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RESPONSE-PUBLIC HEALTH



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Lecture Objectives

- Describe the steps for detection and response to an outbreak
 - Surveillance
 - Outbreak detection
 - Investigation
 - Intervention
- Describe potential indicators of an intentional outbreak



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Public Health Response

- Detect Outbreak
 - Health Surveillance
- Investigate Outbreak
 - Determine who is ill and confirm cause of illness
 - Determine who's at risk for illness and why
- Implement Control Measures
 - Infection control guidance
 - Treatment or prophylaxis (e.g. Vaccines, antibiotics)
 - Product recall
- Continued Risk Assessment
 - Effectiveness of control measures (successful containment)
 - Environmental risk
- Coordinate with Multidisciplinary Efforts
 - Public Health, Medical, Law Enforcement, Others



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Public Health Emergencies

- Examples of public health emergencies:
 - Natural disaster: hurricanes, floods, earthquakes;
 - Outbreaks: from contaminated food or water, influenza pandemics;
 - Intentional or accidental releases: biological, chemical, radiological and nuclear



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What is an Outbreak?

- An outbreak is the occurrence of more cases of a disease than expected in a population during a certain time
 - One case of smallpox would be considered an outbreak requiring immediate PH action, other diseases like plague, botulism, or TB which may occur naturally, also require a PH response
- An epidemic and an outbreak mean the same thing

