

Influenza Seasonal Summary 2014-2015 Season

EpiData Center Department
Communicable Disease Division

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Objective

This report summarizes influenza activity among Department of Navy (DON) and Department of Defense (DOD) beneficiaries during the 2014-2015 influenza season.

Background

Influenza is a contagious, viral, respiratory illness. It can lead to mild or moderate symptoms including fever, sore throat, malaise, and headaches. In severe cases, influenza may result in pneumonia, respiratory failure, and death. Previous Centers for Disease Control and Prevention (CDC) reports estimated 3,000 to 49,000 influenza-associated deaths per season in the United States (US),¹ and the World Health Organization (WHO) estimated 250,000 to 500,000 influenza-associated deaths worldwide each season.² Influenza strains are categorized into influenza types, two of which (Type A and Type B) routinely spread among humans and result in seasonal influenza each year. An emergence of new influenza strains can result in pandemics, such as the 2009 H1N1 influenza pandemic, or sporadic outbreaks, such as the 2013 avian influenza A (H7N9) virus outbreak in China.^{3,4} The influenza season in the US is normally defined as the first week of October through the last week of March. A typical influenza season is characterized by lower incidence of illness in October and November, peak incidence between December and February, and slowly declining incidence in late March.⁵

Seasonal influenza vaccines are the most effective method of reducing the likelihood of illness and spreading it to others.⁶ These vaccines are typically recommended for anyone over six months of age and are particularly important for those at high risk for developing complications from influenza.⁶ The vaccines are formulated based on the viruses predicted to be most prevalent in the upcoming season. Influenza vaccines are available as a high-dose vaccine, intradermal vaccine, regular flu shot, or nasal spray flu vaccine, which is recommended for children two to eight years of age.⁶ Generally, antibodies to the viruses develop within 14 days after vaccine administration.⁶

Influenza-specific antiviral (AV) medications may reduce influenza symptoms, shorten the period of illness, or prevent serious complications such as pneumonia.⁷ Influenza-specific AVs are most effective if administered for five days within two days of symptom onset. AVs may also be administered for post exposure chemoprophylaxis. Antiviral treatment and chemoprophylaxis are an important element of outbreak control among high risk populations in institutional settings.⁸ Risk of complications, type and duration of contact, local public health recommendations, and clinical judgement must all be considered prior to the implementation of AV treatment. Indiscriminate use of AVs for post exposure chemoprophylaxis to asymptomatic patients may elevate resistance to these medications or reduce seasonal availability.⁸ The CDC released two updates via the CDC Health Advisory Network (HAN) during the influenza season reminding providers of the importance of beginning AV treatment as soon as possible after symptom onset, without waiting for confirmatory laboratory testing. These alerts, released during Week 53 (3 December 2014) and Week 1 (9 January 2015), also reinforced CDC recommendations for AV treatment of influenza.^{9, 10}



The CDC reported that influenza activity in the 2014-2015 season began to increase in mid-November and remained elevated through the last week of February. Surveillance markers such as increased positive respiratory influenza specimens, outpatient visits for influenza-like illnesses (ILIs), and the geographic distribution of influenza indicated a peak in case numbers from late December through early January.¹¹ The strains that circulated in the US this season differed from the influenza A (H3N2) component of the seasonal vaccines resulting in reduced vaccine efficacy. The laboratory-confirmed influenza-associated hospitalization rate among civilian adults over 65 years was the highest since 2005, the first year of CDC surveillance.¹¹ This season, the percentage of deaths attributed to pneumonia and influenza exceeded the epidemic threshold (1.65 standard deviations above the seasonal baseline) for eight weeks from January 3 to February 21, 2015.¹²

Influenza is a concern for military service members as they can be at increased risk of infection when exposed to crowded living conditions, stressful work environments, and deployments to endemic regions.¹³ Seasonal influenza vaccination is required annually for all active duty service members and recruits. For the 2014-2015 season, the DOD set a goal of 90% influenza vaccination coverage for service members by 15 December 2014.¹⁴

From 2008 to 2010, the EpiData Center (EDC) Department at the Navy and Marine Corps Public Health Center (NMCPHC) was funded by the DOD Global Emerging Infections Surveillance and Response System (GEIS) program to provide information about influenza laboratory testing and influenza-specific AV treatment at facilities within the Military Health System (MHS). The EDC has monitored influenza laboratory and AV prescription trends in the DOD and DON since the 2008-2009 season using laboratory and pharmacy data transmitted in the Health Level 7 (HL7) format. Before the 2011-2012 influenza season, the DON report was expanded to include a variety of other data sources available to the EDC. The comprehensive DON Situational Report (SITREP) includes information on influenza medical event reports, bacterial coinfections among influenza cases, vaccination coverage, relevant news, and more detailed information about active duty service members and recruits, hospitalized patients, and other vulnerable populations. For historical comparison, surveillance data includes trends dating from the 2005-2006 season. The SITREP is produced each week, distributed to the military public health community, and published to the EDC website (<http://go.usa.gov/DtUC>). Through timely surveillance of influenza activity, information can be disseminated to the preventive medicine community and clinicians ensuring ongoing situational awareness of ever-evolving influenza trends throughout the influenza season. During the off-season, analysts at the EDC review influenza activity weekly and produce a monthly report to identify any unexpected trends.



Methods

EDC influenza surveillance complied with season and week definitions as specified by the CDC. Based on CDC week numbering conventions, an atypical Week 53 was assigned during 2014. All historical comparison data were aligned to the current season week schedule for accurate comparison, where Week 53 data for the 2014-2015 season were compared to Week 1 data from previous seasons. The influenza season for the Northern Hemisphere typically lasts from the first week in October through the last week of March (weeks 40 through 13). This season ended at Week 12 to account for the numbering shift to include Week 53. Based on the CDC definition, a week is defined as the period from Sunday through Saturday.¹⁵

EDC pharmacy and laboratory data originated from the Composite Health Care System (CHCS) and were made available from the Defense Health Surveillance System (DHSS) within approximately two days of record generation. These data were in the HL7 format and contained information for DOD beneficiaries and their dependents who sought care at a fixed military treatment facility (MTF). The EDC received pharmacy and laboratory extracts daily (Monday through Friday). On a weekly basis, an extract of laboratory and pharmacy data for influenza analysis was created, containing cumulative data with a start date of September 14, 2014 (Week 38) through Saturday of the most current week. Data collection began two weeks before the start of the season (Week 40) to provide context of influenza activity at the initiation of seasonal surveillance and to identify cases that may have overlapped between weeks. A cumulative data extract allowed for the capture of updated and/or changed records that were identified in previous weeks.

Clinic type is often used as an indicator of severity. Cases were classified as inpatient or ambulatory based on the data source and Medical Expense and Reporting System (MEPRS) codes present. Pharmacy and encounter records for inpatient and ambulatory clinics were stored in separate databases and classified according to their source. To determine whether a laboratory record was from the inpatient setting, the MEPRS code field was used, with MEPRS codes beginning with 'A' indicating inpatient facilities. Previous analysis at the EDC has shown that some inpatient records appear in ambulatory databases, so MEPRS codes were also used to identify inpatient prescriptions stored in the ambulatory pharmacy database. The MEPRS codes were used to distinguish records from emergency rooms (MEPRS codes beginning with 'BI') from other ambulatory clinics.

Baseline calculations used in influenza surveillance provide a comparison to previous trends. The EDC calculated influenza baselines by using three-year weighted average, where more recent seasons held higher weights than previous seasons.

Laboratory

Chemistry and microbiology data were used to identify positive influenza laboratory results. The laboratory data were limited to relevant clinical specimen sources, including the throat or nasal cavity and specimens from sterile sources. Results were included for all influenza test types: rapid tests, polymerase chain reaction (PCR) tests, direct fluorescent antibody (DFA) tests, and cultures. For positive test results, if possible, the type of influenza was determined (A, B, A



and B, nonspecific). Since patients may have multiple influenza tests performed over the course of an illness, a 14-day gap in care rule was applied. A beneficiary must have had a 14 day lapse since their previous positive influenza test result to be counted as a new case. Rates per 100,000 by age group and by service (active duty only) were calculated using MHS Mart (M2) September 2014 enrollment data for denominators.

Pharmacy

The ambulatory, inpatient, and intravenous pharmacy databases were used to identify prescriptions for influenza-specific AV medications. There are five AV medications approved by the US Food and Drug Administration (FDA) for influenza treatment. Three of these AVs were recommended by the CDC for use during the 2014-2015 influenza season, including oral oseltamivir (Tamiflu), inhaled zanamivir (Relenza), and intravenous peramivir (Rapivab). Due to AV resistance, amantadine and rimantadine were not recommended for AV treatment or chemoprophylaxis of currently circulating influenza A viruses. Our analyses included all five drugs of interest to assess provider prescribing practices.¹⁶

Records with canceled or unknown prescription status and those indicating no medication was dispensed were excluded from the final dataset as these prescriptions were likely not distributed from the MTF pharmacy. Amantadine is also used for the treatment of movement disorders, such as Parkinson's disease; prescriptions for this purpose were distinguishable from influenza treatment prescriptions based on dosage, duration, and amount of refills indicated in the pharmacy record, and were excluded from influenza surveillance. Since patients may receive more than one AV prescription for a single illness, a 30-day gap in treatment rule was applied. Beneficiaries must have had a 30 day lapse since their previous treatment to be counted as a new case.

Inpatient Comorbidities

The comorbidities most often associated with inpatient laboratory positive cases and influenza AV prescriptions are of interest due to the possible antagonistic relationship between influenza and other diseases. Inpatient laboratory and pharmacy records were matched to the Standard Inpatient Data Record (SIDR) for inpatient admissions and the Comprehensive Ambulatory Patient Encounter Record (CAPER) for ambulatory encounter records. When matching inpatient admission data to laboratory and pharmacy records, the collection date or pharmacy transaction date had to fall within the inpatient record's timeframe (between the admission date and disposition date). When matching ambulatory encounter data, the encounter date needed to occur 14 days before or after the collection date or the pharmacy transaction date. International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes present in matching records were summarized. For each inpatient laboratory or pharmacy case, all matching records were reviewed to determine if any included a diagnosis in the 19 ICD-9-CM diagnostic categories established in the CDC ICD-9-CM code guidelines.¹⁷



Database Alignment

Laboratory and pharmacy data serve as a gold standard for influenza surveillance in the DON, and assessing the alignment between these two data sources evaluates the contribution of each to seasonal influenza surveillance. Records indicating positive influenza laboratory tests and influenza-specific prescriptions were matched to determine database alignment during the 2014-2015 influenza season. Records were matched on unique identifiers using a 30-day gap in care rule to identify unique cases. This rule meant that for a second case to occur in the same patient, at least 30 days must have elapsed since any positive test or AV prescription was identified. Cases were classified into three groups by record source: pharmacy only, laboratory only, or both. Database alignment is used to assess relationships among databases specifically relating to influenza surveillance, to determine if the same or different patients are being identified within laboratory and pharmacy records. It also ensures that there is value by including each source in surveillance processes through assessment of how each data source contributes to knowledge of influenza burden.

Encounter ILI Diagnosis Tracking

Each week, influenza-like illness (ILI) diagnoses among DON beneficiaries were monitored in medical encounter data using Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE)-defined syndromic ICD-9-CM codes (Appendix A). The percent of medical encounters containing an ILI diagnosis was calculated to evaluate the number of diagnoses in relation to healthcare utilization at fixed MTFs; denominators were established by aggregating the total number of encounters for the corresponding week using unique appointment identifiers. Inpatient and ambulatory records, including those resulting in an emergency room (ER) visit, were evaluated for all DON beneficiaries.

DRSi

The internet-based Disease Reporting System (DRSi) is utilized by all military service branches for notification of reportable conditions, as indicated in the Armed Forces Reportable Event Guidelines.¹⁸ Reported cases of influenza-associated hospitalization were extracted weekly from DRSi during the 2014-2015 influenza season. According to the Armed Forces Reportable Event Guidelines, influenza-associated hospitalization is defined as an illness compatible with influenza virus infection requiring hospitalization of patients less than 65 years of age, along with laboratory test confirmation or a positive rapid test result less than four days after hospital admission. Medical event reports indicating influenza-associated hospitalization were compared to inpatient cases of influenza identified through laboratory and pharmacy surveillance efforts.

Coinfections

Microbiology Isolates

To determine if a beneficiary with laboratory-confirmed influenza was coinfecting with bacterial organisms, influenza positive cases were matched to the microbiology database within 14 days of the influenza specimen collection date. Matching records were restructured using BACLINK and WHONET[®], software programs developed by the WHO, to identify bacterial infections as well as organize and analyze antimicrobial resistance data. To include all possible cases, hand review of matching laboratory records was completed to capture any records not included in the



expected format. Due to small case numbers, coinfections were grouped by genera for analysis and antimicrobial resistance could not be analyzed.

Specimens were classified as upper or lower respiratory infections using an algorithm developed by the Clinical Epidemiology Division at the EDC. Upper respiratory infections (URI) were defined as those isolated above the larynx (e.g. pharynx, ear, sinus), while lower respiratory infections (LRI) included tracheal, sputum, or bronchial specimens. Records with nonspecific or other specimen sources (e.g. swab, blood) were classified as non-respiratory infections.

Radiology Identified Pneumonia

Laboratory-identified influenza cases were matched to radiology records to identify positive or suspect pneumonia cases during the 2014-2015 influenza season; radiology records were considered where the order effective date was within seven days of the laboratory specimen collection date. Although positive radiology results do not necessarily indicate a clinical diagnosis of pneumonia, surveillance of influenza cases with a positive radiology result can identify potential pneumonia cases before physician diagnoses within encounter records or indicate potential complications.

Vaccination

To determine vaccination coverage of active duty and reserve DON personnel, Defense Manpower Data Center (DMDC) Immunization Tracking System (ITS) data were matched to DMDC active duty and reserve personnel records. DMDC provides a monthly summary of each service member's personnel information, which is received at the EDC after a two month delay. The seasonal influenza vaccine typically becomes available during August. Due to a delay in vaccine delivery, service members with vaccination records from 01 September 2014 through 31 March 2015 were included to calculate the proportion of vaccinated active duty and reserve personnel. The total force of the Navy and Marine Corps for this seasonal summary was determined by the January 2015 DMDC personnel file.

In addition to the overall vaccination coverage rate, positive influenza tests and AV prescriptions among active duty personnel were matched to ITS data to determine seasonal influenza vaccination status at the time of illness. The vaccine had to be administered more than 14 days before the specimen collection or pharmacy transaction date to be considered fully immunized. The type of vaccine administered – inactivated influenza vaccine (IIV) or live-attenuated influenza vaccine (LAIV) – was also assessed. In order to validate vaccination status, Armed Forces Health Longitudinal Technology Application (AHLTA), Military Health System Management and Analysis Reporting Tool (M2), and Medical Readiness Reporting System (MRRS) records were reviewed for all active duty service members who were laboratory positive for influenza but had no ITS vaccination record.

Influenza vaccination was monitored for all beneficiaries to track the volume of vaccines administered and anticipate potential vaccine demand throughout the influenza season at the MTF level. Ambulatory encounters with a Current Procedural Terminology (CPT) code for an influenza vaccination administered in a Navy MTF from 1 September 2014 through 31 March



2015 were evaluated. Duplicate vaccination procedure records that occurred on the same day were not included in the analysis. If there was more than one influenza related CPT code during a single encounter, the first influenza related code was used. All encounters for a beneficiary were retained if they occurred on different days.

Furthermore, vaccination coverage in the Central Fleet Forces Command and Pacific Fleet Command was monitored on a weekly basis throughout the influenza season to track progress in relation to the DOD vaccination goal of 90% by 15 December 2014. Data were generated from the Medical Readiness Reporting System (MRRS) database on a weekly basis, which provided the aggregated number of vaccinated service members, total eligible, and total exempt at each command. The percent of personnel immunized was calculated using the number of personnel vaccinated divided by the number eligible in each command.

DON Results

Laboratory

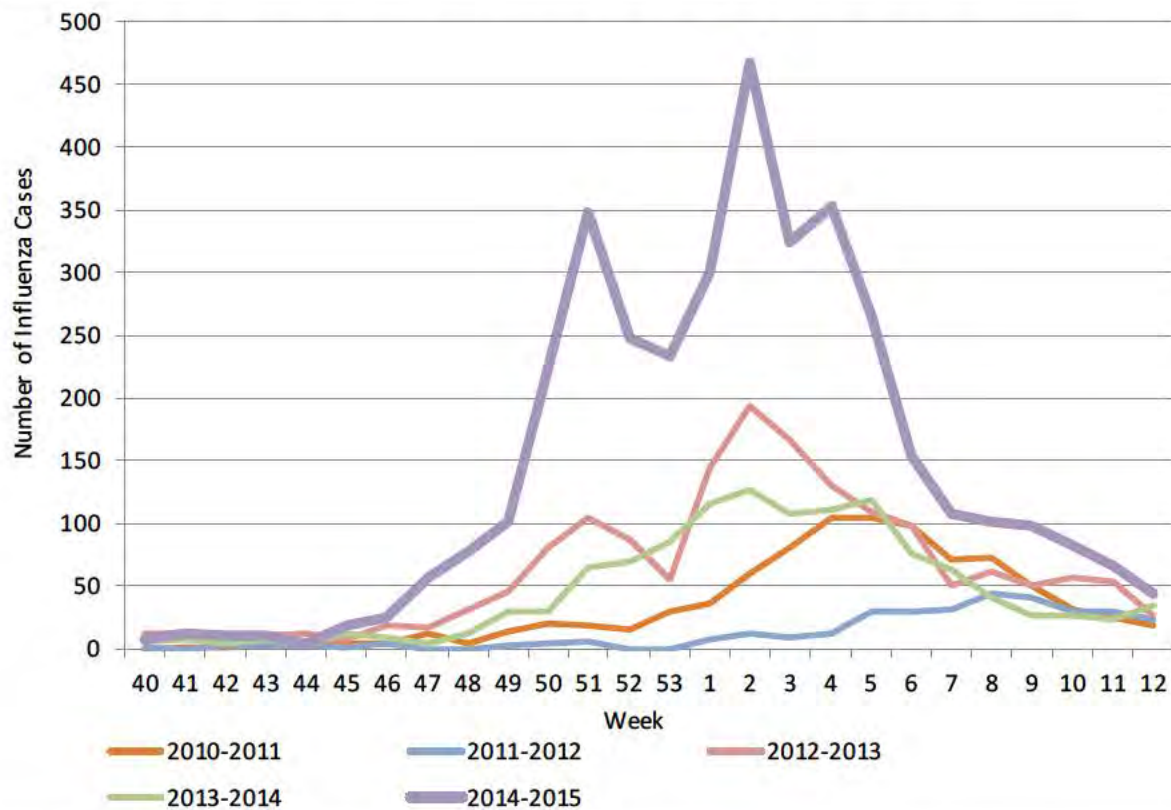
Overall

Among DON beneficiaries, laboratory positive influenza cases exceeded historical trends and exhibited multiple peaks during the 2014-2015 season. Laboratory positive influenza cases reached a high point of 467 cases during Week 2, with two additional peaks observed during Week 51 (n=348) and Week 4 (n=352) (Figure 1). The volume of prescriptions remained elevated for a longer period of time, consistently measuring at least twice the baseline from Week 45 through Week 1. There were seven times more cases during Week 47 than seasonal baseline, and for the following four weeks, case counts continued to rise at an average of four and a half times the seasonal baseline (Figure 2). Throughout the season, the average number of laboratory positive influenza cases (143.9) was approximately three times the baseline average (46.9).

There were 18,962 unique specimens from 16,000 DON beneficiaries tested for influenza during the 2014-2015 season, of which 4,028 (21.2%) had positive results. The majority of specimens were processed using rapid diagnostic tests (71.4%), followed by PCRs (25.7%), cultures (2.6%), and unknown test types (0.3%). There were 3,741 laboratory positive influenza cases among 3,726 DON beneficiaries. There were 3,147 Type A (84.1%), 483 Type B (12.9%), 40 dual infections (1.1%), and 71 cases with unknown influenza type (1.9%). Fifteen beneficiaries had two laboratory positive cases of influenza during the season. The average time between cases of influenza was 53.1 days (range: 15-117 days). No beneficiaries had three or more cases of influenza during the season.



Figure 1. Frequency of Positive Influenza Laboratory Cases among DON Beneficiaries, 2010-2015

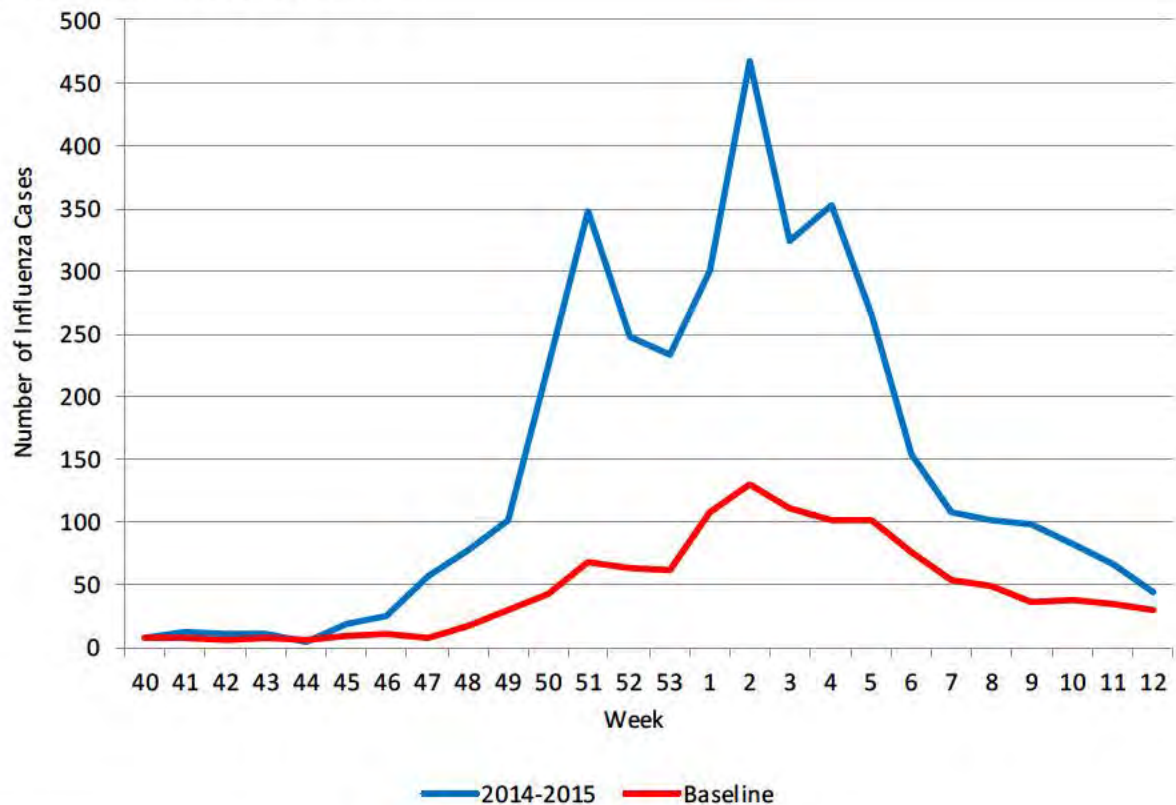


Datasources: HL7-formatted CHCS chemistry and microbiology

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015



Figure 2. Frequency of Laboratory Positive Influenza Cases among DON Beneficiaries in Comparison with Seasonal Baseline, 2014-2015 Season



Baseline calculated as the weighted average of the number of influenza specific antiviral prescriptions in 2011-2012, 2102-2013 and 2013-2014 influenza seasons.

