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Executive Summary

The EpiData Center (EDC) at the Navy and Marine Corps Public Health Center (NMCPHC) monitors influenza activity in the Military Health System (MHS) on a weekly basis throughout the influenza season using Health Level 7 (HL7) formatted Composite Health Care System (CHCS) laboratory and pharmacy records, inpatient admission records, outpatient medical encounter records, and vaccination records. This report summarizes influenza activity among Department of the Navy (DON) beneficiaries during the 2018-2019 season.

Based on the number of identified laboratory-positive influenza cases, the 2018-2019 DON influenza season lasted longer and resulted in more cases than recent seasons (with the exception of the 2017-2018 season). The EDC identified fewer Type B cases than expected late in the season. While the peak number of weekly laboratory-positive influenza cases was much lower than in the 2017-2018 season, the total laboratory-positive case count was fairly similar between both. Based on the number of laboratory-positive cases and dispensed antiviral medications (AVs) from an inpatient setting, the 2018-2019 season was less severe than the previous season. Influenza activity surpassed baseline trends in January and remained elevated through the end of the season (27 April 2019). Influenza activity remained at or above baseline levels for more than 84% of the season. Overall DON trends mirrored those in the general civilian population of the United States (US); both the DON and the Centers for Disease Control and Prevention (CDC) reported peak activity during late January into early February 2019. DON influenza activity peaked during Week 6 (3 February – 9 February 2019).

Summary of Results

The total weekly number of DON influenza cases identified from laboratory, pharmacy, and clinical encounter records (inpatient and outpatient) peaked at Week 6 with 613 cases. The percentage of cases identified in and matched across two or more data sources was 48.5%, with only 20.6% of cases identified in all three data sources. The highest proportion of cases was identified among encounter records.

The overall percent positivity among DON laboratory specimens was 20.7%. Influenza A was the dominant influenza type during the season (93.5% of positive specimens) and predominated in later weeks when influenza B is typically more frequently identified. The volume of laboratory-positive cases was at or above baseline for 26 of 30 surveillance weeks, compared to 25 of 30 surveillance weeks in the 2017-2018 season. Laboratory-positive cases and AVs peaked during Week 6 and remained above baseline through the end of the reporting period. Influenza-like illness (ILI) cases among DON beneficiaries diverged from historical trends for laboratory-positive cases and dispensed AVs, with peaks occurring during Weeks 52, 7, and 10.

Active Duty and Recruits

The seasonal trend of DON active duty (AD) and recruit influenza cases peaked later in the season than the trend for all DON beneficiaries, with rates among AD and recruits peaking in Week 11. The DON achieved 90% vaccination coverage in Week 51 (22 December 2018), one week later than the DOD’s goal date for the DON. The vaccination rate for AD and reserve Sailors and
Marines was 96.6% by the end of the season (Week 17, 27 April 2018). The majority (86.9%) of influenza cases among AD DON service members had a record of vaccination at least 14 days prior to infection, which is considered adequate time to develop immunity.

**Geographic Distribution**

By medical treatment facility (MTF), Navy Medical Center (NMC) Camp Lejeune had the highest frequency of laboratory-positive influenza cases during the season. Naval Hospital (NH) Pensacola had the highest frequency of AVs dispensed among DON beneficiaries. NH Jacksonville and NMC San Diego had the next highest volumes of laboratory cases, while NMC Portsmouth and NMC San Diego experienced the next highest volumes of dispensed AVs among DON MTFs.

**Conclusion**

Compared to recent seasons, the 2018-2019 DON influenza season had a later peak week with an overall laboratory-positive case volume similar, but slightly less to the 2017-2018 season. When possible, cases were identified in and matched across more than one surveillance data source to confirm diagnoses, strength case descriptions, maximize case capture, increase the validity of the findings, and increase the robustness of surveillance. This information may assist the Navy Bureau of Medicine and Surgery (BUMED) to determine the overall burden of influenza in the DON community and its impact on mission readiness and may assist in policy planning and preparation for upcoming seasons.
Objective
This report summarizes influenza activity among DON beneficiaries during the 2018-2019 influenza season and provides select seasonal highlights for the entire DOD.

Background
Influenza is a contagious, viral respiratory illness that can lead to mild or moderate illness. Symptoms include, but are not limited to, fever, sore throat, malaise, and headaches. In severe cases, influenza may result in pneumonia, respiratory failure, and death. The CDC continuously reports on influenza seasons using surveillance data to quantify the burden and severity of disease. From 2010 to 2018, the estimated number of seasonal influenza-associated deaths ranged from a low of 12,000 (2010-2011) to a high of 79,400 (2017-2018). The 2017-2018 season had the largest burden of disease since the 2009 H1N1 pandemic. Worldwide, the CDC estimates that as many as 646,000 people may die from influenza each season. The influenza virus is categorized into three types. Type A and type B routinely spread among humans and cause seasonal infections each year. Type C usually results in less severe symptoms and does not cause seasonal epidemics and therefore is not included in regular influenza seasonal surveillance. 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. The CDC monitors US influenza activity on a weekly basis from October through mid-May. Though seasons vary, a typical influenza season is characterized by a lower incidence of illness during October and November with peak incidence most frequently occurring during February.

In 2017, the CDC implemented seasonal severity definitions based on threshold calculations. The thresholds, created using recent seasonal data, provide a “limit” that must be reached before the severity of a season changes. If the thresholds are crossed in the seasonal peak, then the season severity can change. Seasonal severity is defined by the CDC as low, moderate, high, or very high. The CDC tracks influenza season severity by monitoring key indicators such as the percentage of deaths attributed to pneumonia or influenza, rates of influenza-associated hospitalizations, number of pediatric deaths, and the percentage of outpatient visits for ILI. Bacterial co-infections associated with influenza may also be monitored as an indicator of influenza season severity. Bacterial co-infections are a leading cause of morbidity and mortality, particularly during influenza pandemics. Further, morbidity and mortality rates are higher among influenza-associated bacterial infection cases compared to bacterial pneumonia without influenza infection.

Seasonal influenza vaccination is the most effective method for reducing the likelihood of an influenza viral infection as well as the spread of infection to others. Vaccines are typically recommended for anyone over six months of age and are important for those at high risk for developing complications from influenza. The vaccines are produced months in advance of the influenza season and formulations target the viruses predicted to be most prevalent. are formulated based on predictions of the viruses that are expected to be most prevalent in the upcoming season. Viral antibodies develop within 14 days, on average, after vaccine administration. The CDC’s Advisory Committee on Immunization Practices (ACIP)
recommended the use of injectable inactivated (IIV), live attenuated (LAIV4), and recombinant (RIV) influenza vaccines during the 2018-2019 influenza season. ACIP recommended that providers administer LAIV4 (FluMist® Quadrivalent) under appropriate circumstances.12

Influenza-specific AV medications may reduce influenza symptoms, shorten the period of illness, or prevent serious complications such as pneumonia.13 In addition to existing AV medication, in the fall of 2018, the U.S. Food and Drug Administration approved oral baloxavir marboxil (Xofluza®) use for uncomplicated influenza in persons aged two years and older. Influenza-specific AVs are most effective when a five-day course of treatment is administered within 48 hours of symptom onset (including the baloxavir marboxil). However, clinical benefits have been observed when treatment is initiated beyond the 48 hour window. AVs may also be administered for post-exposure chemoprophylaxis. AV treatment and chemoprophylaxis are important elements of outbreak control among high-risk populations in institutional settings such as child care facilities, nursing homes, correctional facilities, and military barracks. 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 for infected individuals. Indiscriminate use of AVs may elevate resistance to these medications or reduce seasonal availability.13 In some populations, there is evidence for elevated resistance to baloxavir marboxil.14

The CDC released one alert via the CDC Health Advisory Network (HAN) during the 2018-2019 season as influenza activity remained elevated in the US during Week 13 (01 April 2019). The HAN alert served primarily as a notice to providers about the increase of influenza A (H3N2) activity and the clinical implications of a predominantly influenza A (H3N2) season, as influenza B levels remained low during this part of the season. The alert included recommendations for clinicians regarding the use of AVs and an updated summary of approved AVs available for the season. The alert also highlighted the importance of beginning AV treatment for high-risk patients, which include children under two, adults over the age of 65, patients with more severe illness, pregnant women, and those with certain medical conditions, as soon as possible after symptom onset. Treatment for these populations can be administered prior to confirmatory laboratory testing.15

The CDC reported that the 2018-2019 influenza season was of moderate severity for 21 weeks, which is the longest season reported in ten years. Notably, this season was less severe than the past season with fewer hospitalizations among adults, though hospitalization rates were comparable for children. Nationally, influenza activity began increasing during November and by mid-April was below baseline levels. The season peaked in mid-February. The CDC notes that two waves of influenza A occurred during the season with an initial wave of influenza A(H1N1) that predominated early in the season until mid-February, followed by a wave of influenza A(H3N2) that predominated through May. Consistent with previous seasons, influenza B slightly increased in prevalence toward the end of the season but was lower in comparison to recent seasons. Vaccine effectiveness (VE) was estimated at 47% for the 2018-2019 season, which was greater than the 36% effectiveness estimated for the 2017-2018 season16 However, more recent reports indicate that the VE may have actually been poorer based on late-season data, dropping as low as 29%.17 However, it should be noted that the interim estimate was based primarily on influenza A(H1N1)
Influenza in the DON: Seasonal Summary 2018-2019
Updated: July 2019
The EpiData Center
NMCPHC-EDC-TR-346-2019

that predominated early in the season; final VE estimates for the season may be different based on the later wave of influenza A(H3N2).

