Nothing Compares
NORTH CAROLINA

Steps of an Outbreak Investigation: Back to Basics

Communicable Disease Branch
North Carolina Division of Public Health

Pre Conference Sessions Credit

Eastern AHEC Department of Nursing and Allied Health Education is an Approved Provider of continuing education by the North Carolina Nurses Association, an accredited approver by the American Nurses Credentialing Centers Commission on Accreditation.

Participants must attend the entire program in order to earn contact hour credit. Verification of participation will be noted by **check-in** at the start of the program and an **initial out** at the conclusion of the program.

Participants will receive 3.25 contact hours of continuing professional development

Disclosure

- The presenters for this session have no financial conflicts of interest to disclose.
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Pre Test

- Close all training materials!
- Have the entire audience count off in order, write your number on the index card in front of you
- List the 10 steps of an outbreak investigation on your index card
- Turn in index cards

Target Audience

- Local health department
  - Communicable disease nurses
  - Environmental health staff

- Force multipliers
  - Anyone who may be called to assist

Learning Objectives

- Describe public health importance of outbreak investigations
- List components of a case definition
- Define elements included on a line list
- Describe potential control measures
- List the steps of an outbreak investigation

What are the reasons for investigating an outbreak?

Reasons to Investigate an Outbreak

- Identify, describe the source
- Describe new diseases, learn more about known diseases
- Identify populations at risk
- Evaluate existing prevention strategies (e.g., immunization requirement)
- Opportunity to educate public about disease prevention
- Address public concern
- Develop strategies to prevent future outbreaks
- Fulfillment of legal obligations and duty of care for the public
- Terminate the outbreak!

What factors should you consider when deciding to investigate?

When to Investigate

- Consider the following factors:
  - Severity of illness
  - Transmissibility
  - Unanswered questions
  - Ongoing illness / exposure
  - Public concern
  - Prevention potential

Principles of Outbreak Investigations

- Be systematic
  - Follow the same steps for every type of outbreak
  - Write down case definitions
  - Ask the same questions of everybody
- Stop often to re-assess what you know
  - Line list and epidemic curve provide valuable information; many investigations never go past this point
  - Consider control measures to be applied
- Coordinate with partners (e.g., environmental health)

10 Steps of an Outbreak Investigation

1. Identify investigation team and resources
2. Establish existence of an outbreak
3. Verify the diagnosis
4. Construct case definition
5. Case finding: Find cases systematically / develop line list
6. Perform descriptive epidemiology / develop hypotheses
7. Evaluate hypotheses / perform additional studies (as necessary)
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9. Communicate findings
10. Maintain surveillance

Steps of an Outbreak Investigation

These steps may occur simultaneously or be repeated as new information is received

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10 Steps of an Outbreak Investigation

1. Identify investigation team and resources
    a. Local and state resources
    b. Outbreak investigation team, team lead
    c. Research disease, review scientific literature
    d. Determine if immediate control measures needed
    e. Prepare for field work

Local and State Resources

- Local
  - CD nurse(s)
  - Environmental health
  - Preparedness coordinators
  - EpiTeam
  - LHD director

- State
  - CD Branch epidemiologists (epi on call)
  - CD Branch subject matter experts
  - TATP Nurse Consultants
  - PHPR Team

Other Resources

- Local / State
  - Disease Intervention Specialists (DIS)
  - Local PIO
  - State Laboratory of Public Health
  - Hospital-based Public Health Epidemiologist (PHE)
  - Department of Agriculture

- Other resources
  - CDC
  - NC EDSS
  - NC DETECT
  - Media

Activity 1 – Resource Team

- Who is on your resource team?
- Why those individuals?
- Could you reach them after hours?

Routinely update this information

Investigation Team

- Members from your resource table
- Consider establishment of ICS
- Identify ‘Lead’

Research Disease, Review Literature

- NC DPH Communicable Disease Manual (on-line)
- MMWR & other CDC published information
- Control of Communicable Disease Manual (20th edition)
- Manual for the Surveillance of Vaccine-Preventable Diseases (6th edition, 2013)
- Epidemiology and Prevention of Vaccine-Preventable Diseases (13th edition, 2015) (e.g., 'the Pink Book')

Control Measures

- When should control measures be implemented immediately?
  - Source is identified
  - Continued risk of either exposing others or being exposed (e.g., food handler)

- Control measures are applied as soon as possible, may change at any point during investigation

Prepare for Field Work

- Identification of team

- Gather resources, supplies, equipment
  - Computer, questionnaires, specimen collection kits

- Make necessary administrative, personal arrangements for travel
  - Determine role in the investigation
  - Identify points of contact (field and office)

- What do you need to do to prepare?

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2. Establish Existence of an Outbreak

- What is an outbreak?
  - Increase in cases above what is expected in that population in that area
  - Occurrence of 2 or more ‘epi-linked’ cases

2. Establish Existence of an Outbreak

- How do you know?
  - For notifiable diseases
    - Reported to local, state health departments (**NC EDSS!**)
    - Compare number of current cases / rate with previous weeks
    - Compare number of current cases / rate with same time period or season in previous years

2. Establish Existence of an Outbreak

NORTH CAROLINA COMMUNICABLE DISEASE MONTHLY REPORT | July, 2012

Number of probable and confirmed communicable disease cases in North Carolina by disease for: 1) the current month, 2) the year to date, 3) the average cases for the year to date, 4) the total cases during 2011, 5) and the average (with 95% confidence intervals) of the previous five years.

DISEASE	Cases in July, 2012	Cases During January and July, 2012	Average Cases During January and July, 2007 - 2011	Cases in 2011	Average cases (95% confidence interval) per year 2006 to 2010
Botulism[1]	0	0	1	2	1 (0 – 4)
Campylobacter Infection*	122	557	309	909	693 (361 – 1,026)
Chlamydia[2]	4,035	27,689	16,345	54,891	39,161 (29,695 – 48,641)
Cryptosporidiosis	15	58	34	115	114 (22 – 206)
E. coli O157:H7/ STEC Infection*	7	52	51	155	126 (57 – 194)
Ehrlichiosis[3]	26	40	23	107	67 (40 – 174)
Gonorrhea	1,108	8,102	7,083	17,487	15,336 (8,779 – 21,892)
Group A Strep Infection, Invasive	13	87	99	181	143 (81 – 205)
Haemophilus Influenzae	8	56	50	84	86 (7 – 179)
Hepatitis A	0	12	27	31	60 (11 – 109)
Hepatitis B (acute)	4	36	56	124	128 (66 – 190)
Hepatitis B (perinatal)	0	0	0	1	2 (0 – 5)
Hepatitis B (chronic)[4]	52	498	522	1,309	873 (662 – 1,085)
Hepatitis C (acute)	13	39	19	61	29 (6 – 64)
Influenza Death, Adult[5]	0	7	8	26	50 (0 – 117)
Influenza Death, Pediatric	0	2	2	10	3 (0 – 14)
LaCrosse Encephalitis	3	6	3	24	15 (1 – 31)
Legionellosis	4	25	24	86	52 (15 – 86)
Listeriosis	1	5	9	21	25 (8 – 42)
Lyme Disease	6	25	30	91	66 (23 – 155)

2. Establish Existence of an Outbreak

- For non-notifiable conditions:
  - National estimates
  - Hospital discharge records
  - Mortality data
  - Other available records
  - Use data from neighboring areas
  - Call local health care providers
  - Call community members

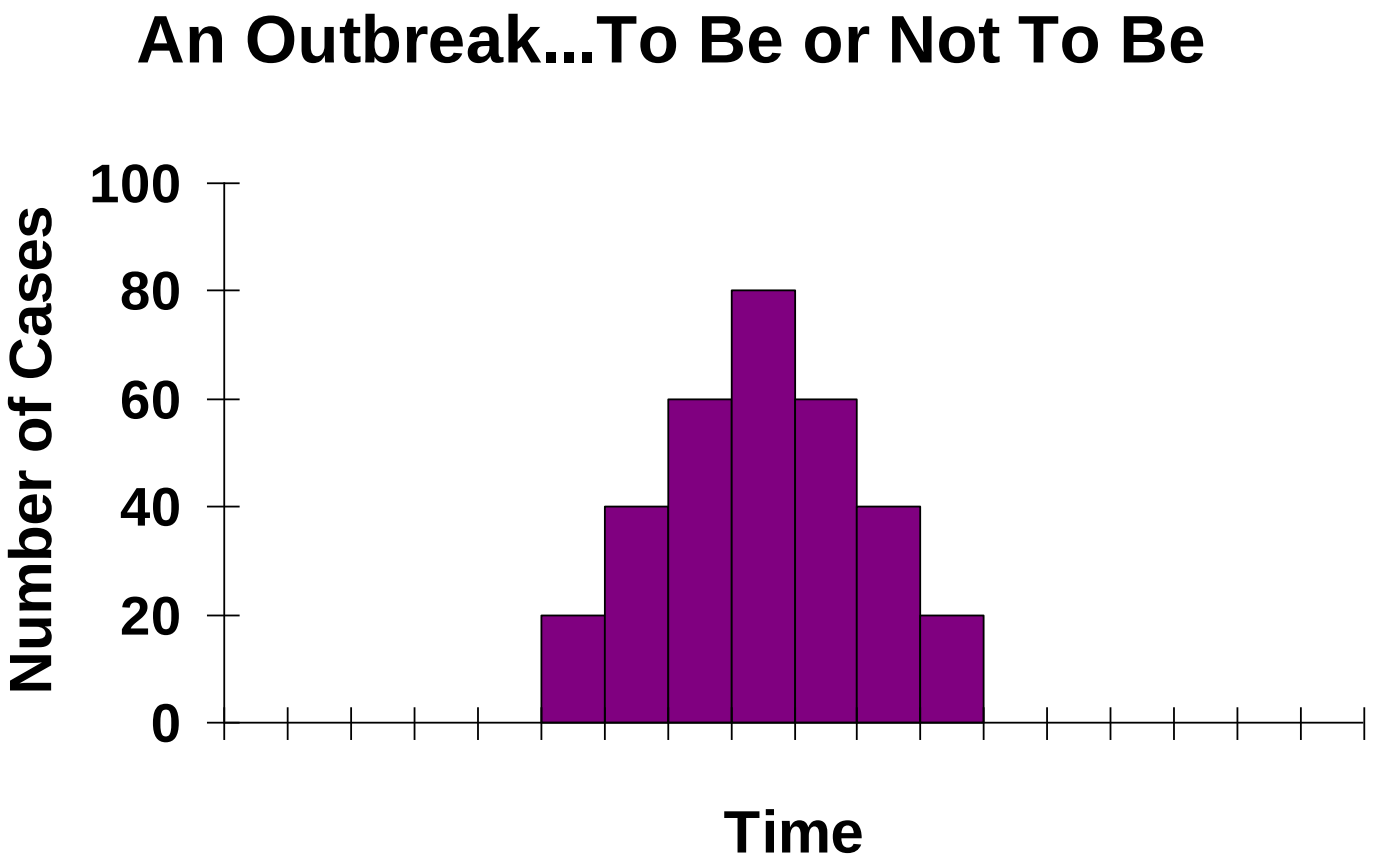
Potential Pitfalls: is it a true increase?

- Reasons why the observed cases may exceed the expected numbers:
  - Increased awareness or public interest
  - Changes:
    - Reporting procedures
    - Case definition
    - Diagnostic procedures
    - Clinician or clinician practices
    - Population
  - Actual outbreak

Example: Outbreak or Not

- Single case of acute Hepatitis A in food-handler?
- Four cases of 'respiratory illness' among residents of a nursing home in January?
- Seven cases of pertussis in a community in December?
- One case of acute GI illness in individual after eating at Diner A?
- Thirty cases of acute GI illness after eating at church picnic?
- One case of smallpox?
- Three cases of active pulmonary TB at Hospital B?

Example: Establish Existence of an Outbreak



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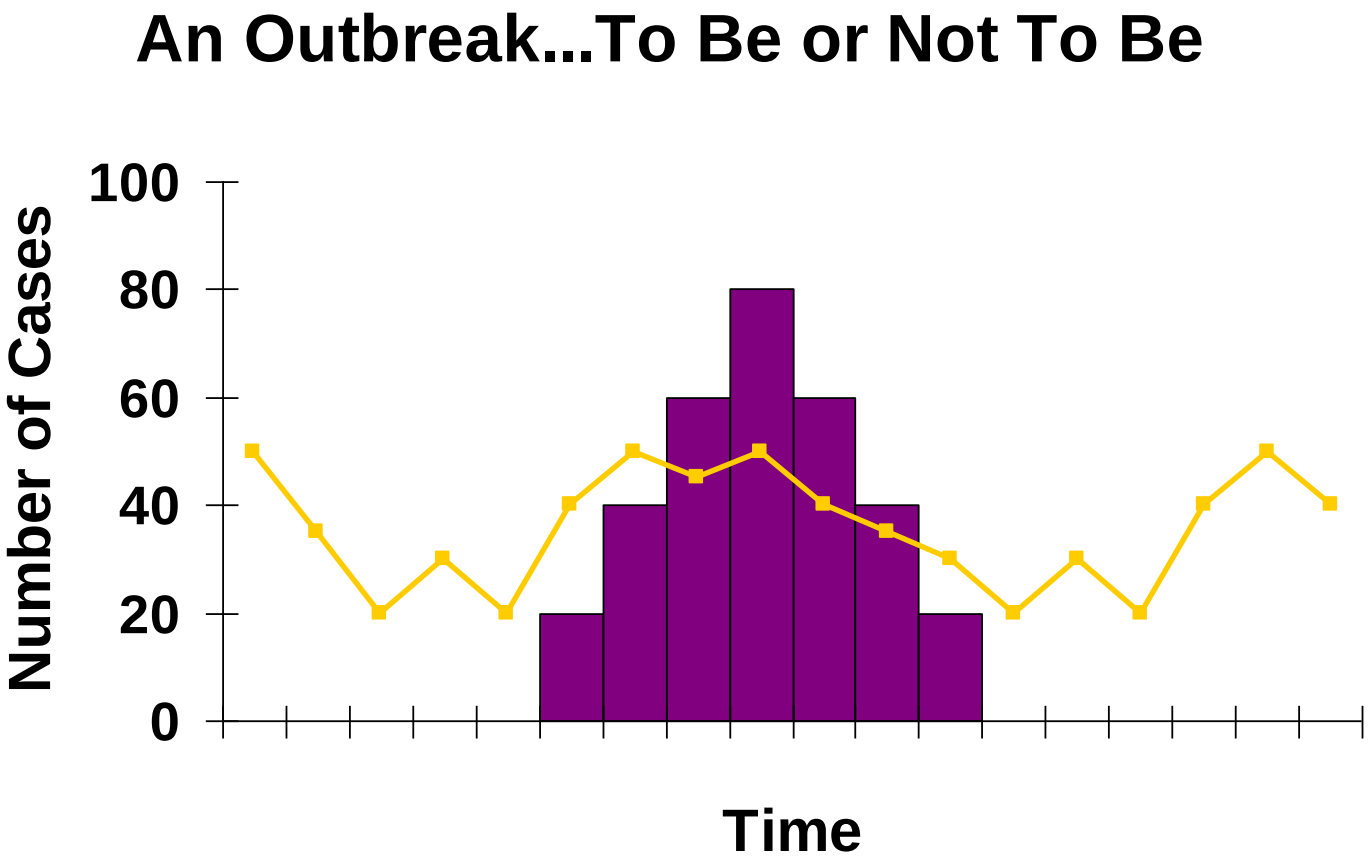

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3. Verify the Diagnosis

- What does that mean?

