

Methods: Department of the Navy Influenza Situation Report, 2021 - 2022 Season

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The EpiData Center

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NAVY AND MARINE CORPS PUBLIC HEALTH CENTER
IMPROVING READINESS THROUGH PUBLIC HEALTH ACTION

Contents

Purpose

This document details the methods and limitations relevant to the Weekly Department of the Navy (DON) Influenza Situation Report (SITREP) produced by the EpiData Center (EDC) at the Navy and Marine Corps Public Health Center (NMCPHC). SITREP methods are reviewed and updated annually to reflect current influenza trends, customer needs, and surveillance capabilities.

Background

Since 2008, the EDC has monitored influenza activity among the DON beneficiary population at routine intervals throughout the influenza season. Surveillance data sources include Health Level 7 (HL7)-formatted laboratory results and pharmacy transactions from the Composite Health Care System (CHCS) via the Defense Health Agency Solutions Delivery Division (DHA-SDD), inpatient admission records, outpatient medical encounter records, and vaccination records.)

The EDC enhances the influenza surveillance efforts over time, resulting in a comprehensive weekly SITREP surveilling of DON beneficiaries seeking care at MTFs. During 2021, the SITREP process integrated Military Health System (MHS) GENESIS laboratory data from participating fixed military treatment facilities (MTFs).

The report reflects numbered weeks aligning with the Centers for Disease Control and Prevention (CDC) reporting intervals in the *Morbidity and Mortality Weekly Report* (*MMWR*).[1] Timely surveillance of influenza activity is disseminated to stakeholders within the military health care community, thus ensuring ongoing situational awareness of ever-evolving influenza trends throughout the influenza season and off-season. The SITREP is distributed to the military public health community and published to the EDC website (https://www.med.navy.mil/Navy-Marine-Corps-Public-Health-Center/).

Data Sources and Availability

Data sources in the weekly SITREP include laboratory, pharmacy, encounter, and immunization data. Table 1 describes the timeliness of data sources.

Table 1. Data Sources for DON Influenza SITREP

Data Source	Timeliness of Data	EDC Historical Data Availability
HL7-formatted CHCS[a] Microbiology and Chemistry Data	Within 2 days of record generation	2004 - present
MHS GENESIS Chemistry and Microbiology Data	Weekly	2017 - present
HL7-formatted CHCS[a] Pharmacy Data (Outpatient (OP)), Unit-Dose (UD) and Intravenous (IV))	Within 2 days of record generation	2006 - present (OP) 2009 - present (UD and IV)
Comprehensive Ambulatory/Professional Encounter Record (CAPER) and Standard Ambulatory Data Record (SADR)	Weekly	2001 - present
Medical Readiness Reporting System (MRRS)	Real-time	Present
Immunization Tracking System (ITS)	Weekly	2001 - present
Standard Inpatient Data Record (SIDR)	Weekly	2001 - present

[a]Composite Health Care System (CHCS)
Prepared by the EpiData Center, NMCPHC, on 22 Sept 2021.

Select MTFs began testing and transitioning from CHCS to MHS GENESIS during October 2017. Additional MTFs will transition over in a multi-year phased plan, impacting data availability from several data sources. MHS GENESIS laboratory data was incorporated into the weekly influenza surveillance processes in March 2021 after much research and data validation. Differentiation between active duty (AD) and recruit service members (SMs) is not reliable in the MHS GENESIS data; the primary source for laboratory surveillance among these groups remains CHCS.

Case Definitions

An influenza case is defined by: 1. a laboratory-positive influenza test result, 2. an inpatient or outpatient medical encounter with a specific influenza diagnosis, or 3. a dispensed antiviral (AV) prescription. A case may be identified from one or more data sources. A 14-day gap-in-care rule is used to define cases for laboratory and pharmacy indicators; multiple cases can occur in the same patient if more than 14 days have elapsed since the prior occurrence.

