Respiratory Outbreaks 101

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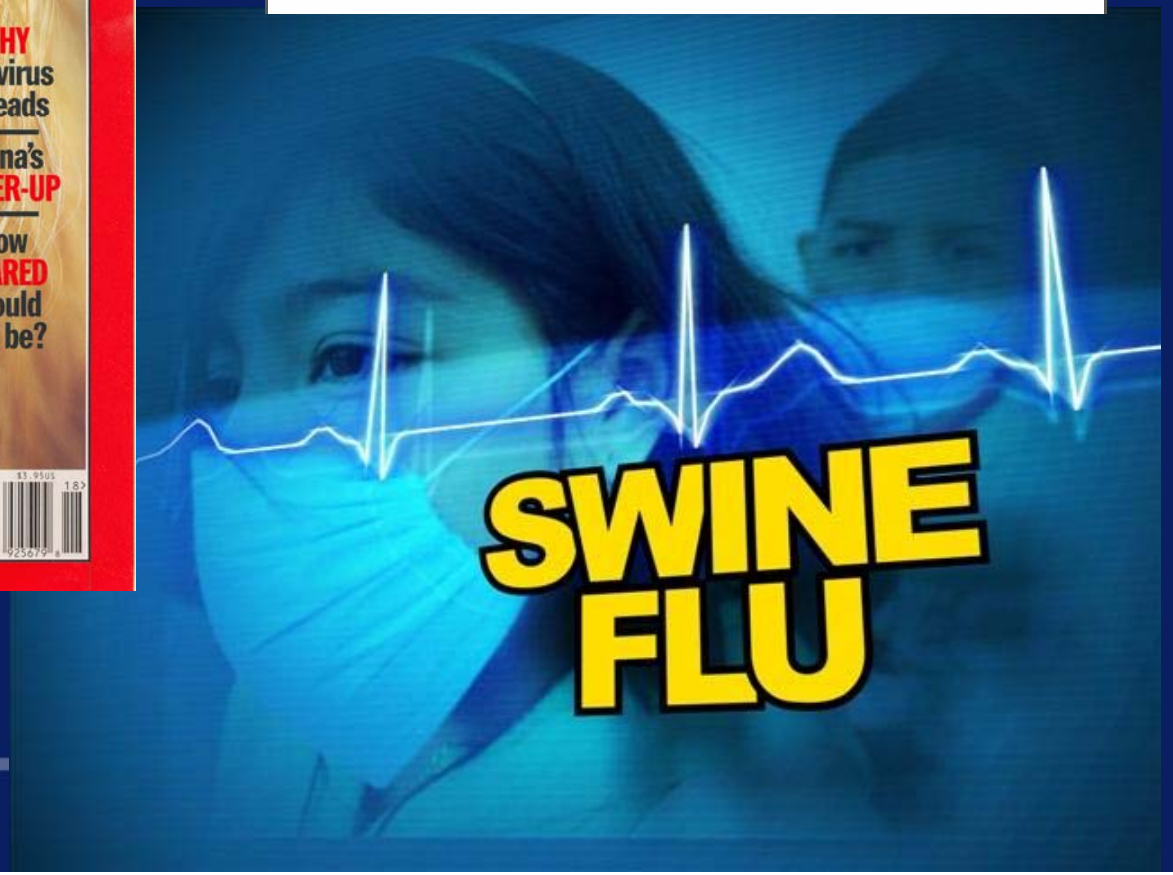
County of Los Angeles Public Health

The New York Times

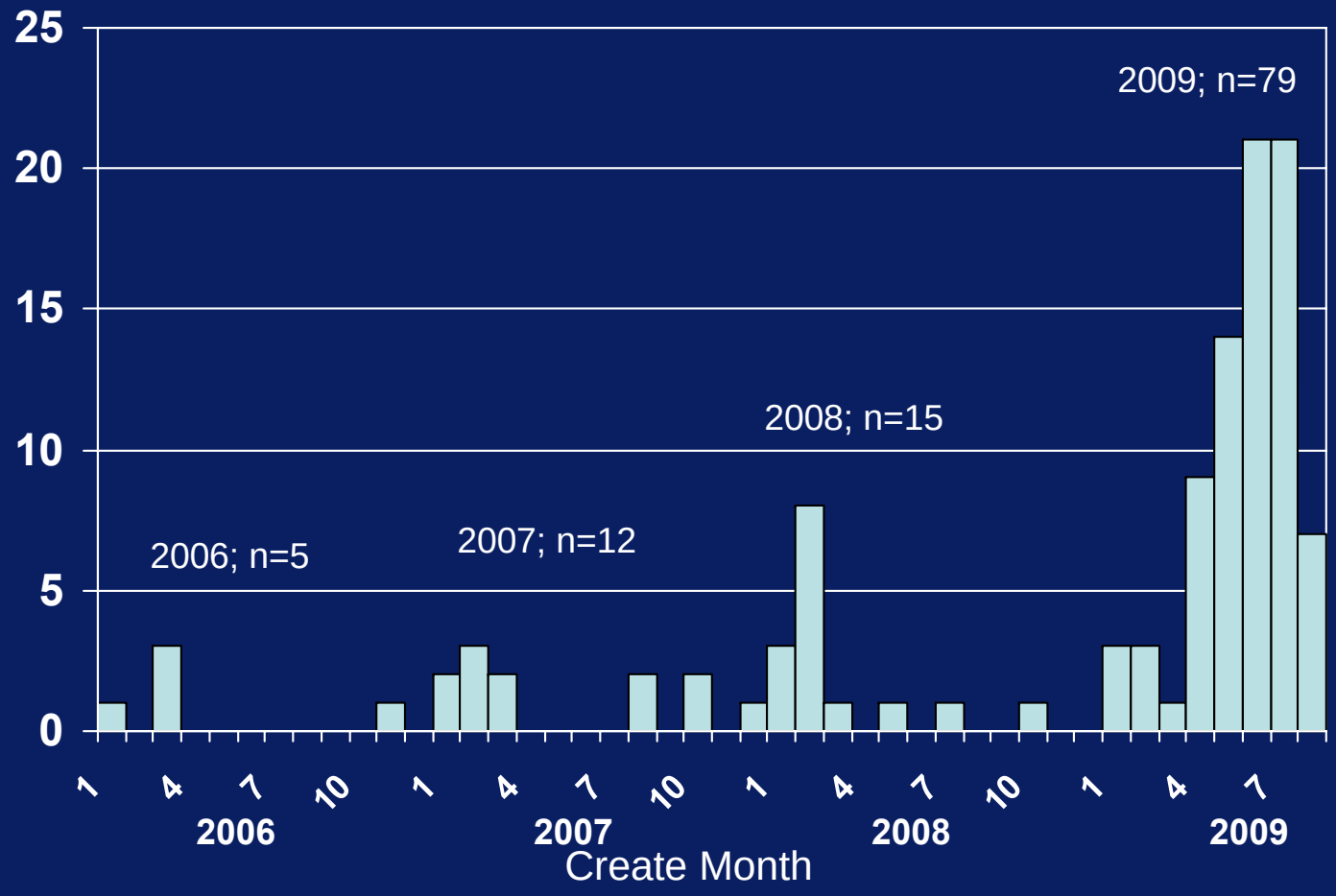
THURSDAY, SEPTEMBER 14, 2006

Tuberculosis is outrunning us. The accelerated pace of resistance comes from the world's neglect of tuberculosis. Stinginess created this problem. Generosity is needed to fix it.

