

**COCA Conference Call
Quarantine and Pandemic Influenza Preparedness
Dr. Michael Doney
August 21, 2006**

Coordinator: Welcome and thank you for standing by. At this time, all participants are in a listen-mode. During the question and answer session, if you'd like ask a question, please press star-1. Also, this call is being recorded. If you would like to access the replay of the conference, please dial 1-800-766-8390 or 402-220-0374. I would like to turn the meeting over to the Dr. Diane Hadzibegovic. Ma'am you may begin.

Diane Hadzibegovic: Thank you.

Good afternoon. The CDC Clinician Communication Team is glad to announce our second COCA Conference Call this month.

We are pleased to have Lieutenant Commander Dr. Michael Doney. He's a Medical Officer at the CDC Washington Quarantine Station.

He has served with several working groups in collaboration with the Department of Homeland Security to develop border health screening protocols in the setting of an influenza pandemic.

He assisted in the development of the communicable disease response plan at ports of entry in the quarantine station jurisdiction which includes Maryland, Virginia, Washington DC, and West Virginia and collaborates with the state and local public health authorities to monitor the health of arriving international travelers.

He's also a staff physician in emergency medicine at the National Naval Medical Center in Bethesda, Maryland.

The slides for today's COCA conference call are available at the COCA conference Web page: www.bt.cdc.gov/coca.

Today's COCA conference call is *Non-Pharmaceutical Public Health Intervention Strategies and Implementation in the Setting of Pandemic Influenza*.

Objectives: Discuss the role of the CDC Division of Global Migration and Quarantine and the CDC Quarantine Stations; discuss community-based

nonpharmaceutical public health interventions and their rationale for use during an influenza pandemic; and to discuss a strategy and implementation rationale for using nonpharmaceutical public health interventions in the setting of an influenza pandemic.

Dr. Doney, you may start.

Michael Doney: Thank you. Good afternoon.

My name is Dr. Lieutenant Commander Michael Doney, and I am a Quarantine Medical Officer at the CDC Washington Quarantine Station.

I am pleased to have this opportunity today to speak with you about the Division of Global Migration and Quarantine and its activities at the quarantine stations and the potential role of non-pharmaceutical public health intervention in an influenza pandemic.

Advance the slide please.

Briefly, I will introduce to you the CDC Division of Global Migration and Quarantine and the role and function of the quarantine stations.

I'll discuss selected non-pharmaceutical public health interventions and the rationale and strategy in terms of targeted layered containment for using these tools.

Advance the slide please.

The Division of Global Migration and Quarantine has statutory responsibility to make and enforce regulations necessary to prevent the introduction, transmission or spread of communicable diseases from foreign countries into the United States.

Just a few of the tasks undertaken in achieving its mission include: Overseeing the medical examination of aliens, notifying state and local health departments for the arrival of refugees and their jurisdiction, overseeing the screening of arriving international travelers for symptoms of illness that could be of public health importance, developing communicable disease response plans at ports of entry and providing travelers with essential health information.

Advance the slide.

This graphic depicts the organization of the division.

The branches within the division include geographic medicine and health promotion which among its many activities produces the book, *Health Information for International Travel*, commonly known as the “Yellow Book”.

The immigrant, refugee, and migrant health branch which may be known to many of you in public health agencies for its important work in administering programs to safeguard the health of these populations.

And then finally the quarantine and border health services branch.

This discussion will focus primarily on the quarantine and border health services branch which administers the quarantine stations.

However, clearly all of the branches and organizational units within the division are critical to the collective success of the division.

Advance please.

We will now turn our attention to the quarantine stations and their role as a coordination point with public health response at ports of entry.

Advance please.

Quarantine stations are located around the country at major ports of entry including airports, seaports and land border crossings.

These sites were chosen based primarily on volume of traffic; however, each station has a jurisdiction within which it is responsible for other ports of entry within their designated region.

Advance please.

Quarantine station staff are highly trained and generally include an officer in charge responsible for operational aspects of the quarantine station, the quarantine medical officer oversees medical epidemiologic and research aspects of the station, and a number of quarantine public health officers who function to provide ill passenger assessments and coordinate many of the port activities with our partners. Each has a role to play in meeting the mission of the quarantine station.

Advance please.

This mission is to protect the health of the public from communicable diseases and include such activities as assessing arriving ill international passengers

and determining the risk they may present to other passengers in the community and coordinating an appropriate response.

Other important activities include monitoring the health of the imported animals as well as determining the risk to public health from animal and other biological substances.

As a staff member of the quarantine station, let me emphasize that these are just a few of the activities that we are involved in at the ports.

Advance please.

Let us now focus our attention on the specific activity of monitoring the health of arriving international travelers and explore these activities a little more in-depth.

Advance please.

The quarantine stations have specific authority and responsibility including those listed here, some of which have more historical importance, while others have more recent significance such as SARS and pandemic influenza strains. Of these, our activities focus most commonly on infectious pulmonary tuberculosis which remains an important public health problem worldwide.

Advance please.

