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BIO ECONOMIC RESEARCH ASSOCIATES

A BIO-ERA TELECONFERENCE June 22, 2006

Recent H5N1 Outbreaks:
The Evolving Challenge of Defining and Communicating Pandemic Risk

EXECUTIVE SUMMARY

The recent cluster of human H5N1 infections on the Indonesian island of Sumatra resulted in a noticeable spike in concern that the risk of efficient human-to-human transmission was increasing. Fortunately, there is still no evidence of sustained, efficient, human-to- human transmission of the H5N1 virus, but as fears surrounding the Karo cluster have subsided, we are left to ponder several critical questions:

- Is the risk of pandemic changing?
- If so, how does one assess the changing profile of pandemic risk?
- And, how do you communicate the meaning of any change in risk profile?

In an effort to grapple with these and other vexing issues, bio-era convened a web teleconference on June 22, 2006 featuring commentary from a distinguished panel of experts, including Dr. David Nabarro, Senior United Nations (U.N.) System Coordinator for Human and Avian Influenza, Dr. William Karesh, Director of Field Veterinary Services, Wildlife Conservation Society, Dr. Peter Sandman, a noted authority on risk communication, and Mr. James Newcomb, Managing Director for Research at bio-era. Participating with them on the call was an equally distinguished collection of bio-era clients and invited guests. What follows is an illustrated and edited transcript of what was said.

The call and transcript were delivered as part of the bio-era service:

***"Thinking Ahead:** Anticipating the Early Impacts of an Avian Influenza Pandemic."*

The service is designed to inform and support efforts to better anticipate and prepare for the impacts of an influenza pandemic. Additional information about the service and upcoming events may be found on the bio-era website at www.bio-era.net, or by calling 617-876-2400.

SPEAKERS

Stephen Aldrich, President & CEO, Bio Economic Research Associates

Steve Aldrich is the founder and visionary leader of bio-era. He studied evolutionary biology at Harvard University before entering business, where he has enjoyed a long and successful career in the research and advisory industry. He joined Cambridge Energy Research Associates (CERA) in 1984, shortly after the firm's inception, and played a major role in building and managing the company, and worked closely with senior management teams and Boards of Directors at major companies on strategic matters.

Dr. William Karesh, Director, International Field Veterinary Program, Wildlife Conservation Society

Dr. Karesh is a leading expert on wildlife health and conservation, and has published over one hundred scientific articles on these issues. He was recently appointed Chairman of the Veterinary Specialist Group for the International Union for the Conservation of Nature.

Dr. David Nabarro, Senior U.N. System Coordinator for Human and Avian Influenza, World Health Organization

Dr. Nabarro is responsible for coordinating United Nations efforts to control avian influenza, and works to ensure that the UN system supports effective local, national, regional and global preparations for a potential human influenza pandemic.

James Newcomb, Managing Director, Research, Bio Economic Research Associates

James Newcomb manages the bio-era research team and process. Jim has a long history of building and leading successful research teams at other information and consulting companies. He was the founding President and CEO of E-SOURCE, a leading provider of research and advisory services to energy companies worldwide, and was the co-founder and managing director of the natural gas team and practice at CERA.

Dr. Peter Sandman, Independent Consultant

Dr. Sandman is a leading expert and consultant in the field of risk communication and reputation management and a Professor of Human Ecology at Rutgers University.

Bio Economic Research Associates (bio-era™) is a leading provider of independent research and advisory services on the emerging bio-economy. Bio-era's mission is to help decision-makers understand and respond to the economic risks and opportunities arising from human-induced change to biological systems. The firm's practice areas include biosecurity, bioenergy, and biotechnology.

Operator: Hello everyone, my name Braden and I would like to welcome you to today's Bio-Economic Research Associates (bio-era) conference call. At this time, all participants are in a listen-only mode. Later, we will conduct a question and answer session. If you should need operator assistance at any time, or if you have a question that you would like answered during the conference, please press "*" and then "0" on your touch tone phone and an operator will assist you. Our first speaker today will be Steve Aldrich, President of Bio Economic Research Associates. Steve, please go ahead.

Steve Aldrich: Hello everyone, and welcome to yet another bio-era teleconference. The title of today's call is: Recent "H5N1 Outbreaks: *The Evolving Challenge of Defining and Communicating Pandemic Risk*." I'm delighted to have on the call with us today an excellent representation of companies and others from our client base, most of whom are engaged in one way or another in pandemic planning and preparedness for their organizations, and monitoring developments around the possibility of pandemic emergence. They are interested in the latest information and insight into how risk may be changing and how they can best communicate to their constituencies an assessment of pandemic risk emergence. So, this is a fascinating topic we're going to address today. I'm very much looking forward to hearing what is said here.

We are going to be joined by Dr. David Nabarro, the Senior United Nations (U.N.) System Coordinator for Human and Avian Influenza. I'll kick off the session by inviting some comments from David on the latest developments and how he sees the challenge of assessing and communicating pandemic risk. Then, we'll turn to my colleague and partner, James Newcomb, who will present bio-era's thoughts on the subject, including an assessment of where we are in the outbreak, the latest developments, and what their significance may be. We're also very fortunate to be joined by both Dr. William Karesh, Director of Veterinary Field Services for the Wildlife Conservation Society. We'll be inviting comments from Billy, and also from Dr. Peter Sandman, a well-regarded expert on the subject of risk communication. To kick things off, I'll check to see if David Nabarro is with us.

David Nabarro: Yes, thank you very much indeed. I'm honored to be participating in an event where both Peter Sandman and Bill Karesh are on the line. Greetings to all of you. I thought I'd start by giving a brief update as I read the situation, in terms of the epidemiology of avian influenza caused by H5 viruses around the world amongst birds, and also an update on some of the sporadic human cases that we've seen, and to look at their significance. Then, I'd like to discuss the communication of epidemic and pandemic risk. I don't personally feel I have much expertise on that, but I would just like to make a couple remarks about that and then I'll tune out as quickly as possible. If I'm going on too long, I know you'll stop me.

During the last month or two, we have seen continuing outbreaks of H5N1 avian influenza in poultry of various species around the world; notably in Romania, Nigeria, China, and Egypt. We're seeing outbreaks, as well as continuing reports of bird die-offs in Indonesia, which gives us cause for concern. And recently, we detected the presence of an H5 virus in a gosling in northern Canada. But that was a low pathogenic H5 virus, and should therefore not enter into our spectrum of concern.

> “We’re continuing to see [H5N1] moving as a result of trade, and perhaps as a result of carriage by wild birds . . .”
>
> — David Nabarro

There has been no dramatic change in the pattern of H5N1. We’re continuing to see it moving both as a result of trade, and perhaps as a result of carriage by wild birds that can be asymptomatic for a time at least. We don’t have enough information about what’s happening in Russia right now. There are more rumors and some reports of new cases in Ukraine, which I have not been able to confirm.

The most recent outbreak of significance was in a village just north of Medan on the island of Sumatra in Indonesia, where between the end of April and the end of May, there were around seven humans that were showing symptoms and were confirmed to be infected by H5N1. There was a dispute during the period between end of April and the end of May as to whether or not some of these people, who were all blood relatives, were infected from each other rather than from birds. In fact, what occurred was what we call inefficient human-to-human transmission of H5N1, which has been reported in Hong Kong since the late 1990s, and has also been suspected in other places as well. That in itself is not really a big deal. What matters is when H5N1 can be transmitted between humans in an efficient and sustainable way. That becomes the alarm for the appearance of a possible human-to-human transmitted pandemic virus, which then triggers a set of actions that have been agreed between countries and championed by the World Health Organization for containment.

But there was a bit of a wobble in public communications during the period of uncertainty over what was happening in this village. The government of Indonesia, a number of journalists, and the international community had to work quite hard to get a story that was consistent, to make sure that people were able to choose what they do on the basis of evidence rather than on conjecture. I’d say we had two days of uncertainty, but particularly by people within the international system. In response, a fairly serious meeting is being conducted in Indonesia right now to discuss how these difficult incidences of human infection are communicated.

I would like to discuss communication in relation to three things. First of all, is the public health risk changing? My judgement is that the risk has not changed compared to what it was six months ago. We still have quite a difficult situation with H5N1 around in the world. It is still a virus that we believe has the potential to cause a pandemic at any time if it were to mutate. But I don’t think that’s any more likely to happen now then it was six months ago. The virus that was, for example, causing these human cases in northern Sumatra was not showing significant genetic differences by comparison to the viruses that are causing trouble in other parts of the world.

Secondly, are individuals, communities, and governments, acting in the most appropriate ways on the basis of information that has been communicated to them? I think we still have some way to go there. We have plenty of evidence that communities in parts of Indonesia, China, Africa and Eastern Europe are still finding it quite hard to work out for themselves what they should be doing in relation to H5N1 avian influenza. Whether it’s to do with how they should change their poultry rearing or poultry consumption practices, there’s still some uncertainty.

The third issue is communication in relation to global public perception. It's difficult to assess, but if we were to poll serious opinion formers who were in receipt of our communications right now, would they be saying to themselves the situation is under more or less control now than it was six months ago? I don't know, but my discussions with journalists as recently as yesterday in Seattle certainly make me feel that journalists themselves feel that people are coming to terms with the threat posed by H5N1. I believe this to be healthy.