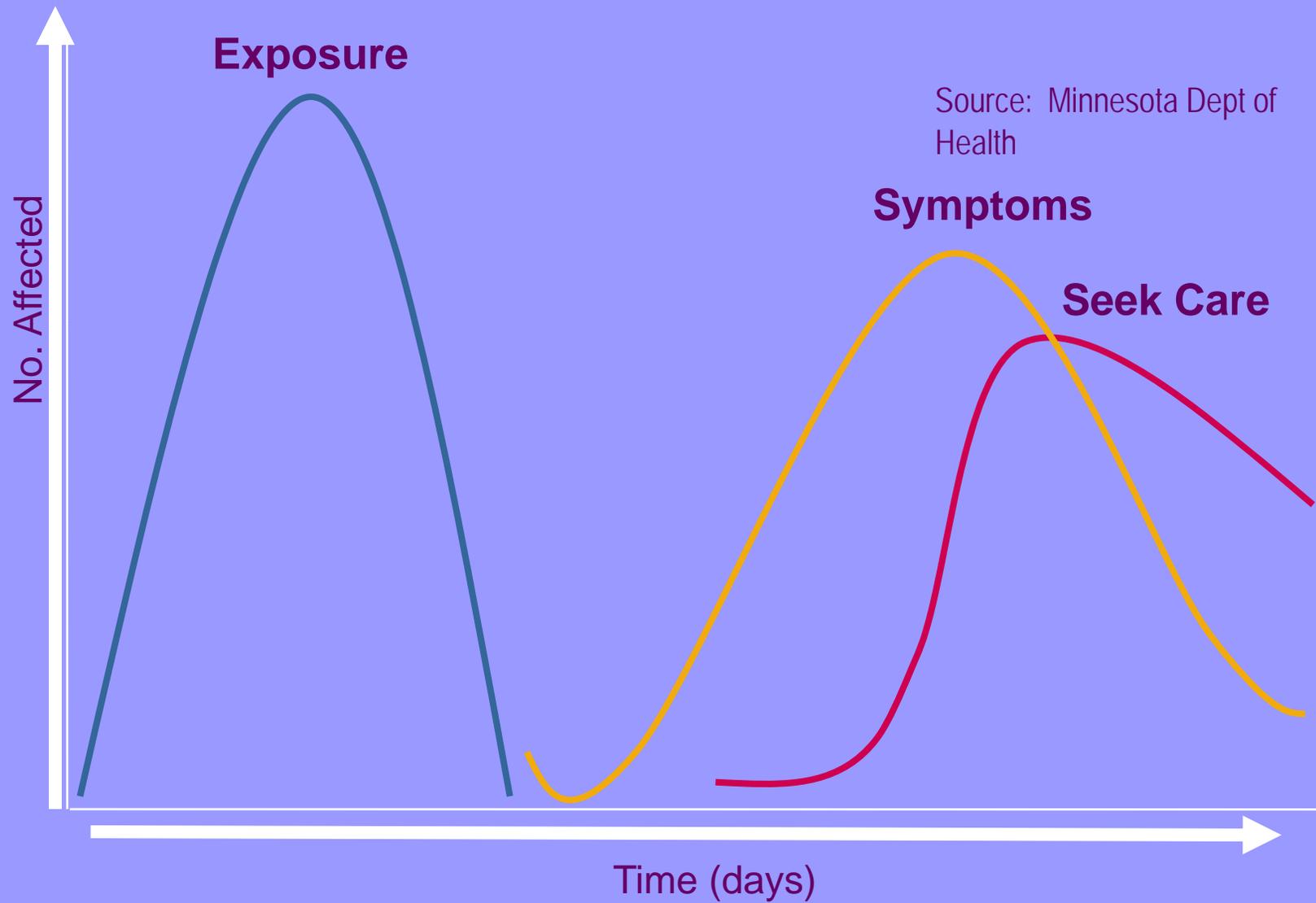


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Infectious Disease Outbreak





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How Are Outbreaks Detected?

- Recognized and reported by individual doctors or groups (e.g., an emergency dept)
- Recognized and reported by those affected (e.g., coworkers, school, banquet)
- Detected by public health agency
 - Through identification of common risk factors or exposures in multiple, individually reported cases (from healthcare providers, laboratory reports)
 - Through enhanced surveillance in cooperation with state and federal public health officials



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Surveillance

- The ongoing, systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely feedback of these data to those who need to know.

In public health, 'surveillance' means tracking the occurrence of diseases of importance – not watching individuals or premises



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Detection Strategies

- Medical (or Clinical) Detection
 - Diagnostic- based on lab results, clinical diagnosis of a reportable disease
 - Pre-diagnostic-based on symptoms (syndromic surveillance)-e.g absenteeism, medication purchases, 911 calls
- Environmental Detection
 - Environmental monitoring-based on “presence in the environment”



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Outbreak Investigation Goals

- Identify disease-causing agent(s)
- Identify sources / modes of spread of disease-causing agent(s)
- Determine who is affected or at risk
- Determine scientifically rational / objective basis for stopping spread of disease
- Select and deploy correct interventions to stop spread of disease



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How Are Outbreaks Investigated?

By applying the principles of "Epidemiology"

- Originally, the study of epidemics / outbreaks
- Study of the factors that contribute to illness in individuals and communities, and how to improve health by altering those factors



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Epidemiology

- Examples of health problems: infectious diseases, chronic diseases, unintentional injuries, violent injuries, deaths
- Why are some people sick and not others?



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Epidemiologic Field Investigation: Basic Steps

1. Detect problem by public health surveillance
2. Verify diagnosis (laboratory confirmation – validated tests)
3. Confirm epidemic
4. Identify and count cases
 - Create case definition
 - Develop listing of cases (line-listing)
5. Characterize data → time, place, person
6. Take immediate control measures
7. Formulate / test hypotheses
8. Implement and evaluate additional control measures
9. Report findings



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Hypotheses -- Theories

- Epidemiologists develop and test theories about how the outbreak occurred
 - Gather information about circumstances of outbreak
 - Do lab tests of people, food, water, environment
 - Interview cases and non-cases to see how they are different
- *This is similar to how law enforcement investigators pursue a theory of the case with interviews and lab tests*



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Characterize Data by Time / Place / Person

- Epidemiologist interviews cases looking for potential common exposures (e.g., day-care, restaurant, unusual food item)
- List of cases, location of cases, time line of illness onset, etc.
- Epidemiologic tools can be used to show that an outbreak is NOT of natural origin