Our interest at the station and within the division are not limited to just those illnesses to which we have statutory responsibility, but also include a number of illnesses which may pose as significant public health threat and may require a coordinated public health response to address.

Many of these illnesses are listed here. In particular, measles and varicella are commonly encountered and meningococcal meningitis is an example of an illness which requires a rapid thorough response effort.

Advance please.

We'd like to now turn our attention to the activities involved in communicable disease response specifically.

Advance.

Under the Code of Federal Regulations at 42 CFR Part 71, all captains of conveyances are required to provide notice of the occurrence of passenger or

crew illness to the quarantine station with jurisdiction at the intended port of arrival.

Advance.

However, surveillance is not limited to conveyance or vessel crew. Through education and outreach to our port-based and community partners, who may come into contact with this population of travelers, we have created a layered system of surveillance that is more robust in its ability to detect illness. In particular, US Customs and Border Protection at ports of entry are a crucial partner with whom we interact on a daily basis.

Advance please.

The goal of the surveillance is to identify ill persons, perform a public health assessment and provide an appropriate disposition. Our limitations in this endeavor include some relative staffing limitations and a reliance on syndromic identification.

Advance please.

While we are reliant upon syndromic surveillance in this population as we work with many of our partners who are not clinically trained and many of our partners in the travel industry and port industry who are not clinically trained, but do encounter these individuals commonly.

These syndromes are combined with travel and activity histories and our knowledge of the global epidemiology of communicable disease develop our probabilistic risk assessment for a given ill traveler.

Advance please.

Advance. Here we go.

Our syndromic surveillance are as noted here. And this includes fever of at least two days duration or fever and specific symptoms which were referable to the illnesses of which we have authority.

Currently, these regulations do not include acute febrile respiratory or neurologic illness. However, we do request reporting of these syndromes. We are working to make these syndromes required reportable.

Advance please.

There are limitations inherent to this syndromic surveillance methodology and the more significant limitations are noted here.

These include the dependence on non- medical personnel and disincentives to travelers to self identify who may fear undergoing a delay in travel while a health assessment is being conducted.

Perhaps most significant, however, is the relatively brief time during which travelers may be encountered within the system for surveillance and a resulting bias toward recognition of acute infections.

The development of the layered surveillance approach was in response to these limitations. Additionally, quarantine stationed staffs have developed strong relationships with state and local health partners to extend our surveillance activities into the communities of persons who have traveled recently.

Advance please.

I'll now direct our discussion to the specific role of quarantine stationed staff in surveillance and response activities at ports.

Advance.

Surveillance may be generally divided into two types at the ports -- passive and active. During passive surveillance, our port-based partners during the routine performance of their duties may become aware of an ill traveler and notify us.

As noted here this maybe the case with an airplane or ship where we received a report of illness. Quarantine station staff will meet the ill person on board to provide a public health assessment.

Paramedics may be present to provide a medical assessment according to their pre-established protocols. It is important to remember that in all cases for those travelers with acute medical needs, immediate health and safety of the ill person is paramount and the public health assessment is appropriately managed with emergency medical care.

As noted, we will routinely coordinate this response with our partners who may have also have a stake in the situation including EMS, Customs and Border Protection, law enforcement and public health authorities.

Advance please.

In contrast to these, if quarantine station staff received actionable health intelligence about communicable disease outbreaks abroad, staff may work in an active surveillance mode and meet arriving conveyances to provide direct and visual inspection, public health assessments, and an appropriate response.

This intelligence may come from our sister branches in the division, from our state and local public health partners who'll note illness in a recently arrived populations or from international public health authorities.

Advance please.

I hope in this brief introduction the activities of the division and its quarantine stations that it is apparent that regardless of the specific activities that our staff may be involved in, partnership is key to an effective coordinated response.

Layered surveillance in a network, coordinated responses at the borders but also within communities has allowed us to make important advances in achieving our mission.

In particular, we value our relationship with state and local public health authorities. They are critical to us in monitoring and responding to the health needs of recently traveled populations in our communities.

Advance please.

I would now like to turn our attention from a general discussion of our activities around communicable diseases at ports of entry and focus more specifically on pandemic influenza.

Also, I would like to extend a concept that I introduced earlier which is that a focus exclusively on borders is likely to be insufficient to limit the spread of illness such as pandemic influenza as in this example.

Rather a coordinated public health response - response which identifies the public - effective public health interventions and it integrates them appropriately at borders within communities likely to yield the greatest benefit.

Inherent in the statement is a requirement for effective support, communication and harmonization of practices.

Advance please.

Before I proceed further, I would like to clarify a few terms to ensure there is no confusion.

Isolation refers to the separation of ill persons with contagious diseases from the population to stop the spread of that illness.

Quarantine is a public health strategy that refers to the separation or restriction of movement of well but exposed persons at risk of becoming infectious.

Quarantine may take place in a variety of settings and maybe voluntary or compulsory taking into account a variety of factors such as respecting individual civil rights, ensuring that appropriate public health and medical monitoring is in place and minimizing the impact on persons and communities while simultaneously ensuring the safety and overall public health of the community.

