DEPARTMENT OF HEALTH & HUMAN SERVICES · USA

CDC

Quarantine and
Migration Health

Real-Life Public Health According to Sir Mick

“No, you can't always get what you want
You can't always get what you want
You can't always get what you want…

…And if you try sometime you find
You get what you need….”

Well, not always…Sometimes you don’t get what you expect or what you want or what you need!

Quarantine and Migration Health

The H1N1 Response in the United States

Surprise, Uncertainty and Too Little Information

Peter Houck, MD
CDC Division of Global Migration and Quarantine

Mexico City, June 2009

Quarantine and Migration Health

Outline

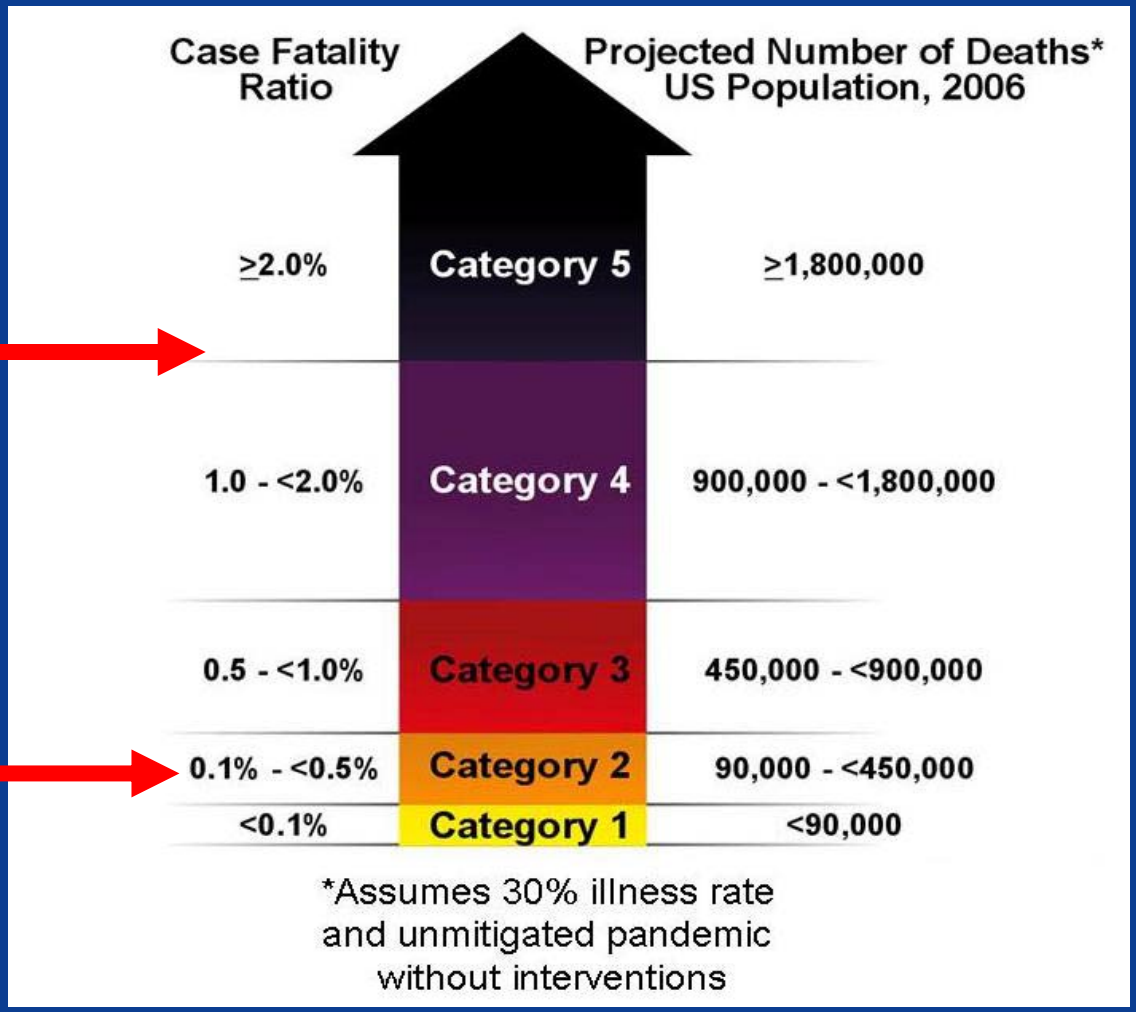
- What we expected for a pandemic
- How we had planned to respond
- What we actually saw and did
- What we are planning

What Did We Expect?

Previous Influenza A Pandemics

- 1918-19, "Spanish flu" (H1N1)
  - **20-50M died world-wide (~500K in U.S.)**
  - **~50% of deaths in young, healthy adults**
  - **Hemorrhagic pneumonia**
- 1957-58, "Asian flu" (H2N2)
  - **~70,000 attributable deaths in U.S.**
- 1968-69, "Hong Kong flu" (H3N2)
  - **34K excess U.S. deaths**

Pandemic Severity Index



1918

1957, 1968

Quarantine and Migration Health

Influenza Pandemic, 1957

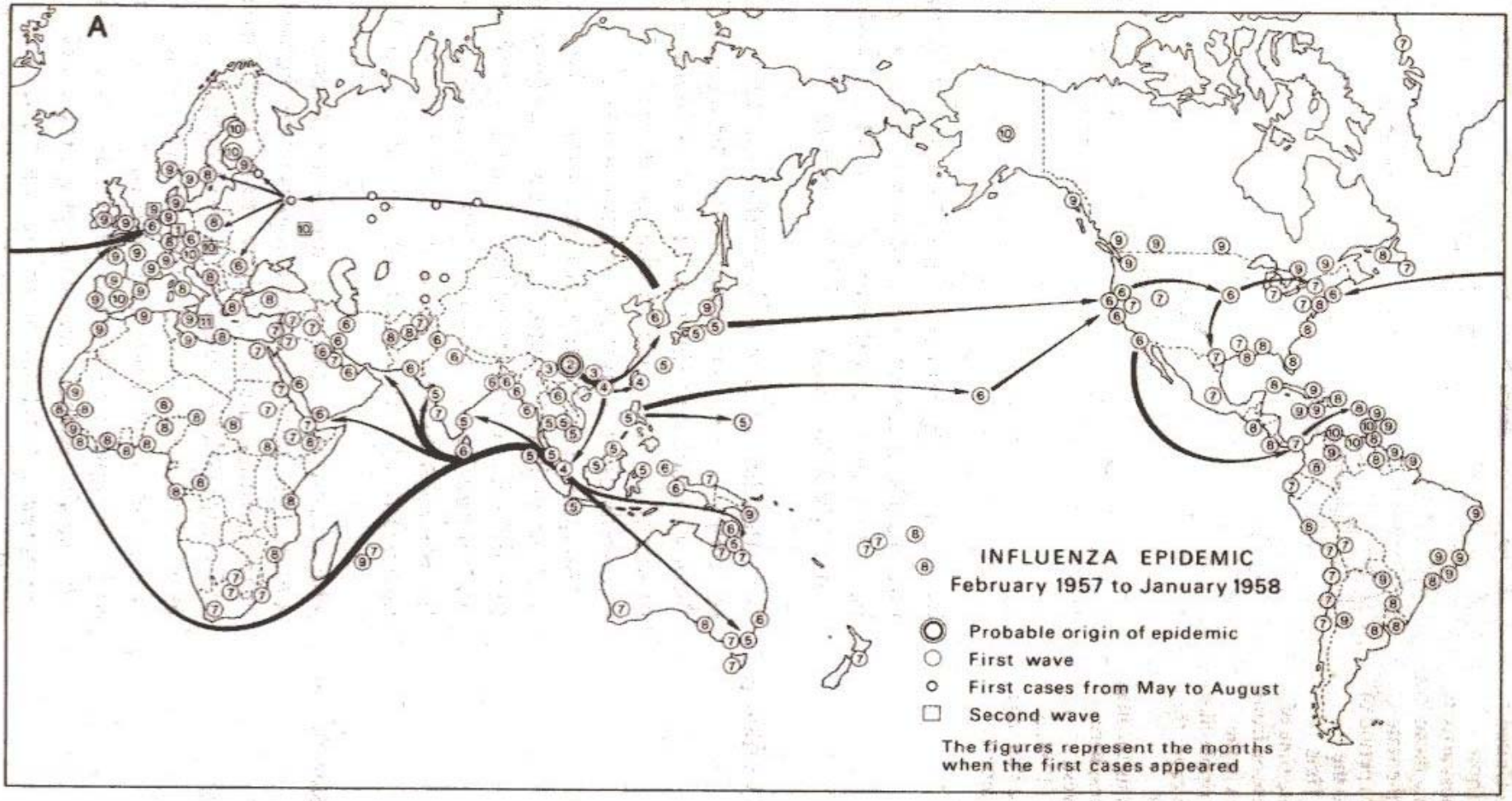


Fig. 2.7(A) Spread of the world influenza epidemic, 1957–8. *Source:* Stuart-Harris (1965, p. 103). (B) Diffusion of same epidemic on a local scale in northern England. *Source:* Hunter and Young (1971, p. 647).