The military medical community closely monitors influenza activity as military service members are at increased risk of infection due to exposure from crowded living conditions, stressful work environments, and deployments to endemic regions. Seasonal influenza vaccination is required annually for all AD service members and recruits. For the 2018-2019 season, the DOD set a goal of 90% influenza vaccination coverage for the entire DOD by January 15, 2019. Within the DON, the goal for service members remained 15 December 2018.

The EDC has retrospective surveillance data for influenza beginning with the 2005-2006 season, but routine surveillance and reporting using HL7-formatted laboratory and pharmacy data from CHCS did not begin for the DOD and DON until the 2008-2009 season. From 2008 to 2010, the EDC 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 MHS. At the start of the 2011-2012 influenza season, DON influenza surveillance expanded to include a variety of other data sources available to the EDC such as the Comprehensive Ambulatory/Professional Encounter Record (CAPER) and the Standard Inpatient Data Record (SIDR). During the 2018-2019 season, data availability was impacted by the use of a new electronic health record system, MHS GENESIS. The EDC does not currently receive data feeds from the four MHS facilities that have implemented GENESIS. As a result, data from Naval Hospital (NH) Oak Harbor, NH Bremerton, Army Medical Center (AMC) Madigan, and Fairchild Air Force Base (AFB) were not captured for the 2018-2019 season.

The EDC publishes a weekly comprehensive DON Situational Report (SITREP) that includes information on influenza medical event reports (MERs), vaccination coverage, influenza-related news, and influenza activity within vulnerable MHS subpopulations including hospitalized patients, AD service members, and recruits. The weekly SITREP is distributed to the military public health community and published to the EDC website. Through timely surveillance of influenza activity, information can be disseminated to the preventive medicine community and clinicians, ensuring ongoing situational awareness of evolving influenza trends throughout the influenza season. During the off-season, analysts at the EDC continue to monitor influenza activity and produce a monthly report.

Methods
EDC influenza surveillance followed the season and week definitions specified by the CDC. The CDC defines an influenza week as the period from Sunday through Saturday. 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), a total of 26 weeks, though more recent seasons have lasted as long as Week 17 (end of April). To account for the extended period of elevated activity during the 2018-2019 season, this report encompasses Week 40 through Week 17 (end of April). The EDC developed a standard method for applying week numbers to current and historical data, which allows for easy comparison across seasons.
The EDC receives HL7-formatted laboratory test results and pharmacy transactions from CHCS via the Defense Health Agency Solutions Delivery Division (DHA-SDD) within approximately two days of record generation. These data extracts contain information for all DOD beneficiaries who either sought care or had test results entered into the record at a fixed MTF. Due to the transition to MHS GENESIS, four MTFs (NH Oak Harbor, NH Bremerton, AMC Madigan, and Fairchild AFB) were not captured in the CHCS data extracts made available to the EDC for the 2018-2019 season.

Laboratory and pharmacy records were classified as inpatient or outpatient based on the data source and Medical Expense and Reporting System (MEPRS) codes within the records. MEPRS codes were used to distinguish inpatient and emergency department (ED) medical encounter records from outpatient medical encounters. Inpatient cases were used as a measure of severity and were defined as cases with records for both inpatient laboratory-positive hospitalizations and inpatient-dispensed AVs. Records were defined as cases based on a 14 day gap-in-care rule; separate cases occurred in the same patient if more than 14 days had elapsed since the prior occurrence.

Historical baselines were used as a comparison for current season trends with respect to laboratory-positive results, influenza AVs, and ILI trends. The EDC calculated baselines using a three-year average to compare weekly results with those from the same week during the past three seasons, which was a departure from historical methods that utilized a three-year weighted average. The methods for the 2018-2019 season were revised to account for the high burden, high severity season in 2017-2018. Using an unweighted average allowed for a better estimate of elevated activity throughout the season. Colored bands representing one standard deviation above and below seasonal baseline estimates were also displayed in figures for laboratory-positive cases and dispensed influenza AVs. The standard deviation bands provide a reference point for comparison of trends in time or volume across seasons. Beginning in the 2018-2019 season, surveillance thresholds were also introduced to signal influenza activity that exceeded expected values and were established for the percentage of ILI encounters, the number of inpatient laboratory-positive cases, and the number of inpatient-dispensed AV cases. A 14 day gap-in-care rule was used to define cases.

The DOD officially transitioned to International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes for recording diagnoses on 01 October 2015. Estimates that were calculated prior to the transition were based on queries of the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes. Following the transition, data requests from the CA PER and SIDR included queries for both ICD-9-CM and ICD-10-CM codes to account for potential lags in coding practices. Appendix A provides a detailed list of the ICD-9-CM and ICD-10-CM codes used in the analysis.
Overall Burden
The overall burden of influenza in the DON was estimated by assessing the total number of influenza cases identified from medical encounters (both outpatient encounters and inpatient hospital admissions), laboratory records, and pharmacy transactions. The data sources were aggregated and unique cases were identified by applying the gap-in-care case definition.

The aggregate data were also used to assess the relationship among databases for the purpose of developing and monitoring a comprehensive influenza surveillance system. The data were analyzed to determine the extent to which cases overlapped within laboratory, pharmacy, and medical encounter records. While analysis of laboratory and pharmacy data serves as an accepted methodology for influenza surveillance in the DON, the inclusion of encounter records consistently provides a more comprehensive understanding of overall influenza burden.

Laboratory Data
HL7-formatted microbiology and chemistry data were used to identify laboratory-positive influenza specimens and cases. The laboratory data were limited to relevant clinical specimen sources, including throat and nasal sources. The influenza type (A, B, A and B, or nonspecific) was assessed for each specimen. Percent positivity was calculated by dividing the number of influenza-positive specimens by the total number of specimens (positive and negative only; inconclusive results were excluded). Positive specimens were classified as cases based on the gap-in-care case definition.

Pharmacy Data
HL7-formatted pharmacy transactions were used to assess the number of dispensed influenza AVs. Four influenza AV medications approved by the Food and Drug Administration (FDA) were recommended for use in the US during the 2018-2019 influenza season: oral oseltamivir phosphate, inhaled zanamivir, intravenous peramivir, and oral baloxavir marboxil. Amantadine and rimantadine were not recommended for influenza treatment or chemoprophylaxis during the 2018-2019 season by CDC and were excluded from influenza surveillance for the 2018-2019 season.

Pharmacy transactions that were cancelled, had unknown prescription status, or dispensed no medication were excluded from the final data as these prescriptions were likely not distributed from the MTF pharmacy. Transactions were classified as cases based on the gap-in-care case definition. An estimate of prophylactic influenza treatment was included in this report as a proportion of all dispensed AVs. Prophylaxis was identified through evaluation of provider administration instructions in the pharmacy record, as well as the dosage and duration of the AV that was dispensed to the patient, based on the CDC’s recommended guidelines for chemoprophylaxis and treatment.

Comorbid Diagnoses for Inpatient Laboratory Cases
Common co-occurring diagnoses for inpatient laboratory-positive cases are of interest due to the possible antagonistic relationship between influenza and other diseases. To obtain diagnosis information on possible comorbidities, inpatient laboratory records were matched to inpatient
admissions and ambulatory encounter records. The inpatient analysis included records where the laboratory collection date was between the admission and discharge dates. The ambulatory record analysis included encounter data where the encounter date occurred 14 days before or after the laboratory collection date. The Clinical Classifications Software (CCS) groupings were adapted by the EDC and used to classify ICD-10-CM diagnosis codes into corresponding diagnosis categories. Unique diagnosis categories were counted once per case; cases may have been classified in more than one diagnosis category.

Clinical Encounters for ILI
CAPER and SIDR data were used to monitor ILI trends using diagnosis codes that aligned to surveillance case definitions established by the Armed Forces Health Surveillance Branch (AFHSB), which is a departure from past methods that used the syndromic case definition established by the DOD Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE) (Appendix A). The percentage of outpatient medical encounters and inpatient admissions containing at least one ILI diagnosis was calculated to evaluate the number of ILI diagnoses related to healthcare utilization at fixed MTFs. Denominators for ILI percentages were established by aggregating the total number of unique appointment identifiers. Inpatient and outpatient records, including those from ED visits, were evaluated.

