HAWAII STATE DEPARTMENT OF HEALTH
DISEASE OUTBREAK CONTROL DIVISION
2016–2017 INFLUENZA SEASON SUMMARY

October 2, 2016 – September 30, 2017: MMWR[1] Week 40, 2016 – 39, 2017

SUMMARY:

The 2016–17 influenza season began on MMWR week 40 (October 2, 2016) and ended week 39 (September 30, 2017). This was a mild season when looking at the percentage of positive specimens, influenza-like illness (ILI) rate, pneumonia and influenza (P&I) mortality, and pediatric deaths, in comparison with baseline and historic levels.

The weekly proportion of outpatient visits for ILI recorded by sentinel providers in Hawaii throughout the season ranged from 0.5% to 5.1%. The data showed a rising ILI trend between weeks 52 (2016)–10 (2017), with a peak in visits at week 4 (5.1%). This coincided with increased national ILI rates during weeks 52 (2016)–12 (2017). The median weekly ILI rate for the season was 2.1%, similar to the median for the past 5 seasons (2.0%). Reported ILI rates were most pronounced for those aged 5–24 years, constituting 61% of all ILI visits. There were 37 ILI clusters during the season, greater than the number of clusters in the past 2 seasons (24 in 2015–2016 and 34 in 2014–2015). These ILI clusters were confirmed as influenza-positive.

Pneumonia and influenza (P&I) mortality surveillance monitors the proportion of all reported deaths related to pneumonia and influenza. The Honolulu P&I contributed to a measure of P&I across the United States of America through the National Center for Health Statistics (NCHS). There were 4,638 total deaths recorded in Honolulu for the 2016–17 influenza season; of these, 589 (11.3%) were related to pneumonia or influenza. This is similar to the seasonal P&I rate in the past five influenza seasons (median 11.2%). While there were no pediatric influenza deaths in Hawaii this season, 110 influenza-associated pediatric deaths were reported nationally to the Centers for Disease Control and Prevention (CDC) during the 2016–2017 season. This was below the median reported over the last five seasons (111).

Laboratory data showed 9,053 (18.9%) of the 47,881 specimens tested for influenza were positive by any method (rapid antigen testing, polymerase chain reaction [PCR], and/or viral culture). This was higher than the median percent positivity (11.3%) documented for the past five seasons. A total of 32,264 (67.4%) samples were tested by rapid antigen testing only, while confirmatory testing (either RT-PCR or viral culture) was performed on the remaining 15,617 (32.6%). Of all specimens tested, 6,668 were positive for influenza A (13.9%), and 2,385 were positive for influenza B (5.0%). The 6,668 influenza A specimens included 49 2009 H1N1 specimens, one other unspecified H1 strain, and 916 H3N2 specimens. The remainder (5,702) were not subtyped. The 2,385 influenza B specimens included 84 Victoria lineage specimens and 193 Yamagata lineage specimens. The remainder (2,108) were not sequenced for lineage. Stratifying by age groups, those aged >65 yrs comprised the largest proportion of specimens tested for influenza (25%), but those aged 5–24 yrs comprised the largest proportion (31%) of positive influenza tests.

Overall, ILI activity during the 2016–2017 influenza season remained similar to prior seasons, while influenza specimen positivity was high compared to previous seasons. Notably, similar to the 2015–2016 influenza season, the timing of Hawaii's peak ILI activity mirrored that of the mainland; the mainland's ILI activity and peak

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[1] MMWR stands for "Morbidity and Mortality Weekly Report," conventionally used by the Centers for Disease Control and Prevention (CDC). The weeks of a flu season are often referred to by their respective MMWR week. See appendix 1 for interpretation of MMWR weeks.

typically precedes Hawaii's by several weeks. This emphasizes the variability of influenza seasons; each season can vary in timing, duration, and severity. Ongoing surveillance will continue to maintain timely situational awareness of influenza.

I. INFLUENZA LIKE ILLNESS (ILI):

ILI surveillance is the primary method used for monitoring influenza activity during the season. The data used to determine the ILI rate in Hawaii originates from sentinel healthcare providers. Each year, sentinel providers register to report ILI data to the Hawaii Department of Health (HDOH) and CDC. A patient with ILI must have the following: fever (temperature of 100°F [37.8°C] or greater) and cough and/or sore throat without a known cause other than influenza. For the 2016–2017 influenza season, 30 sentinel providers registered for the ILINet surveillance program. Of those 30, 16 routinely reported their data to CDC and HDOH. The distribution of providers by practice type is shown below (Table 1). Internal medicine was the most common practice type, followed by family practice and pediatrics. Student health (2), urgent care (1), and emergency medicine (1) had the lowest representation.