Advance please.

Also as we begin to discuss some of the available nonpharmaceutical public health tools, we may roughly group these into social distancing measures or contact interventions which operate at the level of groups or communities - and infection control measures or transmission interventions which operate at the level of the individual.

Advance please.

I will roughly organize the discussion into three parts: Defining the challenge, exploring some of the underlying epidemiologic principles of transmission and the role in breaking the cycle and then proposing the strategy for implementing these nonpharmaceutical interventions or NPI.

Advance.

The graphic depicts data presented by Admiral Benson in his report to Congress in 1919.

Illustrated is the peak in annual death rates per thousand from roughly mid-September through late-December 1918. Corresponding to death rates linked to the onset of the influenza pandemic of that year.

While this spike in death rates is impressive and sobering, it is important to realize that within this aggregate data there lay important differences that are critical in formulating an appropriate response.

With this insight in mind, let's begin to explore this concept in more depth.

Advance.

Modeling has predicted that source containment strategies alone are unlikely to stop spread of a pandemic, although providing some measure of delay. Likewise, severe travel restrictions may provide some limited delay measured in weeks.

With this in mind, planning for domestic community based interventions to mitigate the effects of an influenza pandemic are warranted.

Advance.

In developing a rational intervention strategy, it's crucial to identify and incorporate tools from strategies which speak to the relevant parameters involved in communicable disease spread.

These parameters include primarily epidemiologic factors such incubation period, modes of transmission, reproductive rate and others noted here, as well as social parameters such as mixing patterns and mobility, as well.

Factors such as the acceptability of collective actions and compulsory restrictions, expectations with the community regarding actions, reactions and outcomes, the affordability of interventions and secondary effects all play an important role in shaping an effective response.

Advance.

Vaccine is unlikely to be available early in the pandemic.

Pharmaceutical strategies may have some important effects but are confounded by factors such as availability of adequate stockpiles and questions regarding long term prophylaxis dosing.

Both community-based and individual-based nonpharmaceutical interventions should have an effect on transmission but the appropriate strategy remains unclear.

Advance.

The goal of community-based interventions is as depicted here: to reduce the peak attack rate and delay the onset of the peak. Importance of reducing the magnitude of the peak and shifting the curve to the right lies in the potential to reduce the peak impact on healthcare resources.

Advance.

This graphic will introduce you to the concept of the basic reproductive number or R_0 .

Advance.

R_0 is the expected or average number of new infectious cases in a completely susceptible population due to a single infectious case over the course of the infectious period.

Advance.

Advance again.

In this instance, R_0 is equal to two. It is important to understand, however, that R_0 is not an intrinsic biophysical property of a virus. It is rather a function of the specific virus acting within a specific social milieu at a specific time, thus, reducing the contact rate for infected individual will reduce R_0 .

Advance.

Social distancing interventions seek to reduce the number of contacts. All infection control interventions seek to reduce the probability of transmission all with the goal of reducing R_0 .

Advance.

Let's look at this concept graphically. Here epidemic curves are plotted as a function of varying the R_0 from high of 3.2 in yellow to a low of 1.9 in red. Reductions from the value of R_0 correspond to a reduction in the peak of fraction infected and a delay in the time to onset. Thus, social distancing and infection control interventions may have important effects on the epidemic curve by reducing R_0 .

Let's turn our attention with this theoretical treatment to see if we can find experiential evidence.

Advance.

These graphics from data provided by Mark Lipschitz depicts weekly excess death rates by city for a time period during the 1918 pandemic. There are notable differences in peak and time to onset for these various cities.

There is evidence, although not shown here in the interest of time, that suggests that the differences in these curves may be due to the timing and

scope of the implementation of various social distancing measures, in particular for Philadelphia and Saint Louis.

Please note I do not wish to overstate the case with these conclusions as the evidence is suggestive and not definitive, and any conclusions must be tempered by the limitations inherent in collecting and analyzing data from the historical record, with other relevant variables within these cities maybe lacking.

Advance.

I'd like to now direct our discussion to defining some of the important underlying principles which may assist us in defining rational strategies for intervention.

Advance.

Advance again.

This graph depicts the shape of an epidemic as it spreads.

Advance.

And advance again.

As you may begin to see here, patterns of transmission vary across individuals.

Advance again.

Some individuals transmit to a larger number of people while others transmit to only a few or none. While this graphic is theoretical there's evidence in the literature to support this model, as in the case of SARS.

Advance.

Here, so-called super spreaders were noted that spread the infection to large numbers of individuals in contrast to the majority of infected individuals who spread to only a few.

Advance.

As noted here in this graphic from MMWR, plotting numbers of persons on the Y-axis versus number of persons infected by an individual probable SARS patient on the X-axis, the vast majority of probable SARS patients transmit

the infection to none or just a few persons. However, they were clearly individuals who were responsible for infecting a large number of persons; example 7, 12, 21, and 23 and one all the way up to 40.

Advance, please.

For just a moment, let's step back from the specific evidence -- just depicted and look at a more theoretical treatment of these notions.