– editorial – 14-Sep-2006



Reported Respiratory Outbreaks LAC by Month 2006 – 2009 to Date*



*Respiratory outbreaks with disease names: influenza, H1N1, ILI, Other, Unk. Resp., Unspecified

51 outbreaks in 2009 pending final closure.

As of August 30, 2009

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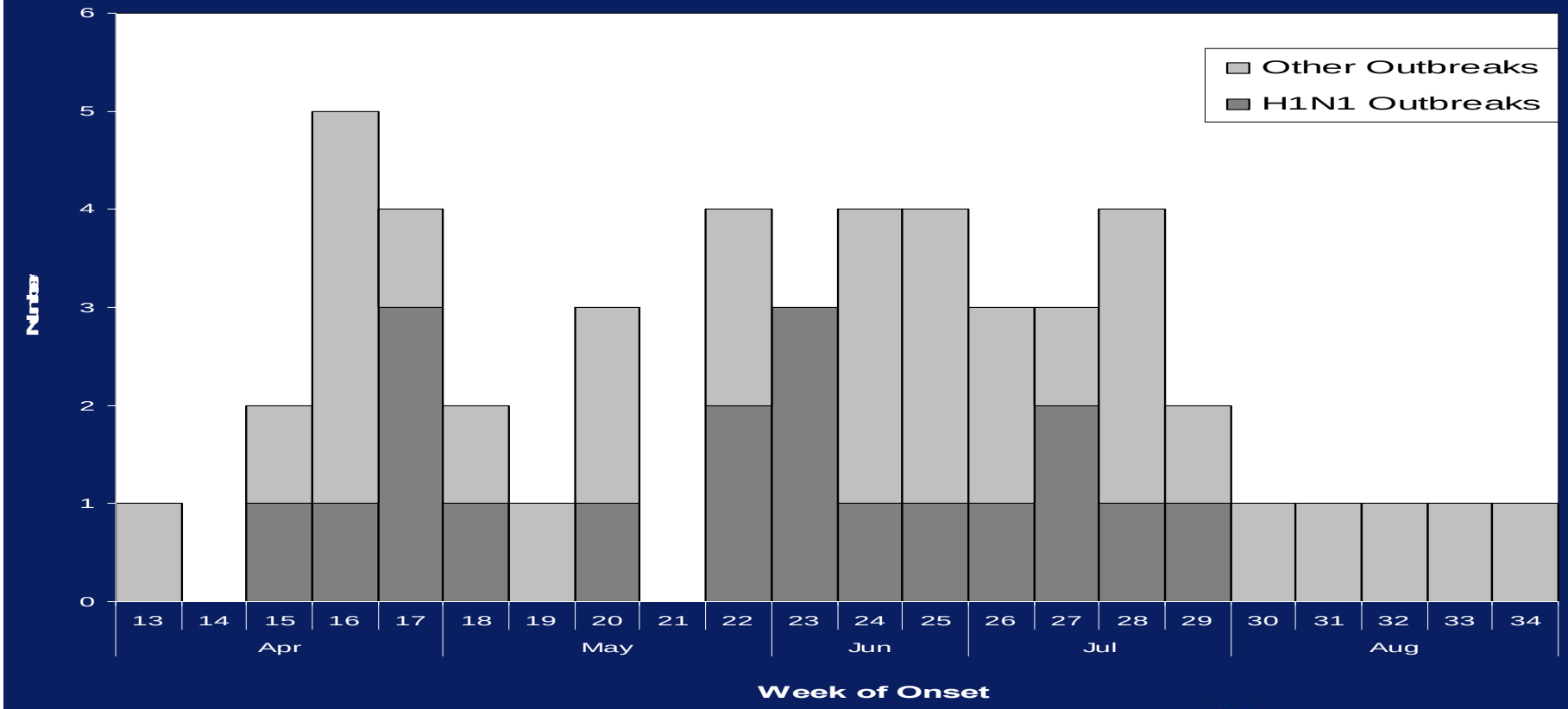
Total Number of Respiratory Illness Outbreaks by MMWR Week April - August, 2009



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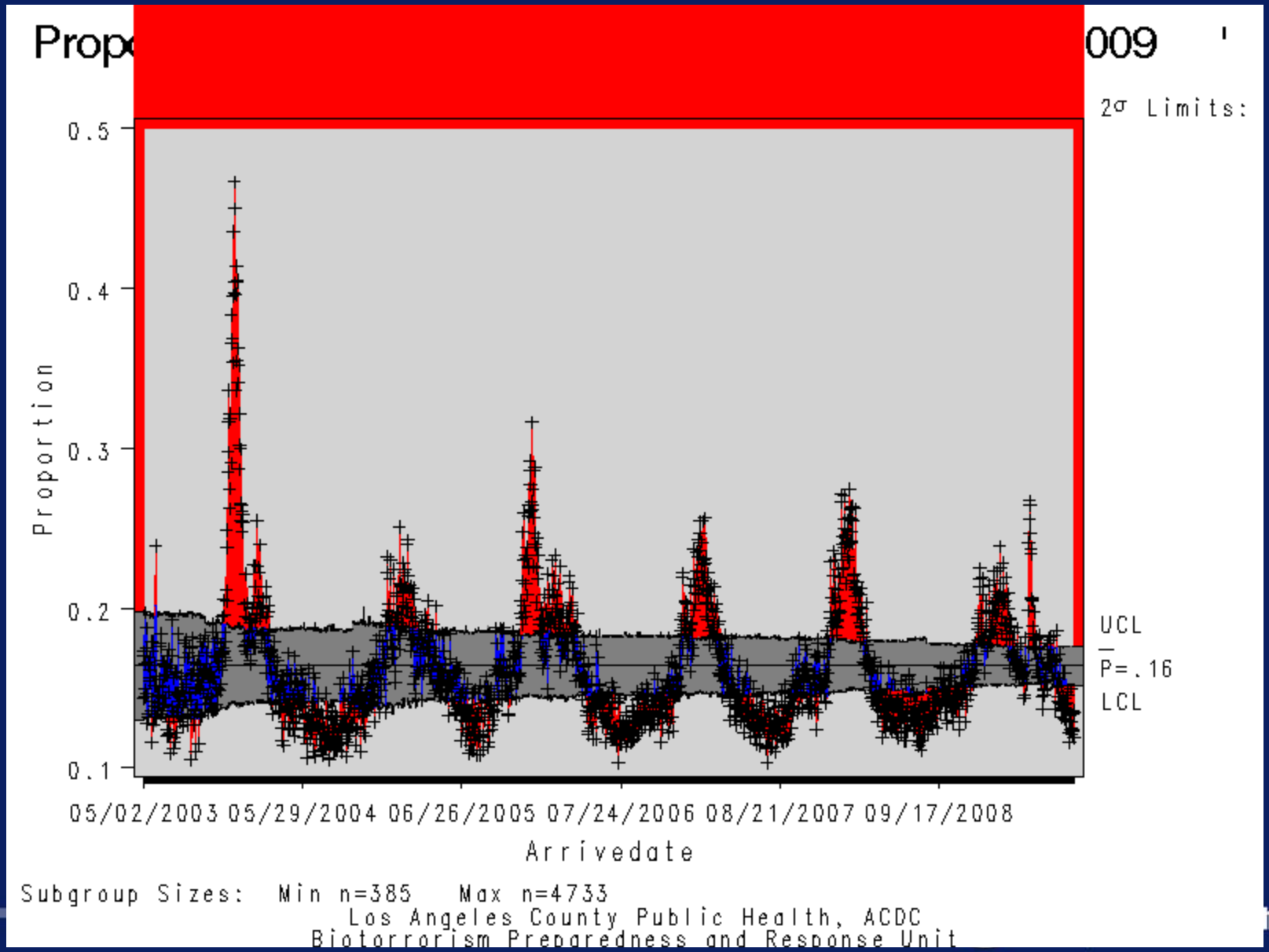
Respiratory Outbreaks: Challenges