- Confirm:
  - Clinical signs
  - Clinical symptoms
  - Test results

- Reduce diagnostic error
  - Confirm appropriate lab tests were performed
  - Confirm symptoms were reported accurately
  - For rare conditions, educate clinicians

3. Verify the Diagnosis

- Obtain medical records, laboratory reports
- Talk with patients
- If needed,
  - Conduct clinical testing
  - Collect specimens
  - Hold specimens
- Consult with DPH CDB, SLPH
- In conjunction with CDB, request SLPH to perform bacteriologic, virologic, other testing

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4. Construct Case Definition

- A case definition
  - Allows a simple, uniform way to identify cases
  - "Standardizes" the investigation
  - Is unique to outbreak but is based on objective criteria

4. Construct Case Definition

- 3 components:
  - Person..... Type of illness, characteristics (e.g., “a person with...”)
  - Place..... Location of suspected exposure
  - Time..... Based on incubation period (if known)

4. Construct Case Definition

- Can emphasize sensitivity (broad) or specificity (narrow) in case definition
  - Sensitive early in investigation
  - Specific as more information is obtained

Example: Case Definition – Broad

- An individual reporting 2 or more of the following symptoms:
  - Diarrhea (3 or more loose stools within a 24 hour period)
  - Abdominal pain
  - Nausea
  - Fever

- Illness onset on or after February 28

- Resided in or traveled to County B during the 10 days prior to illness onset.

Example: Case Definition – Specific

Laboratory confirmation of Salmonella paratyphi B with PFGE pattern missing or pending in a person who experienced illness onset on or after February 28th and resided in or traveled to County B during the 7 days prior to illness onset.

Example: Case Definition – Very Specific

Laboratory confirmation of Salmonella paratyphi B with PFGE pattern .1228

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5. Case Finding

- 'Enhanced surveillance'
  - Look for additional cases
  - Use the case definition

- Two methods:
  - Active
    - Visits, phone calls
    - Ask cases if they know of other ill people
  - Passive
    - HAN, blast fax, press release
    - People self-report illness

5. Develop Line List

- Method to systematically record information
- Simple to review, update, summarize
- Paper or electronic
  - NC DPH has template examples that can be shared

5. Develop Line List

- Identifying information
  - Name, address, phone number, unique identifier
  -
- Demographic information
  - DOB, gender, race, occupation
- Clinical information
  - Date(s) of report and onset of illness, symptoms
  - Laboratory specimen submitted, results
- Exposure / risk factor information
  - Food, water, activities

5. Develop Line List

Identifying Information

1	First-Name	Last-Name	Street1	City	State	Zip-Code	County	Home-Phone
2								
3	Ally	Alligator	100 Swamp Lane	Cedar Park	NC	27514	Flowerbank	111-111-1111
4	Benjamin	Bear	506 Forest Road	Cedar Park	NC	27514	Flowerbank	222-222-2222
5	Carie	Cat	52 House Circle	Cedar Park	NC	27514	Flowerbank	333-333-3333
6	Donald	Duck	200 Disney Way	Cedar Park	NC	27514	Flowerbank	444-444-4444
7	Emily	Elephant	64 Safari Ave	Cedar Park	NC	27514	Flowerbank	555-555-5555
8	Farrah	Fox	182 Tree Farm Road	Cedar Park	NC	27514	Flowerbank	777-777-7777
9	Gary	Gorrilla	70 Jungle Drive	Cedar Park	NC	27514	Flowerbank	888-888-8888
10	Henry	Horse	300 Farm Court	Cedar Park	NC	27514	Flowerbank	999-999-9999

5. Develop Line List

Demographic Information

1	Gender	DOB	Age at Onset	Foodhandler	HCW
2					
3	F	1/2/1986	30	Y	V
4	M	12/1/1988	27	N	N
5	F	5/7/1992	23	N	N
6	M	4/4/1973	42	Y	N
7	F	6/18/1979	36	N	N
8	F	8/24/1982	34	N	Y
9	M	11/25/1981	34	N	N
10	M	9/11/2001	14	N	N

5. Develop Line List

Clinical Information

1	Date of Report	Date of Onset	Died	Hospitalized	ER Visit	Provider Visit	Vomiting	Diarrhea	Bloody Stools	Fever	Abdominal Cramps
2											
3	4/14/2016	4/9/2016	N	N	Y	N	Y	Y	Y	Y	Y
4	4/17/2016	4/11/2016	N	N	Y	N	Y	Y	Y	unknown	Y
5	4/23/2016	4/14/2016	N	N	Y	N	Y	Y	Y	Y	Y
6	4/18/2016	4/7/2016	N	N	N	Y	Y	Y	unknown	Y	Y
7	4/27/2016	4/10/2016	N	N	N	Y	N	Y	N	Y	Y
8	4/23/2016	4/14/2016	N	N	N	Y	unknown	Y	unknown	Y	Y
9	4/20/2016	4/13/2016	N	N	N	Y	N	Y	Y	Y	Y
10	4/24/2016	4/19/2016	N	Y	Y	N	Y	Y	N	unknown	Y

5. Develop Line List

Laboratory & Case Classification Information

1	Salmonella species	Serotype Enteriditis	PFGE .0246	Confirmed	Probable	Suspect	Why Status?
2							
3	Y	Y	Y	Y			PFGE match
4	Y	Y	Y	Y			PFGE match
5	Y	Y	Y	Y			PFGE match
6	Y	Y	Y	Y			PFGE match
7	Y	Y	Y	Y			PFGE match
8	Y	Y	Y	Y			PFGE match
9	Y	Y				Y	PFGE pending
10	Y	Y				Y	PFGE pending

5. Develop Line List

Exposure Information

	Travel to Flowerbank County	Ate at Restaurant A	Swam in River B	Attends Day Camp C	Other Exposures
2					
3	Y	N	Y	N	lifeguard at River B
4	Y	Y	Y	N	works at Day Camp C
5	Y	Y	N	Y	
6	Y	unknown	N	Y	works at Restaurant A
7	Y	N	Y	N	
8	Y	Y	Y	N	ate at McDonalds
9	Y	N	unknown	Y	shops at Wal-Mart
10	Y	N	unknown	Y	

Outbreak Exercise, Part I

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6. Perform Descriptive Epidemiology

- What and why
  - Provides systematic method
  - Characterize, or describe what has occurred
  - Person, place, time

- Components
  - Line list
  - Epi curve

  } useful for developing hypotheses

  - Others, but we will focus on line list and epi-curve

6. Perform Descriptive Epidemiology

- Person
- Place

} Line List

- Time

} Epidemic curve (‘Epi curve’)

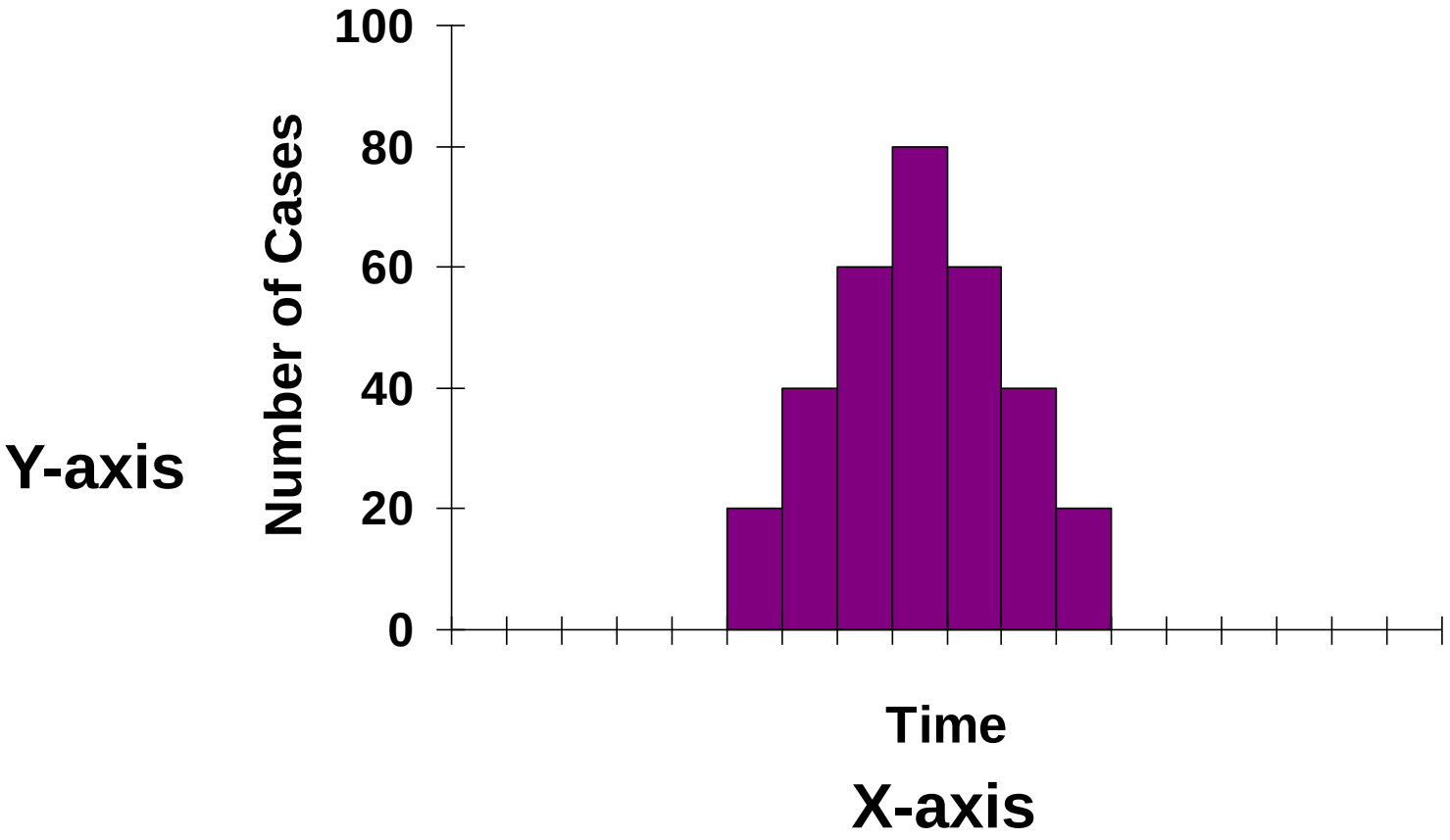
6. Perform Descriptive Epidemiology

- Epi curve: visual representation of
  - Ill persons (cases) over time
  - Magnitude of outbreak
  - Type of outbreak
    - Point source
    - Propagated (person-to-person)
  - Exposure period / Time of exposure (if agent known)
  - Incubation period
  - Possible agents (if time of exposure known)

6. Perform Descriptive Epidemiology

- How do I make an epi curve?
  - Number of cases on the vertical (y) axis
  - Time period (or date of illness onset) on the horizontal (x) axis

