

DOOMSDAY SURVIVAL CODE

A BEGINNER'S GUIDE TO OUTBREAK INVESTIGATION

RUORAN LI, FEB 17, 2019

PUBLIC HEALTH SYMPOSIUM FOR YOUNG LEADERS IN CHINA

SARS 2002-03

What is this mysterious illness?

Where does it come from?

How many ill? How many dead?

Am I in danger?

How can I stay safe?



ACUTE NEUROLOGICAL ENCEPHALOPATHY, INDIA, 1980S - 2017

Is it really a new disease?

Is it transmissible?

Why are only some children sick?

How can we stop the children
from dying?

How can we stop further disease?



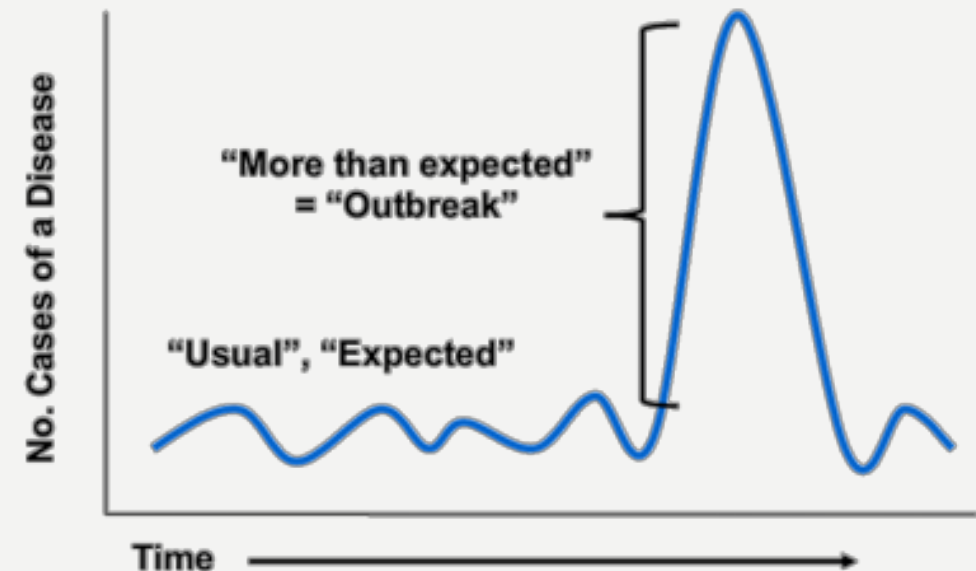
WHAT IS A DISEASE OUTBREAK?

- **Exercise:** talk to your neighbors, and come up with three outbreaks in history (past or present)

- Pre-class: “察布查尔病”

- Summarize definition

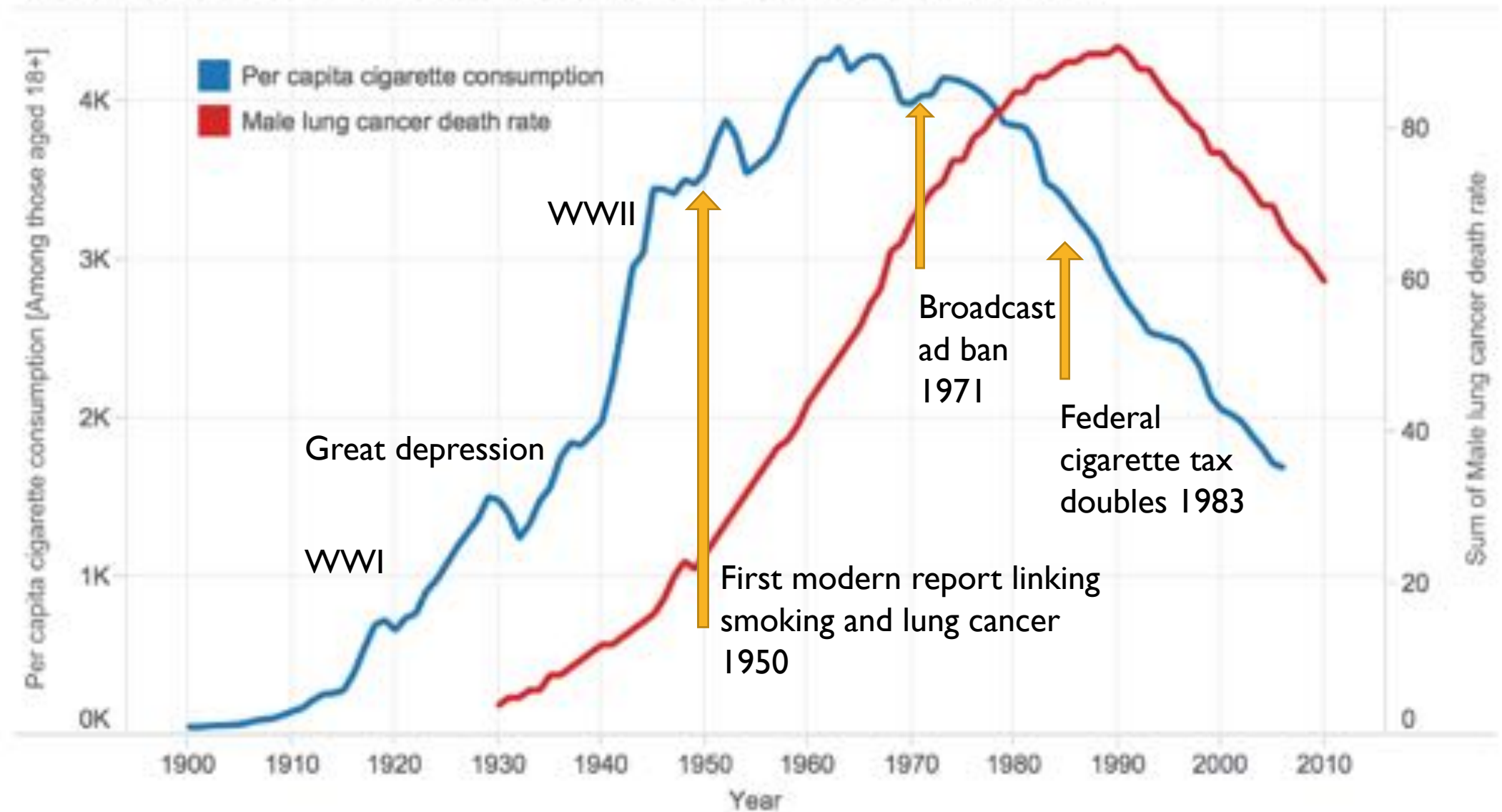
The occurrence of more cases of a disease than expected for a particular place and time



WHY DO WE NEED TO INVESTIGATE DISEASE OUTBREAKS?

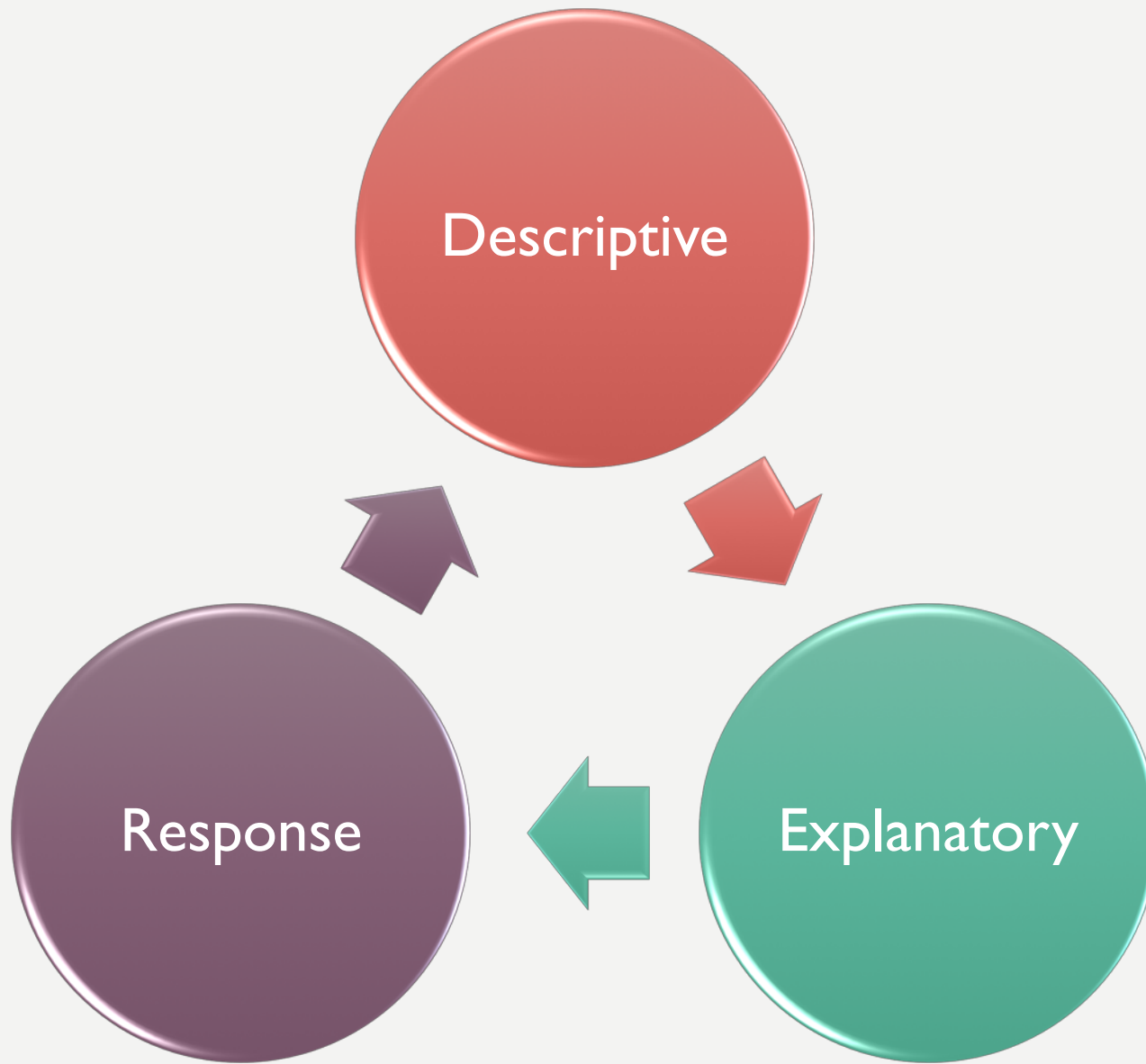
- Studying a new phenomenon leads to new scientific discoveries
 - knowledge and invention
- Control disease, reduce suffering
 - Medical and spiritual
 - Reinstatement of societal functions: healthcare system, governance

Trends in Tobacco Use and Lung Cancer Death Rates in the U.S.