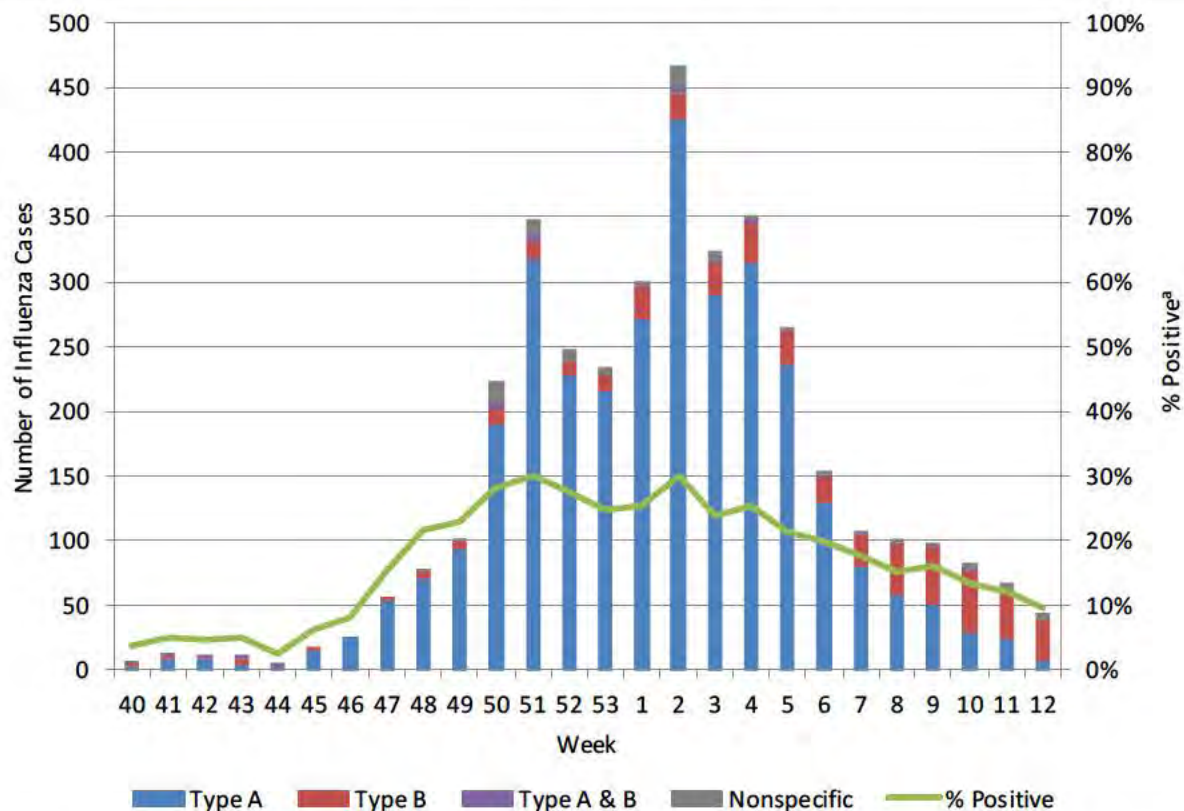
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Overall, 21.2% of specimens tested for influenza were positive in the 2014-2015 season, higher than the previous four seasons. The highest percent positive was observed during Week 51 (30.0%) and Week 2 (29.9%). The percent positive rose above 10% during Week 47 and remained elevated above 10% until Week 12 (Figure 3). The proportion of influenza cases that were Type B increased at the end of the season, accounting for more than 10% of cases beginning in Week 6 and peaking at 66.0% during Week 12 (data not shown).

Figure 3. DON Laboratory Positive Influenza Tests by Influenza Type, 2014-2015 Season



^aPercent positive reflects the proportion of all unique specimens tested for influenza that were positive

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Of the 3,471 positive cases, 127 (3.4%) were from inpatient facilities, 1,107 (29.6%) were from the ER, and 2,507 (67.0%) were from other ambulatory locations, such as family medicine and pediatric clinics. Naval Medical Center (NMC) San Diego had the largest number of positive influenza results in the 2014-2015 season, followed by Naval Hospital (NH) Jacksonville and NH Camp Lejeune. During the season, NH Jacksonville had the greatest frequency of Navy beneficiary cases (11.8%), and NH Camp Lejeune had the greatest frequency of Marine Corps beneficiary cases (20.8%) (Table 1). There were 207 DON cases (5.5%) outside the continental United States (OCONUS). Among OCONUS cases, NH Yokosuka (n=66), Branch Medical Clinic (BMC) Iwakuni (n=27), and NH Okinawa (n=25) had the highest number of cases.

Table 1. Top Three DON Facilities with the Highest Frequency of Laboratory Positive Influenza Tests by Beneficiary Service, 2014-2015 Season

Service	Facility	Frequency (%)
Navy (n=2,585)	NH Jacksonville	305 (11.8%)
	NMC San Diego	281 (10.9%)
	NH Bremerton	197 (7.6%)
Marine Corps (n=1,156)	NH Camp Lejeune	241 (20.8%)
	NH Camp Pendleton	130 (11.2%)
	NHC Quantico	79 (6.8%)
Overall (n=3,741)	NMC San Diego	325 (8.7%)
	NH Jacksonville	320 (8.6%)
	NH Camp Lejeune	269 (7.2%)

Datasources: HL7-formatted CHCS chemistry and microbiology

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Active Duty and Recruits

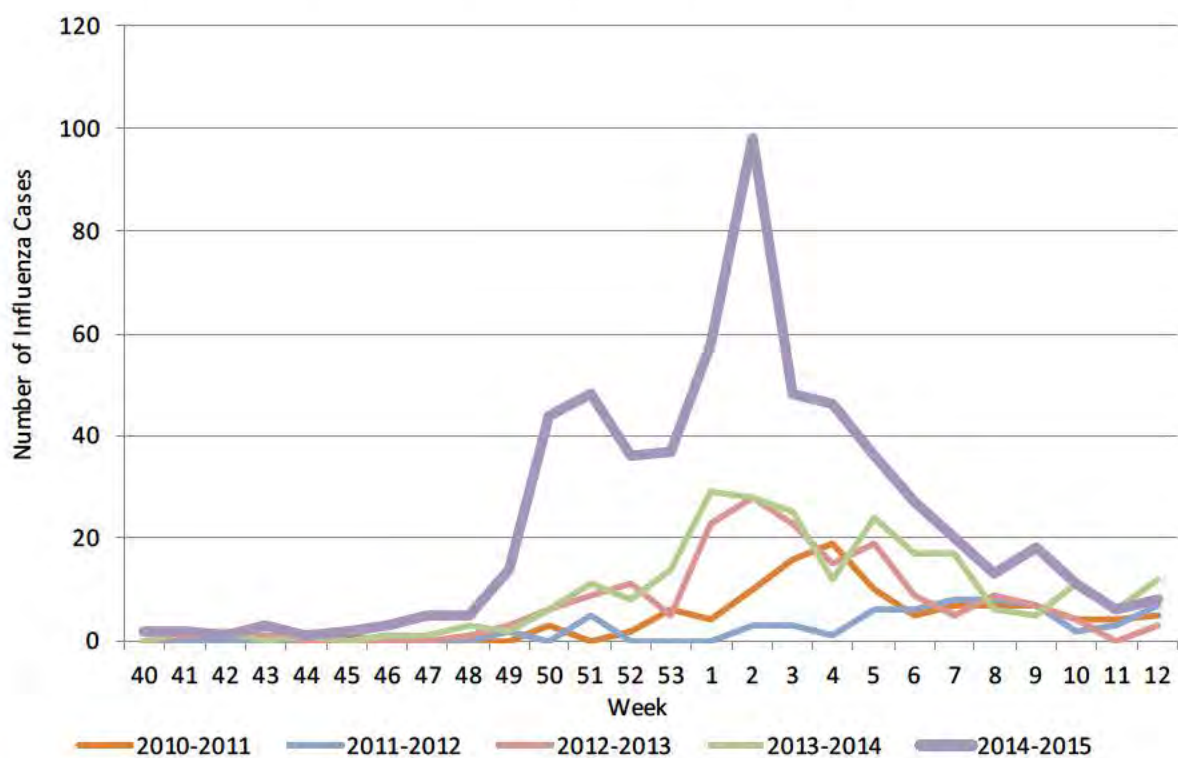
There were 592 DON active duty laboratory positive influenza cases (397 Sailors and 194 Marines) among 591 beneficiaries during the 2014-2015 season. Among DON active duty cases there were 525 with influenza Type A, 32 with Type B, 11 with both Type A and Type B, and 24 with no influenza type identified. One active duty service member accounted for two laboratory positive cases, both positive for Type A, 22 days apart.

The seasonal trend of DON active duty influenza cases was consistent with the trend for all DON beneficiaries, demonstrating an initial peak between Weeks 50 and 51 followed by a greater peak during Week 2. The number of active duty cases during the current season was higher than the four previous seasons (Figure 4) and reached a comparable volume to the 2009-2010 H1N1 pandemic season (n=567).

There were 79 DON laboratory positive influenza cases among recruits during the 2014-2015 season (59 influenza Type A, 6 influenza Type B, 1 both Type A and Type B, and 13 with no influenza type identified). There were 53 recruit cases among Sailors (67.1%) and 26 cases among Marines (32.9%).



Figure 4. DON Laboratory Positive Influenza Cases, Active Duty Service Members, 2010-2015



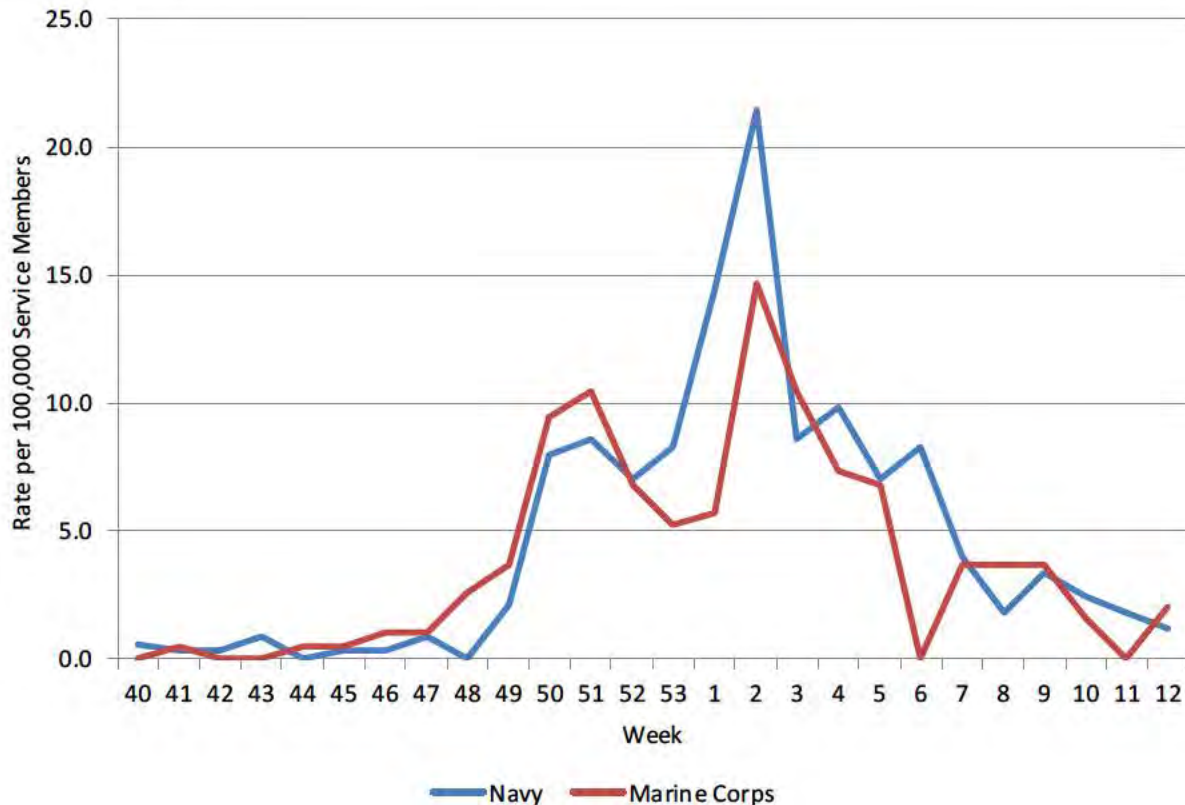
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Influenza rates for active duty service members followed similar trends as overall influenza positive results for the 2014-2015 season. The Navy rate peaked during Week 3 (21.5 per 100,000), and Marine Corps rates peaked during Week 2 (8.7 per 100,000). Marine Corps rates were higher than Navy rates 13 of 25 weeks, compared to only two weeks during the 2013-2014 season (Figure 5).

Figure 5. Rate of DON Laboratory Positive Influenza Cases by Service, per 100,000 Active Duty Service Members, 2014-2015 Season



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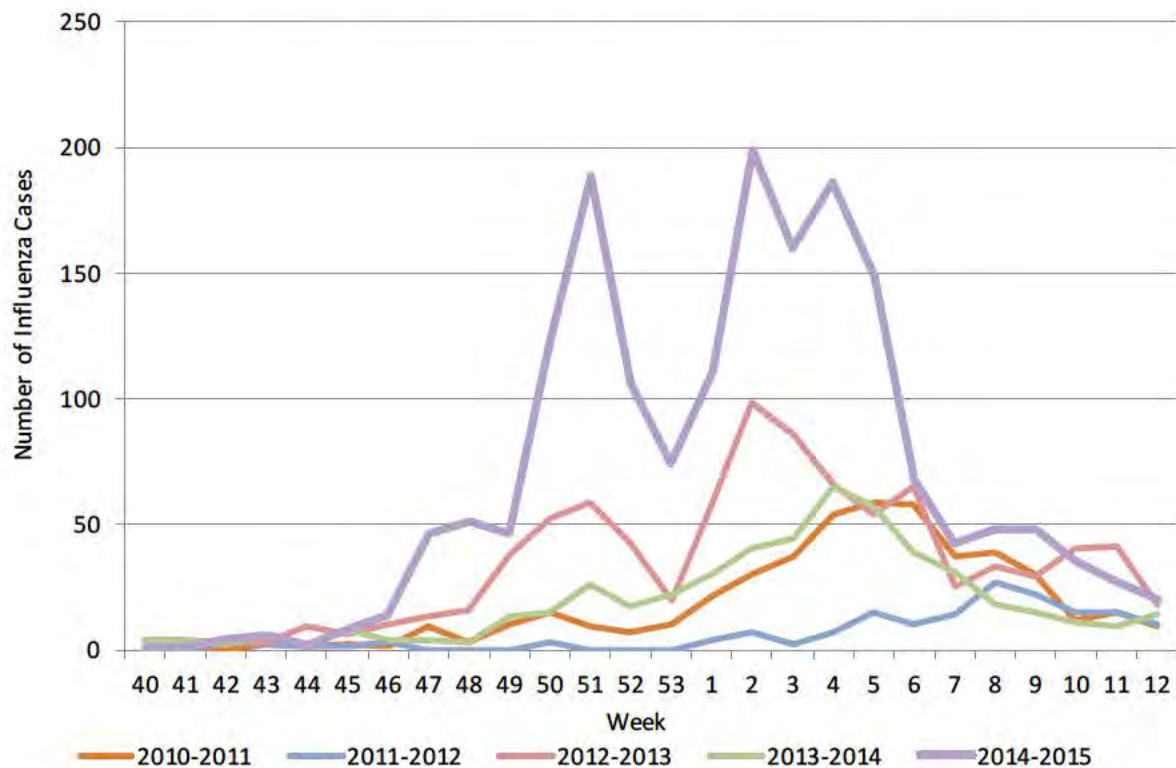
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Children and Other Age Groups

The 2014-2015 season had more than double the case volume among children (age 0-17 years) compared to previous seasons (Figure 6). In general, the seasonal trend for children was similar to the seasonal trend for all laboratory cases. The volume of influenza cases among children peaked during three separate weeks: Week 51 (n=189), Week 3 (n=199), and Week 5 (n=186).

Figure 6. Frequency of Influenza Laboratory Cases among DON Children Age 0-17, 2010-2015



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Influenza rates for all age groups among DON beneficiaries were monitored throughout the season (Table 2). Rates in children (0-4 and 5-17 age groups) were generally higher than in other age groups.

Table 2. Rate of DON Laboratory Positive Influenza Cases by Age Group, per 100,000 Beneficiaries, 2014-2015 Season

Age Group	Average Rate	Peak Rate (Week)	# of Weeks at 0 Cases
0-4	16.0	13.1 (2)	3
5-17	15.9	13.6 (51)	0
18-44	5.6	6.7 (2)	0
45+	7.3	6.4 (2)	0

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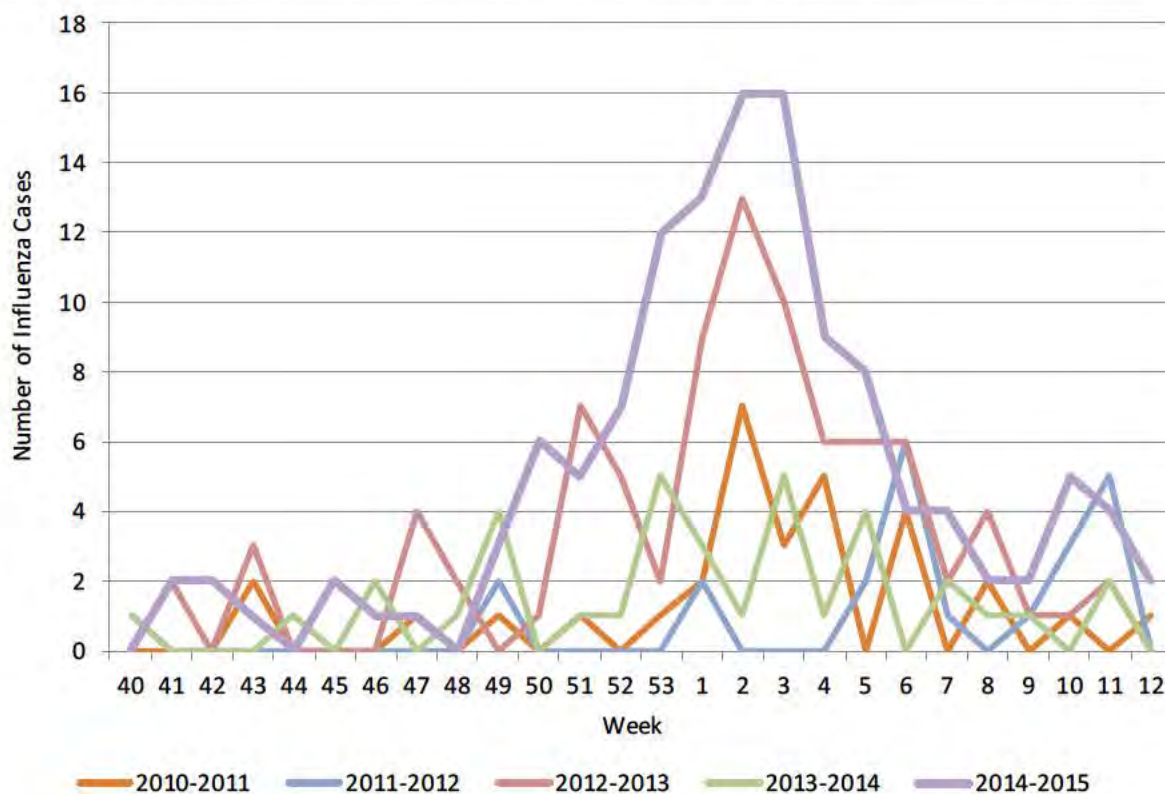
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Inpatient Cases

The inpatient case burden among DON beneficiaries in the 2014-2015 season was higher than previous seasons (Figure 7). A total of 1,136 specimens (11.2% positive) were collected in the inpatient setting for 1,091 people. There were 127 laboratory positive inpatient influenza cases among 127 DON beneficiaries (104 influenza Type A, 17 influenza Type B, three both Type A and Type B, three unknown). Inpatient cases accounted for 3.4% of all influenza cases during the 2014-2015 season. The percent inpatient in 2014-2015 season was comparable to the percent inpatient during the 2013-2014 influenza season (3.0%), and less than the 2012-2013 and 2011-2012 influenza seasons (5.2% and 7.1%, respectively). The average age of an inpatient case was 49 years (range: 0 to 93). There were 14 children age 0-4, 33 children age 5-17, 71 adults age 18-44, and nine adults age 45 and older. Eight inpatient cases were active duty service members (five Sailors and three Marines) and four were Marine Corps recruits. Inpatient cases peaked during Weeks 2 and 3 (n=16 each).

