

INFLUENZA



USAF School of Aerospace Medicine / Epidemiology Consult Services
Presented by: DoD Global, Lab-based, Influenza Surveillance Program
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Navy and Marine Corps Public Health Center
U.S. Army Public Health Command
U.S. Air Force School of Aerospace Medicine
24 September 2013





Influenza Outline



I. About Influenza

I. Clinical Information

II. Subtypes and Strains

III. Immunity-related Changes: Antigenic Drift/Shift

IV. Vaccine

II. Influenza Surveillance in Military Populations

I. Reportable Medical Event Case Definition

II. Influenza-like Illness (ESSENCE)

III. Surveillance Activities by Service

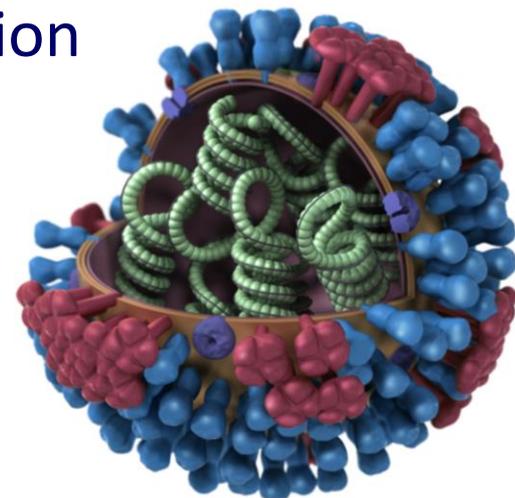
III. Contact Information



Clinical Information



- An acute viral disease of the respiratory tract
 - Fever, cough, sore throat, runny nose, headache, fatigue, body aches
- Spread by droplets or touching contaminated surfaces
- Incubation period is 1-4 days (2 days on average)
- Contagious 1 day prior, and up to 5-7 days after symptom onset (longer for children & immunocompromised)
- Severity depends on flu virus, vaccination status, and health status
- Recovery: few days to two weeks (1 week on average)





Subtypes and Strains

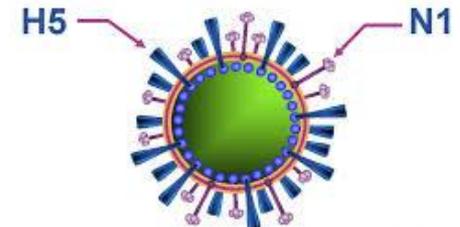


- **Influenza A**

- Evolves rapidly & responsible for most epidemics and pandemics
- Subtypes:
 - Divided into subtypes based on two surface proteins:
 - Hemagglutinin (HA)
 - Neuraminidase (NA)
 - Combine to create a single subtype (Example: H5N1, H3N2)
 - Are further divided into strains
- Found in many different animals

- **Influenza B**

- Gradually changing virus
- Classified by strains based on their lineage: currently Yamagata or Victoria
- Found primarily in humans
- May cause epidemics, but not pandemics





Antigenic Drift

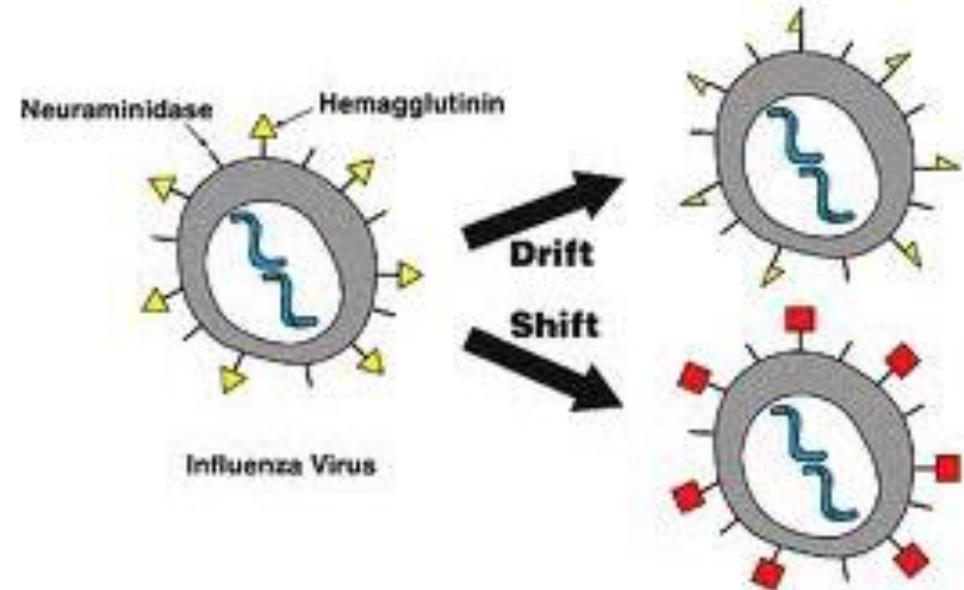
- **Immunity-related changes to influenza A virus**
 - Changes to regions of the HA surface protein can affect human antibody responses to the virus
- **Antigenic Drift**
 - Small gradual changes that occur over time and create a new strain that may not be recognized by immune system
 - Reason that new influenza vaccine is manufactured and distributed each year
 - USAFSAM conducts molecular sequence analysis on influenza specimens to monitor these changes