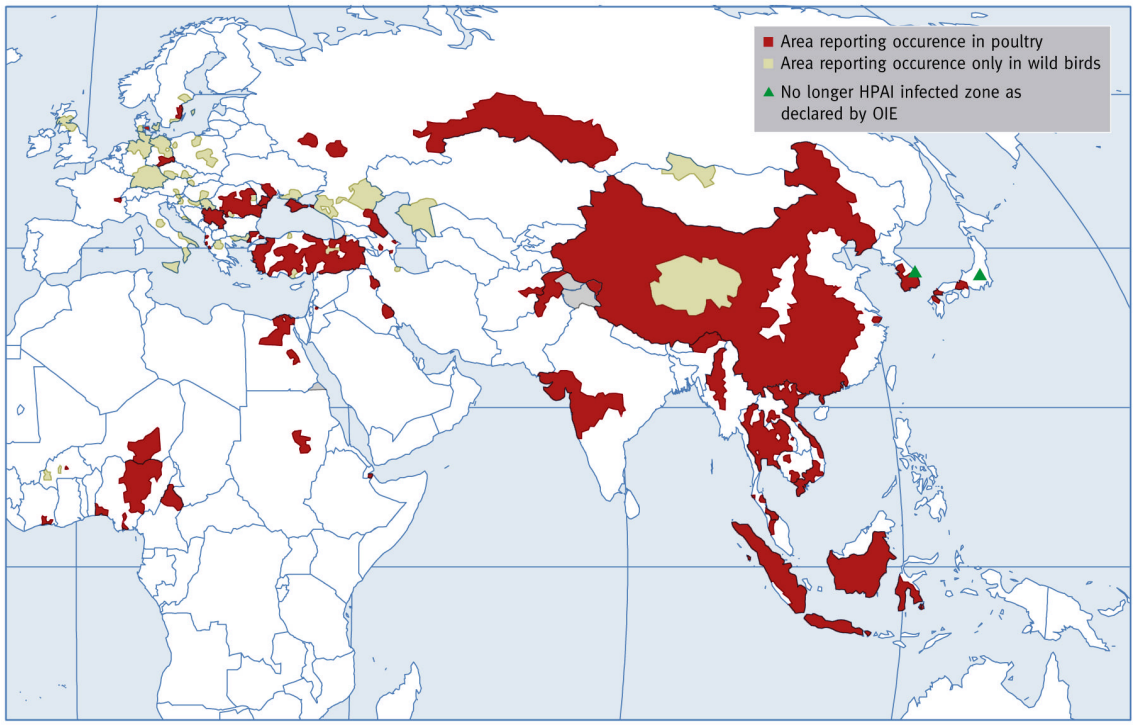
The only group that seems to be particularly focused on pandemic preparedness is international private sector organizations who are concerned about business continuity. On the basis of discussions that I've had in various fora over the last few weeks, I believe they have made great strides.

Stephen Aldrich: Thank you David. I would second your assessment of the way in which the international community has come to grips with the threat. And certainly, our experience on the private sector side is that people are definitely taking the threat seriously from a business continuity point of view and are responding. I think David's comments present a great lead-in from my colleague Jim Newcomb. I'd like to turn the podium directly over to him and give him an opportunity to take us through some of the latest bio-era analysis on this subject.

Jim Newcomb: Thank you Steve, and especially to Dr. Nabarro, who's made my job considerably easier. I would like to add a few points with respect to our perspectives on recent developments. Then, I'd like to invite some comments from Billy Karesh and Peter Sandman.

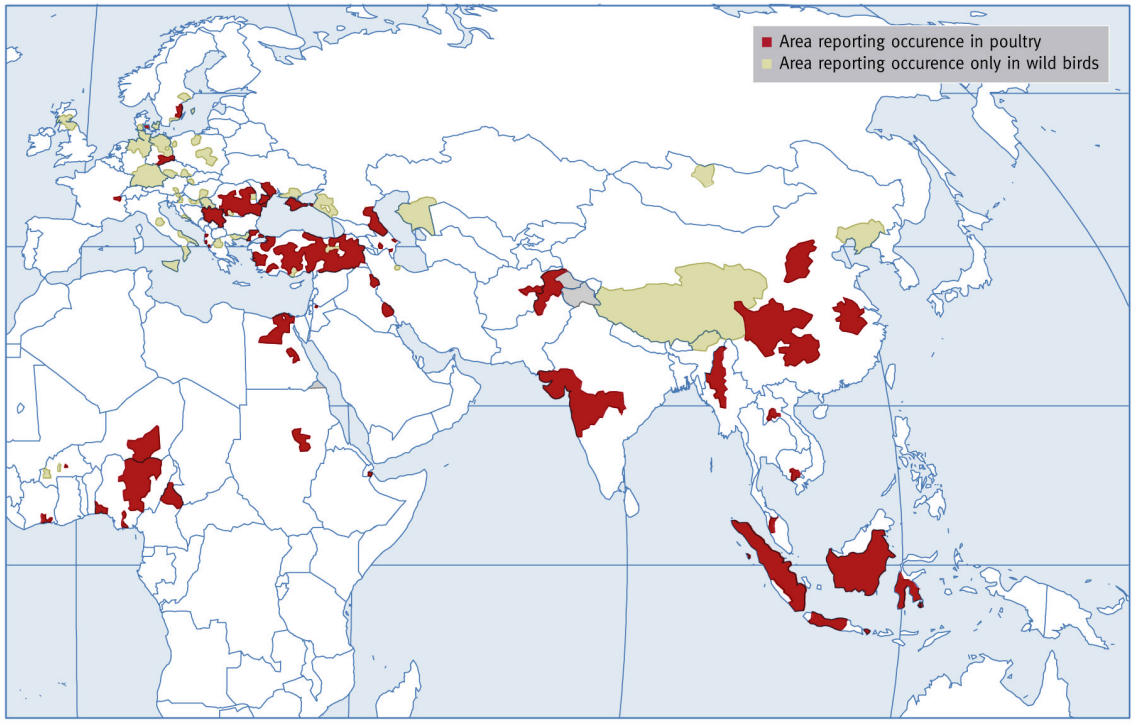
To begin with, there's both good news and bad news regarding how outbreaks of H5N1 in birds have continued to unfold around the world. Of course, the bad news is the ongoing spread to some new areas, and potentially now to Zambia. With respect to the good news, I would like to contrast the image that you're looking at right now—the outbreaks since December 2003—with the following picture that shows the outbreaks in birds that have been recorded this year. You can see here the difference, and I'll flip back and forth a little bit to reiterate those.

H5N1 Outbreaks in Birds Since December 2003



Source: WHO

H5N1 Outbreaks in Birds Since December 2006



Source: WHO

Take a look first of all at Southeast Asia, where Vietnam and Thailand have had successful programs in containing bird outbreaks. And just today, Malaysia announced that it has been free of outbreaks for three months. Look at the differences across much of China with respect to the entire history of outbreaks, and the history just this year.

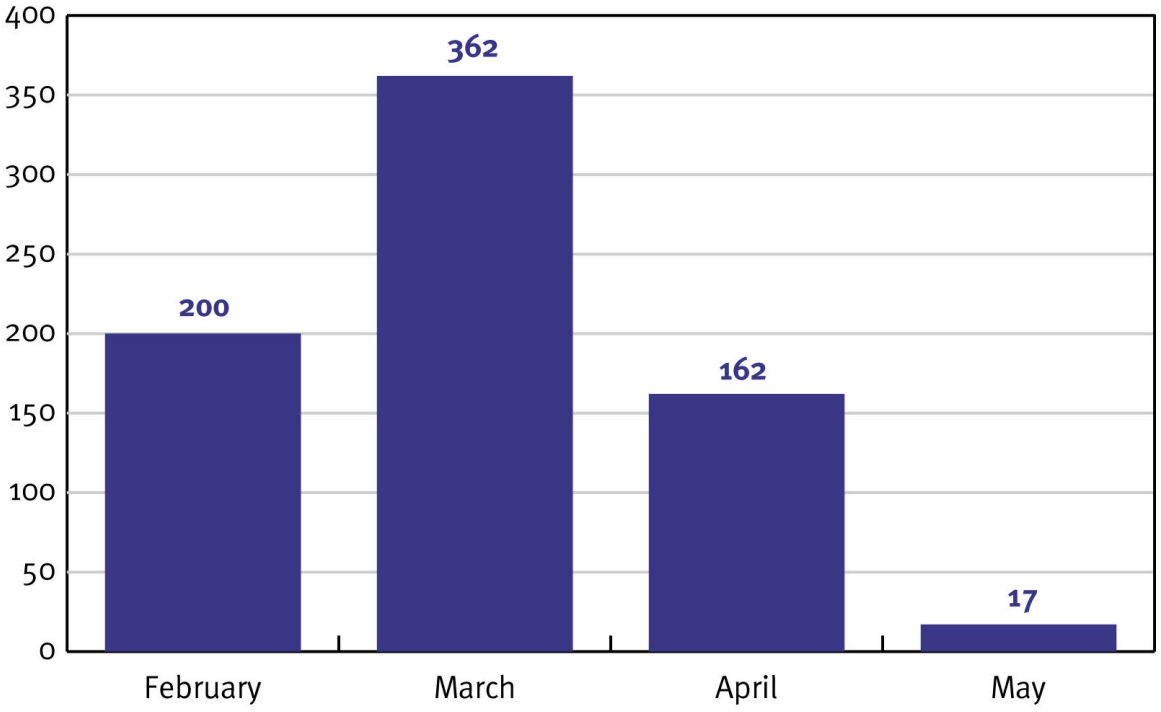
Finally, the perspective across parts of Russia and eastern Europe, where again, efforts in the last year have been successful in reducing and containing the number of outbreaks in birds. This is important, because it tells us something about the potential for aggressive and effective bio-security measures in poultry operations to reduce the number of outbreaks. In fact, quite a few have shown effective containment, even in areas where we know the virus to be endemic to the region. That's the good news, and I think it will be important to the possibility for control of the virus as we move forward.