MERs for Influenza-Associated Hospitalizations
The Disease Reporting System-internet (DRSi) is utilized by all military service branches for notification of reportable conditions. The Armed Forces Reportable Event Guidelines and Case Definitions require reporting of influenza-associated hospitalizations into DRSi. Reportable cases are those where the patient is younger than 65 years of age with a laboratory-positive test and a hospital admission date within 14 days after a positive test or three days or less before the positive test.22 Laboratory-positive cases and AV prescriptions were matched to DRSi MER influenza cases where the date of onset for the MER was within 14 days of the laboratory case or the date of the dispensed AV.

Coinfections
Bacterial coinfections were identified by matching laboratory-positive influenza cases to respiratory specimens from microbiology cultures and chemistry tests within 14 days of the influenza specimen collection date. Chemistry data were used only to capture rapid tests for group A *Streptococcus*. Specimens were classified as upper or lower respiratory infections using an algorithm developed by the Hospital Associated Infections and Patient Safety Division at the EDC. Upper respiratory infections (URIs) were defined as those isolated above the larynx (e.g., pharynx, ear, sinus) and lower respiratory infections (LRIs) included tracheal, sputum, or bronchial specimens. Records with nonspecific or other non-respiratory specimen sources (e.g., blood) were not considered in analysis. Potential coinfections from matched microbiology data were individually reviewed to ensure accurate organism identification. Due to small case numbers, coinfections were grouped by genera for analysis.
Vaccinations

Vaccine coverage among active duty and reserve service members was assessed weekly to monitor progress toward the DOD instruction requiring 90% coverage by 15 December 2018. Vaccination coverage was monitored using weekly data extracted from the Medical Readiness Reporting System (MRRS), which provides an aggregated number of vaccinated AD and reserve service members, total number eligible for vaccination, and total number exempt from vaccination in each component. The percentage of personnel immunized was calculated by dividing the number of personnel vaccinated by the number eligible in each command. Throughout the season, MRRS data were also used to assess vaccination coverage for the Commander, Fleet Forces Command (CFFC) and Commander, Pacific Fleet (CPF).

In addition to the overall vaccination coverage rate, AD personnel and recruits with a positive influenza laboratory result were matched to patient-level data within the Immunization Tracking System (ITS) to determine seasonal influenza vaccination status at the time of illness. Service members who received the vaccine at least 14 days before the specimen collection date were considered fully immunized. The type of vaccine administered (LAIV, IIV, RIV, multiple formulations, or unknown) was also assessed using the common vaccine code (CVX) contained within ITS to validate vaccination status. Service members with vaccination records from 01 August 2018 through 28 April 2019 were included to calculate the proportion of vaccinated AD and reserve personnel. The seasonal influenza vaccine is typically made available during August.
DON Results

Overall Burden

The total number of influenza cases identified from laboratory, pharmacy, and encounter (inpatient and outpatient) records among DON beneficiaries decreased by 34.9% from 22,432 cases for the 2017-2018 season to 14,609 cases for the 2018-2019 season. Cases were most frequently identified in encounter data (9,174; 62.8%), followed by pharmacy (8,811; 60.3%) and laboratory (6,713; 46.0%) data. Overall, 7,083 cases (48.5%) aligned with two or more data sources, compared to 41.7% in the 2017-2018 season; 3,006 cases (20.6%) aligned with all three data sources. However, 7,526 cases (51.5%) were found in only a single data source (Figure 1). These results indicate that a single-source surveillance system would not capture a significant number of potential influenza cases.

Figure 1. DON Influenza Cases by Data Source: Proportion of Overlap among Sources and Frequency of Detection by Source, 2018-2019 Season (n=14,609)

Data sources: HL7-formatted CHCS chemistry, microbiology, and pharmacy databases, SIDR, and CAPER. Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
Influenza cases peaked during Week 6 (09 February 2019) at 1,296 cases (Figure 2). The highest proportion of cases occurred in either pharmacy (48.1% to 66.2%) or encounter data (59.4% to 76.6%). The proportion of cases identified in laboratory data accounted for the fewest cases throughout the season (30.3% to 50.6%), generally increasing after Week 48 (01 December 2018) and peaking during Week 11.

Figure 2. DON Total Number of Influenza Cases from Laboratory, Pharmacy, and Encounter Data, 2018-2019 (n=14,609)

Baseline calculated as the average of the number of laboratory-positive, pharmacy, and encounter influenza cases in 2015-2016, 2016-2017, and 2017-2018 influenza seasons.

Data sources: HL7-formatted CHCS chemistry, microbiology, and pharmacy databases, SIDR, and CAPER.

Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
**Laboratory Data**

**Overall**

The overall volume of laboratory-positive influenza cases among DON beneficiaries during the 2018-2019 season (n=6,712) was lower than in the 2017-2018 season (n=7,629) but greater than during other recent seasons. Laboratory-positive cases occurred among 6,678 DON beneficiaries. The total number of laboratory-positive cases decreased by 12.0% from the previous season. In comparison to recent influenza seasons, the 2018-2019 season was typified by a later peak week, a longer season, and a relatively high burden of cases. Laboratory-positive influenza cases peaked during Week 6 at 613 cases, whereas in the previous season cases peaked in Week 5 (n=869). There were slightly more cases in Week 6 during the 2017-2018 season (n=722). ([Figure 3](#)).

*Figure 3. Frequency of Laboratory-Positive Influenza Cases among DON Beneficiaries, 2014-2019 Seasons*

Data sources: HL7-formatted CHCS chemistry and microbiology databases.
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
The number of laboratory-positive cases was consistently at or above baseline from Week 3 (19 January 2019) through Week 17 (27 April 2019). Over the course of the season, the volume of laboratory-positive cases met or exceeded baseline levels for 26 of 30 surveillance weeks (86.7%). The number of laboratory-positive cases was elevated and exceeded baseline levels by more than one standard deviation for 7 total weeks from Week 6 through 14 (with the exception of Week 8) (Figure 4).

**Figure 4.** Frequency of Laboratory-Positive Influenza Cases among DON Beneficiaries in Comparison with Seasonal Baseline, 2018-2019 Season (n=6,712)

Baseline calculated as the average of the number of laboratory-positive pharmacy and encounter influenza cases in 2015-2016, 2016-2017, and 2017-2018 influenza seasons.
Data sources: HL7-formatted CHCS chemistry and microbiology databases.
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.

Approximately 7,304 (20.7%) unique specimens tested positive for influenza. The majority of positive tests were identified by rapid diagnostic testing (4,979; 68.2%), followed by PCR (2,009; 27.5%) and culture (316; 4.3%).

The percentage of positive specimens rose above 10% during Week 50 (15 December 2018) and remained elevated above 10% through the end of seasonal monitoring (Week 17, 27 April 2019). The highest percentage of positive specimens occurred during Week 6 (668; 31.7%). Influenza types identified were unevenly distributed among the specimens: 6,829 (93.5%) influenza A, 376 (5.1%) influenza B, 57 (0.8%) influenza A and B, and 42 (0.6%) with an unknown influenza type. Influenza A was the predominant virus for the entire season. Type A laboratory-positive specimens peaked concurrently with the overall peak of the season during Week 6 (n=668). Unlike the 2017-2018 season, where 68.0% of specimens overall were typed as influenza A and influenza B
predominated after Week 8, influenza B never became more prevalent than Type A during the 2018-2019 season (Figure 5).

**Figure 5.** DON Laboratory-Positive Influenza Specimens by Influenza Type, 2018-2019 Season (n=7,304)

Note: Percent positive is calculated as the proportion of positive specimens from all unique specimens with conclusive results. Data sources: HL7-formatted CHCS chemistry and microbiology databases. Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
Table 1 illustrates the demographic characteristics of the 6,712 laboratory-positive influenza cases identified in the 2018-2019 season. The frequency of cases was similar by gender, with 3,541 (52.8%) cases among males and 3,171 (47.2%) cases among females. The highest frequency of laboratory-positive influenza cases occurred among children (3,461; 51.6%), followed by AD personnel (1,482; 22.1%), spouses (1,067; 15.9%), and other sponsors (605; 9.0%). Due to the nature of the beneficiary classifications, the totals for children will not add up to the age groups for children.

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<th>Table 1. Demographic Characteristics of Laboratory-Positive Influenza Cases among DON Beneficiaries, 2018-2019 Season</th>
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<td>Other: Non-Sponsor</td>
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Data sources: HL7-formatted CHCS chemistry and microbiology databases.
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.