Death rates source: US Mortality Data, 1960-2010, US Mortality Volumes, 1930-1959, National Center for Health Statistics, Centers for Disease Control and Prevention.

Cigarette consumption source: US Department of Agriculture, 1900-2007.



GENERAL PHASES OF AN OUTBREAK INVESTIGATION

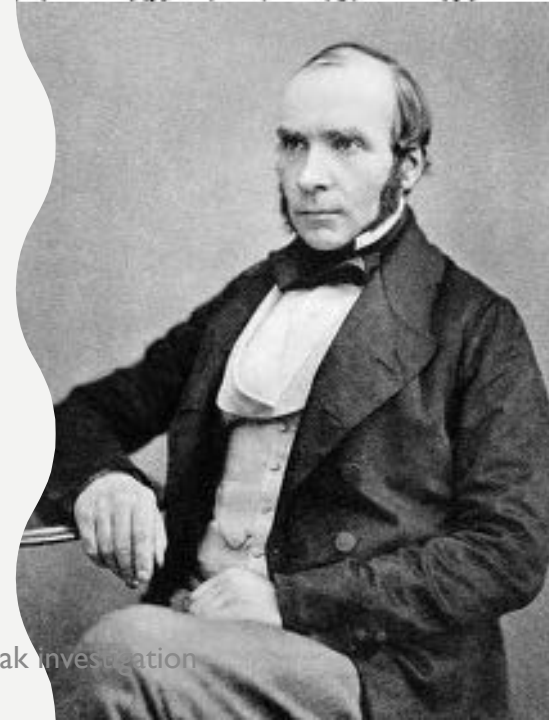
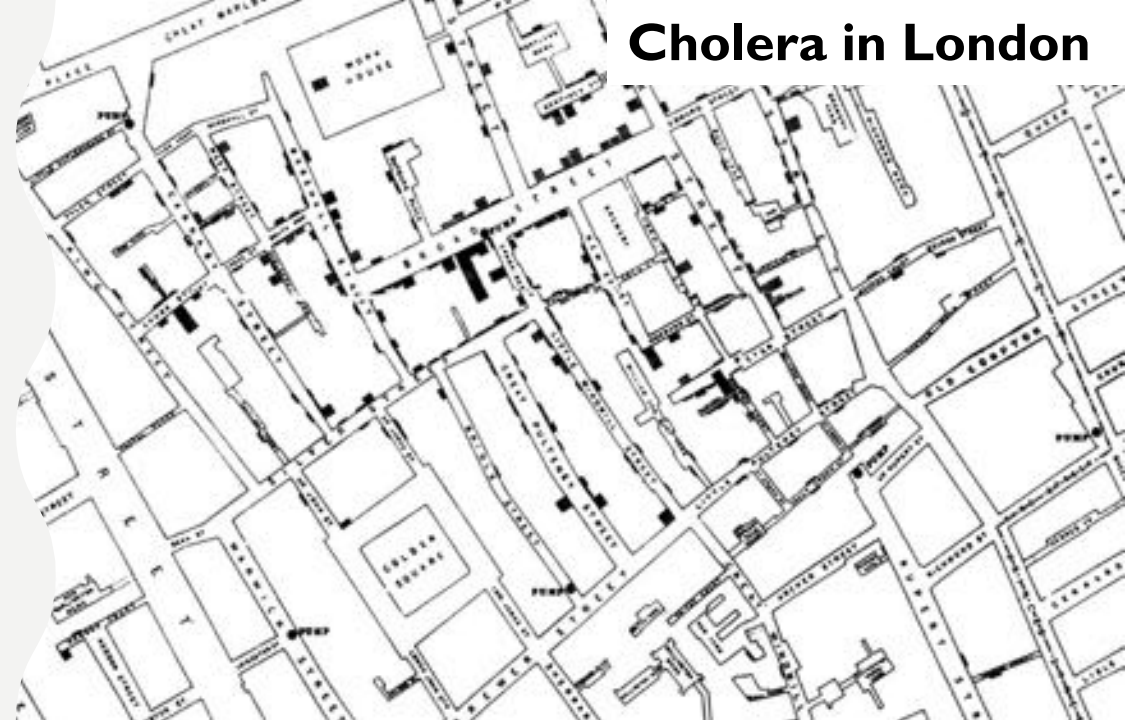
A thick, wavy yellow line runs vertically along the left side of the slide, starting from the top and extending to the bottom. It has a slightly irregular, hand-drawn appearance.

STEPS IN OUTBREAK INVESTIGATION

A BEGINNER'S GUIDE

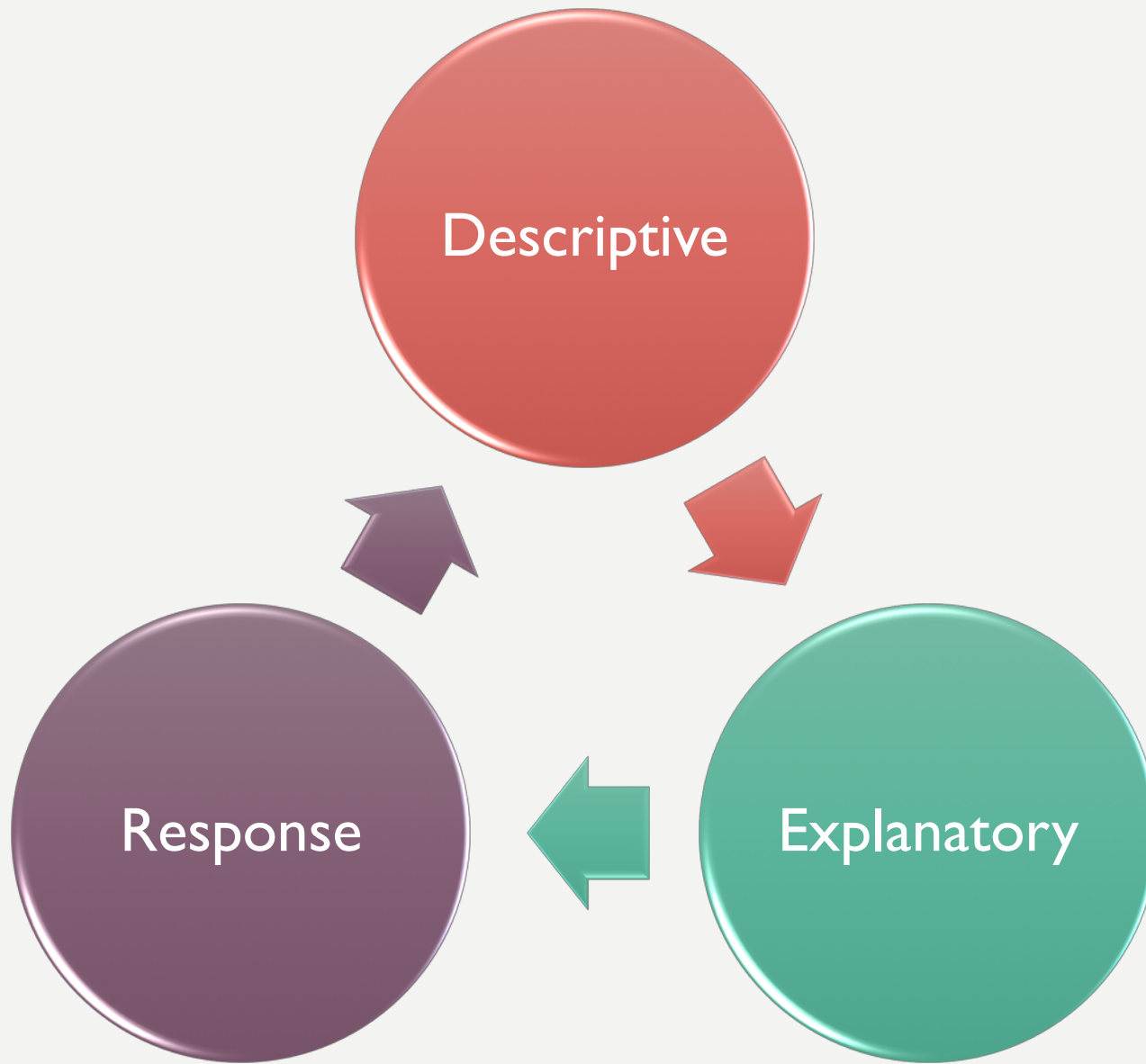
OBJECTIVES OF A FIELD INVESTIGATION

- Identify the:
 - Disease-causing agent
 - Source, and/or
 - Mode of transmission
- Characterize the extent of the outbreak: who has been affected?
- Identify exposures or risk factors that increase risk of disease
- Develop and implement control and prevention measures