Antigenic Shift

- **Antigenic Shift**

- Abrupt major change that produces a novel (not seen previously in humans) influenza A virus, for example pandemic H1N1
- Result of direct animal-to-human transmission or mixing of human and animal viral genes within the same individual (reassortment)
- Most people have little or no protection against the new virus



- **Example: 2009 influenza A(H1N1)pdm**



Vaccine



- **Get Vaccinated Early**
 - Flu seasons can be unpredictable and begin as early as October
 - Takes about 2 weeks for antibody production after vaccination
 - Influenza vaccine cannot give you influenza
 - The virus injected is inactivated (killed) or is attenuated (weakened)
 - Designed to only cause mild infection at cooler temperatures (not in the lungs)
- **This year, DoD ordered 3.9 M doses of trivalent (injection) and quadrivalent (FluMist) vaccines for service members and beneficiaries**
 - Trivalent (injection): A(H3N2), A(H1N1)pdm09, B/Yamagata
 - Quadrivalent (FluMist): A(H3N2), A(H1N1)pdm09, B/Yamagata, B/Victoria
- **CDC estimated that among vaccinated individuals, about 60% fewer influenza cases occurred than would have if they had not been vaccinated.**



Testing for Influenza



- **Rapid Diagnostic Tests**
 - Fast & easy but....
 - High specificity (correctly identifies negatives)
 - Low sensitivity (does not pick up positives very well)
 - Accuracy depends on the prevalence of circulating viruses
- **Confirmatory Tests**
 - Much more sensitive & specific
 - Common
 - RT-PCR detection (24-48 hours)
 - Tissue cell culture (up to 10 days for negative result)
 - Others
 - Immunofluorescent antibody staining (IFA) antigen detection
 - Hemagglutination inhibition (HI) 4-fold rise in antibody titer in paired acute and convalescent sera
 - Immunohistochemical (IHC) staining antigen detection (autopsy)



Influenza Surveillance



- Surveillance in military populations
- Varied approaches
 - Reportable Medical Events (RME)
 - Syndromic
 - Sentinel
 - Shipboard & Recruits (Navy)?
 - Population (Army)?



Influenza and Military Populations



- Even with modern medical advances, influenza and influenza-like illness can cause high morbidity rates, undermining readiness
- Military members and their families:
 - Are stationed where new strains are likely to appear
 - Are highly mobile across the globe and could quickly spread a pandemic strain
 - May live in areas that represent "gaps" in the World Health Organization (WHO)/Centers for Disease Control and Prevention (CDC) influenza surveillance network
- Training environments are well suited for the spread of emerging respiratory pathogens
- Highly immunized military plus electronic vaccination data registry facilitate rapid assessment of vaccine protection against emerging strains



Influenza and Military Populations



- **1918 Spanish Influenza**
 - 500 million infections and 50-100 million deaths (more than WWI, which lasted four years)
 - During Sept – Nov 1918, 20-40% of US Army and Navy personnel contracted influenza or pneumonia
 - High morbidity interfered with training and induction schedules in the US and left hundreds of thousands of military personnel non-effective
 - More American soldiers and sailors were killed by influenza and pneumonia than by enemy weapons in WWI



Historical photo of the 1918 Spanish influenza ward at Camp Funston, Kansas, showing the many patients ill with the flu



Reportable Medical Events



- “A reportable event may represent an inherent, significant threat to public health and military operation. These events have the potential to affect large numbers of people, to be widely transmitted within a population, to have severe/life threatening clinical manifestations, and to disrupt military training and deployment. Timely accurate reporting of probable, suspected or confirmed cases ensures proper identification, treatment, control, and follow-up of cases
 - AFI 48-105, Army, Navy
- AFRESS and DRSi
 - Web-based application
 - Identify, collect, document, manage, and track information on RMEs
 - Completeness/timeliness of data is user-driven



