 Mar 2 PMID: 29500305

Prevalence of hepatitis A

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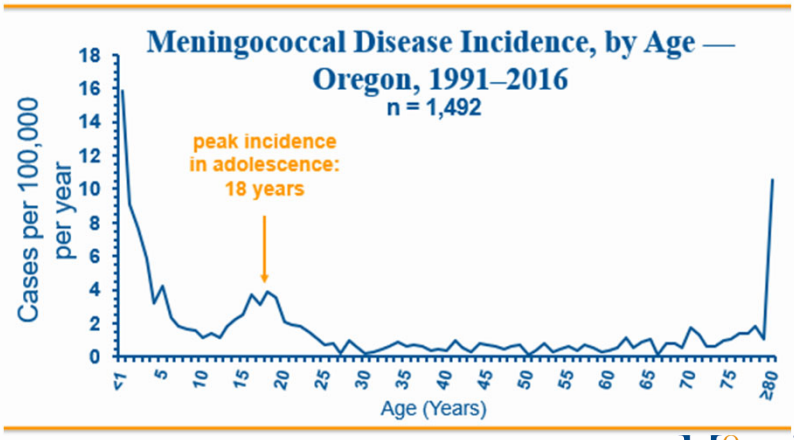
Develop Interventions



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Improve Understanding

- Increase knowledge of emerging diseases (e.g., novel influenza strains, SARS-CoV-2)
- Monitor changes in infectious agents
  - Antibiotic resistance

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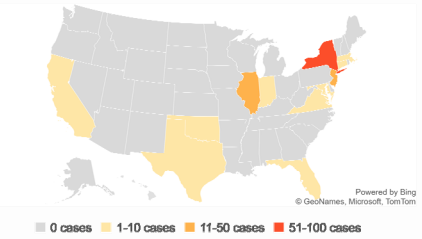
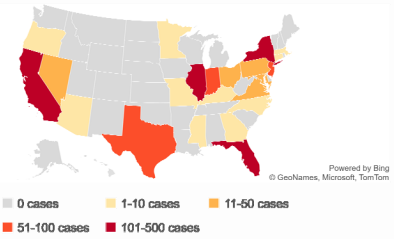
Candida auris: first Oregon cases reported in 2021

Reported clinical cases of *Candida auris*, 2017



Reported clinical cases of *Candida auris*, 2021



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Source: CDC

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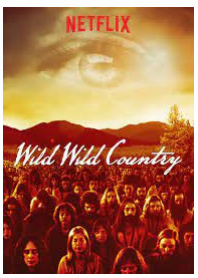
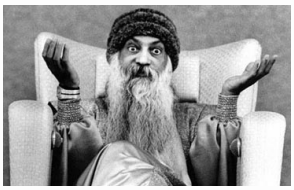
Detecting Outbreaks

- Detect changes in disease patterns in community
  - increase in cases (sudden or gradual)
  - disease affects certain demographic group
  - disease in previously unaffected geographic area





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Some Surveillance Data Sources

- Lab results
- Case (morbidity) reports
- Mortality reports (death records)
- Heath care data (hospital discharge, outpatient, ED)
- Disease specific (influenza, FoodNet)
- Others…

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What Diseases are Reportable?

- Council of State and Territorial Epidemiologists (CSTE) makes recommendations - www.cste.org
  - ➢ Each state determines list of reportable conditions
- Range in US: 35 – 130 conditions per state

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Reportable Healthcare-associated Organisms in Oregon

Organism	Reportable?
Pan non-susceptible (panNS) organisms	YES
Carbapenem-resistant Enterobacterales (CRE)	YES
Carbapenem-resistant *Acinetobacter* species (CRA)	Starting end 2023
Carbapenemase producing organisms (CPO)*	Starting end 2023
*Candida auris**	Staring end 2023
Carbapenem-resistant *Pseudomonas aeruginosa (CRPA)***	NO, unless CPO or panNS

*Previously reportable under the "outbreaks and uncommon illnesses"
** some labs voluntarily report CRPA to OHA,

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Passive Disease Surveillance