Baselines, Thresholds, and Trends

Comparisons use historical baselines and thresholds as a benchmark for current season trends with respect to laboratory-positive results, dispensed influenza AV medications, and influenza-like-illness (ILI). Since the 2018 - 2019 season, the EDC uses an unweighted three year average for baseline calculations. Weekly baselines are calculated using a three-year average to compare results with those from the same week during the past three seasons. Bands for one and two standard deviations above seasonal baseline estimates may be displayed to indicate when timing

or volume trends diverge from those of recent seasons. An unusually low influenza burden observed during the 2020-2021 season due to the coronavirus disease (COVID-19) pandemic resulted in the CDC and Armed Forces Health Surveillance Division (AFHSD) of the Defense Health Agency (DHA) recommending using baselines calculations for the 2020 - 2021 season. In compliance, the EDC is using baselines calculated from weekly averages in the 2017 - 2018, 2018 - 2019, and 2019 - 2020 seasons. MTFs transitioned to MHS GENESIS are removed from the pharmacy and ILI baselines; this data is currently not available for the 2021 - 2022 season.

Surveillance thresholds are used to signal influenza activity that exceeds expected values; these are established for:

- the percentage of ILI encounters
- the number of inpatient laboratory-positive cases
- the number of inpatient dispensed AV cases
- the number of AD and recruit laboratory-positive cases
- the number of AD and recruit dispensed AV cases

Surveillance thresholds are calculated by adding one standard deviation to the overall unweighted average for in-season weeks. The ILI threshold is calculated by adding two standard deviations to the off-season average. Off-season weeks are determined by adapting the CDC's definition of non-influenza weeks.[2] Any week that represented at least 2% of the total season's laboratory-positive influenza cases for at least two consecutive weeks is considered to be "in-season" or influenza weeks; all other weeks are considered to be "off-season" or non-influenza weeks.

The SITREP includes a dashboard-style summary table that highlights important trends among the key influenza indicators. Trend comparisons for laboratory-positive cases, dispensed AVs, and the outpatient ILI percentage are based on the trends over the past two weeks to determine if they are increasing, decreasing, or remaining the same. These trends are not tested for statistical significance. Activity levels for the current week are highlighted, plotted against seasonal baselines, and compared to these baselines weekly. Table 2 details the baseline comparison used for each indicator.

Table 2: Trend Comparisons in the DON Influenza SITREP

Indicator(s)	Purpose/Description	Comparison	Values and Interpretation
* Lab Cases (N) * Dispensed AVs (N)	Compares influenza activity to seasonal baseline/threshold levels based on timing and volume. This may indicate either the timing of the season (early or late) or an increased/decreased volume of cases.	Seasonal Baseline (3-year average) and Seasonal Threshold (Off-season avg + 2 Std Devs)	**Low** (< 1 std. dev. below baseline or below seasonal threshold) : Activity is significantly below expected levels. **Normal** (+/-1 std. dev. from baseline and above seasonal threshold) : Influenza activity is within expected levels. **Elevated** (≥ 1 std. dev. above baseline): Activity is above expected levels.
* ILI Outpatient Visits (%)	Signals the start and end of increased influenza activity based on percent of ILI outpatient encounters. The % of ILI reflects the relative burden of ILI visits on the healthcare system.	Surveillance Threshold (Off-season avg + 2 Std Devs)	**Low** (< off-season average): ILI visits are very low. **Normal** (off-season avg. to < surveillance threshold) : ILI visits are within expected levels for the off-season. **Elevated** (≥ surveillance threshold): ILI visits are significantly above off-season expected levels; passing or moving below the surveillance threshold should correspond with the start and end of the influenza season. *Note that during holidays the total number of outpatient visits may be considerably lower, resulting in a spike in the % of ILI visits. This typically occurs around Week 52.*
* Inpatient Lab Cases (N) * Inpatient Dispensed AVs (N)	Indicates the impact of influenza cases on hospitalizations; the number of inpatient cases is used to assess severity in comparison to recent seasons. A maximum line, which shows the maximum weekly count of inpatient cases during any week from the past three seasons) adds further perspective.	Surveillance Threshold (In-Season Average + 1 Std Dev)	**Low** (< 1 std. dev. below threshold): Inpatient cases are below in-season expected levels. **Normal** (+/- 1 std. dev. from In-season Avg) : Inpatient cases are within expected levels for the influenza season. **Elevated** (≥ threshold): Inpatient cases are exceeding in-season expected levels. *Note that the total number of weeks with a given activity level should also be considered when interpreting severity.*
* Active Duty Labs(N) * Active Duty AVs (N) * Recruit Labs (N) * Recruit AVs (N)	Indicates elevated levels of DON active duty and recruit influenza cases.	Surveillance Threshold (3 year average + 1 Std Dev)	**Low** (< 1 std. dev. below avg): Activity is below in-season expected levels. **Normal** (+/- 1 std. dev. from In-season Avg): Activity is within expected levels for the influenza season. **Elevated** (≥ 1 std. dev. above in-season avg): Activity is exceeding in-season expected levels.