- Differentiating outbreaks from sporadic disease can be difficult
  - Baseline disease rates often unknown
  - Seasonality: cyclical increases in sporadic disease expected
- Wide range of pathogens can cause similar clinical syndromes
  - Viral, bacterial, fungal
  - Outbreaks may involve multiple etiologies
  - Potential new pathogens

Seasonal Variation



Respiratory Outbreak Etiologies

Pathogens	Hantaviruses, New World
Adenovirus	*Histoplasma capsulatum*
Bacillus anthracis	Human metapneumovirus
Blastomyces dermatitidis	Influenza viruses
Bordetella pertussis	*Legionella* spp.
Chlamydia (Chlamydophila) psittaci	*Mycobacterium tuberculosis*
Chlamydia (Chlamydophila) pneumoniae	*Mycoplasma pneumoniae*
Coccidioides immitis	Parainfluenza virus type 1-4
Coronavirus	Respiratory syncytial virus (RSV)
Coxiella burnetti	Rhinovirus
Francisella tularensis	*Streptococcus pneumoniae*
Group A *Streptococcus*	*Yersinia pestis* *(secondary to bubonic plague)*
Haemophilus influenzae	*Yersinia pestis* *(primary pneumonic plague)*

Why Investigate?

We Investigate Because

- Potential intervention
  - Vaccine, environmental intervention, education
- Advance knowledge
  - Epidemiologic – e.g., disease or transmission characteristics
  - Laboratory– e.g., diagnostic test evaluation
  - Intervention effectiveness
- Unusual outbreak characteristics
  - Unknown etiology or clarification of causative agent(s)
  - Severe disease
  - Large or rapidly progressing
  - Potential BT event
  - Vulnerable or unusual population
- Demand--excessive public anxiety/concern

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Goals

- To determine etiology of respiratory morbidity and mortality in LA County
- To reduce morbidity and mortality due to respiratory outbreaks in LA County
  - May not be able to reduce transmission
- To ally concerns of the public
- Special studies
  - Intervention efficacy

Common Definitions

- **Outbreak – An outbreak or cluster of respiratory disease is illness in excess of what would expected for a given time and location**
- ***Epidemic* – a located cluster of cases**
- ***Pandemic* – worldwide epidemic**

AFRI

- Most of the time we don't know the etiology of the respiratory outbreak

- Acute Febrile Respiratory Infection
  - Fever >100 °F or 38°C
  - New onset cough or sore throat

LA County Definition for AFRI Outbreak

- Community setting: 5 or more AFRI occurring in a 1 week period in an epidemiologically linked group
- Congregate living setting: 3 or more AFRI occurring in a week period
- Congregate living setting: 1 case of confirmed influenza

First Call

- **What do you do?**

Initial Outbreak Assessment

- Initial outbreak assessment like doing a history and physical
- Gather subjective and objective data
- Make a SOAP note

Initial Outbreak Form (1)

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Acute Communicable Disease Control
313 N. Figueroa St., Rm. 212, Los Angeles, CA 90012
213-240-7941 (phone) 213-482-4856 (facsimile)
www.publichealth.lacounty.gov/acd

Initial Outbreak Form for School/Daycare Settings

Fax completed form to ACDC at (213) 202-5999

VCMR ID: _____ Health District: _____ Outbreak Number: _____

Type of Outbreak: ☐ Respiratory ☐ Gastrointestinal (GI) If GI, is food source suspected?: ☐ Yes ☐ No ☐ Unknown
☐ Rash ☐ Other: _____

Facility Name		Date of Initial Report ___/___/_____	
Address- Number, Street	City	State	ZIP Code

Contact Person
Name: Phone ( )

Type of Facility	Date of Site Visit
☐ School ☐ Daycare ☐ Other (please specify):_____	___/___/_____ OR ☐ Not applicable

Facility information

Total number of children/students: _____ Total number of staff: _____

What are the business hours for the school/daycare facility? _____ AM/PM to _____ AM/PM

Is there an onsite healthcare worker (e.g., school nurse)? ☐ Yes ☐ No If Yes, what is his/her schedule? _____

Demographics

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Initial Outbreak Form (2)

OUTBREAK RELATED QUESTIONS

Onset of symptoms (initial case) ___/___/_____

Number of classrooms involved? _____ What grade(s)? _____ Total number of children in those classrooms _____

Special Ed.? ☐ Yes ☐ No Were specimens collected? ☐ Yes ☐ No If Yes, what type: _____

1) To date, how many **STUDENTS** have/had symptoms of illness? _____
2) To date, how many **STAFF** have/had symptoms of illness? _____
3) Of those ill, how many have a laboratory/physician diagnosis? _____ students _____ staff
4) What were the laboratory test results or physician diagnoses? _____

_____

5) How many have been hospitalized? _____ students _____ staff
6) Has anyone received treatment for their illness? ☐ Yes ☐ No ☐ Unknown
   If Yes, what type of treatment? ☐ antibiotics ☐ antivirals ☐ other
7) Has the facility sent ill persons home? ☐ Yes ☐ No ☐ Unknown
8) What control steps have been taken or recommended (check all that apply)?
   ☐ sent ill students/staff home ☐ screened classrooms for others ill ☐ increased student education/posters
   ☐ sent informational letters to home (please attach copy) ☐ increased environmental cleaning ☐ in-services for staff
   ☐ Other: _____
9) If respiratory outbreak, were flu vaccines offered at the school prior to the outbreak? ☐ Yes ☐ No ☐ Unknown
   If Yes, who was vaccinated? ☐ students (approx. number _____) ☐ staff (approx. number _____)

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Chief complaint, vital signs

Outbreak Worksheet (line list)

OUTBREAK WORK SHEET FOR SCHOOL/DAYCARE SETTINGS

Fax completed worksheet to ACDC at 213-202-5999

School/Daycare Name: _____ Contact Person/Phone No.: _____

Outbreak Number:

Student/Staff Identification				Student/ Staff location		Illness Description														Diagnostics				Outcome		
	Student/Staff Name	Date of birth or Age	Sex (M/F)	Classroom or Office #	Grade	Date onset illness	Highest temperature (°F)*	Vomiting (Y/N)	Nausea (Y/N)	Diarrhea (Y/N)**	Abdominal Cramps (Y/N)	Body Aches (Y/N)	Chills (Y/N)	Cough (Y/N)	Runny Nose (Y/N)	Sore throat (Y/N)	Rash (Y/N)	Other (Y/N) _____	Other (Y/N) _____	Date recovered	Doctor visit (Y/N)	Specimen collected (Y/N)	Specimen Type (stool, blood, NP, other)	Diagnosis/Lab Result	Hospitalized (Y/N)	Days hospitalized	Died (Y/N, if yes, date)
1	Last, First Phone Number																									
2	Last, First Phone Number																									

Public Health

Specific symptoms, lab results

Case Definition

- **AFRI**
- **Consistency is important**
- **May or may not include laboratory results**

Initial diagnosis, deciding which symptoms are relevant

Develop a Case Definition

Table: Common components and examples of an outbreak case definition

Element*	Descriptive features	Examples
Person	Age group	"children under the age of 5 years"
	Sex	"males"
	Occupation	"health care workers at hospital X"
	Exclusion criteria	"persons with no previous history of chronic cough or asthma"
	Race	
Place	Geographic location	"resident of Y county or state"
	Facility	"living in X nursing home"; "student at A high school"
Time	Illness onset	"onset of illness between May 4 and August 31, 2007"
Clinical features	Pneumonia	"clinical or radiographically confirmed pneumonia" "shortness of breath and fever"
Laboratory criteria	Cultures; serology	Pneumococcus isolated from blood; rapid influenza test positive

**Please note components of an outbreak case definition vary for each outbreak.*

Epi Curve

- **Picture worth 1,000 words**
- **Should be based on consistent case definition**
- **Information may come from many sources**

Like an oxygenation saturation curve in a vent patient in the ICU

Example of the Use of Epi Curves

- Outbreak at a Juvenile Detention Center
  - Made up of 6 separate camps
  - Camps shared an infirmary and sometimes equipment
  - Continued over several weeks

