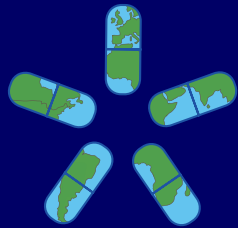


Overview of Influenza Surveillance and Antiviral Resistance in Kenya



Global
**Antibiotic
Resistance**
Partnership

CDDEP THE CENTER FOR
Disease Dynamics,
Economics & Policy
WASHINGTON DC • NEW DELHI

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Global Disease Detection Division
CDC-Kenya
August 6, 2009

Outline

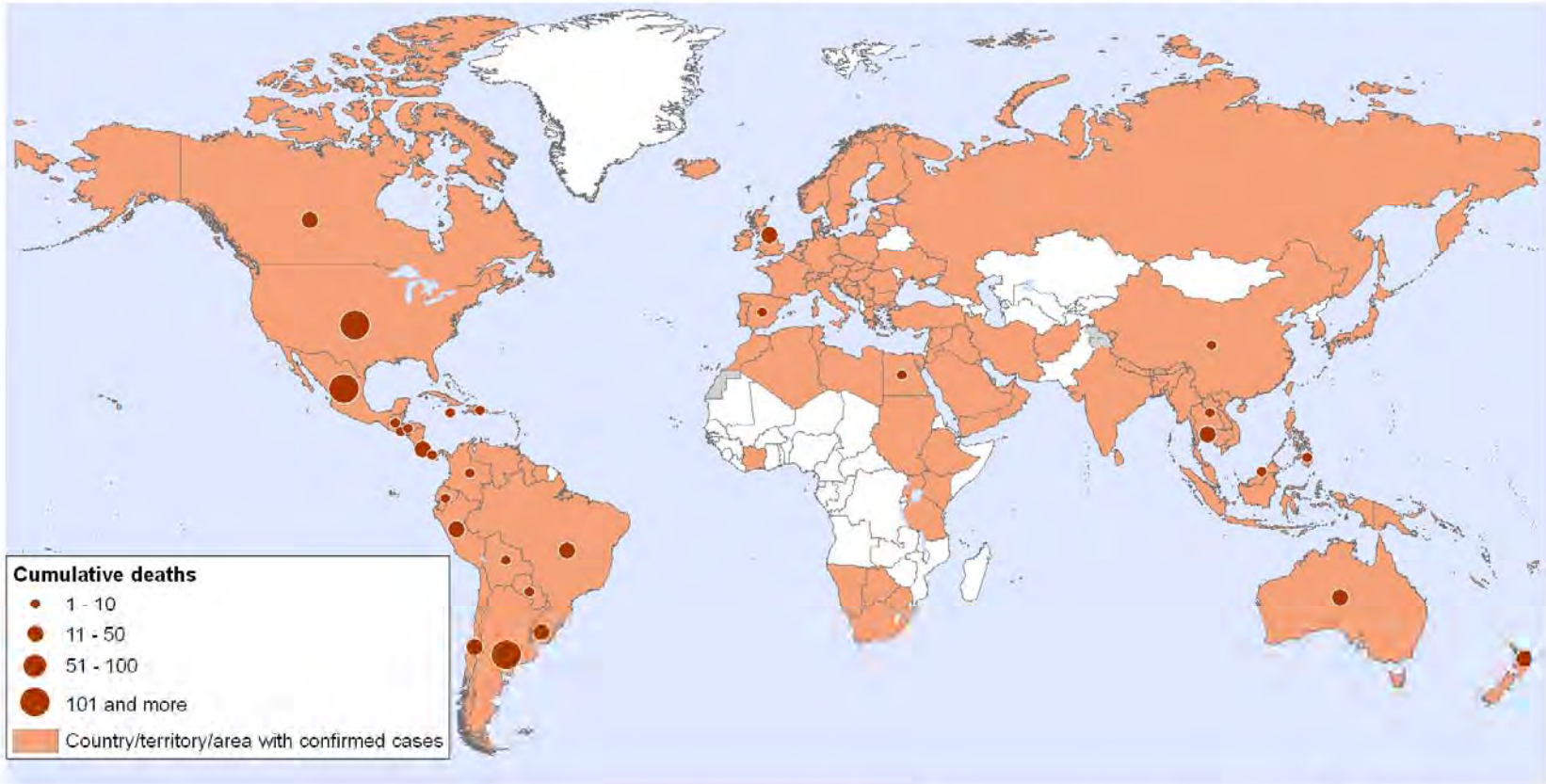
- **Background**
- **CDC's involvement in influenza surveillance in Kenya**
- **Overview of oseltamivir resistance**
 - **Seasonal influenza**
 - **Pandemic influenza**