TYPE OF PRACTICE	# OF SENTINEL PROVIDERS ACTIVELY REPORTING
Internal Medicine	13
Family Practice	8
Pediatrician	5
Student Health	2
Urgent Care	1
Emergency medicine	1

Table 1. Practice type distribution of the 30 reporting Hawaii ILI sentinel providers registered for the 2016–2017 season

Sentinel provider geographic representation was not equally distributed among the various counties; the most populous county, Honolulu, had the highest number of sentinel providers. Of the 30 total providers, 20 were located in Honolulu county and 6 in Hawaii county. Maui (3) and Kauai (1) had the fewest sentinel providers. CDC recommends that smaller states maintain at least 10 ILI sentinel providers per state.

LOCATION	# OF ACTIVELY REPORTING SENTINEL PROVIDERS	POPULATION (2016)	ACTIVE SENTINEL PROVIDERS PER 100,000 RESIDENTS
Honolulu	20 (66.7%)	992, 605 (69.5%)	2.0
Maui	3 (10.0%)	165,474 (11.6%)	2.0
Hawaii	6 (20.0%)	198,449 (13.9%)	3.0
Kauai	1 (3.3%)	72,029 (5.0%)	1.0
Total	30	1,428,557	3.0

Table 2. Geographic distribution of the 30 reporting Hawaii ILI sentinel providers, by county

During the 2016–2017 influenza season, sentinel providers reported a total of 63,162 patient visits (a median of 1,279 per week). Of these total patient visits, 1,526 (2.4%) were for ILI, with an average of 29 visits per week which was statistically higher than the average ILI rate for the past five flu seasons (2.2%; p=0.0001). For the 2016–2017 season, weeks 52 (2016)–10 (2017) had the highest ILI rates, with a peak of 5.1% occurring in week 4. For the majority (94%) of the season, the weekly proportion of outpatient visits for ILI were statistically

comparable to the historical baseline[2] for Hawaii, the national ILI rate, and the national ILI baseline[3] set by CDC (Figure 1). The national ILI rate appeared to peak in weeks 52 (2016)–12 (2017), which was similar to the timing of the peak seen in Hawaii. This was not typical; for the past four out of five influenza seasons Hawaii's ILI peak followed the national peak by approximately 3–4 weeks.

Percentage of Visits (N=63,162) for Influenza Like Illness (ILI) Reported by Hawaii Sentinel Providers, 2016−17 Influenza Season
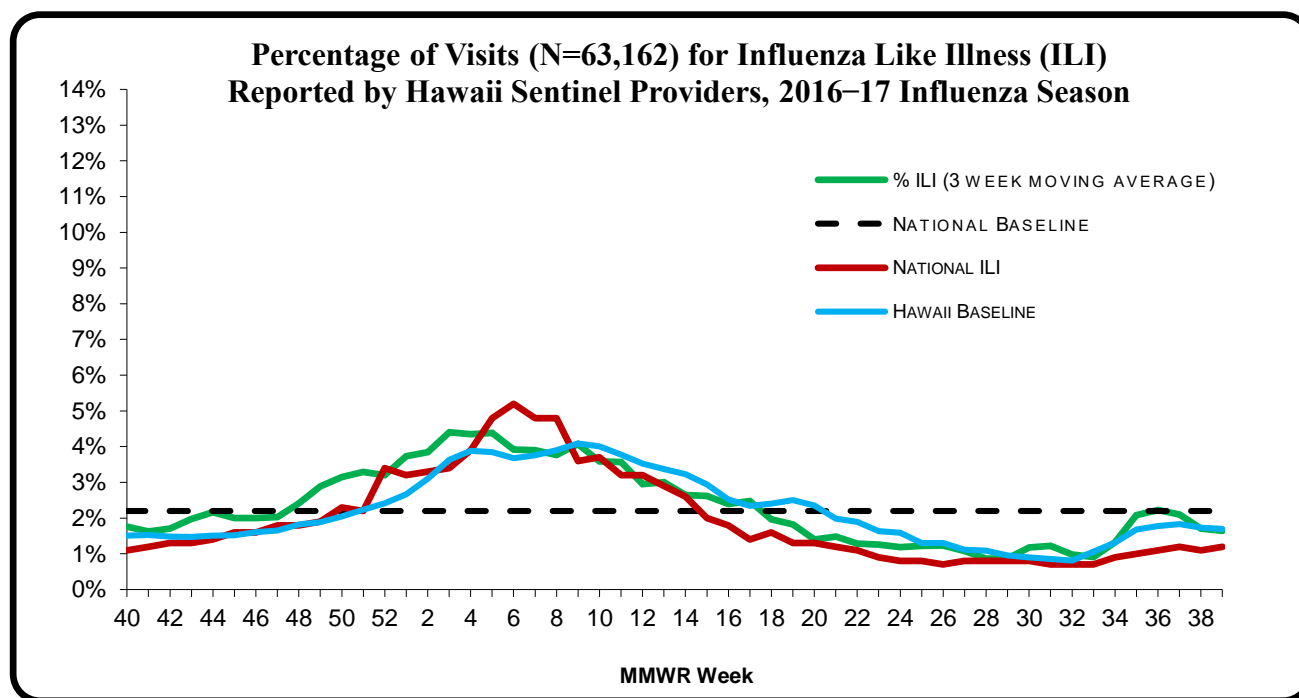