Reportable Medical Events



Influenza-associated Hospitalization

Criteria

Included population	< 65 years of age Any beneficiary type/mandate status
Patient status	Influenza-associated hospitalization Fever $\geq 100.5^{\circ}\text{F}$ with cough or sore throat in absence of other diagnosis
Laboratory	Positive rapid or confirmatory test < 4 days after hospital admission

Case Classification

Confirmed	Meet criteria with confirmatory lab test (RT-PCR, culture, IFA, IHC, HI titer)
Probable	Meet case definition with positive rapid antigen test

Notes

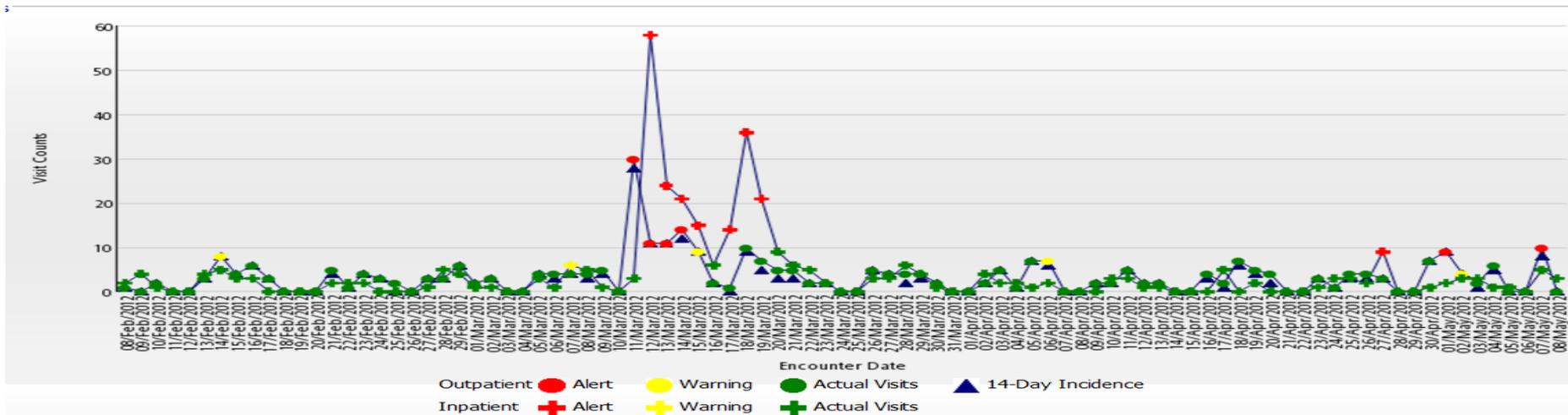
For all confirmed cases, a nasal wash specimen should be submitted to an appropriate lab for further influenza lab testing (i.e. sequencing)



ILI Syndromic Surveillance



- Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE)
 - Designed by Johns Hopkins University Applied Physics Laboratory and DoD
 - Internet-based syndromic disease surveillance system
 - Used by DoD and some civilian health departments
- Useful for early detection with maximum sensitivity
 - Often at the cost of specificity (false alerts)





ILI Syndromic Surveillance



- ILI
 - No influenza specific ICD codes
 - Includes ICD, CPT and Chief Complaint data
- ILI – ALT
 - Includes a broader list of ICD codes (28 vs.13)
 - Also does not include influenza specific ICD codes
- Influenza Specific
 - Influenza specific ICD codes only



