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RESPONSE-PUBLIC HEALTH



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Objectives of Presentation

- Be able to describe public health steps for outbreak recognition and response including:
 - Surveillance and outbreak detection
 - Investigation
 - Intervention
- Be able to describe potential indicators of an intentional outbreak



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Outline

- Public health response elements
- Outbreak definition, strategy and goals
- Epidemiology and outbreak investigation
- Control measures
- Challenges and clues of an intentional outbreak
- Ongoing assessment
- Conclusion



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Public Health Response

- Detect Outbreak
 - Health Surveillance
- Investigate Outbreak
 - Determine who is ill and confirm cause of illness
 - Determine who is at risk for illness and why
- Implement Control Measures
 - Infection control guidance
 - Treatment or prophylaxis (e.g. Vaccines, antibiotics)
 - Remove any implicated products from the market



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Public Health Response

- 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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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 public health action
 - Other diseases (e.g. plague, botulism, tuberculosis) may occur naturally, but also require public health action
- An epidemic and an outbreak mean the same thing

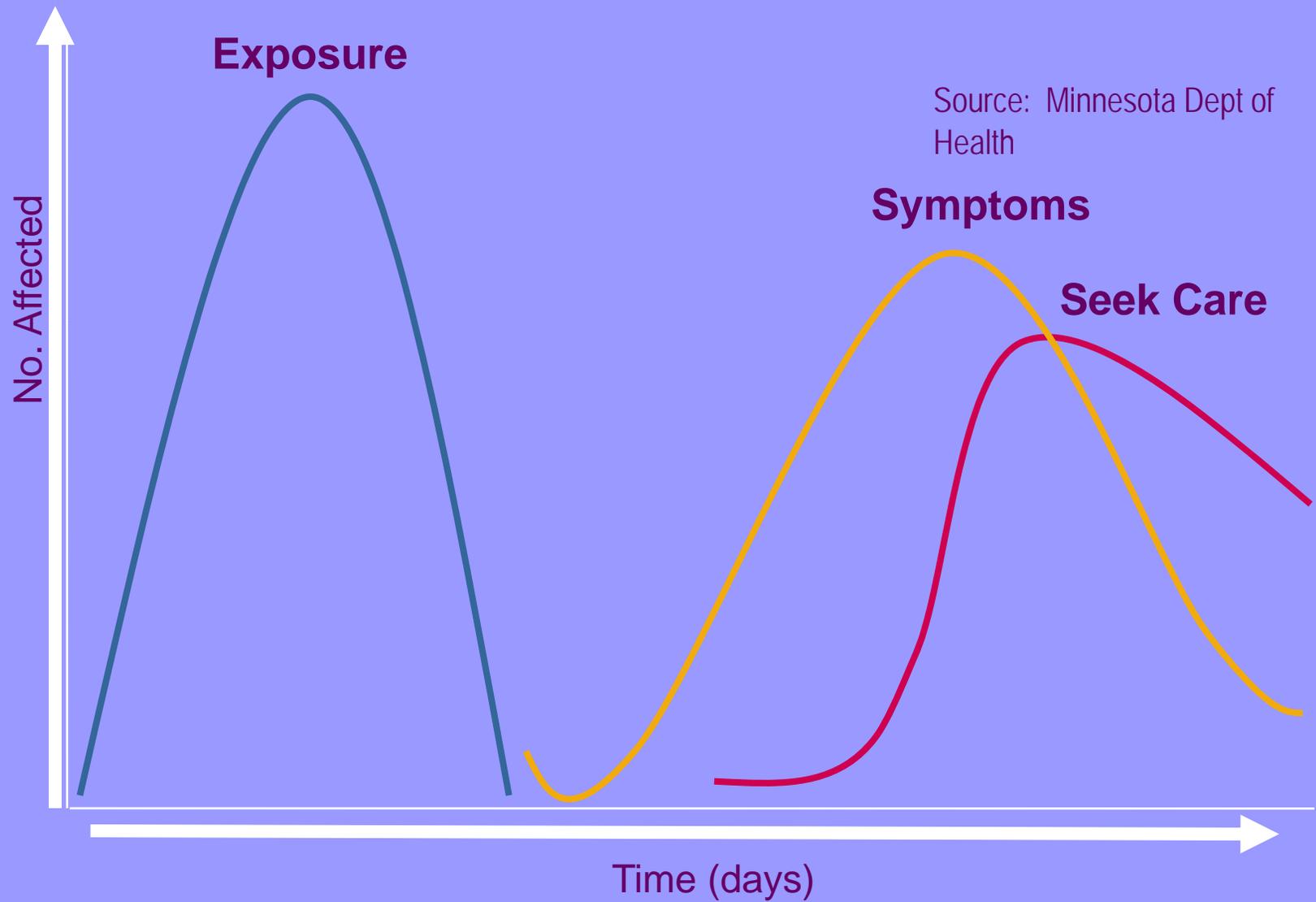


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Infectious Disease Outbreak





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How Are Outbreaks Detected?