Active Duty and Recruits

The DON had 1,482 AD laboratory-positive influenza cases during the 2018-2019 season, compared to 1,230 AD cases in the 2017-2018 season. A total of 970 (65.4%) cases occurred among Sailors and 512 (34.6%) cases occurred among Marines, whereas during the 2017-2018 season there were 874 (71.0%) cases among Sailors and 356 (28.9%) cases among Marines. Among recruits, 90 laboratory-positive influenza cases were identified in the 2018-2019 season, compared to 135 in the 2017-2018 season. During the current season, 17 (18.9%) cases occurred among Sailors and 73 (81.1%) cases occurred among Marines. Laboratory positive cases peaked during Week 11 for AD Sailors and Marines (n=131) and Week 13 for recruits (n=12).
The seasonal trend of DON AD influenza cases was mostly consistent with the trend for all DON beneficiaries, with elevated activity above baseline for 24 of 30 surveillance weeks. Laboratory-positive cases among AD were at or above one standard deviation from the baseline for eleven total weeks during the season; recruit rates met or exceeded one standard deviation for five weeks. The overall frequency of AD cases for the 2018-2019 season was much higher than the frequency of cases from recent seasons.

Influenza rates for both AD Sailors and Marines diverged from seasonal baselines and peaked several weeks after the baseline peaks. The rate among both AD Sailors (25.5 per 100,000 service members) and AD Marines (25.4 per 100,000 service members) peaked in Week 11. The influenza rates among AD Sailors and Marines generally mirrored each other during the season, peaking during the same week and declining in a similar pattern thereafter (Figure 6).

**Figure 6.** Rates of DON Laboratory-Positive Influenza Cases by Service, per 100,000 Active Duty Service Members, 2018-2019 Season

Baseline calculated as the unweighted average of the number of laboratory-positive influenza cases in 2015-2016, 2016-2017, and 2017-2018 seasons.
Data sources: HL7-formatted CHCS chemistry and microbiology databases.
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.

**Children and Other Age Groups**

The frequency of laboratory-positive cases among children (0-17 years) during the 2018-2019 season was higher than during the 2015-2016 and 2016-2017 seasons and decreased by less than 1% over the 2017-2018 season (data not shown). However, the peak count (n=439) during the 2017-2018 season was much higher than the peak count during the current season. Peak
frequencies were observed during Week 6 (n=335), one week later than the 2017-2018 season. The number of laboratory-positive cases among children was elevated and exceeded baseline levels by more than one standard deviation for five total weeks (Figure 7).

**Figure 7.** Frequency of Laboratory-Positive Influenza Cases among Children Age 17 and Under in Comparison with Seasonal Baseline, 2018-2019 Season (n=3,381)

Baseline calculated as the unweighted average of the number of laboratory-positive influenza cases in 2015-2016, 2016-2017, and 2017-2018 seasons.
Data sources: HL7-formatted CHCS chemistry and microbiology databases.
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
Influenza rates for all age groups of DON beneficiaries were monitored throughout the season. The average rates in children (0-4 years and 5-17 years) were higher than in other age groups. The peak rates of laboratory-positive influenza cases among children were similar between the two age groups; children ages 0 to 4 peaked in Week 7 and again in Week 11 (68.4 per 100,000 population) and children ages 5 to 7 peaked in Week 6 (67.6 per 100,000 population). The rates for older individuals peaked later, with adults ages 18-44 peaking in Week 7 (20.9 per 100,000 population) and adults over the age of 45 peaking in Week 9 (8.3 per 100,000 population) (Figure 8).

Figure 8. Rates of DON Laboratory-Positive Influenza Cases among DON Beneficiaries, By Age Group, 2018-2019 Season.

Rate is calculated as the number of laboratory-positive cases in that group per 100,000 population.
Data sources: HL7-formatted CHCS chemistry and microbiology databases.
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
Inpatient Cases

The total burden of laboratory-positive inpatient cases among DON beneficiaries during the 2018-2019 season was lower than the previous season. Of 6,712 total laboratory-positive influenza cases in the 2018-2019 season, there were 78 (1.2%) inpatient cases, representing a 54.7% decrease from the previous season (n=172), a high severity season. The frequency of inpatient cases did not exceed the surveillance threshold of 12 cases during the season (Figure 9). During the previous three seasons, the highest number of inpatient cases during any week was 24 cases, and the number of inpatient cases remained above the threshold for three consecutive weeks (Weeks 52-1) during the 2017-2018 season.

Most inpatient cases were Type A (72; 92.3%). More than half of the inpatient cases were above the age of 45 years (42; 53.9%). The highest frequency of inpatient laboratory-positive cases occurred among spouses (28, 35.9%) and other sponsors (28; 35.9%), followed by children (12; 15.4%) (data not shown).

Figure 9. Inpatient Laboratory-Positive Influenza Cases, DON Beneficiaries, 2018-2019 Season (n=78)

Surveillance threshold is calculated as the in-season average number of inpatient cases plus one standard deviation in 2015-2016, 2016-2017, and 2017-2018 seasons.

Data sources: HL7-formatted CHCS chemistry and microbiology databases.

Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
Co-occurring Diagnoses among Inpatient Laboratory Cases

Laboratory-confirmed inpatient cases (n=78) were matched to hospital admissions and outpatient encounter data to identify co-occurring diagnoses. The 20 most common diagnoses (in any diagnostic position in the record) among influenza-positive inpatient cases are shown in Table 2 (excluding administrative and unclassified residual codes). An influenza diagnosis was included in an encounter record among 92.3% of the laboratory-confirmed inpatient cases. Fluid and electrolyte disorders were identified in 39.7% of cases and essential hypertension was identified in 38.5% of the cases. Other conditions that may increase the risk of influenza-related complications include diabetes mellitus without complication (17.9%), cardiac dysrhythmias (25.6%), and pneumonia (26.9%).23 The median duration between admission and discharge for patients with an inpatient admission record and a laboratory-confirmed influenza test was 2 days, with a maximum duration of 21 days.

Table 2. Twenty Most Common Diagnoses among Inpatient DON Laboratory-Positive Influenza Cases, 2018-2019 Season (n=78)

<table>
<thead>
<tr>
<th>Diagnostic Category</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza</td>
<td>72</td>
<td>92.3%</td>
</tr>
<tr>
<td>Fluid and electrolyte disorders</td>
<td>31</td>
<td>39.7%</td>
</tr>
<tr>
<td>Essential hypertension</td>
<td>30</td>
<td>38.5%</td>
</tr>
<tr>
<td>Other aftercare</td>
<td>30</td>
<td>38.5%</td>
</tr>
<tr>
<td>Disorders of lipid metabolism</td>
<td>27</td>
<td>34.6%</td>
</tr>
<tr>
<td>Other gastrointestinal disorders</td>
<td>27</td>
<td>34.6%</td>
</tr>
<tr>
<td>Other lower respiratory disease</td>
<td>27</td>
<td>34.6%</td>
</tr>
<tr>
<td>Deficiency and other anemia</td>
<td>24</td>
<td>30.8%</td>
</tr>
<tr>
<td>Other screening for suspected conditions (not mental disorders or infectious disease)</td>
<td>24</td>
<td>30.8%</td>
</tr>
<tr>
<td>Pneumonia (except that caused by tuberculosis or sexually transmitted disease)</td>
<td>21</td>
<td>26.9%</td>
</tr>
<tr>
<td>Cardiac dysrhythmias</td>
<td>20</td>
<td>25.6%</td>
</tr>
<tr>
<td>Screening and history of mental health and substance abuse codes</td>
<td>18</td>
<td>23.1%</td>
</tr>
<tr>
<td>Acute and unspecified renal failure</td>
<td>17</td>
<td>21.8%</td>
</tr>
<tr>
<td>Hypertension with complications and secondary hypertension</td>
<td>16</td>
<td>20.5%</td>
</tr>
<tr>
<td>Other nutritional; endocrine; and metabolic disorders</td>
<td>16</td>
<td>20.5%</td>
</tr>
<tr>
<td>Respiratory failure; insufficiency; arrest (adult)</td>
<td>16</td>
<td>20.5%</td>
</tr>
<tr>
<td>Other nervous system disorders</td>
<td>15</td>
<td>19.2%</td>
</tr>
<tr>
<td>Diabetes mellitus without complication</td>
<td>14</td>
<td>17.9%</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>13</td>
<td>16.7%</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease and bronchiectasis</td>
<td>13</td>
<td>16.7%</td>
</tr>
</tbody>
</table>

Includes all diagnoses in any diagnostic position from inpatient and outpatient records within 14 days of the laboratory-identified case. Cases may be classified within more than one category. This table does not display the frequency of administrative and unclassified residual codes.

Data sources: CAPER and SIDR.

Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
Geographical Distribution

NMC Camp Lejeune had the highest frequency of laboratory-positive influenza cases during the season, followed by NH Jacksonville and NMC San Diego. Eight of the facilities with the highest frequencies of laboratory-positive cases among DON beneficiaries were Navy facilities, though it should be noted that NH Jacksonville transitioned under the Defense Health Agency (DHA) in October 2018. Two joint facilities were also among the ten facilities with the highest volume of DON cases. Fort Belvoir Community Hospital (FBCH) reported the highest proportion of cases from a non-Navy facility and contributed 5.1% (n=342) of all DON laboratory-positive influenza cases for the 2018-2019 season (Figure 10). Other naval health clinics peaked later in the season around Weeks 12 and 13 (data not shown).