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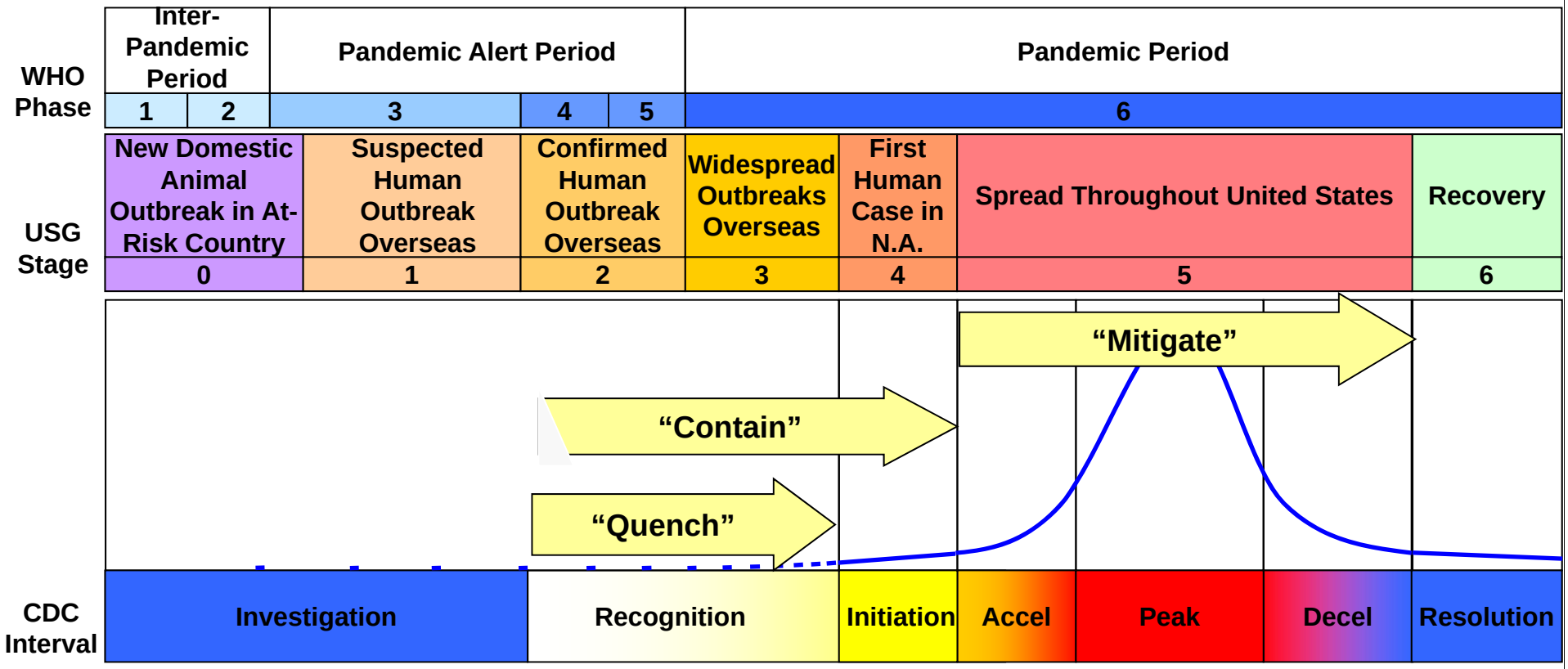
Pandemic Intervals



Quarantine and Migration Health

Most likely candidate for next pandemic influenza?
Was thought to be influenza A H5N1

Quarantine and Migration Health

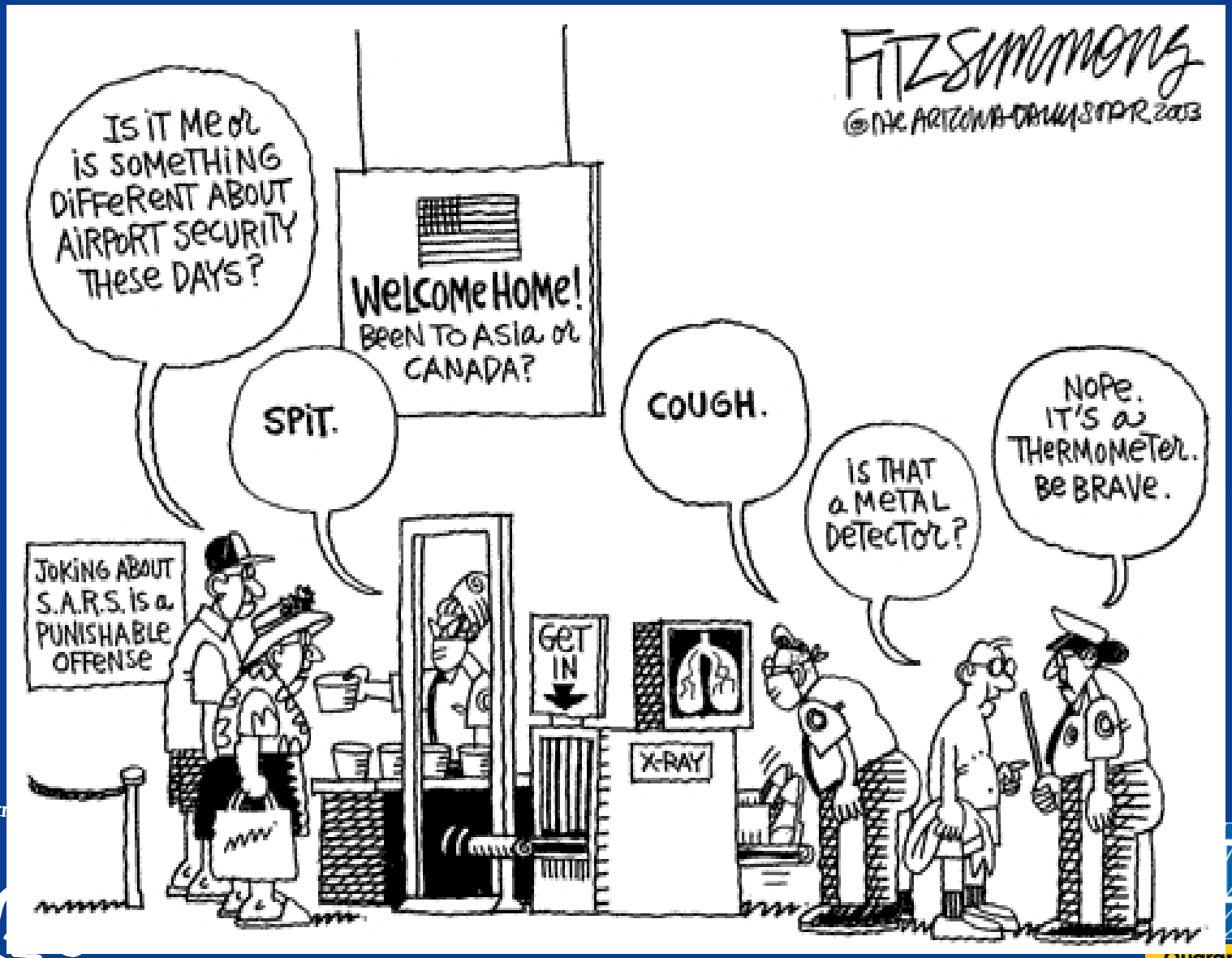
How Did We Plan to Respond?