Figure 7. Frequency of Inpatient Influenza Laboratory Cases among DON Beneficiaries, 2010-2015



Datasources: HL7-formatted CHCS chemistry and microbiology

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Locations with the highest number of DON inpatient laboratory cases were NMC San Diego (n=55), NMC Portsmouth (n=18), Walter Reed National Military Medical Center (NMMC) (n=11), and NH Camp Pendleton (n=10). There were three OCONUS inpatient cases (one each at NH Guam, NH Guantanamo Bay, and NH Okinawa).

Inpatient Comorbidities

The 127 unique laboratory-confirmed inpatient cases were matched to inpatient admission and ambulatory encounter data to identify comorbid diagnoses. Twenty-seven cases had no matching inpatient admission record. The average time between admission and discharge for patients with inpatient admission records was 3.5 days, with a maximum duration of 76 days.

The most common ICD-9-CM code group were diseases of the respiratory system (87.0%); of these, 79 (90.8%) had a code in the subcategory for pneumonia and influenza. Half or more cases had a V-code (codes providing supplementary health information) or an endocrine, nutritional, metabolic, or immunity disorder present in the inpatient record.

Table 3. Inpatient Comorbidities among Inpatient DON Influenza Laboratory Cases, 2014-2015 Season

ICD-9-CM Category	Frequency	Percent
Diseases of the respiratory system	87	87.0%
V-Codes (supplementary classification of factors influencing health status)	59	59.0%
Endocrine, nutritional, and metabolic diseases and immunity disorders	57	57.0%
Diseases of the circulatory system	49	49.0%
Symptoms, signs, and ill-defined conditions	43	43.0%
Diseases of the genitourinary system	35	35.0%
Diseases of the digestive system	27	27.0%
Diseases of the musculoskeletal system and connective tissue	22	22.0%
Diseases of blood and blood-forming organs	21	21.0%
Infectious and parasitic diseases	21	21.0%
Diseases of the nervous system and sense organs	27	27.0%
Mental disorders	19	19.0%
Injury and poisoning	10	10.0%
Complications of pregnancy, childbirth, and the puerperium	4	4.0%
Diseases of the skin and subcutaneous tissue	4	4.0%
E-Codes (external causes of injury)	4	4.0%
Congenital anomalies	3	3.0%
Neoplasms	2	2.0%
Certain conditions originating in the perinatal period	1	1.0%

Note: cases may be classified within more than one ICD-9-CM category.

Datasource: Standard Inpatient Data Record (SIDR)

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015



Almost all inpatient laboratory cases had a matching ambulatory encounter record within 14 days (n=117, 92.1%). The most frequent ICD-9-CM categories were diseases of the respiratory system, V-codes, and symptoms, signs, and ill-defined conditions (Table 4).

Table 4. Ambulatory Comorbidities among Inpatient DON Influenza Laboratory Cases, 2014-2015 Season

ICD-9-CM Category	Frequency	Percent
Diseases of the respiratory system	103	88.0%
V-Codes (supplementary classification of factors influencing health status)	100	85.5%
Symptoms, signs, and ill-defined conditions	91	77.8%
Endocrine, nutritional, and metabolic diseases and immunity disorders	70	59.8%
Diseases of the circulatory system	54	46.2%
Diseases of the musculoskeletal system and connective tissue	42	35.9%
Diseases of the genitourinary system	41	35.0%
Diseases of the nervous system and sense organs	30	25.6%
Infectious and parasitic diseases	28	23.9%
Diseases of blood and blood-forming organs	25	21.4%
Injury and poisoning	25	21.4%
Diseases of the digestive system	24	20.5%
Mental disorders	20	17.1%
Complications of pregnancy, childbirth, and the puerperium	7	6.0%
Diseases of the skin and subcutaneous tissue	7	6.0%
E-Codes (external causes of injury)	6	5.1%
Neoplasms	5	4.3%
Congenital anomalies	4	3.4%
Certain conditions originating in the perinatal period	2	1.7%

Note: cases may be classified within more than one ICD-9-CM category.

Datasource: Comprehensive Ambulatory Professional Encounter Record (CAPER)

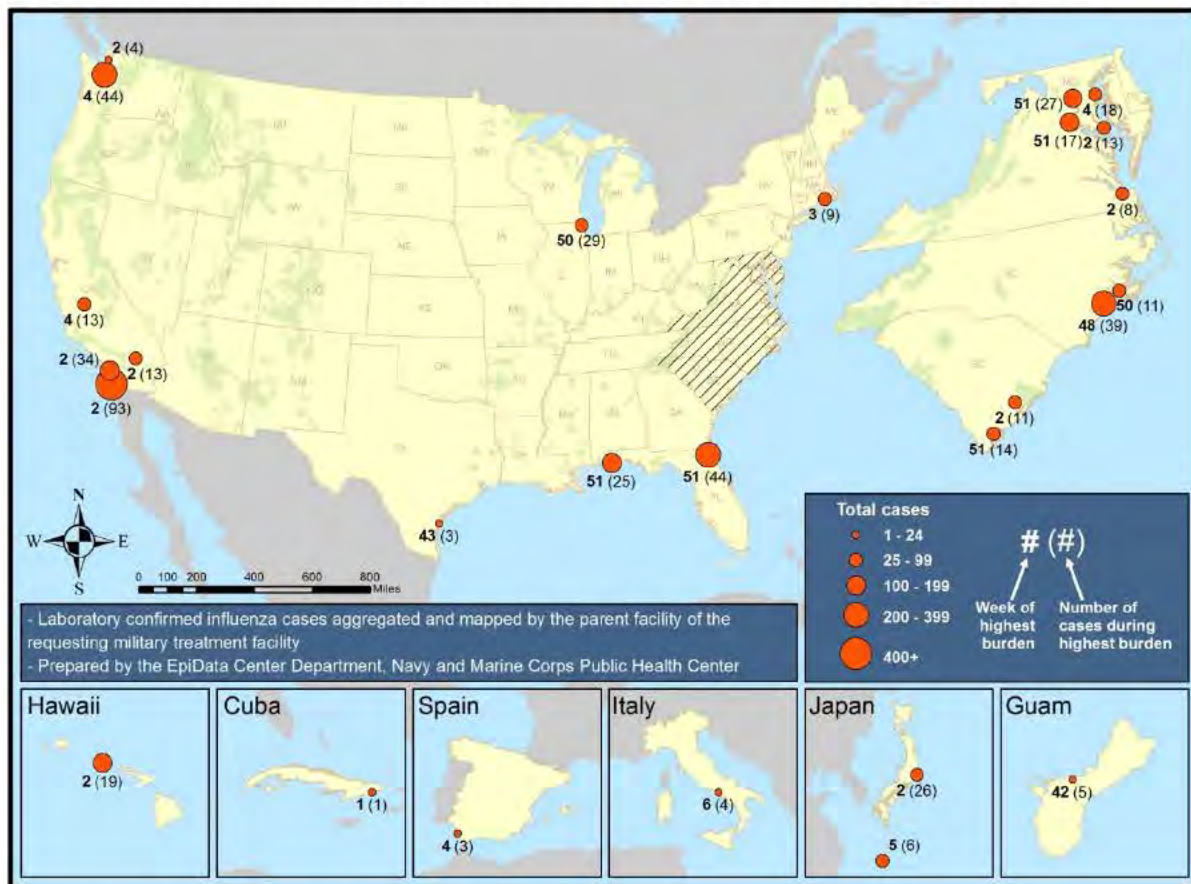
Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015



Geographical Distribution

Navy parent MTFs in the mid-Atlantic and Southeast United States experienced their highest burden of laboratory positive influenza cases earlier than those located in the US Pacific Coast and OCONUS, with the exception of Guam, which experienced its highest burden during Week 42 (Figure 8).

Figure 8. Laboratory Positive Influenza Cases by Parent Facility and Week of Highest Burden, DON Beneficiaries at DON Facilities & Walter Reed National Military Medical Center, 2014-2015 Season



Datasource: HL7-formatted CHCS pharmacy

Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015.

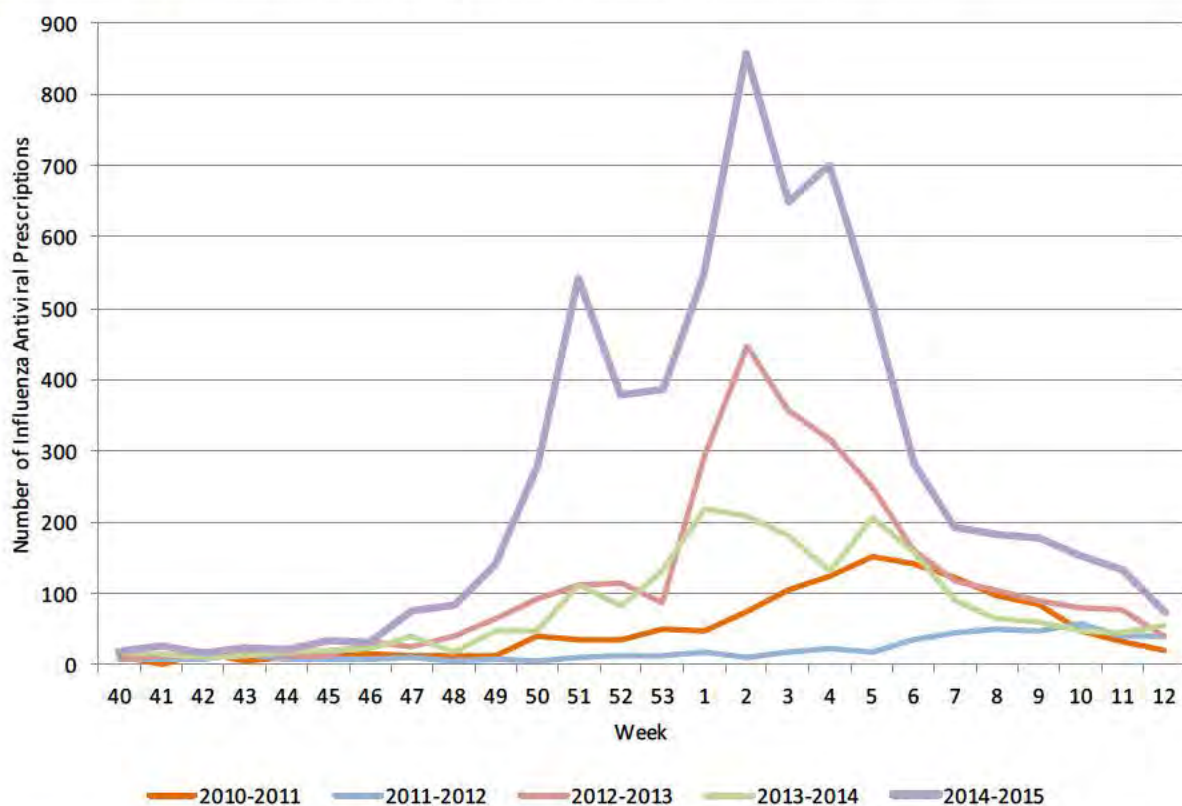


Pharmacy

Overall

Among DON beneficiaries, influenza-specific AV prescriptions exceeded historical trends and exhibited multiple peaks during the 2014-2015 season (Figure 9). The volume of prescriptions remained elevated for a longer period of time, consistently measuring at least twice the baseline from Week 47 through Week 11, and reaching a high point of 857 prescriptions during Week 2 (Figure 10). Throughout the season, the average number of influenza-specific AV medications (250.6) was approximately three times the baseline average (81.6).

Figure 9. Frequency of Influenza Antiviral Prescriptions Dispensed to DON Beneficiaries, 2010-2015

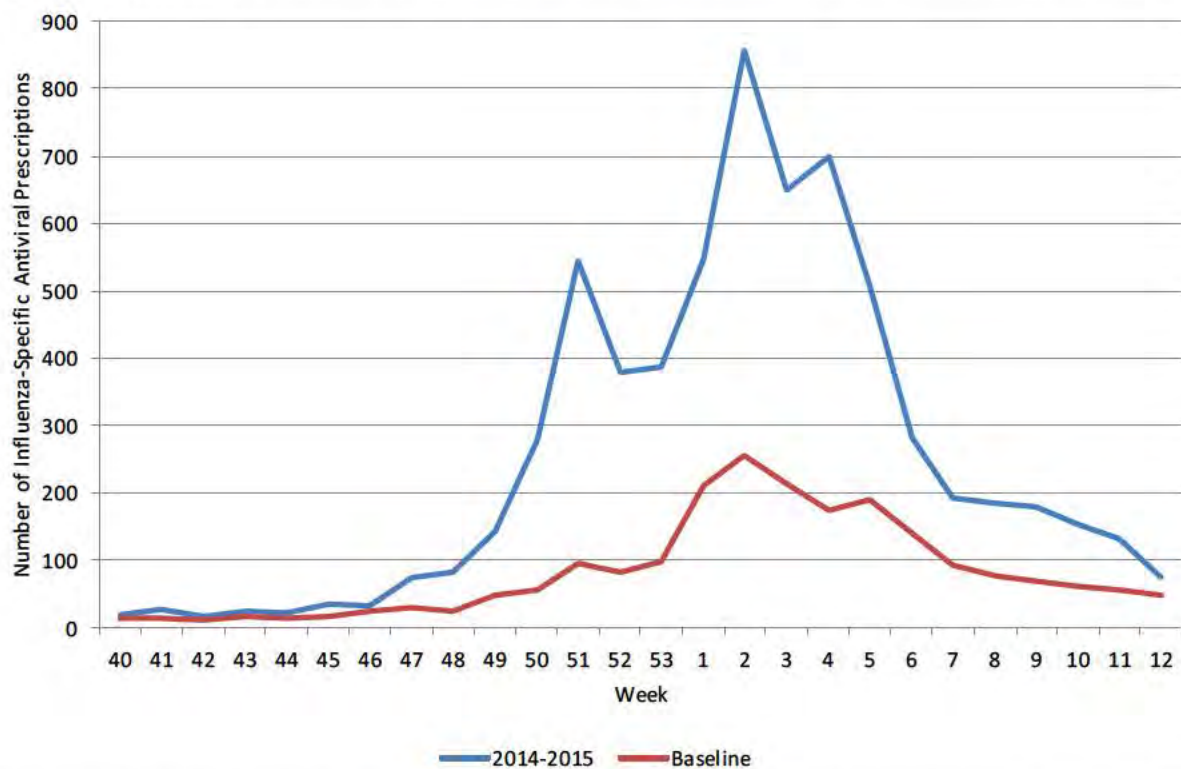


Datasource: HL7-formatted CHCS pharmacy

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015



Figure 10. Frequency of Influenza Antiviral Prescriptions Dispensed to DON Beneficiaries in Comparison with Seasonal Baseline, 2014-2015 Season



Baseline calculated as the weighted average of the number of influenza specific antiviral prescriptions in 2011-2012, 2012-2013 and 2013-2014 influenza seasons.

Datasource: HL7-formatted CHCS pharmacy

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015



A total of 6,515 influenza antivirals were prescribed to DON beneficiaries during the 2014-2015 influenza season; 99.6% of these antivirals represent beneficiaries who had only one prescription during the season (n=6,488). Of the five drugs of interest, oseltamivir was prescribed most frequently in both the inpatient and ambulatory settings; just 25 amantadine prescriptions and one zanamivir prescription were dispensed (Table 5). There were no rimantadine or peramivir prescriptions dispensed, and no intravenous influenza-specific antivirals were identified for DON beneficiaries.

Table 5. Influenza Antiviral Prescriptions Dispensed to DON Beneficiaries by Facility Setting, 2014-2015 Season

Antiviral	Ambulatory (%)	Inpatient (%)	Total (%)
Amantadine	11 (0.2%)	14 (4.0%)	25 (0.4%)
Oseltamivir	6,153 (99.8%)	336 (96.0%)	6,489 (99.6%)
Zanamivir	1 (<0.1%)	0 (0%)	1 (<0.1%)
Total	6,165	350	6,515

Datasource: HL7-formatted CHCS pharmacy

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015



The most antivirals were distributed to children (38.0%), followed by spouses (27.2%), and active duty personnel (16.8%). Within the two age groups representing children, 22.6% were five to 17 years, and 13.3% were ages four and under. (Table 6)

Table 6. Influenza Antiviral Prescriptions Dispensed to DON Beneficiaries by Gender, Age Group, and Beneficiary Category, 2014-2015 Season

	Frequency (%)
Total	6,515 (100%)
Gender	
Male	3,132 (48.1%)
Female	3,383 (51.9%)
Age Group	
0 - 4	866 (13.3%)
5 - 17	1,469 (22.6%)
18 - 44	2,425 (37.2%)
45+	1,755 (26.9%)
Beneficiary Category	
Active Duty	1,092 (16.8%)
Recruit	195 (3.0%)
Spouse	1,769 (27.2%)
Child	2,475 (38.0%)
Other: Sponsor	977 (15.0%)
Other: Non-Sponsor	7 (0.1%)

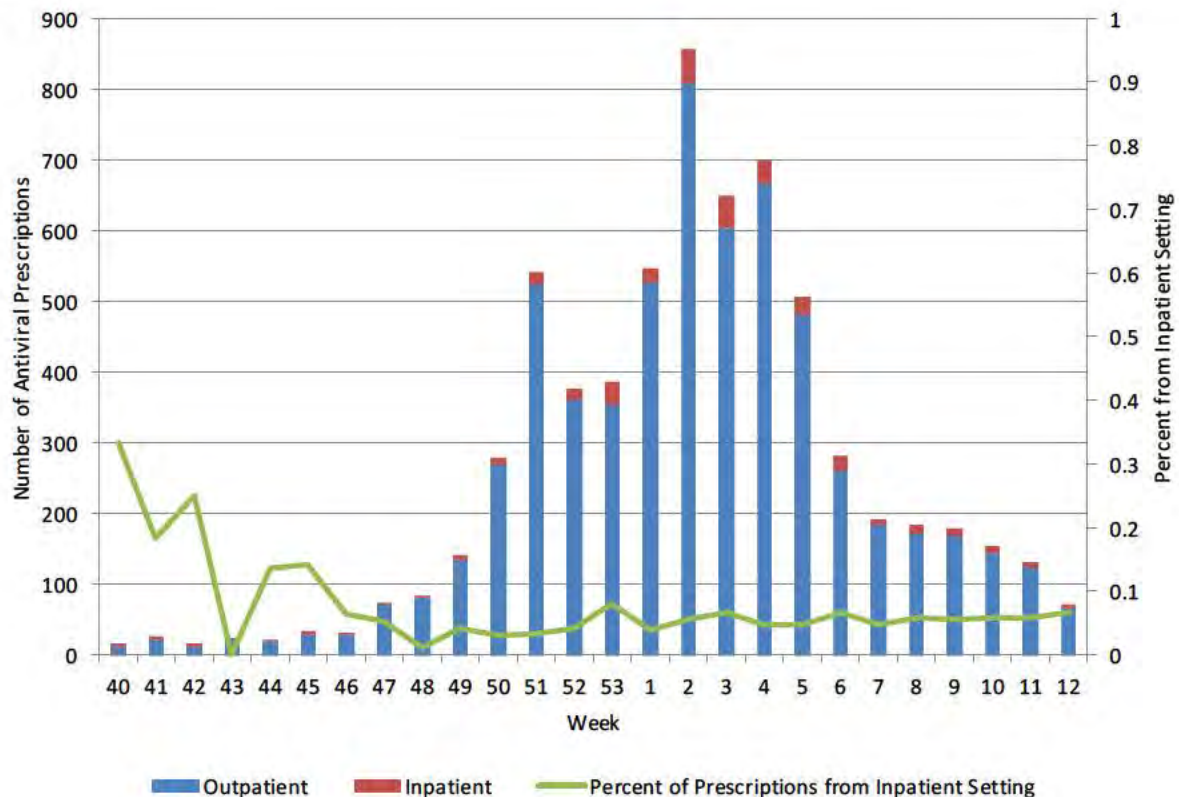
Datasource: HL7-formatted CHCS pharmacy

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015



Approximately five percent of the influenza antivirals were prescribed from an inpatient setting. Although the number of inpatient prescriptions increased during the peak season, they remained relatively proportional to the overall number of antivirals prescribed to DON beneficiaries during this time; a larger proportion of inpatient prescriptions were identified earlier in the season, where over 30% of the total antivirals were prescribed from an inpatient setting (Figure 11).

Figure 11. Frequency of Influenza Antiviral Prescriptions and Percent Dispensed in an Inpatient Setting to DON Beneficiaries, 2014-2015



Datasource: HL7-formatted CHCS pharmacy

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015



Naval Medical Center (NMC) San Diego had the largest number of influenza specific antivirals dispensed during the 2014-2015 season, followed by NH Camp Pendleton and NH Pensacola. By service, NMC San Diego (19.6%) and NH Camp Pendleton (18.9%) had the greatest frequency of antivirals dispensed to Navy and Marine Corps beneficiaries, respectively. There were 247 AV transactions (3.8%) in OCONUS; NH Yokosuka (n=77), Naval Branch Health Clinic Atsugi (n=50) and NH Okinawa (n=42) had the highest number of cases.