- Recognized and reported by individual doctors or groups (e.g., an emergency department)
- 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 laboratory 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 laboratory 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 laboratory 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



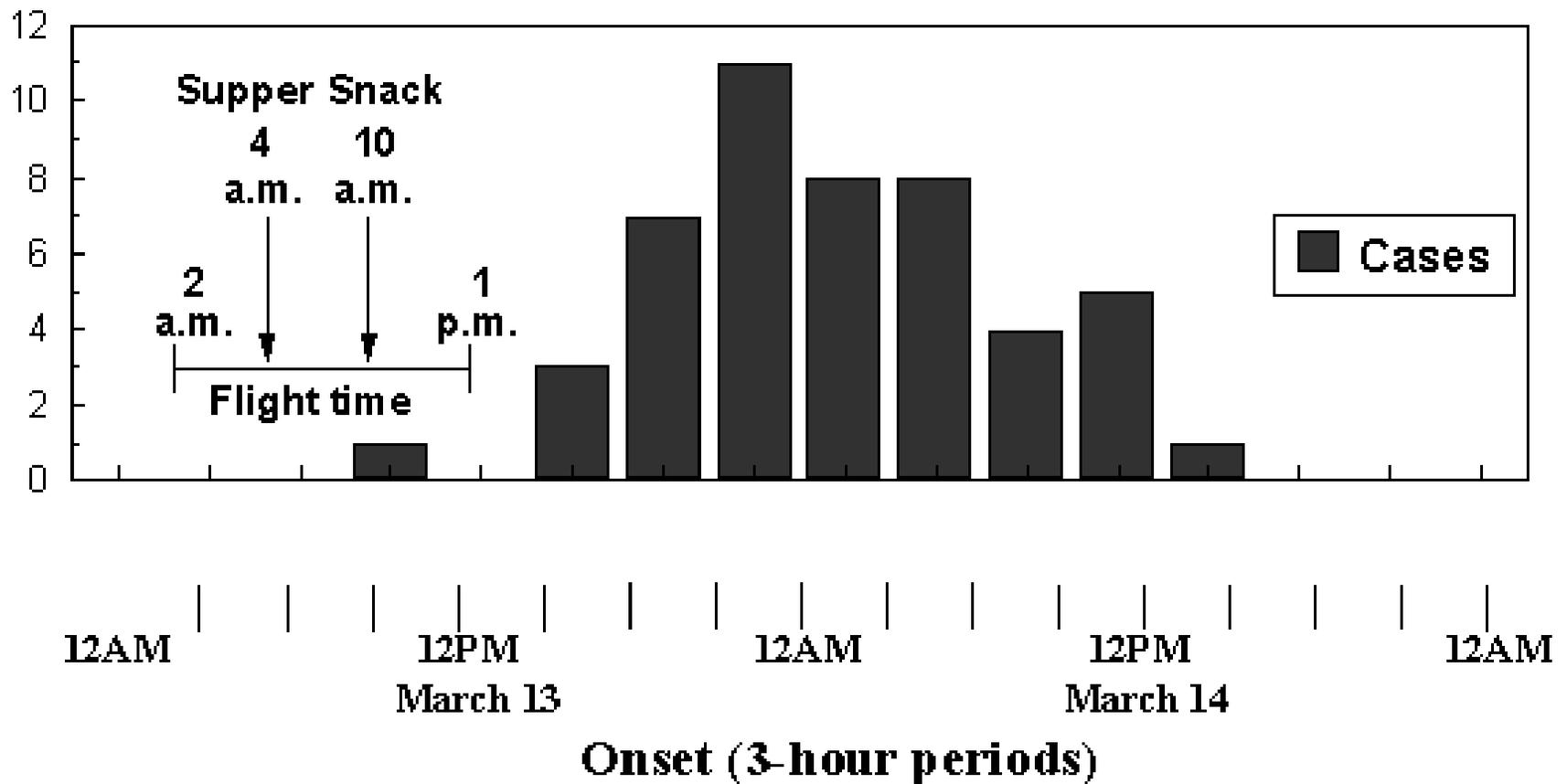
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Salmonellosis in passengers on a flight from London to the United States, by time of onset, March 13--14, 1984