Layered Defense Against a Pandemic

- Quarantine and isolation
- Health screening at ports of entry
- Distribution of inbound flights
- En route screening
- Health screening at ports of embarkation
- Possible travel restrictions from affected regions

- Containment at source: travel restrictions, antivirals, quarantine, and isolation (World Health Organization Rapid Reaction)

Screening at Entry



David Fitzsimmons, *Arizona Daily Star*, 4/22/03

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Quarantine and Migration Health

U.S. Risk-Based Border Strategy (RBBS)

SAFER · HEALTHIER · PEOPLE™

Quarantine and Migration Health

Public Health Primary Screening

1. Visual exam for obvious signs of illness
2. Review Health Declaration
3. Interview (follow up questions to traveler, if indicated)
4. Check results of thermal scanning device, if used
5. Decide if traveler is suspect ill or if presumed well

If traveler is suspect ill:	If traveler is presumed well:
• Identify long term contacts of suspect ill traveler • Escort suspect ill traveler and any long term contacts to Public Health Secondary Screening	• Send the presumed well and short term contacts to the flight group waiting area (cohort area)

Migration Health

Visual Inspection

Scott Stantis, *The Birmingham News*, 4/2/03

Quarantine and Migration Health

Draft Health Declaration

U.S. HEALTH DECLARATION FORM
PASSENGER & CREW

DRAFT

Today's date: day ___ month ___ year ___

Airline: ___ Flight number: ___

Seat Number: ___ Seat number if moved: ___

Family name: ___

First name (given): ___

Middle name: ___

Passport issued by (country): ___

Passport number: ___

A. To answer each question, please mark an X in the YES or NO box:

	YES	NO
Have you felt like you had a fever or chills in the last 24 hours?		
Do you have a cough or have difficulty breathing?		
In the last 7 days, have you been near or spent time with someone who had a fever and cough?		

If YES to any of the questions above, please inform the crew on your plane.

B. Please list all the countries where you have been (including where you live) in the last 7 days:

- List in order with most recent country first.
- List countries where your plane stopped if you got off the plane.

1. ___ 4. ___
2. ___ 5. ___
3. ___ 6. ___

1. Please list the names of all persons traveling with you on this flight:

___ ___

___ ___

___ ___

2. Are you traveling with a group on this flight? YES ___ NO ___

3. If yes, name of group: ___

Continued on other side...

4. Birth date: day ___ month ___ year ___

5. Sex: Male ___ Female ___

6. Home address: ___

City: ___ State/Prov.: ___

Country: ___

7. Full U.S. addresses for the next 7 days: ___

8. Phone numbers (where you can be reached in the next 7 days): ___

9. E-mail address: ___

10. Contact information of another person who can reach you in the next 7 days:

Name: ___

Address: ___

Phone (home): ___ (mobile): ___

E-mail: ___

Under Title 18 U.S. Code section 1001, making any false statement is a criminal offense.

11. Signature (or parent's signature if passenger is younger than 18 years) ___

For U.S. Port of Entry Staff Only

For DHS use (Primary Screening)	For HHS use (Secondary Screening)
Thermal Scanner: positive ___ negative ___ PH Secondary: YES ___ NO ___	

Clinical Influenza Definitions vs. Laboratory Confirmation in Household Population

Definition	Sens	Spec	# cases
1. Fever 38C or 2 of symptoms *	0.57	0.81	62
2. At least 2 of symptoms †	0.57	0.90	37
3. Fever ‡ plus cough or sore throat	0.48	0.97	17
4. Fever ‡ plus cough or runny nose	0.48	0.98	16
5. Fever ‡ only	0.48	0.98	15

* Symptoms are headache, runny nose, sore throat, aches or pains in muscles or joints, cough, or fatigue.

† Symptoms are fever, cough, headache, sore throat, aches or pains in muscles or joints.

‡ Temperature ≥ 37.8C.

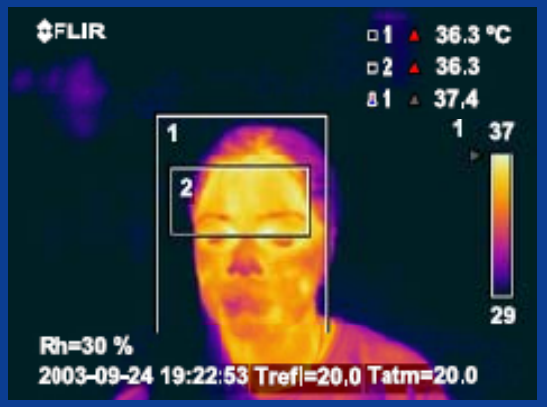
Cowling et al. PLoS ONE. 2008;3:e2101.

CDC Quarantine and Migration Health

Estimating Temperature with Thermal Imaging

Image from McBride et al, 2007

37°C tympanic



39°C tympanic

Images from Ng et al, 2004

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Advantages of ITDS for Mass Fever Screening

- Rapid
- High volume
- Non-contact
- Non-invasive
- Objective

Disadvantages of ITDS for Mass Fever Screening

- Personnel requirement
  - 100–500+ to run system at 20–25 IPOE
  - Trainers
  - Technicians
  - Used when human resources will be very limited
- Delay to travelers
- Space requirements
- Low accuracy and precision
  - False positives and negatives

Limitations of ITDS for Influenza Screening

- Detect fever, not infections!
- Cannot detect incubating or afebrile infected individuals (low sensitivity)
- Cannot distinguish infection of interest from other febrile conditions (low specificity)
- Results have low predictive value

CDC

Quarantine and Migration Health

Public Health Secondary Screening (PHSS)

Evaluate risk of potentially ill travelers

- Perform epidemiological and physical exam
- Confirm suspect ill
- Determine who may have been exposed
- Isolate ill persons, if necessary
- Quarantine contacts, if necessary
- Return other travelers to the Flight Group Waiting Area (Cohort Area)