Table 7. Top Three DON Facilities with the Highest Frequency of Influenza Specific Antivirals by Service, 2014-2015 Season

Service	Facility	Frequency (%)
Navy (n=4,709)	NMC San Diego	923 (19.6)
	NH Jacksonville	368 (7.8)
	NH Pensacola	353 (7.5)
Marine Corps (n=1,806)	NH Camp Pendleton	342 (18.9)
	NH Beaufort	285 (15.8)
	NH Camp Lejeune	219 (12.1)
Overall (n=6,515)	NMC San Diego	1,012 (15.5)
	NH Camp Pendleton	512 (7.9)
	NH Pensacola	403 (6.2)

Datasources: HL7-formatted CHCS pharmacy

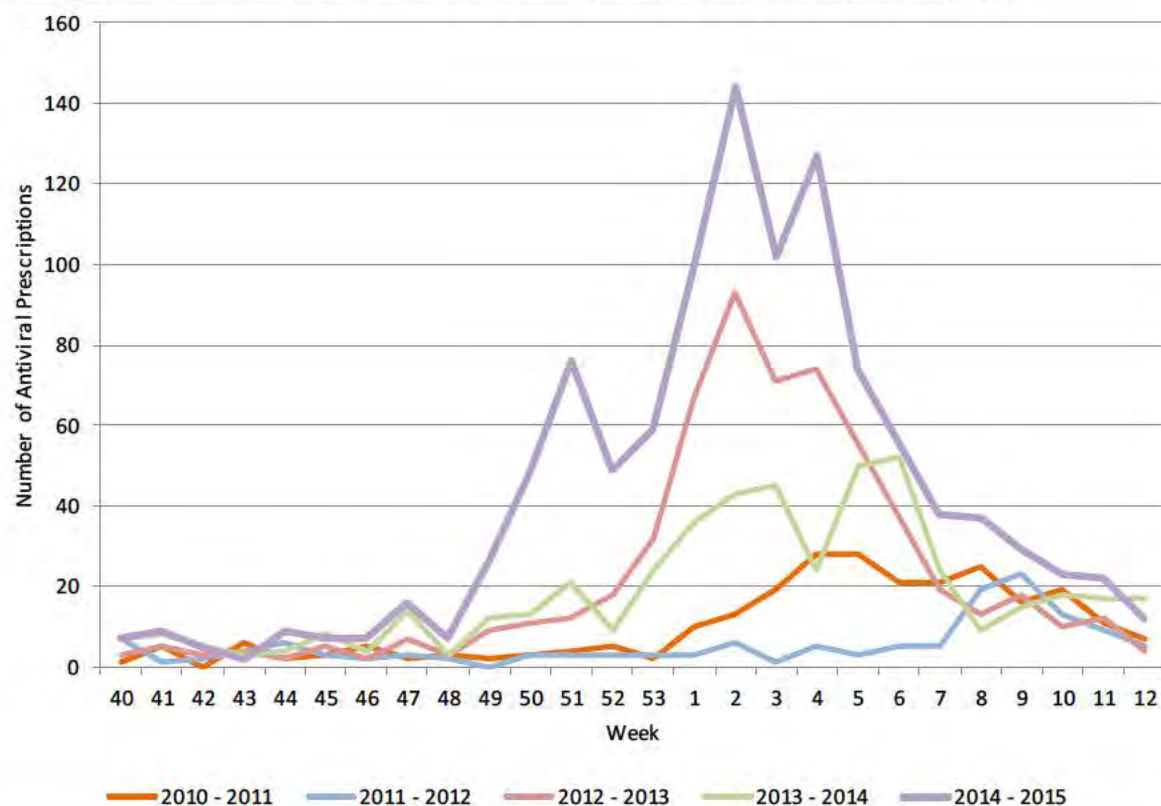
Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015



Active Duty and Recruits

The frequency of influenza AV prescriptions dispensed to DON active duty personnel was higher this season than the past four seasons; in total, 1,092 prescriptions were dispensed to active duty personnel during 2014-2015, as compared to 485 prescriptions in the previous season. The weekly trends among active duty personnel mirror those of all DON beneficiaries, exhibiting three distinct peaks and reaching a high point of 144 prescriptions during Week 2 (Figure 12).

Figure 12. Frequency of Influenza Antiviral Prescriptions Dispensed to DON Active Duty Personnel, 2010-2015



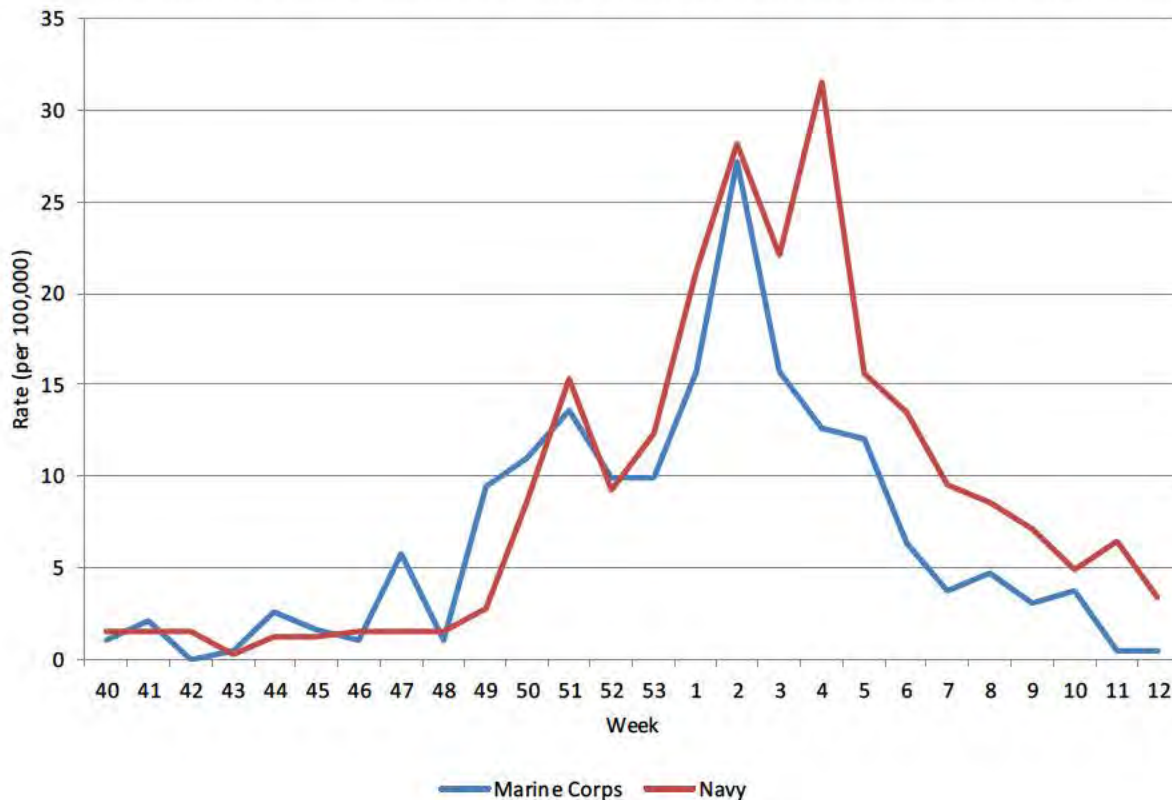
Datasource: HL7-formatted CHCS pharmacy

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015



Influenza AV prescription rates for active duty Sailors and Marines were comparable throughout the season, reaching maximum rates of 31.6 and 27.2 per 100,000 personnel, respectively. However, active duty Sailor rates exhibited an extended peak during Week 4 that was not observed among Marines (Figure 13).

Figure 13. Influenza Antiviral Prescription Rates (per 100,000) by Service, DON Active Duty Personnel, 2014-2015 Season



Datasource: HL7-formatted CHCS pharmacy

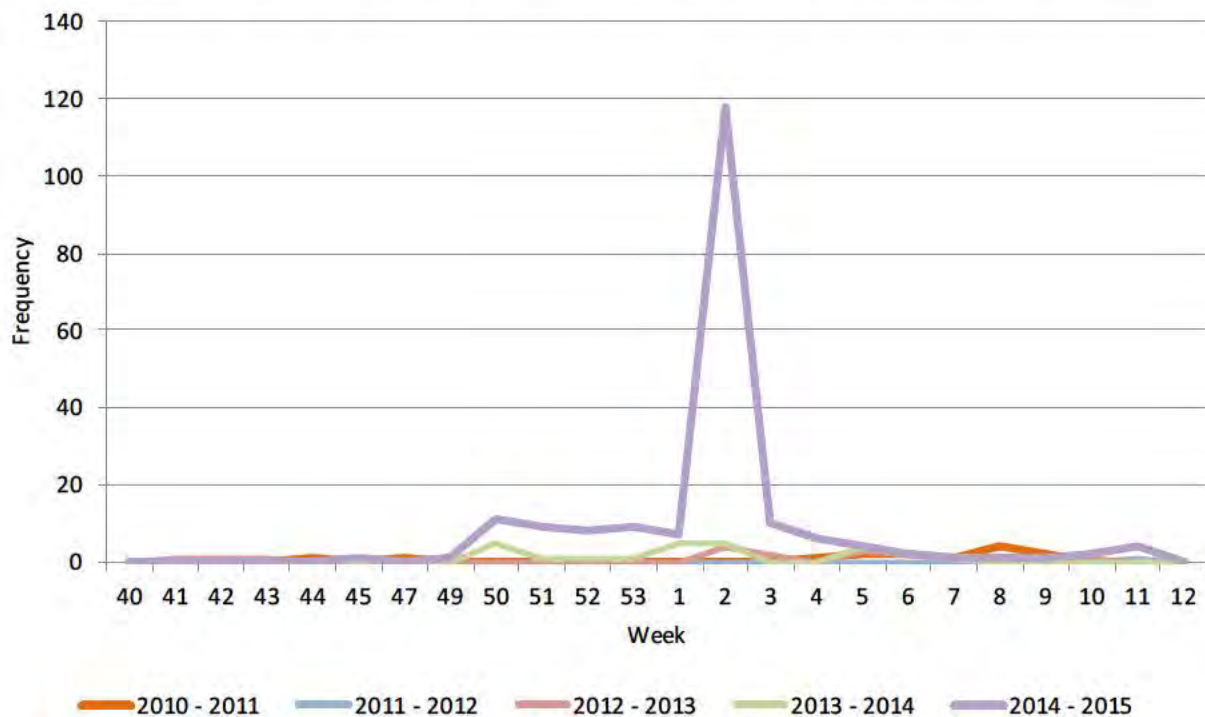
Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015

Of the 1,092 DON active duty personnel who were prescribed an AV for influenza, 914 (83.7%) had a record of an influenza vaccination more than 14 days before their influenza antiviral was prescribed, indicating they had sufficient time to develop an immune response; 86 (7.9%) had a record of influenza vaccine after or within 14 days of their antiviral prescription, and 92 (8.4%) had no record of seasonal influenza vaccination. Among the 914 patients who received an antiviral for influenza after sufficient time to develop an immune response from the vaccine, the majority of vaccinations were injection (n=522) followed by intranasal (n=356). Smaller numbers of individuals had records indicating they were vaccinated with both the injection and intranasal vaccine (n=26), which may be due to coding errors, and ten individuals had an unspecified formulation (data not shown).



The frequency of influenza AV prescriptions dispensed to DON recruits was higher this season than the past four seasons; in total, 195 prescriptions were dispensed to recruits during 2014-2015, as compared to 25 prescriptions in the previous season (Figure 14). The observed increase was largely due to the peak in AV prescriptions dispensed to Marine Corps recruits during Week 2. Of the 118 prescriptions dispensed during this week, 111 (94.1%) were dispensed to Marine Corps recruits at NH Beaufort. Anecdotal reports from public health personnel at Camp Lejeune indicated one laboratory positive case was identified at the training center, and antivirals were provided in response as preventive prophylaxis.

Figure 14. Frequency of Influenza Antiviral Prescriptions Dispensed to DON Recruits, 2010 - 2015 Seasons



Datasource: HL7-formatted CHCS pharmacy

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015

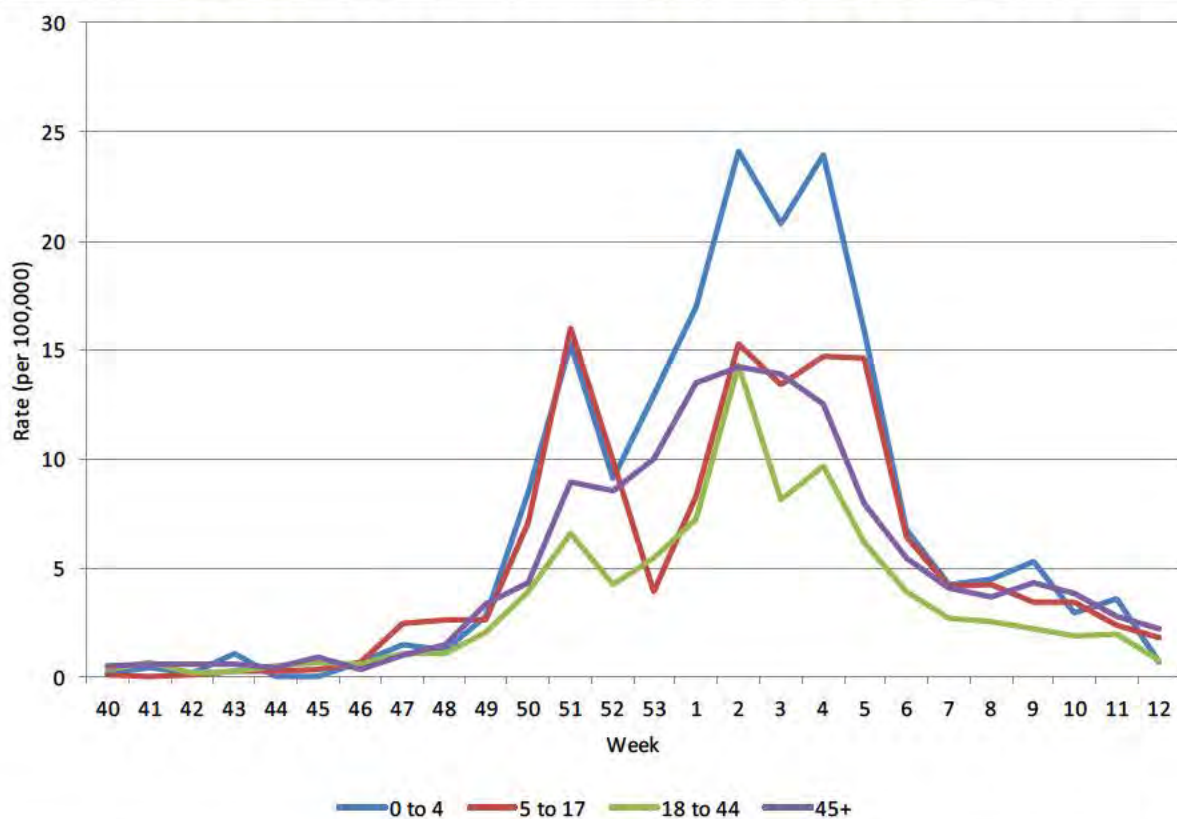
Over half of the recruits prescribed an influenza antiviral received a vaccination less than 14 days within the pharmacy transaction date (n=120; 61.5%). Approximately one-third of recruits received the vaccine before the 14 day window required for immunity (n=67; 34.4%), and only eight recruits had no vaccination record. Among the 67 recruits who acquired immunity status before the antiviral prescription transaction date, 66% (n=44) received an injection and 34% (n=23) received an intranasal vaccine.



Children and Other Age Groups

Rates of influenza AV prescriptions among DON beneficiaries were highest among children under the age of five years, peaking in Weeks 2 and 4 at approximately 24 prescriptions per 100,000 children. Rates among children ages five to 17 were similar during the early portion of the season, subsequently declining and then increasing during Week 1. The older age group never reached the high rates displayed among children under five. Beneficiaries ages 45 years and above exhibited a more gradual increase in influenza AV prescription rates throughout the season and did not exceed weekly rates displayed by children (Figure 15).

Figure 15. Influenza Antiviral Prescriptions Rates (per 100,000) by Age Group, DON Beneficiaries, 2014-2015 Season



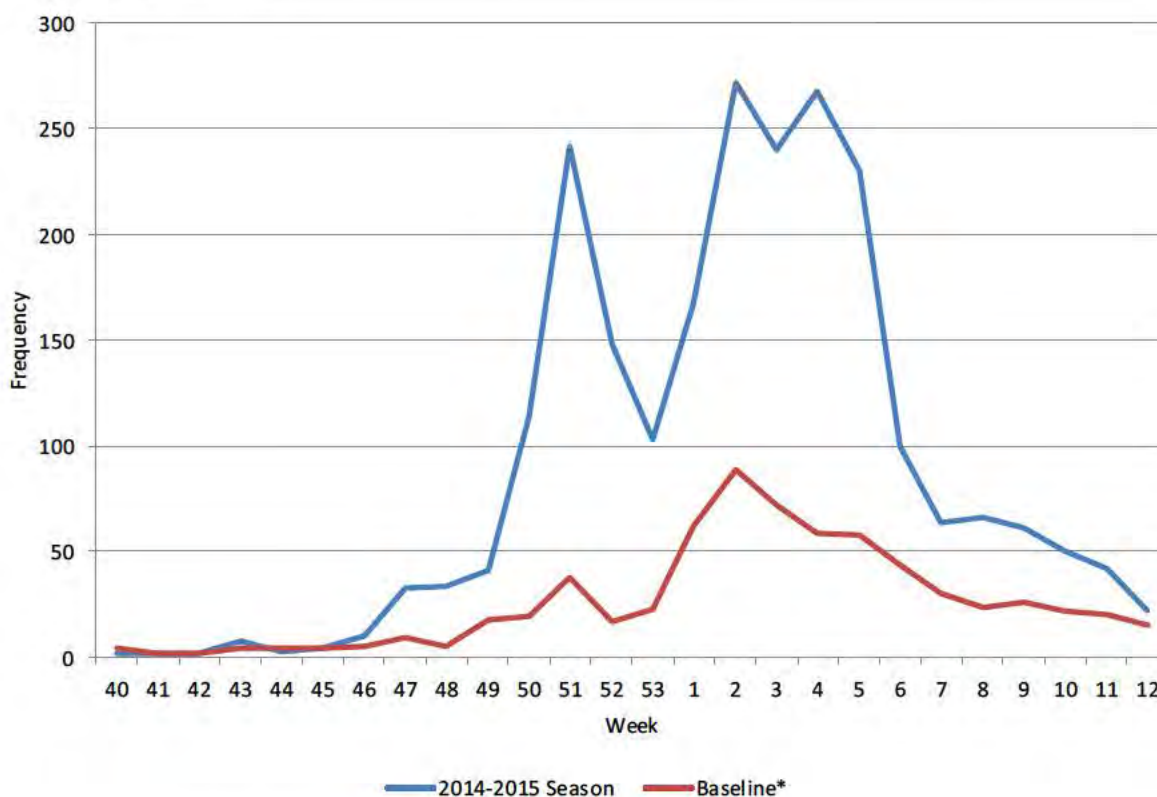
Datasource: HL7-formatted CHCS pharmacy

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015



The overall number of AV prescriptions dispensed to children (under the age of 18) far exceeded historical trends, remaining above the baseline after Week 45 throughout the season. The maximum weekly number of AV prescriptions (n=272) dispensed to children during Week 2 measured approximately three times the seasonal baseline (Figure 16).

Figure 16. Frequency of Influenza Antiviral Prescriptions Dispensed to Children in Comparison with Seasonal Baseline, 2014-2015 Season



*Weighted average of 2011-2012, 2012-2013, 2013-2014 seasons.

Children include dependents of active duty personnel under the age of 18.

Datasource: HL7-formatted CHCS pharmacy

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015



Inpatient Comorbidities

Among the 350 cases receiving influenza AV prescriptions in an inpatient setting during the 2014-2015 season, 301 (86.0%) had a matching inpatient clinical record, where the pharmacy transaction date occurred between the admission date and discharge date. The mean duration between admission and discharge for patients with inpatient prescriptions measured four days, with a maximum duration of 77 days. Records were classified using broad ICD-9-CM categories in Table 8 below. Almost 90% of patients with a matching inpatient record had an ICD-9-CM diagnosis for respiratory disease.

Table 8. Inpatient Comorbidities among Cases Receiving Influenza Antiviral Prescriptions, 2014-2015 Season (N=301)

ICD-9-CM Category	Frequency
Diseases of the respiratory system	265 (88.0%)
Endocrine, nutritional and metabolic diseases and immunity disorders	168 (55.8%)
V-Codes (supplementary classification of factors influencing health status)	169 (56.2%)
Diseases of the circulatory system	154 (51.2%)
Symptoms, signs and ill-defined conditions	122 (40.5%)
Diseases of the genitourinary system	94 (31.2%)
Diseases of the nervous system and sense organs	88 (29.2%)
Diseases of the digestive system	76 (25.3%)
Disease of blood and blood-forming organs	72 (23.9%)
Mental disorders	69 (22.9%)
Infectious and parasitic diseases	67 (22.3%)
Diseases of the musculoskeletal system and connective tissue	54 (17.9%)
Injury and poisoning	45 (15.0%)
Complications of pregnancy, childbirth and puerperium	21 (7.0%)
Neoplasms	20 (6.6%)
E-codes (external causes of injury)	20 (6.6%)
Diseases of the skin and subcutaneous tissue	17 (5.7%)
Congenital anomalies	9 (3.0%)
Certain conditions originating in the perinatal period	0 (0.0%)

Note: cases may be classified within more than one ICD-9-CM category.

Datasources: Standard Inpatient Data Record (SIDR)

Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015



All but one case receiving an AV prescription in an inpatient setting (n=349, 99.7%) had a matching ambulatory encounter record within 14 days of the pharmacy transaction date. Similar to inpatient ICD-9-CM code results, the largest frequency of diagnoses included diseases of the respiratory system, where 89.1% of cases with a matching ambulatory record included an ICD-9-CM code within this disease category (Table 9).

Table 9. Ambulatory Comorbidities among Cases Receiving Influenza Antiviral Prescriptions, 2014-2015 Season (N=349)

ICD-9-CM Category	Frequency
Diseases of the respiratory system	311 (89.1%)
V-Codes (supplementary classification of factors influencing health status)	306 (87.7%)
Symptoms, signs and ill-defined conditions	272 (77.9%)
Endocrine, nutritional and metabolic diseases and immunity disorders	187 (53.6%)
Diseases of the circulatory system	168 (48.1%)
Diseases of the musculoskeletal system and connective tissue	121 (34.7%)
Diseases of the genitourinary system	105 (30.1%)
Diseases of the nervous system and sense organs	99 (28.4%)
Infectious and parasitic diseases	86 (24.6%)
Disease of blood and blood-forming organs	81 (23.2%)
Diseases of the digestive system	72 (20.6%)
Injury and poisoning	70 (20.1%)
Mental disorders	68 (19.5%)
Neoplasms	36 (10.3%)
Complications of pregnancy, childbirth and puerperium	36 (10.3%)
Diseases of the skin and subcutaneous tissue	34 (9.7%)
Congenital anomalies	13 (3.7%)
E-codes (external causes of injury)	12 (3.4%)
Certain conditions originating in the perinatal period	6 (1.7%)

Note: cases may be classified within more than one ICD-9-CM category.

Datasources: Comprehensive Ambulatory Data Record (CAPER)

Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015



Inpatient Cases with Antiviral Prescriptions

Of the 115 DON beneficiaries that were laboratory positive for influenza in the inpatient setting, 88 (76.5%) had pharmacy records that indicated prescriptions for AV treatment. All inpatient cases were prescribed oseltamivir. A large majority of cases had an AV prescription dispensed on the same day as the laboratory specimen was collected (n=56; 63.6%); the difference between the collection date and pharmacy transaction date ranged from two days before to 42 days after. Table 10 compares the inpatient cases receiving AV medication to those who did not; the largest proportion of those receiving an AV prescription were above 45 years (59.1%).