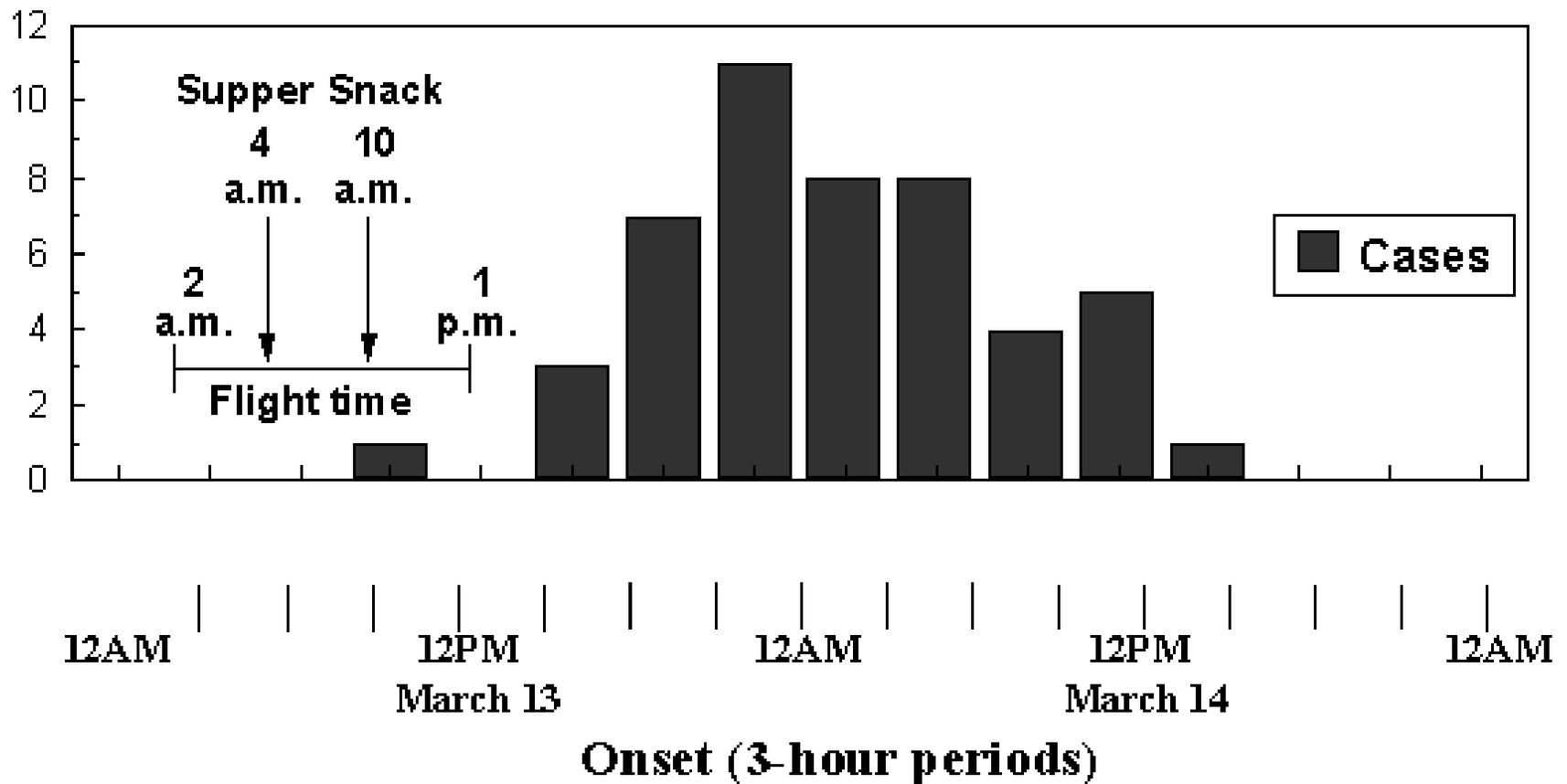
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Salmonellosis in passengers on a flight from London to the United States, by time of onset, March 13--14, 1984

Cases



Source: *Investigating an Outbreak*, CDC



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Laboratory Confirmation of Diagnosis/organism is Essential

- Use standardized protocols with validated tests
- Employ multiple diagnostic approaches (e.g. microscopy, culture, PCR, etc.) to confirm results
- Use of a reference laboratory if results inconclusive
 - Established contacts and communication with reference laboratory
 - Ability to ship specimens
- Protocols for results reporting



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Where Did the Outbreak Start?

- Most outbreaks do not have an identifiable scene you can put a tape around:
 - Spread is from person to person; or
 - Common source of exposure is gone; or
 - Group has dispersed from site of exposure; or
 - Source material discarded or replaced



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Categories of Intervention

- Efforts directed at source of infectious agent
 - Vehicle
 - Vector
- Efforts directed at people at risk



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Interventions Directed at Source

- Eliminate / treat source
 - Dispose of contaminated food, shock-chlorinate contaminated water
 - Mosquito control
- Isolate / treat infected persons
 - Prevent further spread by minimizing population's risk of exposure to infectious persons
- Close contaminated sites / sources
 - Protect people by minimizing risk of exposure from infected sites / sources



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Interventions Directed at People at Risk

- Reduce risk of exposure in susceptible people – e.g., by educating on how to avoid exposure
- Directly protect at-risk people
 - Vaccinate
 - Post-exposure treatment with medicines or vaccines to prevent or lessen illness