Figure 10. Facilities with the Highest Frequencies of Laboratory-Positive Influenza Cases among DON Beneficiaries, 2018-2019 Season

Of the facilities with the ten highest frequencies of DON cases, seven peaked later than the overall DON peak of Week 6. NMC Camp Lejeune and NH Yokosuka peaked during Week 5, and NH Jacksonville peaked during Week 6 (Figure 11).
Figure 11. Weekly Frequencies of Laboratory-Positive Influenza Cases at DON MTFs Reporting the Highest Overall Frequencies in the 2018-2019 Season

Data sources: HL7-formatted CHCS chemistry and microbiology databases.
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
Pharmacy Data

Overall

The total number of influenza AVs dispensed to DON beneficiaries during the 2018-2019 season (n=8,812) decreased by nearly 40.0% and peaked later than the 2017-2018 season (n=14,443). During the current season, the weekly volume of dispensed AVs began to increase sharply after Week 47, peaked during Week 6 (n=809), and was 60.0% less the number of AVs dispensed (n=1,926) during the peak week of the previous season (Figure 12).

Figure 12. Frequency of Influenza Antiviral Prescriptions Dispensed to DON Beneficiaries, By Season, 2014-2019

Data sources: HL7-formatted CHCS pharmacy database.
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.

Similar to the seasonal trend for laboratory-positive cases, the number of dispensed AVs was consistently at or above baseline for the majority of the 2018-2019 season. The volume of dispensed AVs exceeded baseline levels for 20 of 30 surveillance weeks (66.6%) and exceeded baseline levels by more than one standard deviation for 2 non-consecutive weeks (Figure 13).
Figure 13. Frequency of Influenza Antiviral Prescriptions Dispensed to DON Beneficiaries in Comparison with Seasonal Baseline, 2018-2019 Season (n=8,812)

Baseline calculated as the unweighted average of the number of antiviral prescriptions dispensed in 2015-2016, 2016-2017, and 2017-2018 seasons.
Data sources: HL7-formatted CHCS pharmacy database.
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
Of all AVs dispensed to DON beneficiaries, oseltamivir was most frequently prescribed (99.9%), followed by zanamivir (0.02%) (data not shown). The frequency of dispensed AVs was similar among females (50.6%) and males (49.4%). Similar to trends among laboratory-positive cases, by beneficiary category the highest frequency of AV cases occurred among the child beneficiary category (3,957; 44.9%), followed by spouses (2,038; 23.1%), AD service members (1,753; 19.9%), and other sponsors (1,005; 11.4%) (Table 3). Due to the nature of the beneficiary classifications, the totals for children will not add up to the totals for the age groups for children.

<table>
<thead>
<tr>
<th>Total</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8,812</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>4,356 (49.4%)</td>
</tr>
<tr>
<td>Female</td>
<td>4,456 (50.6%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 4</td>
<td>1,481 (16.8%)</td>
</tr>
<tr>
<td>5 - 17</td>
<td>2,322 (26.4%)</td>
</tr>
<tr>
<td>18 - 44</td>
<td>3,166 (35.9%)</td>
</tr>
<tr>
<td>45+</td>
<td>1,843 (20.9%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Beneficiary Category</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Duty</td>
<td>1,753 (19.9%)</td>
</tr>
<tr>
<td>Recruit</td>
<td>48 (0.5%)</td>
</tr>
<tr>
<td>Spouse</td>
<td>2,038 (23.1%)</td>
</tr>
<tr>
<td>Child</td>
<td>3,957 (44.9%)</td>
</tr>
<tr>
<td>Other: Sponsor</td>
<td>1,005 (11.4%)</td>
</tr>
<tr>
<td>Other: Non-Sponsor</td>
<td>12 (0.1%)</td>
</tr>
</tbody>
</table>


Active Duty and Recruits
During the 2018-2019 season, 1,753 (19.9% of the DON total) AVs were dispensed to AD service members; Sailors received 1,345 (76.7%) AVs and Marines received 408 (23.3%). Among recruits, 48 AVs were dispensed; recruit Sailors received 16 (33.3%) AVs and recruit Marines received 32 (66.6%) AVs. The weekly frequency of dispensed AVs for AD service members peaked later than for the DON overall, with the peak (n=173) occurring three weeks after the DON peak during Week 9. The overall frequency of AVs dispensed to AD service members for the 2018-2019 season was higher than in recent seasons, with the exception of 2017-2018. The rate among AD Sailors peaked in Week 9 at 39.2 per 100,000 service members. The rate among AD Marines peaked during Week 9 as well at 20.6 per 100,000 service members. The rate of AV
prescriptions dispensed among AD Sailors was higher than that of AD Marines for 25 of 30 weeks (Figure 14).

Figure 14. Rates of Influenza Antiviral Prescriptions Dispensed by Service, per 100,000 Active Duty Service Members, 2018-2019 Season

Baseline calculated as the unweighted average of the number of antiviral prescriptions dispensed in 2015-2016, 2016-2017, and 2017-2018 seasons.
Data sources: HL7-formatted CHCS pharmacy database.
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
Children and Other Age Groups

The total number of AV prescriptions dispensed to children (0-17 years) during the 2018-2019 season was 3,803, which is lower than during the previous season. Peak frequencies were observed during Week 7 (n=377). The number of AVs dispensed among children was elevated and exceeded baseline levels by more than one standard deviation for seven consecutive weeks (Figure 15).

**Figure 15.** Frequency of Influenza Antiviral Prescriptions Dispensed among Children Age 17 and Under in Comparison with Seasonal Baseline, 2018-2019 Season (n=3,803)

Baseline calculated as the unweighted average of the number of antiviral prescriptions dispensed in 2015-2016, 2016-2017, and 2017-2018 seasons.

Data sources: HL7-formatted CHCS pharmacy database.

Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
The rate of dispensed AVs among DON beneficiaries was highest among children. Rates trended higher for those aged 0-4 years and 5-17 years as compared to those aged 18-44 years and 45+ years. The rate for those aged 0-4 years peaked during Week 7, while all other age groups peaked in Week 6. The peak rate among children age 0-4 years was 83.9 per 100,000 population, and the peak rate for children age 5-17 years was 69.2 per 100,000 population. (Figure 16).

**Figure 16. Rates of Influenza Antiviral Prescriptions Dispensed among DON Beneficiaries, By Age, 2018-2019 Season**

![Graph showing rates of influenza antiviral prescriptions dispensed among DON beneficiaries by age from week 4 to week 17, with peak rates for children aged 0-4 years in week 7 and 5-17 years in week 6.](image-url)

Data sources: HL7-formatted CHCS pharmacy database.
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.

**Inpatient Dispensed Antivirals**
Among the 8,812 AVs dispensed during the 2018-2019 season, 307 (3.6%) occurred in an inpatient setting. The frequency of inpatient dispensed AVs exceeded the surveillance threshold for 6 of 30 surveillance weeks (Figure 17).
Figure 17. Influenza Antiviral Prescriptions Dispensed in an Inpatient Setting, DON Beneficiaries, 2018-2019 Season (n=307)

Surveillance threshold is calculated as the in-season average number of inpatient cases plus one standard deviation in 2015-2016, 2016-2017, and 2017-2018 seasons.
Data sources: HL7-formatted CHCS pharmacy database.
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.

Prophylactic Antiviral Prescriptions
The proportion of dispensed antivirals that were identified as chemoprophylaxis accounted for 11.1% of all dispensed antivirals. The majority of AVs were dispensed for treatment of influenza, accounting for 88.5% of all dispensed antivirals. AVs dispensed for chemoprophylaxis peaked after the total AV peak (Week 6) in Week 8 (Figure 18). By MTF, NH Pensacola had the largest number of prophylactic prescriptions (n=582, 6.7%), while Army Medical Center (AMC) Brooke Army Medical Center had the largest number of AVs dispensed for influenza treatment (n=1,470, 16.7%) to DON beneficiaries (data not shown).
Prophylaxis is identified through a combination of antiviral dose, duration, and provider instructions. Data sources: HL7-formatted CHCS pharmacy database. Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.