DoD Global, Lab-based Influenza Surveillance Program



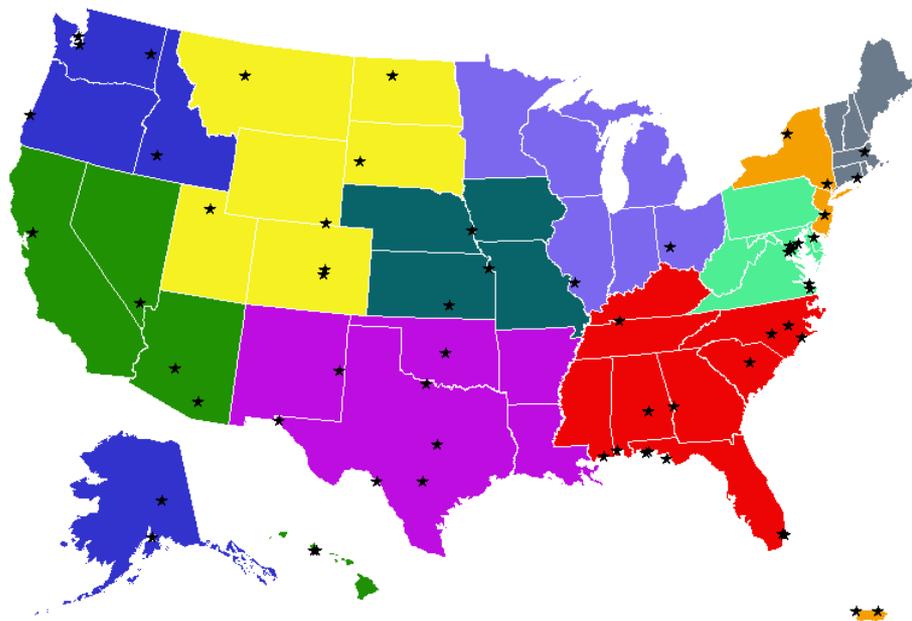
- **AF Influenza Program “Project Gargle” : 1976-1997**
- **National Science and Technology Council Presidential Decision Directive (NSTC PDD-7)**
 - U.S. not prepared for threat posed by emerging infectious diseases
 - Action taken and AF was assigned lead executive agent for DoD influenza surveillance
- **DoD Global, Lab-based Influenza Surveillance Program : 1998 – present**
 - Sentinel-based, across services
 - Selected according to mission, location, gap in international surveillance
 - Collect 6-10 specimens/week meeting ILI case definition
 - Complete patient information on influenza surveillance questionnaire
 - Submit specimens and questionnaires to the USAFSAM lab