Monitoring patterns of key diseases

- Mandated by State rules (OAR)
- Relies on providers and labs

Advantage: Cost-effective

Limitations:

- Underreporting
- Changes in definitions
- Reporting delays
- Variations among reporters

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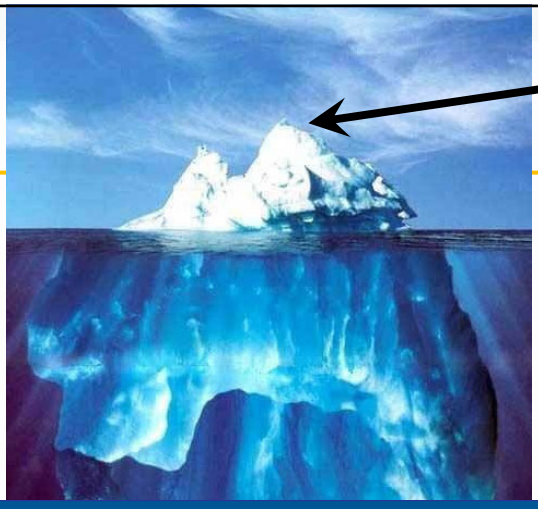

Reports of communicable diseases are just the “tip” of what is really going on in a community

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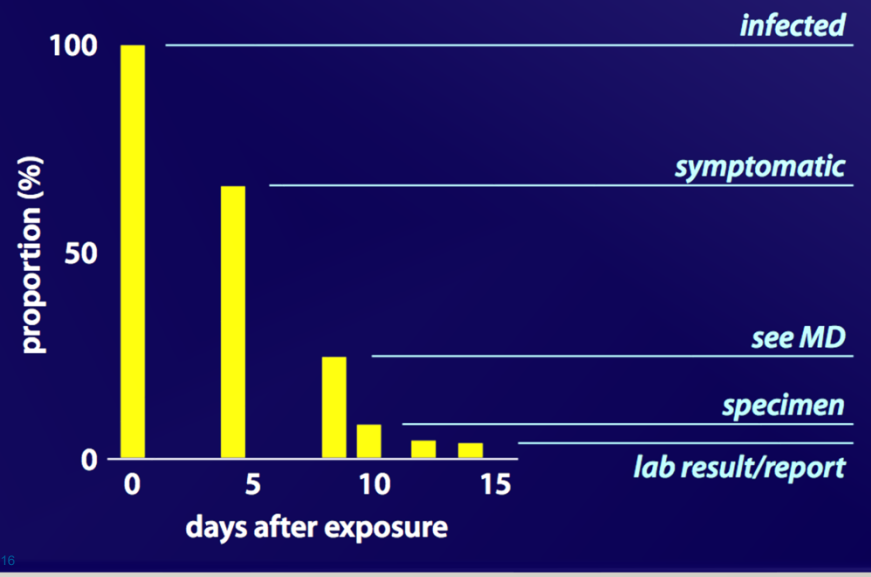
Reported Incidence ≠ Reality



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Active Disease Surveillance

- **Outreach** to reporting sources
  - Personal visits
  - Telephone calls
  - Alerts
- Typically for limited duration

Advantage: Obtain more accurate disease information

Disadvantage: Expensive, time-consuming

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Analysis of Surveillance Data

- Analysis — key to communicable diseases control
- Useful to maintain chart with 5 years of case frequencies – see Orpheus reporting features*
- Simple statistics (counts, rates) can be examined
  - compare my county with Oregon?
  - compare Oregon with the United States?