Figure: Epi Curve Template for Respiratory Illness Outbreak

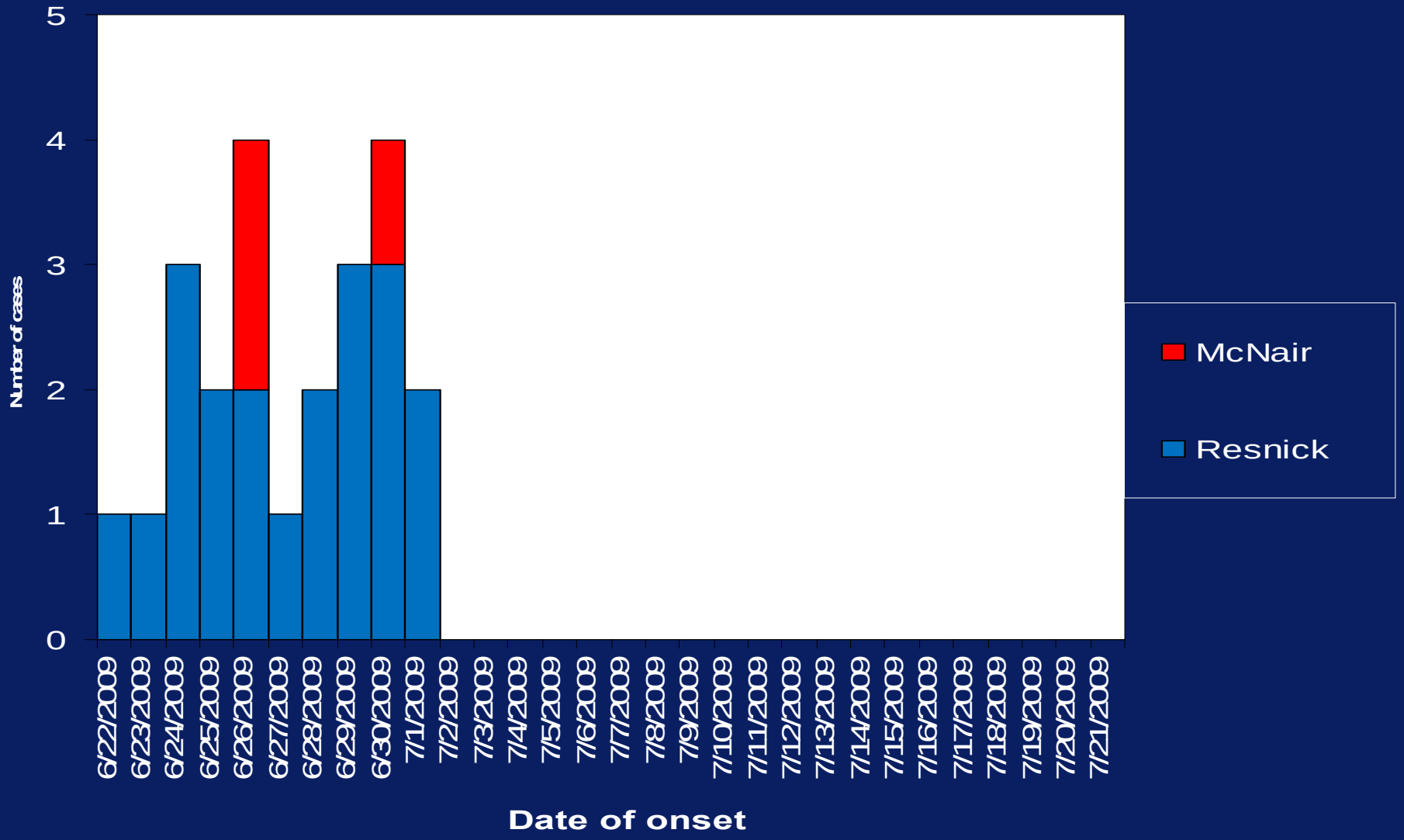

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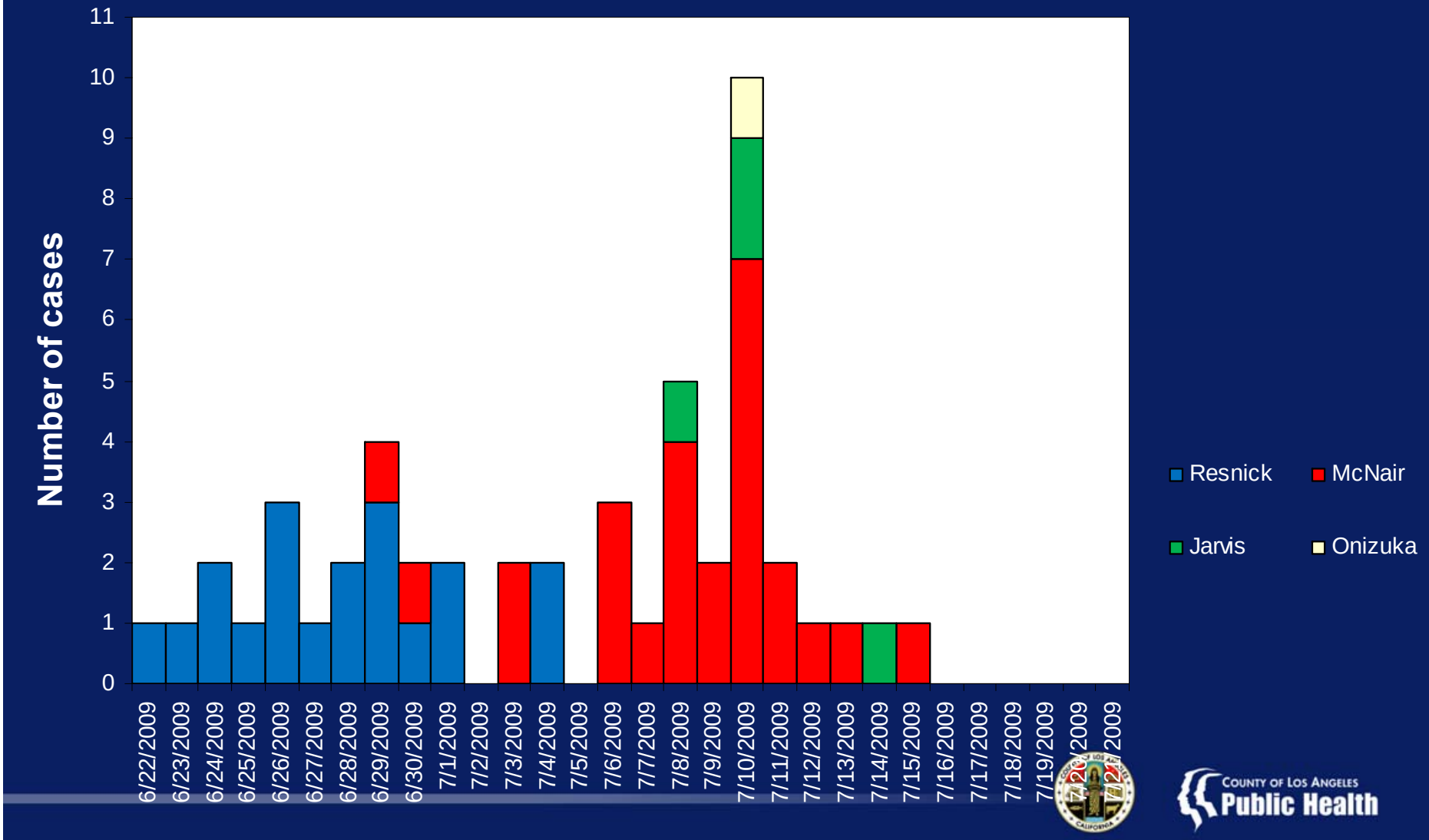
Figure: Epi Curve Template for Respiratory Illness Outbreak (Case Definition: Any person, child or staff at any of the Challenger camps with fever of 98.8◦F or higher AND cough, sore throat or congestion)



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Determining Etiology

- Most outbreaks look the same
  - Some clinical clues
- Principle respiratory syndrome or associated syndromes
- Age and population characteristics
- Season and location
- Exposures

Clinical Clues

Pathogen	Institutional clusters?	Specific group settings often affected	Occupation or avocation	Animal exposure risk factor	Environmental exposure	High risk activities	Persons with increased susceptibility or disease severity	Potential for bioterrorism agent?
Coccidioides immitis	Yes	Military	Farmer, Construction worker	None	Soil, Dust clouds	Excavation	HIV, Post-transplant, Filipinos, African-Americans	No
Coronavirus	Yes	None	Healthcare or Laboratory worker (SARS-HCoV)	None	No	Travel to affected areas (for SARS-HCoV infections)	Infants, Elderly, Diabetes mellitus	No
Coxiella burnetti	Yes	None	Animal handler, Laboratory worker	Primarily cattle, sheep, goats	Animal products of conception, Aerosol (bioterrorism), ticks	Occupational contact with animal or animal products	Pregnant, Immunocompromised, Existing cardiac valvulopathy	Yes
Francisella tularensis	No	None	Hunter, Animal handler, Landscaper, Farmer, Laboratory worker	Lagamorphs, Rodents, Ticks, Biting flies	Contaminated hay, mud or water	Mowing, Weed-wacking, Skinning, dressing, or eating game, Hunting, Outdoor activities	HIV (Typhoidal)	Yes
Group A *Streptococcus*	Yes	Day Care, Long-Term Care Facility/Nursing Home, Military	Military	None	No		Elderly, HIV, Diabetes, Skin breakdown, Malignancy	No
Haemophilus influenzae	Yes	Day Care/School		None	No		Asplenics, HIV, Sickle cell disease, Malignancy, American Indian/Alaska native children	No
Hantaviruses, New	No	None	Construction worker, Grain farmer,	Rodents	Rodent excreta	Outdoor activities, Cleaning/entering rodent-infested		No

Determining Etiology

- Need laboratory diagnosis to know for sure
  - Bacteria: sputum
  - Viruses: NP swab or wash
  - 3-5 samples per outbreak
  - Obtain samples from people with recent onset
- Diagnose the outbreak, not the individual
- No need for clearance samples or to treat the individual any differently

Assessment and Interventions

- Site Visits
- Educational material
- Isolation/Quarantine/Social Distancing
- Pharmaceutical Interventions

Non pharmaceutical interventions = NPI

Site Visit

- Assess cleanliness of facility (things on the floor, sharing of waterbottles?)
- Assess educational efforts to date (posters, evidence of in-services?)
- Assess resources (hot water? Hand scrub?)
- Assess data sources
- Assess ability to do interventions/lab specimens

NPI: Applies to All Outbreaks

- Education for handwashing, handscrubs, and respiratory hygiene
- Exclusion criteria (for how long?)
- Environmental cleaning
  - Use EPA registered disinfectant
  - Use for appropriate time
  - Make sure the label says active against the particular pathogen

Survival of Influenza Virus

*Surfaces and Affect of Humidity & Temperature**

- **Hard non-porous surfaces 24-48 hours**
  - **Plastic, stainless steel**
    - **Recoverable for > 24 hours**
    - **Transferable to hands up to 24 hours**
- **Cloth, paper & tissue**
  - **Recoverable for 8-12 hours**
  - **Transferable to hands 15 minutes**
- **Viable on hands <5 minutes only at high viral titers**
  - **Potential for indirect contact transmission**

***Humidity 35-40%, Temperature 28C (82F)**

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Source: Bean B, et al. JID 1982;146:47-51

Pharmacuetical Intervention

- Influenza: antiviral treatment and vaccine
- Group A strep: penicillin
- Pertussis: erythromycin
- Strep pneumo: penicillin-like antibiotic
- RSV: palivizumab for prophy