Table 10. Demographic Characteristics of DON Laboratory Positive Inpatient Cases by Antiviral Treatment Status, 2014-2015 Season

	Dispensed Antiviral Prescription (%)	No Antiviral Prescription (%)
Gender		
Male	47 (53.4)	13 (48.1)
Female	41 (46.6)	14 (51.9)
Age Group		
0-4	10 (11.4)	3 (11.1)
5-17	5 (5.7)	3 (11.1)
18-44	21 (23.9)	8 (29.6)
45+	52 (59.1)	13 (48.1)
Beneficiary Category		
Active Duty	4 (4.5)	2 (7.4)
Recruit	3 (3.4)	1 (3.7)
Spouse	34 (38.6)	12 (44.4)
Child	16 (18.2)	7 (25.9)
Other: Sponsor	31 (35.2)	5 (18.5)
Total	88 (100)	27 (100)
Datasource: HL7-formatted CHCS microbiology, chemistry and pharmacy		
Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015		



Rapid Test Results with Antiviral Prescriptions

There were 13,540 unique rapid laboratory specimens, of which 2,277 (16.8%) had an AV prescribed within 14 days of the specimen collection date. Among the DON beneficiaries dispensed an influenza-specific AV, approximately two-thirds (66.8%) had a positive rapid test (Table 11).

Table 11. DON Rapid Influenza Specimen Results by Influenza Antiviral Treatment Status, 2014-2015 Season

Rapid Test Result	Rapid Tests w/Antivirals (%)	Rapid Tests w/o Antivirals (%)
Negative	755 (33.2%)	10,153 (90.1%)
Positive	1,522 (66.8%)	1,110 (9.9%)
Total	2,277	11,263

Datasources: HL7-formatted CHCS microbiology, chemistry and pharmacy

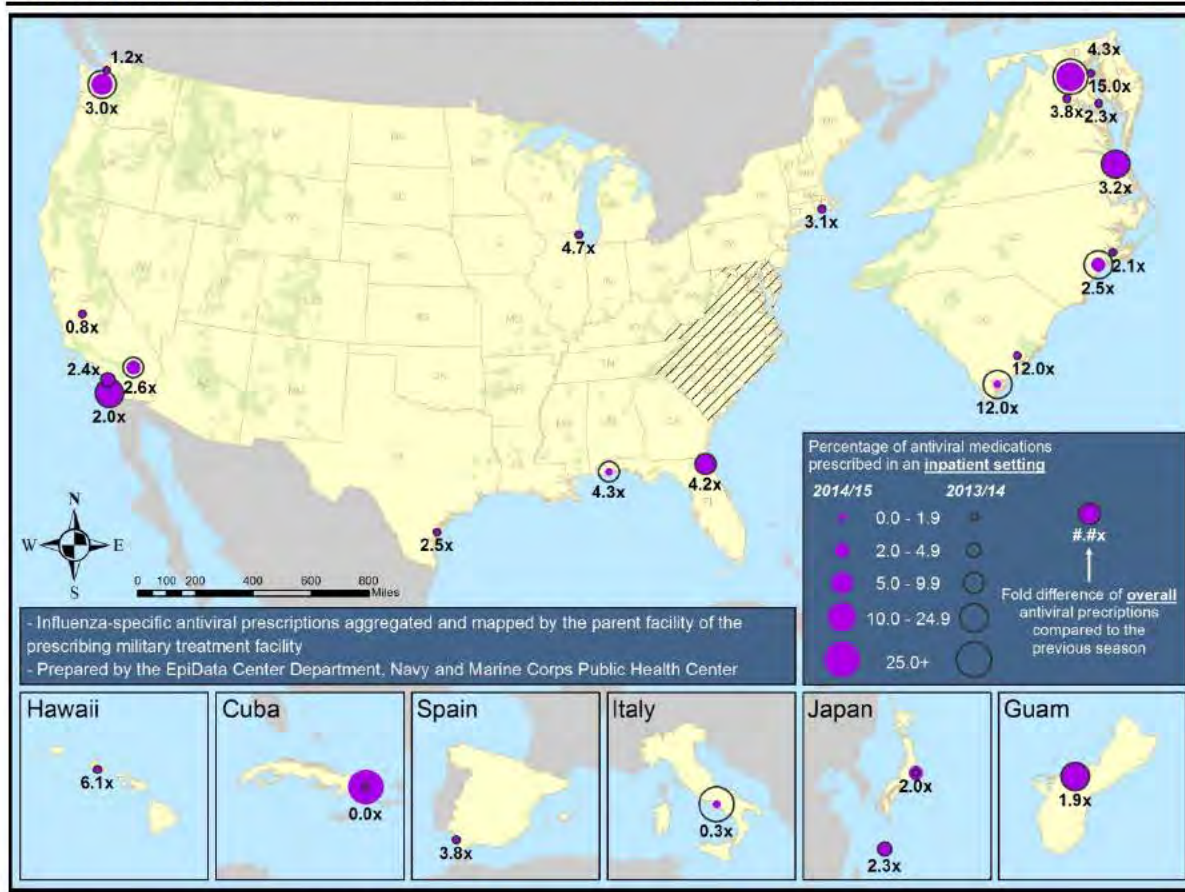
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center



Geographical Distribution

The overall volume of AV prescriptions increased substantially compared to the previous season at some Navy parent MTFs with notable increases in the mid-Atlantic region. Despite an overall increase in AV prescriptions, the proportion of influenza-specific AV prescribed in an inpatient setting was largely comparable or reduced when compared to the previous influenza season. MTFs in North Carolina and South Carolina had especially low percentages of inpatient AV prescriptions.

Figure 17. Influenza-Specific Antiviral Prescriptions by Parent Facility Compared to the Previous Season, DON Beneficiaries at DON Facilities & Walter Reed National Military Medical Center, 2014-2015 Season



Datasource: HL7-formatted CHCS pharmacy

Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015.



Pharmacy and Laboratory Database Alignment

For the purposes of evaluating alignment between laboratory and pharmacy data sources, the following results define an influenza case by the identification of a laboratory positive specimen or receipt of an influenza-specific AV. During the 2014-2015 influenza season, there were 8,259 influenza cases identified from the pharmacy and/or laboratory databases. On average, over the past five seasons, 19.0% of all cases were identified in both the laboratory and pharmacy databases. During the 2014-2015 influenza season, the alignment between both sources was higher than average, but still remains below one-quarter of all cases (Table 12). The volume of cases detected by each source was substantially higher than the past five influenza seasons, with the overall case count being almost double the previous highest season (2012-2013).

Table 12. Record Source for DON Influenza Cases by Season, 2010-2015

Season	Record Source			Total
	Pharmacy Only (%)	Laboratory Only (%)	Both (%)	
2010-2011	1,066 (53.7)	654 (33.0)	264 (13.3)	1,984
2011-2012	437 (53.9)	279 (34.4)	95 (11.7)	811
2012-2013	2,345 (56.4)	1,184 (28.5)	629 (15.1)	4,158
2013-2014	1,613 (57.1)	760 (26.9)	451 (16.0)	2,824
2014-2015	4,527 (54.8)	1,749 (21.2)	1,983 (24.0)	8,259

Datasources: HL7-formatted CHCS microbiology, chemistry, and pharmacy

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015

Table 13 shows the burden of cases from each source over the past five years, and can be used to assess the contribution of pharmacy and laboratory data to seasonal influenza surveillance. This season, more than half of all laboratory cases were also captured by pharmacy surveillance, while one one-third of pharmacy cases were also captured by laboratory surveillance. These results indicate that single-source surveillance efforts would not identify 4,527 pharmacy cases or 1,749 laboratory cases during the 2014-2015 influenza season.

Table 13. Burden of DON Influenza Cases by Source and Season, 2010-2015

Season	Pharmacy		Laboratory		Combined Influenza Case Count
	Case Count	Cases Matching Laboratory (%)	Case Count	Cases Matching Pharmacy (%)	
2010-2011	1,330	264 (19.8)	918	264 (28.8)	1,984
2011-2012	532	95 (17.9)	374	95 (25.4)	811
2012-2013	2,974	629 (21.1)	1,813	629 (34.7)	4,158
2013-2014	2,064	451 (21.9)	1,211	451 (37.2)	2,824
2014-2015	6,510	1,983 (30.5)	3,732	1,983 (53.1)	8,259

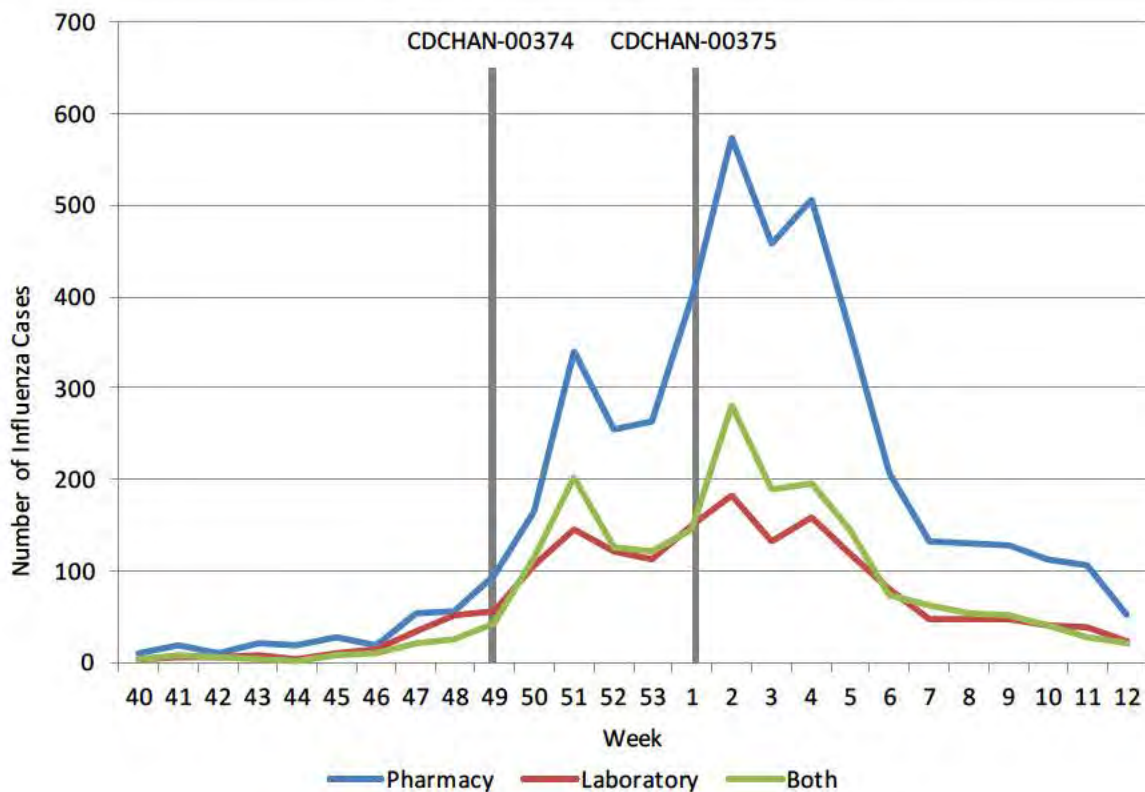
Datasources: HL7-formatted CHCS microbiology, chemistry, and pharmacy

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015



In general, weekly trends of influenza cases were similar across each of the three data sources. This season, CDC-HANs (Health Alert Network) were released during Weeks 49 and 1 reminding providers about the benefits of AV treatment.^{9,10} Shortly after each CDC-HAN was released, there was a peak observed in influenza activity. To compare influenza activity within each surveillance source before and after these alerts, the week before each HAN (Week 48 and 53) was compared to the following peak week (Week 51 and 2, respectively). In the period before the first alert to the following peak (Week 48 to 51), the number of influenza cases from both sources and from pharmacy only increased more rapidly (7.8 and 6.0 times, respectively) than cases from laboratory only (2.8 times). During the week before the second CDC-HAN to the following peak (Week 53 to 2), the frequency of cases increased in relative proportion for those within both databases (2.3 times more), pharmacy (2.2 times more), and laboratory (1.6 times more).

Figure 18. DON Influenza Cases by Data Source, with Timing of CDC-HAN* Alerts, 2014-2015 Season



* CDC Health Alert Network

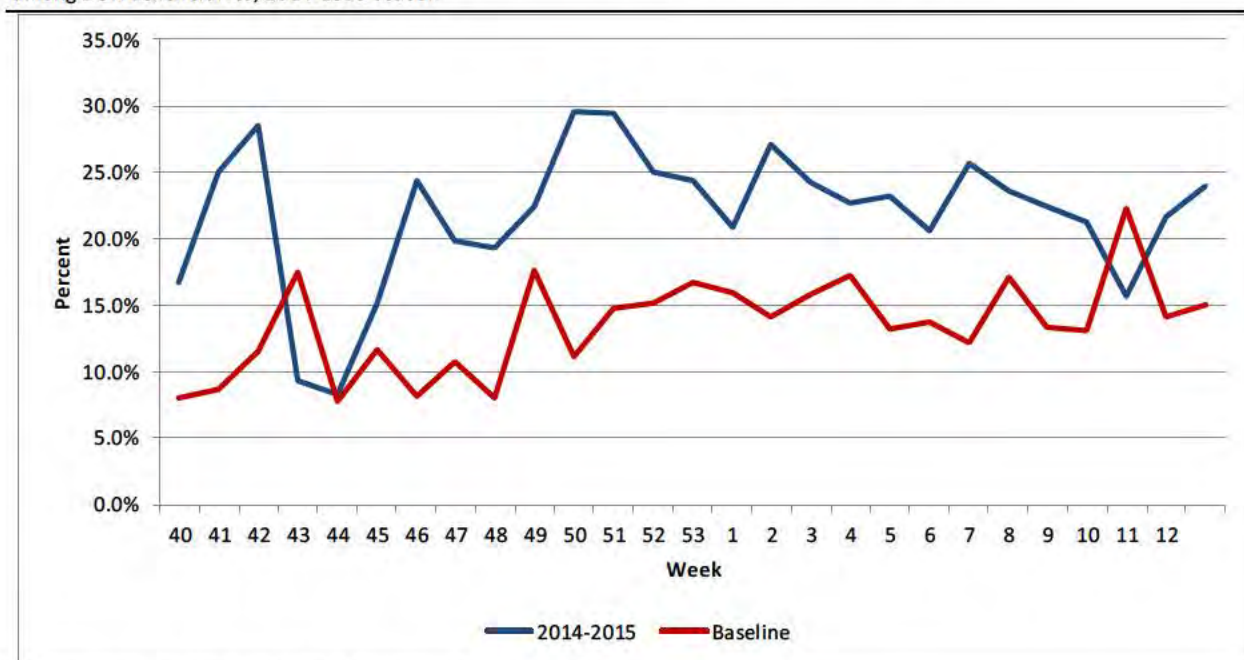
Datasources: HL7-formatted CHCS microbiology, chemistry, and pharmacy

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015



The proportion of cases from both sources was above baseline for all but two weeks during the influenza season (Week 43 and Week 11) (Figure 19). This is consistent with a better overall alignment of pharmacy and laboratory data during the 2014-2015 influenza season.

Figure 19 Proportion of DON Influenza Cases Identified in Both Laboratory and Pharmacy Data Sources among DON Beneficiaries, 2014-2015 Season



Datasources: HL7-formatted CHCS chemistry and microbiology

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015



Demographic characteristics of patients by record source are presented in Table 14. There were slightly more females with AV pharmacy prescriptions only, while all other groups had slightly more male patients. Patients with AV pharmacy prescriptions only were more likely to be older than patients in other record sources. Fewer children received AV pharmacy prescriptions only, while fewer spouses were only laboratory positive. The proportion of active duty and recruit patients was similar across the three source groups. The distribution of service was similar across all record groups. More inpatient cases had both a positive laboratory test and an AV pharmacy prescription than either source alone.

Table 14. Demographic Characteristics of DON Influenza Patients by Record Source, 2013-2014 Season

	Record Source			
	Pharmacy Only (%)	Laboratory Only (%)	Both (%)	Total (%)
Gender				
Male	2,255 (46.8)	919 (52.5)	999 (50.4)	4,173 (48.8)
Female	2,567 (53.2)	830 (47.5)	985 (49.7)	4,382 (51.2)
Age Group				
0-4	629 (13.0)	296 (16.9)	254 (12.8)	1,179 (13.8)
5-17	899 (18.6)	596 (34.1)	615 (31.0)	2,110 (24.7)
18-44	1,872 (38.8)	596 (34.1)	669 (33.7)	3,137 (36.7)
45+	1,422 (29.5)	261 (14.9)	446 (22.5)	2,129 (24.9)
Beneficiary Category				
Active Duty	877 (18.2)	317 (18.1)	272 (13.7)	1,466 (17.1)
Recruit	147 (3.1)	30 (1.7)	51 (2.6)	228 (2.7)
Spouse	1,422 (29.5)	312 (17.8)	454 (22.9)	2,188 (25.6)
Child	1,619 (33.6)	937 (53.6)	923 (46.5)	3,479 (40.7)
Other: Sponsor	753 (15.6)	151 (8.6)	280 (14.1)	1,184 (13.8)
Other: Non-Sponsor	4 (0.1)	2 (0.1)	4 (0.2)	10 (0.1)
Service				
Marine Corps	1,335 (27.7)	608 (34.8)	546 (27.5)	2,489 (29.1)
Navy	3,487 (72.3)	1,141 (65.2)	1438 (72.5)	6,066 (70.9)
Clinic Type				
Inpatient	154 (3.2)	23 (1.3)	203 (10.2)	380 (4.4)
Emergency Room	807 (16.7)	500 (28.6)	515 (26.0)	1,822 (21.3)
Other Ambulatory	3,861 (80.1)	1,226 (70.1)	1266 (63.8)	6,353 (74.3)

Datasources: HL7-formatted CHCS microbiology, chemistry, and pharmacy

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015

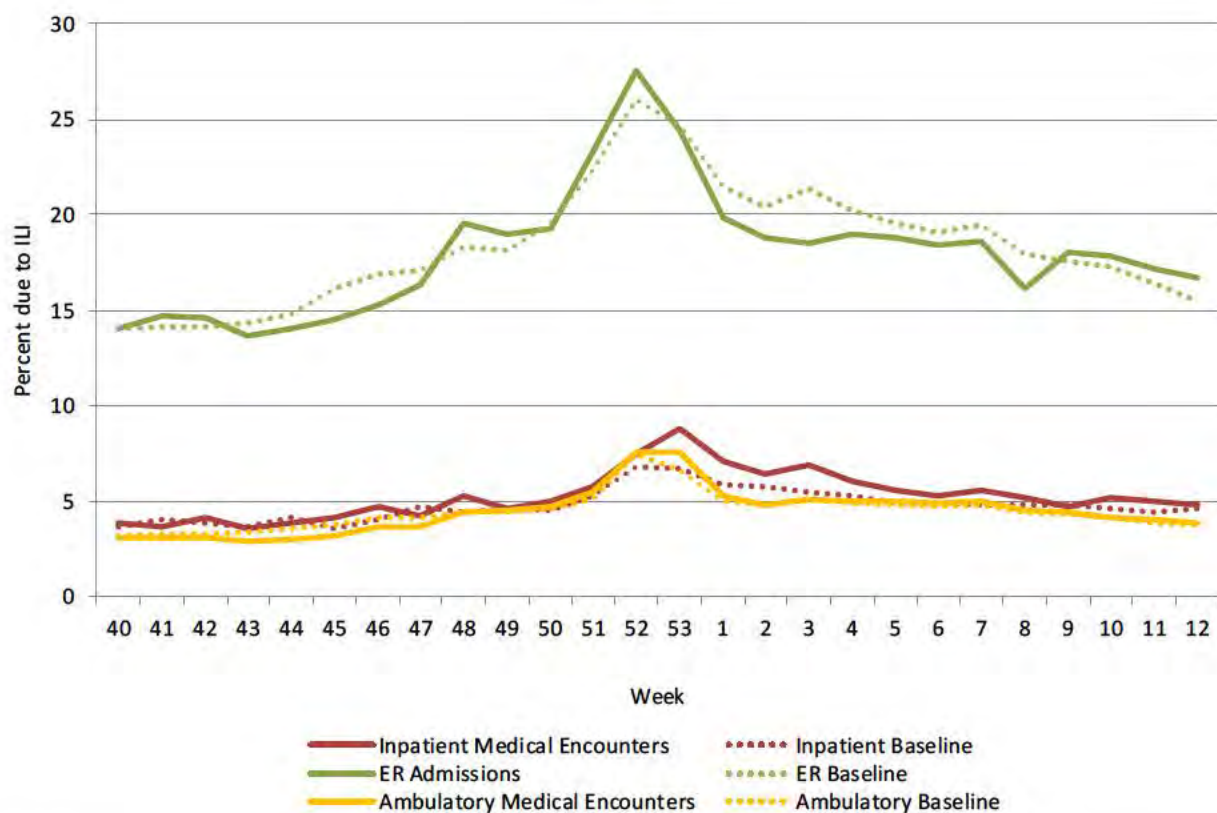


Encounter ILI Diagnosis Tracking

Overall

Among DON beneficiaries, the percentage of medical encounters and ER visits due to ILI followed expected trends, though slightly exceeding baseline values at some points, particularly during the peak of the season. Emergency room visits due to ILI ranged from approximately 14.0% to a high point of 27.6% during Week 52, thereafter declining. The overall percentage of inpatient and ambulatory medical encounters due to ILI remained far below those of ER visits, both peaking during Week 53 at 8.8% and 7.6%, respectively.

Figure 20. Medical Encounters and ER Visits due to Influenza-Like Illness (ILI) among DON Beneficiaries, 2014-2015 Influenza Season and Baseline Comparison



Ambulatory counts include emergency room and all other outpatient encounters.