Quarantine and Migration Health

Number of Persons Entering the United States, 2008*

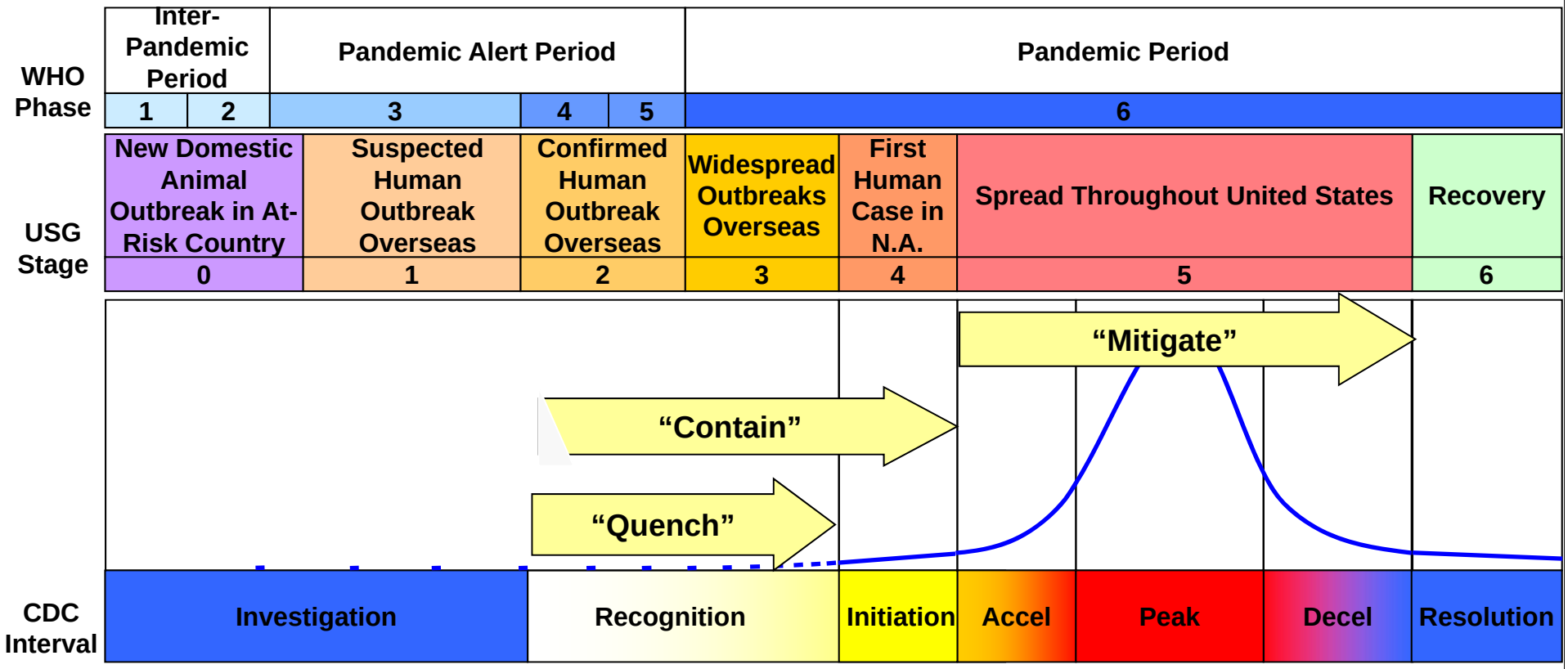
Port	Daily	Annual (millions)
Air	**223,000**	**81**
Sea	**71,000**	**26**
Land	**787,000**	**293**
Total	**1,081,000**	**400**

*Seaport data is based on 2005 data, the latest available from the Department of Transportation

CDC
Quarantine and Migration Health

CDC Quarantine Stations
2008 Jurisdictions

Pandemic Intervals



Quarantine and Migration Health

“Community Mitigation Strategies”

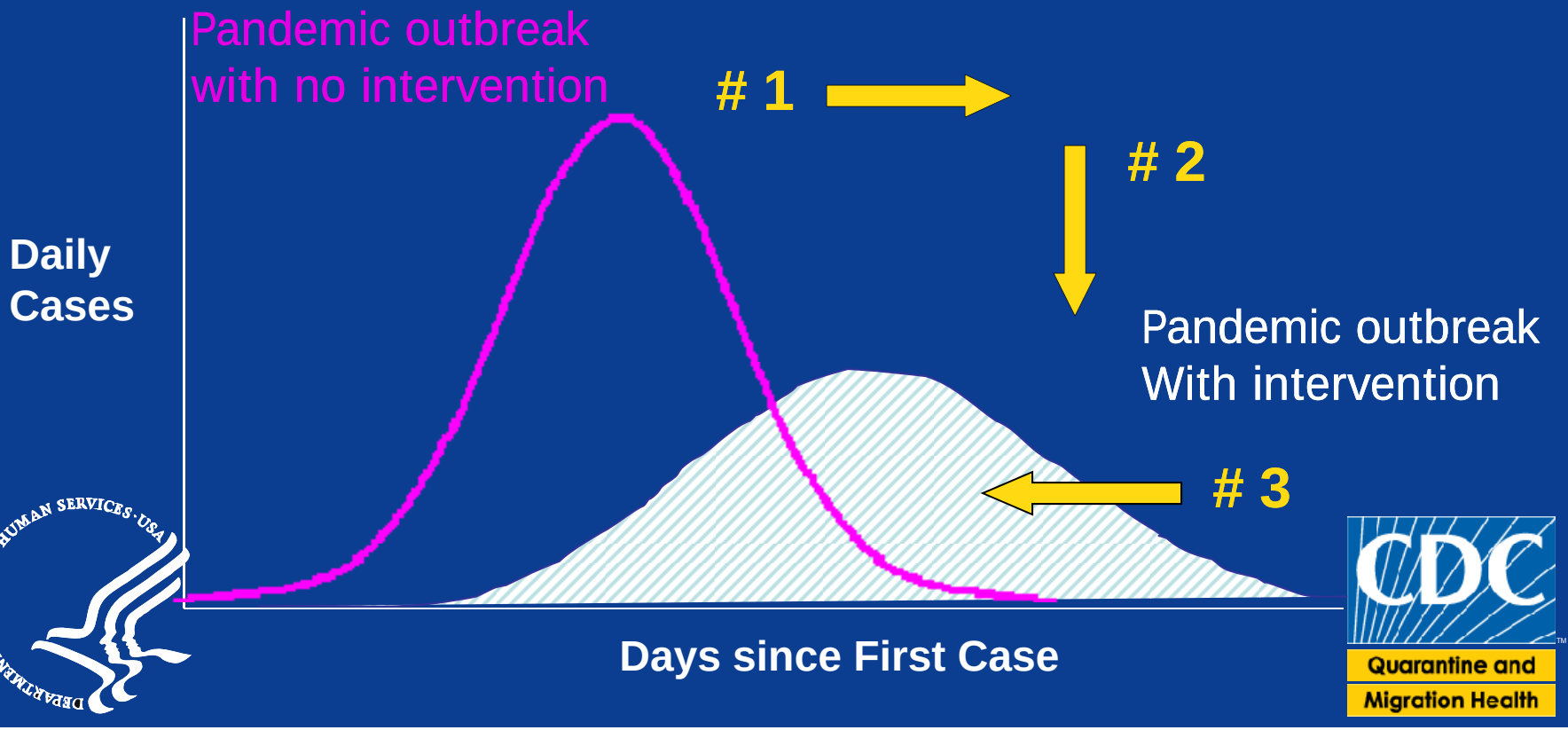
- Isolation and treatment of ill persons
- Voluntary home quarantine of household contacts
- School and childcare dismissal plus social distancing
- Workplace and community social distancing

Community Mitigation by Severity Category

	Pandemic Severity Index		
Interventions by Setting	1	2 and 3	4 and 5
Home			
Voluntary isolation **of ill at home (adults and children); combine with use of antiviral treatment as available and indicated**	Recommend	Recommend	Recommend
Voluntary quarantine **of household members in homes with ill persons (adults and children); consider combining with antiviral prophylaxis if effective, feasible, and quantities sufficient**	Generally not recommended	Consider	Recommend
School			
Child social distancing **–dismissal of students from schools and school-based activities, and closure of child care programs**	Generally not recommended	Consider: ≤ 4 weeks	Recommend: ≤ 12 weeks
–reduce out-of-school contacts and	Generally not	Consider:	Recommend:

What are Our Goals?

