Disease Surveillance

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Acute & Communicable Disease Prevention Program

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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

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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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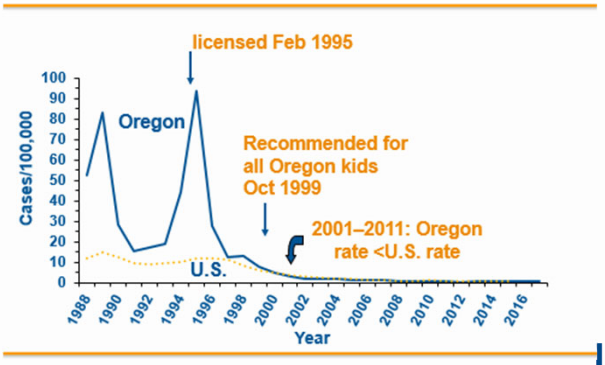
Monitor Magnitude of Disease

Impact of prevention measure: hepatitis A vaccination



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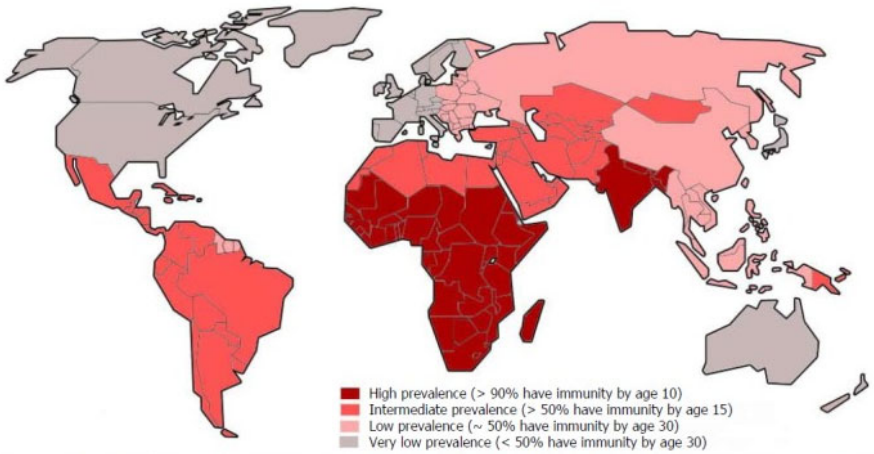
Identify Those at Highest Risk

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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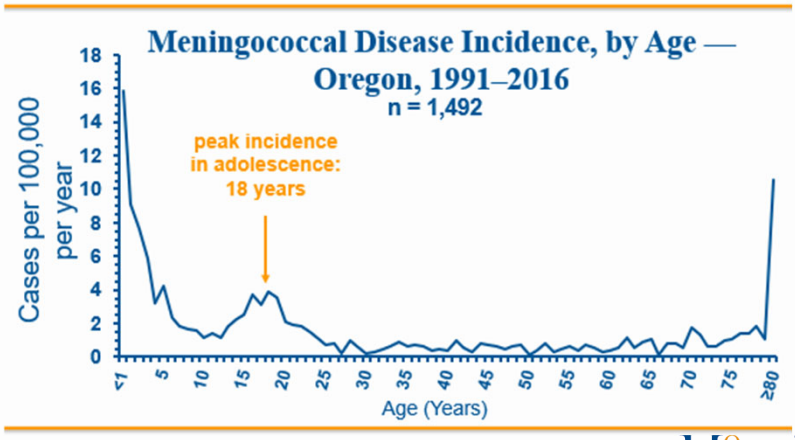
Develop Interventions



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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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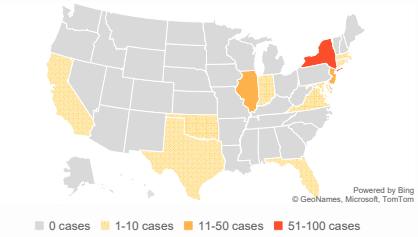
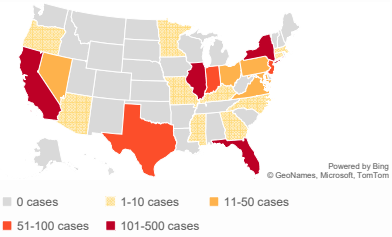
Candida auris: first Oregon cases reported in 2021