DoD Global, Lab-based Influenza Surveillance Program

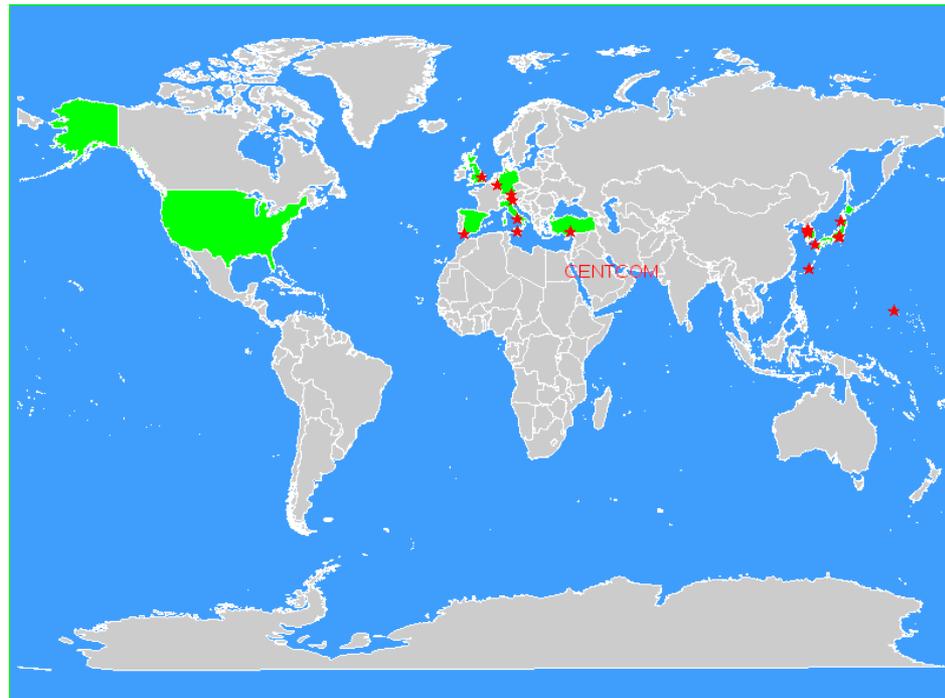


Sentinel Surveillance Sites 2013-2014



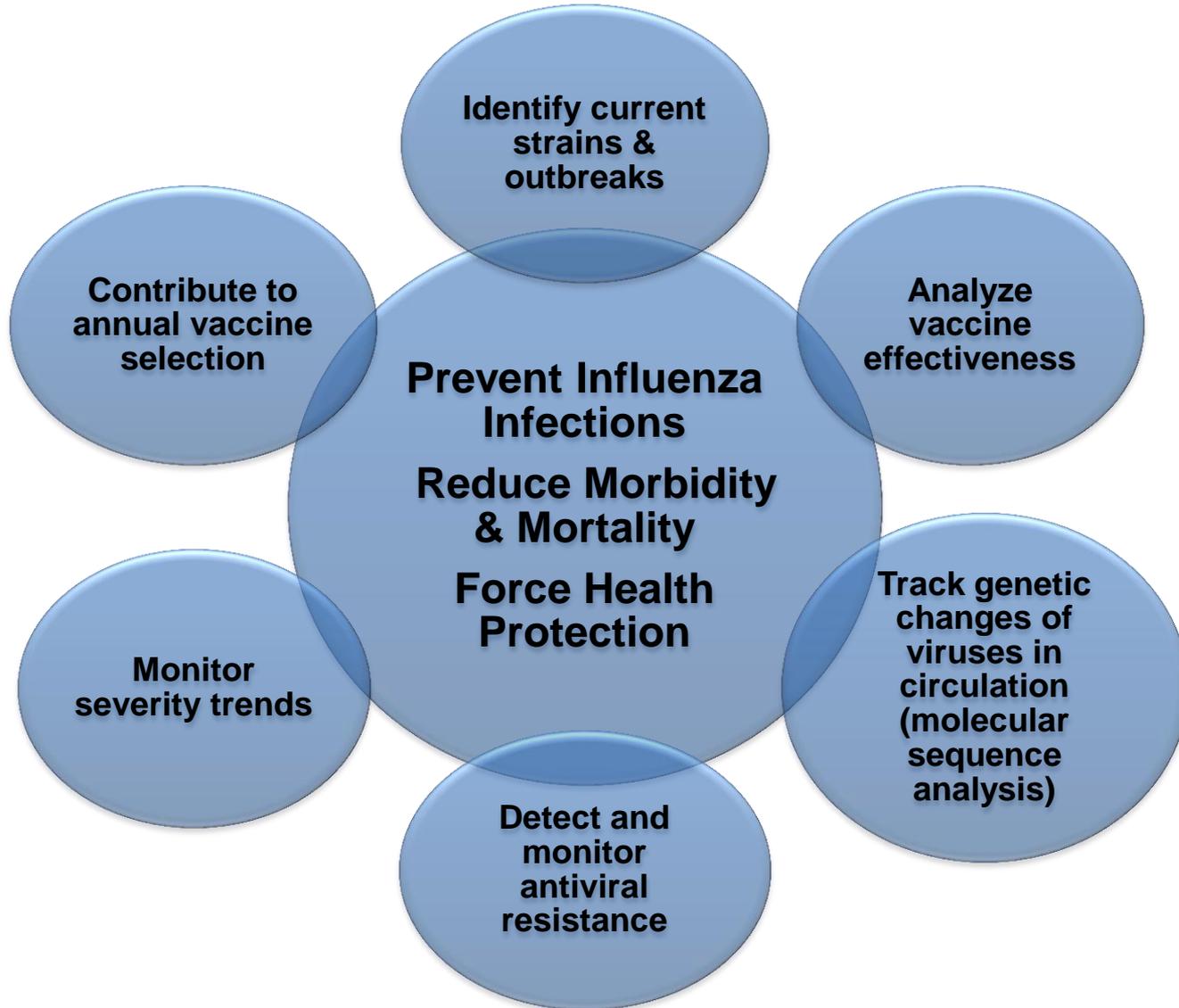
CONUS sentinel sites: 55

OCONUS sentinel sites: 34



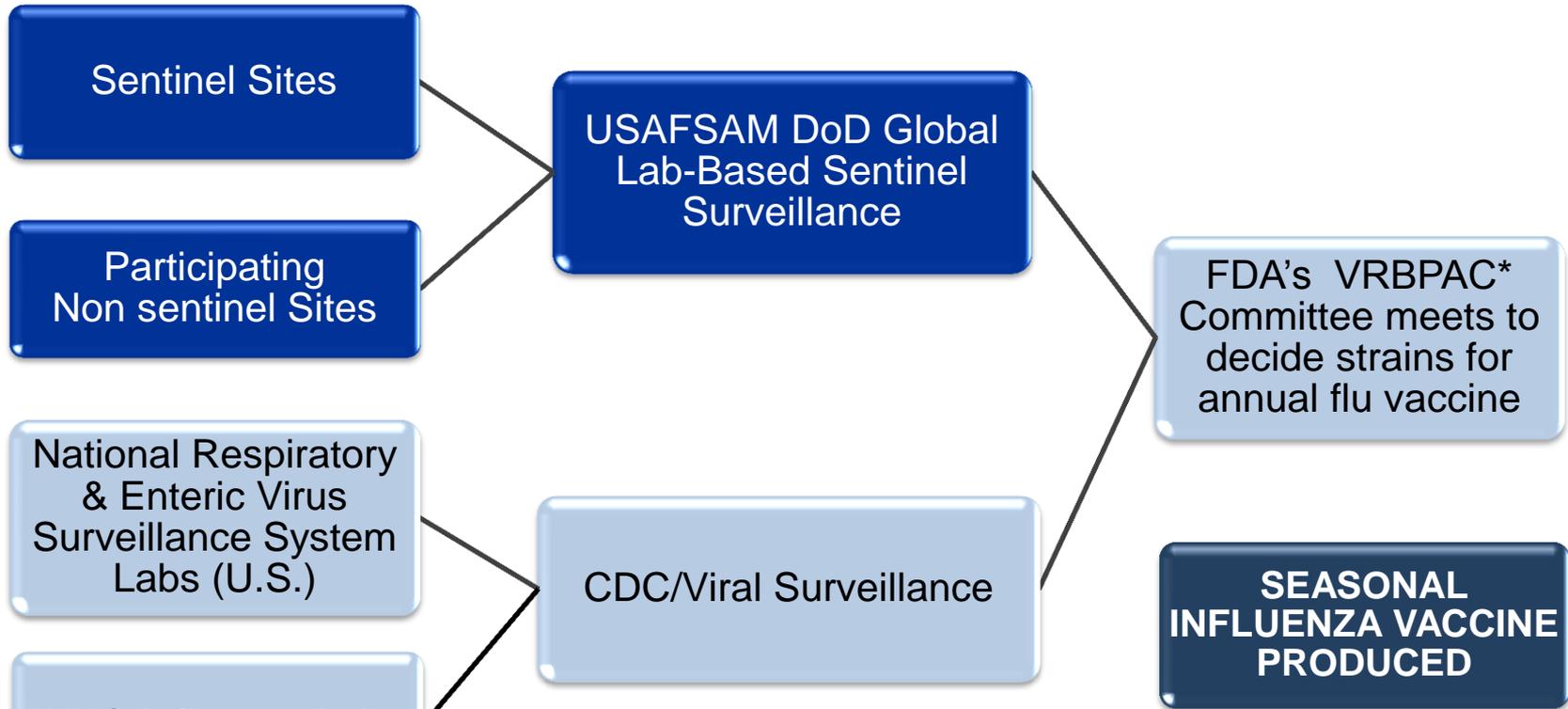


DoD Global, Lab-based Influenza Surveillance Program





Surveillance Process and Vaccine Development



DoD System Civilian System