There has also been a considerable amount of work done to monitor wild birds. Of course, Billy is very close to this, and was at the conference in Europe just recently. I would like to touch upon the evidence that's come from the EC survey of wild birds, which tested around 60,000 birds between February 1st and May of this year, and confirmed a number of cases of high pathogenic avian influenzas across Europe. The evidence from the time series data shows that the highest proportion of wild birds carrying highly pathogenic avian influenza (HPAI) were coming through in March, and the number of cases dropped off quite sharply in May. The evidence with respect to what types of birds have been affected is quite interesting, because it shows close to two thirds of the cases that tested positive were swans, another 16% or so were ducks, and smaller proportions were geese and other birds.

EC Surveys Wild Birds for H5N1

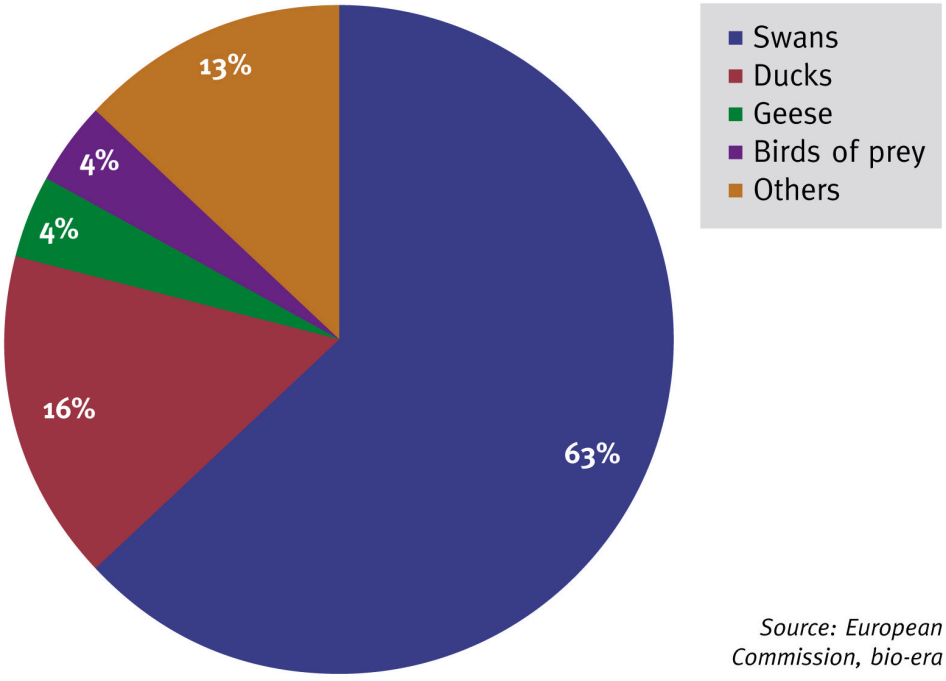
- **Approximately 60,000 wild birds were tested for H5N1 between February 1st and May 21st, 2006.**
- **Over 700 cases of HPAI were detected in wild birds in 13 EU states:**
  - Greece, Italy, Slovenia, Hungary, Austria, Germany, France, Slovakia, Sweden, Poland, Denmark, Czech Republic and the UK.
- **Only four outbreaks of H5N1 in poultry during this period; all were stamped out by immediate detection and swift culling operations.**

HPAI Cases in Wild Birds in Europe, 2006



Source: European Commission, bio-era

HPAI Cases in Wild Birds in Europe, 2006



Source: European Commission, bio-era

When it comes to the risk communication part of this equation, what we're seeing is that there is a lot of attention to wild birds because there's more testing. There's more evidence to report, and there's more news focused on the wild bird part of the equation. By contrast, we see and hear very little data about the potential role of illegal poultry trade or illegal trade of wild animals because there is very little information. I think public risk assessment or risk perceptions are heavily skewed by the type of data that's being presented in the news. At this point, I would like to invite a brief comment from Billy on the message and conclusions that should be drawn from this data, and what may be learned from the recent conference in Europe.

Bill Karesh: Certainly, the European example during late winter is somewhat unexpected in its timing. Many of us were concerned that infected birds might return this spring to Europe to spend the spring and summer. But they came in the winter, which was somewhat of an anomaly, and that seems also to be linked to the cold weather and freezing conditions in eastern Europe and the Black Sea and the Caspian that drove birds westward to find warmer places. It's inconclusive as to how [H5N1] got up into northern Germany, but it appears that the heavy freezing conditions were limiting water resources, particularly for swans. They were clumped together in very high densities. There's an opportunity there for an agent like H5N1 to really spread as you clump birds together, just as in industrial poultry operations.

The swans seem to be particularly sensitive to the highly pathogenic H5N1 strain, and serve as a sentinel. We don't know how many of the samples you've shown in your figures are from dead birds, so we don't know much about how long they might shed the virus in the wild before they get sick and die. The disease progresses very rapidly, so they might be able to shed the virus for a day or two. There's some evidence from some of the European work that indicates less fecal shedding with the H5N1 strain. There may be more respiratory shedding in some of the dabbling ducks, but they can still contaminate water, so that might serve as a different route and might be why we're not finding positive birds in many cases.

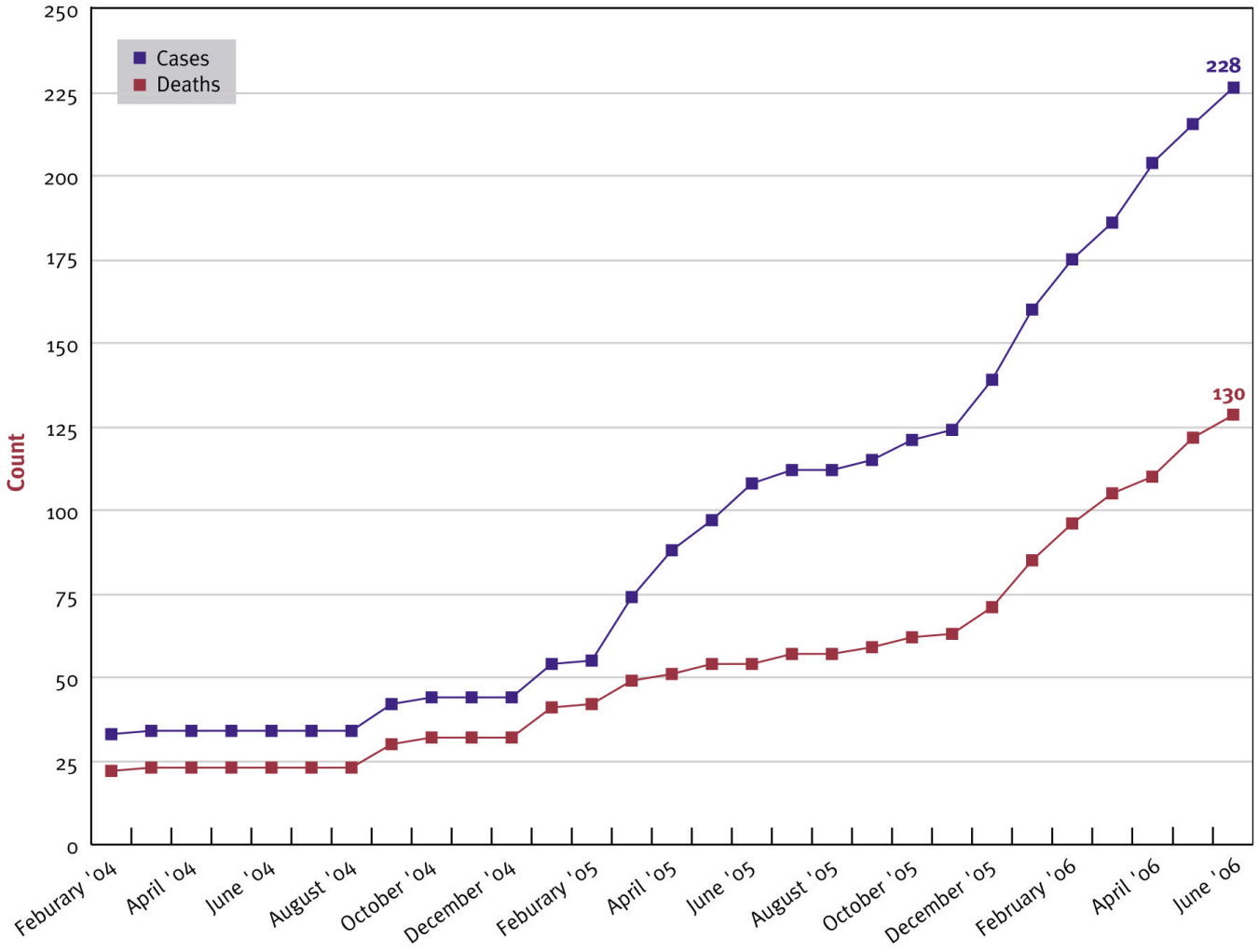
Jim Newcomb: What's your expectation with respect to this fall? Do you think we'll see a pattern that might look again like last year, with some birds in the fall months testing positive in Europe?