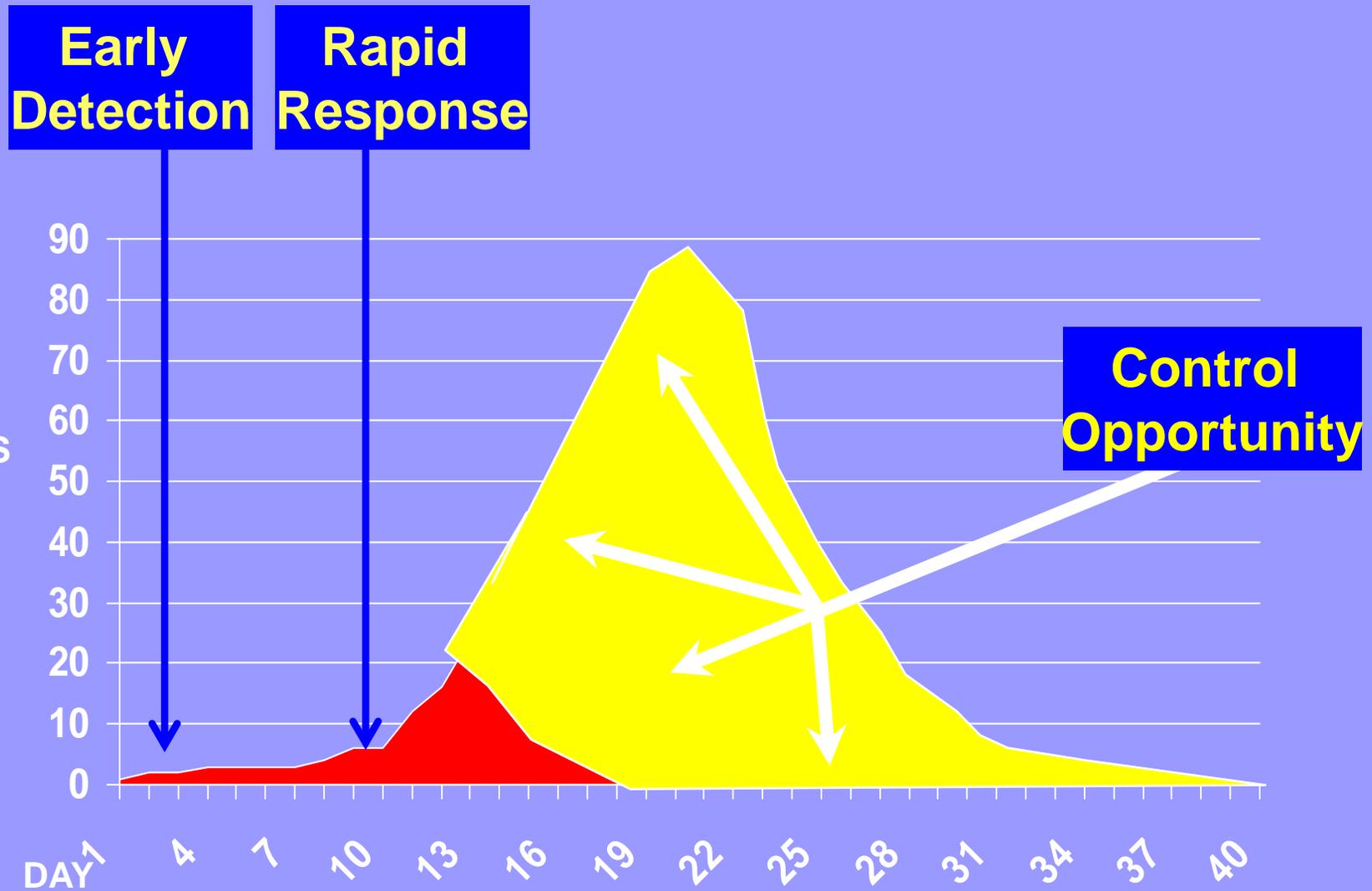


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Outbreak Alert and Response: a model to demonstrate effectiveness of public health control





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Challenges of an Intentional Release

Characteristics may include:

- Release of a large amount of an agent
- Release of the agent over a very short period of time
- Agent may distribute itself over a large area
- Potential to expose large numbers of individuals
- May result in the need to provide medication to large numbers of individuals to protect them from becoming ill and/or to treat the ill