We'd like to introduce to you the concept of the scale-free network.

Simply put, a scale-free network is one in which the connectivity between nodes follows a power-law distribution. What this means, as in the example depicted here on the right, is that they're a few highly connected hubs amongst a large network of less connected nodes as opposed to the situations depicted on the left, where there's a random network where the majority of nodes have a similar number of connections and which follows a bell curve distribution of connectivity.

If it doesn't make a lot of sense to you, a common real-world example of this may be seen in the case of airlines which fly to many cities but usually have only a few highly connected hub airports representing bases of operation.

Advance.

So returning to our case of patterns of transmission and shaping the spread of an epidemic, if we try to identify those highly connected hubs of transmission and target those individuals for intervention, we may amplify the effectiveness of our interventions -- advance, advance again -- as shown here.

Advance.

Before continuing on to this graph, I would like to note that the critical insight to be gained from this discussion is that by averaging over a heterogeneous contact network, i.e., one that follows a scale-free pattern of connectivity, one may miss critical features that may allow for an appropriately targeted mitigation strategy. And the question becomes, how do I identify these highly connected hubs of transmission in the case of influenza?

In this graphic, depicting 1918 age-specific attack rates, it may be seen that attack rates were highest in older children, teens and young adults.

Let's focus on this idea of attack rate as related to age and introduce another concept which is that of social compartments.

Advance.

This table depicts patterns of transmission between age groups and further defines sites of likely transmission.

Advance.

Child-to-child and teen-to-teen transmission occurring in schools - occurs in schools -- advance -- and child-to-adult transmission occurs in households, and adult-to-adult transmissions occurring in the workplace, all three represent significant means of transmission. In particular child-to-child in schools, 21.4 and adult-to-adult in workplaces, 22.4.

Advance.

Using this type of data, we may begin to define the concept of social compartments and attach significance to them in terms of sites of likely transmission -- schools, workplaces, and households.

Advance.

So what is to be done?

Advance again.

I will now direct the presentation to discussing the strategy in terms of targeted layer containment, which draws upon concepts which we have been discussing to this point.

I would like to make it clear to you that this strategy of targeted layered containment or TLC is not US government, Department of Health and Human Services, or CDC policy; rather, at this time it is a way of conceptualizing the problem and designing an effective mitigation strategy and identifying the relevant variables and relationships as we begin to craft the pandemic response. I view this presentation as an initial step in simulating a conversation in this regard.

Advance.

The fundamental notion and strength to the TLC strategy is the concept of layered approaches and interventions as depicted in this slide. Having defined the population of children and social compartment of school as a significant factor in disease transmission, one may then effectively target an intervention to lower R_0 .

Implementing the strategy will decrease school-based transmission among children, but will correspondingly increase the relative contribution of other patterns of transmission, for example, community transmission among children who may then congregate at malls, movie theaters, parks, et cetera.

By targeting and then layering approaches that in return address transmission among other age groups in social compartments, it becomes possible to yield a comprehensive community mitigation strategy.

Advance.

In here with layered interventions, we begin to see a decrement in R_0 .

Advance again.

This slide will allow us to examine this notion from a slightly different perspective.

Beginning with this susceptible population who is exposed to pandemic influenza -- advance -- one may intervene with social distancing and infection control measures to limit exposure.

Advance.

Advance again.

Furthermore, there may be a role for pharmaceutical prophylaxis.

Advance.

For those individuals who are infected but in a latent phase, social distancing and infection control measures may limit secondary cases by limiting transmission.

Advance.

Advance.

For those individuals who are overtly ill, case management which includes treatment and isolation may further limit transmission. While shunting of an asymptomatic but infectious individuals away from susceptible persons through these measures may limit further spread.

Advance.

You see here -- advance -- case treatment and isolation -- advance -- and then shunting away.

Advance.

Models have been developed to examine the performance of several of these measures including layered strategies and community mitigation. These models have attempted to incorporate parameters including population variables, transmission characteristics of the virus, and transmission within age groups and social compartments.

Let's now turn our attention to some of these results.

Advance.

Before exploring some of the results from these modeling studies, I would like to point out that full discussion of these models including assumptions and modeling parameters is beyond the scope of this presentation and is in fact a full presentation in its own right.

We'll attempt to provide an overview of trends in the outputs in their relevance to the TLC strategy.

The Ferguson model looked at the impact of various interventions on the clinical attack rate of a pandemic with the base case of R_0 equal to 2.

Successive layered applications of interventions reduced the clinical attack rate in a step-wise fashion. Interventions included the base case, case treatment and school closure, case treatment and school closure plus household prophylaxis and then finally all layered on household quarantine.

Additionally, none of these interventions were modeled at complete coverage. For example, the model included only 70% total compliance with quarantine, yet reductions were noted uniformly.

Advance.

Extending this analysis to other endpoints of interest, Ferguson examined the effect of these interventions on reductions in peak attack rate, delay in time to peak and consumption of antiviral stocks.

A reduction of peak attack rate was noted along with the delay in time to peak. Moreover, implementation of home quarantine led to a reduction of the utilization of antiviral stockpiles associated with case treatments and household prophylaxis.