Bill Karesh: That's possible. Normally, we would think of this as a summer breeding season disease. Based on what we've seen in Sweden and northern Norway, there's a chance for a return in the fall which really didn't happen this past year. And if you look at the genetics of the spread, that's happening so rarely. So we don't really know what the role of Arctic gatherings are playing. It seems that there are outbreaks seeding into all birds out of China, which is probably what happened again last month in Mongolia. But, like you were saying earlier, we don't know how much of this is related to the movement of poultry and poultry products. Then there are localized incidents of spill-over into wild birds that spread H5N1 locally or regionally. That could of course continue to happen.

Jim Newcomb: Thank you. We'll come back to this subject, or certainly invite comments from participants at the end of the call. For now, I would like to turn to the subject of human cases. The number of human cases has risen steadily this year, reaching 228 since February 2004, with a total fatality

rate that still stands slightly over 50%. As many of you know, the incidence of human cases, in Indonesia in particular, has been the focus of attention following some waves of human cases in Egypt and Turkey and other countries earlier this year.

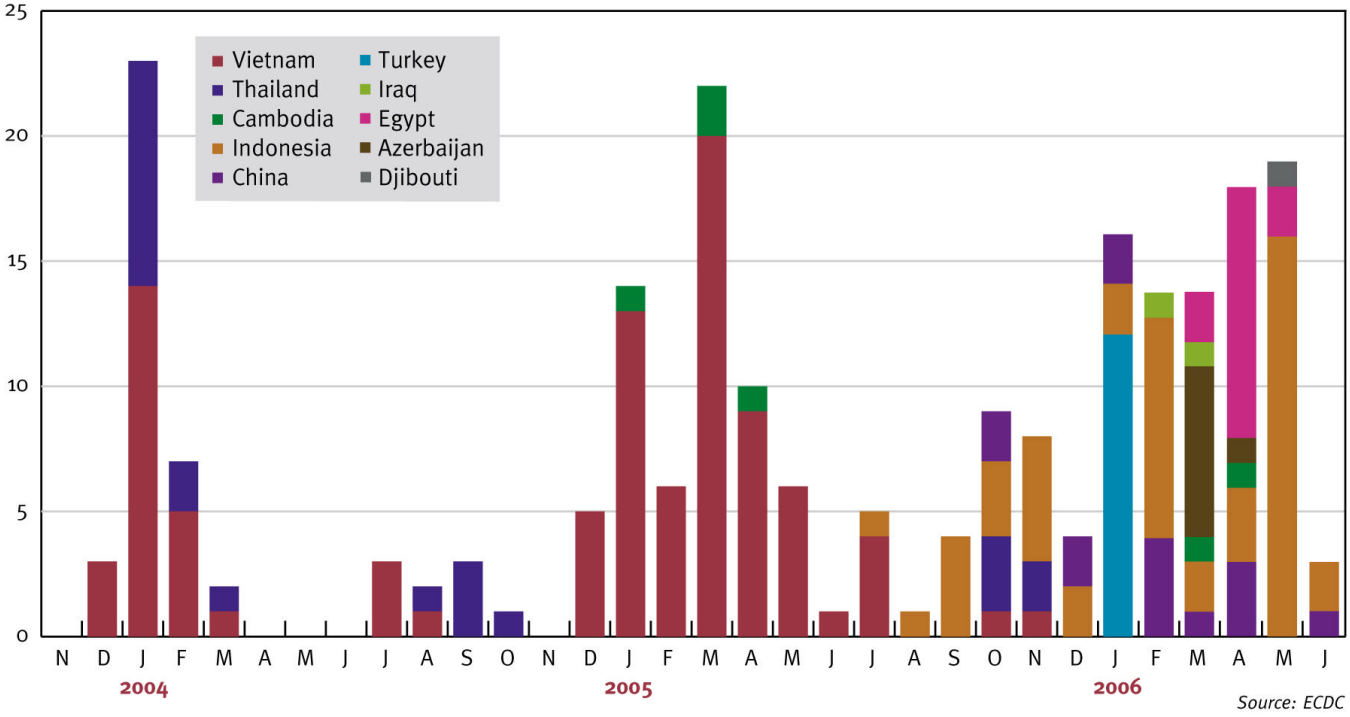
Laboratory-confirmed Human Cases of H5N1 Since February 2004



Source: http://www.who.int/csr/disease/avian_influenza/country/en/

Another phenomenon that is on our radar screens is the fact that this year has not seen the kind of seasonal lull in new human cases that was characteristic of 2004 and 2005. As you can see from this history, the month of June and the summer months in previous years recorded relatively few cases, and there were distinct lulls through the spring and early summer. We really have not seen that pattern this year, and it's given rise to comments both from the head of the WHO's China office and the health minister of Hong Kong, raising questions as to whether this is perhaps an indicator that we should be paying attention to.

Human H5N1 Cases by Date of Onset and Country Since December 2003



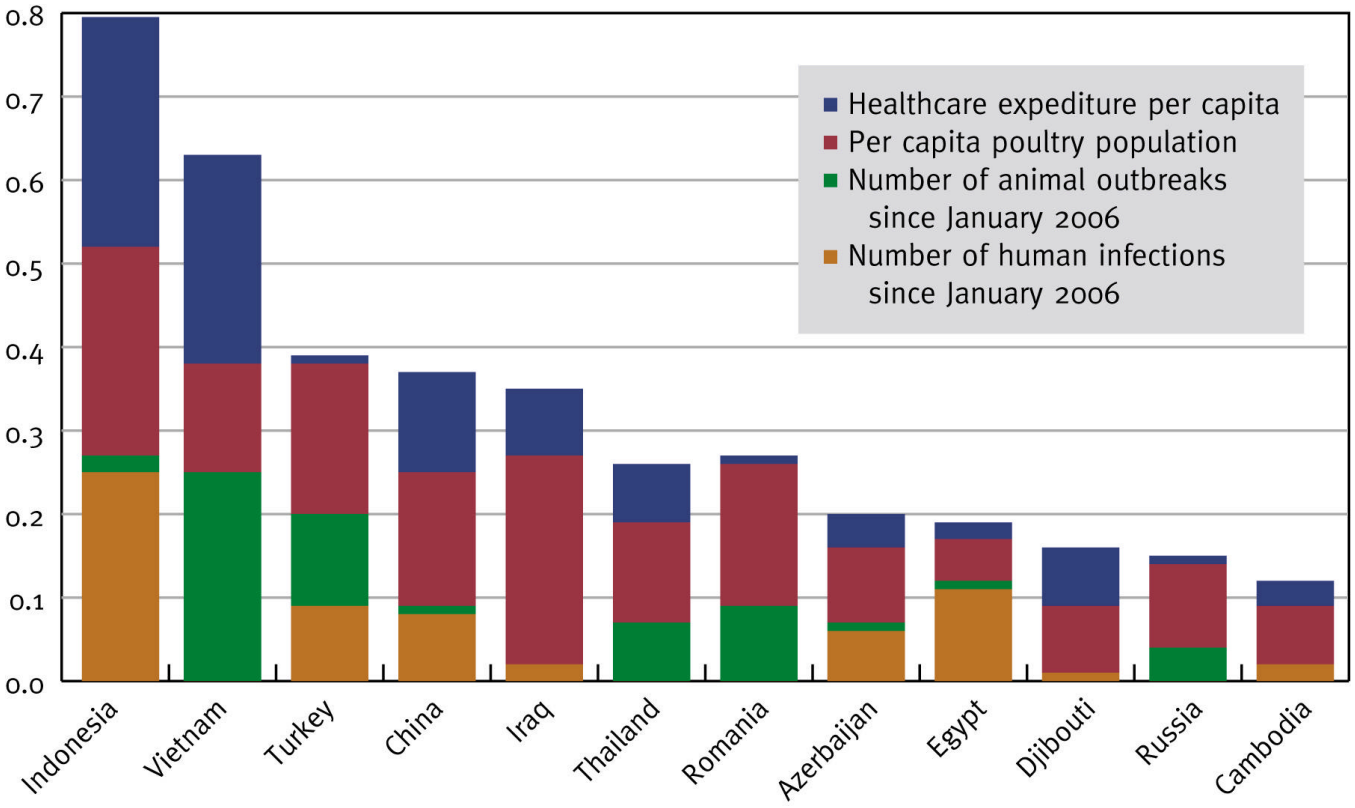
Source: ECDC

What we know about human cases and animal outbreaks in Indonesia is that the disease is quite widespread across a number of regions of the country. The conditions are what we would consider very high risk in terms of density of human and poultry populations, and the social, cultural and economic conditions that put humans and birds into very close proximity.

What we know from Indonesia is that there have been 51 confirmed cases of H5N1, with 39 deaths. Today's news from the WHO is confirmation of human-to-human transmission in the recently reported cluster of infected family members. A reason for additional concern in Indonesia has been the uneven performance of testing of human cases, and difficulty of resolving test results from Indonesia with those from international laboratories. So, this is an area where we must be careful today in interpreting the news that we see as events unfold in Indonesia and other parts of the world based on preliminary test results.