Cases



Source: *Investigating an Outbreak*, CDC



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Laboratory Confirmation: An Essential Element

- 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



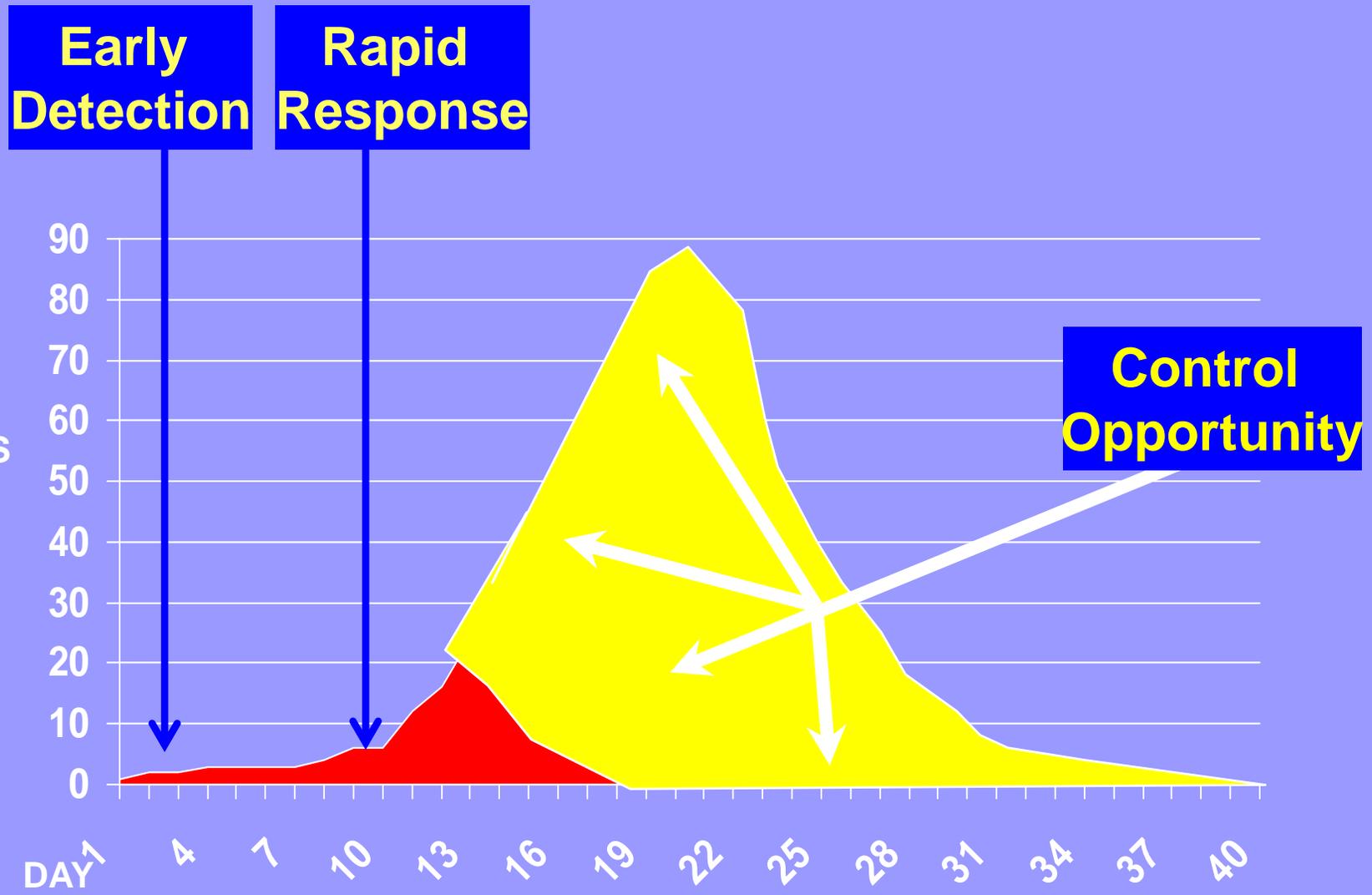


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Outbreak Alert and Response: a model to demonstrate effectiveness of public health control