*https://public.tableau.com/profile/oregon.public.health.division.acute.and.communicable.disease.pre#!/

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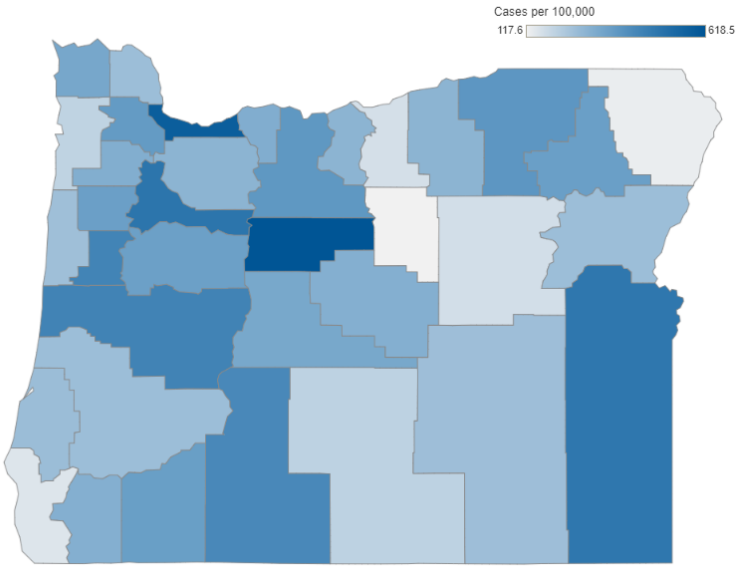
Incidence of chlamydia by county of residence: Oregon, 2011–2020



Note: Rates based on small case counts might be unstable.

https://public.tableau.com/profile/oregon.public.health.division.acute.and.communicable.disease.pre#!/

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Data Dissemination

- OHA ACDP resources:

Oregon Communicable Disease Data:
https://www.oregon.gov/oha/PH/DISEASESCONDITIONS/COMMUNICABLEDISEASE/DISEASESURVEILLANCEDATA/Pages/index.aspx
CD summary:
https://www.oregon.gov/oha/PH/DiseasesConditions/CommunicableDisease/CDSummaryNewsletter/Pages/index.aspx

CD Summary

Who are potential consumers of CD data?

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Attributes of an Effective Surveillance Program

- Sensitivity
- Specificity
- Many others…..

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Sensitivity

Ability to detect cases of communicable disease that system is meant to detect

- Able to detect an **outbreak** or sudden change?
- Sensitive enough to identify disease problems in your community?

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Specificity

The **ability to detect only true cases**

- Does excessive "background noise" generate false alerts?

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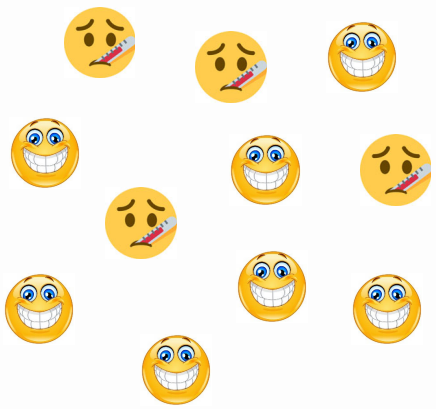
Sensitive vs. specific in outbreaks



- Consider a hypothetical group of people who might be included in an outbreak investigation
- Thermometer = true case
- Smiling = non-case

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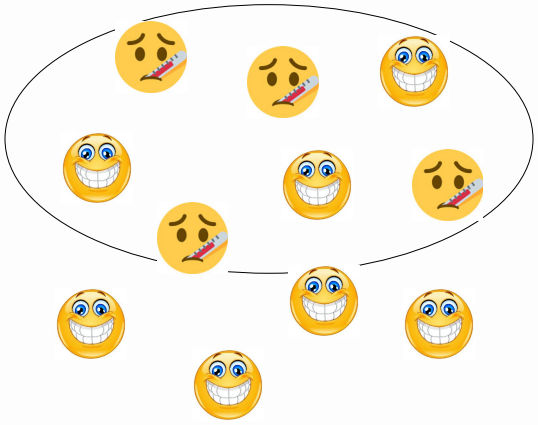
Sensitive



Sensitive case definition:

More likely to include true cases

Might incorrectly include non-cases

- Thermometer = true case
- Smiling = non-case

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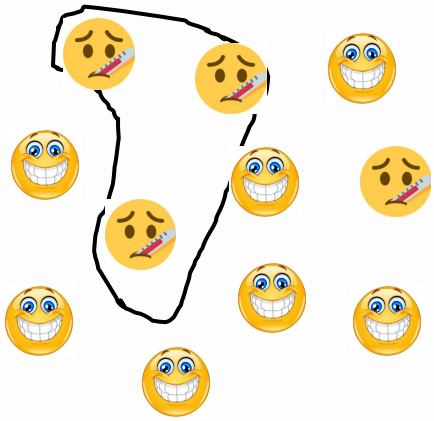
Specific