Datasource: Comprehensive Ambulatory Professional Encounter Record (CAPER)

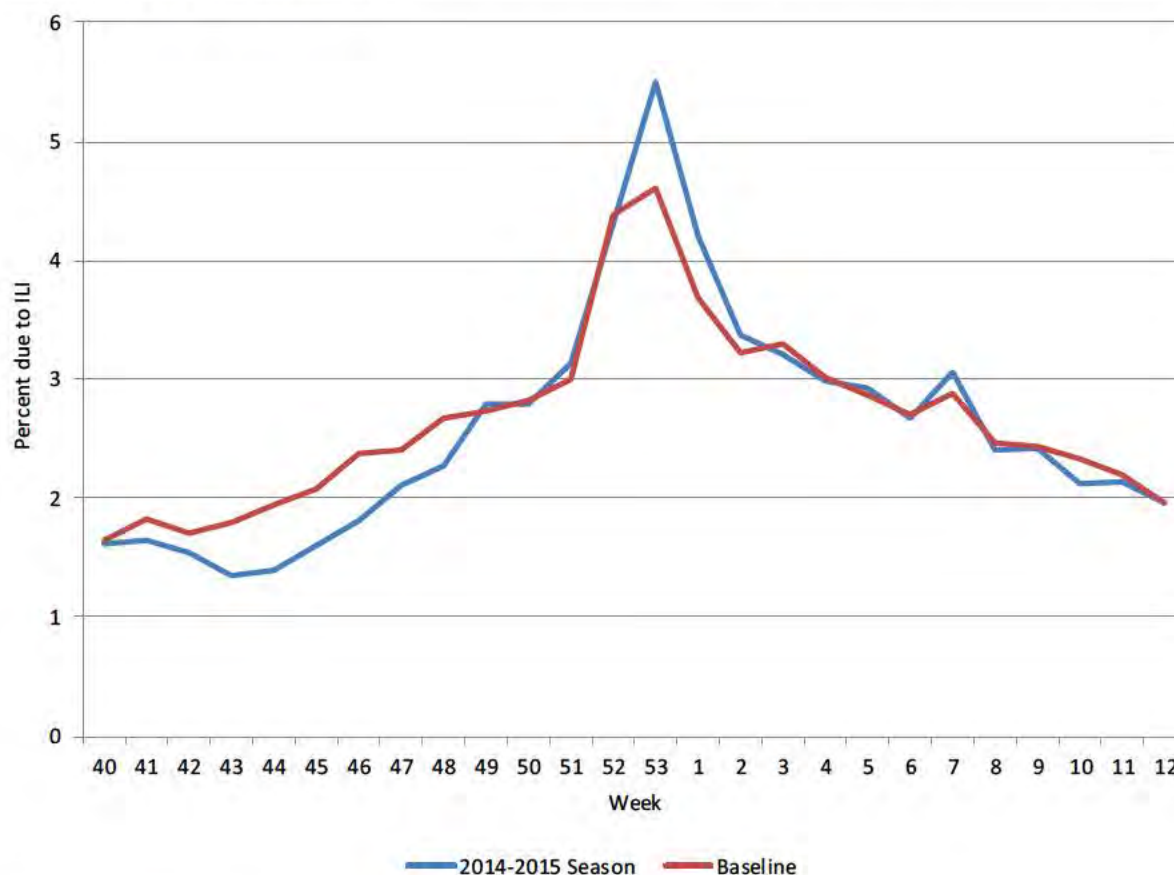
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Active Duty Navy

The percent of ambulatory encounters attributed to ILI among active duty Navy personnel peaked during Week 53 at 5.5%, exceeding the baseline high point of 4.6% (Figure 21). While these trends are comparable to those among all DON beneficiaries, the percent of ambulatory encounters due to ILI was lower for active duty personnel throughout the season; on average, 2.7% of encounters included an ILI ICD-9-CM diagnosis, as compared to 4.5% among all DON beneficiaries (data not shown).

Figure 21. Ambulatory Medical Encounters due to Influenza-Like Illness (ILI) among Active Duty Navy Personnel, 2014-2015 Influenza Season and Baseline Comparison



Datasource: Comprehensive Ambulatory Professional Encounter Record (CAPER)

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DRSi

There were 22 cases of influenza-associated hospitalization of DON beneficiaries reported to DRSi during the 2014-2015 influenza season. Among these, 21 (95.5%) were also identified through laboratory or pharmacy surveillance efforts, and 13 (59.1%) were identified in all three data sources. Influenza-associated hospitalizations were reported most frequently in Weeks 50 and 2 (four each). Walter Reed National Military Medical Center reported the highest number of influenza-associated hospitalizations (n=8).

During the 2014-2015 influenza season, there were 68 laboratory positive inpatient influenza cases under the age of 65 (51.1% of all inpatient laboratory cases), meeting the reportable case definition. Of these, 20 (29.4%) were reported to DRSi.

Table 15. Demographic Characteristics of DON Beneficiaries with DRSi Reported Influenza-Associated Hospitalizations, 2014-2015 Season

Gender	Frequency (%)
Male	11 (50.0)
Female	11 (50.0)
Age Group	
0-4	2 (9.1)
4-17	4 (18.2)
18-44	11 (50.0)
45+	5 (22.7)
Beneficiary Category	
Sponsor	8 (36.4)
Spouse	6 (27.3)
Child	8 (36.4)
Service	
Navy	14 (63.6)
Marine Corps	8 (36.4)

Datasource: Disease Reporting System-internet (DRSi)

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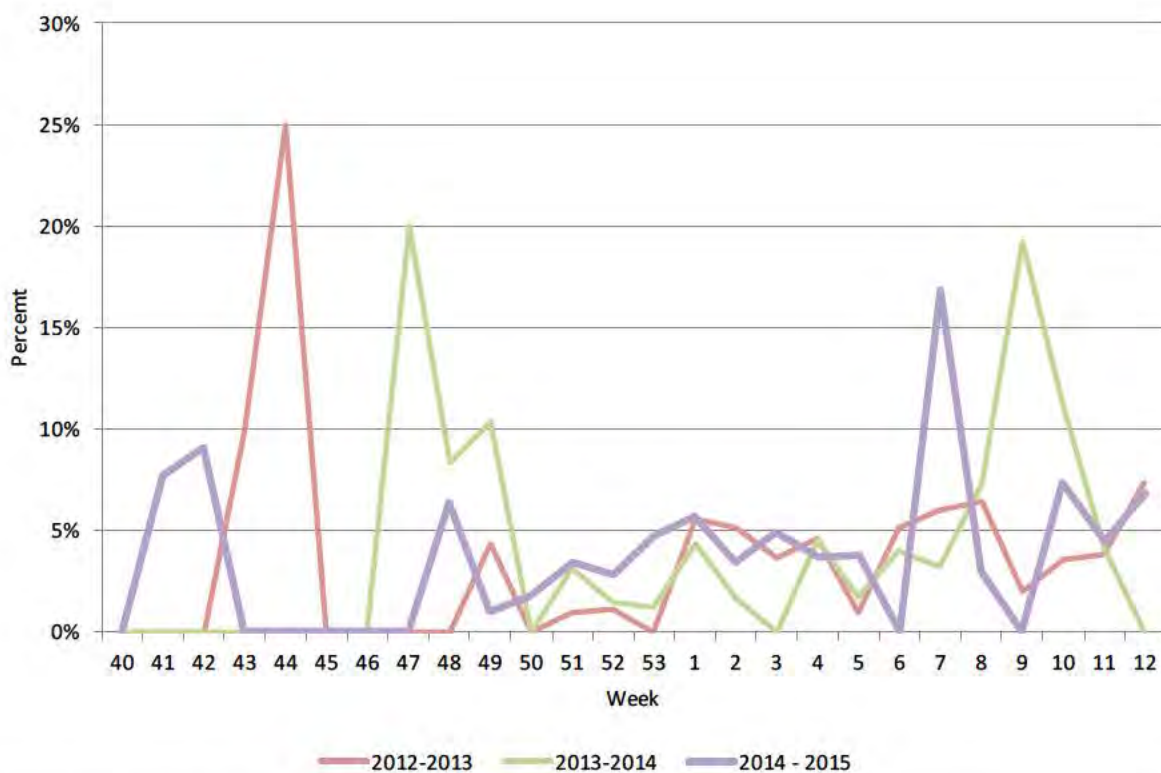


Coinfections

Microbiology Isolates

During the 2014-2015 season, 3.4% (n=147) of laboratory positive influenza cases had a bacterial coinfection, which is similar to the burden of coinfections identified in the 2013-2014 (3.3%) and 2012-2013 (3.5%) seasons. As shown in Figure 22, the proportion of coinfections among laboratory positive cases remained low, particularly during the weeks with the highest influenza activity. Larger variability was observed on the season begin and end weeks, likely due to the decreased frequencies of laboratory positive cases.

Figure 22. Percentage of Bacterial Coinfections among Laboratory-Identified Influenza Cases, DON Beneficiaries, 2012-2015 Influenza Seasons



Datasource: HL7-formatted CHCS laboratory

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015



The distribution of demographic characteristics varied between respiratory and non-respiratory infections. Children represent the highest percentage of upper respiratory infections, whereas adults ages 45 and above accounted for over two-thirds of lower respiratory infections. All but one upper respiratory infection was identified in an ambulatory setting. Lower respiratory infections were more evenly distributed between encounter types, where almost half were within an inpatient setting. Navy beneficiaries represent a larger frequency of coinfections compared to Marine Corps beneficiaries, consistent with the overall distribution of influenza cases by service. Few active duty and recruit Sailors and Marines were identified with coinfections; this distribution is also congruent among active duty and recruit personnel with influenza only (Table 16).

Table 16. Demographics among Laboratory-Identified Influenza Cases with Coinfections, DON Beneficiaries, 2014-2015 Influenza Season (n=147)

	Influenza Only (%)	Influenza with Bacterial Coinfection			Total (%)
		Non-Respiratory (%)	Upper Respiratory (%)	Lower Respiratory (%)	
Gender					
Male	1,867 (51.7)	29 (39.7)	29 (47.5)	4 (30.8%)	62 (42.2)
Female	1,744 (48.3)	44 (60.3)	32 (52.5)	9 (69.2)	85 (57.8)
Age					
0 - 4	540 (15.0)	9 (12.3)	4 (6.6)	2 (15.4)	15 (10.2)
5 - 17	1,175 (32.5)	6 (8.2)	30 (49.2)	0 (0)	36 (24.5)
18 - 44	1,222 (33.8)	24 (32.9)	25 (41.0)	2 (15.4)	51 (34.7)
45+	674 (18.7)	34 (46.6)	2 (3.3)	9 (69.2)	45 (30.6)
Beneficiary Category					
Active Duty	575 (15.9)	7 (9.6)	11 (18.0)	0 (0)	18 (12.2)
Recruit	76 (2.1)	2 (2.7)	2 (3.3)	0 (0)	4 (2.7)
Spouse	733 (20.3)	27 (37.0)	7 (11.5)	6 (46.2)	40 (27.2)
Child	1,811 (50.2)	16 (21.9)	38 (62.3)	4 (30.8)	58 (39.5)
Other Sponsor	411 (11.4)	20 (27.4)	3 (4.9)	3 (23.1)	26 (17.7)
Other Non-Sponsor	5 (0.1)	1 (1.4)	0 (0)	0(0)	1 (0.7)
Service					
Marine Corps	1,115 (30.9)	21 (28.8)	24 (39.3)	4 (30.8)	49 (33.3)
Navy	2,496 (69.1)	52 (71.2)	37 (60.7)	9 (69.2)	98 (66.7)
Encounter Type					
Outpatient	3,517 (97.4)	52 (71.2)	60 (98.4)	7 (53.9)	119 (81.0)
Inpatient	94 (2.6)	20 (27.4)	0 (0)	6 (46.2)	26 (17.7)
Other	0 (0)	1 (1.4)	1 (1.6)	0 (0)	2 (1.4)
Total	3,611	73	61	13	147

Datasources: HL7-formatted CHCS microbiology and chemistry

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015



As shown in Table 17, there were 16 unique genera of bacterial coinfections isolated. The most commonly identified genera include *Streptococcus*, *Staphylococcus* and *Escherichia*; these results are consistent with data from the past three seasons. Upper respiratory infections were most commonly *Streptococcus*, while most lower respiratory infections were *Staphylococcus* or *Pseudomonas*.

Table 17. Genera of Coinfections among Laboratory-Identified Influenza Cases, DON Beneficiaries, 2014-2015 Influenza Season (n=147)

Coinfection Genus	Specimen Type			Total (%)
	Non-Respiratory (%)	Upper Respiratory (%)	Lower Respiratory (%)	
<i>Corynebacterium</i>	2 (2.7)	0 (0)	0 (0)	2 (1.4)
<i>Enterobacter</i>	3 (4.1)	0 (0)	0 (0)	3 (2.0)
<i>Enterococcus</i>	5 (6.9)	0 (0)	0 (0)	5 (3.4)
<i>Escherichia</i>	18 (24.7)	1 (1.6)	0 (0)	19 (12.9)
<i>Gemella</i>	1 (1.4)	0 (0)	0 (0)	1 (0.7)
<i>Klebsiella</i>	5 (6.9)	0 (0)	0 (0)	5 (3.4)
<i>Lactobacillus</i>	4 (5.5)	0 (0)	0 (0)	4 (2.7)
<i>Micrococcus</i>	2 (2.7)	0 (0)	0 (0)	2 (1.4)
<i>Moraxella</i>	1 (1.4)	0 (0)	1 (7.7)	2 (1.4)
<i>Neisseria</i>	0 (0)	0 (0)	1 (7.7)	1 (0.7)
<i>Propionibacterium</i>	3 (4.1)	0 (0)	0 (0)	3 (2.0)
<i>Proteus</i>	1 (1.4)	0 (0)	0 (0)	1 (0.7)
<i>Pseudomonas</i>	2 (2.7)	1 (1.6)	4 (30.8)	7 (4.8)
<i>Serratia</i>	2 (2.7)	0 (0)	0 (0)	2 (1.4)
<i>Staphylococcus</i>	16 (21.9)	1 (1.6)	6 (46.2)	23 (15.6)
<i>Streptococcus</i>	8 (11.0)	58 (95.1)	1 (7.7)	67 (45.6)
Total	73	61	13	147

Datasources: HL7-formatted CHCS microbiology and chemistry

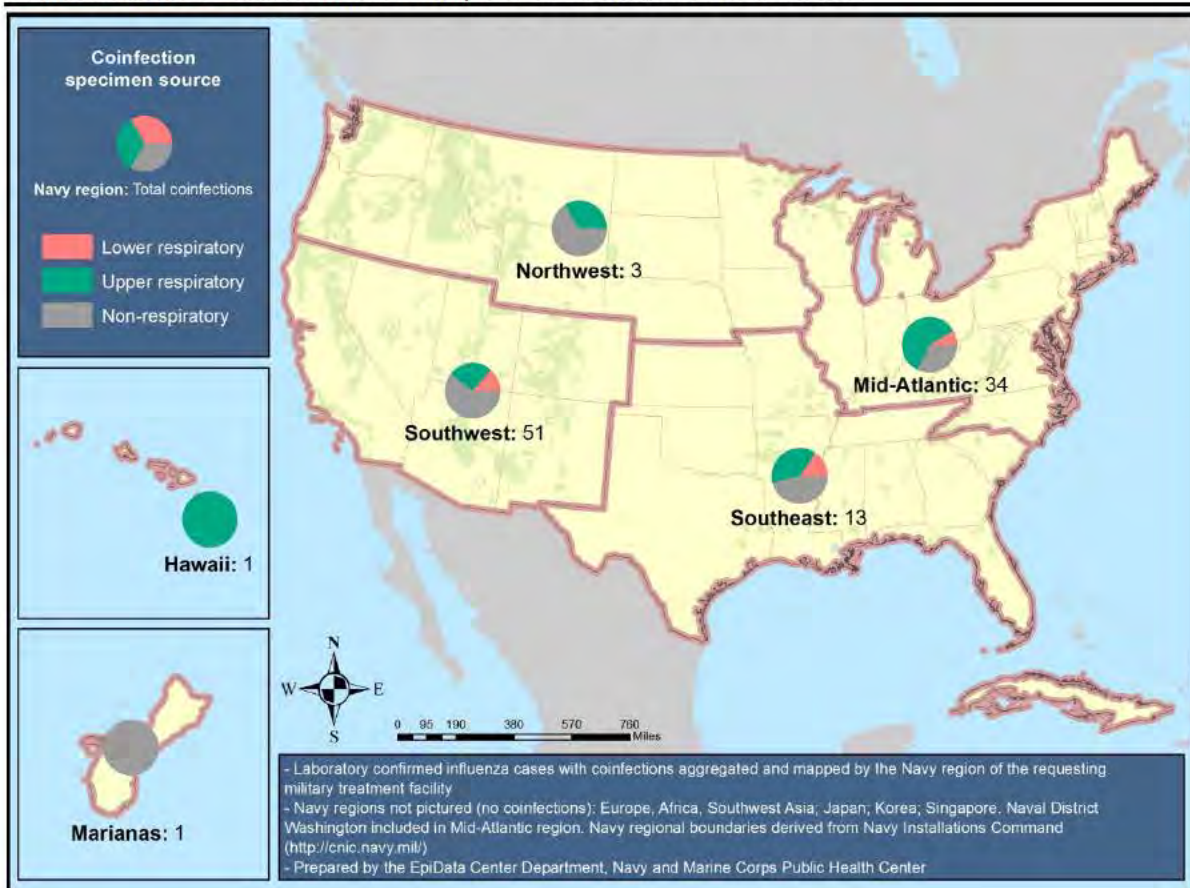
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Geographical Distribution

More than half of the influenza coinfections in the Mid-Atlantic Navy Region during this season were upper respiratory, while lower respiratory coinfections were more prominent in the Southwest and Southeast Navy Regions. The Northwest Navy Region demonstrated the lowest number of influenza coinfections ($n=3$). Only two coinfections were detected in OCONUS Navy Regions: Hawaii and Marianas (one each).

Figure 23. Regional Distribution of Influenza Coinfections by Specimen Source, DON Beneficiaries at DON Facilities & Walter Reed National Military Medical Center, 2014-2015 Season



Datasource: HL7-formatted CHCS pharmacy

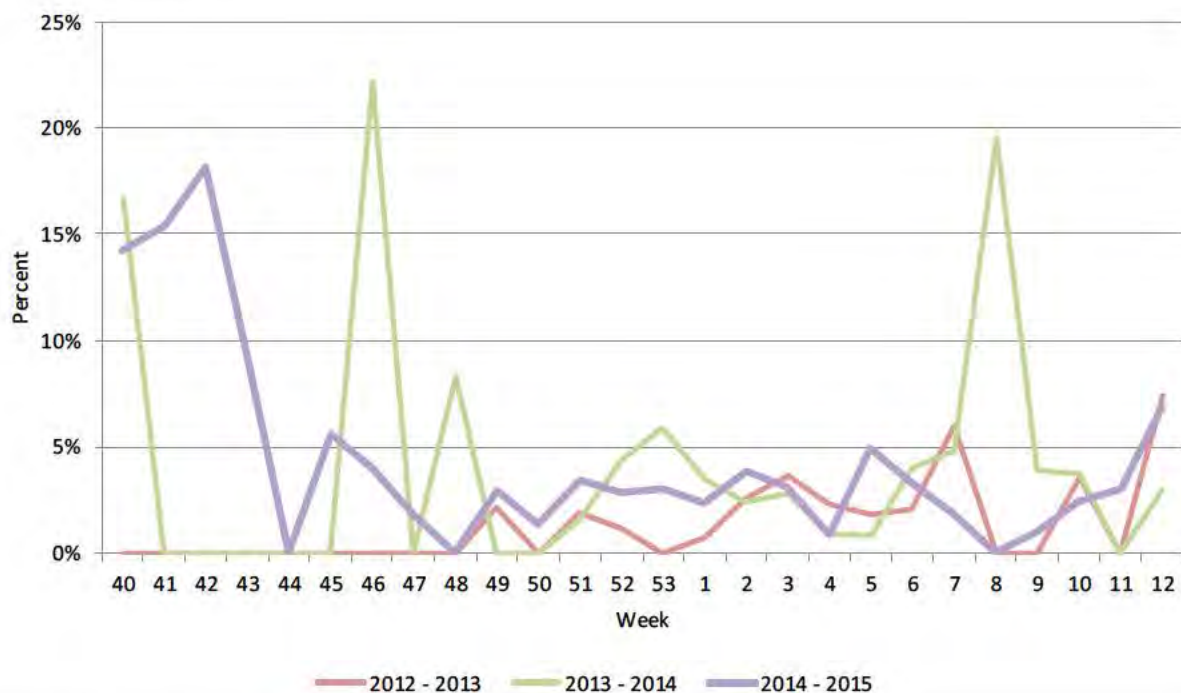
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015.



Radiology Identified Pneumonia

During the 2014-2015 season, 2.9% (n=107) of laboratory positive cases were also identified with radiology-defined pneumonia; approximately two-thirds of these pneumonia cases were classified as suspect and the remaining one-third as positive. This finding is similar to the 2013-2014 (3.5%) and 2012-2013 (2.0%) seasons. The largest volume of pneumonia cases was identified during Week 2 (n=18). As shown in Figure 24, the proportion of radiology-defined pneumonia cases remained relatively consistent, particularly during the weeks with the highest influenza activity. Larger variability was observed during the season begin and end weeks, likely due to the decreased frequency of laboratory positive cases.

Figure 24. Percentage of Laboratory-Identified Influenza Cases with Radiology-Identified Pneumonia by Week, DON Beneficiaries, 2012-2015 Influenza Seasons



Datasource: HL7-formatted CHCS radiology

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015



During the current season, children represented the largest beneficiary category identified as a pneumonia case (41.1%); beneficiaries ages 45 and above accounted for 33.6%. Navy beneficiaries represent the majority of pneumonia cases (66.4%), consistent with the overall distribution of influenza cases by service (Table 18).