Documentation

Final Report Form: Community

ACUTE FEBRILE RESPIRATORY ILLNESS AND/OR ACUTE INFECTIOUS PNEUMONIA
COMMUNITY-BASED SETTINGS
OUTBREAK REPORT FORM

OUTBREAK INFORMATION			
Outbreak classification ☐Confirmed ☐Probable	*Local outbreak tracking number**	*First onset date* ____/____/_____	*Last onset date* ____/____/_____
Pathogen identified? ☐Yes ☐No ☐Unk If yes, ***specify pathogen***	***Describe clinical case definition (clinical syndrome) used during the outbreak*** _____ *Identify predominant symptoms experienced by at least half of reported cases:* ☐Fever ☐Cough ☐Sore throat ☐Malaise/fatigue ☐Chills/Rigor ☐Arthralgia / Myalgia ☐Shortness of breath ☐Other1 _____ ☐Other 2_____ ☐Other3 _____		

Number of lab-confirmed cases _____	*Number of clinical cases* _____	*Total cases* _____

SETTING INFORMATION			
Setting Type (check all settings where illnesses occurred)			
☐Child day care/pre-school	☐Primary school (K-5)	☐Middle/High School (6-12)	☐College non-dormitory
☐General community	☐Adult day care	☐Other**	

Like your discharge summary

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Final Form: Congregate Living

ACUTE FEBRILE RESPIRATORY ILLNESS AND/OR ACUTE INFECTIOUS PNEUMONIA
CONGREGATE-LIVING SETTINGS
OUTBREAK REPORT FORM

OUTBREAK INFORMATION			
Outbreak classification ☐Confirmed ☐Probable	*Local outbreak tracking number**	*First onset date* ____/____/_____	*Last onset date* ____/____/_____
Pathogen identified? ☐Yes ☐No ☐Unk If yes, ***specify pathogen***	***Describe clinical case definition (clinical syndrome) used during the outbreak*** _____ *Identify predominant symptoms experienced by at least half of reported cases:* ☐Fever ☐Cough ☐Sore throat ☐Malaise/fatigue ☐Chills/Rigor ☐Arthralgia / Myalgia ☐Shortness of breath ☐Other1 _____ ☐Other 2_____ ☐Other3 _____		

	RESIDENTS	STAFF PERSONS	TOTAL
Number lab confirmed cases			
Number of clinical cases			
Total number of persons present during the outbreak period.	____☐Census ____☐Beds		

SETTING INFORMATION				
Setting Type (check all settings where illnesses occurred)				
☐Skilled nursing	☐Residential care facility**	☐Independent living facility**	☐Assisted living facility	☐Acute care hospital
☐Other hospital	☐Dormitory**	☐Jail	☐Military facility	☐Camp

Like your discharge summary

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Final Forms: Details

DEMOGRAPHIC AND CLINICAL INFORMATION FOR CASE-PATIENTS			
Age range:_____to_____yrs.	*Median age if available: _____*	*Number (%) Female _____*	
Number of patients with fever	*Highest temperature recorded _____☐F _____☐C*	*Number with clinical diagnosis of pneumonia*	*Number with abnormal chest x-ray*
Number hospitalized due to outbreak illness _____		*Number died due to outbreak illness _____*	

LABORATORY TESTING AMONG ALL PATIENTS (RESIDENTS AND STAFF): Please attach copies of test results, if available

Type of specimens and tests ordered	*No. patients tested*	*Findings (Count by patient, not by specimens tested)*
EXAMPLE **NP Swab, commercial rapid antigen** **NP Swab, PCR (VRDL)**	**5** **5**	**1 Influenza A/B non-specific; 4 Negative** **3 Influenza B, 2 Negative**

CONTROL MEASURE INFORMATION

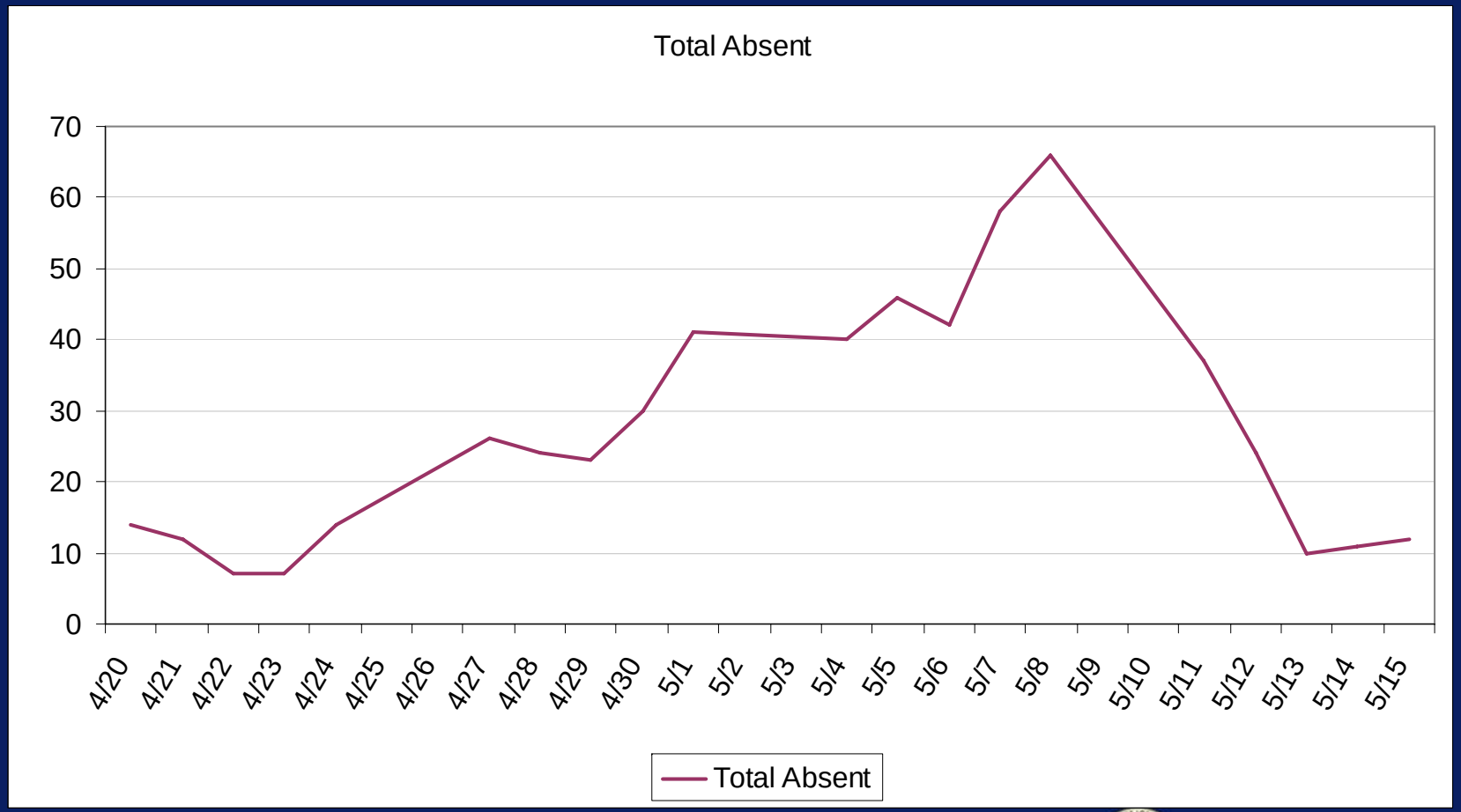
	Yes	*No*	*Unk*	*If yes, describe*
1. Isolation/home restrictions for ill persons				
2. For influenza outbreaks, were persons vaccinated against influenza after onset of this outbreak?				
3. Increased education on personal hygiene (respiratory and hand hygiene)				
4. Environmental controls				
5. Other measures (1)				
6. Other measures (2)				
7. Other measures (3)				

ADDITIONAL INFORMATION: If available, please attach a facility map, epidemic curve (graph of outbreak cases by time), laboratory results and a summary of the local investigation (if completed). If no summary exists, please provide any other important details and descriptions below.