Figure 1. Comparison of the weekly Hawaii ILI rate, national baseline, national ILI rate, and Hawaii baseline by MMWR week, 2016–2017

The age group distribution of recorded ILI patients can be seen in Figure 2. More than half (61%) of all reported ILI patients were aged 5–24 yrs. Differences in distribution by age group may not only reflect differences in infection rates but may also be impacted by the practice types of the sentinel providers in our surveillance program as well as differential care-seeking behaviors in different age groups. About 3% of reported ILI patients were aged >65 yrs. However, this population may be seen by non-sentinel providers (e.g., nursing home providers) or because of age and comorbidities may have more severe presentations meriting emergency department care.

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[2] The Hawaii historical baseline (%ILI and %P&I) is the average of 3-week moving averages over the preceding five flu seasons of historical data (2011–2012, 2012–2013, 2013–2014, 2014–2015, and 2015–2016).

[3] The National Baseline is calculated by CDC as the mean percentage of visits for ILI during weeks 21–39 with two standard deviations. Because of large variability in regional ILI, comparison of the national baseline with local ILI may not be appropriate. It is provided in this report because no meaningful regional baselines are available for comparison. The national baseline combines all data reported by states to CDC, including ILI in outpatient, ER, urgent care, and inpatient settings.
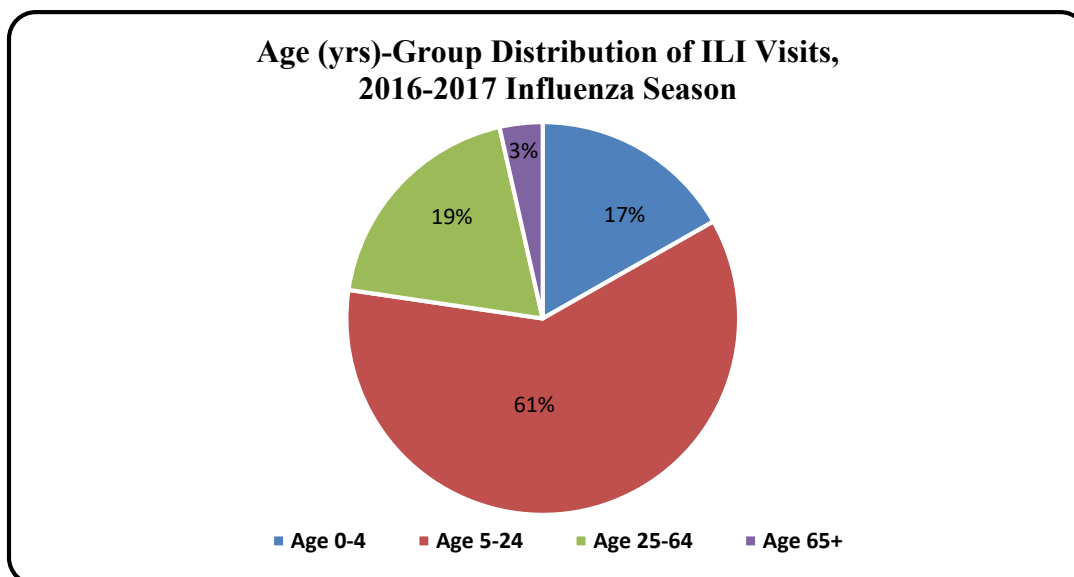
Age (yrs)-Group Distribution of ILI Visits, 2016-2017 Influenza Season