1. Delay disease transmission and outbreak peak
2. Decompress peak burden on healthcare infrastructure
3. Diminish overall cases and health impacts



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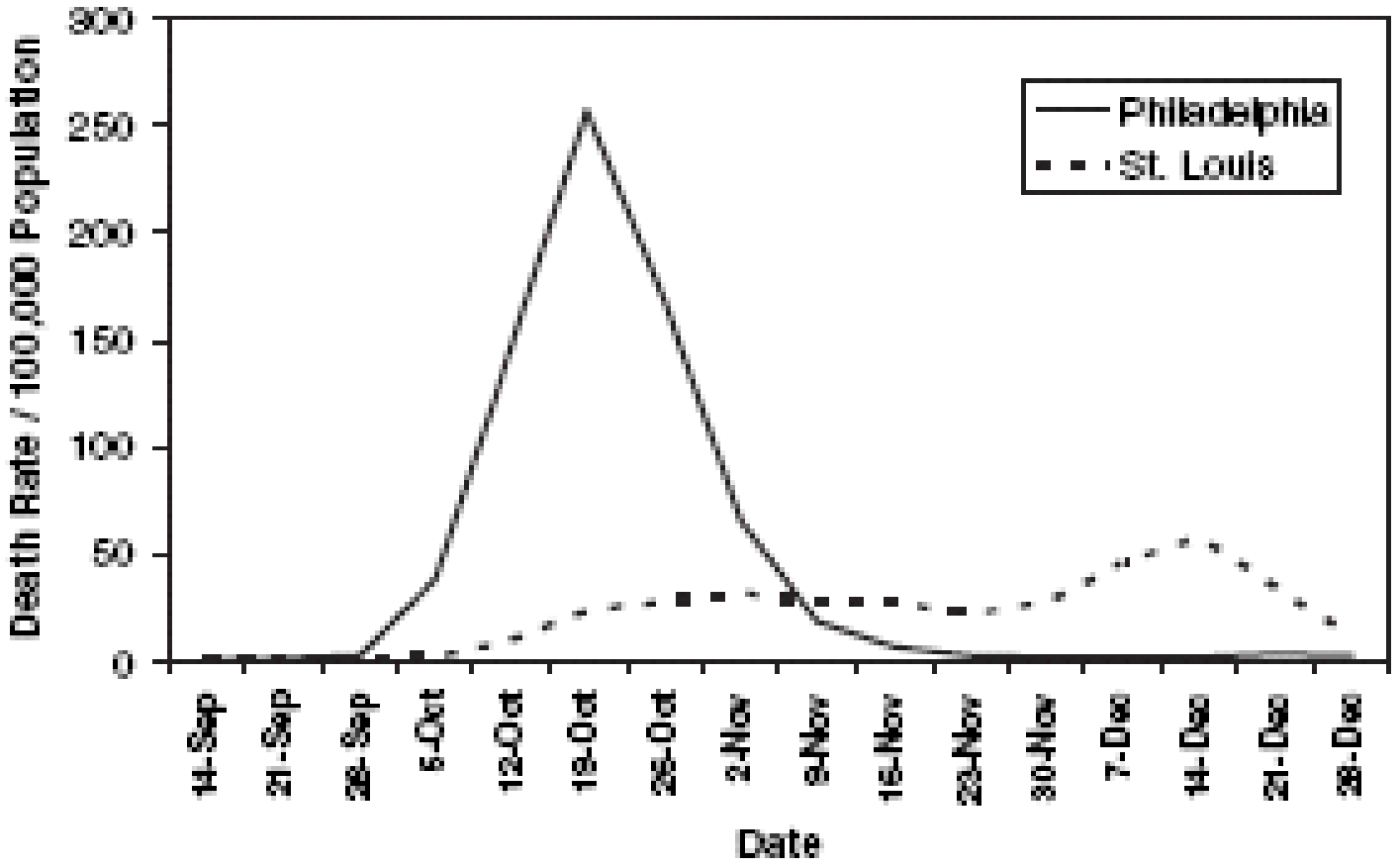
Excess P&I mortality over 1913-1917 baseline, Philadelphia & St. Louis, 1918



(from Hatchett, 2007)

What Did We Actually See and Do with Novel Influenza A (H1N1)?

MMWR
Dispatch
April 21, 2009 / 58 (Dispatch);1-3

Swine Influenza A (H1N1) Infection in Two Children --- Southern California, March--April 2009

On April 17, 2009, CDC determined that two cases of febrile respiratory illness occurring in children who resided in adjacent counties in southern California were caused by infection with a swine influenza A (H1N1) virus. The viruses from the two cases are closely related genetically, resistant to amantadine and rimantadine, and contain a unique combination of gene segments that previously has not been reported among swine or human influenza viruses in the United States or elsewhere. Neither child had contact with pigs; the source of the infection is unknown. Investigations to identify the source of infection and to determine whether additional persons have been ill from infection with similar swine influenza viruses are ongoing. This report briefly describes the two cases and the investigations currently under way. Although this is not a new subtype of influenza A in humans, concern exists that this new strain of swine influenza A (H1N1) is substantially different from human influenza A (H1N1) viruses, that a large proportion of the population might be susceptible to infection, and that the seasonal influenza vaccine H1N1 strain might not provide protection. The lack of known exposure to pigs in the two cases increases the possibility that human-to-human transmission of this new influenza virus has occurred. Clinicians should consider animal as well as seasonal influenza virus infections in their differential diagnosis of patients who have febrile respiratory illness and who 1) live in San Diego and Imperial counties or 2) traveled to these counties or were in contact with ill persons from these counties in the 7 days preceding their illness onset, or 3) had recent exposure to pigs. Clinicians who suspect swine influenza virus infections in a patient should obtain a respiratory specimen and contact their state or local health department to facilitate testing at a state public health laboratory.

Case Reports

Patient A. On April 13, 2009, CDC was notified of a case of respiratory illness in a boy aged 10 years who lives in San Diego County, California. The patient had onset of fever, cough, and vomiting on March 30, 2009. He was taken to an outpatient clinic, and a nasopharyngeal swab was collected for testing as part of a clinical study. The boy received symptomatic treatment, and all his symptoms resolved uneventfully within approximately 1 week. The child had not received influenza vaccine during this influenza season. Initial testing at the clinic using an investigational diagnostic device identified an influenza A virus, but the test was negative for human influenza subtypes H1N1, H3N2, and H5N1. The San Diego County Health Department was notified, and per protocol, the specimen was sent for further confirmatory testing to reference laboratories, where the sample was verified to be an unsubtypable influenza A strain. On April 14, 2009, CDC received clinical specimens and determined that the virus was swine influenza A (H1N1). The boy and his family reported that the child had had no exposure to pigs. Investigation of potential animal exposures among the boy's contacts is continuing. The patient's mother had respiratory symptoms without fever in the first few days of April 2009, and a brother aged 8 years had a respiratory illness 2 weeks before illness onset in the patient and had a second illness with cough, fever, and rhinorrhea on April 11, 2009. However, no respiratory specimens were collected from either the mother or brother during their acute illnesses. Public health officials are conducting case and contact investigations to determine whether illness has occurred among other relatives and contacts in California, and during the family's travel to Texas on April 3, 2009.

Patient B. CDC received an influenza specimen on April 17, 2009, that had been forwarded as an unsubtypable influenza A virus from the Naval Health Research Center in San Diego, California. CDC identified this specimen as a swine influenza A (H1N1) virus on April 17, 2009, and notified the California Department of Public Health. The source of the specimen, patient B, is a girl aged 9 years who resides in Imperial County, California, adjacent to San Diego County. On March 28, 2009, she had onset of cough and fever (104.3°F [40.2°C]). She was taken to an outpatient facility that was participating in an influenza surveillance project, treated with amoxicillin/clavulanate potassium and an antihistamine, and has since recovered uneventfully. The child had not received influenza vaccine during this influenza

MMWR Weekly
May 1, 2009 / 58(16);435-437

Update: Swine Influenza A (H1N1) Infections --- California and Texas, April 2009

MMWR *en Español*

On April 24, this report was posted as an MMWR *Dispatch on the* MMWR *website* (http://www.cdc.gov/mmwr).

On April 21, 2009, CDC reported that two recent cases of febrile respiratory illness in children in southern California had been caused by infection with genetically similar swine influenza A (H1N1) viruses. The viruses contained a unique combination of gene segments that had not been reported previously among swine or human influenza viruses in the United States or elsewhere (*1*). Neither child had known contact with pigs, resulting in concern that human-to-human transmission might have occurred. The seasonal influenza vaccine H1N1 strain is thought to be unlikely to provide protection. This report updates the status of the ongoing investigation and provides preliminary details about six additional persons infected by the same strain of swine influenza A (H1N1) virus identified in the previous cases, as of April 24. The six additional cases were reported in San Diego County, California (three cases), Imperial County, California (one case), and Guadalupe County, Texas (two cases). CDC, the California Department of Public Health, and the Texas Department of Health and Human Services are conducting case investigations, monitoring for illness in contacts of the eight patients, and enhancing surveillance to determine the extent of spread of the virus. CDC continues to recommend that any influenza A viruses that cannot be subtyped be sent promptly for testing to CDC. In addition, swine influenza A (H1N1) viruses of the same strain as those in the U.S. patients have been confirmed by CDC among specimens from patients in

The Disease was Already in the US When We Detected It

- Entry screening at borders wouldn't help
- Was it arriving in US by aircraft?
- Severity?