Advance.

Longini modeled the effectiveness of several types of interventions, both pharmaceutical and non-pharmaceutical in a layered strategy assuming a base case with R_0 equal to 1.9.

Generic social distancing and school closure independently had an effect, although a layered application -- as noted in green -- was most efficacious.

A purely pharmaceutical strategy which included case treatment and household prophylaxis was effective, noted in light blue, although not as effective as the layered non-pharmaceutical interventions.

Also, this strategy requires sufficient antiviral stockpile.

Combining the strategy with targeted antiviral prophylaxis termed TAP or TAP, which is defined as prophylaxis of close social contacts such as classmates and neighbors, et cetera, had a measurable impact but also resulted in increased use of antiviral stockpiles. And this is noted in the dark blue.

Combination of the pharmaceutical strategy plus targeted prophylaxis with school closure and generic social distancing measures had the greatest aggregate reduction in clinical attack rate and led to a fairly dramatic reduction in consumption of antiviral stockpiles. And this is depicted in the light purple.

Advance.

Finally, Glass modeled the effectiveness of school closure and school closure plus targeted social distancing measures at varying rates of compliance from 10% to 90% against the base case of no intervention at a R_0 of 1.6.

Regardless of the compliance rate for social distancing measures, layering these non-pharmaceutical measures had a measurable impact greater than school closure alone, supporting the concept of a layered combination of strategies.

Advance.

There's evidence that in many of these models, school closure forms a base or, say, base case within the non-pharmaceutical strategies.

But what is the evidence to support school closure?

Large scale school closure in Israel during an influenza epidemic, for an unrelated cause actually, was noted to result in decreases in respiratory infections and the consumption of medical care and pharmaceuticals -- 42% in the diagnosis of respiratory infections, 28% reduction in visit to physicians and emergency departments and just over a third decrease in medication purchases.

Advance.

So what do the modeling results mean?

It is important to bear in mind that in and of themselves, these models do not provide proof-positive of efficacy or effectiveness with these approaches. However, they do provide a reason for optimism regarding the possibility for intervention and the strategy of layering interventions.

Of course these approaches need to be continually evaluated based on underlying assumptions and ongoing experience.

Advance.

Let me provide a brief but large-scale overview of how these interventions might be implemented for borders and within communities vis-à-vis the WHO pandemic phases.

We may be missing a slide here, but - okay, let me advance forward.

I think we can say, with regard to non-pharmaceutical measures, generally, any specific measure in for implementation is dependent on transmission characteristics of the virus and the severity of illness.

Continuing with a summary of the targeted layered containment strategy, TLC includes isolation of ill persons, voluntary home quarantine for household contacts and social distancing and individual infection control measures.

Social distancing may include measures such as school closure, workplace continuity of operations plans, which incorporate liberal leave policies and other measures such as canceling or limiting of public events.

Also, individual infection control measure such as hand washing and respiratory hygiene will be broadly recommended. Mask use for ill persons and risk-based use of personal protective equipment are also key components of this strategy.

Advance.

Factors affecting the ability of communities to implement non-pharmaceutical interventions will be key to the ultimate and overall success of this approach. There were number of factors in consideration for successful implementation including social and governmental stability, cohesion and the will to implement and maintain these measures.

Also, maintenance of sufficient critical infrastructure to support these measures is key as is effective communication with rural areas and the development of means to maintain these measures within high-density cities.

Advance.

Also, there are other important considerations including the need to further define the front-end variables of where and when to implement these strategies, for how long to maintain these interventions, and back-end variables such as how and where to - how and when and where to terminate the interventions.

Moreover, the means to sustain families and communities for the duration of these interventions and the role of social and economic disparities and the relationship to second order effects and economic impacts remain to be clarified.

I'd like to thank you for your attention. And before I take questions, I would like to point out that this presentation is developed from others prepared and presented previously - (principally) by Capt. Martin Cetron, Director of the Division of Global Migration and Quarantine and many other DGMQ staff, too numerous to name individually. I'm indebted to all of them for their time and efforts.

Also, I would like to direct everyone's attention to the Web site www.pandemicflu.gov, the US government Web site that provides comprehensive information about pandemic flu and preparedness issues. There you will find the information on the Federal government, as well as state and local governments, planning preparedness measures including issues related to quarantine.

You may also find information on pandemic influenza on the Web site of the CDC at www.cdc.gov.

Thank you.

Diana Hadzibegovic: Dr. Doney, thank you very much.

Now we can start the question and answer session, and I just wanted to remind - for those who cannot ask a question, they don't have a chance today to ask a question, please email to coca@cdc.gov, and we'll make sure to forward your question to Dr. Doney for response.

One more time, coca -- C-O-C-A -- @cdc.gov.

Shelley, please announce the question and answer session.

Coordinator: Thank you.

At this time, if you'd like to ask a question, please press star-1. You'll be announced prior to asking your question. To withdraw your question, you may press star-2. Once again, to ask a question, please press star-1. One moment, please, for the first question. You may ask your question.