Geographical Distribution
NH Pensacola reported the highest volume of dispensed AVs to DON beneficiaries during the season, followed by NMC Portsmouth and NMC San Diego. Eight of the facilities with the highest frequencies of dispensed AVs among DON beneficiaries were Navy facilities, though it should be noted that NH Jacksonville transitioned under the Defense Health Agency (DHA) in October 2018. Two joint facilities, three Air Force facilities, and three Army facilities were also in the top 25 for dispensed AVs among DON beneficiaries. NH Pensacola contributed 12.0% (n=1,055) of all influenza DON AV cases during the 2018-2019 season. Walter Reed National Medical Center reported the highest volume of dispensed AVs from a non-Navy facility and contributed 4.5% of DON AVs (n=394) (Figure 19).
Figure 19. Facilities with the Highest Frequency of Influenza Antiviral Prescriptions Dispensed among DON Beneficiaries, 2018-2019 Season

- NH Pensacola: 1055
- NMC Portsmouth: 1047
- NM San Diego: 885
- NH Jacksonville: 497
- NMC Camp Lejeune: 478
- NH Camp Pendleton: 473
- Walter Reed Natl Mil Med CTR: 394
- Fitzsimons Community Hospital: 350
- NMC Lemoore: 281
- NH Yokosuka: 246


Of the facilities with the ten highest frequencies of dispensed AVs in the DON, only NH Yokosuka peaked before the DON peak (Week 5 vs. Week 6). NH Jacksonville and NMC Camp Lejeune peaked during Week 6 (Figure 20).
Data sources: HL7-formatted CHCS pharmacy database. 
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.

**Encounter-Based ILI**

**Overall**

During the 2018-2019 season, there were 231,833 total ILI medical encounters and ED visits among DON beneficiaries. The percentage of encounters due to ILI followed general historical trends in the early and late parts of the season, and all baseline peaks were during Week 52. The peak weeks were similar to the 2017-2018 season. The percentage of ED visits due to ILI peaked during Week 52 (20.9%) and Week 7 (20.7%). The overall percentages of inpatient and outpatient medical encounters due to ILI were less than that of ED visits; inpatient ILI peaked at 7.7% during Week 10, which was nine weeks later than the 2017-2018 season. Outpatient ILI peaked in Week 52 at 6.3% (Figure 21). ILI trends differ from laboratory and pharmacy trends, exhibiting a first peak five weeks earlier.
Figure 21. Percentage of Medical Encounters due to Influenza-Like Illness (ILI) among DON Beneficiaries in Comparison with Seasonal Baselines, 2018-2019 Season

Baseline calculated as the unweighted average of the percentage of outpatient medical encounters due to ILI in 2015-2016, 2016-2017, and 2017-2018 seasons.
Influenza-like illness (ILI) is defined based on the surveillance definitions from the Armed Forces Health Surveillance Branch (AFHSB).
Data sources: CAPER and SIDR.
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
Active Duty

The percentage of outpatient encounters attributed to ILI among AD DON service members generally followed baseline trends during the 2018-2019 season. A peak occurred during Week 52 with 3.7% of outpatient encounters due to ILI, which corresponded to the week ending 29 December 2018. (Figure 22). Outpatient ILI levels were at or exceeded the surveillance threshold of 2.7% for three weeks total during the peak of influenza activity.

**Figure 22.** Percentage of Outpatient Medical Encounters due to Influenza-Like Illness (ILI) among Active Duty DON Service Members in Comparison with Seasonal Baselines, 2018-2019 Season

Baseline calculated as the unweighted average of the percentage of outpatient medical encounters due to ILI in 2015-2016, 2016-2017, and 2017-2018 seasons.

Influenza-like illness (ILI) is defined based on the surveillance definitions from the Armed Forces Health Surveillance Branch (AFHSB).

Data sources: CAPER and SIDR.

Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
**MERs for Influenza-Associated Hospitalizations**

During the 2018-2019 influenza season, 119 influenza-associated hospitalizations for DON beneficiaries were reported to DRSi. Fifty-six percent (n=66) of MERs had both a corresponding pharmacy and laboratory record. Twenty-three percent (n=27) matched only to laboratory records, and 3.4% (n=4) matched only to pharmacy records. Twenty-two MERs (18.5%) did not match laboratory or pharmacy records. Influenza-associated hospitalizations were most frequently reported during Week 6 (n=22, data not shown). See Figure 23 for details. NMC Portsmouth and NH Jacksonville reported the highest number of influenza-associated hospitalizations (n=28, data not shown). Those aged 18-44 years accounted for 38.7% of MERs. A majority of reports were for those with a Navy sponsor service.

**Figure 23.** Medical Event Reports for Influenza-Associated Hospitalizations among DON Beneficiaries aged 65 and Younger, 2018-2019 Season

Data sources: Disease Reporting System – Internet (DRSi).
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
Coinfections

During the 2018-2019 season, 3.2% (n=213) of laboratory-positive influenza cases (n=6,712) had a total of 217 bacterial respiratory coinfections. Children ages 5-17 years old had the largest proportion of coinfections (3.2%) out of the total influenza cases for that age group (n=2,359).

URIs represented 94.0% (n=204) of all coinfections (n=217) and were present in 3.0% of all influenza cases. LRIs represented 6.0% (n=13) of all coinfections and were present in 0.2% of all influenza cases. Adults over the age of 45 had the most LRIs (n=8).

Coinfections among laboratory-positive influenza cases represented six unique genera of bacterial isolates, which was half the number from the 2017-2018 season. Overall, the most commonly identified genus was *Streptococcus* (n=198). Nearly 99.5% of *Streptococcus* coinfections were isolated from upper respiratory specimens. Among lower respiratory specimens, *Staphylococcus* was the most commonly isolated genus (53.8%) (Table 4).

Table 4. Genera of Coinfections among Laboratory-identified Influenza Cases, DON Beneficiaries, 2018-2019 Season.

<table>
<thead>
<tr>
<th>Coinfection Genus</th>
<th>Upper Respiratory (%)</th>
<th>Lower Respiratory (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Streptococcus</em></td>
<td>197 (96.6%)</td>
<td>1 (7.7%)</td>
<td>198 (91.2%)</td>
</tr>
<tr>
<td><em>Staphylococcus</em></td>
<td>3 (1.5%)</td>
<td>7 (53.8%)</td>
<td>10 (4.6%)</td>
</tr>
<tr>
<td><em>Haemophilus</em></td>
<td>3 (1.5%)</td>
<td>2 (1.5%)</td>
<td>5 (2.3%)</td>
</tr>
<tr>
<td><em>Klebsiella</em></td>
<td>0 (0%)</td>
<td>2 (1.5%)</td>
<td>2 (0.9%)</td>
</tr>
<tr>
<td><em>Escherichia</em></td>
<td>0 (0%)</td>
<td>1 (7.7%)</td>
<td>1 (0.5%)</td>
</tr>
<tr>
<td><em>Neisseria</em></td>
<td>1 (0.5%)</td>
<td>0 (0.0%)</td>
<td>1 (0.5%)</td>
</tr>
<tr>
<td>Total</td>
<td>204</td>
<td>13</td>
<td>217</td>
</tr>
</tbody>
</table>

Data sources: Health Level 7(HL7)-formatted CHCS microbiology and chemistry databases. Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.

Vaccinations

Active Duty

The DOD sets an annual goal in December to reach 90% influenza immunization of all military personnel. For the 2018-2019 season, the DOD deadline was Week 3 (15 January 2019), while the DON deadline was set for Week 50 (15 December 2018), the same as in recent years. The DON achieved 90% vaccination coverage in Week 51 (24 December 2018), one week later than the DON’s goal date. Among AD service components, the Marine Corps reached the DON goal for vaccination coverage in Week 50 and the Navy reached the goal one week later during Week 51. Among reserve components, the Navy Reserve reached the goal of 90% vaccination coverage during Week 3 and the Marine Corps Reserve in Week 6. It should be noted that MRRS relies on timely reporting; a lag in reporting by units into MRRS may result in a delay in meeting the goal. The final immunization coverage for AD and reserve components of the DON (at Week 17) is presented in Table 5.
Table 5. Influenza Vaccination Coverage, DON Active and Reserve Components, 2018-2019 Season

<table>
<thead>
<tr>
<th>Service/Component</th>
<th>Total Population</th>
<th>Number Vaccinated&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Number Exempt</th>
<th>Percent Vaccinated&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navy Active Duty</td>
<td>300,617</td>
<td>290,416</td>
<td>1,310</td>
<td>97.0%</td>
</tr>
<tr>
<td>Navy Reserve</td>
<td>50,883</td>
<td>48,061</td>
<td>525</td>
<td>95.0%</td>
</tr>
<tr>
<td>Marine Corps Active Duty</td>
<td>142,314</td>
<td>137,262</td>
<td>604</td>
<td>97.0%</td>
</tr>
<tr>
<td>Marine Corps Reserve</td>
<td>34,032</td>
<td>30,780</td>
<td>946</td>
<td>93.0%</td>
</tr>
<tr>
<td>Total</td>
<td>527,846</td>
<td>506,519</td>
<td>3,385</td>
<td>96.6%</td>
</tr>
</tbody>
</table>

<sup>a</sup>Includes injection and intranasal vaccines for the 2018-2019 season.

<sup>b</sup>Percent vaccinated is calculated as the proportion of service members vaccinated out of total eligible members. Immunization status is current as of 01 May 2019.

Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.

Among the 1,428 AD service members with a laboratory-positive influenza record in the 2018-2019 season, 1,288 (86.9%) were vaccinated more than 14 days prior to their influenza infection, meaning that they were considered to be fully immune to the influenza virus. Eight percent (n=118) of laboratory-positive AD cases had no record of vaccination, and a further 75 (5.1%) were vaccinated less than 14 days prior to infection, meaning that they were not yet immune to influenza at the time of infection. A total of 90 recruits had a laboratory-positive influenza report. Forty-six (51.1%) of those recruits were vaccinated more than 14 days prior to their infection and 31 (34.4%) were vaccinated less than 14 days prior to infection. Thirteen (14.1%) had no vaccination record.

**US Fleet Forces Command**

Overall US Fleet Forces achieved 90% influenza vaccination during Week 49, which was one week earlier than the DON goal date for 90% vaccination (15 December 2018). CPF surpassed the DON’s goal by achieving 90.7% vaccination coverage in Week 49. CFFC reached the goal one week later by achieving 92.6% vaccination coverage in Week 50 (Figure 24). At the end of the season (Week 17), 98.6% of eligible Fleet Forces personnel had received an influenza vaccination.
Figure 24. Influenza Vaccination Coverage for Commander, Fleet Forces Command (CFFC) and Commander, Pacific Fleet (CPF), 2018-2019 Season

Data sources: Medical Readiness Reporting System (MRRS).
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
DOD Results

Laboratory Data
During the 2018-2019 season, 25,367 laboratory-positive influenza cases occurred among DOD beneficiaries, a 23.6% decrease from the 2017-2018 season (n=33,216). Approximately 21.1% of unique specimens (n=30,154) tested positive for influenza.

The highest percentage of positive specimens occurred during Week 7 (32.4%) (16 February 2019), whereas in the previous season positive specimens peaked in Week 2 (7 January 2018). The percentage of positive specimens rose above 10% during Week 51 (22 December 2018), compared to Week 46 in the previous season (12 November 2017), and remained elevated above 10% through the remainder of the season. The most common influenza type among laboratory-positive specimens was influenza A (93.1%), followed by influenza B (5.4%), dual infection with A and B (0.7%), and nonspecific types (0.8%). Influenza A was the predominant virus for the entirety of the season. Influenza A laboratory-positive specimens peaked during Week 7 (n=3,042), the same as the overall season peak. Influenza B became more prevalent as the season progressed, but never surpassed Type A as the predominant circulating type. (Figure 25).

Figure 25. DOD Laboratory-Positive Influenza Tests by Influenza Type, 2018-2019 Season

Percent positive is calculated as the proportion of positive specimens from all unique specimens with conclusive positive results.

Data sources: Health Level 7(HL7)-formatted CHCS chemistry and microbiology databases.
Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
During the 2018-2019 season, there were 25,367 AD DOD laboratory-positive influenza cases [11,486 (45.3%) Army, 6,275 (24.7%) Air Force, 4,468 (17.6%) Navy, 2,244 (8.9%) Marine Corps, and 295 (1.2%) Coast Guard]. Rates of laboratory-positive influenza cases by service are presented in Figure 25. Rates were generally highest among Air Force service members and peaked at 50.8 per 100,000 service members during Week 9. Influenza rates for AD service members peaked between Week 2 and Week 11; the Coast Guard rate peaked in Week 2, the Air Force rate in Week 9, and the Army, Navy, and Marine Corps rates peaked in Week 11 (Figure 26).

Figure 26. Rates of Laboratory-Positive Influenza Cases by Service, per 100,000 Active Duty Service Members, 2018-2019 Season

Data sources: Health Level 7 (HL7)-formatted CHCS chemistry and microbiology databases. Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
Discussion

The 2018-2019 DON influenza season was longer in duration and higher in case volume compared to the 2015-2016 and 2016-2017 seasons, though the volume and severity of influenza was lower than the 2017-2018 season. Large numbers of influenza cases were observed in all three data sets surveilled: laboratory-positive records, AV dispensation records, and medical encounter records. Children (0-17 years) had consistently higher rates of laboratory-positive cases and dispensed AVs when compared to adults ages 18 and older. Influenza activity began diverging from baseline trends in January and activity remained elevated throughout the remainder of the seasonal reporting period, and was at or above baseline levels for more than 84% of the season. The DON influenza season was of moderate severity according to CDC definitions; DON inpatient laboratory-positive cases never exceeded the surveillance threshold during the season, however inpatient dispensed antivirals exceeded the threshold for six consecutive weeks (Weeks 6-11). For comparison, the 2017-2018 season was one of high severity where inpatient cases exceeded expected levels for at least ten weeks. However, changes in testing (such as an increase or decrease in testing practices at specific MTFs), prescribing, or care-seeking practices may contribute to an increase or decrease in the observed volume of cases and are important to consider when interpreting findings. The EDC was able to estimate the approximate volume of prophylactic AVs dispensed during the season, which assisted in interpretation of the antiviral trends. Less than 25% of dispensed AVs were categorized as chemoprophylaxis.

Influenza activity in the DON followed weekly trends similar to those in the civilian US population as reported by the CDC, with peak activity during Weeks 6-7. CDC influenza surveillance indicated that influenza A (H1N1) was the predominant strain during the 2018-2019 season. During seasons when the predominant subtype circulating in the population is influenza A (H3N2), such as the 2017-2018 season, the CDC indicated that even well-matched vaccines may have limited protective effects. Mid-season CDC estimates for vaccine effectiveness (VE) for the 2018-2019 season indicated a 47% reduction in the risk of an influenza-associated medical event associated with vaccination, higher than VE estimates for the previous season (36%). However, initial late-season estimates were much lower (29%) compared to the previous season.

For DON AD service members, the rates of laboratory-positive cases and dispensed AVs exceeded baseline rates for several weeks. Influenza-related hospitalizations among AD service members negatively impact medical readiness. During the 2018-2019 season, six inpatient laboratory-positive cases and 42 inpatient dispensed antivirals AVs were identified in AD service members. Influenza vaccinations are an important part of ensuring continued mission readiness by reducing influenza illness and severity among AD service members. BUMED guides the implementation of influenza immunization policy among AD Navy and Marine Corps service members and helps to ensure that vaccination goals are met for the DON. The seasonal DOD goal of 90% influenza vaccination coverage of DON AD personnel was achieved one week after the DOD deadline of 15 December 2018. However, influenza specimens were identified in AD and recruit personnel who obtained full immunization coverage before a positive specimen collection date. Over 86% of AD Sailors and Marines with a laboratory-confirmed influenza case were vaccinated more than 14 days prior to infection.
Laboratory-positive influenza cases and dispensed AVs from an inpatient setting are used as a proxy for the severity of the influenza season. A lower volume of inpatient laboratory-positive cases occurred during the 2018-2019 season compared to recent seasons, indicating a low to moderate severity season. Specifically, the volume of laboratory-positive cases from an inpatient setting decreased by 54.6% from the 2018-2019 season, a high severity season.

Medical encounters for ILI, based on the AFHSB definition22, do not appear to correlate well with the influenza trends observed in laboratory and pharmacy data. The percentage of ILI encounters peaked both earlier and later than the overall activity peak in laboratory and pharmacy records. The magnitude by which indicators diverged from the baseline this season was also dissimilar; the percentage of ILI tracked with baseline levels during most of the season and was only slightly elevated during the peak of the season, while laboratory and pharmacy indicators exceeded one standard deviation above baseline for an extended period during the height of the season. This discrepancy is likely related to the broad set of diagnostic codes included in the AFHSB ILI definition, possibly resulting in a high sensitivity and low specificity for influenza.

Strengths
Within the EDC, surveillance of HL7-formatted laboratory and pharmacy data continues to serve as the primary standard for measuring influenza activity among military beneficiary populations. Weekly baselines and surveillance thresholds are presented with each surveillance measure to provide perspective on current influenza activity in relation to recent seasons, but the EDC maintains the capability to review long-standing historical influenza trends. Laboratory surveillance for influenza is available beginning with the 2005-2006 influenza season, while historical trends for influenza-specific AVs are available as early as the 2006-2007 influenza season.

The influenza surveillance capabilities established by the EDC provide an unparalleled, comprehensive 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 MTFs. The ability to use a broad perspective and understand the value of each data source’s contribution are essential factors for a comprehensive surveillance system. Additionally, national surveillance systems do not provide monitoring for influenza-specific AVs, which provide a mechanism to detect influenza-like activity regardless of whether the underlying disease is laboratory-confirmed or diagnosed in encounter records. This is particularly important where influenza testing may not be routine.