*Food and Drug Administration, Vaccines and Related Biological Products Advisory Committee

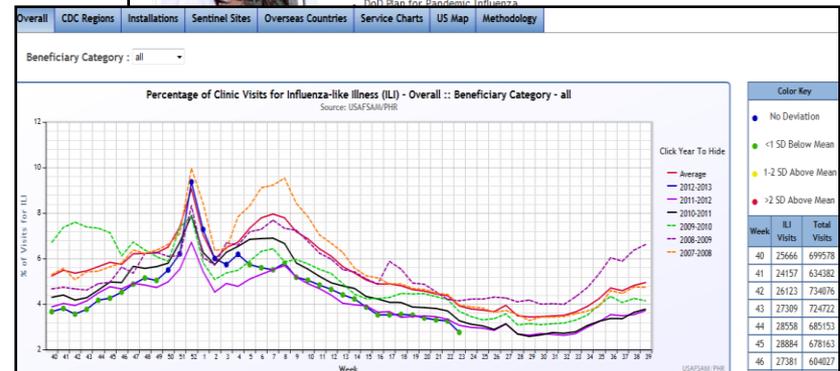


DoD Global, Lab-based Influenza Surveillance Program



<https://gumbo2.wpafb.af.mil/epi-consult/influenza/>

- Dashboard
- Service and site-specific lab data
- ILI activity
 - Site-specific
 - By service, region, etc.
- Weekly reports
- Program guidance
 - Brochures, nasal wash instructions, etc.
 - Policy documents
- Historical data
- Program publications