Question: Yes. Thank you, Lieutenant Commander, that was a very nice presentation and overview.

My question relates specifically to school closure.

We get, as I think a number of people on the line do, a certain amount of pressure both from the emergency planning community as well as the Department of Education to give them predefined thresholds for school closure, which gives us a great deal of heartburn, and we certainly have examples that are put up to such as the Costa Contra County, California, threshold of 10% absenteeism.

As I understand the data you presented and some of what Dr. Cetron has presented in other venues, that's going to be way too late.

On the other hand, I hear a lot of talk among the emergency preparedness community of just saying, we will close schools when WHO declares phase -- a pandemic alert phase - level 5 which, I guess, it concerns me, it could be too early.

I guess my two questions are; one, is there any rational predefined level for a pandemic caused by a strain, which doesn't currently exist; and secondly, how do you think we might come to some common ground when working with our emergency preparedness colleagues on this issue.

Michael Doney: Okay. Thank you very much for that question.

I can definitely understand and appreciate your interest as an education worker in the school with a large student population.

I can tell you broadly that the issues involved are rather complex. And as I noted in the answer this - or in the discussion, I think your first question which is trying to define a rational predefined level at which you would activate school closure as an intervention, really, speaking to the issue of sort of front-end variables about where, when and how.

I am not aware of a fixed target threshold at this time.

There are some examples and you mentioned, one, the Costa Contra County in California.

Now, I think there is as we have discussed previously as you had mentioned, there is some benefit to activating these strategies early on and this was related to some data that wasn't shown in this particular presentation but looking at the experience in cities from 1918, that the reductions in the peak can - and the onset did seem to link with early implementation of some of these measures. But I can't tell you for sure what that might be.

Sort of complicating the issue of a simple standard is trying also to relate how communities may be layering or activating these interventions generally. For example, if school system A implements school closure yet the adjacent school system B does not, what are the implications for the overall success in the strategy and how do we link these collective actions together.

So, to answer your question, I can't answer it directly and in fact I added on another layer of trying to define what the front-end variables are.

I can tell you that there is a lot of collaboration and work that's ongoing at this time. The division has hosted a series of consultants conferences, and you may have been involved in these previously, to bring together leaders from the academia and industry, public health and government representatives to begin to craft these answers. I hope that they will be forthcoming shortly.

That's going to speak to your second question is, how do you sort of define a common ground for working with your emergency planners.

I think that the answer to that question is much like what I think we're trying to do here, which is to begin to initiate the conversation and to work with them to create an awareness of the various levels and the various types of front-end variables front-end questions that we have and try to flesh-out that strategy.

So I think the common ground might be just working with them to a basic collaboration with their fellow emergency planners within communities to

start to see how would they - assuming that there would be implementation of school closure, how will they work with their local adjacent emergency planners and adjacent communities to link their actions collectively.

I'm not sure if that's really my - rather extended answer. I'm not sure I can answer your questions directly other than to say that, I think, it's an ongoing conversation. Hopefully, that will begin to help.

Q (con't): Thanks. I knew it was a tough question.

Question: I was wondering under what circumstances would we quarantine on the site of our campus, either in our dorms or in our classroom buildings. And the second part of that is, who would be the one to initiate such an action like that?

Michael Doney: Thank you.

I think you really have two questions there; one is who - if I understand it, who will declare a quarantine or who can initiate that type of action. And then what is the determination of the best site of a quarantine.

Q (con't): Yeah.

Michael Doney: The Federal Quarantine authority such as I spoke to in the presentation or such as that might be used by the Division of Global Migration and Quarantine is really specific to the setting of border public health interventions; for example, arriving international passengers.

With the question of quarantine within communities that might be recommended for schools or businesses, this is really a question that involves the authority of the states or the local public health authority that being based on a number of factors, which included into individual liberties, the illness involved, perceived threat to public health so that really is an authority that evolve to the state to this - in that instance - in the instance of your university.

As to the determination of the best site for a quarantine, once again depending on the setting that would be determined by all the relevant stakeholders and authorities so the state local public health authority, community partners; and the factors involved in the selection would be, how will we minimize the impact on the individual in the community, but also ensure that the site selected would allow for appropriate health monitoring access to healthcare, while also providing adequate protection for the ill person's family, others in the living quarters and then the community generally.

Now depending on the totality of these circumstances, home quarantine maybe more favorable and is the most commonly selected in a setting such as a pandemic with large numbers of individuals who may require quarantine.

This - that model may not be generally applicable. However, depending on the ability to ensure medical monitoring, the delivery of food, et cetera, that may actually result to being the best place. However, other institutions such as a hotel room or a room in a long-term care facility, other site maybe most appropriate.

But that really is a determination that probably will be best made within the community in consultation with the community stakeholders.

Q (con't): Thank you.

Question: Thank you. That was a wonderful presentation. I have a specific question with regard to the partnership that you mentioned that may overlap with public acceptance of either isolation or quarantine.

And I'm taking my lessons from the SARS experience in Toronto of which much has been published.