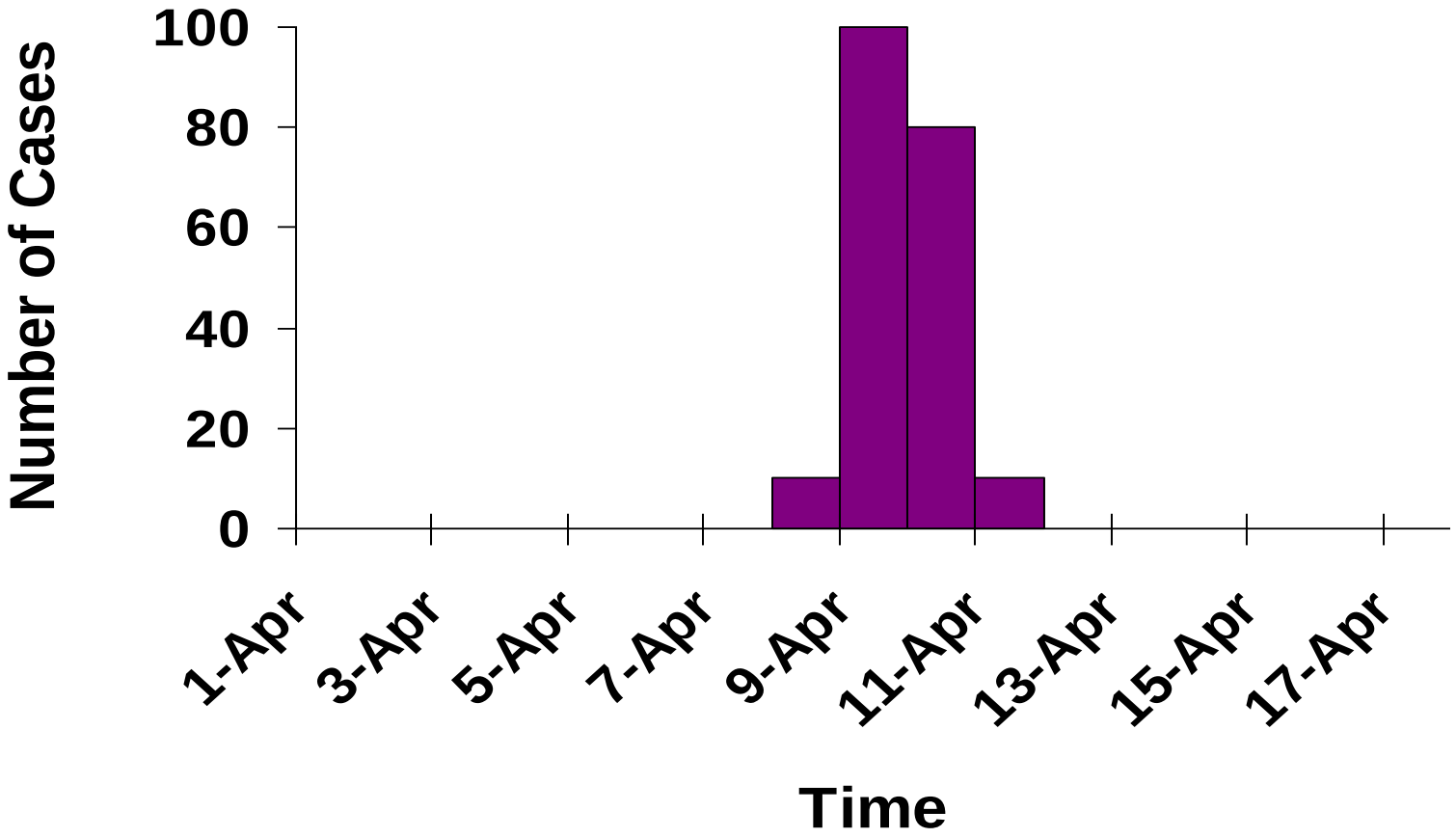
Example – X and Y axis



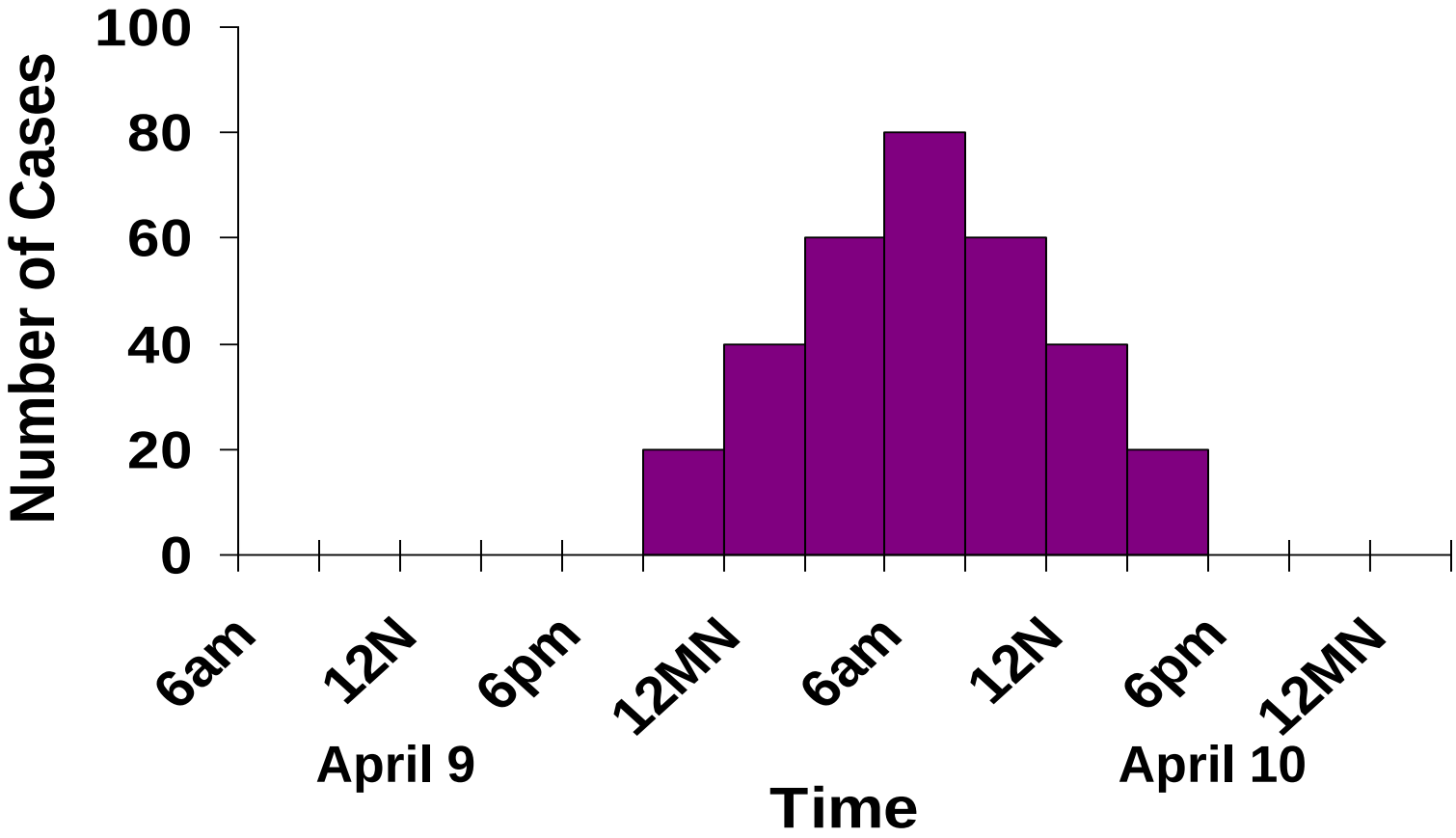
6. Perform Descriptive Epidemiology

- How do I choose the correct unit of time?
  - Depends upon the incubation period
  - If incubation period is not known, graph several epi-curves with different time units

Example Epi Curve – Time Unit (Day)



Example Epi Curve – Time Unit (Hours)



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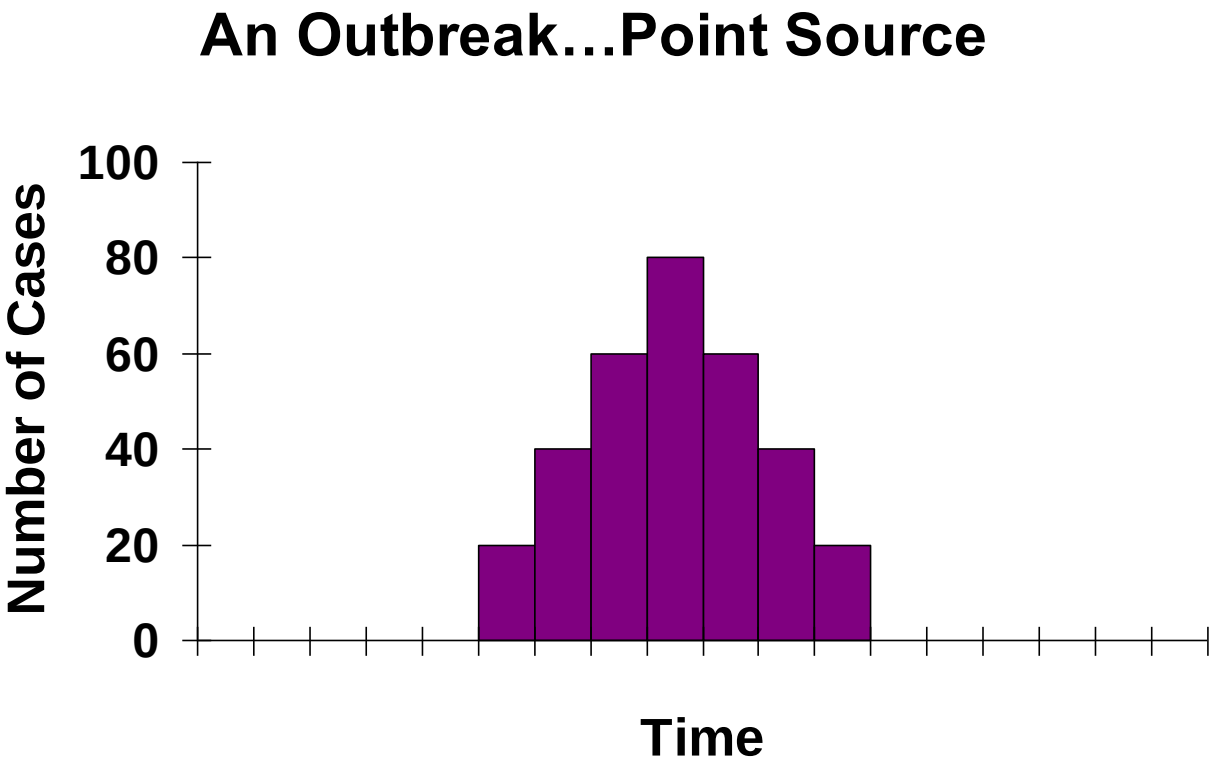
6. Perform Descriptive Epidemiology

- Point source
  - Usually demonstrated by sharp upward slope and a gradual downward slope
  - Common source outbreak
  - Period of exposure is brief
  - Cases occur within one incubation period

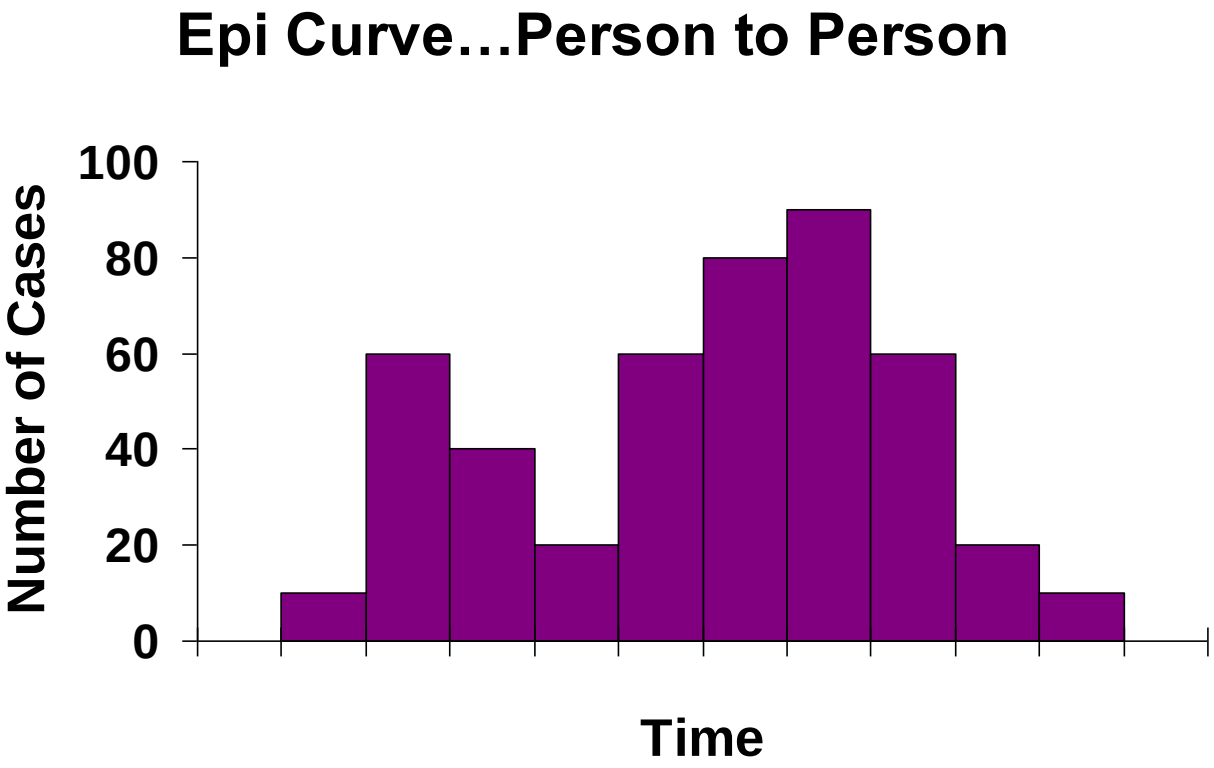
Example Epi Curve – Point Source



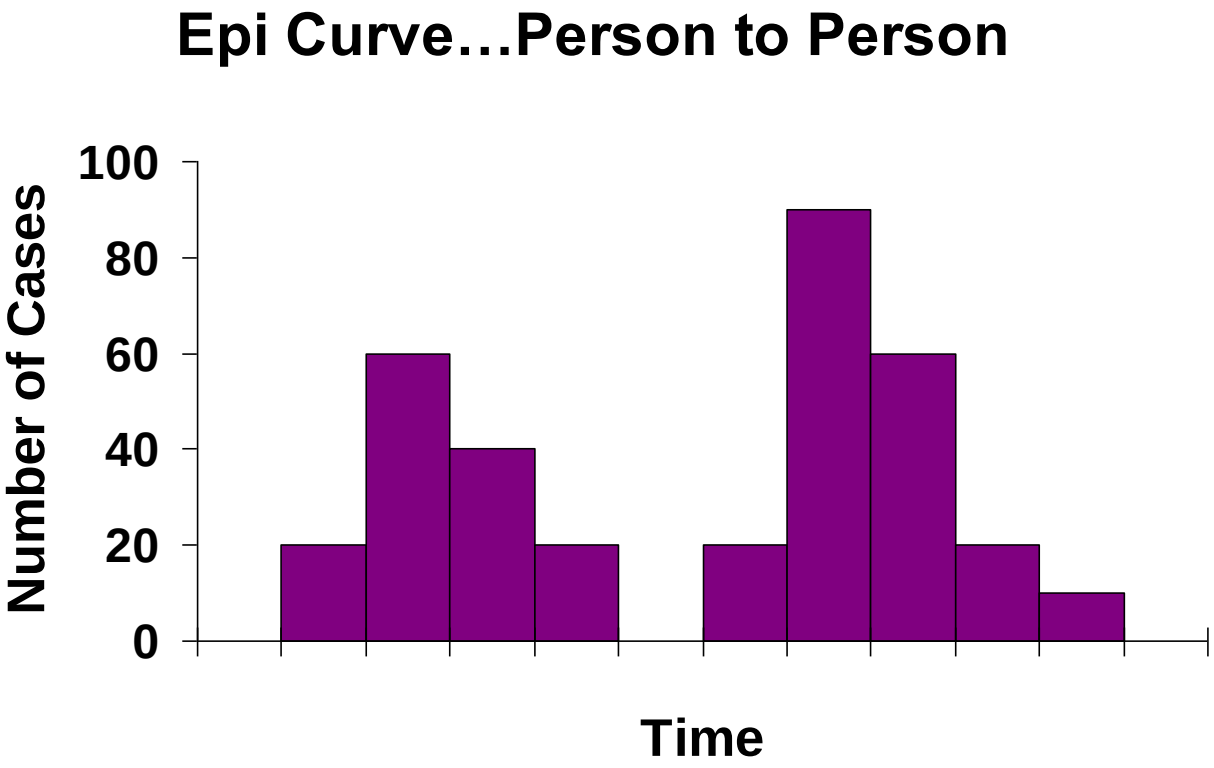
6. Perform Descriptive Epidemiology

- Propagated (person-to-person)
  - Progressively taller peaks, an incubation period apart
  - Person to person transmission
  - May last a long time
  - May have multiple waves