At International Points of Entry We Did What We Always Do

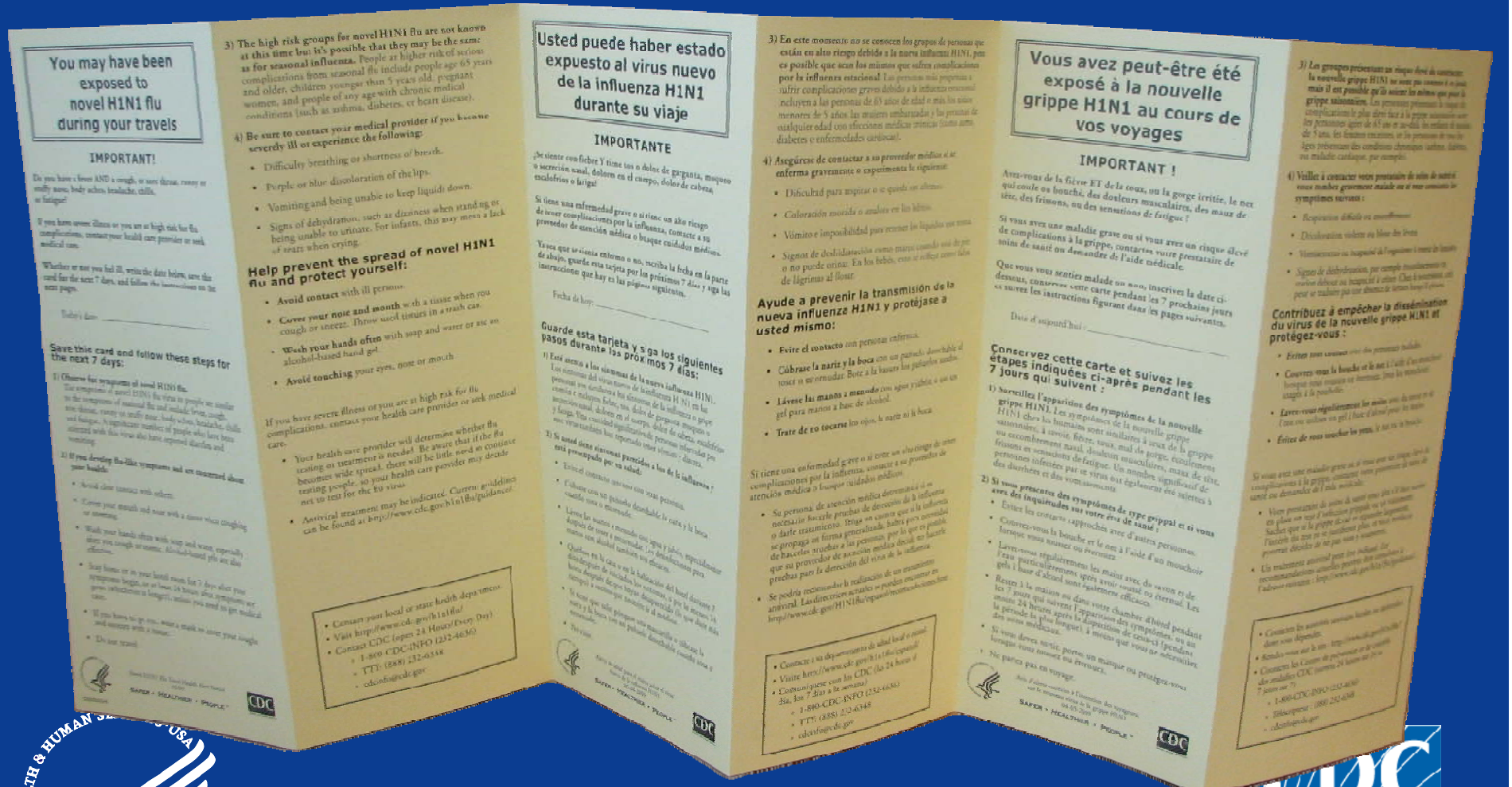
- Customs/immigration/crew report illness
- Quarantine staff evaluate ill passengers
- Early in outbreak some contact tracing
- Education of travelers
- No new screening activities
- No exit screening

Health Alert Poster

Health Alert Posters at the El Paso Airport

Quarantine and Migration Health

THAN Yellow



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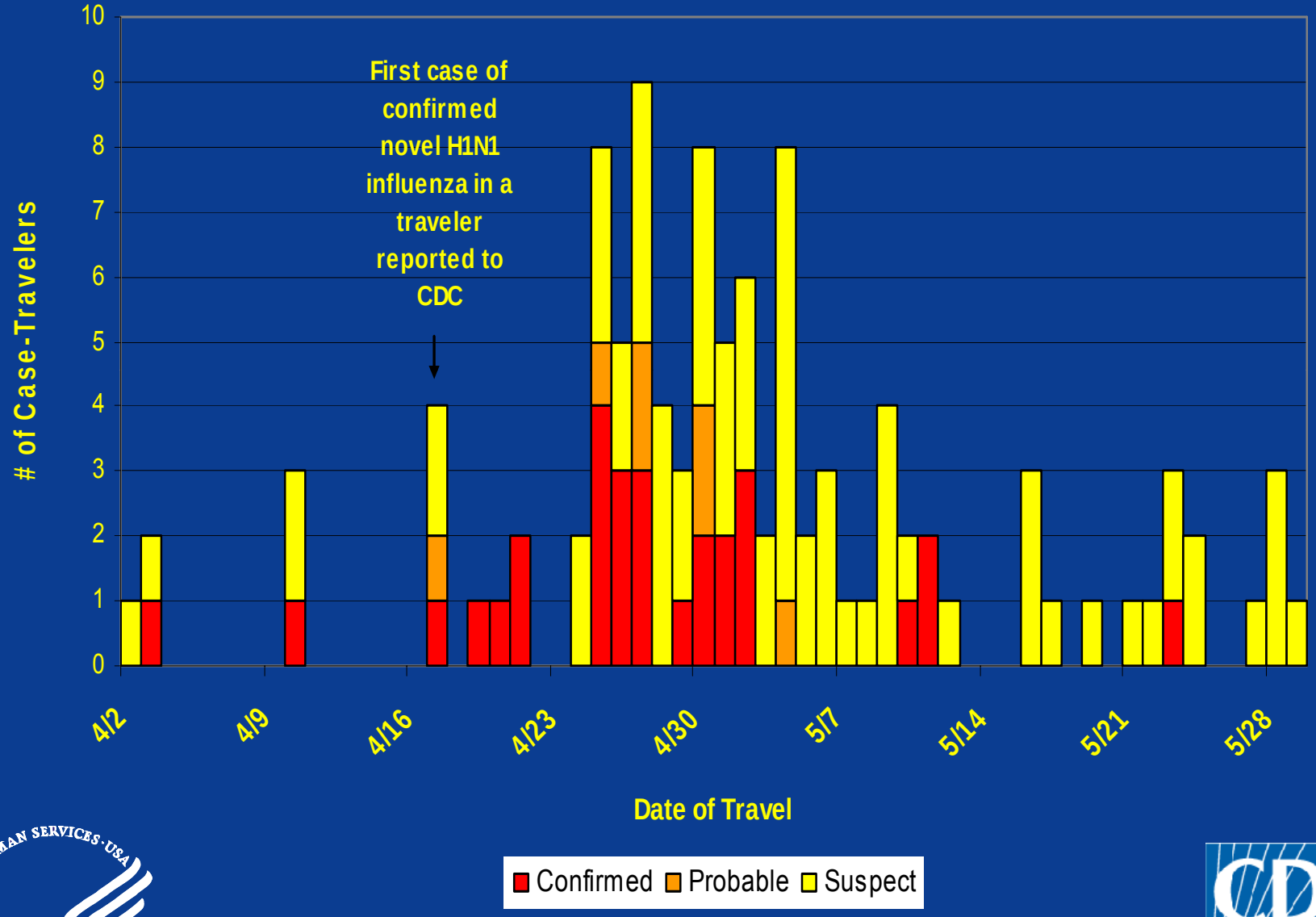
CDC
Quarantine and Migration Health

Domestic Travelers, Reported to the Quarantine Activity Reporting System, April 1 - May 31, 2009 (n=107)



Quarantine and Migration Health

Meanwhile…Community Mitigation

- Voluntary isolation
- Education about handwashing, covering coughs, stay home
- Develop guidance documents
- School closure

MMWR Weekly
May 1, 2009 / 58(16);431-433

Update: Infections With a Swine-Origin Influenza A (H1N1) Virus -- United States and Other Countries, April 28, 2009

On April 28, this report was posted as an MMWR *Dispatch on the* MMWR *website* (http://www.cdc.gov/mmwr).