In early 2005, we put together some indices that look across Asia for pandemic emergence risk. We've updated that data quite recently based on the broader range of countries that have seen outbreaks. [Below], is an index that is comprised of four components, and I'll break those out for you. The components are *(1)* health care expenditure per capita, which we believe to be inversely related to pandemic risk as an indicator for public health capacity in a given country. *(2)* The per capita poultry population. *(3)* The number of animal outbreaks since January of this year, and *(4)* the number of human infections since January of this year. Based on this set of factors, you can see that Indonesia, Vietnam, Turkey, and China all stand at the high end of the risk spectrum.

Influenza Pandemic Emergence Risk Index



Note: This index is a composite measure of disease emergence risk, on a scale of zero to 1.0. The components of the index are (1) the number of H5N1 human infections in 2006 (2) the number of animal outbreaks, weighted 90% on oubreaks in 2006 (3) per capita poultry populations, and (4) health care expenditure per capita (in inverse form).

We'd add some caveats to interpretation of this data. We really don't know the basis for evaluating where pandemic risk is highest. We're looking at data that may tell us something about underlying conditions, but it's very difficult to filter information and process information that might be of predictive value. There are some excellent examples in Malcom Gladwell's book *Blink* of how to evaluate information under tight time limitations. One example addresses the diagnosis of potential heart attack victims at Cook County Hospital in Chicago, and the new types of algorithms that were developed to filter information that is and isn't useful in making a diagnosis. There are some excellent examples of combat field circumstances in Vietnam, in which commanders in the field have to make quick decisions. An important and interesting example from that context was of a field commander who, when the shooting started, would take a few minutes to pay close attention to what was happening before getting on the radio to his counterparts. That may be instructive for us, as well as our government and other institutions, as we're working through a very dynamic and difficult situation with H5N1 avian influenza.

Today, we're trying to determine what information is useful and what is distracting. The information that we have may not be the most useful, and some of the gaps in our information may be more critical. For instance, are poultry outbreaks a useful indicator of pandemic risk? Well, potentially, but there's certainly an argument that they may not be given the history of Vietnam and other countries that have had plenty of poultry outbreaks. The numbers are probably higher for those countries because of the accuracy of their reporting. The accuracy and comprehensiveness of their reporting may be a precursor or a preliminary indicator of the degree to which that country may ultimately be effective in containing poultry outbreaks and reducing the risk of pandemic.

So, there are some difficult questions for us to ask here. When we begin to ask these questions, I would suggest that we ask harder questions about the data we do have, and what additional data may be needed, such as the number of outbreaks in domestic and wild cats. But it's also the case that socioeconomic conditions may provide important pieces of information. Just mentioned at the top of this call is that we're watching sequence data and hoping to interpret what a significant or an insignificant change in sequence data is. But, I'm not sure that we have a very clear foundation for making such judgements. So we're at a very early stage in our assessments of what will be of predictive value. That difficulty is compounded by the fact there are measurement problems. For instance, there may not be comparability in reporting poultry outbreaks from different countries, and we face significant problems in surveillance programs generally.

Risk Assessment: Filtering Information for Usefulness

- **Determining what information is useful and what is distracting is a difficult task**
  - Are poultry outbreaks a measure of pandemic risk?
  - What about cats?
  - Socioeconomic conditions?
  - Sequence data?
- **Measurement effects can compound the problem**
  - Are OIE data on poultry outbreaks meaningful for international comparisons?
  - Surveillance programs will detect more infections

To point to a specific example, many of you may have different impressions about exactly what was concluded with respect to the potential H5N1 infection in geese on Prince Edward Island in Canada. If you read the Reuters article, you certainly may have a clear impression that H5N1 was not detected there. The headline here, and the first line of the article are quite definitive: "A backyard flock of geese, ducks and chickens in eastern Canada was *not* infected with the highly pathogenic H5N1 bird flu strain, officials said on Tuesday, dismissing fears that the strain might have arrived in North America for the first time."

Discovery of H5N1 in Canada Proves to Be False Alarm...

Canada finds no high-risk bird flu in suspect flock

Tue Jun 20, 2006 6:40pm ET

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[-] Text [+]

By David Ljunggren and Marcy Nicholson

OTTAWA/WINNIPEG (Reuters) - A backyard flock of geese, ducks and chickens in Eastern Canada was not infected with the highly pathogenic H5N1 bird flu strain, officials said on Tuesday, dismissing fears that the strain might have arrived in North America for the first time.

The fears had been aroused after a gosling in the small flock in Prince Edward Island died, and a lab in Eastern Canada examined it and found evidence of H5 avian flu.

But the officials said on Tuesday that Canada's national laboratory in Winnipeg, Manitoba, had not been able to reproduce the virus found by the Eastern lab.

While preliminary tests at the location were positive for H5N1, subsequent tests at a laboratory in Winnipeg failed to confirm that diagnosis. So, Helen Branswell, an always-thorough Canadian reporter, is probably more accurate, reporting that the questions raised by developments on Prince Edward Island "can't yet be put to rest." So, there are many, many instances that we see day-in and day-out with respect to reporting. These may trigger different public responses and different media interpretations. That obviously sets up a variety of concerns and questions about risk communication, and I'll turn to Peter in just a minute for some comments on that.

... Or Not!

Federal lab hasn't found any avian flu viruses in PEI samples

Helen Branswell
The Canadian Press

Tuesday, June 20, 2006

Questions raised by the discovery of an H5 avian flu virus on a Prince Edward Island poultry farm can't yet be put to rest, the Canadian Food Inspection Agency admitted Tuesday as it announced its laboratory could not find any avian flu viruses in samples taken from the birds on the farm.

"We can't produce the same test result in Winnipeg that the Atlantic Veterinary College produced on testing the samples," Dr. Jim Clark, national manager of CFIA's avian influenza working group, said in a conference call for journalists. "All samples that we have in Winnipeg have been tested, with negative results."

The negative findings don't mean the original test was false, although federal officials are investigating that possibility.

But this development does mean that the agency's lab now has to resort to inoculating eggs with material from the bird samples in the hopes that virus grows in those eggs so that they will have material they can study and test.

CREDIT: AP Photo/Achmad Ibrahim
Crates of chickens

I want to touch on a couple of other points before concluding. First of all, there are a great many issues that relate to pandemic risk and whether or not it is inexorably ratcheting higher or whether there is some possibility of mitigating that risk over time. Much of the work we do here is connected to scenario planning, and we're always struggling to keep a perspective on the range of possibilities that are realistic, to suggest a devil's advocate perspective with respect to the consensus message. That risk equation, I would argue, considers that H5N1 is endemic, and can't be stamped out in wild birds. I'm not saying that we'd agree with all of these conclusions, but the kind of message one gets from the media is that that is the root of the problem. Thirdly, that more human cases will result from the widening spread in birds. And finally, more human cases mean more opportunities for the evolution of, and in some views, the inevitable emergence of a pandemic strain.

Is Pandemic Risk Inexorably Ratcheting Higher?

• The Risk Equation in Public Health Messages:

- H5N1 is endemic (can't be stamped out) in wild birds
- The global spread of H5N1 in birds is inevitable
- More human cases will result from widening spread in birds
- More human cases means more opportunities for evolution of pandemic strain

• Reasons to question the assumptions:

- H5N1 outbreaks in birds have been sharply reduced in some countries (e.g., Vietnam, Thailand, China)
- If wild birds are more victims than vectors, control of H5N1 in poultry could have major impact
- Availability of countermeasures is steadily improving

There are certainly a number of points on which one could differ with that conventional view. One interesting point is that the evidence from Vietnam, Thailand, and parts of China suggests that bird vaccination programs and better biosecurity may be very effective in controlling H5N1 in poultry, and as a result, in wild birds and in humans. If in fact wild birds are more victims than vectors, than those control measures and careful, well-enforced bird vaccination programs may be quite effective. So, it's conceivable that we might be able to significantly roll back the extent of the outbreaks; maybe not eliminate them, but significantly roll them back in poultry, and secondarily in wild birds.

The other component of the picture is the steady development of countermeasures for both birds and humans. Of course, we're paying attention to what the WHO says with respect to pandemic phases, and much attention today is focused on this and on a trigger-like threshold. You'll recall that we've warned in these calls for more than a year and a half of the economic volatility of responses to WHO pandemic phase announcements.