Example Epi Curve – Person to person (Propagated)



Example Epi Curve – Person to person (Propagated)



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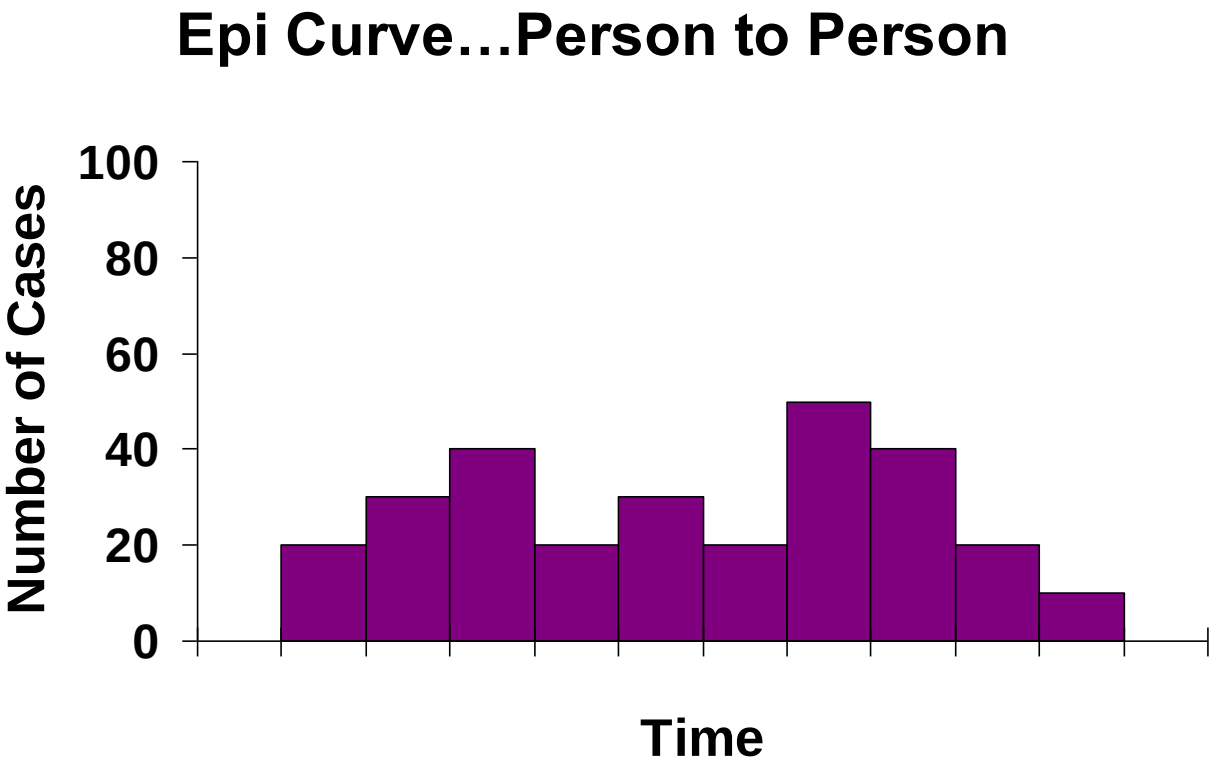

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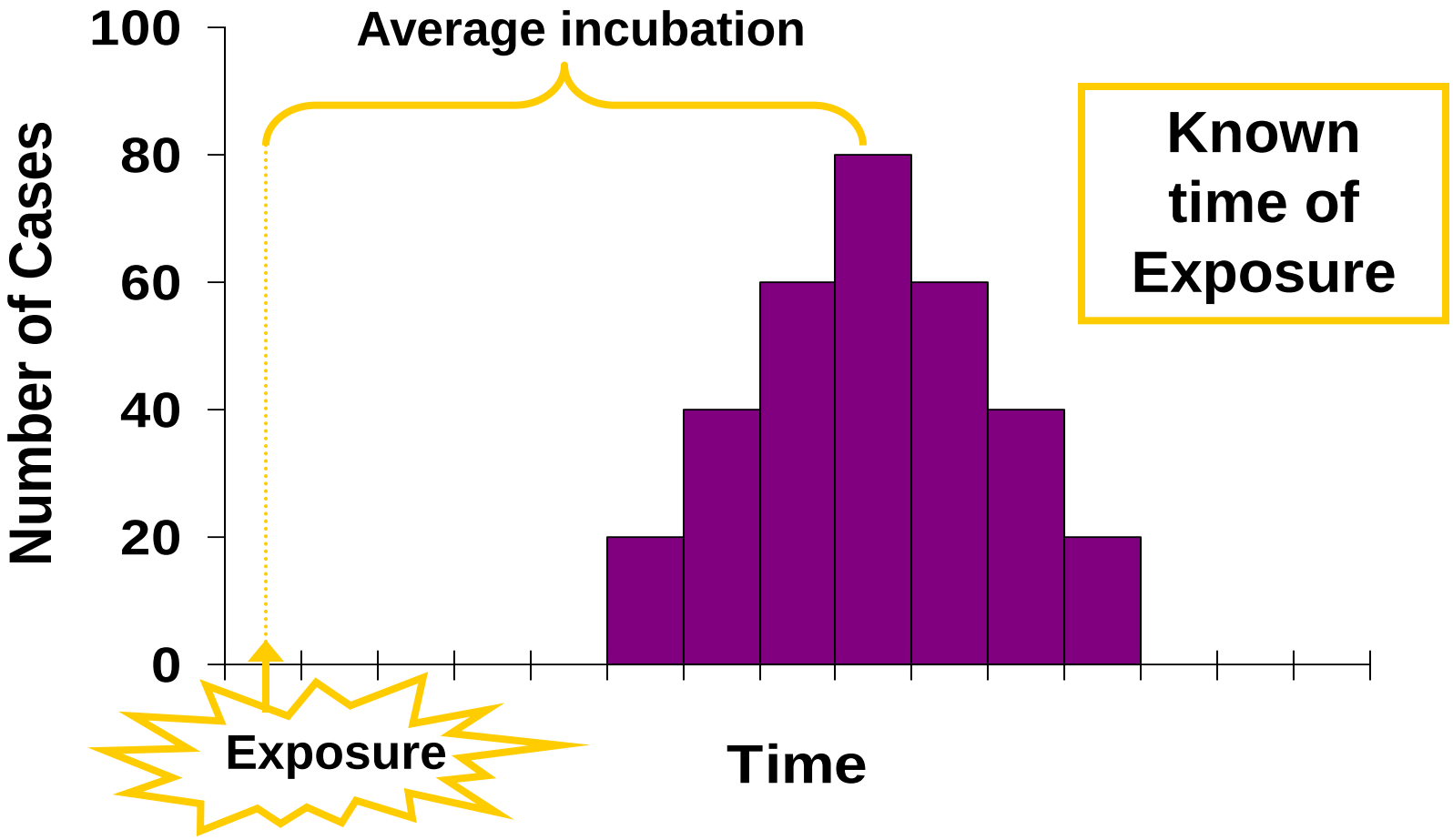
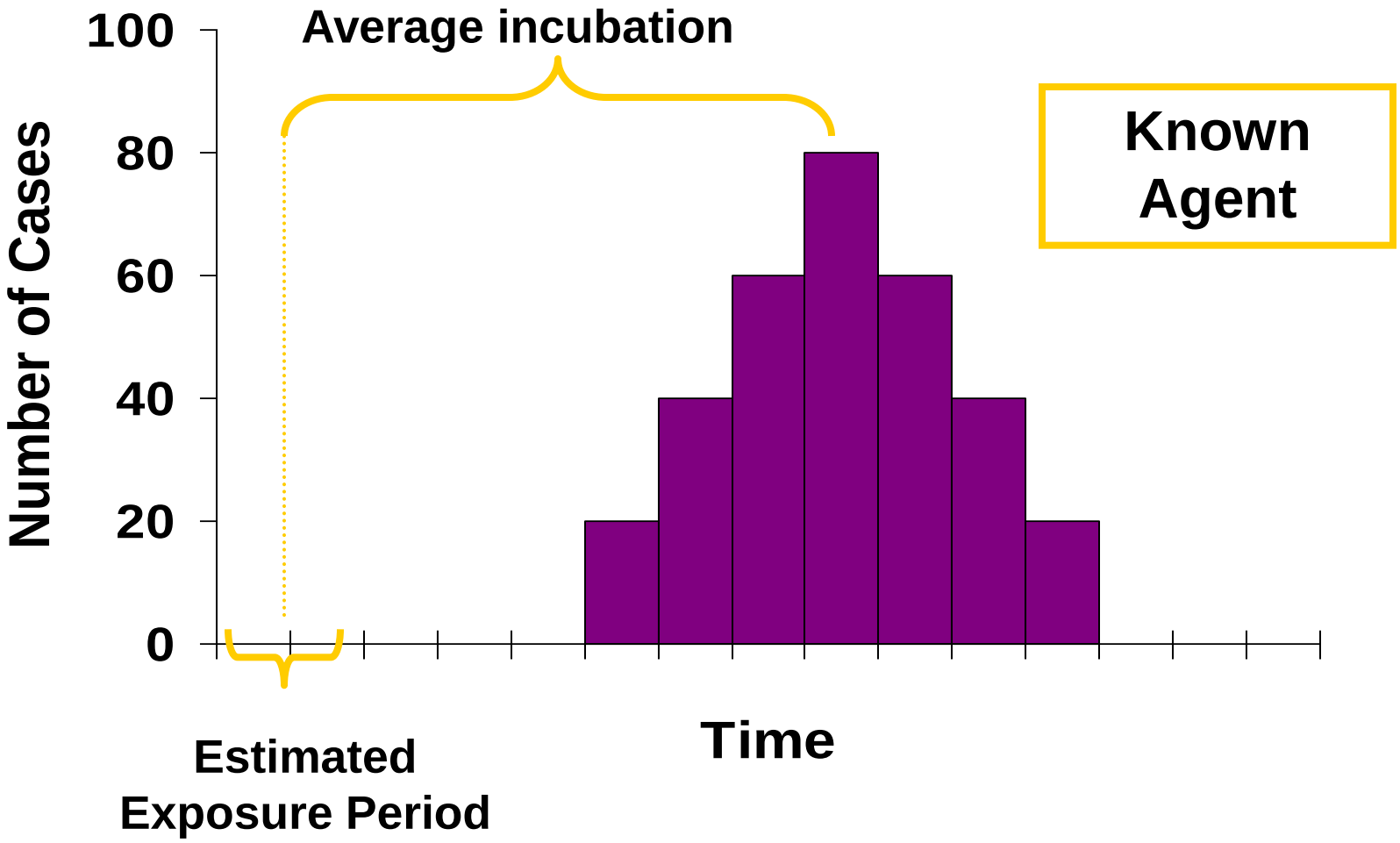
Example – Exposure Period



Example – Exposure Period



6. Develop Hypotheses

- What are hypotheses?
  - Statements which help us describe why and how the outbreak occurred

- How do you generate hypotheses?
  - Examine descriptive epidemiology:
    line list, epi-curve
  - Administer open-ended questionnaire to cases
  - Review the existing body of knowledge

6. Develop Hypotheses

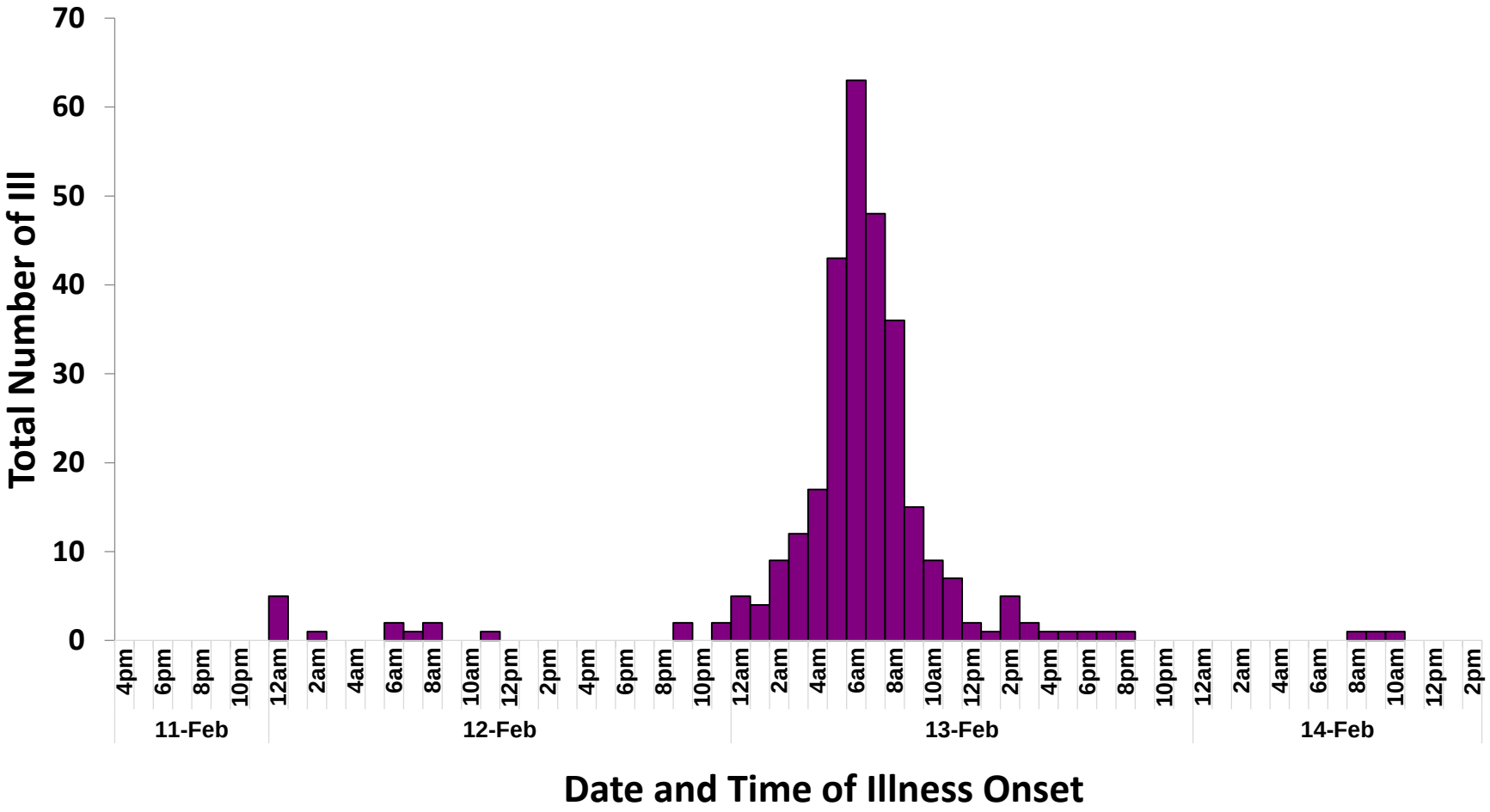
- Questions to ask yourself:
  - What is the agent's usual reservoir
  - How is the agent usually transmitted
  - What vehicles are commonly implicated
  - What are the known risk factors
  - In discussions with ill persons, what possible exposures were in common