H1N1 Worldwide Outbreak

Pandemic (H1N1) 2009,

Status as of 22 July 2009

Countries, territories and areas with lab confirmed cases and number of deaths as reported to WHO



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

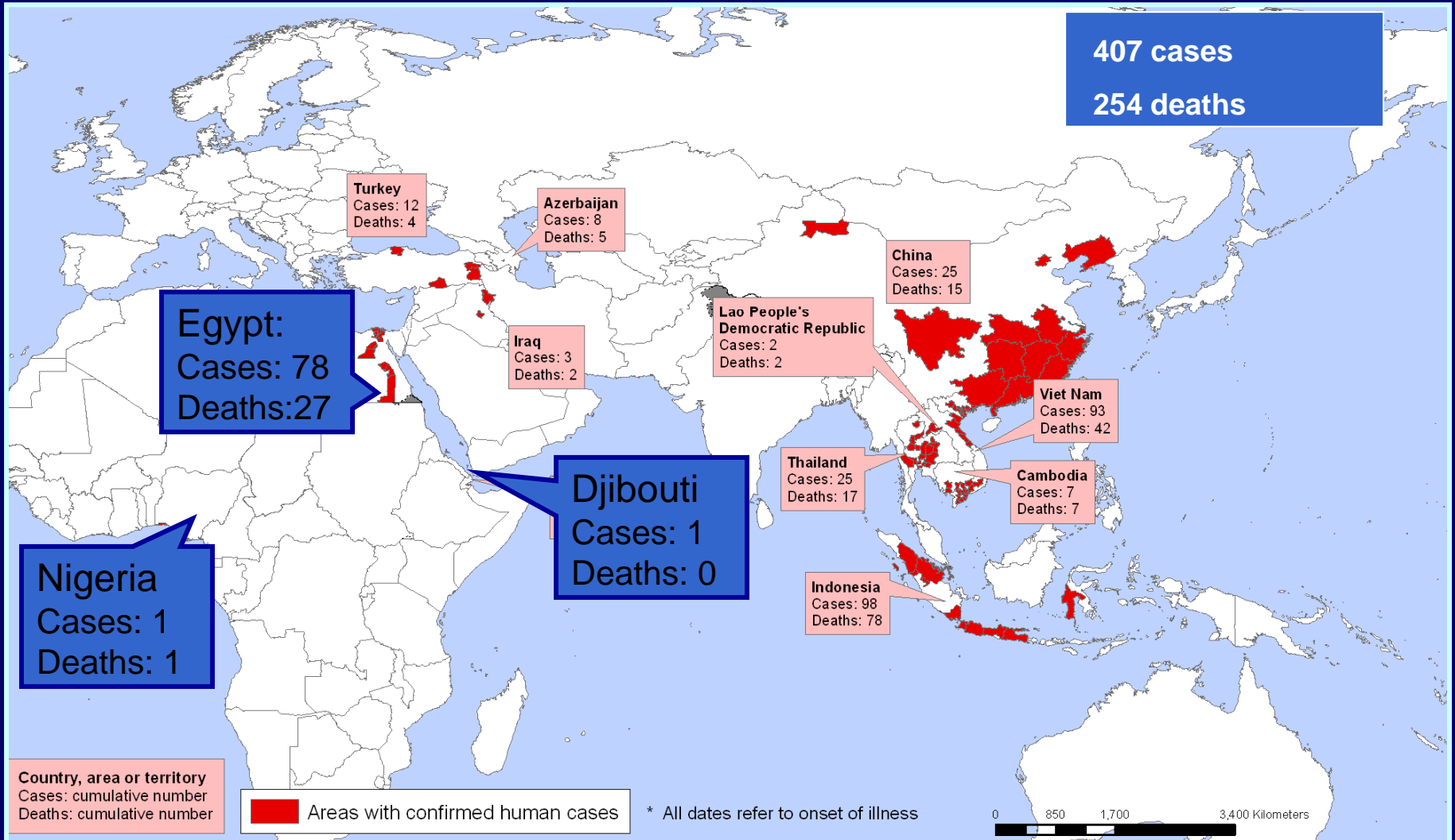
Data Source: World Health Organization
Map Production: Public Health Information
and Geographic Information Systems (GIS)
World Health Organization



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Map produced: 24 July 2009 10:00 GMT

Avian Influenza in Humans since 2003



World Health Organization

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Data Source: WHO / Map Production: Public Health Mapping and GIS Communicable Diseases (CDS) World Health Organization

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Pandemic Influenza Preparedness in Africa

- **Limited surveillance and laboratory capacity for influenza**
 - **Substantially improved over past 3 years**
- **Few dedicated personnel for surveillance, response at country level, regional level**
- **Close contact between humans and poultry, other animals**