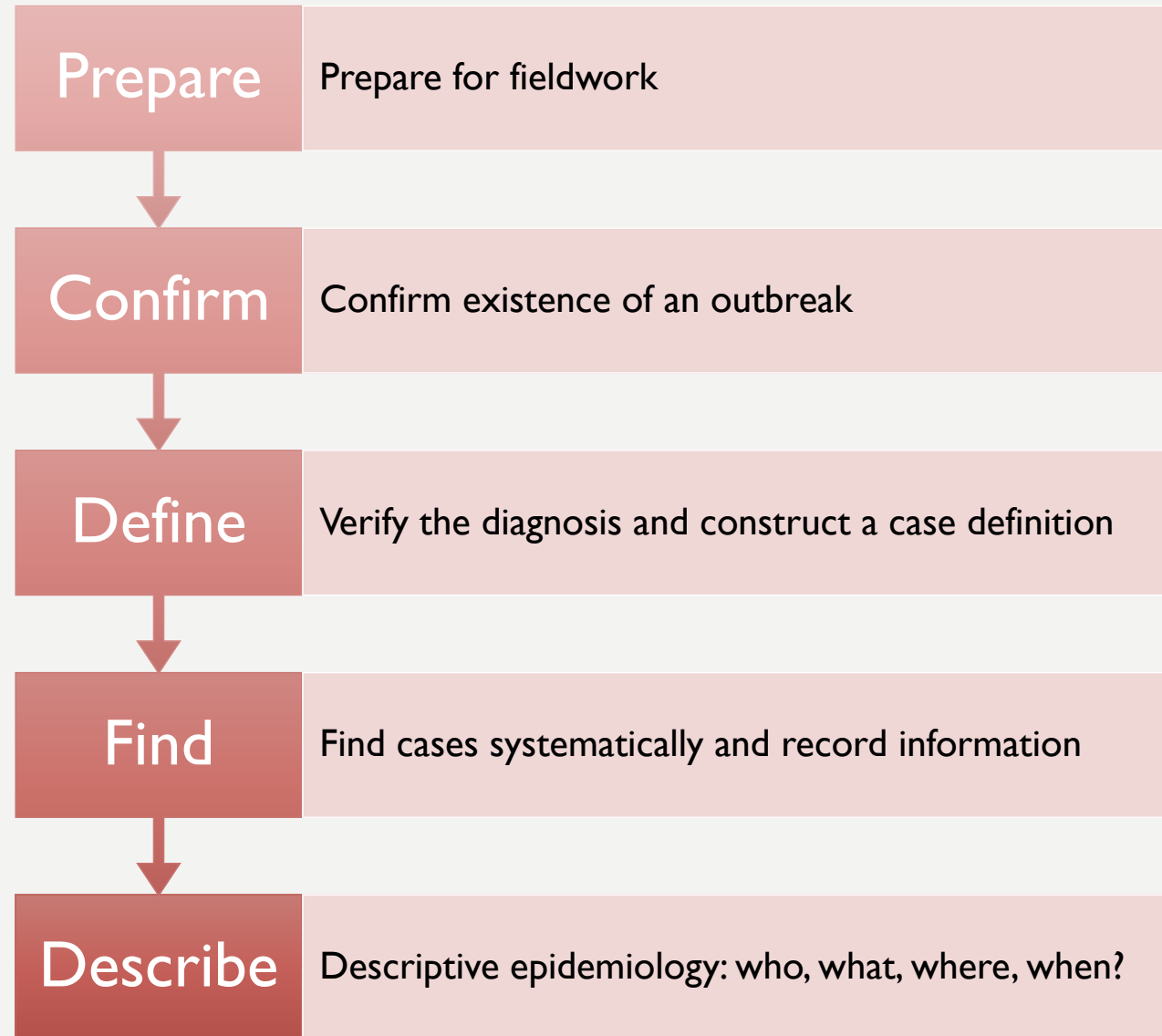
THE BEGINNING

- **Imagine you're writing a story** on a deadly doomsday outbreak – the virus that's going to kill everyone; zombies... **Answer the following questions:**
 - Who is the hero of your story? How does he discover the outbreak? What does he do?
- **Now think about what happens in real life...**
 - Who is usually the person that first discovers an outbreak?
 - What would this person do next?

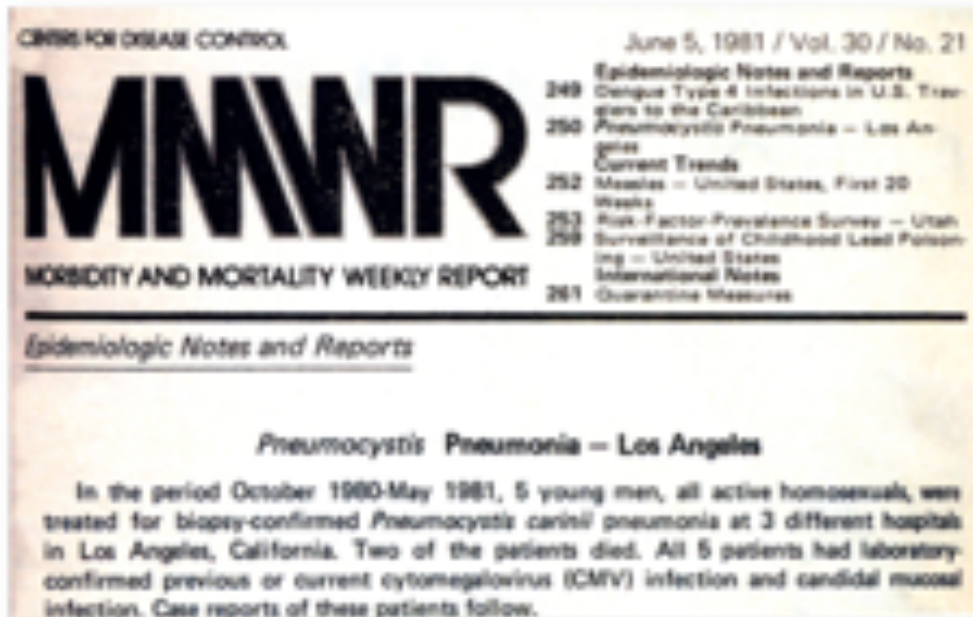


GENERAL PHASES OF AN OUTBREAK INVESTIGATION

THE DESCRIPTIVE PHASE



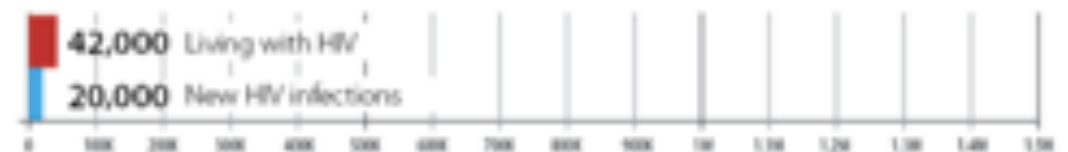
1981



Bar Graph Key

- Estimated number of persons living with HIV (diagnosed and undiagnosed)*
- Estimated number of HIV infections**

- June 5: First official reporting of what will be known as AIDS.
 - = A report described *Pneumocystis pneumonia* in previously healthy, gay men in LA. This is the first official reporting of what will be known as the AIDS epidemic.
 - http://www.cdc.gov/mmwr/preview/mmwrhtml/june_5.htm
- June: CDC forms Task Force on Kaposi's Sarcoma and Opportunistic Infections.
 - = About 30 Epidemic Intelligence Service officers and staff participated.
- July 3: Report of Kaposi's Sarcoma and *Pneumocystis pneumonia* in 26 homosexual men in New York and California.
 - = <https://stacks.cdc.gov/view/cdc/1265>

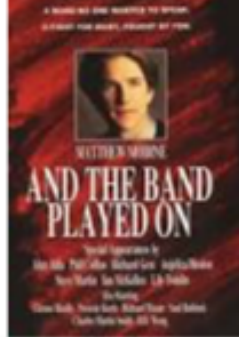


CDC HIV and AIDS timeline:

<https://npin.cdc.gov/pages/hiv-and-aids-timeline>

And the Band Played On

1993 · Drama · 2h 21m



7.8/10
IMDb

100%
Rotten Tomatoes

88% liked this movie

Google users



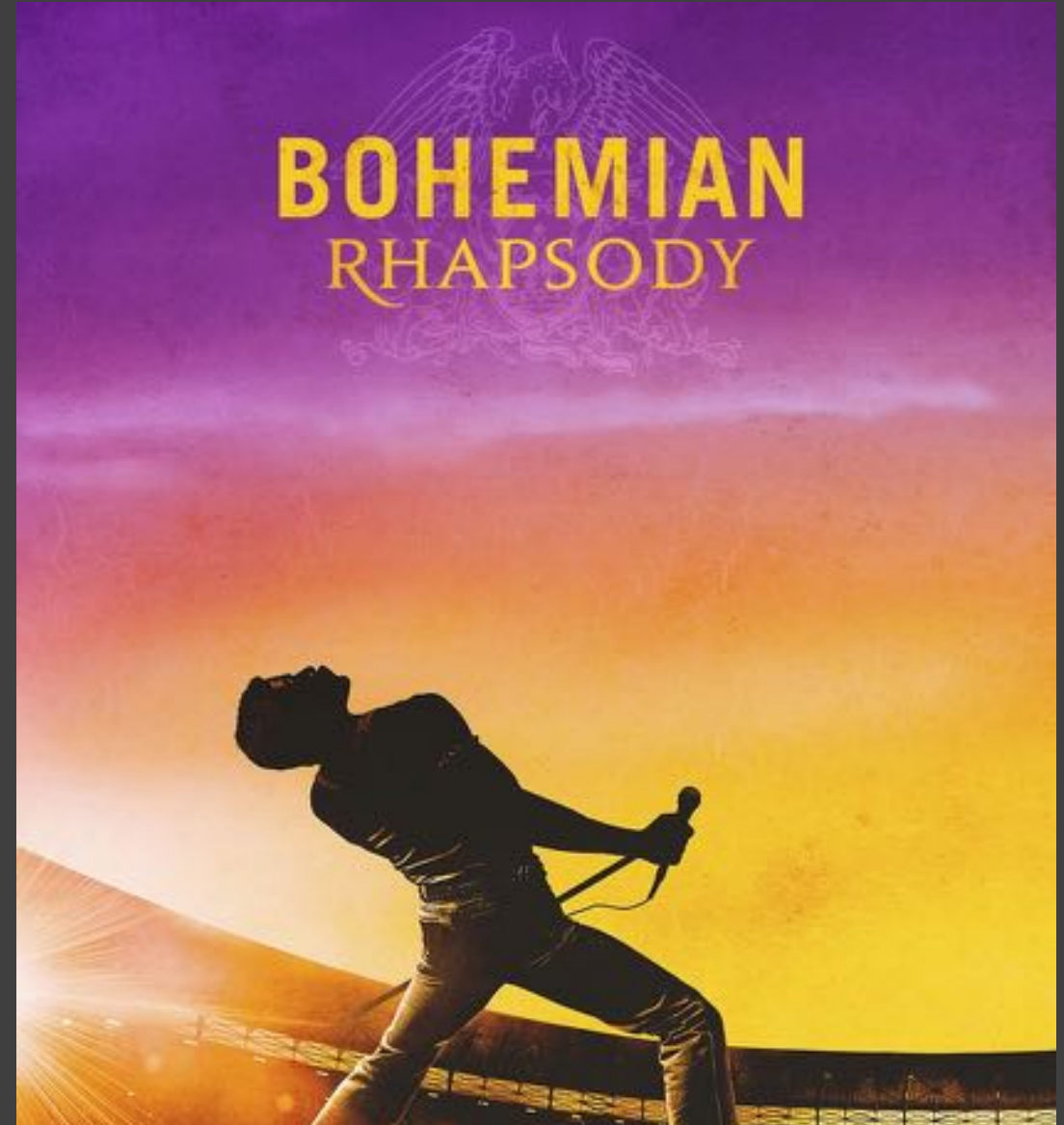
In 1981, epidemiologist Don Francis (Matthew Modine) learns of an increased rate of death among gay men in urban areas. The startling information leads him to begin investigating the outbreak, which is ultimately identified as AIDS. His journey finds mostly opposition from politicians and doctors, but several join him in his cause. As it becomes apparent that people have personal reasons to turn the other cheek, Francis persists. Meanwhile, the number of deaths continues to grow.

Release date: September 11, 1993 (USA)

Director: Roger Spottiswoode

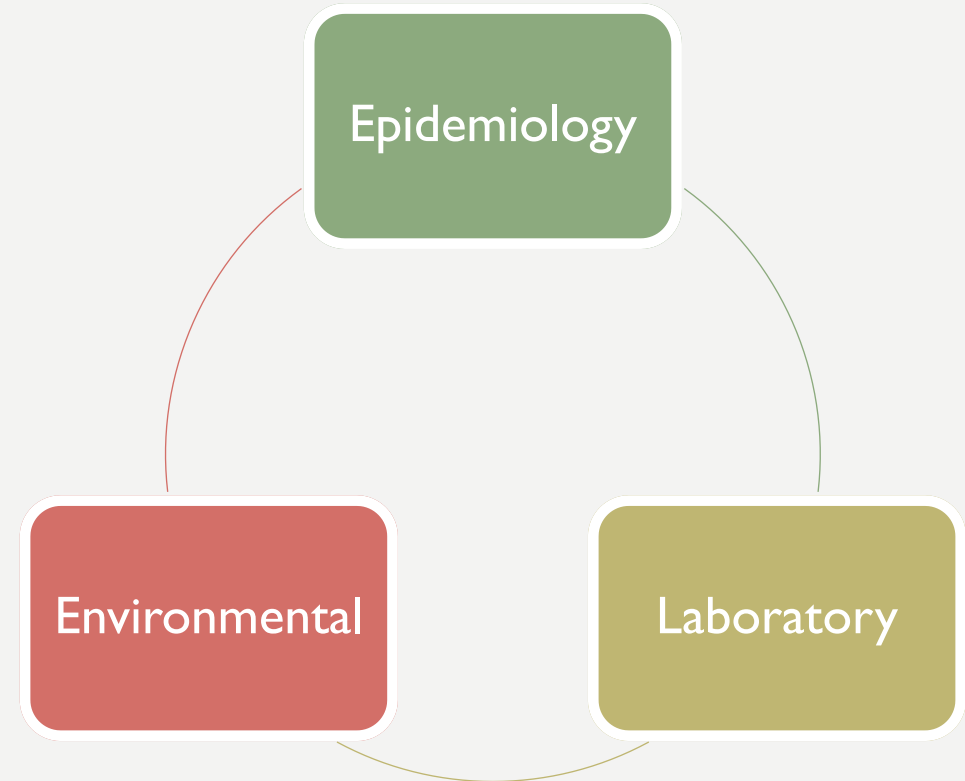
Budget: 8 million USD

Awards: [Primetime Emmy Award for Outstanding Television Movie](#),
[MORE](#)



HOW DO YOU PREPARE FOR FIELDWORK?

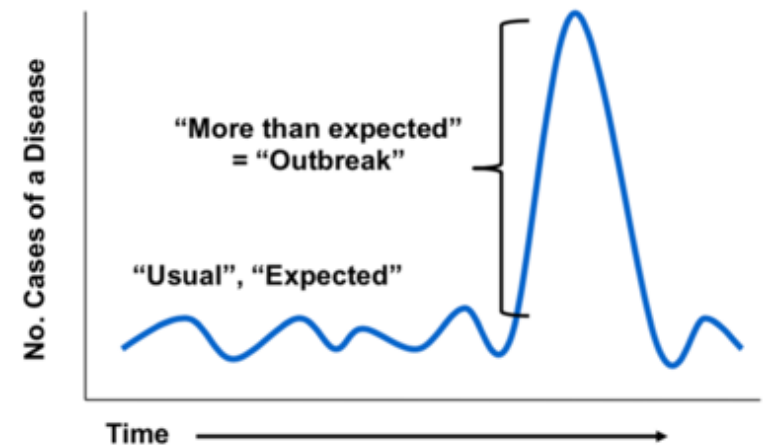
- Form a team
 - Group work: who should be in a team?
- Learn about the disease
- Make administrative, personnel, and logistic arrangements
- Coordinate with local contacts