Example – Develop Hypothesis

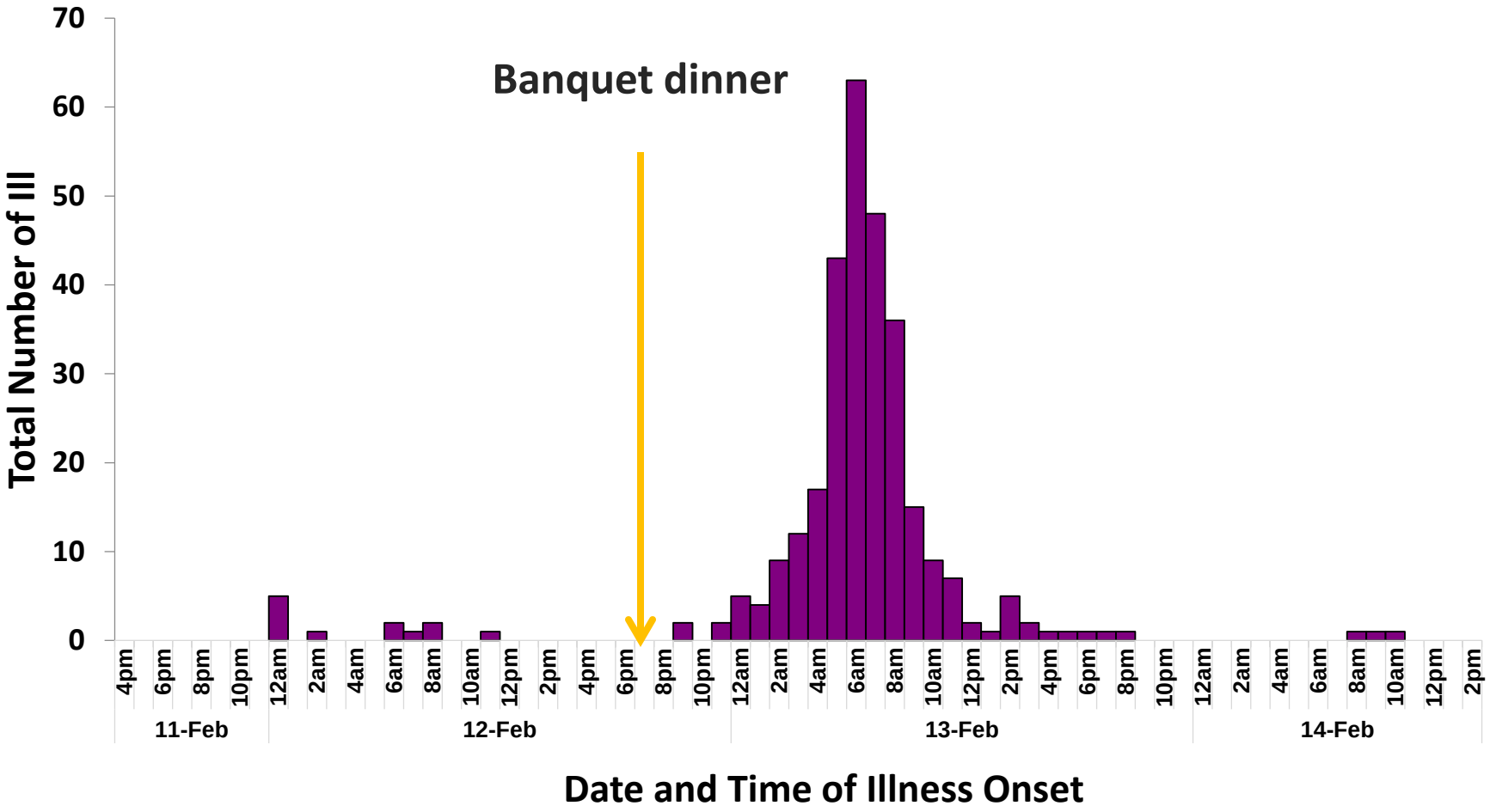
- Case and clinical information:
  - Acute gastroenteritis
  - Most aged 14 – 18 years
  - 307 ill persons (cases)
  - Onset of illness: 12am Feb 12 – 10am Feb 14

- Common exposures:
  - Attending youth conference

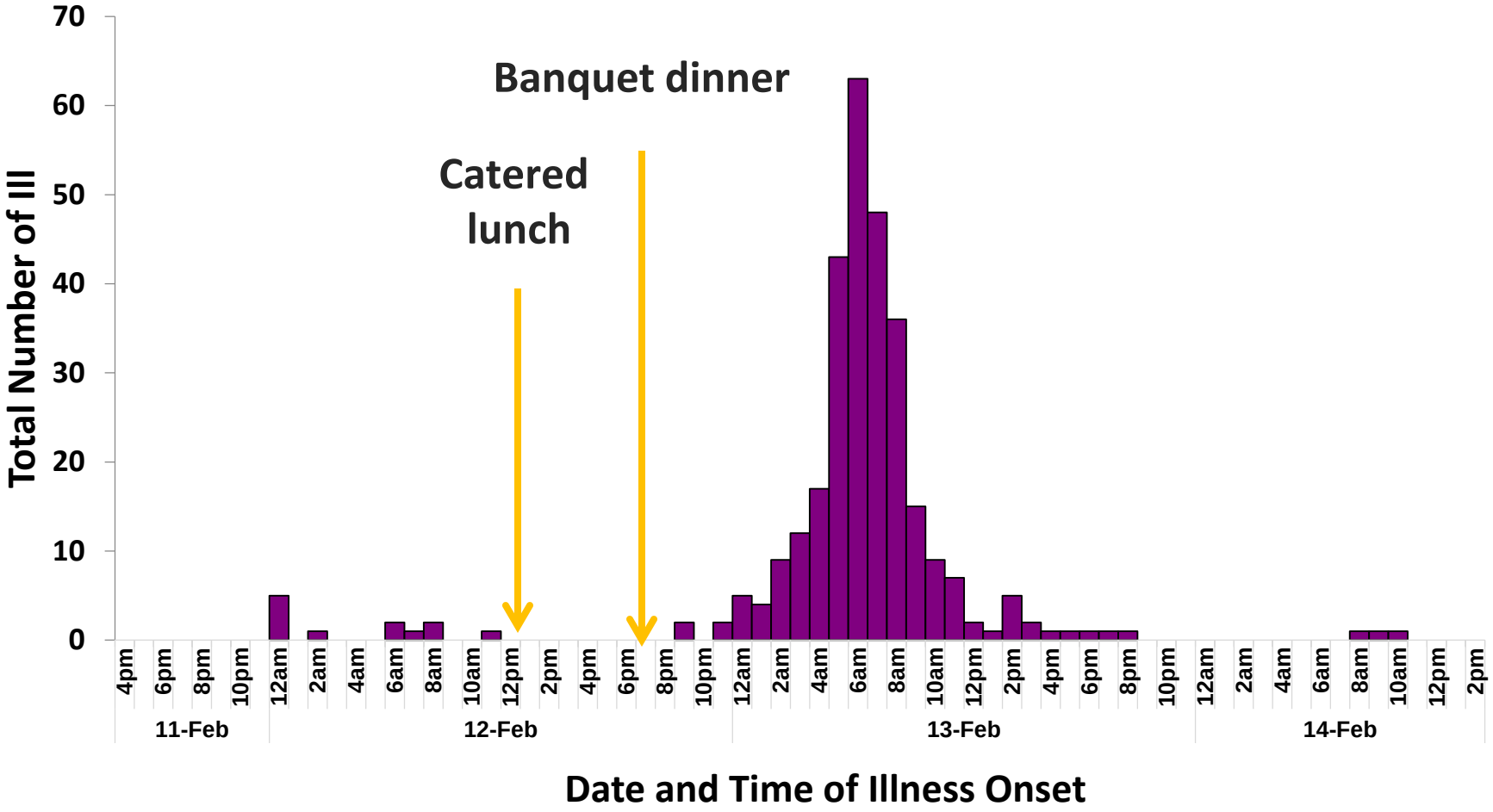
Example: Cases of Gastroenteritis by Time of Symptom Onset (n=307)



Example: Cases of Gastroenteritis by Time of Symptom Onset (n=307)



Example: Cases of Gastroenteritis by Time of Symptom Onset (n=307)



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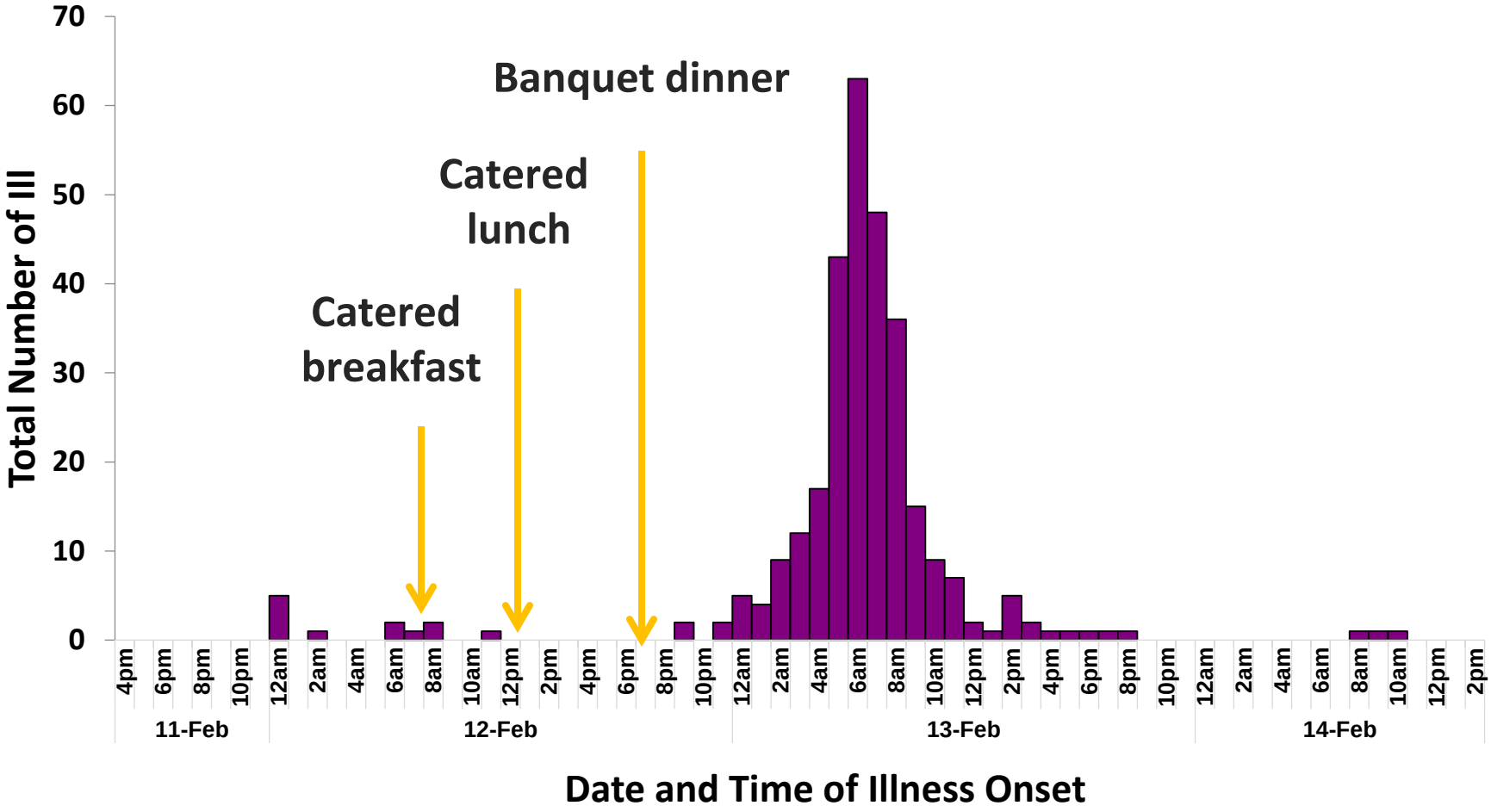
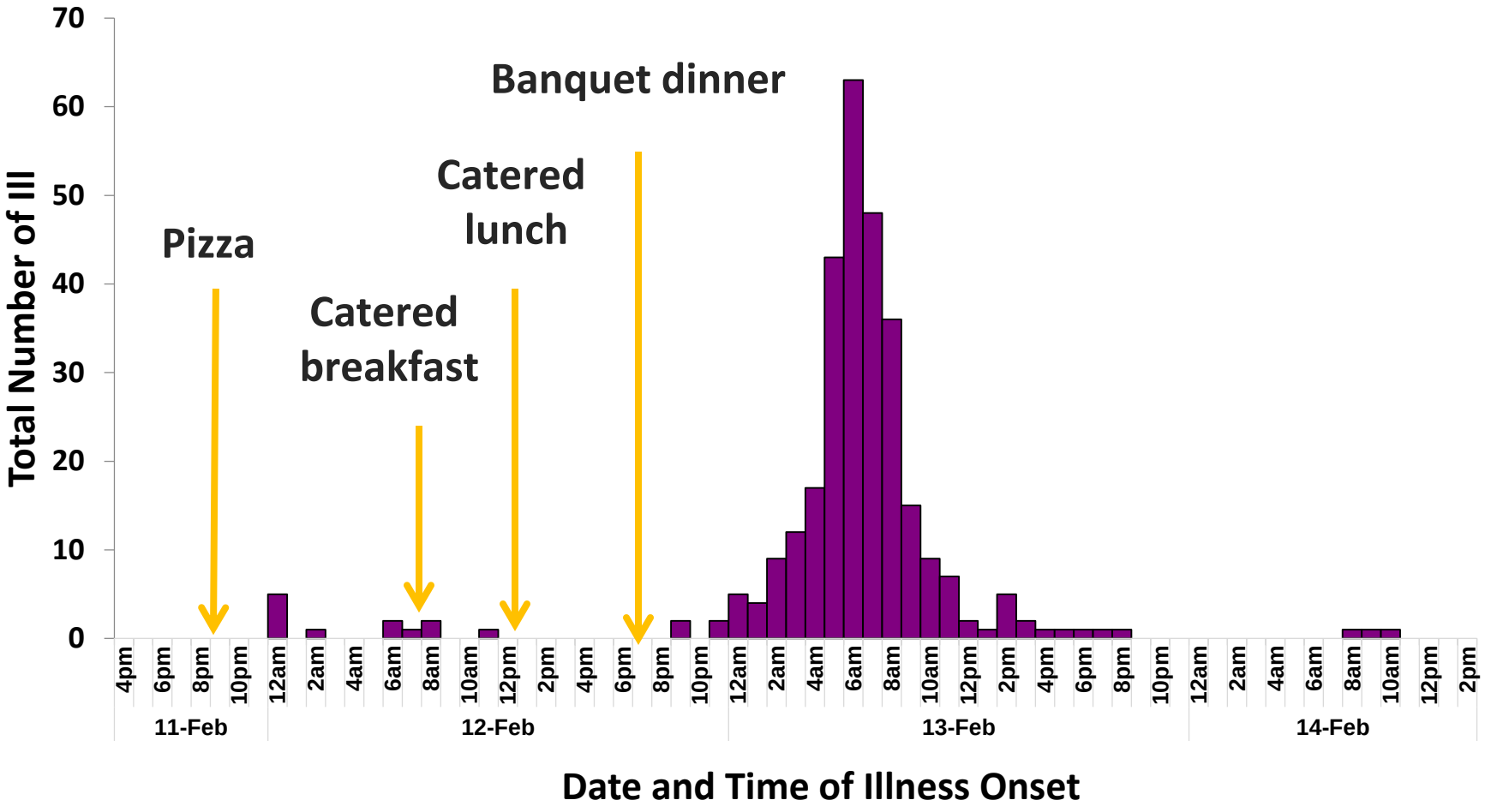