Of others still a lot of disagreement about public acceptance and the factors that are required for public acceptance. I think everybody agrees that sharing of information goes to credibility, which in turn goes to public acceptance.

And our experience with syndromic surveillance, particularly with regard to communicable infectious disease in the southwest, I'm in New Mexico is that - if information can be exchanged not merely from clinicians but, that is to say, traditional clinicians, physicians, osteopaths, et cetera, but from school nurses in particular, to local public health officials then local public health officials have a platform upon which to make a case for the need for quarantine albeit on where circumstances indicate.

So my question comes down to this, what is that value of real-time communication between trenchant observers who may not be clinicians such as school nurses with public health officials in order to establish cases for public acceptance of school closure in particular in the setting of a pandemic?

Michael Doney: I want to be sure that I'm understanding your question clearly.

Q (con't): Sure.

Michael Doney: And as I understand what you're asking is, what is the value of establishing a syndromic surveillance system within schools that might be administered perhaps by school nurses in opening our line of communication between them and public health authorities, the reporting of a syndromic surveillance data to - does occur in - within schools, reporting that to public health authorities to come up with a policy about how isolation quarantine may be administered.

Q (con't): Well, you got 90% of my question right, and I know it was a long and involved one.

Everything was correct up to the later point which is, what is the potential impact in your view and I know this hasn't been well studied on addressing the problem of the public acceptance of quarantine by having information from schools, in particular, school nurses, in real time?

Because if we learned anything at all from the Toronto SARS experience, there was variable compliance with regard to quarantine instructions that seemed in general according to most authors' reviews that I've seen, to be related to the credibility of information, that is, where is it coming from, how robust is it, what are the numbers and who's doing the report.

Michael Doney: I see. I think I understand a little more clearly now.

You know, I think that there is a large and important role for that type of reporting, and I think to get a sense, a real-time sense of how this illness would be evolving within the community, I will have to admit, I need to probably delve a little more and provide a little more thought into that question. I think there's a lot of subtleties there.

In order to provide you a - the best answer possible, if I may, I'd like to get back to you off-line through the COCA question submission system and provide you a little more comprehensive answer to that.

Q (con't): Yeah. I would posit while you're thinking about it, that specifically at least our experience covering about a million people with clinician based syndromic surveillance as opposed to data gathering from ICD-9 codes, but direct clinician-driven syndromic surveillance. Is that the credibility of that information that is the robustness of that information goes to its credibility which in turn helps with compliance with quarantine in the setting of communicable disease, for example, within college campuses or even across cities.

Michael Doney: Well, thank you very much.

Well, I do appreciate your thoughts on that and I think we have the basis for an interesting conversation among ourselves subsequent to this call. But I think that this is - this type of conversation is to a large measure, I think, what we are looking forward as we move - as we've further developed the strategy for non-pharmaceutical interventions, I think, much as we have with the consultants conferences gathering input, ideas and experiences from our partners throughout the states and localities, it's critical really to the overall success of this. So thank you very much for your observation and your question. I'll try to get back to you shortly.

Question: Good morning, Commander.

I was wondering if you all - I've noticed in the list of your partners, I did not see the Department of Defense. Department of Defense has a lot of airport spaces that bring in a lot of passengers from overseas and that sort of thing. Could you speak a little bit about how the quarantine station system interacts with the Department of Defense?

Michael Doney: Yes, thank you very much for that question.

I think that there are a number of areas in which we are collaborating, both directly and indirectly, one issue is in the routine movement of DOD personnel and their dependents. And generally as people move within the commercial airlines which accounts for a significant movement of these persons, they will fall within our purview, the authority of the quarantine stations.

Now in the setting of a large-scale movement in persons and there's been talk of relocating people back, potentially, at the time of a pandemic, how those movements of persons would occur, whether that would occur through airports or whether they return to military basis, I think, is a topic of ongoing conversation.

Generally, we do not operate on DOD premises and reporting and responses done through other means that are internal to Department of Defense.

But I think in a large-scale pandemic situation, these relationships that will be flashed out accordingly, there are other relationship that we have with DOD when it comes to management of air traffic. And these also are ongoing, but we're definitely having those types of conversations.

Question: Yes. Again, thank you very much for your presentation.

I was just curious actually looking on the slide about the tool box and again, you know, LA County has 10 million people and, you know, some of these recommendations, you know, have some big - besides the school closure on which Jay alluded to earlier which is a really, you know, which starts everyone of you are targeted layer of containment strategies and for health department, it's really difficult when you don't, you know, really give any type of guidelines, but yet you say for every level you have to close schools.

The next big question really is, you know, the prophylaxis of household contact which also again, you know, you mentioned in that tool box slide the treatment of, you know, may improve outcomes but not affect transmission and then antiviral prophylaxis will have more effects on reducing transmission.

Is that sort of a flip-flop on saying, you know, for people that have antiviral stockpile we should consider not using it for treatment first or using it for prophylaxis and if you do for prophylaxis, are you talking five months? Again, it's sort of out there, I know it's just one part of your cost, but it does have some big implications.

Michael Doney: Right, thank you for that question.