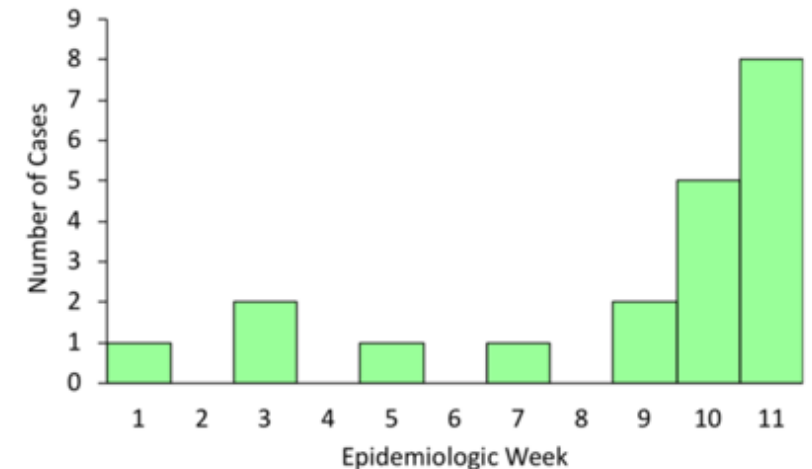
CONFIRM THE OUTBREAK

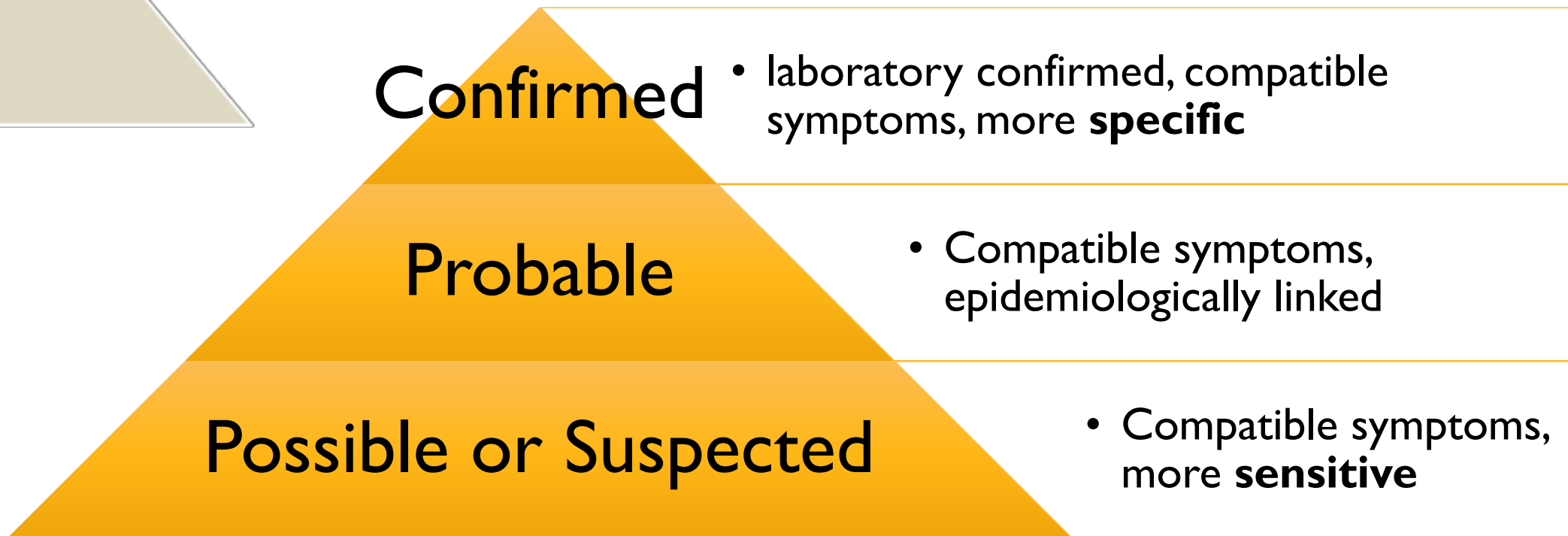
- REMEMBER: not all increases in number of cases represent outbreaks!
 - What are examples of increases in cases that do NOT represent an outbreak?
- Review reports
- Confirm same disease
- Confirm the number of cases exceeds the usual number

The occurrence of more cases of a disease than expected for a particular place and time



Number of Reported Cases of Dysentery by Epidemiologic Week, City X, 2015

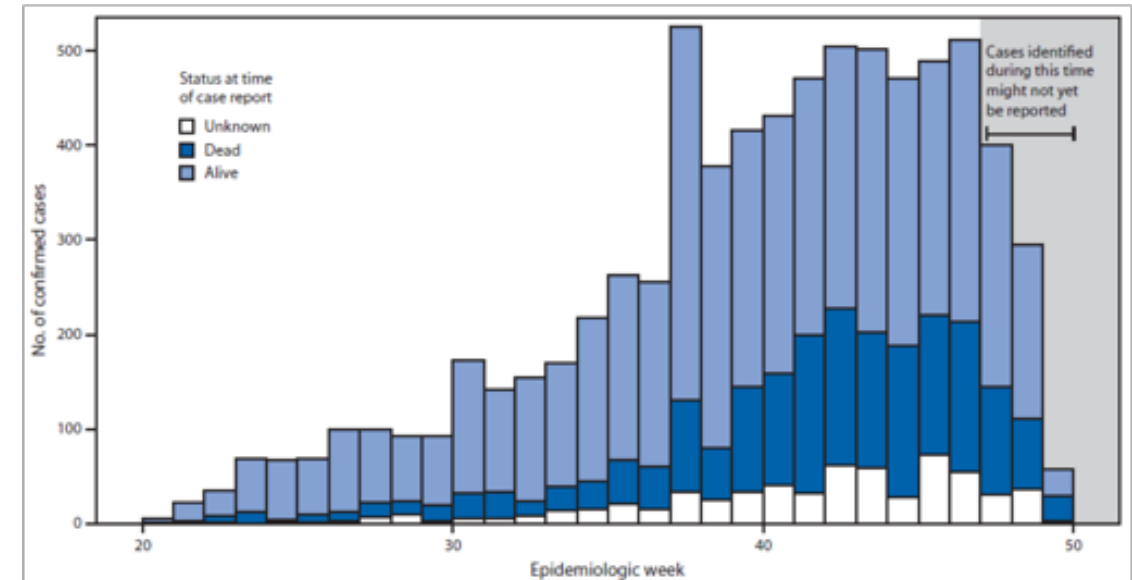
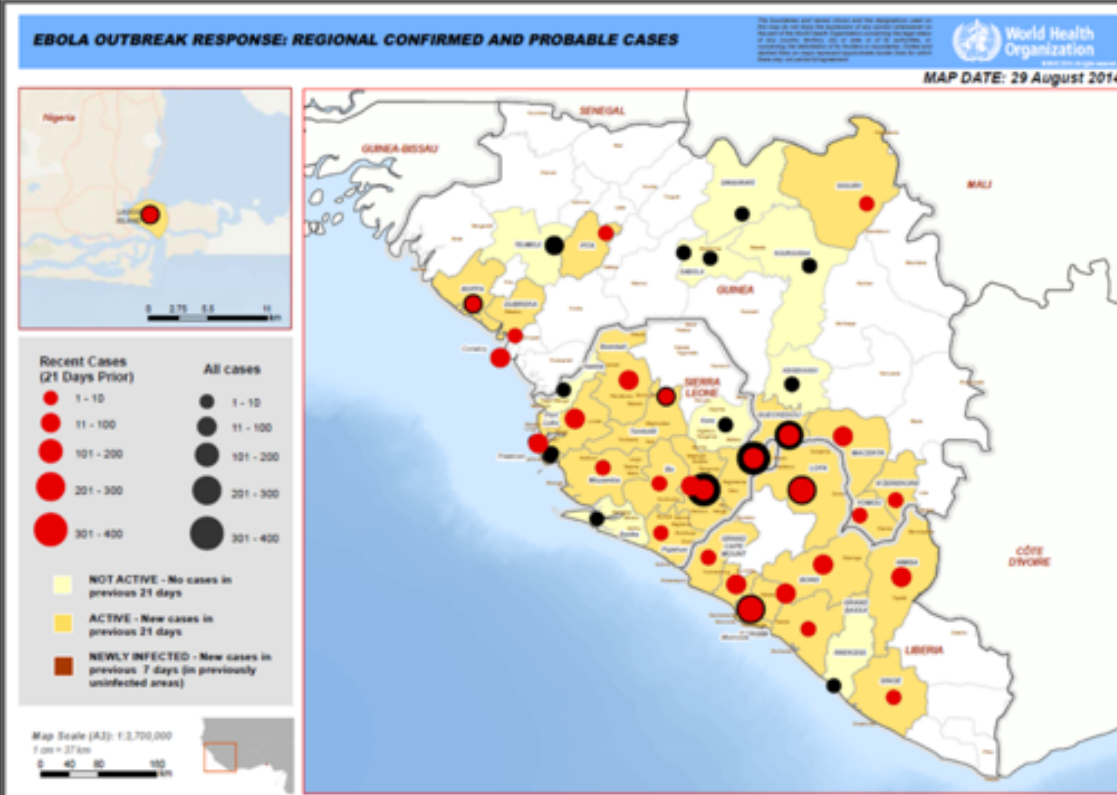




CASE DEFINITION

After defining a case, describe: who, where, when?