Example: Cases of Gastroenteritis by Time of Symptom Onset (n=307)



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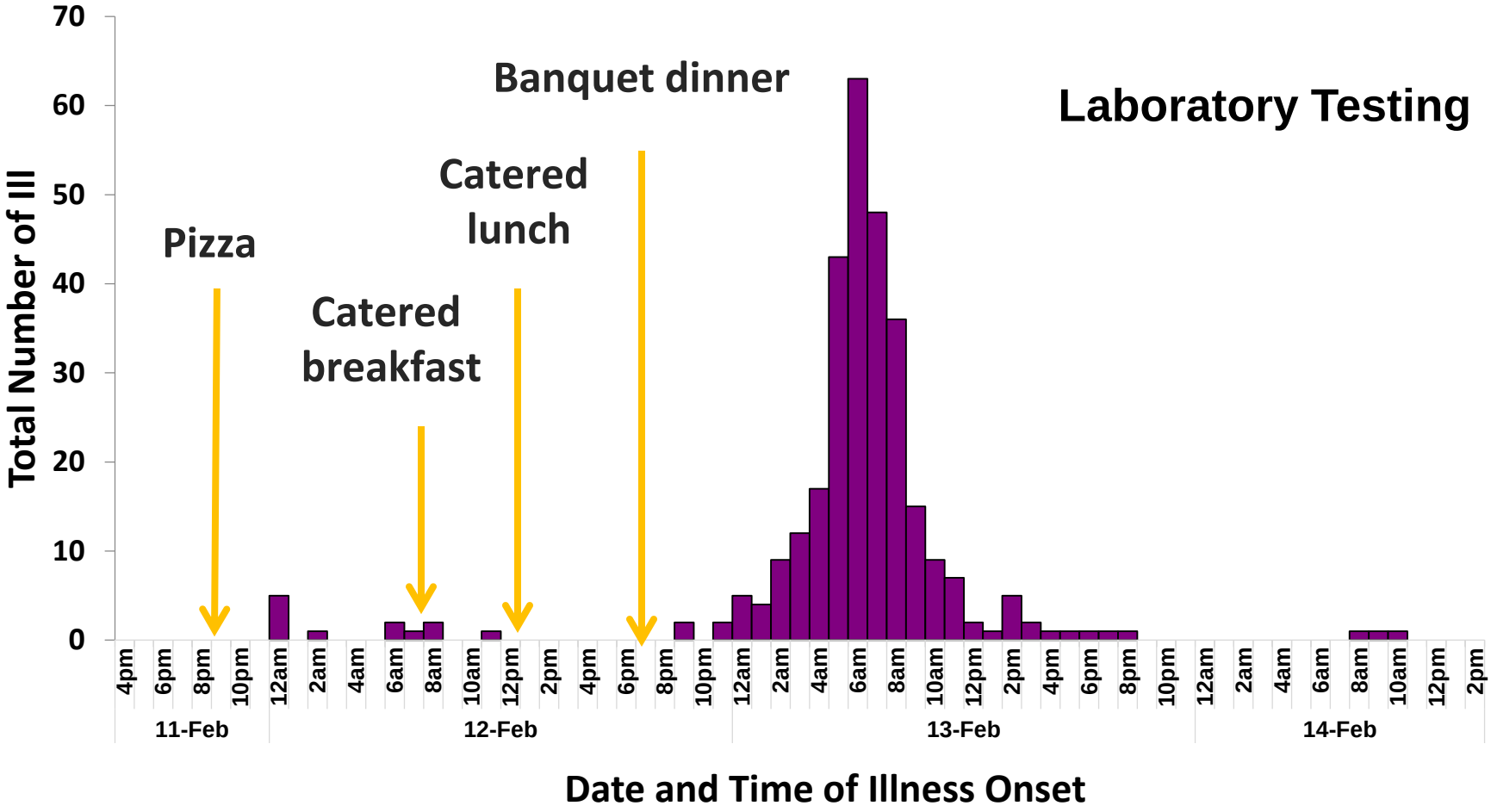

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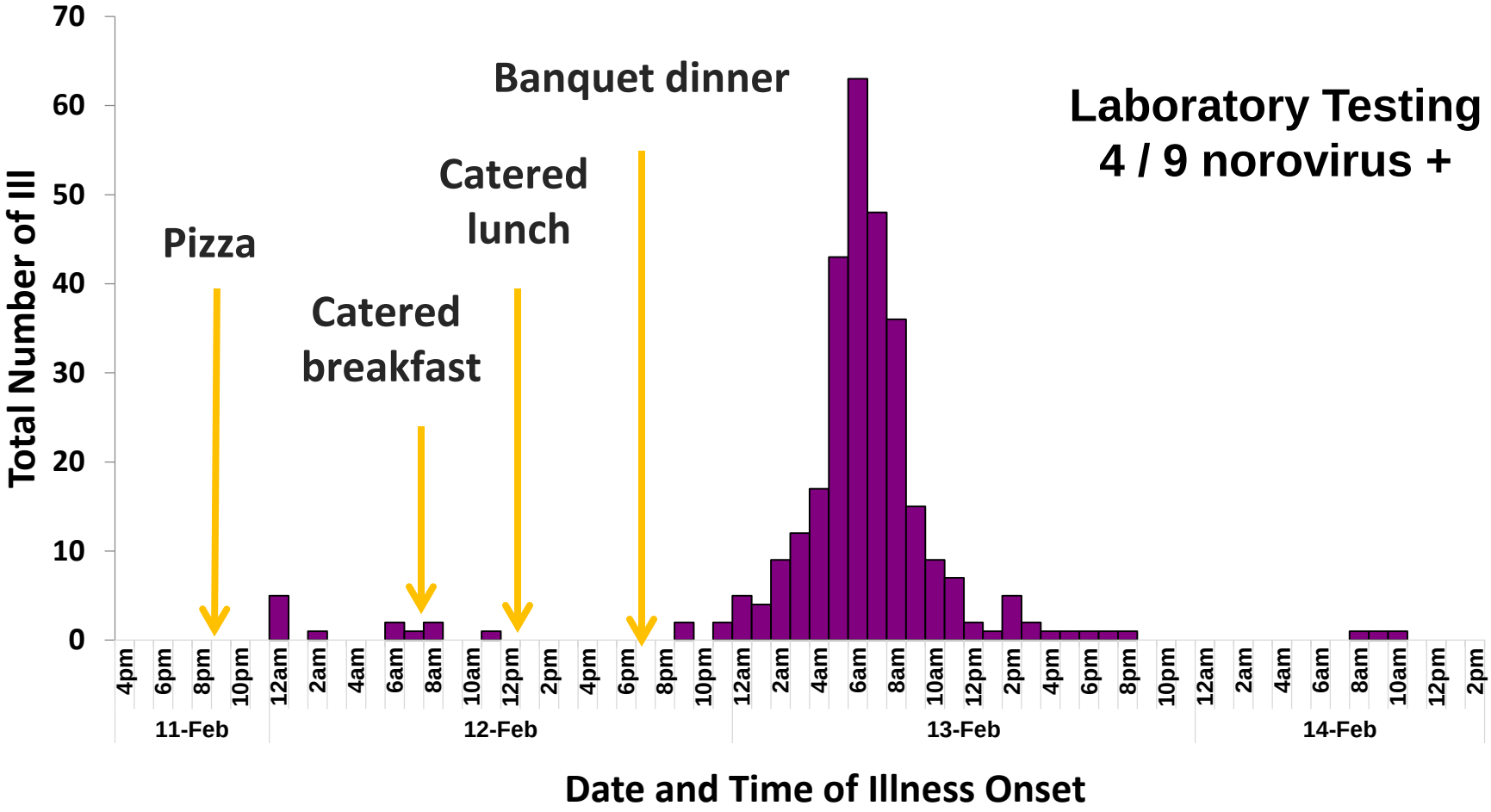
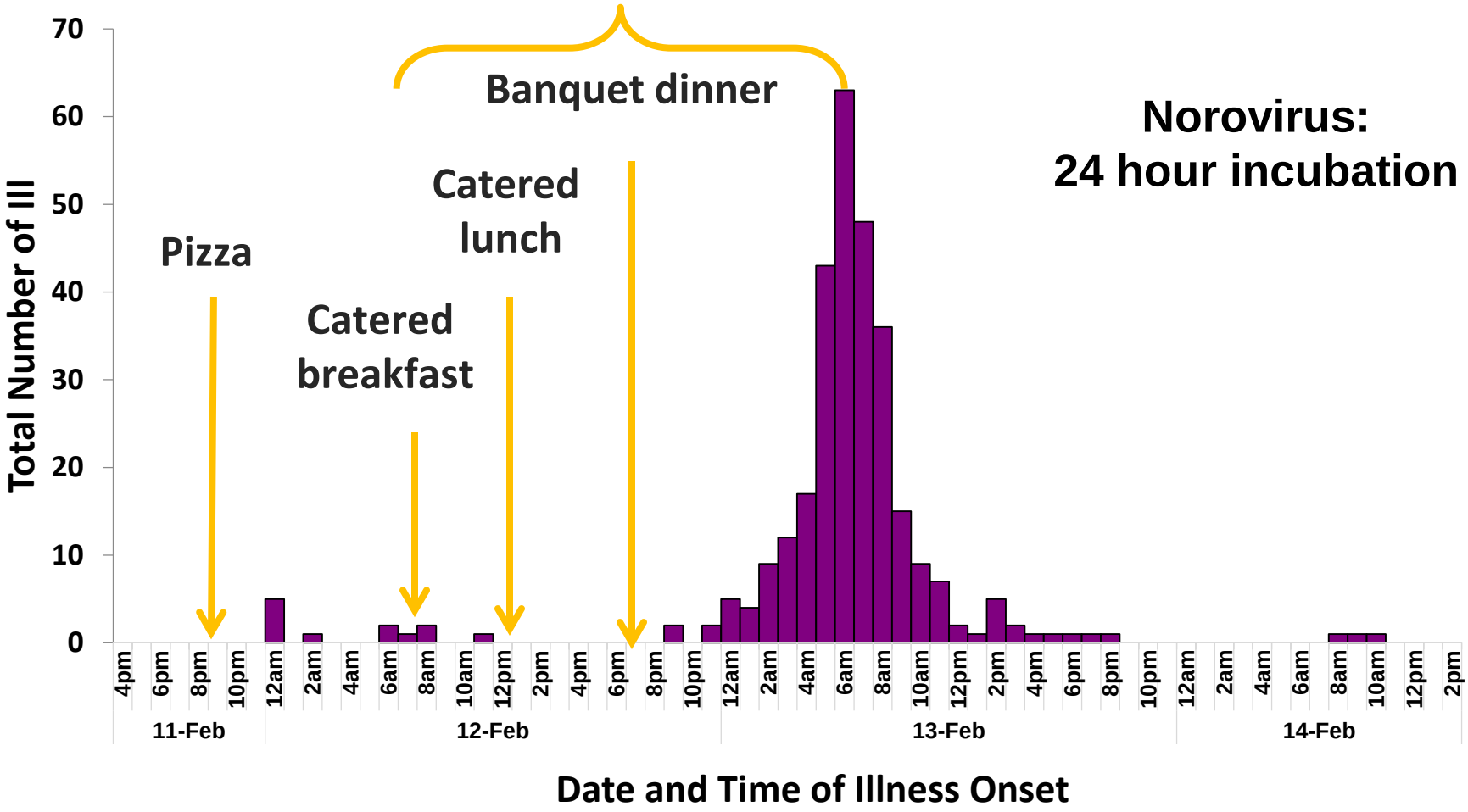


Norovirus Infection

- RNA virus
- Resistant to environmental stress
- Incubation period usually 24 hours with range 12-72 hours
- Causes GI illness with watery diarrhea and >50% vomiting