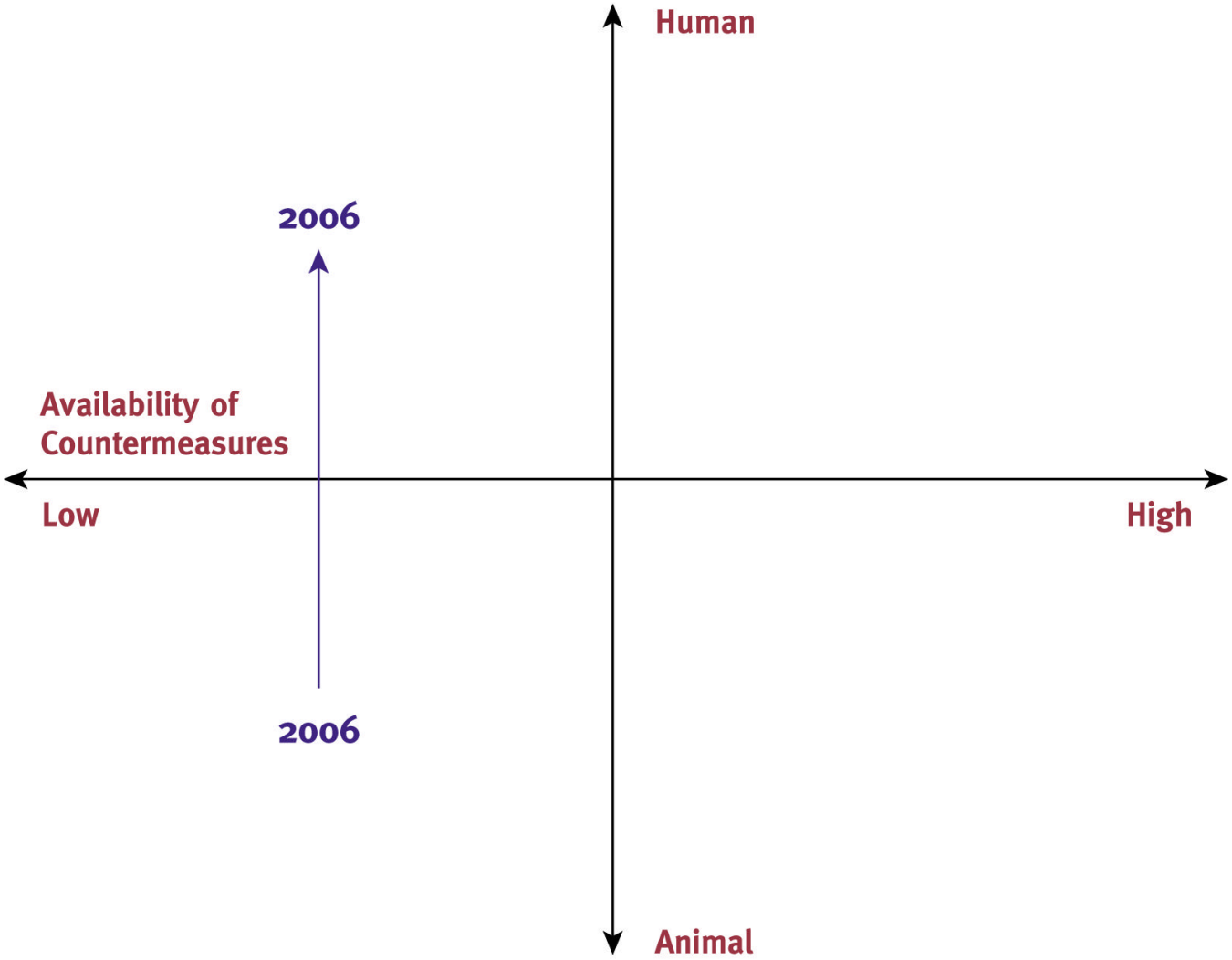
WHO Pandemic Phases

Phase 1	An influenza virus subtype that has caused human infection may be present in animals. If present in animals, the risk of human infection or disease is considered to be low.
Phase 2	No new influenza virus subtypes have been detected in humans. However, a circulating animal influenza virus subtype poses a substantial risk of human disease.
Phase 3	Human infection(s) with a new subtype, but no human-to-human spread At most, rare instances of spread to a close contact.
Phase 4	Small cluster(s) with limited human-to-human transmission Spread is highly localized, suggesting that the virus is not well adapted to humans.
Phase 5	Larger cluster(s), but human-to-human transmission is still localized Virus may not yet be fully transmissible.
Phase 6	Pandemic phase: increased and sustained transmission in the general population

Source: WHO

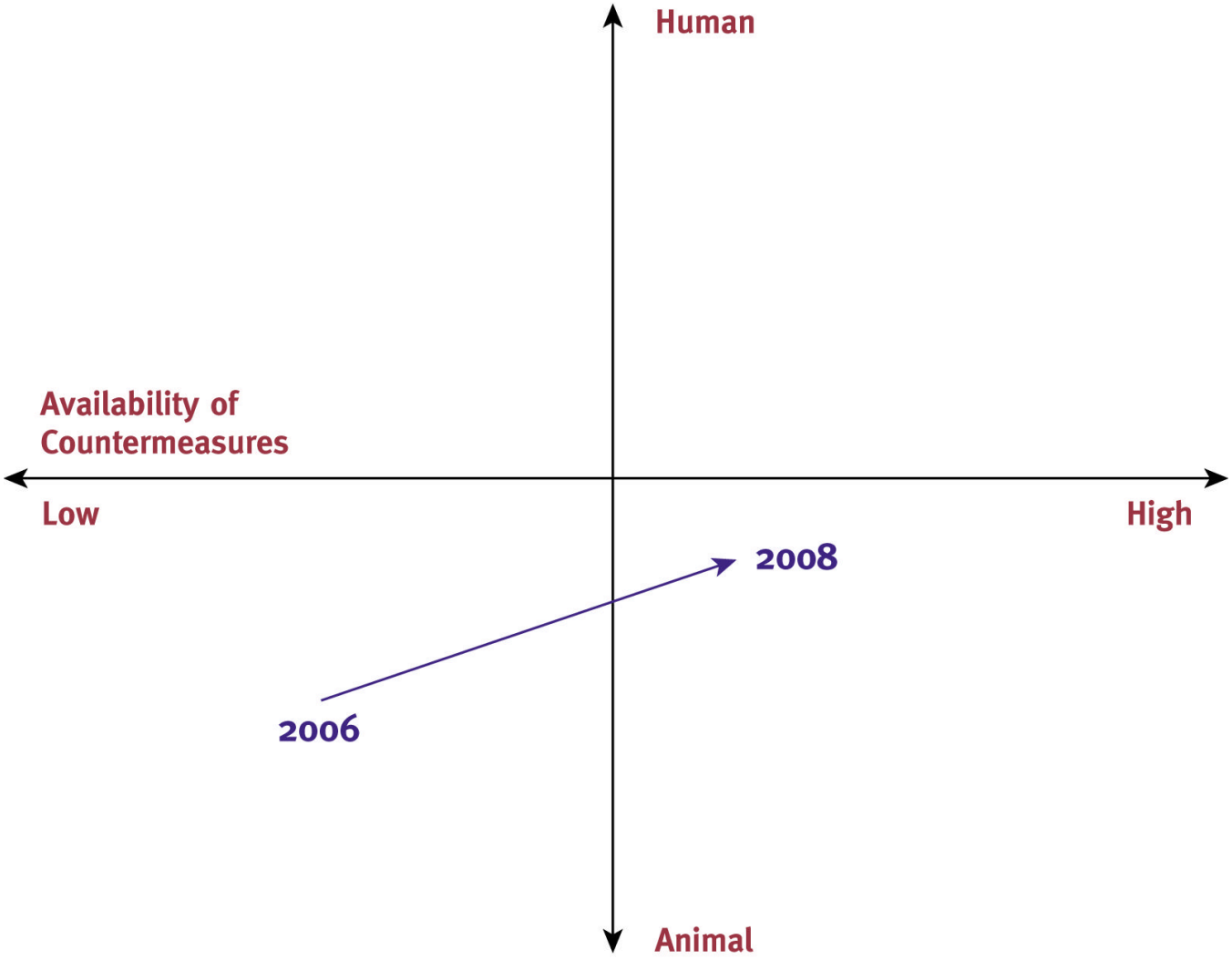
I would like to further frame up some possibilities with respect to the current landscape and the possible trajectory of future events. I'm referring to our situation with respect to a vertical axis [below] of animal versus human disease scenarios and a cross-axis that has to do with the availability of countermeasures, both for combating the disease in animals and for combating the disease in humans. If efficient human-to-human transmission were to emerge today, we'd go in 2006 from an animal scenario with low availability of countermeasures to a human scenario with still very low availability of countermeasures. The more time we have, the more we may be able to move rightward on this horizontal axis. In fact, recent studies from WHO suggest that if we get really creative and use animal vaccine production capacity to produce human vaccines in the event of a near-term crisis, we might be surprised that we have more capacity than expected to deal with vaccine production issues. This may still be a slow and probably end-of-cycle process to respond to the sudden emergence of pandemic, but it's one more dimension that gives us more counter-measure capacity.