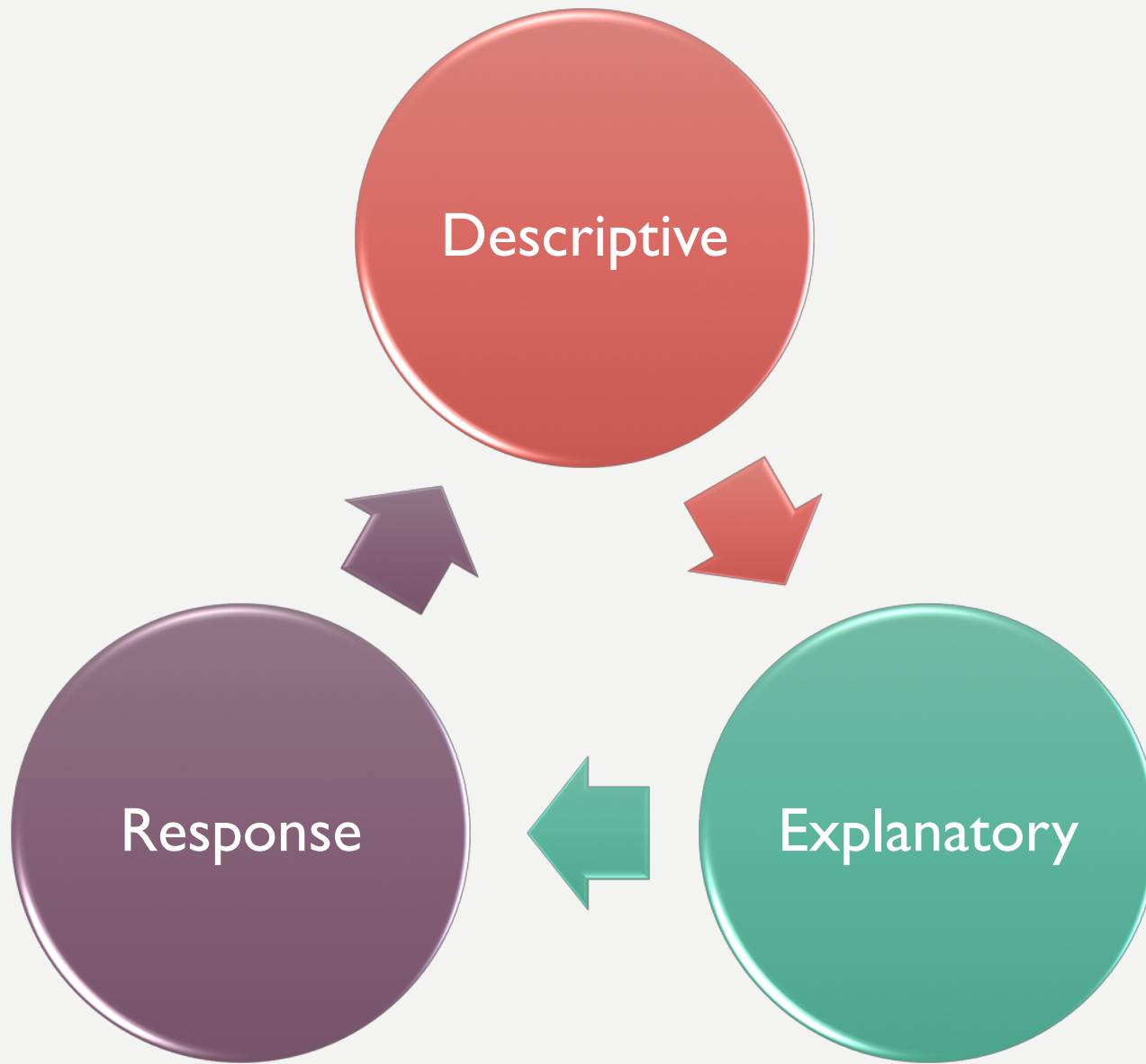
Ebola, 2014



MMWR 64(03);70-73

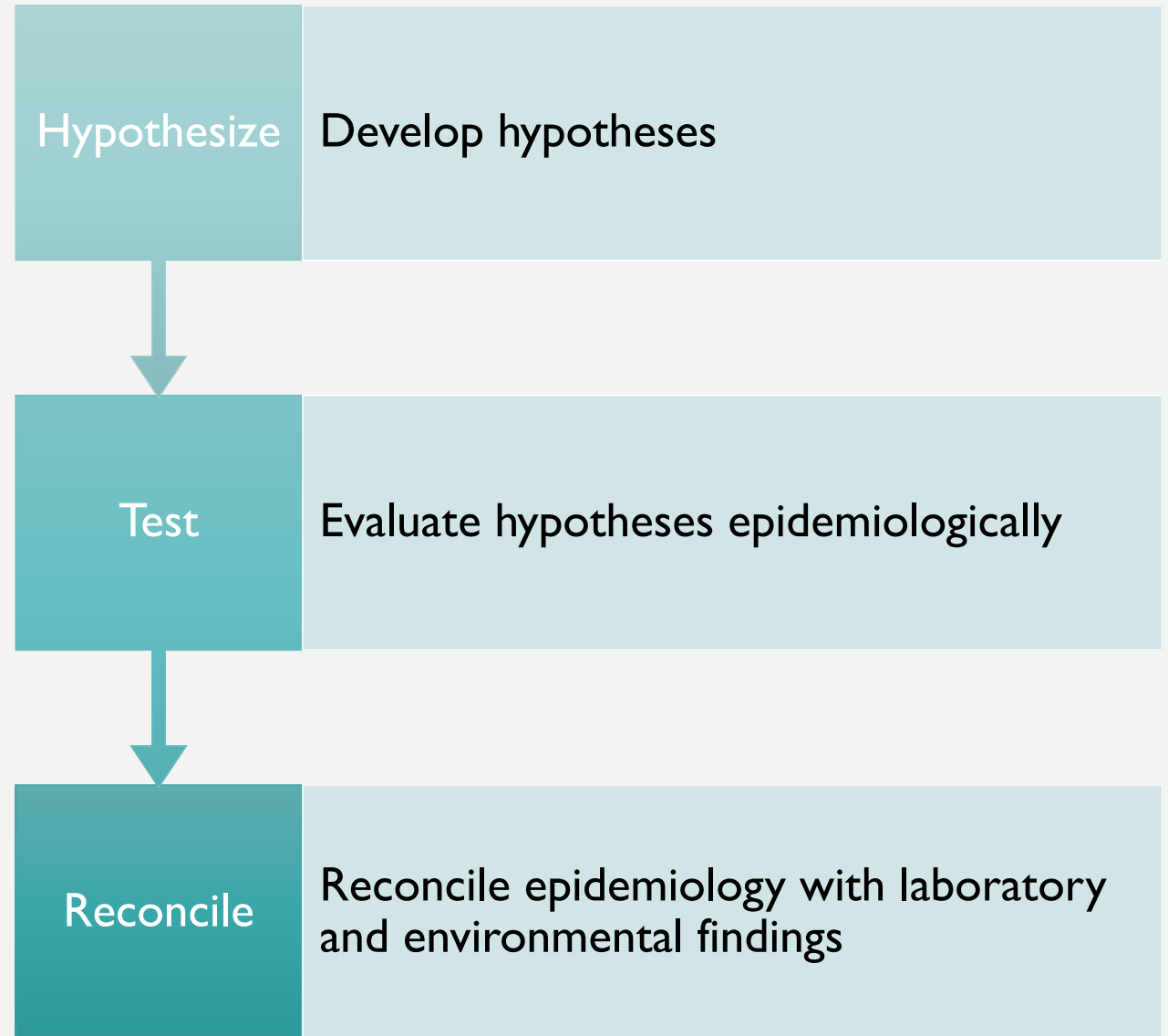
A graphic with a bright yellow background. In the center is a white, cloud-like shape with a scalloped border. Overlaid on this shape is the text "5 MIN BREAK" in a bold, dark brown, sans-serif font. The number "5" is slightly larger than the words "MIN BREAK".

5 MIN BREAK



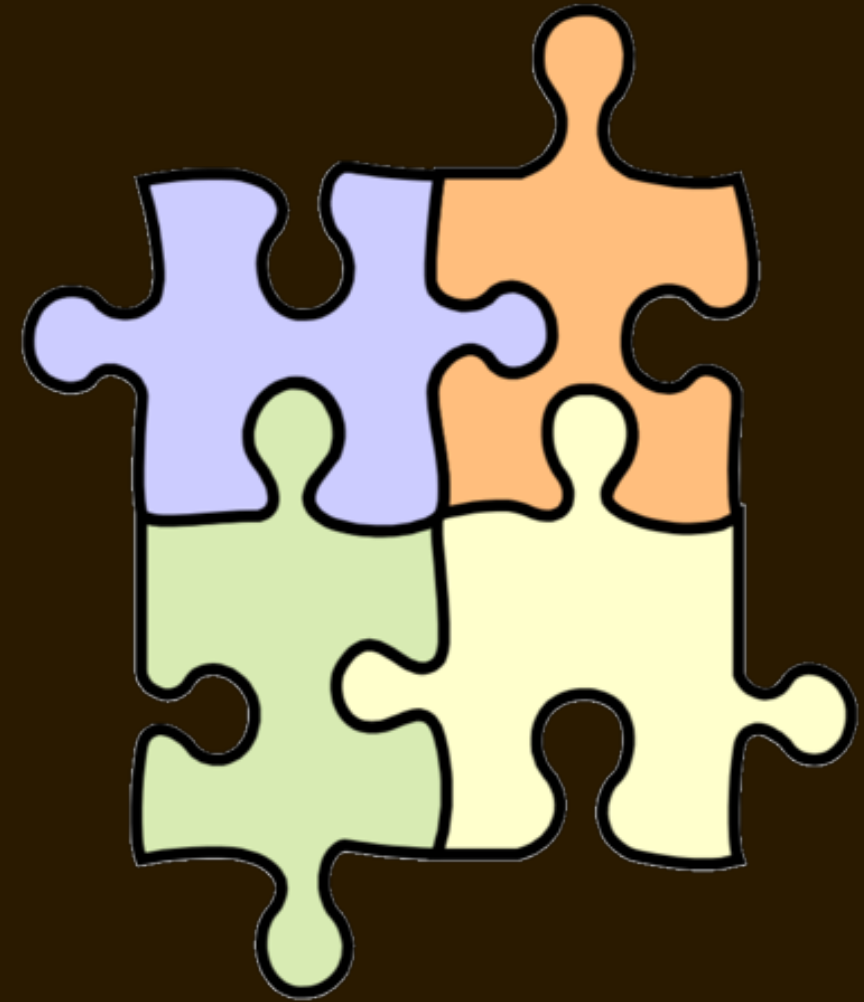
GENERAL PHASES OF AN OUTBREAK INVESTIGATION