Vaccination Coverage

Vaccination coverage among DON AD and reserve (R) SMs is assessed weekly to monitor progress toward the DON instruction which normally requires 90% coverage by 15 December for all SMs.[3] Vaccination coverage is calculated using weekly data extracted from the Medical Readiness Reporting System (MRRS), providing an aggregate number of vaccinated AD and R SMs, total number of vaccination-eligible personnel, and total number of vaccination-exempt personnel in each component. The percentage of personnel immunized is calculated by dividing the number of vaccinated personnel by the number of vaccination-eligible personnel. Results are reported for Navy and Marine Corps AD and R personnel, and for US Fleet Forces Commands.

AD personnel and recruits with a positive influenza laboratory result are matched to patient-specific data within the Immunization Tracking System (ITS) to determine their vaccination status. Documented exemption records or waivers are also indicated for SMs without a vaccine. SMs who received the vaccine at least 14 days before the specimen collection date of a positive laboratory result are considered fully immune. Additionally, the type of influenza vaccine is described using the common vaccine code (CVX) in the ITS: live attenuated (LAIV), inactivated (IIV), recombinant (RIV), or unknown.

Estimation of Overall Burden

The overall burden of influenza in the DON is estimated by assessing the total number of influenza cases identified from medical encounters (outpatient visits and inpatient admissions), laboratory records, and pharmacy transactions. Encounters are those with an influenza-specific diagnosis, as opposed to the broad syndromic ILI definition used in ILI surveillance (Appendix A). The case definition is applied to records aggregated from all three data sources to identify unique cases. A baseline is displayed along with the overall burden of influenza cases.

Laboratory Indicators

CHCS generated HL7-formatted and MHS GENESIS chemistry and microbiology data are used to identify laboratory-positive influenza specimens and cases. Each specimen is evaluated by the test type (rapid, polymerase chain reaction [PCR], direct fluorescent antibody [DFA], or cultures), as well as the influenza type (A, B; A and B, or nonspecific). Percent positivity is calculated by dividing the number of influenza-positive specimens by the total number of specimens. Inconclusive results are excluded from the calculation. The 14-day gap-in-care case definition is applied to all laboratory-positive specimens. The Medical Expense and Performance Reporting

System (MEPRS) code within the record is used to classify cases as inpatient or outpatient. MHS Management Analysis and Reporting Tool (M2) eligibility data for denominators from June 2021 are used to calculate age group rates for laboratory-positive cases. Prior seasons used enrollment data based on the TRICARE Relationship table in M2; however in 2017, eligibility changes resulted in discontinued use of the table.[4] As a result, age group rates for the 2018-2019 season and forward are not comparable to prior seasons.