Avian Flu Scenario Ideas



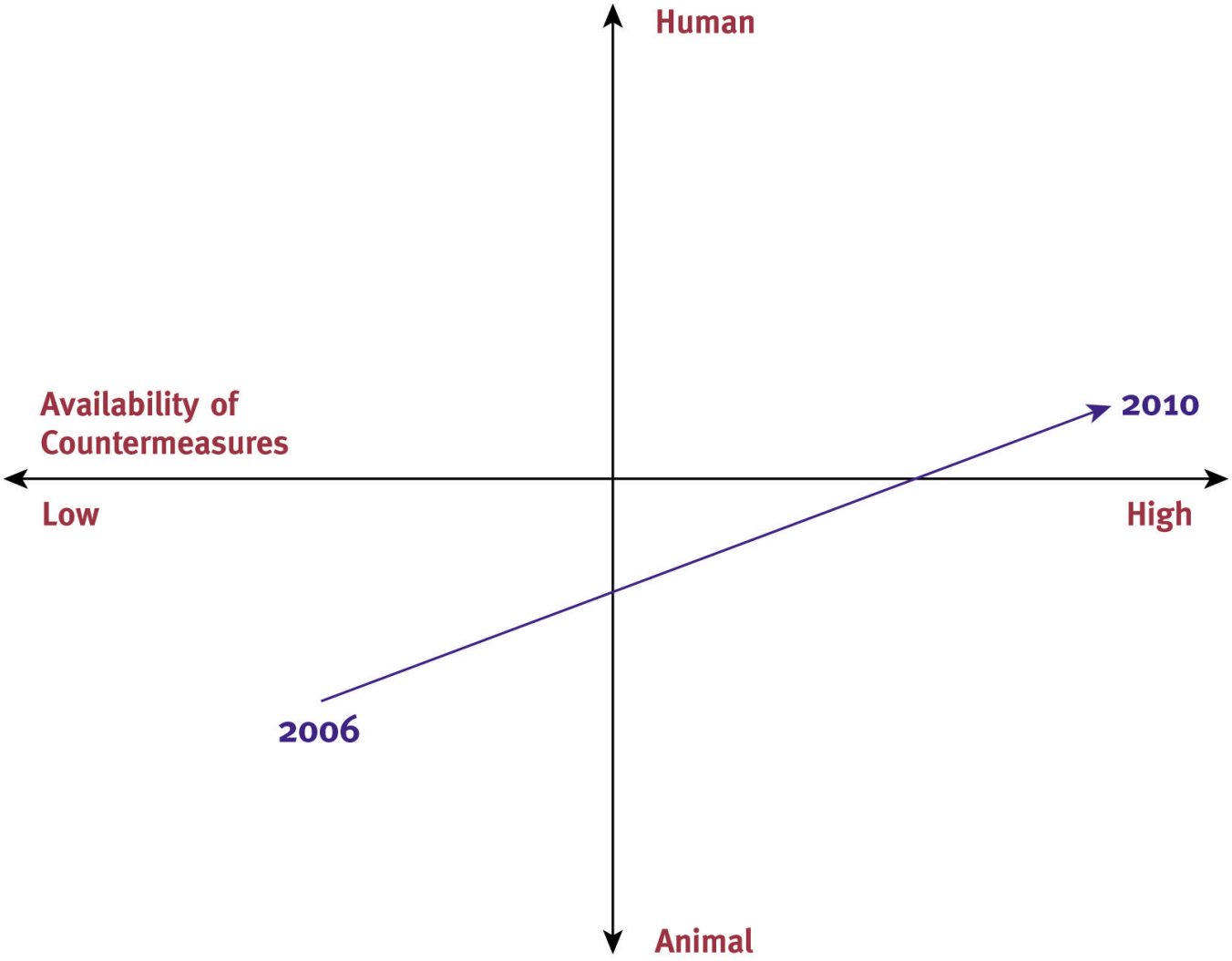
It might be that by 2008, in a best-case scenario, we have the continuing global spread of the animal disease, but an on-going progression in the stockpiling of Tamiflu, human vaccines, and improvements in production capacity for human vaccines. It might even be, as I've suggested, that we could reduce the number of animal outbreaks over that time.

Avian Flu Scenario Ideas



Finally, by 2010, the very slow fuse on pandemic emergence may lead to the birth of a pandemic at a time frame in which we have quite considerable capacity to respond, by virtue of new DNA vaccine technologies, and potentially a portfolio of new and existing anti-viral drugs. This kind of landscape I think gives us a much broader spectrum of possibilities to think about. Although it's not very much of the public message that we hear today.

Avian Flu Scenario Ideas



From a corporate perspective, when we ask what all of this means for risk communication, I would like to touch on three points. The first is that we think it's appropriate for you to condition your audiences, and there are multiple audiences—boards of directors, investors, employees, and customers—that expect relevant, reliable information delivered to them through predictable channels. The message here is that you don't want the timing of your communication to overshadow the message, where the audience is shocked by the fact that you're communicating with them and perhaps you're communicating with them in a dramatic or urgent fashion.

We've seen some institutions and corporations across a quite wide spectrum already paving the way for their communities and their audiences to anticipate communications from them. An excellent example is the Cargill™ newsletter and information distributed to many of their stakeholders in a single information card that illustrates the differences between pandemic influenza, influenza in birds, and regular seasonal influenzas.

Risk Communication Strategies for Corporations on H5N1 and Pandemic Risk

- **Condition your audiences (Board of Directors, investors, employees, customers) to expect relevant, reliable information delivered through predictable channels**
  - e.g., Cargill Newsletter and information card
- **Differentiate expectations about possible outcomes (where possible)**
- **Anticipate and guide adjustment reactions by different audiences and sectors**

The second point is to differentiate expectations about possible outcomes. This is difficult, and the exercise I've just gone through can help condition stakeholders to a wide range of possible outcomes. Finally, anticipating and guiding adjustment reactions by audiences in various sectors. I want to give you an example of that because it's an important phenomena, and it's one that Peter Sandman has written about extensively and we've certainly seen it in our observation of recent events in the UK and Europe.

What happened in the UK is really quite striking. When H5N1 arrived in Europe, poultry demand declines of 40% to 80% were observed in Greece and Italy in response to shock and fear about H5N1 proximity and risk. However, when H5N1 showed up in Scotland, UK poultry consumption dropped by less than 5%. It's about a US$1.5 billion industry, and poultry accounts for about 40% of the meat eaten in the UK. Preliminary numbers from poll data indicated that many consumers would choose not to eat poultry if H5N1 arrived in their country. But there were also some factors that seemed to provide some counterweight, including previous experience in the UK with foot and mouth disease and BSE.

This cuts two ways. In one sense, those events undermined public confidence in government and in government regulations, but there were also significant steps taken to rebuild trust and to reform regulation in the aftermath of those events. Most importantly, the creation of the food standards agency (FSA) with a redefined mission. If you take a look at their web site, you'll find out further information about their mission, their board, and their communication style. But it's hard to assess which of those changes may have been effective in this instance. The outcome was that consumer behavior in the UK was remarkably stable when H5N1 was confirmed there. This is not necessarily because communications were consistent and effective, as there were discordant communications from some EU and UK regulators.

A Success Story: The U.K. Response to H5N1

- **U.K. poultry consumption dropped less than 5% after H5N1 was discovered in that country.**
  - This compares with poultry short-term demand declines of 40–80% in Greece and Italy and 20% in France
  - 300,000 tons of poultry are in storage in EU
- **U.K. poultry industry revenues are $1.5 bn/yr; poultry accounts for 40% of meat eaten**
- **Experts feared a "triple whammy" of losing exports, suffering loss of imports, and seeing collapse of demand**
  - polls indicated 23% of consumers would stop eating chicken and 49% would consider cutting poultry from their diets
- **Reforms creating DEFRA and the Food Standards Agency were aimed at rebuild trust after BSE and foot and mouth scandals (see: www.food.gov.uk)**
- **Government and corporate messages were sometimes discordant**
  - EU/UK communication on risk of eating poultry
  - Grocery chain Waitrose announced it was not sourcing poultry from Scotland
  - Tesco, Sainsbury, Asda denied early impacts

It's an interesting and positive instance of effective risk communication. It had the effect of moderating what was a quite strong shock reaction pattern that had been exhibited in other parts of Europe, and it could be useful for further study as we move forward. I'll conclude with that and turn it back to Steve to open the discussion and invite comments from Peter and others.

Steve Aldrich: Thank you. Peter has more experience than any of us in dealing with questions of risk communication. So, having heard our presenters here today, Peter, what's your take? What do you make of all this?

Peter Sandman: I guess I would focus on at least one point and maybe two. The point that underlies a lot of what Jim has said, and much of this entire call, is the distinction between a bird flu outbreak in birds and a possible pandemic in humans. That's the distinction that I think Cargill rightly focused on in some of its materials. At least in the developed world, I think the single most important thing that we need to get clear is that that distinction is real. All too often, via the media, we communicate two messages to people. One is that birds are carrying H5N1, and it's spreading, and the other is that we're terribly afraid of a pandemic that could kill millions. Both of those two are true, but they're pretty unconnected. They're not completely unconnected, but they're fairly unconnected.

People who aren't quite aware of the very tangential way in which they are connected wind up thinking that we're going to get a pandemic from birds. That yields the excessive reaction to H5N1 outbreaks in poultry that Jim talked about, particularly in Italy and Greece, but in other European countries as well; though, apparently not in the UK. But it also yields an insufficient reaction to pandemics. As along as people are thinking we're going to get pandemics from diseased birds, one consequence is that we become excessively worried about diseased birds. The flipside to that is that we're insufficiently worried until diseased birds reach us.

> "The point that underlies a lot of what Jim has said, and much of this call, is the distinction between a bird flu outbreak in birds and a possible pandemic in humans."
>
> — Peter Sandman

There are in fact four levels of this disease. Without belaboring it, let me just list them. One is the panzootic we have already of H5N1 in birds; particularly domestic birds. The second is the zoonotic outbreaks that people are getting sick from; apparently mostly from contact with diseased or dead birds, and secondarily through other vectors that between birds and humans. That's been some 200 people and it's not yet a big deal, but it is seen by the public as a big deal. The third is a mild pandemic, which WHO is mostly worried about. This would be a pandemic along the lines of 1957 or 1968 for which preparedness is mostly a medical issue and a health issue. The fourth is a severe pandemic—anything similar to 1918 or worse—where the main issues would not be medical issues, but infrastructure issues. The uncertainties relate to secondary catastrophes; from running out of food, running out of energy, or running out of chlorine to keep the water clean. Of course, the business continuity issues are the most acute in the last of these four scenarios. So, I think keeping them separate is incredibly important.