CDC's involvement in Influenza Surveillance in Kenya

- **Sentinel surveillance at referral hospitals (MoPHS)**
- **Population-based surveillance in Nairobi, Kisumu**
- **Syndromic surveillance (not laboratory-based) for Avian Influenza through the MoPHS-run Integrated Disease Surveillance and Response (IDSR) system**
 - **Health facility level**

Sentinel Surveillance in Kenya

- **Joint project with the Kenyan Ministry of Health**
- **Complements USAMRU-K/MoPHS surveillance**
- **Objectives:**
 - **Provide early warning system for a pandemic**
 - **Understand epidemiology and burden of disease of influenza in Kenya**
 - **Characterize circulating strains of influenza in Kenya**

Sentinel Surveillance in Kenya

- **10 Sentinel Surveillance Sites**
 - 8 Provincial Hospitals
 - 2 Refugee Camps (Dadaab, Kakuma)
- **Captures patients with:**
 - Influenza-like Illness (ILI)
 - Severe Acute Respiratory Illness (SARI)
 - Suspected Avian Influenza

MoPHS- CDC Sentinel Surveillance Sites



Sentinel Surveillance in Kenya

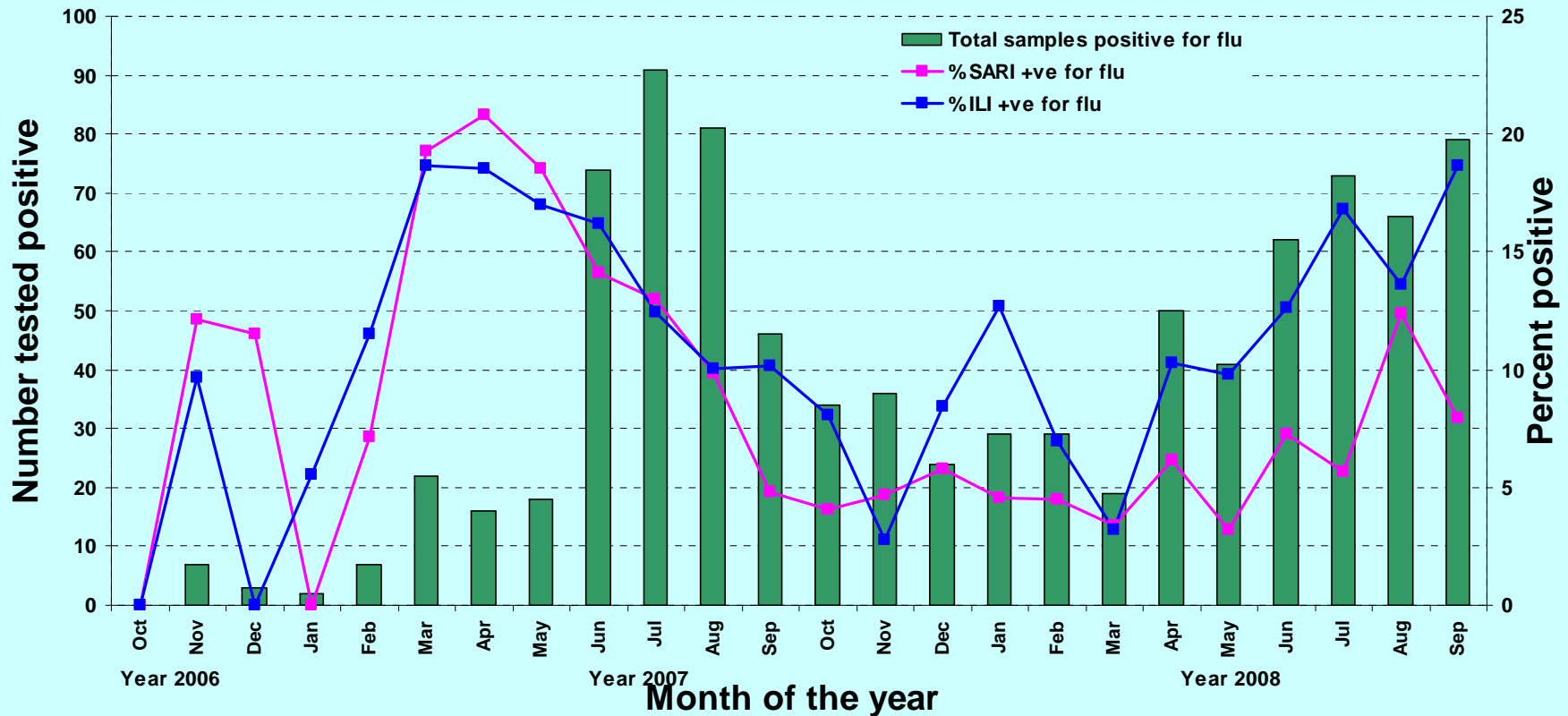
- **For all patients meeting the case definition:**
 - Nasopharyngeal Swab
 - Throat Swab
 - Questionnaire
- **Swabs sent to Laboratory for testing by RT-PCR**
 - National Influenza Center, Kenya Medical Research Institute (KEMRI)
 - CDC-Kenya IEIP laboratory
 - Positive samples sent to WHO Collaborating Center (CDC-Atlanta)