Useful Outbreak Data

- Gold standard: new incidence of AFRI (daily)
- Illness data from school (daily)
  - Nurse's office logs
- Absence count from school, by reason for absence (daily)
  - Separate those ill from those out for other reasons
- Less useful: total school absence counts

Outbreak at a Public Elementary School of 550 students



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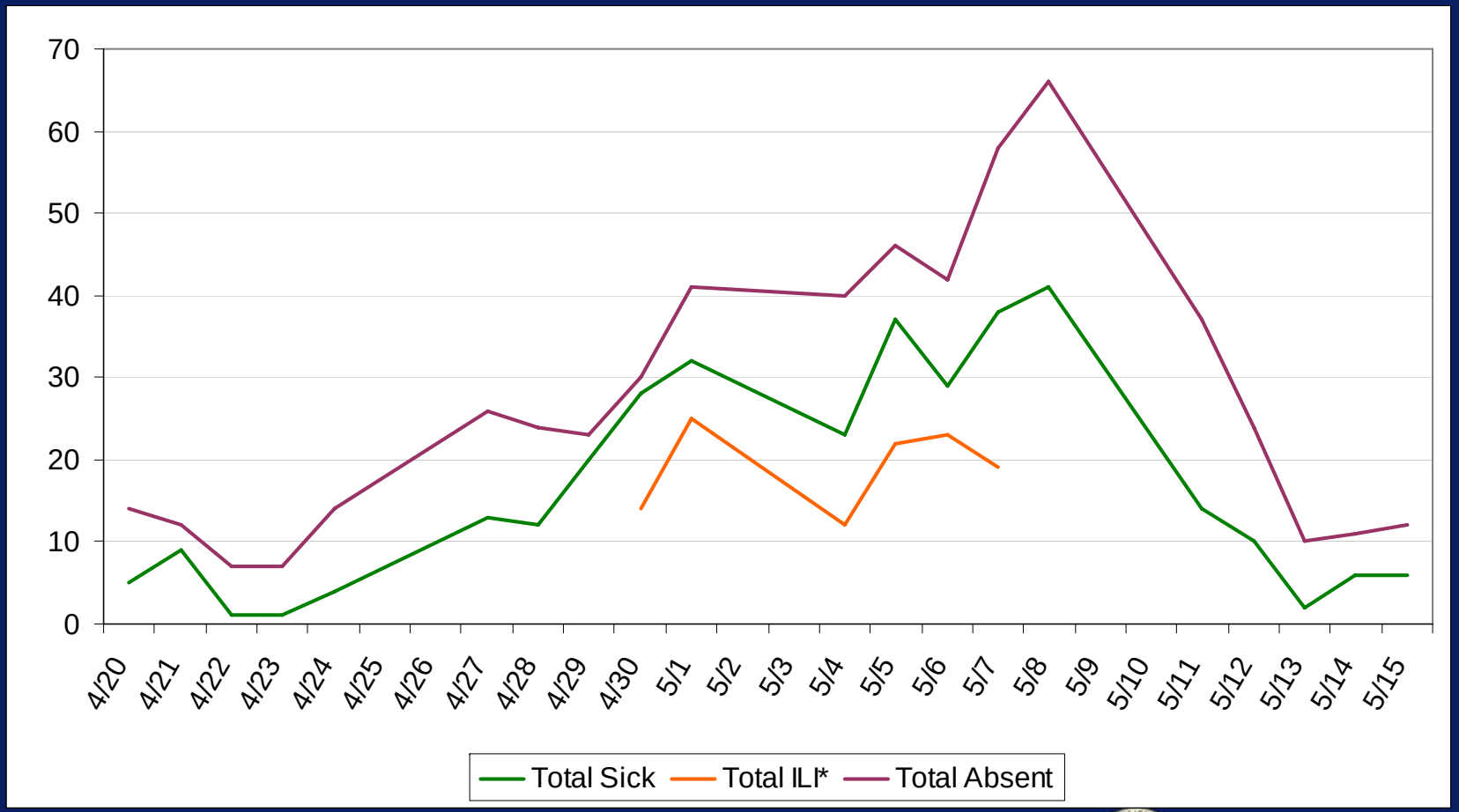

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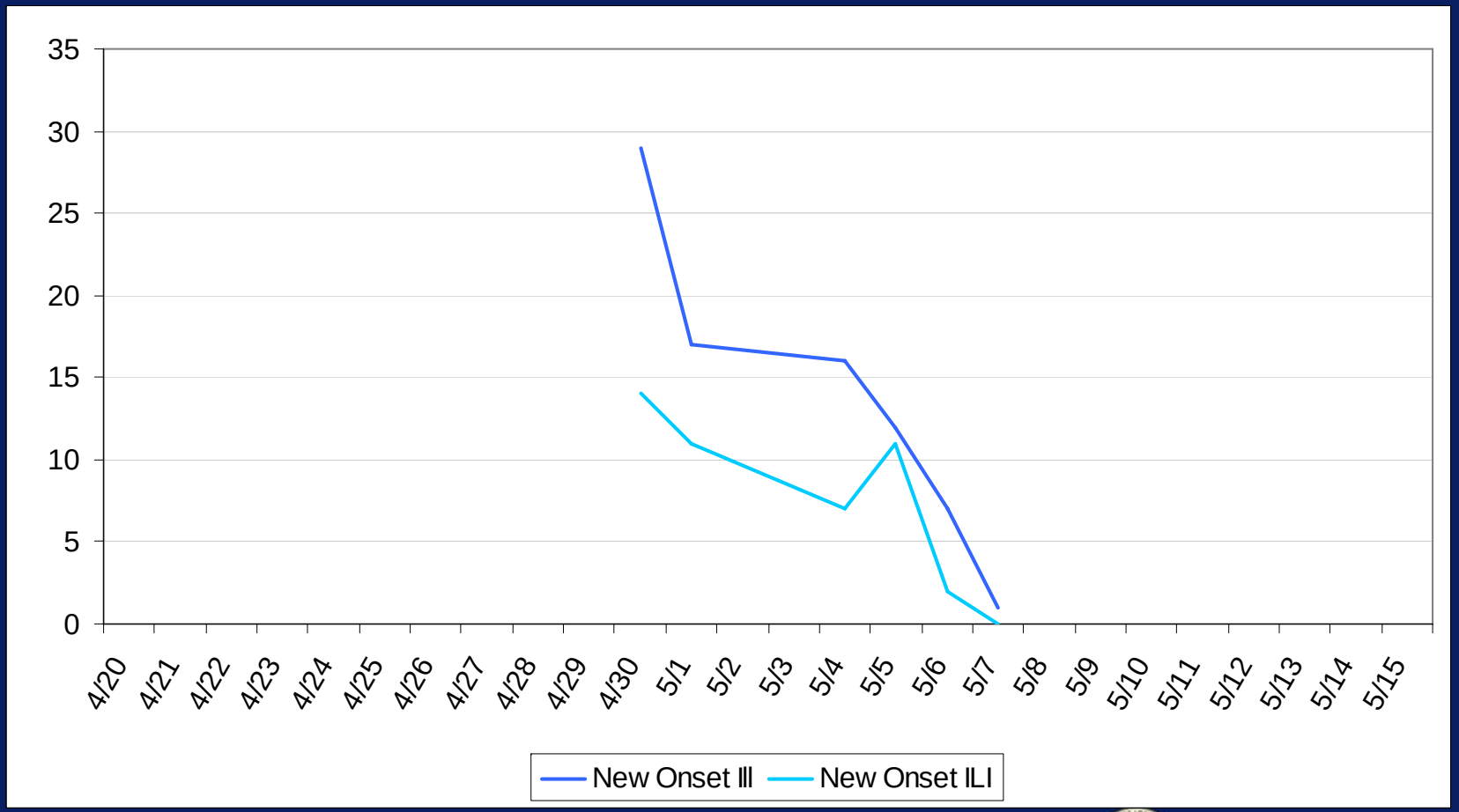