Table 18. Demographic Characteristics of Radiology-Defined Pneumonia among Laboratory-Identified Influenza Cases, DON Beneficiaries, 2014-2015 Season (n=107)

	Frequency (%)
Gender	
Male	61 (57.0)
Female	46 (43.0)
Age Group	
0 - 4	23 (21.5)
5 - 17	20 (18.7)
18 - 44	28 (26.2)
45+	36 (33.6)
Beneficiary Category	
Active Duty	14 (13.1)
Recruit	7 (6.5)
Spouse	25 (23.4)
Child	44 (41.1)
Other: Sponsor	16 (15.0)
Other: Non-Sponsor	1 (0.9)
Service	
Marine Corps	36 (33.6)
Navy	71 (66.4)
Classification	
Positive	35 (32.7)
Suspect	72 (67.3)
Total	107

Datasources: HL7-formatted CHCS radiology

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015



Vaccinations

Active Duty

Navy active duty service members reached 90% vaccination coverage in Week 2, which was comparable to the 2013-2014 season. Marine Corps active duty service members reached 90% vaccination coverage at Week 4, one week earlier than the 2013-2014 season. Navy reservists reached 90% vaccination coverage at Week 2, one week earlier than the 2013-2014 season but Marine Corps reservists did not reach 90% coverage this season. The final immunization coverage for active duty and reserve components of the DON for the 2014-2015 influenza season (at Week 12) is presented in Table 19.

Table 19. Influenza Vaccination Coverage, DON Active and Reserve Components, 2014-2015

Service/Component	Total Population	Number Vaccinated*	Number Exempt	Percent Vaccinated
Navy Active Duty	320,486	304,551	13	95.0%
Navy Reserve	56,845	53,981	2	95.0%
Marine Corps Active Duty	184,781	172,592	4	93.4%
Marine Corps Reserve	32,733	29,122	0	89.0%
Total	594,845	560,246	19	94.2%

*Includes both injection and intranasal influenza vaccines.

Immunization status as of 31 March 2015.

Datasources: Immunization Tracking System (ITS), Defense Manpower Data Center (DMDC).

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015



Of the 591 active duty service members with a positive laboratory influenza result during the season, 516 (87.3%) were vaccinated more than 14 days prior to their infection. Forty-four had no record of vaccination, and 31 were vaccinated less than 14 days prior to infection and would not have been considered to be protected from influenza at the time of infection. Eighty recruits had a positive laboratory influenza report during the season. Of these, 48 (60.0%) were vaccinated more than 14 days prior to their infection and 22 were vaccinated less than 14 days prior to infection. Ten recruits had no vaccination record; Table 20 presents the vaccination status of active duty and recruit influenza laboratory cases and type of vaccination received.

ITS records indicated that 54 of the active duty and recruit DON service members with a positive laboratory influenza result during the season were not vaccinated. Secondary review processes of AHLTA clinical records indicated four were test patients and five service members had been vaccinated at least 14 days prior to the positive laboratory influenza result. M2 had no vaccination records for these service members. MRRS record reviews indicated that an additional two service members had received an influenza vaccine more than 14 days prior to infection and that 10 service members were eligible for medical or administrative deferment of the vaccine. There were 33 remaining service members who had no record of an influenza vaccine or vaccine deferment and had a positive laboratory influenza result in any source. Overall, these sources provided vaccination documentation for an additional 17 cases (34.0% of the 50 active duty service members identified as valid laboratory cases).

Table 20. Vaccination Status of DON Active Duty and Recruit Influenza Cases, 2014-2015 Season

Status	Immunity Status	Vaccine Type					Total	Percent
		LAIV	IIV	Unspecified Formulation	LAIV & IIV	None		
Active Duty	Vaccinated; immune	235	261	8	12	-	516	87.3%
	Vaccinated; not immune	4	25	1	1	-	31	5.2%
	No vaccination record	-	-	-	-	44	44	7.4%
Total		239	286	9	13	44	591	-
Recruit	Vaccinated; immune	37	10	-	1	-	48	60.0%
	Vaccinated; not immune	16	5	-	1	-	22	27.5%
	No vaccination record	-	-	-	-	10	10	12.5%
Total		53	15	-	2	10	80	-

LAIV=live-attenuated influenza vaccine (intranasal), IIV=inactive influenza vaccine (injection).

Vaccinated; immune: Vaccinated more than 14 days prior to infection.

Vaccinated; not immune: Vaccinated less than 14 days prior to infection or after infection.

Datasources: Immunization Tracking System (ITS), Defense Manpower Data Center (DMDC).

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015.



MTF Vaccine Distribution

There were a total of 336,734 ambulatory encounters for influenza vaccination at Navy MTFs for all DOD beneficiaries between September 1, 2014 and March 31, 2015. There were only slightly more inactivated influenza vaccine (IIV, 55.4%) given than live-attenuated influenza vaccine (LAIV, 44.6%). Most seasonal influenza vaccines administered this season at Navy MTFs were live, intranasal, quadrivalent influenza vaccines (35.5%), which are categorized by CPT code 90672 (Table 21).

Table 21. Influenza Vaccines Administered at Navy MTFs by Type, All DOD Beneficiaries, September 2014 through March				
CPT Code	CVX Code	Vaccine Type	Count	Percent
90654	144	Influenza, seasonal, intradermal, preservative free	240	0.10%
90655	140	Influenza, seasonal, injectable, preservative free, for persons 6-35 months	3,478	1.00%
90656	140	Influenza, seasonal, injectable, preservative free, for persons 3 years and older	41,648	12.40%
90657	141	Influenza, seasonal, injectable, for persons 6-35 months	2,546	0.80%
90658	141	Influenza, seasonal, injectable, for persons 3 years and older	33,720	10.00%
90660	111	Influenza, live, intranasal	30,449	9.00%
90661	153	Influenza, injectable, MDCK, preservative free	500	0.10%
90662	135	Influenza, high dose seasonal	1,171	0.30%
90672	149	Influenza, live, intranasal, quadrivalent	119,635	35.50%
90673	155	Influenza, recombinant, injectable, preservative free	82	0.00%
90685	150	Influenza, injectable, quadrivalent, preservative free, for persons 6-35 months	16,159	4.80%
90686	150	Influenza, injectable, quadrivalent, preservative free, for persons 3 years and older	48,339	14.40%
90688	158	Influenza, injectable, quadrivalent, for persons 3 years and older	38,767	11.50%
Total			336,734	

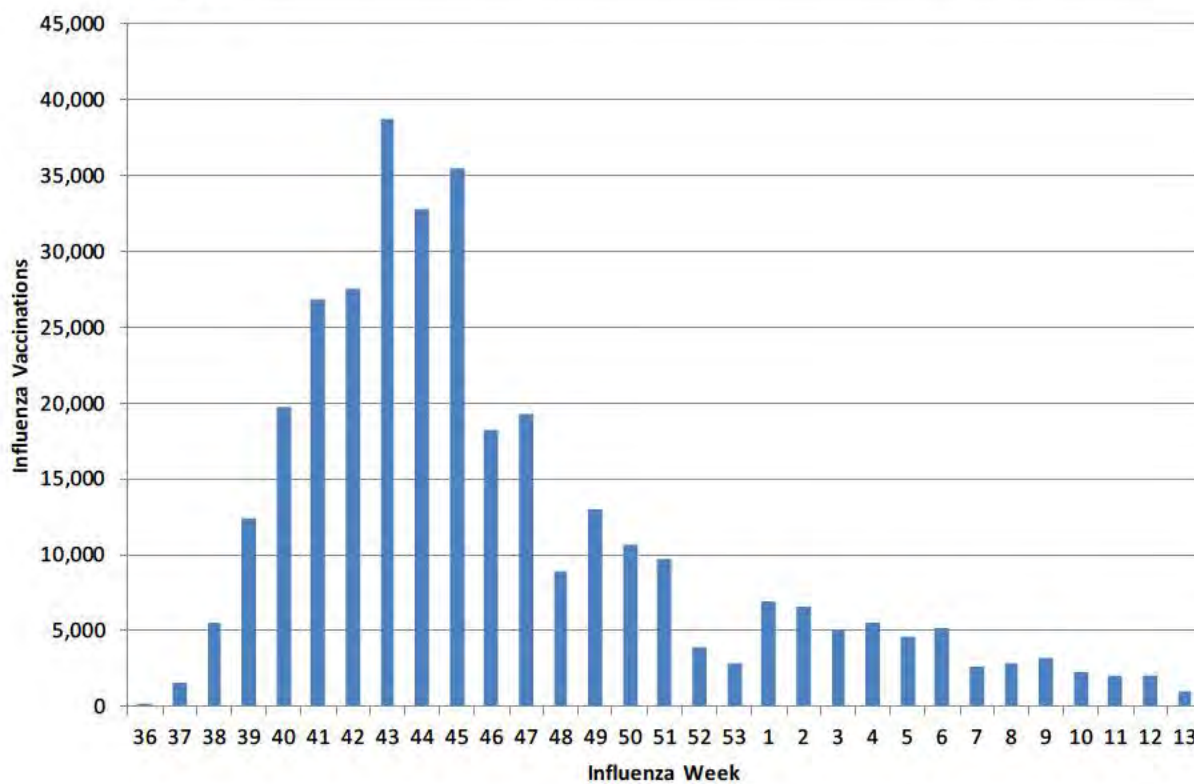
Datasource: Comprehensive Ambulatory Professional Encounter Record (CAPER).

Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015.



The peak time period of vaccine administration at Navy MTFs occurred between Weeks 43 and 45, when approximately 35,000 vaccines were administered weekly to beneficiaries of all services (Figure 25). The Navy MTFs that administered the most influenza vaccines included NMC Portsmouth (16.5%), followed by NMC San Diego (9.7%), NH Pensacola (8.4%), and James A Lovell FHCC (7.5%).

Figure 25. Influenza Vaccines Administered During Outpatient Encounters at Navy MTFs, All Beneficiaries, 2014-2015 Influenza Season



Datasource: Comprehensive Ambulatory Professional Encounter Record (CAPER)

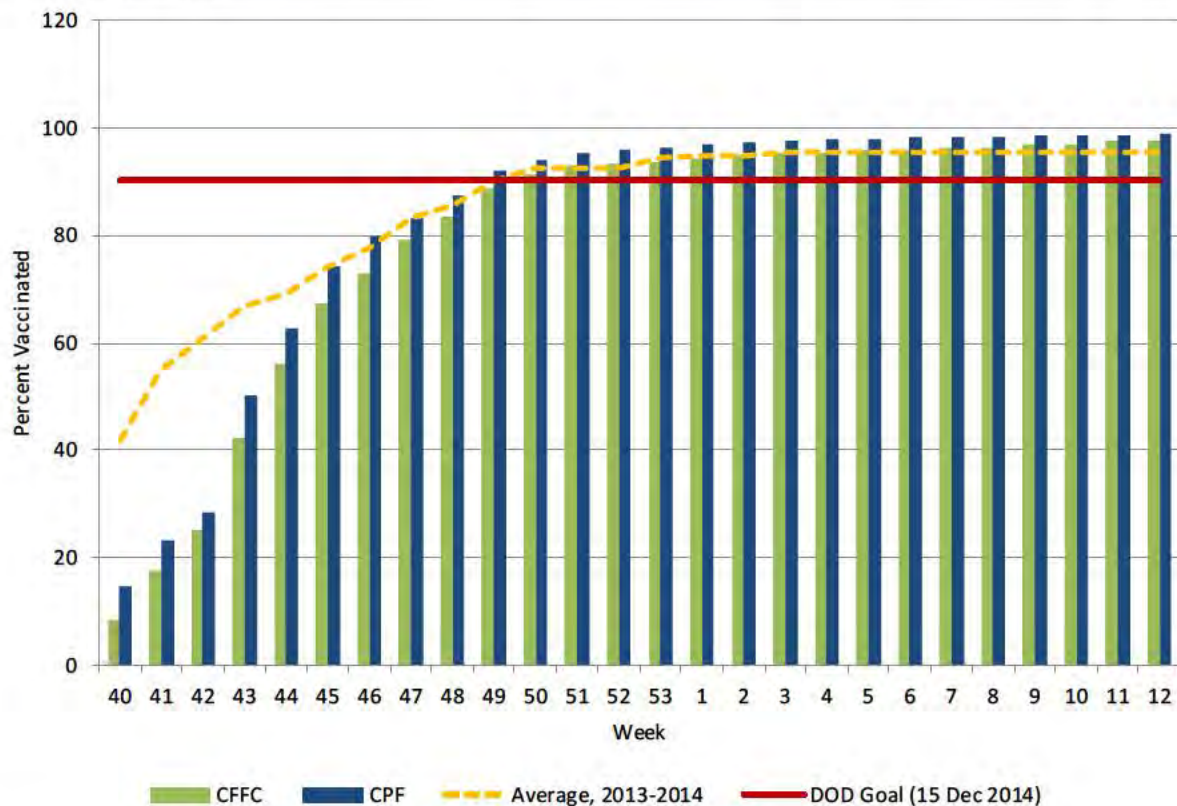
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US Fleet Forces Command

Although vaccination coverage for Fleet Forces Commands started later in comparison to last season, the DOD goal to attain 90% coverage was met before the end date of 15 December 2014. The percentage of eligible active duty personnel vaccinated among Central Fleet Forces Command (CFFC) reached 91.4% by Week 50 and obtained 97.7% coverage by the end of the season. The DOD goal was attained one week earlier for Pacific Fleet Forces Command (CPF), achieving 92.1% at Week 49 and 98.7% by the end of Week 12 (Figure 26).

Figure 26. Influenza Vaccination Coverage for Central Fleet Forces Command (CFFC) and Pacific Fleet Command (CPF), Seasons 2014-2015 and 2013-2014



Average includes CFFC and CPF data for the previous season.

Datasource: Medical Readiness Reporting System (MRRS)

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015



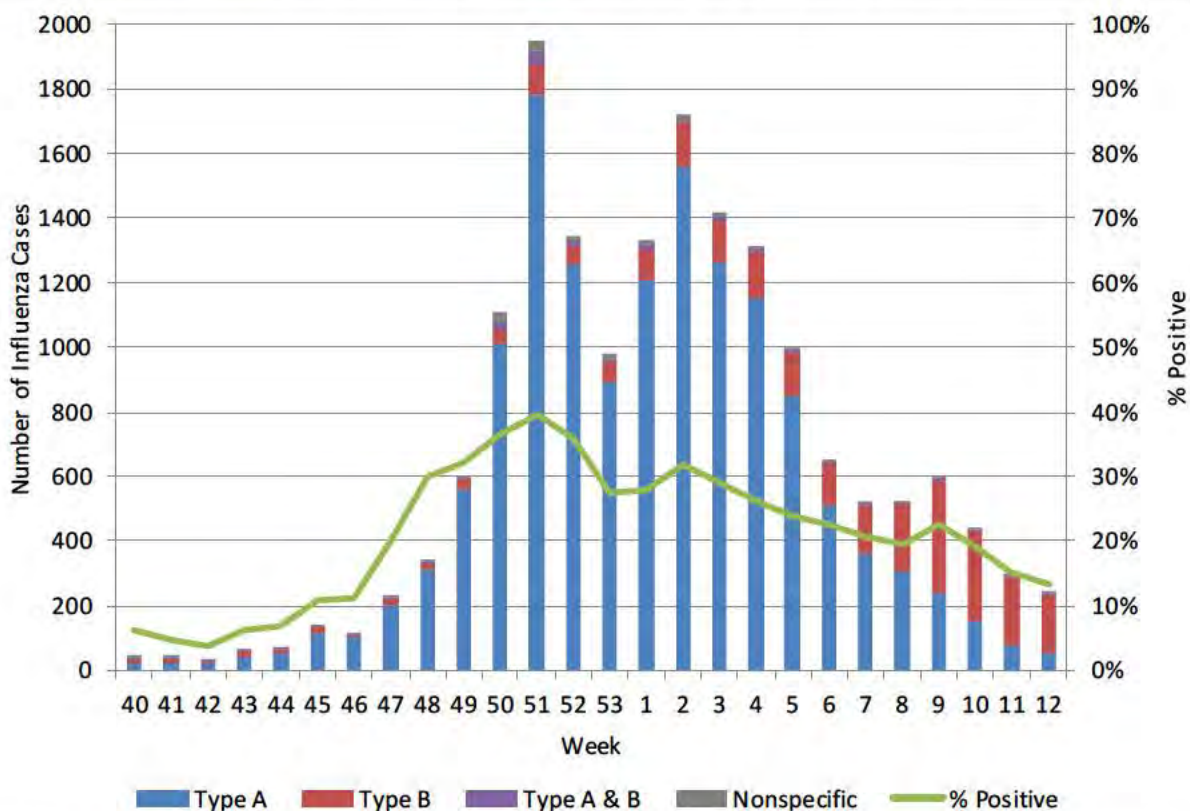
DOD Results

Laboratory

There were 17,087 influenza positive laboratory cases for 17,013 people among DOD beneficiaries in the 2014-2015 season, of which 14,118 (82.6%) were influenza Type A, 2,543 (14.9%) were influenza Type B, 224 (1.3%) were dual infections, and 202 (1.2%) were nonspecific influenza types. The majority of positive cases were identified by rapid testing (57.0%), followed by PCR (25.4%) and culture (17.5%).

The number of positive laboratory specimens peaked during Week 51 (n=6,335), with a second peak during Week 2 (n=6,281) (Figure 27). The percent of positive influenza tests passed 10% in Week 45, and remained above 10% for the rest of the season. The percent of positive influenza tests followed a trend similar to the number of positive laboratory specimens with additional smaller peak during Week 9, during which the volume of influenza Type B cases was highest. Overall, 25.8% of influenza tests were positive.

Figure 27. DOD Laboratory Positive Influenza Tests by Influenza Type, 2014-2015 Season



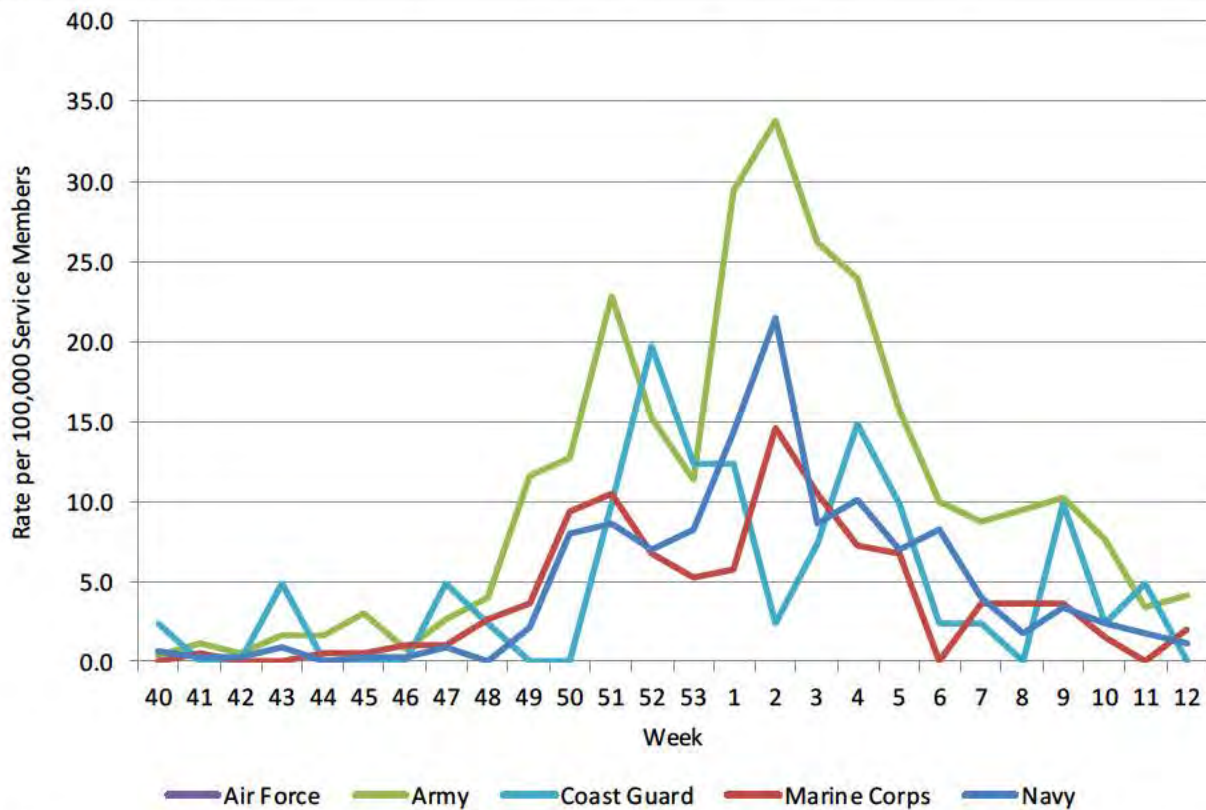
Datasources: HL7-formatted CHCS chemistry and microbiology

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015



This season, there were 3,188 active duty laboratory positive influenza cases (1,435 Army, 1,109 Air Force, 399 Navy, 194 Marine Corps, and 51 Coast Guard) and 136 recruit laboratory positive influenza cases (53 Navy, 32 Army, 26 Marine Corps, 25 Air Force). Rates by service per 100,000 active duty service members are presented in Figure 28. Rates were generally highest among Army service members throughout the season. Influenza rates in all services, except Coast Guard peaked in Weeks 2, similar to the overall DOD population. Coast Guard rates peaked during Week 52.