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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

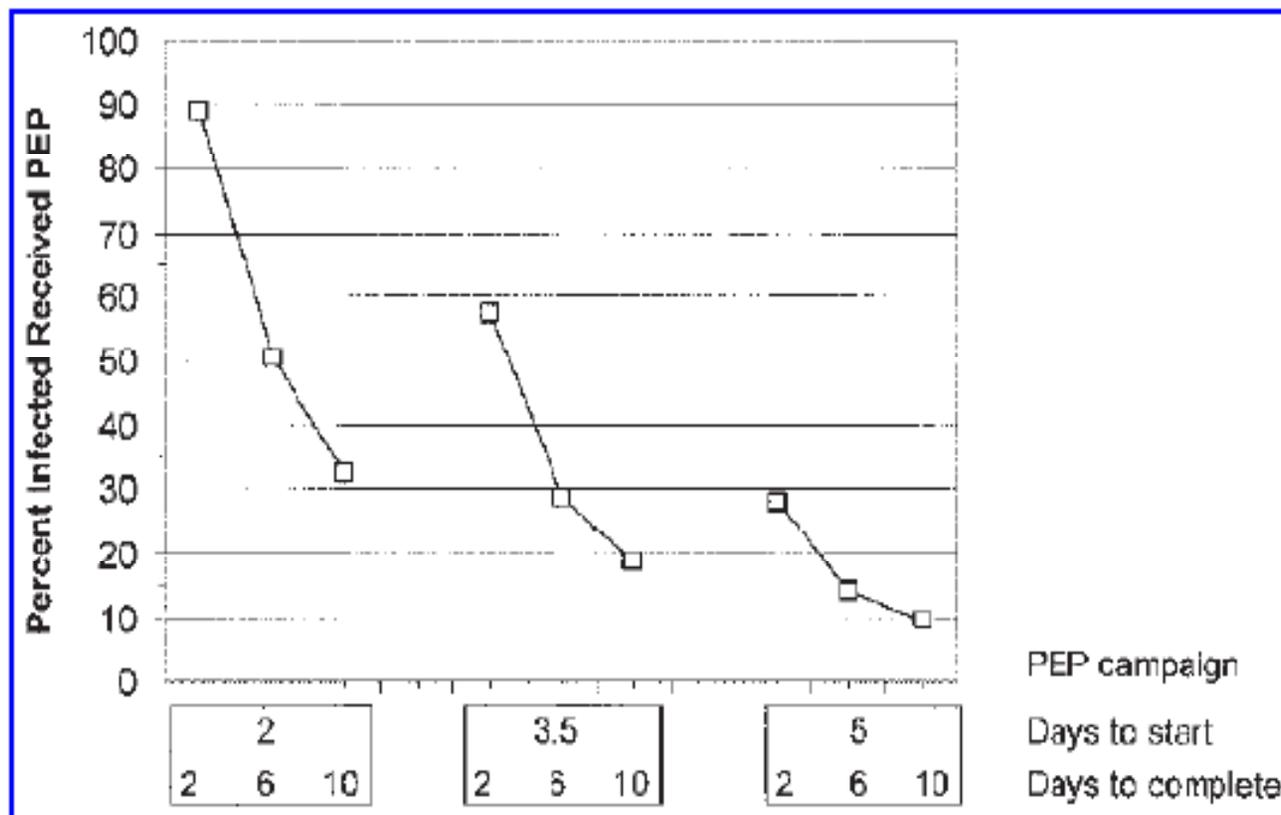


Figure 4. The Percent of People Infected by the Intentional Release Who Received PEP Before Becoming Seriously Ill. The PEP campaigns are described by the time to start the campaign (after the release) and the length of time required to complete the campaigns. These results assume the Post A response,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

- Many sick people with same disease or symptoms
- Large numbers of unexplained illnesses or death
- All ill people share a common event, workplace or site
- Multiple clinical presentations of a disease in outbreak (e.g. pulmonary and oculoglandular tularemia)
- Greater severity or death rate than normally expected
- Same genetic 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 detection, investigation and response to bioterrorism events
- This role is founded upon the public health principles and practices of epidemiology
- The clues associated with an intentional outbreak can contribute to early recognition
- Early detection and response can save lives