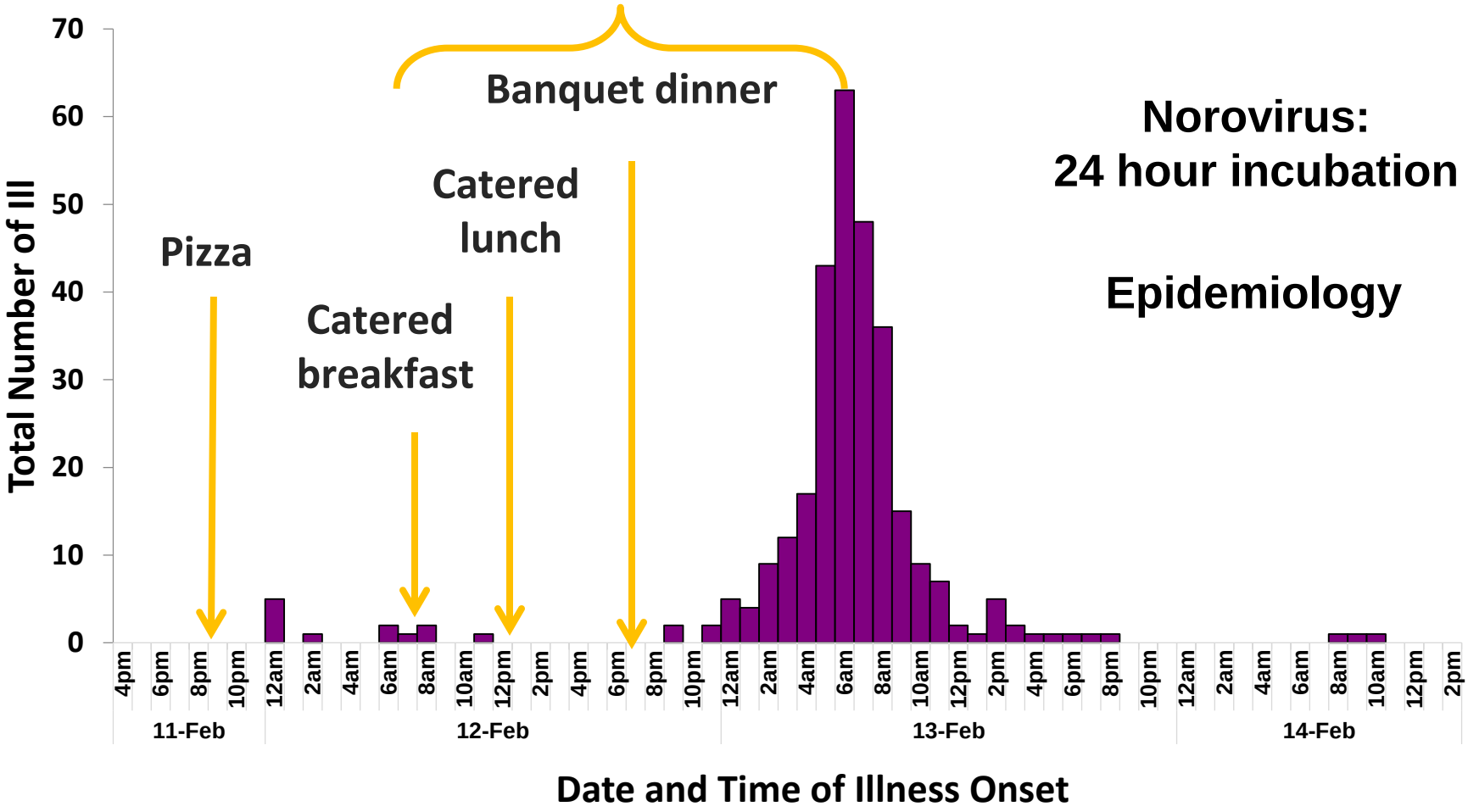
Example: Cases of Gastroenteritis by Time of Symptom Onset (n=307)



Example – Initial Hypothesis

- We hypothesize that:
  - norovirus was the causative agent of the outbreak, and
  - eating breakfast served on February 12 was the most likely exposure to norovirus

Example: Cases of Gastroenteritis by Time of Symptom Onset (n=307)



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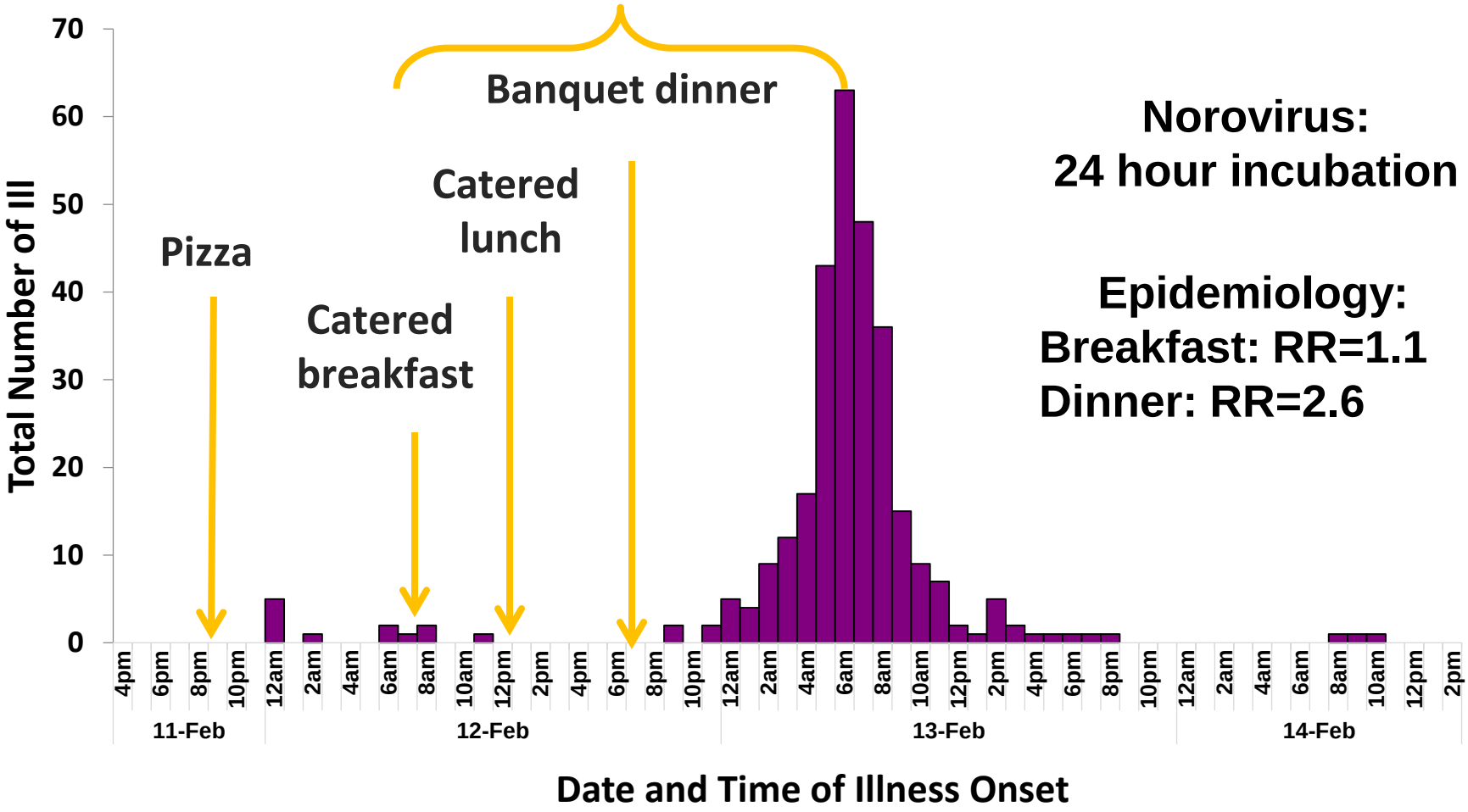

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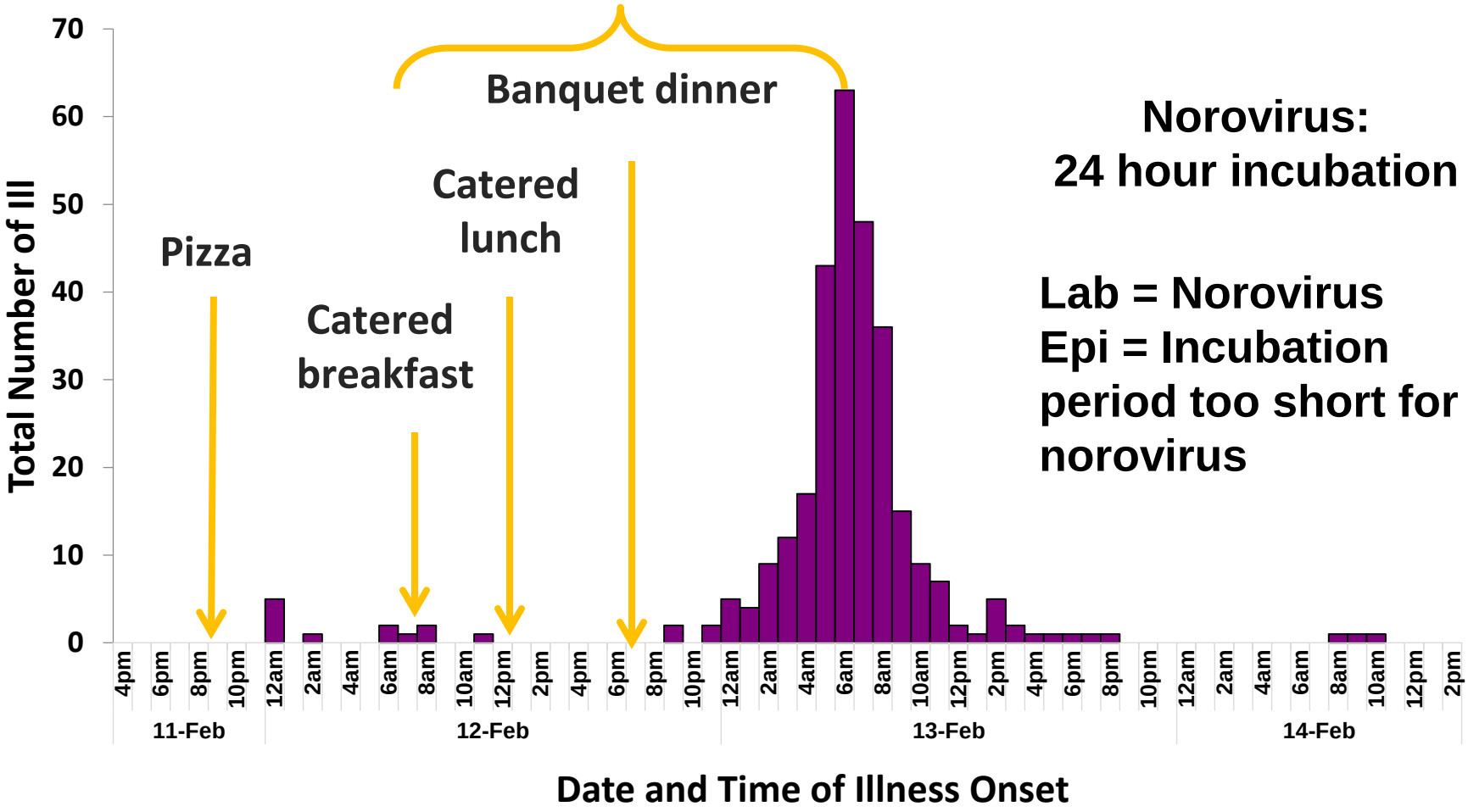
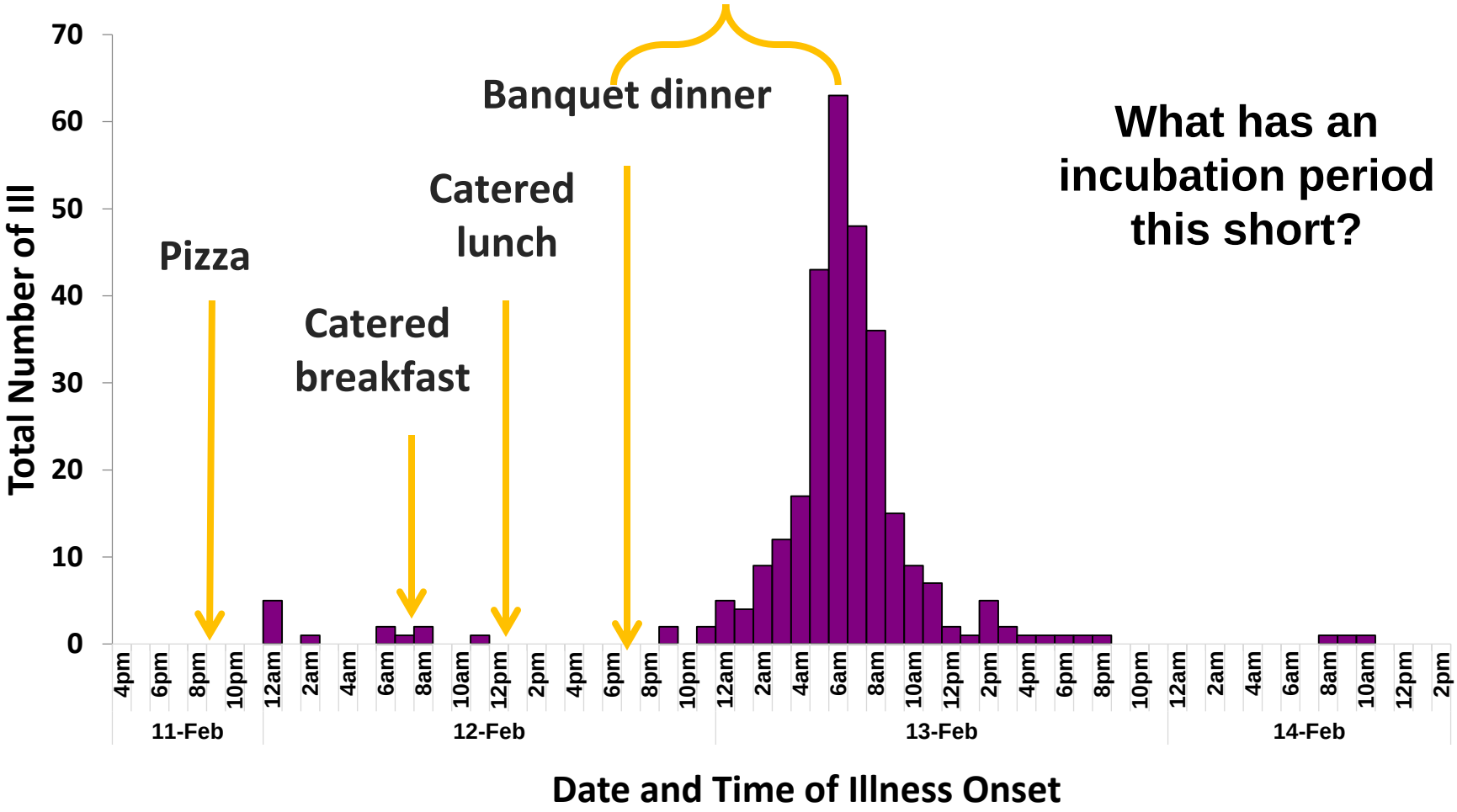