Figure 28. Rate of Laboratory Positive Influenza Cases by Service, per 100,000 Active Duty Service Members, 2014-2015 Season



Datasources: HL7-formatted CHCS microbiology and chemistry, MHS Mart (M2)

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015

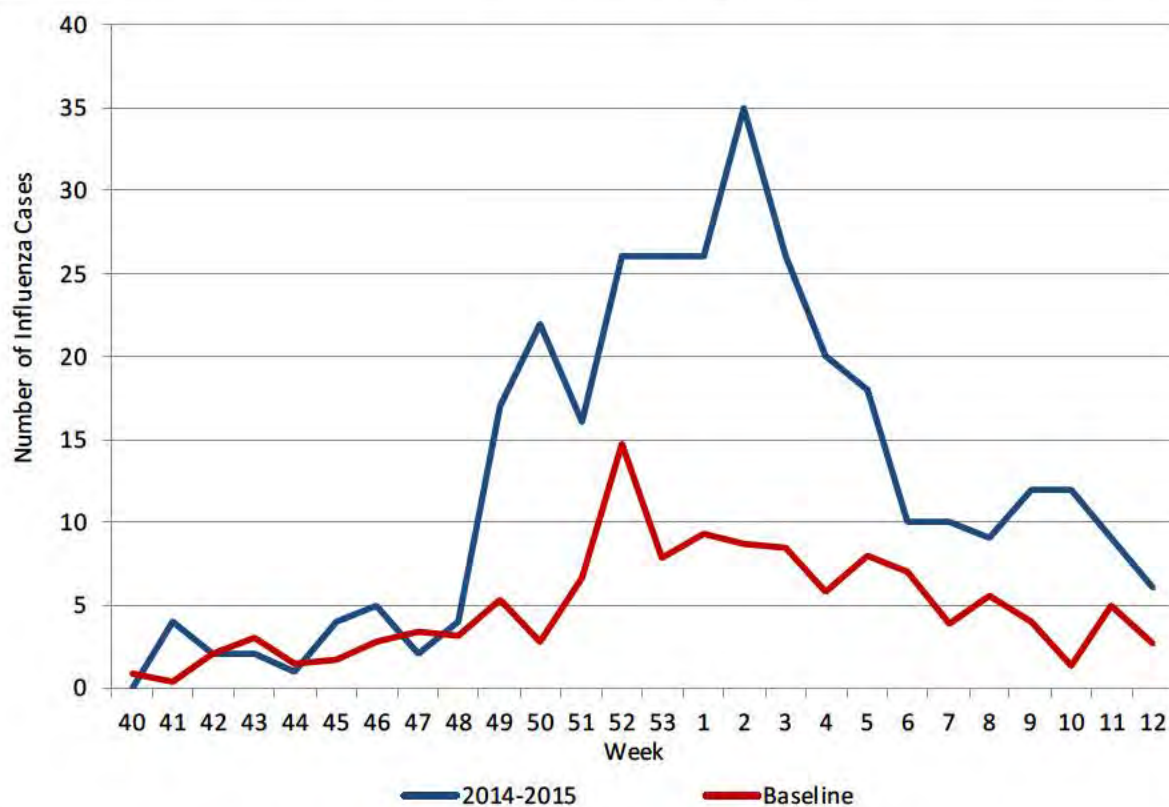


Inpatient Cases

There were 324 influenza positive results for 324 DOD beneficiaries in the inpatient setting, of which 264 (81.5%) were Type A, 53 (16.4%) were Type B, and seven (2.2%) were dual infections. The majority of inpatient cases were identified by PCR tests (57.7%), followed by rapid tests (26.2%) and cultures (16.1%). The average age of an inpatient case was 52 years (range: 0 to 95). There were 22 inpatient active duty cases (10 Army, five Navy, four Air Force, three Marine Corps) and four inpatient recruit cases (all Marine Corps).

The number of inpatient cases this season was higher than any previous season. The number of inpatient influenza cases was above baseline for 11 of 25 weeks throughout the 2014-2015 influenza season. Inpatient cases, like overall laboratory cases peaked during Week 2 (Figure 29).

Figure 29. Frequency of Inpatient Influenza Laboratory Cases among DOD Beneficiaries, 2014-2015 Season



Baseline calculated as the weighted average of the number of inpatient cases in 2011-2012, 2012-2013, and 2013-2014 influenza seasons.

Datasources: HL7-formatted CHCS chemistry and microbiology

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015



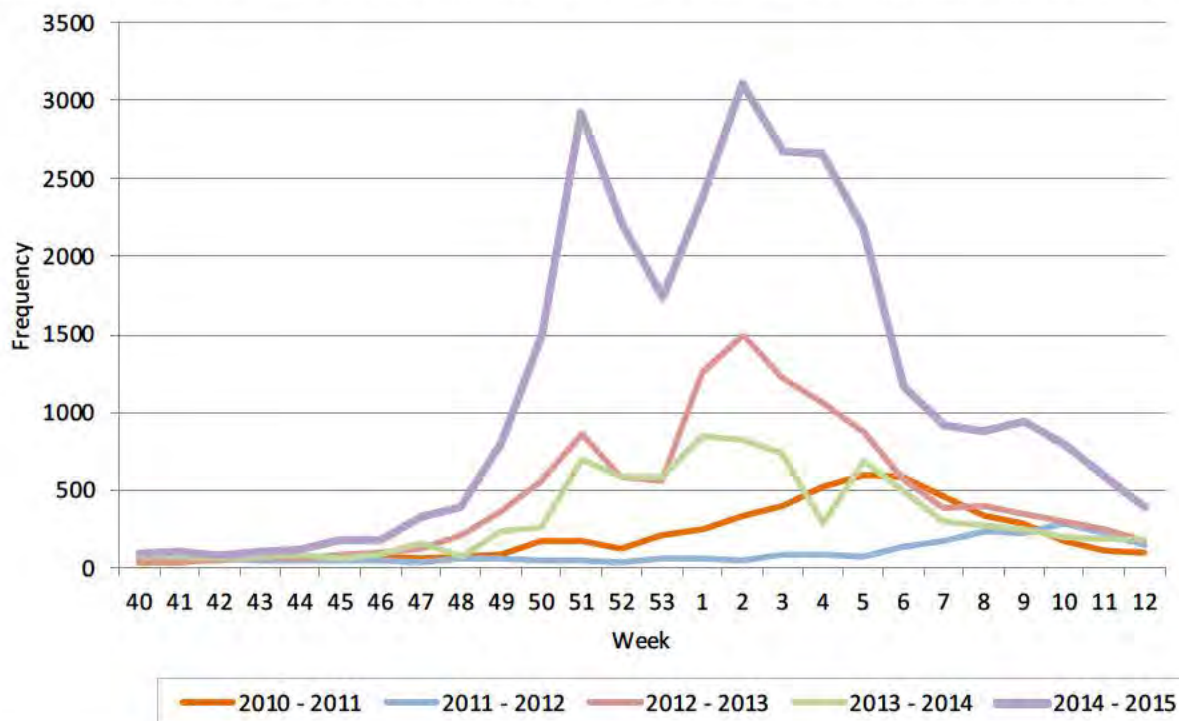
Pharmacy

A total of 29,391 influenza AV prescriptions were dispensed to DOD beneficiaries in the 2014-2015 influenza season, which measured three times the number of prescriptions dispensed during the previous season. Antiviral prescription trends for the current season were characterized by an initial peak during Week 51, followed by a secondary peak during Week 2, thereafter declining through the remainder of the season (Figure 30).

Approximately four percent (n=1,173) were prescribed in the inpatient setting. Among the five drugs of interest, oseltamivir was prescribed most frequently in both the ambulatory and inpatient settings. Less than ten rimantadine and zanamivir prescriptions were identified in an ambulatory setting (Table 22).

Among beneficiary groups, children represented the largest majority of dispensed antivirals (41.6%), followed by spouses (24.2%), and active duty personnel (18.4%); recruits accounted for 271 (0.9%) prescriptions) (Table 23).

Figure 30. Frequency of Influenza Antiviral Prescriptions Dispensed to DOD Beneficiaries, 2010 - 2015 Seasons



Datasource: HL7-formatted CHCS pharmacy

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2015



Table 22. Influenza Antiviral Prescriptions Dispensed to DOD Beneficiaries by MTF Facility Setting, 2014-2015 Season (n=29,391)

Antiviral	Ambulatory (%)	Inpatient (%)	Total (%)
Amantadine	94 (0.3)	49 (4.2)	143 (0.5)
Oseltamivir	28,116 (99.6)	1,124 (95.8)	29240 (99.5)
Rimantadine	5 (<0.1)	0 (0.0)	5 (<0.1)
Zanamivir	3 (<0.1)	0 (0.0)	3 (<0.1)
Total	28,218	1,173	29,391

Datasource: HL7-formatted CHCS pharmacy transactions from MHS facilities

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015

Table 23. Influenza Antiviral Prescriptions Dispensed to DOD Beneficiaries by Demographics, 2014-2015 Season

	Frequency (%)
Total	29,391 (100%)
Gender	
Male	14,604 (49.7)
Female	14,787 (50.3)
Age Group	
0 - 4	4,383 (14.9)
5 - 17	7,265 (24.7)
18 - 44	10,480 (35.7)
45+	7,263 (24.7)
Beneficiary Category	
Active Duty	5,399 (18.4)
Recruit	271 (0.9)
Spouse	7,106 (24.2)
Child	12,228 (41.6)
Other: Sponsor	4,308 (14.7)
Other: Non-Sponsor	79 (0.3)

Datasource: HL7-formatted CHCS pharmacy transactions from MHS facilities

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, June 2015



Discussion

During 2014-2015, influenza activity among beneficiaries within the military health system began early and remained elevated for a prolonged period of time in comparison to previous seasons. Among DON beneficiaries, the seasonal average of laboratory positive cases and influenza specific antivirals both measured three times historical baselines during certain times of the season. Trends in laboratory and pharmacy surveillance were comparable, both exhibiting an initial peak during Week 51, thereafter trending downward, followed by a secondary peak in Week 2. The percentage of medical encounters and ER visit through Saturday of the most current week due to ILI demonstrated a peak during Week 52, followed by a downward trend during the remainder of the season. An increased burden of influenza among active duty personnel was also observed this year, as the overall volume of laboratory positive cases reached a burden comparable to the 2009-2010 H1N1 pandemic season.

Influenza activity followed similar trends to those reported by the CDC, where influenza in the United States began to increase in November and peaked in late December.¹⁹ Approximately 32% of influenza specimens from collaborating laboratories with the World Health Organization (WHO) and National Respiratory and Enteric Virus Surveillance System were positive at Week 52. Laboratory positivity among DON beneficiaries reached a high point just one week earlier, at 30% during Week 51. Through the peak of the current season, CDC surveillance indicated H3N2 viruses predominated nationally.²⁰ Although EDC laboratory surveillance processes do not allow for complete subtyping results, the findings support this evidence, where the majority of MHS laboratory positive test results were attributable to influenza type A. Furthermore, the CDC reported substantial influenza B activity occurring late in the season.²⁰ This finding is also comparable to EDC surveillance results, as the proportion of laboratory positive type B results began to increase at the end of February and continued through March.

According to CDC surveillance, the timing and severity of influenza varied by geographic location throughout the season, where activity in the select Northeast states peaked earliest while Midwest states peaked the latest.²⁰ This is consistent with findings from the DON where MTFs in the mid-Atlantic experienced their highest burden of laboratory positive influenza cases earlier than those on the Pacific coast. Among OCONUS parent MTFs, peaks in laboratory positive cases occurred later in the season (between Weeks 1 and 6), with the exception of Guam which peaked particularly early (Week 42). At the time, public health officials in Guam reported widespread flu activity ahead of normal heightened activity in the continental United States.²¹

Previous influenza A (H3N2)-predominant seasons have been associated with increased hospitalizations and deaths, particularly among children below the age of five and adults aged 65 years and older. Nationally, the CDC reported an especially severe season for adults over the age of 65, who had the highest laboratory-confirmed hospitalization rates and accounted for the majority of pneumonia and influenza deaths.²⁰ On a weekly basis, the EDC utilized several surveillance measures to monitor influenza severity, including laboratory positive results and pharmacy transactions within an inpatient setting, bacterial coinfections identified among laboratory positive influenza cases, and the frequency of influenza-associated hospitalizations.



DON beneficiaries did not experience high levels of influenza severity as reported by the CDC, potentially due to an active immunization and prevention program, overall healthy adult population, fewer elderly than in the general population, and direct access to medical care. While the number of inpatient laboratory positive specimens and pharmacy transactions was higher compared to previous seasons, the proportion of all cases that were inpatient was relatively consistent with previous seasons. This finding is also consistent with bacterial coinfection surveillance, where the frequency of coinfections among laboratory positive influenza cases was higher than demonstrated in the previous three seasons; however, the percent among inpatient laboratory cases remained consistent with the past three seasons. Notably, adults above 45 years were demographically over-represented among lower respiratory infections; this finding aligns with CDC reports of increased morbidity among older adults during the current season.

In addition to warnings of increased severity associated with circulating influenza A (H3N2), the CDC reported that the majority of circulating influenza A viruses differed from the components within the 2014-2015 Northern Hemisphere seasonal vaccines, and the predominance of these antigenically and genetically drifted viruses had resulted in reduced vaccine effectiveness. Despite the decreased effectiveness, the CDC continued to recommend widespread use of the seasonal influenza vaccine for cross-protection to reduce the likelihood of severe outcomes, such as hospitalization and deaths.²²

The Navy Bureau of Medicine and Surgery (BUMED) plays a crucial role in the implementation of the influenza immunization policy; this season's goal of vaccination coverage to 90% of active duty personnel was obtained before the DOD deadline of 15 December 2015. Despite successful vaccination program efforts, influenza specimens were still identified in active duty and recruit personnel who obtained full immunization coverage before a positive specimen collection date. Among active duty Sailors and Marines, over 87% of those identified as a laboratory confirmed influenza case were vaccinated more than 14 days prior to infection. This result is slightly above the observed rate of potential vaccine failure among active duty personnel with a positive influenza laboratory result last season, where approximately 80% of active duty laboratory cases were vaccinated more than 14 days prior to infection.

In addition to vaccination, the initial CDC Health Advisory emphasized the value of initiating influenza-specific AV treatment as soon as possible for symptomatic patients, without waiting for laboratory confirmation.²² In the weeks following the first release of the health advisory, the number of antivirals dispensed to children rose to eight times above the seasonal baseline. The proportion of influenza cases from pharmacy, with and without laboratory positive testing, also increased at much higher rate than laboratory positive cases without AV prescriptions. During the same time period, the laboratory percent positive increased from 21.7% to 30.0%. Anecdotally, providers have indicated that once seasonal influenza is endemic in a provider's locality and they see large volumes of patients with the same symptoms, they perform less testing and begin treating patients empirically. Though the CDCHAN alert did not discourage providers from testing patients for influenza, it did focus on the importance of initiating treatment for symptomatic patients, without delay for laboratory confirmation. Since the percent



positive for laboratory tests was increasing during this period of high influenza activity, it does not appear that these high volumes of AV prescriptions were being dispensed to patients whose laboratory test results were ultimately negative. While laboratory testing was not increasing as rapidly as AV treatment, the percent of cases that came from both laboratory and pharmacy surveillance also peaked after the CDCHANs were released. This indicates that there were an increased number of laboratory-positive influenza patients receiving influenza AV treatment as recommended by the CDC. It should be noted that during times of known high influenza activity with increased percent positive testing, the overall volume of laboratory cases did not increase to an equal degree, indicating that while providers were treating dramatically higher volumes of patients for influenza, they did not also respond with increased laboratory testing. While laboratory testing remains the gold standard for influenza surveillance, due to the ability to confirm influenza infection, laboratory surveillance alone would not have provided a complete assessment of the burden of influenza on the DON.

Strengths

The weekly DON SITREP evolves each season based on feedback from the preventive medicine community, leadership, and new data capabilities. Within the EDC, HL7-formatted laboratory and pharmacy surveillance continue to provide a gold standard for measuring influenza activity among military beneficiary populations. Weekly baselines are presented with each of our surveillance measures to provide perspective on current influenza activity in relation to more recent seasons, but the EDC maintains the capability to review long-standing historical influenza trends. Laboratory surveillance for influenza dates back to the 2005-2006 influenza season, while historical trends for influenza-specific antivirals are readily available as early as the 2006-2007 influenza season.

The influenza surveillance capabilities established by the EDC provide an unparalleled perspective that other national surveillance processes do not, particularly for laboratory and pharmacy data sources. Unlike CDC laboratory influenza surveillance, which relies on sentinel sites, EDC surveillance encompasses a full spectrum of beneficiaries accessing care through medical treatment facilities. Additionally, national surveillance systems do not provide monitoring for influenza-specific antivirals, which provide a mechanism to detect influenza-like activity regardless of whether the underlying disease is laboratory confirmed. This is particularly important where influenza testing may not be routine.²³

Furthermore, the EDC utilizes HL7 laboratory and pharmacy surveillance to account for under-reporting of hospitalized influenza infections. This season approximately one quarter of laboratory positive DON inpatient cases under age 65 were reported to DRSi. Reporting severe influenza cases is important as these events have the potential to greatly impact mission readiness, particularly those occurring in active duty service members. Timely reporting allows for proper identification, treatment, control, and follow-up of cases, enhancing preventive medicine leaders' ability to respond with control and prevention measures. The EDC assists MTFs with case reporting by feeding laboratory positive reportable influenza cases to the case finding module in DRSi. Data fed to the case finding module can be used to pre-fill a medical



event report (MER), reducing the amount of time required for MER completion and lowering the risk for data entry errors. Case reporting guidelines and requirements should be reemphasized prior to the start of the season and emphasized throughout the season.

This season, the EDC expanded weekly surveillance processes outside of the DON SITREP to provide supportive expertise to BUMED and the Armed Forces Health Surveillance Center (AFHSC). To support influenza surveillance across the DOD, the EDC provided weekly extracts of HL7 formatted laboratory records, including classified test results and sub-types where applicable. These extracts were utilized to create the weekly DOD Seasonal Influenza Surveillance Summary, published by AFHSC. In addition, the EDC calculated overall percent positive and inpatient percent positive of influenza laboratory tests and percent of AV prescriptions dispensed in the inpatient setting by parent MTF. These values were supplied to BUMED on a weekly basis to contribute to an online dashboard utilized to provide situational awareness of disease burden impact on facilities, measure readiness, and facilitate organizational planning.

Limitations

Several noteworthy limitations are applicable to this report. Medical data considered in this report were generated within CHCS at fixed-MTFs. This analysis does not include records from purchased care, shipboard, battalion aid stations, or in theater facilities.

The microbiology database primarily consists of results for culture testing. Microbiology testing results only show the organism(s) that were identified, not what the test was intended for; e.g., if a physician suspects an organism different from the one that was identified, the record will not show the organism that the physician suspected. Microbiology data are useful for identifying laboratory positive cases of illness. However, cases where a physician chooses to treat presumptively without laboratory confirmation will not be captured. Clinical practice with regards to culturing varies between providers and facilities. Examples of situations where cultures may not be performed include confirmatory tests for patients with influenza-like illness symptoms, or patients with superficial infections who are treated presumptively.

The chemistry database consists of non-culture laboratory test results (e.g. PCR and antigen testing). Providers may order a group of tests, called panels, when patients present with non-specific symptoms. If the test name or test results within a panel are not disease-specific, these results may not be captured in search terms used to query the chemistry data. Classifying chemistry tests involves extensive searching of free-text test result fields. It is possible that some test results could be misclassified, though validation steps were included to reduce error.

The radiology database consists of results for radiographic testing. Providers order radiology tests based on patient symptoms and their clinical impressions. Results included in the radiology records describe radiologist findings and impressions of the test. In general, a summary of the test results is available at the end of the test result text, but misclassification of the outcome is still possible as this is a free-text field. Though case status can be classified based on radiology



records, final diagnosis of a patient is done by a physician after considering a patient's clinical history, current symptoms, and available laboratory test results. When radiology test results are updated, only the most recent record is considered for analysis. During ongoing surveillance efforts, case status may change as record updates become available.

The pharmacy databases consist of ambulatory non-intravenous prescriptions (ambulatory), inpatient non-intravenous prescriptions (unit-dose), and intravenous prescriptions (intravenous). Though treatment compliance in the inpatient setting can be assumed, ambulatory pharmacy records indicate that a patient received a prescription and subsequent compliance is unknown. Due to near real-time data feeds, analysts are able to determine if a prescription was edited or canceled; however, the time difference between these events may allow for a short period of treatment not considered in this analysis. During ongoing surveillance efforts, patient treatment status may change as edited or canceled prescription records are received.

Data for medical surveillance are considered provisional and medical case counts may change if the discharge record is edited after the patient is discharged from the medical treatment facility, and case counts may change between the time the report is created and distributed. Records of medical encounters depend on correct ICD-9-CM coding practices. Additionally, because records are submitted into the system at different times, there may be patients who have had an inpatient or ambulatory encounter but were not captured in the current data. Inpatient records are created at discharge or transfer from an inpatient medical treatment facility. For active duty personnel only, non-MTF (purchased care) hospitalizations generate a record upon discharge.

The EDC weekly extract of ITS data are limited to active duty DON and reserve service members and includes vaccinations recorded within the MHS and SNAP Automated Medical System (SAMS) for shipboard and Marine Corps personnel. SAMS updates to ITS may be delayed due to internet and server connection requirements. Family member vaccination status cannot be assessed in ITS. Reserve service members' routine vaccinations may not be captured in ITS data if reservists do not routinely seek care/vaccinations within the MHS. Furthermore, Exemption or waiver records for members are only generated once at the time they are granted. Any extended exemption provided prior to EDC extract initiation (2007) will not be present in the EDC ITS data.

DMDC provides a monthly snapshot of each service member's personnel information, which is typically received after a two month delay. Matching to DMDC data allowed for the entire service to be considered in a particular month, but any changes made to a service member's record, including separation, after the snapshot date will not be accounted for until the next monthly extract. Activated reservists may be captured in the active duty DMDC file rather than the reserve DMDC file.

DRSi is a passive medical event reporting system dependent upon DRSi recorders to document reportable events into the system on a case-by-case basis; therefore, underreporting is likely for most routine medical events. MER completeness and validity is reliant upon accurate data entry by DRSi recorders, usually preventive medicine technicians (PMTs), tasked with completing



MERs at the local command level. Internet access is required to submit a MER, so the time from the event to entry into DRSi may be delayed, especially events discovered at sea or when deployed. Reportable medical events identified outside of the MHS, such as purchased care visits, cannot be recorded in DRSi unless the case is reported to a local MTF.



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Appendix A: ILI Diagnosis Codes

ICD-9-CM Codes for Influenza-Like Illness (ILI) Diagnoses	
079.99	unspecified viral infections
382.9	Otitis media unspecified
460	acute nasopharyngitis (common cold)
461.9	acute sinusitis unspecified
464	acute laryngitis and tracheitis
464.1	acute tracheitis
464.10	acute tracheitis without mention of obstruction
464.11	acute tracheitis with obstruction
464.2	acute laryngotracheitis
464.20	acute laryngotracheitis without mention of obstruction
464.21	acute laryngotracheitis with obstruction
465.9	acute upper respiratory infection, unspecified site
466	acute bronchitis and bronchiolitis
466.0	acute bronchitis
480.9	viral pneumonia, unspecified
485	bronchopneumonia, organism unspecified
486	pneumonia, organism unspecified
487*	influenza
488*	influenza due to certain identified virus
490	bronchitis, not specified as acute or chronic
490.0	bronchitis, not specified as acute or chronic
780.6	fever
780.60	fever, unspecified
786.2	cough
Data source: ESSENCE ILI Syndrome Definition, as of 01 Aug 2014	
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