Reported clinical cases of *Candida auris*, 2017



Reported clinical cases of *Candida auris*, 2021



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Source: CDC

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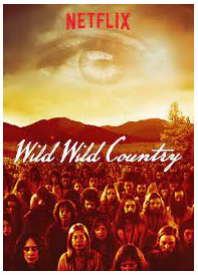
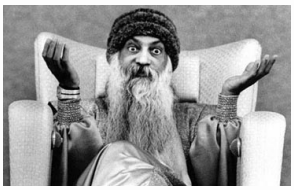
Detecting Outbreaks

- 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…

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

https://www.oregon.gov/oha/PH/DISEASESCONDITIONS/COMMUNICABLEDISEASE/REPORTINGCOMMUNICABLEDISEASE/Pages/index.aspx#posters

Reportable Healthcare-associated Organisms in Oregon

Organism	Reportable?
Pan non-susceptible (panNS) organisms	YES
Carbapenem-resistant Enterobacterales (CRE)	YES
Carbapenem-resistant *Acinetobacter* species (CRA)	Started end of 2023
Carbapenemase producing organisms (CPO)*	Started end of 2023
*Candida auris**	Started end of 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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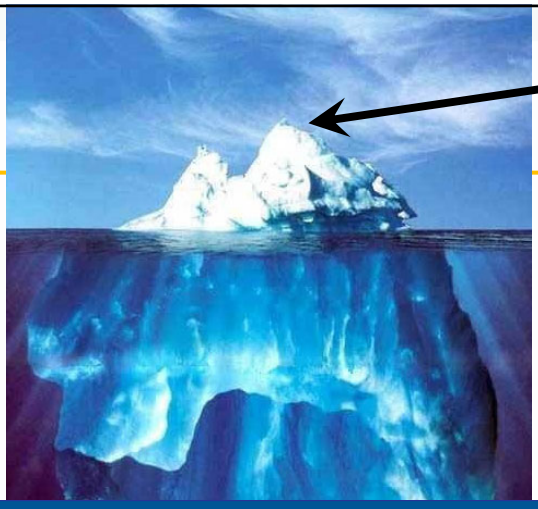

Reports of communicable diseases are just the “tip” of what is really going on in a community

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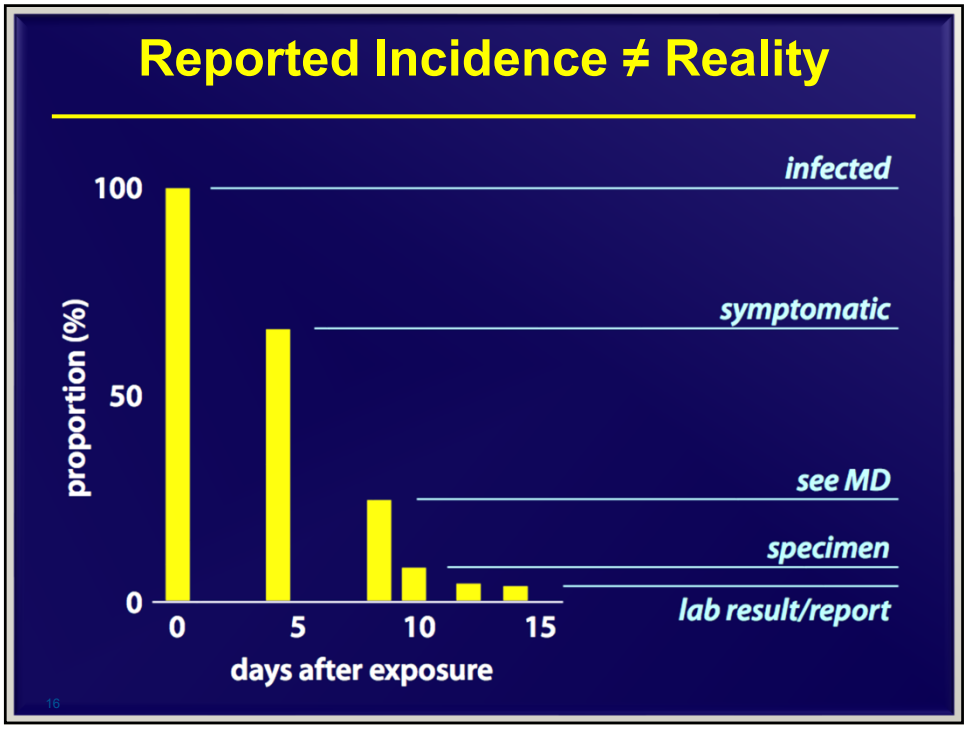

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Active Disease Surveillance

- **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
- Review chart with 5 years of case frequencies – see Orpheus > Reports > Tableau > Weekly*
- Examine counts and rates
  - compare county with Oregon?
  - compare Oregon with the United States?