THE EXPLANATORY PHASE



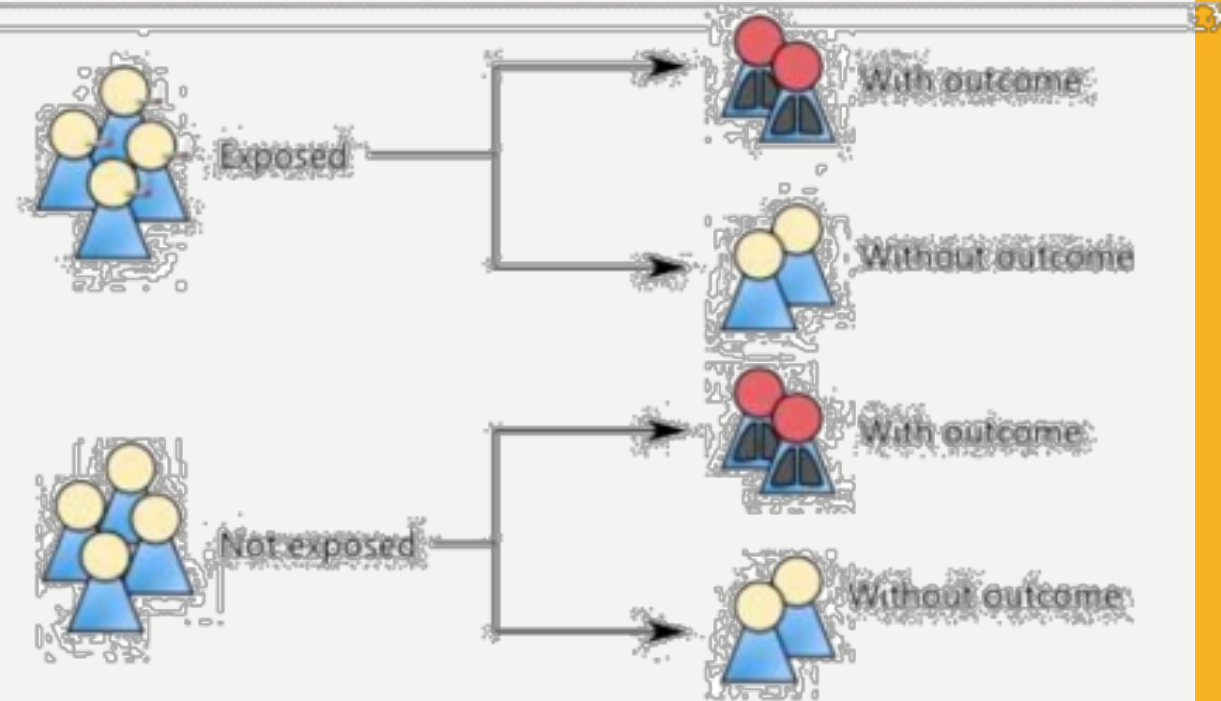
GENERATING HYPOTHESES IN AN OUTBREAK

- Hypothesis: educated guess about an association between an **exposure** and **outcome**, and/or about mode of spread.
 - Testable
- How to generate hypothesis?
 - Subject-matter knowledge
 - Descriptive epidemiology (where, who, where?)
 - Outliers (唯一汉族 “察布查尔病” 病例)
 - Talk to people! (open ended questionnaires)



EPIDEMIOLOGY (IN ONE SLIDE)

- How do you test if something is a cause for a disease?
- Conduct a study by
 1. identifying a cohort of people who have the potential to have the disease
 2. Ask about their exposures (X)
 3. Analyze the data on exposures and disease to test the hypotheses
 1. Are those exposed to X more likely to get disease?
 2. Are those with disease more likely to have been exposed to X?



Naveen Phuyal

<https://www.slideshare.net/naveen5112/5-cohort-studies>

E. coli through raw cookie dough

What patients reported in open ended interviews:

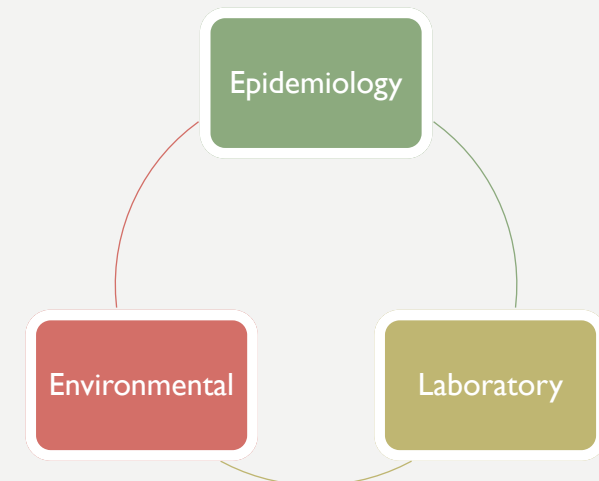
- 5 of 5 ate ground beef
- 3 of 5 ate strawberries
- 5 of 5 ate raw cookie dough
- 4 of 5 ate Brand X raw cookie dough

Chocolate milk w/ Nestle Quick variety → not sure
Colgate Kids or Crest Kids
Dutamine lately
Cookie dough → Toll House mini choc chips } sm amt
Brownie mix → Pillsbury } raw when
Korean school on Saturday → p school → mom's cooking
Korean store to get water mood

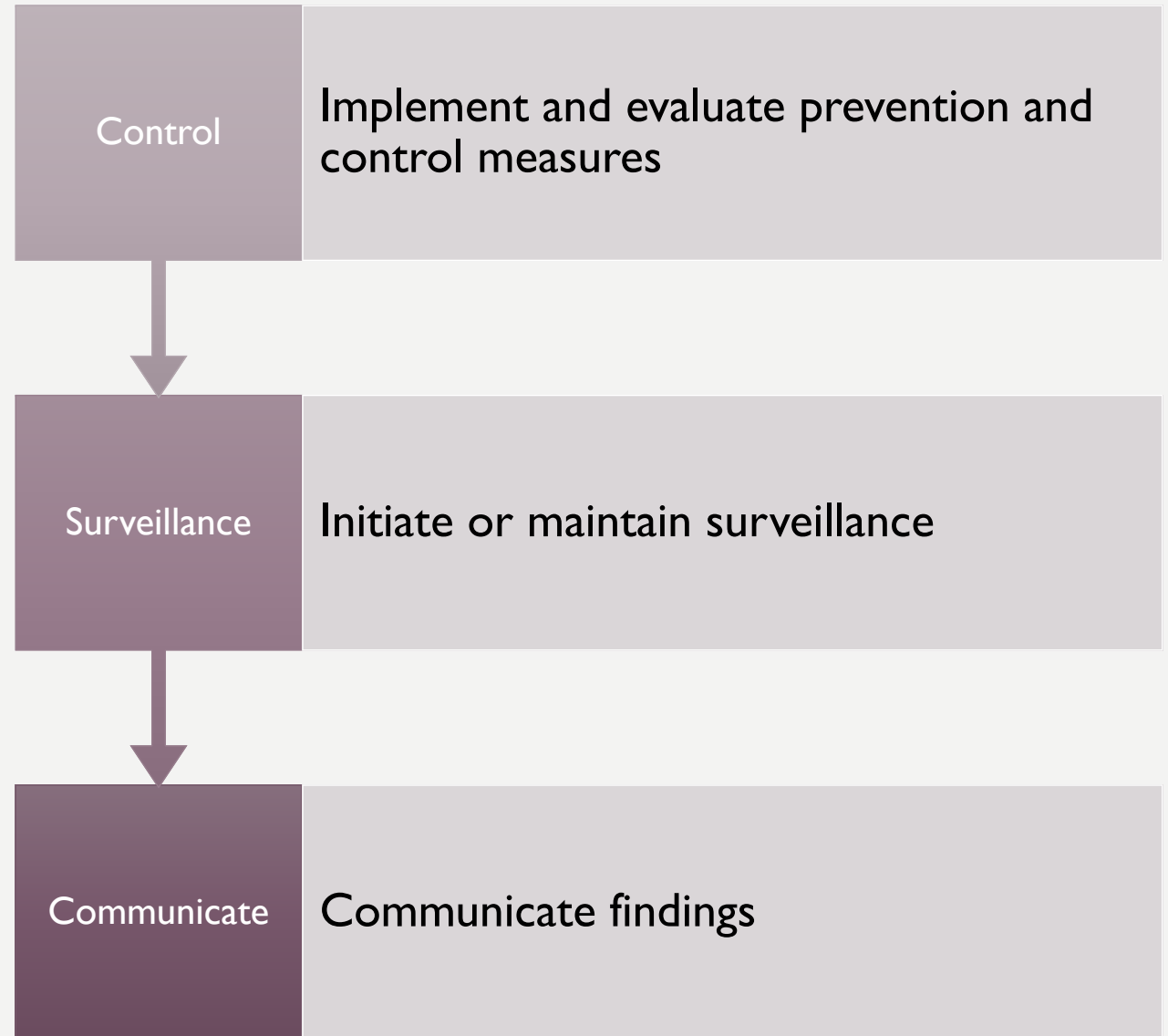


	Cases	Controls
Ate raw cookie dough	33	4
Did not eat raw cookie dough	3	33

Could this be due to chance? $p < 0.0001$



THE RESPONSE PHASE



RELATIVE PRIORITY OF INVESTIGATIVE AND CONTROL MEASURES

		Source/Mode of Transmission	
		<i>Known</i>	<i>Unknown</i>
Causative Agent	<i>Known</i>	Investigation + Control +++	Investigation +++ Control +
	<i>Unknown</i>	Investigation +++ Control +++	Investigation +++ Control +