Since April 21, 2009, CDC has reported cases of respiratory infection with a swine-origin influenza A (H1N1) virus (S-OIV) transmitted through human-to-human contact (1,2). This report updates cases identified in U.S. states and highlights certain control measures taken by CDC. As of April 28, the total number of confirmed cases of S-OIV infection in the United States had increased to 64, with cases in California (10 cases), Kansas (two), New York (45), Ohio (one), and Texas (six). CDC and state and local health departments are investigating all reported U.S. cases to ascertain the clinical features and epidemiologic characteristics. On April 27, CDC distributed an updated case definition for infection with S-OIV (Box).

Of the 47 patients reported to CDC with known ages, the median age was 16 years (range: 3--81 years), and 38 (81%) were aged <18 years; 51% of cases were in males. Of the 25 cases with known dates of illness onset, onset ranged from March 28 to April 25 (Figure). To date, no deaths have been reported among U.S. cases, but five patients are known to have been hospitalized. Of 14 patients with known travel histories, three had traveled to Mexico; 40 of 47 patients (85%) have not been linked to travel or to another confirmed case. Information is being compiled regarding vaccination status of infected patients, but is not yet available. According to the World Health Organization (WHO), as of April 27, a total of 26 confirmed cases of S-OIV infection had been reported by Mexican authorities. Canada has reported six cases and Spain has reported one case.*

Severity of Disease Was Not Clear

- Looked like very severe disease in Mexico
- Mild disease in US
- What to do???????????

MMWR Weekly
May 8, 2009 / 58(17);470-472

Swine-Origin Influenza A (H1N1) Virus Infections in a School --- New York City, April 2009

On April 30, this report was posted as an MMWR *Dispatch on the* MMWR *website* (http://www.cdc.gov/mmwr).

On April 24, 2009, CDC reported eight confirmed cases of swine-origin influenza A (H1N1) virus (S-OIV) infection in Texas and California (*1*). The strain identified in U.S. patients was confirmed by CDC as genetically similar to viruses subsequently isolated from patients in Mexico (*1*). Since April 24, the number of cases in the United States* and elsewhere† has continued to rise. As of April 28, approximately half (45) of all U.S. cases of S-OIV infection had been confirmed among students and staff members at a New York City (NYC) high school. This report describes the initial outbreak investigation by the NYC Department of Health and Mental Hygiene (DOHMH) and provides preliminary details about 44 of the 45 patients (the remaining patient resides outside of NYC and was not included in the analysis). The preliminary findings from this investigation indicate that symptoms in these patients appear to be similar to those of seasonal influenza. DOHMH will continue monitoring for changes in the epidemiology and/or clinical severity of S-OIV infection.

Epidemiologic and Laboratory Investigations

On April 23, DOHMH was notified of approximately 100 cases of mild (uncomplicated) respiratory illness among students at an NYC school (high school A) with 2,686 students and 228 staff members. During April 23--24, a total of 222 students visited the school nursing office and left school because of illness. Given initial reports on April 24 of what was later determined to be a large S-OIV outbreak in Mexico, DOHMH decided to rapidly mobilize staff members

MMWR Weekly
May 8, 2009 / 58(17);467-470

Outbreak of Swine-Origin Influenza A (H1N1) Virus Infection --- Mexico, March--April 2009

MMWR *en Español*

On April 30, this report was posted as an MMWR *Dispatch on the* MMWR *website* (http://www.cdc.gov/mmwr).

In March and early April 2009, Mexico experienced outbreaks of respiratory illness and increased reports of patients with influenza-like illness (ILI) in several areas of the country. On April 12, the General Directorate of Epidemiology (DGE) reported an outbreak of ILI in a small community in the state of Veracruz to the Pan American Health Organization (PAHO) in accordance with International Health Regulations. On April 17, a case of atypical pneumonia in Oaxaca State prompted enhanced surveillance throughout Mexico. On April 23, several cases of severe respiratory illness laboratory confirmed as swine-origin influenza A (H1N1) virus (S-OIV) infection were communicated to the PAHO. Sequence analysis revealed that the patients were infected with the same S-OIV strain detected in two children residing in California (*1*). This report describes the initial and ongoing investigation of the S-OIV outbreak in Mexico.

Enhanced Surveillance

Done
Trusted sites
100%
Migration Health

TABLE. Number and percentage of confirmed cases of novel influenza A (H1N1) virus infection, by patient age group and hospitalization status — United States and Mexico, March 1–May 5, 2009

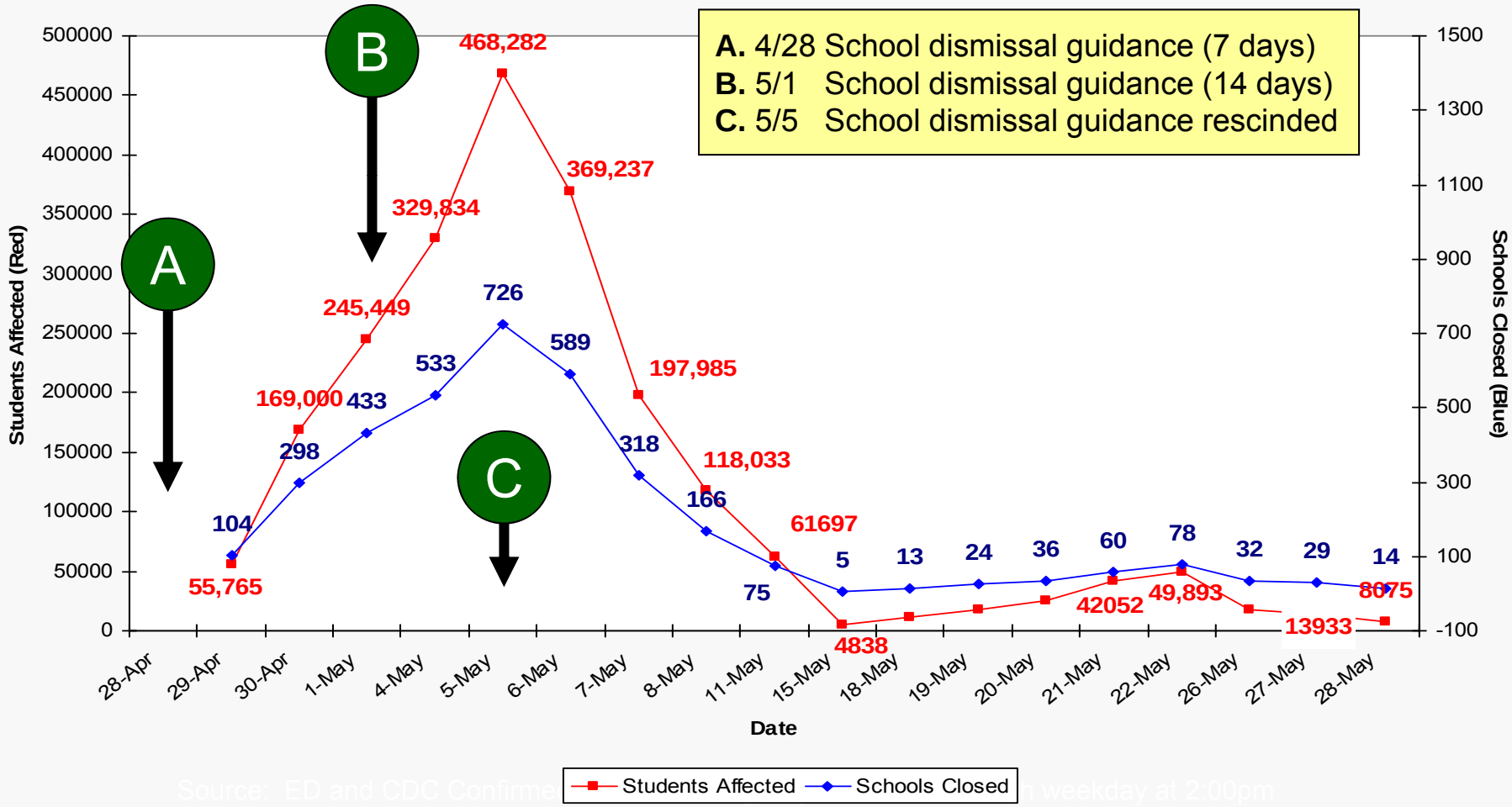
	United States			Mexico		
		Hospitalized			Hospitalized	
Age (yrs)	Total	No.	(%)	Total	No.	(%)
<5	51	7	(14)	115	6	(5)
5–14	204	9	(4)	248	4	(2)
15–29	250	9	(4)	313	13	(4)
30–44	68	9	(13)	154	16	(10)
45–59	36	1	(3)	94	7	(7)
≥60	10	0	(0)	21	2	(10)
Not available	23	0	(0)	4	4	(100)
Total	642	35	(5)	949	52	(6)