Sentinel Surveillance in Kenya

- **Started October 2006**
- **>16000 samples tested**

Monthly Distribution Influenza-positive ILI and SARI Cases in Kenya

Monthly distribution of flu positive ILI and SARI cases observed in Kenya, between October, 2006 and September, 2008 (N=909)



Population-based surveillance in Kenya

– Nairobi Slum (Kibera)



– Kisumu

- Rural
- western Kenya



Population-based Surveillance Objectives

- Identify and characterize potentially important “new or emerging” pathogens
- Establish public health priorities in rural and urban settings
- Provide platform for evaluating impact of interventions to address leading causes of priority diseases

Population-based Surveillance Community Systems

- 55,000 people in two sites (rural-25,000 and urban Kibera 30,000)
- Visits to each household every two weeks
 - Questions about episodes of pneumonia, diarrhea, fever, and jaundice
 - Questions about mortality

Population-based Surveillance Community Systems

- Enhanced field clinics established in both sites
 - Free and high quality care
- Specimens obtained according to protocol and tested in CDC laboratory
 - Pneumonia specimens tested for multiple viral pathogens, including influenza

Influenza and Antibiotic Use

- In US, rapid diagnosis of influenza →
 - reduce inappropriate prescribing of antibiotics
 - Reduce hospital costs
- Rural Thailand*
 - Positive rapid influenza test → Physicians less likely to prescribe antibiotics (73% vs. 87%)

*Bhavnani D et al. The influence of rapid influenza diagnostic testing on antibiotic prescribing patterns in rural Thailand. *Int J Infect Dis* 2007; 11: 355–359.

Influenza Basics

- **Two main types – A and B**
- **Type A viruses divided into subtypes based on two surface proteins (H,N)**
 - **H5N1**
 - **H3N2**
 - **H1N1**

Antiviral Resistance

- **Big problem for seasonal influenza**
- **Two classes of drugs for influenza**
 - **Adamantanes (Influenza A)**
 - Amantadine and Rimantidine
 - **Neuraminidase Inhibitors (Influenza A and B)**
 - Oseltamivir, Zanamivir

Antiviral Resistance

- **Seasonal Influenza**

- **Adamantanes**

- Widespread resistance among H3N2 viruses
 - Some resistance among *seasonal* H1N1 (11% in US 2007-08)
 - Influenza B not susceptible

- **Neuraminidase Inhibitors**

- Increasing resistance to oseltamivir (tamiflu) among *seasonal* H1N1
 - H3N2, B viruses sensitive
 - All sensitive to zanamivir

Oseltamivir (Tamiflu) Resistance

- **<1% oseltamivir resistance before 2007**
- **H1N1 oseltamivir resistance first reported in Norway late 2008**
- **Resistance shown in many European countries 2007-2008 (16% overall)**
- **2007-2008 US: 12 % resistance among H1N1 strains**
 - **Not associated with oseltamivir treatment prior to sampling**

Oseltamivir (Tamiflu) Resistance

- **2008-2009 United States**
 - **98 % resistance among seasonal H1N1**

Oseltamivir Resistance

- **Oseltamivir Resistance in Africa**
- **South Africa**
 - **Winter 2008 (May, June, July)**
 - **All 45 H1N1 isolates tested in South Africa and 23 isolates tested at WHO collaborating centers were resistant**

Oseltamivir Resistance

- **Kenya**
- **2 seasonal H1N1 isolates tested in 2008**
- **Both resistant to H1N1, sensitive to zanamivir, adamantanes**

Antiviral Resistance – Novel H1N1

- **Oseltamivir resistance among Novel H1N1 resistance**
 - **Three reported cases**
 - **Hong Kong**
 - **Patient was not taking oseltamivir**
 - **Japan and Denmark**
 - **2 patients were taking prophylaxis**
 - **No reports of secondary transmission of resistant strains**

Antiviral Resistance – H5N1

- **Oseltamivir resistance has been reported in three patients with Avian Influenza A (H5N1)**
 - Vietnam 2005

Antiviral Resistance – Implications

- **Oseltamivir use uncommon in most of sub-Saharan Africa except South Africa**
 - **For now, limited implications for seasonal influenza**

Antiviral Resistance – Implications

Pandemic influenza

- Impact could be greater in Africa**
- Many African countries do have access to oseltamivir from WHO, but not other drugs (zanamivir)**
- Oseltamivir resistance could create situation where no treatment for pandemic flu patients**

Thank you