The second point I'd like to make is that, with the severe pandemic in humans, the risk communication issue that makes that very difficult is that the risk is unknown, but it's a low-probability event. High magnitude, low-probability risks are hard for people to think about. There are plenty of people who read about pandemic influenza on the internet and elsewhere, and have reached the conclusion that a severe pandemic is definitely going to happen. Or, they focus on the low probability and decide it's not worth worrying about. Neither of those makes for good planning. The business community has wisely adjusted to the notion that something is hugely important even if it's unlikely, and that it is worth buying insurance against. Hedging is a concept that's easy for the business community to understand.

Jim Newcomb: Peter, I have a question, just to put a specific point on this. Let's say that there are outbreaks of H5N1 in the US, and it's a bad case. It's in poultry barns, and it's not quite as effectively contained as we would like it to be. None of it enters the food chain, but the consequence is that people are afraid to eat chicken and poultry demand drops precipitously. So, I'm a restaurant chain owner/operator, and nobody's eating chicken. There are many strategic dimensions, but from a risk communication perspective, what would be your reaction?

Peter Sandman: If I were a restaurant owner, I would want to be saying to people that two things are true. One is that we have very good reason to be confident that the chicken we're serving is free from H5N1 and here's why. The other is that when you see pictures on television of culls of millions of chickens, it puts you off of chicken for a while. We're confident that the chicken is safe, but we don't expect many people to eat it for a few weeks. Don't give yourself a hard time if you don't feel like eating chicken. Normal people don't feel like eating chicken right now, and you'll come back in a few weeks. Meanwhile, it will stay on the menu.

I think that's what Jim meant when he said, "tolerate and guide the adjustment reaction." For instance, after the tsunami, people did not want to eat fish. They didn't want to because it was all too easy to imagine what the fish might have been eating. All the experts in the world, including from WHO, were out there saying that fish are safe to eat, but it took people in that part of the world a month or so to come around. You just had to tolerate that adjustment reaction. You had to respect it. I would want a restaurant that respects people being disinclined to eat chicken, even as it explains to them that the chicken is safe to eat.

Jim Newcomb: Thank you very much for that comment Peter.

Steve Aldrich: While we're waiting for the first question to queue up, I would like to ask Peter another quick question. Or, Billy, if you have a comment, chirp in. There are two subjects of discussion for the call. One is the challenge of communicating risk, but there is also this problem of communicating a muddled situation; about how pandemic emergence risk might be changing. I just wondered if either of you, maybe starting with Peter, had any thoughts on that?

Peter Sandman: I'm not entitled to have an opinion on whether it is changing, but David Nabarro suggested he thought it wasn't changing very much. I didn't hear anything in Jim's comments that suggested that it was changing very much, so I think, the main point one wants to communicate is that

this isn't getting worse. Still, it isn't going away either. What we're looking for are signs to indicate that it is getting worse. Of course, efficient human-to-human transmission is the biggie. But, there are some other signs that could precede that.

You also want to indicate that there is an end game other than pandemic. We're developing better countermeasures. You begin to think you have a long term problem, you know, that isn't going to provoke a pandemic, or alternatively that you're ready for the pandemic if it comes. I think you want to say to the public, "could get worse, could get better." Meanwhile, the risk is about the same as it was six months ago. If you're a whole lot more worried than you were six months ago, or a whole lot less worried than you were six months ago, then you're in a minority and you're playing a hunch.

Steve Aldrich: Billy, do you have any thoughts on what you've heard?

Bill Karesh: Yes, and I would like to add something that relates to what Peter Sandman was saying. In some ways, getting back to the Canadian experience and whether or not H5N1 had indeed been detected. We've had low pathogenic H5N1 in wild birds in Canada for years. That's nothing new. But I don't think the public was ever very well-informed about that. Yes, wild birds have spread avian influenza strains for thousands of years. But no, we don't have good evidence that high pathogenic H5N1 is endemic in wild birds. So, there are many confusing messages going out about that and the public gets confused and they don't know who to trust. The general public needs a place to go to that they can tend to trust, or they won't trust anyone.

Peter Sandman: It's worth noting that there are several "publics" involved. There's a public that's barely paying attention. There's a public that tends to think this is all crap and greatly exaggerated and is suspicious and skeptical of the alarming news. There's a public that is extremely alarmed and is suspicious and skeptical of cover-up any time anything turns out not to be alarming. So, there are multiple "publics" that needs to be addressed.

Operator: We have a question from Gabriel with Beckman Coulter.

Gabriel Compton: Based on migratory patterns and other seasonal factors, when might we anticipate the greatest period of risk for the arrival of H5N1 in North America in wild bird populations?

Bill Karesh: In theory, it is possible that birds spending the summer breeding season in the arctic from Asia will mix with some North American birds that could then bring it south to North America during their late summer or early fall migration. Unfortunately, or fortunately, that doesn't happen very often. There is some evidence that there are some genetic linkages, but it's a very rare event.

During the last 30 years of sampling viruses in Asia and North America, I have not seen very much mixing. While it happens on a very rare occasion, it's not a common thing, and doesn't happen every summer breeding season. However, there are other ways for wild birds to get infected regionally. If someone smuggled in either birds in the pet trade or they smuggled in infected poultry, it could get into wild birds to the south of us too. This is also a low probability, and there's no

evidence that's ever happened. So, it gets back to what Dr. Sandman was saying earlier. We're talking about extremely low probability events that will probably have large consequences, at least, with the public perception. I think that even if H5N1 gets into poultry in North America it'll be controlled so quickly that it won't be a big problem. It probably wouldn't become a human disease, but it could have a larger public impact emotionally and psychologically.

Gabriel Compton: Ok. Thank you.

Operator: Our next question comes from Janet Smith at Dupont.

Janet Smith: I was wondering if you can give us some insight into how we should think about raising employee awareness of what the potential threats are, but at the same time not raising a level of panic that would be counterproductive?

Peter Sandman: The two most important reasons for raising employee awareness now relate to improving psychological and logistical preparedness. The third reason, of course, is so that employees can participate in, and become confident in, the company's precautionary measures. Any reasonable program that a company is going to develop for business continuity is going have to include talking to employees and seeking guidance from employees in advance.

Most experts in communication are not worried that alerting people to a risk that has not yet materialized is capable of producing panic. Panic is quite rare. Even in crisis situations, panic is quite rare. Panicky feelings are not rare. Most people master those feelings. If you look at behavior in the stairwells of the World Trade Center on September 11, 2001, you see a lot of people who felt panicky, but evacuated the building with dispatch and courtesy. In many cases, they exhibited heroic behavior to help their neighbors. It is vanishingly unlikely that you can induce panic in people about something that may or may not happen.

You may scare them enough to start taking it seriously, which could get them to start reading about it, and thinking about it, and wanting to take precautions, and asking the company tough questions. For instance, they could ask the company about which pieces of the business they plan to stay in because they're essential to society, or which pieces of the business they plan to shut down for the duration of the pandemic because they're not essential to society. Also, which pieces of the business they plan to shut down for the duration of the pandemic because they're not essential to the society? That's not panic. That's turning your mind to the question and beginning to ask tough questions about the possible precautions that ought to be taken.

If you define panic the way the experts do, I don't think you have to worry that you'll be so effective in alerting people to the risk that they'll panic. You won't. I give you my personal promise. If you define panic as people taking it seriously; not just taking the precautions you recommend, but having ideas of their own on what precautions they ought to take and what precautions management ought to take, and what HR policies management ought to have in place… If you do a good job of alerting people to the risk, they will become more opinionated at how it ought to be managed. That's not panic, that's progress.

Steve Aldrich: Thank you. Jim, can I invite a final comment from you and perhaps you can close the call?

Jim Newcomb: I think it's been a great call. All of us have certainly had our hands full interpreting a very puzzling pattern of information. I don't suspect that that's going to get very much easier as events move forward. But I do know that many people are well along with pandemic planning and some of the ideas that we talked about in terms of communicating with the multiple audiences that are affiliated with their organizations. That groundwork is likely to serve everyone well over time. We'll continue to provide updates and interpretation and assessment of events as we move forward.

Steve Aldrich: Peter, would you like to let folks know your website so they can follow up with additional interest?

Peter Sandman: Absolutely. Material is available at www.psandman.com. If you don't find what you want, write me at peter@psandman.com.

Steve Aldrich: Thank you very much for joining us. Billy, where should people go for more information about WCS and the One World One Health initiative?

Bill Karesh: We have several sites. One is www.oneworldonehealth.org, where we have videos of lectures and comments there. The field vet program is www.fieldvet.org, and you can find a link to it there. I'll make a plug for Peter Sandman. I wasn't asked to do this, but we've been using his information in work over the last year since we found out about it from the Pan American Health Organization (PAHO) and within WCS. It's been tremendously helpful for our contingency planning, so I would encourage all of you to take advantage of his offer to look at his site.

Steve Aldrich: Billy, don't hesitate to plug us, too. [laughter]

Bill Karesh: You're all great. It was great here. Thanks. [laughter]

Steve Aldrich: Thanks everybody. We'll see you later.