If I - may ask you to break that down into blocks. I believe you were referring to...

Q (con't): Okay. Your slide "Potential Tools in Our Tool Box" - when you were talking about antiviral prophylaxis. And you were saying, you know, the best thing for a prevention in a pandemic is the vaccine, okay, knowing that's not going to come for six to nine months, you talk about antiviral treatment will approve outcomes but we'll only have modest effects on transmission and then you talked about the antiviral prophylaxis which may have more effects on transmission.

And then on subsequent slides where you talked about population-based containment, you know, if you go under susceptible and then exposure, you know, you throw in again a lot of prophylaxis is your next, you know, big red, whatever, lightning bolt.

And I was just curious when you say prophylaxis in these models, are you referring to population-based prophylaxis and for how long and is it, you know, still hanging out there?

Michael Doney: Right.

I think the first question, which had to do with treatment dosing may reduce - may improve outcomes but may not have as much effect on transmission

relate to the fact of how transmission is occurring, which maybe before there is, you know, overt onset of illness and that period of time before the person is placed on to treatment dosing when they may be capable of transmitting the virus.

Prophylaxis then, referring to the fact that people who maybe on prophylaxis may have more substantial effects on reducing transmission as they - there is not that period of time when they may be capable of transmission before they're initiated on therapy.

So I think though that there are, you know, the total period of time that maybe required for prophylaxis dosing, questions about long-term safety of prophylactic dosing and not to mention the demand on stockpiles, I think all of these questions - many of these questions remain to be clarified and I don't know that the answers are really firmly in place.

Now, with regard to the modeling and they have, you know, several different scenarios have been modeled and one is sort of targeted antiviral prophylaxing and one is more general prophylaxis and I think that there is perhaps a role for all of these and certainly that would be suggested by some of the modeling data.

But I think what the main intention of the presentation was to say that irrespective of how these interventions are layered and whether they are layered in combination strategies like in, I believe, it was Glass that looked at - oh I'm sorry, Longini that looked at pharmaceutical interventions, nonpharmaceutical interventions and layering these things together that there is opportunity for an improvement in outcomes, whichever outcome you're looking at with the addition of the nonpharmaceutical interventions.

Now, I believe you had a question that related to school closure, and I don't know if that - if you could repeat that part of it.

Q (con't):

Well, I mean again everyone of your, you know, targeted layer containment strategies always begins with closing schools as your first step and then your other layers are adding on the other issues of targeted prophylaxis or social - other social distancing measures. And again it was just to reiterate again, you know, the school closure statement has to be agreed upon somewhere in CDC and weighed against like you said, you know, population-based effects of releasing, you know, into our population all these children who won't be in school and the economic effect of parents having to stay home to care for those children, I mean it varies, I think, considerably in locations.

And yet if you look at it in this black and white manner, school closure, I mean that's what's going to get propagated among population and I mean I think it does have some other downsides.

Michael Doney: Right. Now I welcome your comments and your input on that. And I think that there does remain much that needs to be clarified about the strategy.

You had commented initially that all of these things seem to start with school closure and that is in trying to formulate who are, you know, where is the, you know, the population that seems to be at the at the crux of transmission for whatever reason and then the social compartment in which that is taking place, that school closure or schools does - is sort of very unique that respect.

And school closure then becomes, you know, as seen as sort of a base for layering these strategies together, yet I think it is, as we've said, there remains much to be clarified about trigger points, both front-end and sort of back-end variables about how this is done.

And I think that we do take your observations strongly to heart in trying to craft how the strategy would - could be actually implemented.

Q (con't): Thank you. The other thing is - do if you have like 57 or 68 data, I mean I live in both of those pandemics and I don't remember school closures. So I was just curious I know we always go back to the 1918 or the Israeli studies, but I was just curious, I mean, someone must have data from '57 and '68 to summarize.

Michael Doney: I think what we were trying to do in this particular study is to look in sort of the data about how these strategies were layered within cities, I think is what lends the strength to the idea of targeting and then layering these things together and also in particular to timing.

So, to the degree that that sort of interventions were undertaken in the other pandemics, I am not aware of data that would contribute substantially to that argument, but yet we will, you know, definitely talk with our advisers influenza on that.

Michael Doney: If I may just make a closing comment and I do thank everyone for their questions and definitely I - to the degree that the presentation stimulates thought, I also thank you for your questions, which I think like I said, it's a conversation both ways to generate further thought for us as we've looked to sort of question out this strategy.

I just, once again, wanted to reiterate that this is not representative of any official policy of either the US government, HHS or CDC, but rather like I

said a conversation about a potential strategy that may represent really a variable means for intervening in a setting of a severe pandemic.

So thank you very much for the discussion.

Diana Hadzibegovic: Lieutenant Commander Michael Downey, thank you very much; wonderful presentation. Thanks to our audience.

For more information, please visit our Web site, www.bt.cdc.gov/coca for questions about this presentation and other questions, please send to coca@cdc.gov.

Please stay tuned for our next COCA conference call. Until that, CDC commission communication team. Good-bye.