*https://tableau.dhsoha.state.or.us/#/site/OHA/views/ACDPWeeklyReport-Internal-CountyLevel/ACDPWeeklyReport?:iid=3

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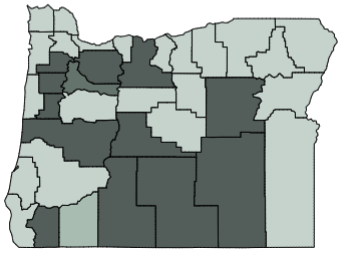
Case rates of pertussis (per 100,000) by county of residence: Oregon, 2013-2022

Harney	16.28▶
Grant	14.91▶
Lake	▶13.62
Lane	▶13.08
Wasco	▶11.98
Deschutes	▶11.95
Benton	▶9.97
Josephine	▶9.10
Clackamas	▶9.03
Polk	▶8.75
Klamath	▶8.67
Yamhill	▶8.30
Marion	■7.94
Jackson	■6.87
Washington	◀6.04
Jefferson	◀5.97
Multnomah	◀5.92
Linn	◀5.86
Sherman	◀5.51†
Tillamook	◀5.31
Coos	◀5.19
Columbia	◀5.03
Union	◀4.13
Clatsop	◀3.84
Lincoln	◀3.73
Malheur	◀2.20
Crook	◀2.20
Umatilla	◀2.12
Hood River	◀1.63†
Douglas	◀1.26
Curry	◀0.87†
Baker	◀0.60†
Wheeler	◀0.00†
Wallowa	◀0.00†
Morrow	◀0.00†
Gilliam	◀0.00†

Legend for county rates

- 2 standard deviations over statewide rate
- 1 standard deviations over statewide rate
- Similar to statewide rate
- 1 standard deviations under statewide rate
- 2 standard deviations under statewide rate



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https://public.tableau.com/app/profile/oregon.public.health.division.acute.and.communicable.disease.pre/viz/2022SelectedReportableCommunicableDiseaseSummary/TableofContents

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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 consumers of CD data in your jurisdiction?

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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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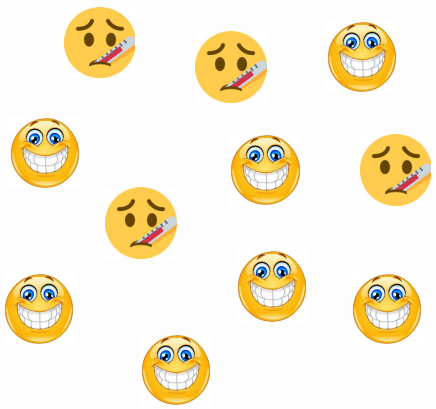
Sensitive vs. specific in outbreaks



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

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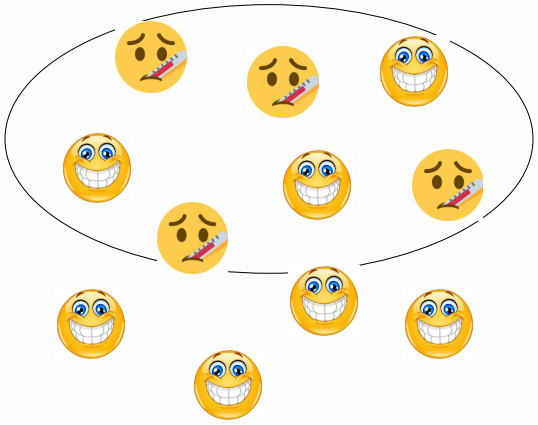
Sensitive



Sensitive case definition:

More likely to include true cases

Might incorrectly include non-cases

- Thermometer = true case
- Smiling = non-case

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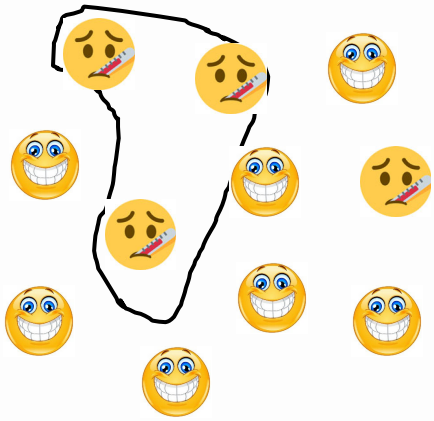
Specific



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.)
- Informal poll: Current role in outbreak investigations?

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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
- Review questions together at end

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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?

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Disease Surveillance Exercise

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

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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?

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Disease Surveillance Exercise

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

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