Example: Cases of Gastroenteritis by Time of Symptom Onset (n=307)



Clostridium perfringens Toxicoinfection

- Spore-forming Gram positive rod
  - Arises after consumption of bacteria-containing food
  - Toxin produced within the small intestine following ingestion
- Diarrhea predominant illness with little vomiting
- Incubation period usually 6–12 hours
- Associated with poorly cooked meat

Example – Additional Lab Information

- Norovirus testing
  - Reverse transcription PCR (RT-PCR)
  - Sent to CDC for confirmation

- *Clostridium perfringens* enterotoxin testing
  - Oxoid toxin detection kit
  - PCR

Example – Additional Lab Information

- Testing did not confirm the presence of norovirus
- After 4 weeks at 4°C, stool tested for *Clostridium perfringens* enterotoxin
  - Toxin present in 8 of 9 specimens tested
  - Enterotoxin gene detected in 5 of 6 specimens tested

Example – Final Hypothesis

- We hypothesize that:
  - *Clostridium perfringens* toxicoinfection was the causative agent of this point source outbreak
  - Associated with consumption of inappropriately-cooked chicken at the dinner served on February 12

6. Develop Hypotheses

- Questions to ask yourself regarding hypothesis:
  - Is hypothesis stated in a way that can be ‘tested’
  - Does it address:
    - agent
    - vehicle / source
    - mode of transmission
    - exposure that caused illness

6. Test the Hypothesis

- We hypothesize that:
  - *Clostridium perfringens* toxicoinfection was the causative agent of this point source outbreak
  - Associated with consumption of inappropriately-cooked chicken at the dinner served on February 12
- Testable ✔
- Agent ✔
- Vehicle or source of agent ✔
- Mode of transmission ✔
- Exposure ✔

10 Steps of an Outbreak Investigation

1. Identify investigation team and resources
2. Establish existence of an outbreak
3. Verify the diagnosis
4. Construct case definition
5. Case finding: Find cases systematically / develop line list
6. Perform descriptive epidemiology / develop hypotheses
7. Evaluate hypotheses / perform additional studies (as necessary)
8. Implement control measures
9. Communicate findings
10. Maintain surveillance

7. Evaluate Hypotheses

- Two methods:
  - Compare hypothesis with established facts
  - Perform additional studies (e.g., analytic)
    - Cohort or case-control
    - Assess exposures equally among ill and non-ill persons

7. Evaluate Hypotheses

- Compare hypothesis with established facts
  - Evidence is so strong that hypothesis does not need to be tested
  - E.g., Salmonella Paratyphi B with PFGE pattern .1228 (the outbreak strain) isolated from unpasteurized tempeh
  - E.g., norovirus identified in a nursing home; norovirus is known to be circulating in the community

7. Perform Additional Studies

Used when the relationship between exposure and disease is less clear

Value of Analytic Studies

- Support for specific public health action (e.g., recall)
- Describe new diseases, learn more about known diseases
- Address public and political concern
- Develop strategies to prevent future outbreaks
- Fulfillment of legal obligations and duty of care for the public

7. Perform Additional Studies

- Cohort
  - Able to identify every person in group (‘cohort’)
  - Possible when group is well defined
  - Include *EVERYONE* who could have been exposed
    - E.g., Meeting attendees, students, wedding reception, LTCF residents

7. Perform Additional Studies

- Case-control
  - Compare exposures among ill persons (case) and non-ill persons (controls)
  - Used when a complete list is not available or too large
  - Controls are sample of same population from which cases arose (e.g., source population)
    - E.g., same city, attend same restaurant
  - If a control had developed illness, would have been included as a case

7. Perform Additional Studies

Step 7 will almost always be performed in consultation with DPH and we will assist you. This will not be addressed in further detail at this initial training, but may be addressed in a later training.

7. Example – Evaluate the Hypothesis

- We hypothesize that:
  - *Clostridium perfringens* toxicoinfection was the causative agent of this point source outbreak
  - Associated with consumption of inappropriately-cooked chicken at the dinner served on February 12

- What type of analytic study could be used to evaluate the above hypothesis?

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8. Implement Control Measures

- Immediate implementation of control measures from Step 1
  - Source is identified
  - Continued risk of either exposing others or being exposed
  - E.g., food handler

8. Implement Control Measures

- Required response from public health
- Can occur at any point during the outbreak
- Prevent further exposure, future outbreaks
- Should be guided by epidemiologic results in conjunction with environmental investigation
- Performed in conjunction with DPH, regulators, industry, other agencies
- Balance between preventing further disease, protecting credibility and reputation of institution
- Identify one person to communicate control measures

8. Example – Control Measures

- Summary:
  - Attendees at a youth conference
    - > 1,000 attendees
    - 307 ill persons (cases)
  - *Clostridium perfringens* toxicoinfection
  - Associated with inappropriately cooked chicken

- Recommended control measures?

Outbreak Exercise, Part II

10 Steps of an Outbreak Investigation

1. Identify investigation team and resources
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10. Maintain surveillance

9. Communicate Findings

- Two forms:
  - Oral:
    - Internally with team
    - Externally to public, media, health care providers
  - Written:
    - Daily updates (Situation Reports)
    - Final outbreak report, which is a public record

9. Communicate Findings

- Public and media:
  - Single member of team should interact with media, communicate progress and findings
  - Media attention desirable if public action is needed
  - Response to media attention important to address public concerns about outbreak
  - Opportunity to educate community
  - Single overriding communication objective (SOCO)

9. Communicate Findings

- Daily updates (Situation Reports)
  - Narrative
    - Number of persons ill
    - Number of persons potentially exposed (if known)
    - Range of onset dates
    - Type of symptoms
    - Available laboratory results
    - Number hospitalized / died
    - Actions already taken
  - Action Items
    - Summary of recommendations and plans for surveillance, control

Example – Situation Report

SIT REP: Unknown respiratory illness in a LTCF, Guilford County

Fleischauer, Aaron

This message was sent with High importance.

Sent: Fri 6/1/2012 4:26 PM
To: **sit.rep**
Cc: brogers@co.guilford.nc.us; philliard@co.guilford.nc.us; wrobinson@co.guilford.nc.us

SIT REP – June 1, 2012

Reported by: Aaron Fleischauer, 919-715-6431

Event: Unknown respiratory illness *outbreak* in a long-term care facility (LTCF), Guilford County, NC

LHD Contact: Betty Rogers, Guilford County Health Department, 336-641-6500

Dr. Ward Robinson, Guilford County Health Department, 336-549-9724

DPH Contact: Dr. Jean-Marie Maillard, 919-7157395

Narrative:

- Guilford County reports an unknown respiratory illness *outbreak* at a LTCF (Adams Farm Living and Rehab, Jamestown, NC)
- An estimated 20-30 residents and at least 2 staff have reported febrile respiratory illness during past 2-3 weeks
  - Several residents have been admitted to Moses Cone and High Point Regional Hospitals
  - Possibly 4 deaths secondary to pneumonia have also been reported
- The facility has been closed to new admissions

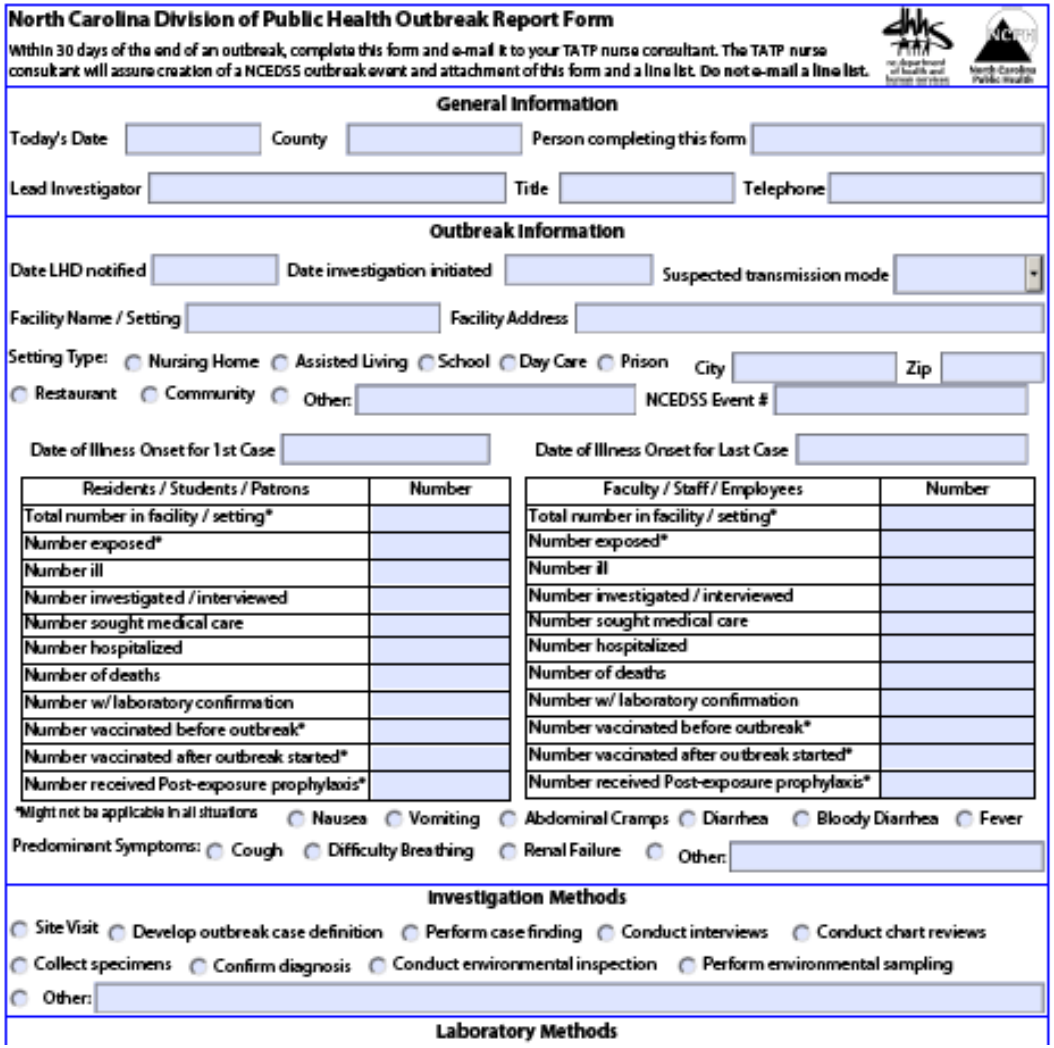
Action Items:

- Guilford County will visit the facility this afternoon to:
  - Begin line list of ill persons

9. Communicate Findings: Outbreak Report

- Outbreak report
  - Final summary of investigation
  - Actions taken
  - Recommendations provided

Example – Outbreak Report



North Carolina Division of Public Health Outbreak Report Form

Within 30 days of the end of an outbreak, complete this form and e-mail it to your TATP nurse consultant. The TATP nurse consultant will assure creation of a NCEDSS outbreak event and attachment of this form and a line list. Do not e-mail a line list.

General Information

Today's Date | County | Person completing this form

Lead Investigator | Title | Telephone

Outbreak Information

Date LHD notified | Date investigation initiated | Suspected transmission mode

Facility Name / Setting | Facility Address

Setting Type: ○ Nursing Home ○ Assisted Living ○ School ○ Day Care ○ Prison City | Zip

○ Restaurant ○ Community ○ Other: | NCEDSS Event #

Date of Illness Onset for 1st Case | Date of Illness Onset for Last Case

Residents / Students / Patrons	Number
Total number in facility / setting*	
Number exposed*	
Number ill	
Number investigated / interviewed	
Number sought medical care	
Number hospitalized	
Number of deaths	
Number w/ laboratory confirmation	
Number vaccinated before outbreak*	
Number vaccinated after outbreak started*	
Number received Post-exposure prophylaxis*	

Faculty / Staff / Employees	Number
Total number in facility / setting*	
Number exposed*	
Number ill	
Number investigated / interviewed	
Number sought medical care	
Number hospitalized	
Number of deaths	
Number w/ laboratory confirmation	
Number vaccinated before outbreak*	
Number vaccinated after outbreak started*	
Number received Post-exposure prophylaxis*	

*Might not be applicable in all situations

Predominant Symptoms: ○ Nausea ○ Vomiting ○ Abdominal Cramps ○ Diarrhea ○ Bloody Diarrhea ○ Fever ○ Cough ○ Difficulty Breathing ○ Renal Failure ○ Other:

Investigation Methods

○ Site Visit ○ Develop outbreak case definition ○ Perform case finding ○ Conduct interviews ○ Conduct chart reviews ○ Collect specimens ○ Confirm diagnosis ○ Conduct environmental inspection ○ Perform environmental sampling ○ Other:

Laboratory Methods

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10. Maintain Surveillance

- Evaluate / document effectiveness of control measures
- To ensure outbreak is over
- To ensure secondary outbreak is not occurring

- It is recommended to maintain surveillance for 2 average incubation periods following the last date of illness onset

Conclusions

- Epidemiologic investigations essential component of public health, present opportunities to:
  - Characterize diseases
  - Identify populations at risk
  - Evaluate programs, policies, or existing prevention strategies
  - Train public health staff
  - Educate the public
  - Fulfill legal obligations and duty of care for the public

- 10 steps provide systematic framework necessary to investigate any outbreak

Outbreak Exercise, Part III

Acknowledgements

- CDB Epidemiologists
- TATP Regional Nurse Consultants

Post Test

- Close all training materials!
- Write the same number that you used earlier on the index card in front of you
- List the 10 steps of an outbreak investigation on your index card
- Turn in index cards