Mid-Season Influenza Vaccine Effectiveness for the 2012-2013 Influenza Season

Angelia A. Eick-Cost

Zheng Hu   Gary T. Brice
Michael J. Cooper   Laurel V. Lloyd
Jose L. Sanchez   Katie J. Tastad
Jennifer M. Radin   Shauna C. Zorich
Anthony W. Hawksworth   Victor H. MacIntosh

Naval Health Research Center

Mid-Season Influenza Vaccine Effectiveness for the 2012-2013 Influenza Season

Angelia A. Eick-Cost, PhD, ScM; Zheng Hu, MS; Michael J. Cooper, PhD (CDR, USPHS); Jose L. Sanchez, MD, MPH (COL, USA, Ret.); Jennifer M. Radin, MPH; Anthony W. Hawksworth; Gary T. Brice, PhD (CDR, USN); Laurel V. Lloyd, MPH; Katie J. Tastad, MPH; Shauna C. Zorich, MD, MPH (Maj, USAF); Victor H. MacIntosh, MD, MPH (Lt Col, USAF)

The Armed Forces Health Surveillance Center (AFHSC), Naval Health Research Center (NHRC) and United States Air Force School of Aerospace Medicine (USAFSAM) conduct annual mid-season influenza vaccine effectiveness (VE) analyses for the Department of Defense (DoD). As each organization conducts influenza surveillance on different populations, their analyses provide a unique opportunity to assess influenza VE among service members, dependents and civilians. This report describes the findings for the middle of the 2012-2013 influenza season.

Assessment of VE was performed by three case-control approaches in which cases were individuals with positive laboratory tests for influenza. First, the AFHSC used the Defense Medical Surveillance System (DMSS) to identify all active component, non-recruit service members during 1 September 2012 to 14 February 2013. Health Level 7 data in the DMSS was used to identify influenza cases that were laboratory confirmed by a rapid influenza test, reverse transcriptase polymerase chain reaction (RT-PCR), or viral culture. Controls were active component service members with health care encounters for

musculoskeletal conditions (without respiratory diagnoses) and were matched to cases by sex, age, date of diagnosis (+/-3 days) and treatment facility. Most cases and controls were treated at military or civilian medical facilities in the U.S.; however the population did include service members who sought care at military medical facilities in Europe, Korea, and Japan. Vaccination status was determined by immunization records documented in the DMSS.

Second, NHRC's analysis relied on influenza-like illness (ILI) surveillance among DoD dependent and other civilian populations living in southern

TABLE. Mid-season İnfluenza vaccine effectiveness (VE) among different populations for the 2012-2013 influenza season

Population	Viral subtype	Vaccine type	Cases No. (% vaccinated)	Controls[a] No. (% vaccinated)	Crude VE (95% CI)	Adjusted VE[b] (95% CI)
Active component service members (AFHSC)	Overall	Any type	744 (87)	2,916 (91)	38 (18-53)	35 (14-51)
		TIV	332 (71)	1,259 (78)	39 (18-55)	35 (12-53)
		LAIV	504 (81)	1,907 (86)	37 (15-53)	34 (12-51)
Civilians and dependents (NHRC)	Overall	Any type	139 (16)	290 (45)	77 (62, 86)	72 (52, 84)
	Influenza A (H3)	Any type	90 (11)	290 (45)	82 (62, 91)	85 (69, 92)
	Influenza B	Any type	40 (28)	290 (45)	54 (4, 78)	41 (-30, 74)
Service members and dependents (USAFSAM)	Overall	Any type	628 (52)	1,008 (59)	25 (8,38)	44 (28, 56)
		LAIV	469 (35)	708 (41)	22 (1, 39)	40 (18, 56)
		TIV	462 (34)	716 (42)	27 (7, 43)	47 (29, 60)
	Influenza A (H3)	Any type	502 (52)	1,008 (59)	24 (6, 39)	48 (32, 60)
		LAIV	370 (35)	708 (41)	24 (1, 41)	44 (23, 60)
		TIV	373 (35)	716 (42)	24 (2, 42)	49 (31, 62)
	Influenza A (H1)	Any type	37 (70)	111 (63)	-38 (-209, 38)	-10 (-182, 57)
	Influenza B	Any type	87 (43)	261 (64)	58 (32, 75)	39 (-9, 65)

[a]AFHSC used healthy controls (matched to cases by sex, age, and date [+/- 3 days] and treatment facility) and NHRC and USAFSAM used unmatched influenza test negative controls.

[b]Adjusted for (1) AFHSC: prior vaccination status, (2) NHRC: age group, hospitalization status (i.e., inpatient, outpatient), days with symptoms upon presentation, and surveillance population/location, or (3) USAFSAM: age group, week of collection (and geographic region for analysis of influenza A [H1] only)

Abbreviations: AFHSC=Armed Forces Health Surveillance Center; NHRC=Naval Health Research Center; USAFSAM=United States Air Force School of Aerospace Medicine; TIV = trivalent inactivated vaccine; LAIV = live, attenuated influenza vaccine

California and Illinois during 9 December 2012 to 26 January 2013. Influenza cases were individuals who had positive laboratory tests for influenza by RT-PCR. Controls were individuals with ILI who tested negative for influenza. Vaccination status was determined by medical chart review. Individuals were considered vaccinated if their ILI diagnosis occurred more than 14 and less than 180 days since influenza vaccination.