Note: If you would like to receive these reports by email, send a request via email to the program at: influenza@wpafb.af.mil

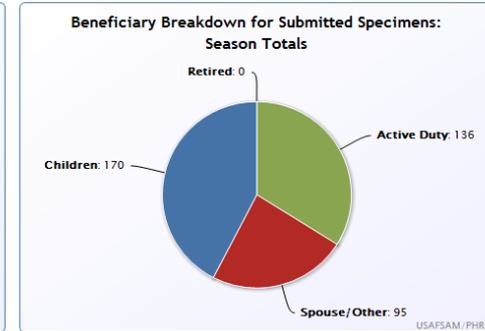
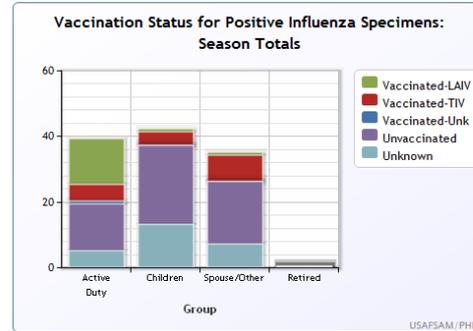
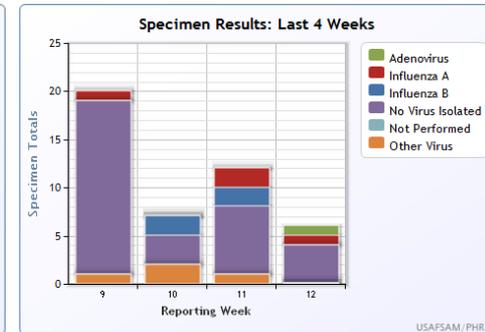
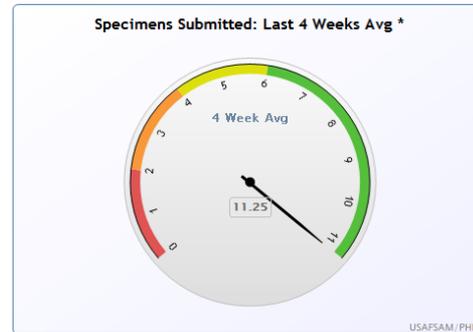


Influenza Dashboard



- Online dashboard that displays base-level information
 - Submission data
 - POC information
 - Shipping & storage information

WEEKLY SPECIMEN TOTALS							
Week	Adenovirus	Influenza A	Influenza B	No Virus Isolated	Not Performed	Other Virus	Total
40	0	0	0	3	0	1	4
41	1	0	0	5	0	0	6
42	0	0	0	2	0	0	2
43	1	1	0	6	0	0	8
44	0	0	0	4	0	0	4
45	0	0	0	7	0	0	7
46	0	0	0	2	0	0	2
47	1	1	0	3	0	0	5
48	1	1	0	2	0	0	4
49	0	2	1	5	0	0	8
50	1	8	1	5	0	0	15
51	0	18	5	12	0	1	36
52	1	2	3	9	0	2	17
1	1	10	1	12	0	2	26
2	0	16	2	16	0	1	35
3	0	8	1	18	0	2	29
4	0	2	1	27	0	3	33
5	1	8	0	23	1	0	33
6	1	3	2	9	0	0	15
7	0	1	1	18	0	0	20
8	1	2	1	5	0	0	9
9	0	1	0	18	0	1	20
10	0	0	2	3	0	2	7
11	0	2	2	7	0	1	12
12	1	1	0	4	0	0	6





Navy Influenza Surveillance



- Shipboard ILI surveillance
 - Fleet DNBI
 - Naval Health Research Center (NHRC) FRI program
- NMCPHC Influenza SITREPs



Navy Influenza Surveillance



- Fleet DNBI surveillance and reporting
 - Required weekly reporting of xls reports from all Navy ships, includes DNBI category of ILI
 - Meaningful, actionable reference rates by ship type
 - Spreadsheet templates and reporting guidance can be found at: [http://www.nmcphc.med.navy.mil/Preventive Medicine/Disease Surveillance/dnbi.aspx](http://www.nmcphc.med.navy.mil/Preventive_Medicine/Disease_Surveillance/dnbi.aspx)
- NHRC FRI program
 - Describe circulating respiratory pathogens on participating ships, including influenza
 - Identify pathogens in support of outbreaks
 - Contact NHRC at nhrc-fri@med.navy.mil for more information and to receive quarterly reports
- Can describe ILI outbreaks, anticipate duration of illness, describe extent of outbreak, and identify patterns to curtail disease spread



Navy Influenza Surveillance



DON Influenza SITREP 2011-2012 Influenza Season Week 30 (July 22 — July 28, 2012)

Laboratory Summary:

- There were no laboratory positive influenza results among DON beneficiaries this week.
 - NH Yokosuka has had the most cases this season (118).
- [More](#)

Vaccination:

-92.6% of active duty Navy personnel have been vaccinated as of July 28th.