Pharmacy Transactions for Antiviral Prescriptions

HL7-formatted pharmacy transactions are used to assess the number of dispensed influenza AV prescriptions. Four FDA-approved AV medications are recommended for use during the 2021-2022 flu season according to the CDC: oseltamivir (marketed as Tamiflu® and available in generic versions), zanamivir (Relenza®), peramivir (Rapivab®), and baloxavir marboxil (Xofluza®).[5] Similar to recent seasons, amantadine (Symmetrel®) and rimantadine (Flumadine®) are not recommended for influenza treatment or chemoprophylaxis due to circulating influenza viruses resistant to AV medications.[6] As of November 2017, weekly influenza surveillance excludes amantadine; however, all other drugs are tracked. The 14-day gap-in-care case definition is applied to dispensed AVs to account for multiple transactions. Dispensed AV cases are classified as inpatient or outpatient based on the data source and MEPRS code within the record. A seasonal baseline is displayed with dispensed AV cases. Surveillance thresholds are displayed with the count of inpatient dispensed AV cases. MHS GENESIS data is not available for pharmacy transactions.

Clinical Encounters for Influenza-Like Illness

Comprehensive Ambulatory/Professional Encounter Record (CAPER) data are used to monitor ILI trends using diagnosis codes matching the ILI case definition outlined in the AFHSD surveillance case definitions (Appendix A).[7] All seasons prior to the 2018-2019 season used the Department of Defense's (DOD) Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE) case definition. As a result of the ILI definition change, comparison should not be made to past seasons. Furthermore, the ILI indicator should not be compared to the CDC's ILI indicator due to differing methodologies. The percentage of outpatient medical encounters containing at least one ILI diagnosis in any diagnostic field is calculated to evaluate the number of ILI diagnoses in relation to health care utilization; denominators are established by aggregating the total number of unique appointment identifiers. The weekly percentage of ILI is presented in the SITREP along with the seasonal baseline and surveillance threshold.

Active Duty and Recruit Surveillance

Influenza surveillance trends are described for AD and recruit populations. CHCS generated HL-7-formatted laboratory-positive cases are shown as rates per 100,000 persons; denominators are from M2 June 2021 enrollment data. Additionally, the number of laboratory-positive cases and dispensed AVs are tracked by service for the current reporting week and cumulatively for the season. MHS GENESIS laboratory data does not differentiate between AD and recruit SMs, therefore this section of the SITREP does not include data from MTFs transitioned to MHS GENESIS.

Conclusions

Robust influenza surveillance in the DON is achieved through the use of multiple data sources. Multiple data sources increases the validity of the findings and provides a comprehensive overview of influenza trends among DON beneficiaries. The information contained in the SITREP may assist the Navy Bureau of Medicine and Surgery (BUMED) in determining the overall burden of influenza in the DON community, its impact on mission readiness, and may assist in policy planning and preparation for upcoming seasons.

Limitations

Weekly SITREP analyses are subject to certain limitations that should be considered when interpreting results. Medical data considered in this report were generated within CHCS or MHS GENESIS at fixed MTFs. This analysis does not include records from purchased care providers, shipboard facilities, battalion aid stations, or in-theater facilities.

The microbiology database primarily consists of results for culture testing. Microbiology testing results show only 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. 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 databases generally consist 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 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 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 had an inpatient or outpatient encounter not captured in the current data. Inpatient records are created at discharge or transfer from an inpatient medical treatment facility. For AD personnel only, non-MTF (purchased care) hospitalizations generate a record upon discharge.

The EDC weekly extract of ITS data are limited to AD DON and R SMs, and includes vaccinations recorded within the MHS and Shipboard Non-tactical Automatic Data Process (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. Routine vaccinations for R SMs may not be captured in ITS data if Rs 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.

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 AD and R SMs is entered by authorized users, and delay of record entry may be due to connectivity from fleet units and medical support. MRRS data come from multiple sources, including the Defense Manpower Data

Center (DMDC). Data gaps in the sources that feed the MRRS may impact the completeness and timeliness of the system.

MHS GENESIS pharmacy and encounter data are currently not incorporated into the weekly SITREP. Service affiliation and AD/recruit status is unreliable or missing in these MHS GENESIS data sources. Reported DON influenza trends may differ from actual trends due to the absence of this data.

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