Third, the USAFSAM assessment was conducted using global, laboratory-based influenza surveillance of service members and dependents with ILI symptoms during 30 September 2012 to 26 January 2013. Influenza cases were individuals who had positive laboratory tests for influenza by RT-PCR or viral culture. Controls were selected from ILI patients whose laboratory tests were negative for influenza. Vaccination status was obtained from Air Force electronic immunization records or the program's surveillance questionnaire.

All organizations calculated crude odds ratios and used logistic or conditional logistic regression to calculate adjusted odds ratios. VE was defined as one minus the odds ratio times 100. For example, if 10 percent of 50 cases were vaccinated and 40 percent of 50 controls were vaccinated, the odds of having been vaccinated would be 5/45=0.11 among cases and 20/30=0.67 among controls. The odds ratio is then the odds among cases divided by the odds among controls (0.11/0.67 = .16) and the VE would be calculated as 1.0 - 0.16 x 100 or 84 percent. When possible, analyses were stratified by influenza type, subtype and vaccine type (trivalent inactivated vaccine [TIV] and live attenuated influenza vaccine [LAIV]). Models were adjusted for (1) AFHSC: prior vaccination status; (2) NHRC: age group, hospitalization status (i.e., inpatient or outpatient), days with symptoms upon presentation, and surveillance population/location; and (3) USAFSAM: age group, week of collection (and geographic region for analysis of influenza A subtype H1 only).

Statistically significant findings of influenza VE ranged from 34 to 85 percent depending on the population, influenza subtype, and vaccine type **(Table)**. TIV and LAIV conferred similar levels of protection in all analyses. Vaccination coverage varied among the study populations; the highest coverage was among active component service members (AFHSC) and lowest among civilians and dependents (NHRC). Highly immunized populations (active component service members) appeared to have lower VE than less immunized populations (civilians and dependents); however, further studies would be required to properly assess this hypothesis. Models for influenza A (subtype H1) and B resulted in non-statistically significant findings; this result could be due in part to limited numbers of laboratory-confirmed influenza infections during the periods of study.

Author affiliations: Armed Forces Health Surveillance Center (Drs. Eick-Cost and Sanchez, Ms. Hu, CDR Cooper); Naval Health Research Center (Ms. Radin, Mr. Hawksworth, CDR Brice); and the United States Air Force School of Aerospace Medicine (Mss. Lloyd and Tastad, Maj Zorich, Lt Col MacIntosh).

REPORT DOCUMENTATION PAGE

The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB Control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. Report Date (DD MM YY) Mar 2013	2. Report Type Journal Type	3. DATES COVERED (from - to) 2012-2013

4. TITLE AND SUBTITLE
Mid-Season Influenza Vaccine Effectiveness for the 2012-2013 Influenza Season

6. AUTHORS
Angelia A. Eick-Cost, Zheng Hu, Michael J. Cooper, Jose L. Sanchez, Jennifer M. Radin, Anthony W. Hawksworth, Gary T. Brice, Laurel V. Lloyd, Katie J. Tastad, ShaunaC. Zorich, & Victor H. MacIntos

5a. Contract Number:
5b. Grant Number:
5c. Program Element:
5d. Project Number:
5e. Task Number:
5f. Work Unit Number: 60501
5g. IRB Protocol Number: 20007.0024

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Naval Health Research Center
P.O. Box 85122
San Diego, CA 92186-5122

8. PERFORMING ORGANIZATION REPORT NUMBER
  Report No. 13-12

8. SPONSORING/MONITORING AGENCY NAMES(S) AND ADDRESS(ES)

Commanding Officer   Chief, Bureau of Medicine and Surgery
Naval Medical Research Center   7700 Arlington Blvd, Suite 5117
503 Robert Grant Ave   Arlington, VA 220402-5117
Silver Spring, MD 20910-7500

10. Sponsor/Monitor's Acronyms(s)
  NMRC / BuMed
11. Sponsor/Monitor's Report Number(s)

12 DISTRIBUTION/AVAILABILITY STATEMENT
  Approved for public release; distribution unlimited.

13. SUPPLEMENTARY NOTES
  March 2013 Vol. 20 No. 3 MSMR

14. ABSTRACT (maximum 200 words)
The Armed Forces Health Surveillance Center (AFHSC), Naval Health Research Center (NHRC) and United States Air Force School of Aerospace Medicine (USAFSAM) conduct annual mid-season influenza vaccine effectiveness (VE) analyses for the Department of Defense (DoD). As each organization conducts influenza surveillance on different populations, their analyses provide a unique opportunity to assess influenza VE among service members, dependents and civilians. This report describes the findings for the middle of the 2012-2013 influenza season.

14. SUBJECT TERMS
  Vaccine Effectiveness, Influenza

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGE	18a. NAME OF RESPONSIBLE PERSON
a. REPORT	b.ABSTRACT	C. THIS PAGE	UNCL	4	Commanding Officer
UNCL	UNCL	UNCL			**18b. TELEPHONE NUMBER (INCLUDING AREA CODE)** COMM/DSN: (619) 553-8429

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39-18