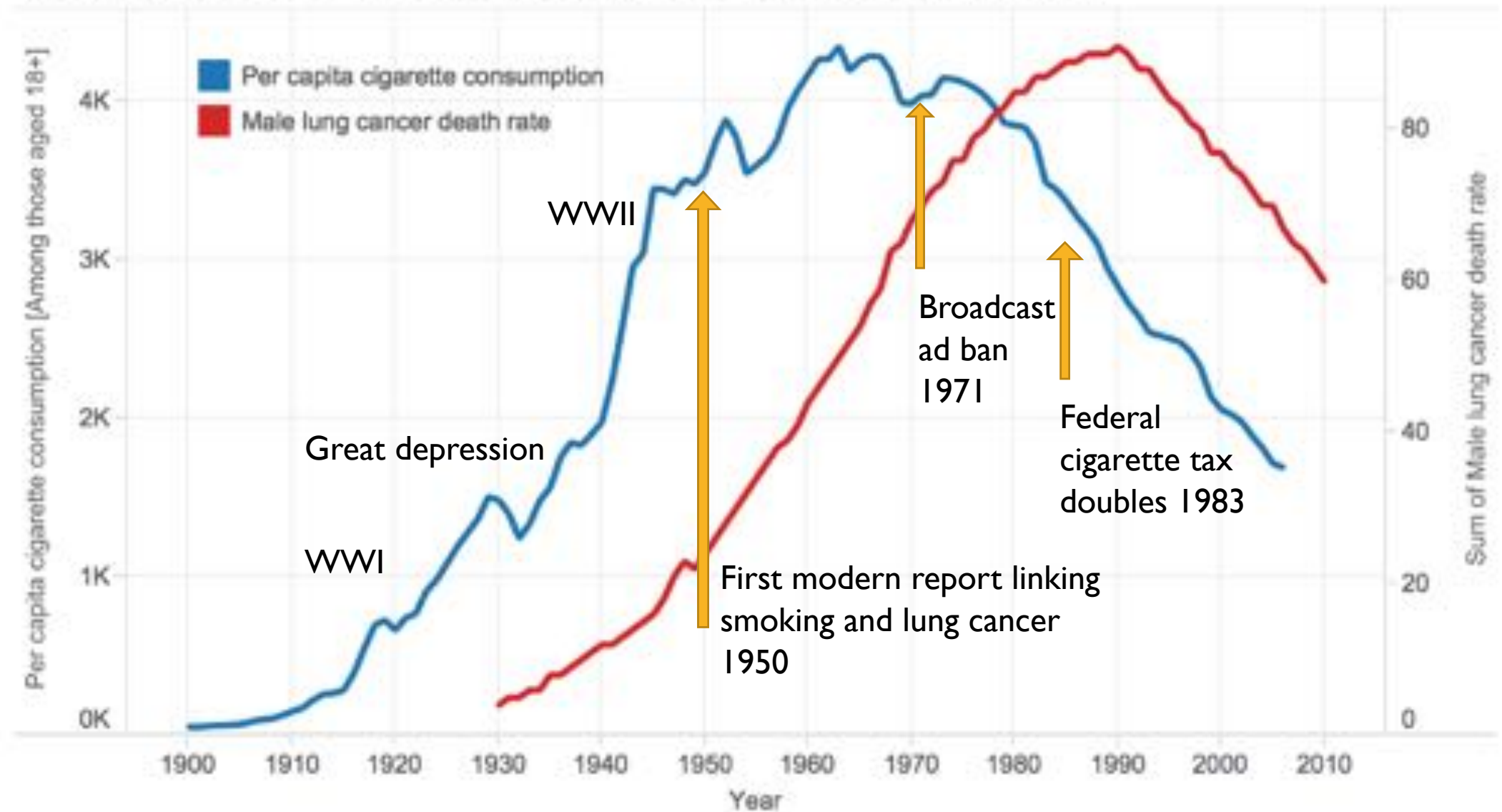
+++ Higher Priority
+ Lower Priority

PREVENTION AND CONTROL MEASURES

- Immediate control measures
 - Work with persons at risk
 - Reduce mortality (early presentation, hypoglycemia)
 - Reduce morbidity (food before bed)
- Long term control measures
 - Work with regulators and government
 - Address underlying vulnerabilities (under-nutrition)

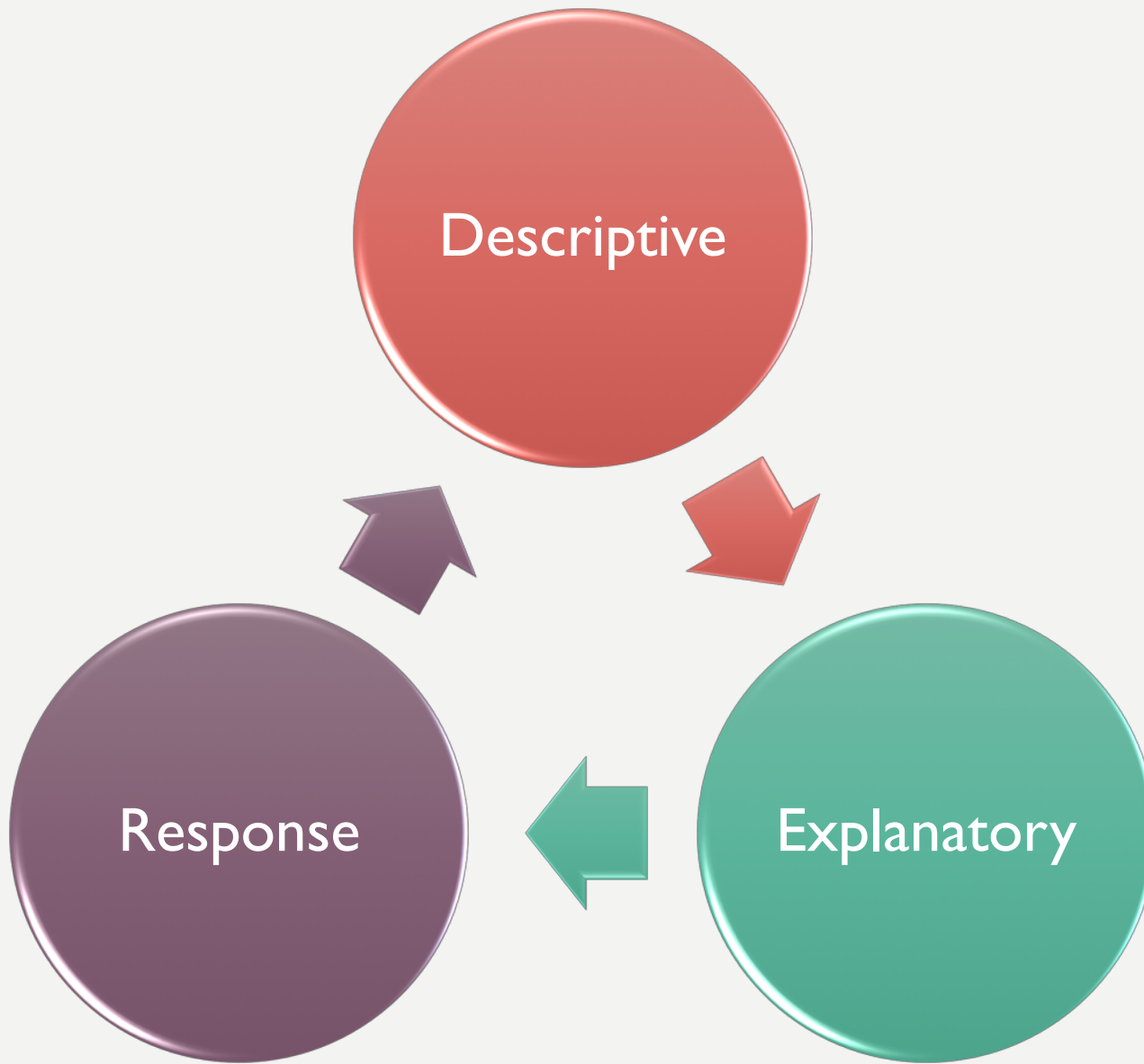


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GENERAL PHASES OF AN OUTBREAK INVESTIGATION

ACKNOWLEDGEMENT



Dr. Kayla Laserson, Investigating Outbreaks course in HSPH (EPI523)



CDC EIS Resources



India EIS Programme





ASSIGNMENT

A BEGINNER'S GUIDE TO OUTBREAK INVESTIGATION

ASSIGNMENT OPTION A

- Choose **one outbreak in history** you're interested in exploring. Focus on one outbreak (e.g. Ebola during 2014-15), rather than a disease.
- Describe to the class how this outbreak was investigated. Make sure to identify historical **events** with the different **steps** in an outbreak investigation you have learned in this class.
- As a bonus, critique aspects of the investigation and tell us what you would have done if you were investigating the outbreak.

– ***5 min presentation***

OUTBREAKS MENTIONED IN THIS CLASS

- SARS
- Acute neurological encephalopathy (lychee)
- Cholera
- HIV
- Ebola
- 察布查尔病
- Cookie dough *E. coli* outbreak

But you can choose any other outbreak in history!

- Toxic shock syndrome
- Influenza during WWI
- A recent school/migrant tuberculosis outbreak
- MERS
- *Others...*

ASSIGNMENT OPTION B

- Either choose or design a ***fictional product*** which illustrates the ideas of an outbreak investigation
- Present to the class how this *fictional product* embodies the different steps in an outbreak investigation. Make sure to explain what this fictional product is, and answer the following questions:
 - Which steps are illustrated in this product?
 - Which steps are missing in this product?
 - What is the role of individual citizens in this outbreak, and what is the role of the government in this outbreak?
 - ***5 min presentation***

FICTIONAL PRODUCT

- A novel
- A painting
- A game
- A TV/radio show
- A song
- *Anything else*

Extra challenge:
Find a Chinese language
literature/game/show!