Furthermore, the EDC utilizes HL7-formatted laboratory and pharmacy surveillance to account for under-reporting of hospitalized influenza infections. Reporting severe influenza cases is important as these events have the potential to greatly impact mission readiness, particularly those occurring in AD 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 providing laboratory-positive, reportable influenza cases in the case finding module of DRSi. Data in the case finding module can be used to pre-populate a MER form, 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, particularly if case definitions and requirements have changed.

The EDC conducts weekly surveillance processes outside of the DON SITREP analysis to provide supportive expertise to BUMED and AFHSB. To support influenza surveillance across the DOD, the EDC provides weekly extracts of HL7-formatted laboratory and pharmacy records, including classified test results and sub-types where applicable. These extracts are utilized to create the weekly DOD Seasonal Influenza Surveillance Summary published by AFHSB. In addition, the EDC calculates overall laboratory percent positive, inpatient-laboratory percent positive, and inpatient-AV percent positive by parent MTF. These values are supplied to BUMED on a weekly basis during the influenza season to contribute to an online dashboard used to provide situational awareness of disease burden, measure readiness, and facilitate organizational planning.

Limitations
Several noteworthy limitations are applicable to this analysis. Medical data considered in this report were generated within the CHCS at fixed MTFs. This analysis does not include records from the four MTFs that have transitioned to MHS GENESIS, purchased care providers, shipboard facilities, battalion aid stations, and in-theater facilities. Case counts may be impacted over time due to changes in testing, prescribing, or care-seeking practices and are important to consider when interpreting findings.

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 may 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 ILI symptoms or patients with superficial infections who are treated presumptively. Classifying microbiology tests involves extensive searching of free-text test result fields.

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 pharmacy databases consist of outpatient non-intravenous prescriptions, inpatient non-intravenous prescriptions (unit-dose), and intravenous prescriptions. Though treatment compliance in the inpatient setting can be assumed, outpatient pharmacy records indicate only 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. Much like the laboratory databases, pharmacy records do not include purchased care records and therefore the number of dispensed AVs may be an underestimate. As opposed to previous years, the EDC was able to determine the proportion of AVs that were dispensed for prophylactic use in the 2018-2019 season.

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 MTF, and case counts may change between the time the report is created and distributed. Records of medical encounters depend on correct ICD-9-CM and ICD-10-CM coding practices. Additionally, because records are submitted into the system at different times, there may be patients who have had an inpatient or outpatient encounter but were not captured in the current data. Inpatient records are created at discharge or transfer from an inpatient medical treatment facility. For DOD AD personnel only, non-MTF (purchased care) hospitalizations may generate a SIDR record upon discharge.

The EDC weekly extract of ITS data are limited to AD 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 generated only 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.

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 are 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. PMTs also have 30 days to submit a MER, which may result in delayed reporting. 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.

MRRS is a web-based application that tracks a variety of individual medical readiness indicators, including immunizations for the Coast Guard, Navy, and Marine Corps. MRRS access requires an account to enter information or view reports. Information for active duty and reserve service members is entered by authorized users but delay of record entry may be due to connectivity limitations from fleet units and medical facilities. MRRS data come from multiple sources,
including the Defense Manpower Data Center. Data gaps in the sources that feed the MRRS may impact the completeness and timeliness of the system.

**Conclusion**

The 2018-2019 DON influenza season peaked at a later date, with extended elevation of activity (particularly among AD Sailors and Marines) and a relatively high burden of cases compared to more recent seasons, with exception to the 2018-2019 season. Robust influenza surveillance in the DON was achieved through the use of multiple data sources. While the various data sources do have limitations, integration of these data sources increased the validity of the findings and provided a comprehensive overview of influenza trends among DON beneficiaries. This information may assist BUMED in determining the overall burden of influenza in the DON community and its impact on mission readiness. Additionally, influenza surveillance may inform preparation, policy-planning, and decision-making for upcoming seasons and help DON continue to meet their vaccination goals.
References


# Appendix A: ICD-10-CM Codes for Influenza-like Illness (ILI) Diagnosis, 2018-2019 Season

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B97.89</td>
<td>other viral agents as the cause of diseases classified elsewhere</td>
<td>J10.81</td>
<td>influenza due to other identified influenza virus with other manifestations with encephalopathy</td>
</tr>
<tr>
<td>H66.9</td>
<td>otitis media, unspecified</td>
<td>J10.82</td>
<td>influenza due to other identified influenza virus with other manifestations with myocarditis</td>
</tr>
<tr>
<td>H66.90</td>
<td>otitis media, unspecified, unspecified ear</td>
<td>J10.83</td>
<td>influenza due to other identified influenza virus with other manifestations with otitis media</td>
</tr>
<tr>
<td>H66.91</td>
<td>otitis media, unspecified, right ear</td>
<td>J10.84</td>
<td>influenza due to other identified influenza virus with other manifestations</td>
</tr>
<tr>
<td>H66.92</td>
<td>otitis media, unspecified, left ear</td>
<td>J11</td>
<td>influenza due to unidentified influenza virus</td>
</tr>
<tr>
<td>H66.93</td>
<td>otitis media, unspecified, bilateral ear</td>
<td>J11.0</td>
<td>influenza due to unidentified influenza virus with pneumonia</td>
</tr>
<tr>
<td>J00</td>
<td>acute nasopharyngitis; common cold</td>
<td>J11.00</td>
<td>influenza due to unidentified influenza virus with unspecified type of pneumonia</td>
</tr>
<tr>
<td>J01.9</td>
<td>acute sinusitis, unspecified</td>
<td>J11.08</td>
<td>influenza due to unidentified influenza virus with specified pneumonia</td>
</tr>
<tr>
<td>J01.90</td>
<td>acute sinusitis, unspecified</td>
<td>J11.1</td>
<td>influenza due to unidentified influenza virus with other respiratory manifestations</td>
</tr>
<tr>
<td>J06.9</td>
<td>acute upper respiratory infection, unspecified</td>
<td>J11.2</td>
<td>influenza due to unidentified influenza virus with gastrointestinal manifestations</td>
</tr>
<tr>
<td>J09</td>
<td>influenza due to certain identified influenza viruses</td>
<td>J11.8</td>
<td>influenza due to unidentified influenza virus with other manifestations</td>
</tr>
<tr>
<td>J09.X</td>
<td>influenza due to identified novel influenza A viruses</td>
<td>J11.81</td>
<td>influenza due to unidentified influenza virus with encephalopathy</td>
</tr>
<tr>
<td>J09.X1</td>
<td>influenza due to identified novel influenza A virus with pneumonia</td>
<td>J11.82</td>
<td>influenza due to unidentified influenza virus with myocarditis</td>
</tr>
<tr>
<td>J09.X2</td>
<td>influenza due to identified novel influenza A virus with other respiratory manifestations</td>
<td>J11.83</td>
<td>influenza due to unidentified influenza virus with otitis media</td>
</tr>
<tr>
<td>J09.X3</td>
<td>influenza due to identified novel influenza A virus with gastrointestinal manifestations</td>
<td>J11.89</td>
<td>influenza due to unidentified influenza virus with other manifestations</td>
</tr>
<tr>
<td>J09.X9</td>
<td>influenza due to identified novel influenza A virus with other manifestations</td>
<td>J12.89</td>
<td>other viral pneumonia</td>
</tr>
<tr>
<td>J10</td>
<td>influenza due to other identified influenza viruses</td>
<td>J12.9</td>
<td>viral pneumonia, unspecified</td>
</tr>
<tr>
<td>J10.0</td>
<td>influenza due to identified novel influenza A viruses</td>
<td>J18</td>
<td>pneumonia, unspecified organism</td>
</tr>
<tr>
<td>J10.00</td>
<td>influenza due to other identified influenza virus with unspecified type of pneumonia</td>
<td>J18.1</td>
<td>lobar pneumonia, unspecified organism</td>
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<tr>
<td>J10.01</td>
<td>influenza due to other identified influenza virus with the same other identified influenza virus pneumonia</td>
<td>J18.8</td>
<td>other pneumonia, unspecified organism</td>
</tr>
<tr>
<td>J10.08</td>
<td>influenza due to other identified influenza virus with other specified pneumonia</td>
<td>J18.9</td>
<td>pneumonia, unspecified organism</td>
</tr>
<tr>
<td>J10.1</td>
<td>influenza due to other identified influenza virus with other respiratory manifestations</td>
<td>J20.9</td>
<td>acute bronchitis, unspecified</td>
</tr>
<tr>
<td>J10.2</td>
<td>influenza due to other identified influenza virus with gastrointestinal manifestations</td>
<td>J40</td>
<td>bronchitis, not specified as acute or chronic</td>
</tr>
<tr>
<td>J10.8</td>
<td>influenza due to other identified influenza virus with other manifestations</td>
<td>R05</td>
<td>cough</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R50.9</td>
<td>fever, unspecified</td>
</tr>
</tbody>
</table>

Data sources: Armed Forces Health Surveillance Branch.22

Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, July 2019.
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The EpiData Center
NMCPHC-EDC-TR-346-2019

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