MMWR Weekly May 8, 2009 /58(17);453-458

www.cdc.gov/H1N1flu

Division of Global Migration and Quarantine
Novel Influenza A (H1N1) - 29 May 2009
School Dismissal, United States, 4/29 – 5/27, 2009

14 schools closed due to H1N1 in 4 states today: MA, NY, TX, and WA
The closures impacted 8075 students and 613 teachers
12 schools reopened in MA, NJ, and NY affecting approx. 5035 students and 471 teachers



Source: ED and CDC Confirmed [illegible] weekday at 2:00pm

Public Health Research

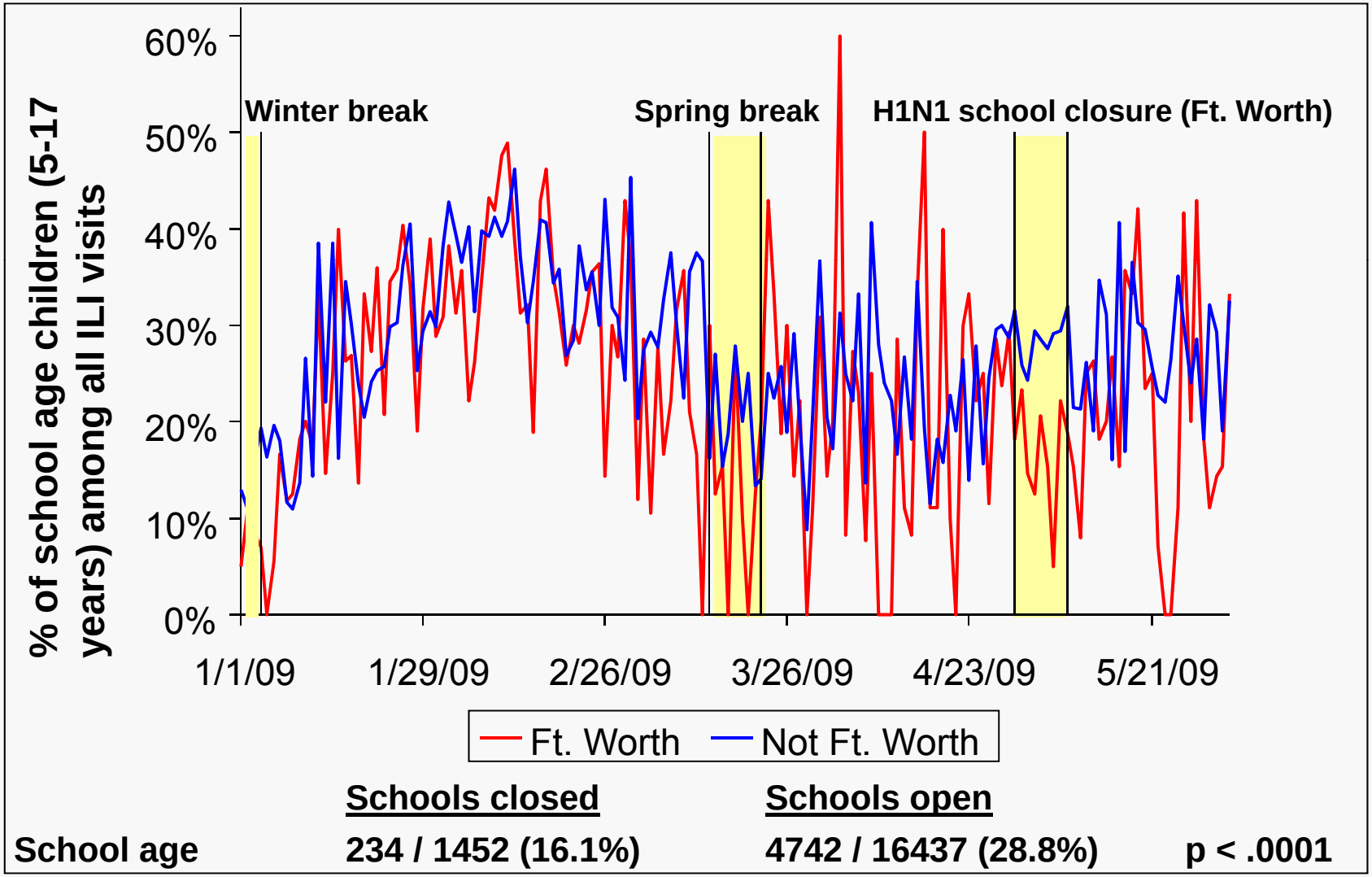
- Intense investigation of first four flights with confirmed H1N1 case passengers
- Investigation of outbreak among crew of cruise ship between Seattle and Alaska
- Evaluation of community mitigation

Anecdotal or Data-based Evidence - 2009

- **School closures "seems" to work**
  - UK – early school closure, case treatment, school and HH prophylaxis (London, Birmingham) – aborted secondary transmission if done within 48 hours (achievable 1 of 3 instances)
  - Japan – cases in schools, 2 cities with school outbreaks – district-wide closure for 7 – 14 days – aborted outbreak
  - NYC only 1 school saw recurrence of cases after reopening
  - Discrepancy of ILI visits of school age children in Dallas/Ft. Worth
- **Messaging to college students on appropriate behavior seems effective**
- **Absenteeism data alone not good surrogate for H1N1**
- **More opportunities to learn:**
  - **Mexico: School and business closures**
  - **Chile: School closure, antiviral use in students/HH**
  - **Australia: moving from containment to protection**
  - **NYC: 451 schools under observation**
  - **Summer Camps**

Division of Global Migration and Quarantine
Novel Influenza A (H1N1) – 26 June 2009
Nonpharmaceutical Interventions

Proportion of ILI Cases in School-aged Children
Tarrant and Dallas Counties, 2009



	Schools closed	Schools open	
School age	234 / 1452 (16.1%)	4742 / 16437 (28.8%)	p < .0001

Current Unknowns

- Scope and duration of current outbreak
- Potential for second wave
- Potential for increased severity

Plans

- Assume the worst
- Plan for border screening
- Put most effort into mitigation

Gracias!