Specific case definition:

More likely to correctly exclude non-cases

Risks missing true cases (if they don't meet narrow case definition)

- Thermometer = true case
- Smiling = non-case

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Definition of Disease Outbreak

- A disease outbreak defined as:
  - Occurrence of **two or more cases**
  - With the same clinical illness
  - Affects people from different households
  - Cases share common exposure (setting, activity, medical procedure, food item etc.)
- Poll question

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Is this an outbreak… or something else?

- All reported increases in communicable disease should be examined.
- Disease reports may increase for several reasons:
  - populations change
  - provider awareness
  - case definition change
  - new diagnostic tests

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Questions?

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Disease Surveillance Exercise

- Handout: CD 303 Exercises (pages 1 and 2)
- Complete each question before proceeding to next question
- Will walk through questions as a group

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Disease Surveillance Exercise

Background Information

E. coli O157:H7 has been recognized since the 1980s as an important pathogen that can cause serious illness. Outbreaks have been attributed to ground beef, roast beef, water, apple cider, unpasteurized milk, and contact with animals. Human infection occurs through ingestion of food or water contaminated with animal fecal material, but person-to-person transmission also occurs. The organism can survive for extended periods in water, meat stored at subfreezing temperatures, soil, and acidic environments, but can be destroyed by thorough cooking or pasteurization. Patients infected with *E. coli* O157:H7 typically present with severe abdominal cramps, bloody diarrhea, and low-grade fever after a 1 to 10-day incubation period (usually 2-5 days). Children and the elderly are at greatest risk for complications such as hemorrhagic colitis, hemolytic uremic syndrome, and death.

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Disease Surveillance Exercise

Scenario

On **August 10,** the Oregon County Health Department received a report of a child with *E. coli* O157 (O157) diarrhea. This was their first O157 report in over a year. Within 24 hours Oregon County had received 3 more reports of O157 infection in children.

Question 1: If you took the information on the 4 cases, what would you want to know?

- Who: identify cases (tip of iceberg)
- What: agent and clinical findings
- When: onset
- Where: location and geography
- Why: possible causes
- Anything else?

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Disease Surveillance Exercise

Question 2: Is this an outbreak? (chat question)

- Outbreak = 2 or more cases with similar clinical illness, from different households, share common exposure. What is the background rate for *E. coli* O157 in Oregon County? Is this more cases than expected for this place and time?
- The CD staff at Oregon County health department, in consultation with the State epidemiologist, determines that this is an outbreak, with cases occurring at higher rates than expected.

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Disease Surveillance Exercise

Question 2 (continued): What else could be going on?

- New lab test that's more sensitive
- Increased public awareness: more people seeking medical care
- An increase in at-risk populations in the county (large event, college in session)
- An increase in number of cases reported due to changes in reporting methods (such as active surveillance)
- Increase in provider awareness, ordering of lab tests, enhanced diagnosis of disease

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Disease Surveillance Exercise

All 4 ill children that were reported to Oregon County Health Department over 24-hour period had attended the Oregon County Fair and had bloody diarrhea. The fair had been held **August 1 – 6**. Over ~120,000 people had attended this fair. However, the fair ended 3 days earlier. The fairground facilities are used for activities throughout the year.

Question 3: Why is this outbreak worth investigating?

- High-consequence disease - need to monitor magnitude and extent
- Implement disease control measures to stop the transmission
- Develop skills and knowledge for LHD staff
- Does this *E. coli* O157 organism have any unusual characteristics?
- Identify those at risk within the jurisdiction
- Public, political, and legal concerns

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Disease Surveillance Exercise

Question 3 (continued): Who should know that an outbreak is suspected? (chat question)

- Health department administrators
- County fair organizers- any events up and coming?
- County and state information officers.

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