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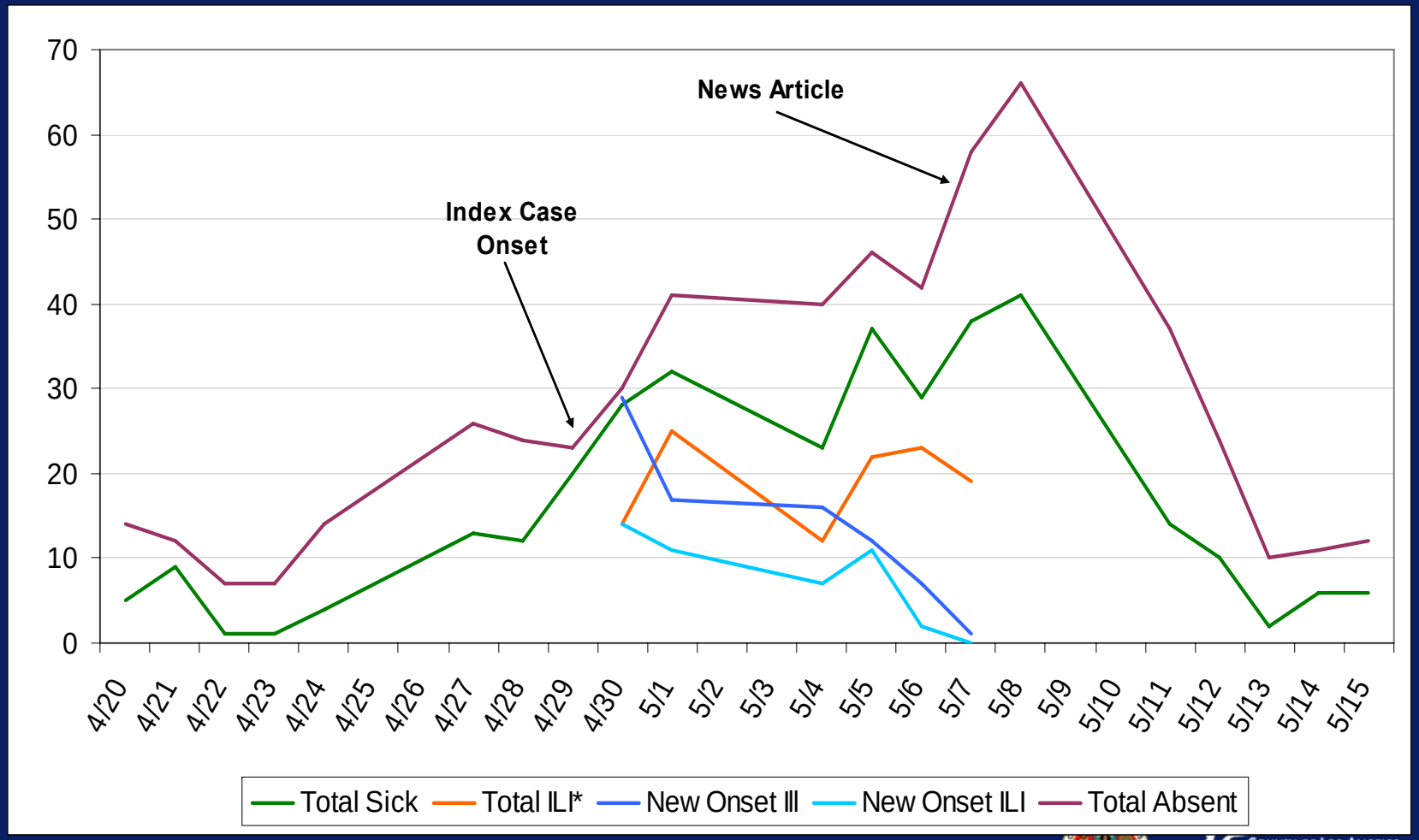

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School Outbreak Investigations

- Request school data
  - Daily list ILI
  - Daily list absent due to any illness
  - Daily list any absence (by grade if possible)
  - Daily count of any of the above
- Complete line list of ill students
  - Onset date, symptoms very important
  - Verify if seen by PMD, any diagnostic testing done
- Any questions, ask ACDC

Outbreaks With Poor Data

- Data inconsistent, poorly collected
  - Often paper-based records
  - Nurse office visit logs only data available
- Unable to determine proper onset dates for cases and outbreak
  - Can't distinguish between ill and non-ill

School Outbreak Investigations

- Site visits have multiple purposes
  - Obtain information/data
  - Make concrete recommendations
  - Serve as ambassadors
- Obtain best possible data
  - Different schools keep different records
- Please inform ACD of new developments in outbreaks

LAUSD- A Special Case

- Work through central office
- Wait until permission from central office before going on campus
- Get data from central office
  - Therefore must be clear on what you want and when
- Make a point of sharing data/analyses back with central office

Lessons Learned

- Some outbreaks too big to follow-up completely
  - Detailed data becomes cumbersome
  - Total counts of absent/ill students may be the most realistic
- All outbreaks different
  - Different types of data available
  - Different levels of CHS involvement

Resources

- If help needed, contact ACDC
  - B-73
  - Guidelines for Investigating Respiratory Outbreaks (handed out to AMDs)
  - Worksheets:
    - Line lists
    - Site visits
- CDC Website
  - http://emergency.cdc.gov/urdo/

Questions?