-91.6% of active duty Marine Corps personnel have been vaccinated as of July 28th.

[More](#)

Active Duty, Recruits:

- During Week 30, there were no influenza positive results among active duty service members.
- [More](#)

Children, Special Populations:

- The rate of positive influenza tests was 0 per 100,000 for all age groups during Week 30.

Severity:

- There were seven inpatient influenza tests performed during Week 30; none were positive.
 - There were no hospitalized influenza cases reported to DRSI since the last report (Week 25).
- [More](#)

Other:

- There were no influenza specific antiviral (AV) prescriptions dispensed since Week 27.
- There was one coinfection (Staphylococcus) identified among DON beneficiaries since Week 25. There have been 16 coinfections identified this season. The most frequently identified coinfections have been *Streptococcus* (5) and *Staphylococcus* (4).
- There were no influenza-associated pneumonia cases identified in the radiology data since Week 25. There have been eight cases this season to date.

In the News:

- The WHO reports that the influenza season has commenced in the temperate southern hemisphere countries. [More](#)
- Avian influenza (H3N8) has been identified as the virus responsible for the death of 162 seals along the New England Coast, providing further evidence that the virus can mutate to infect the mammalian respiratory tract. [More](#)
- The top three flu vaccine makers for the US have started shipping their first doses for the 2012-2013 flu season. [More](#)
- CDC reports an outbreak of influenza A (H3N2) among humans and swine at an Indiana county fair. [More](#)

Prepared by: NMCPHC, EpiData Center. For more information contact Gosia Nowak at (757) 953-0979

Weekly SITREP including:

- Vaccination rates
- Overall flu burden
- Active Duty/recruit burden
- Description of hospitalized cases and trends
- Noteworthy information in the open media
- Distributed via email, contact Mrs. Gosia Nowak, gosia.nowak@med.navy.mil, if you'd like to be included in the distribution list



Army Influenza Surveillance



- Uses a combination of CHCS Ad Hoc Reporting, DRSi and ESSENCE
- CHCS flat files are sent from each Army lab on a weekly basis to USAPHC containing all positive and negative results of PCRs, cultures and rapid antigen testing
- Army influenza reports can be found at:
<http://phc.amedd.army.mil/whatsnew/Pages/PublicationDetails.aspx?type=USAPHC%20Influenza%20Surveillance%20Activity>



Contact Information



Air Force:

Email: episervices@wpafb.af.mil or influenza@wpafb.af.mil (flu program)

Website(CAC-required): <https://gumbo2.wpafb.af.mil/epi-consult/influenza>

Commercial (937) 938-3207; DSN 798-3207

Navy: Contact your cognizant NEPMU

NEPMU2: COMM: (757) 950-6600; DSN: (312) 377-6600

Email: NEPMU2NorfolkThreatAssessment@med.navy.mil

NEPMU5: COMM: (619) 556-7070; DSN (312) 526-7070

Email: ThreatAssessment@med.navy.mil

NEPMU6: COMM: (808) 471-0237; DSN: (315) 471-0237

Email: NEPMU6ThreatAssessment@med.navy.mil

Army:

USAPHC – Disease Epidemiology Program

Aberdeen Proving Ground - MD

Comm: (410) 436-7605 DSN: 584-7605

USAPHC.Disease.epidemiology@us.army.mil



Resources



USAFSAM/PHR Epidemiology Consult Service: Influenza Surveillance

<https://gumbo2.wpafb.af.mil/epi-consult/influenza/>

MILVAX, Influenza – Seasonal vaccine information

<http://www.vaccines.mil/Influenza - Seasonal>

FLU.GOV “Know what to do about the flu”

<http://www.flu.gov/>

CDC Influenza Home Page

<http://www.cdc.gov/flu/>

WHO Global Influenza Surveillance Network.

Manual for the laboratory diagnosis and virological surveillance of influenza

http://whqlibdoc.who.int/publications/2011/9789241548090_eng.pdf