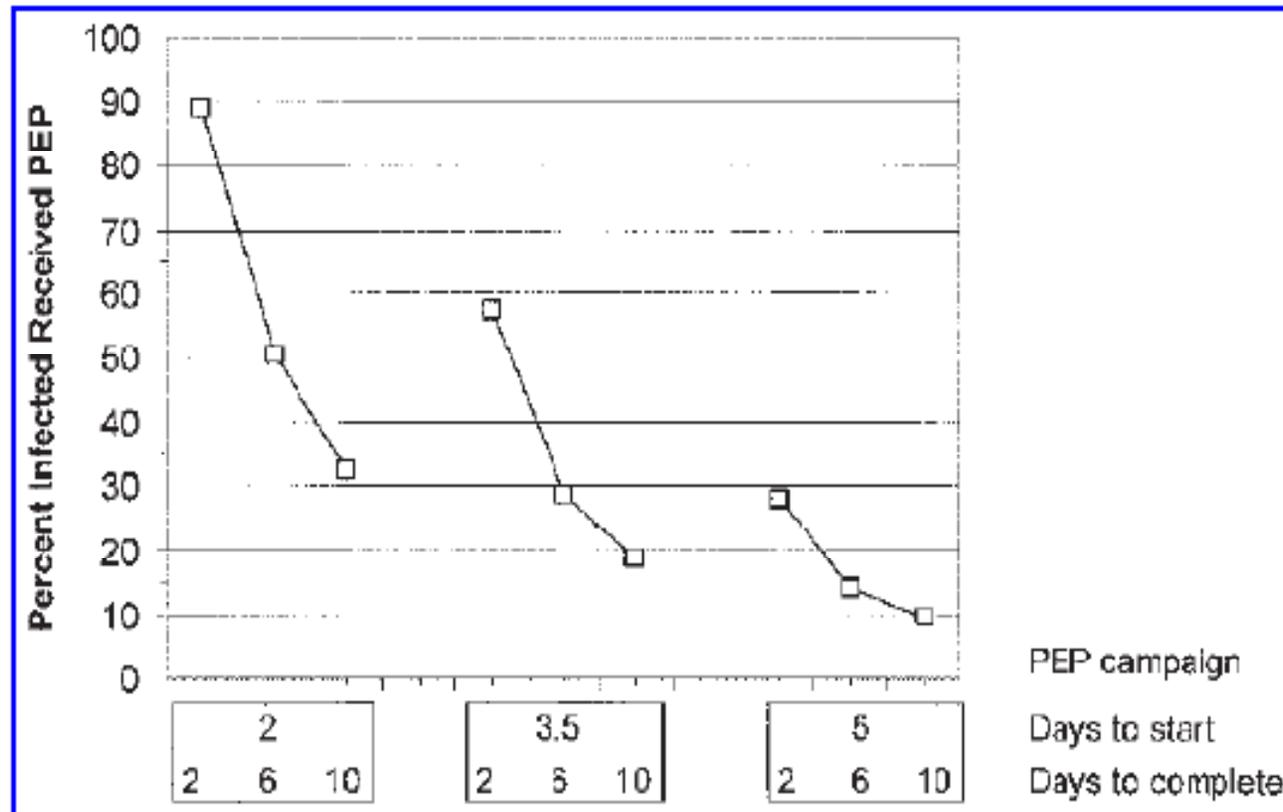


Figure 4. The Percent of People Infected by the Intentional Release Who Received PEP Before Becoming Seriously Ill. The PEP campaigns are described by the time to start the campaign (after the release) and the length of time required to complete the campaigns. These results assume the Post A response, which involves PEP antibiotics alone.

From: Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science. Vol 5 (1). 2007. pp 26-34.



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Clues for a Potential Intentional Outbreak

- A suspected dissemination device is found
- Threats received
- Group taking credit
- Plausible accusations
- Cannot solve outbreak with usual epidemiological investigation techniques



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Clues for a Potential Intentional Outbreak

- Cases of a usually rare disease (smallpox, anthrax, plague)
- A disease that occurs out of season, in an unusual location, with an unusual mode of spread, or with other unusual characteristics (i.e. antibiotic resistance, atypical symptoms or victim demographics)



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Other PH Clues to Possible Bioterrorism



- Many sick people with same known disease or symptoms
- Large number of people with unexplained illness, symptoms, or outcome (death)
- All ill people attended a common event or share a common workplace or other locale
- Multiple clinical presentations of disease in outbreak (e.g. pulmonary and oculoglandular tularemia)
- Greater severity or death rate than normally expected for the type of illness or symptoms
- Genetically same agent in geographically distinct areas
- Concurrent animal disease



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Continual risk assessment

- Effectiveness of control measures
 - Is the outbreak contained (number of cases decreasing)
- Environmental risk?
 - Contamination that requires clean-up
 - Room, building, cruise ship, food manufacturing plant, etc.
 - Infected vectors? (animals, insects)



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Conclusions

- Public Health has an essential role in the investigation and response to bioterrorism events
- Public Health and Law Enforcement investigations have many similar information needs
- Both Public Health and Law Enforcement must coordinate and respond together when intentional outbreaks are suspected