- Age 0-4: 17%
- Age 5-24: 61%
- Age 25-64: 19%
- Age 65+: 3%

Figure 2. Age-group distribution of ILI visits for the 2016–2017 influenza season

There were 37 ILI or confirmed influenza clusters reported during the 2016–2017 season, which was statistically higher than the average number of clusters reported in the past five influenza seasons (26; p=0.0019). The 2016–2017 season clusters were associated with long-term care facilities (29), hospitals (4), schools (3), and a correctional facility. Virus type of clusters, where known, can be seen in Figure 3. Nearly half (43.2%) of clusters occurred between December 2016 and January 2017.
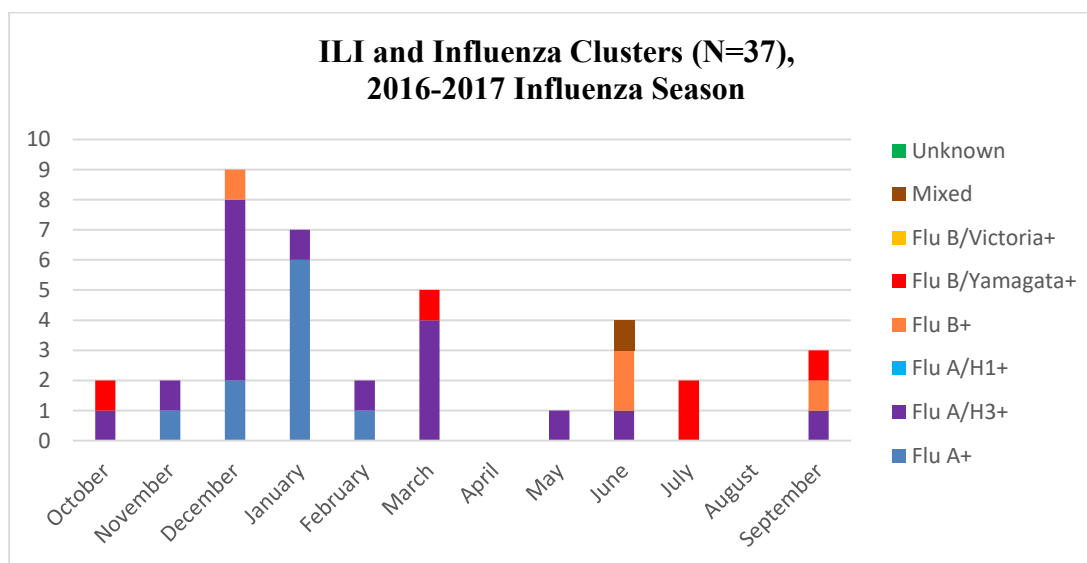
ILI and Influenza Clusters (N=37), 2016-2017 Influenza Season

Legend:
- Unknown
- Mixed
- Flu B/Victoria+
- Flu B/Yamagata+
- Flu B+
- Flu A/H1+
- Flu A/H3+
- Flu A+

Figure 3. ILI and influenza clusters, by influenza type and MMWR week, for the 2016–2017 season

II.   PNEUMONIA & INFLUENZA MORTALITY:

Pneumonia and influenza-related mortality is another method used to track influenza activity during the season. The data for pneumonia and influenza mortality comes from the Office of Vital Statistics at HDOH. The P&I rate is calculated by dividing the number of deaths related to P&I by the number of deaths from any cause.

Category	Number
Total deaths (all causes)	4,638
Average/week	*89.2*
Total deaths related to pneumonia/influenza	589
Average/week	*11.3*
Cumulative average P&I rate	12.7%
Peak P&I rate	22.6% (week 18)

Table 3. Pneumonia and influenza mortality statistics for the 2016–2017 influenza season

The table above shows cumulative P&I rate for the 2016–2017 season (12.7%) which was higher than the average P&I rates in the past five influenza seasons (11.2%; p=0.0006). The figure below (Figure 4) depicts the trends for the Hawaii P&I mortality 3 week moving average alongside three additional measures: a Hawaii historic baseline[4], an epidemic threshold, and the NCHS mortality rate[5]. The peak for the Hawaii P&I rate occurred in week 18 (22.6%).
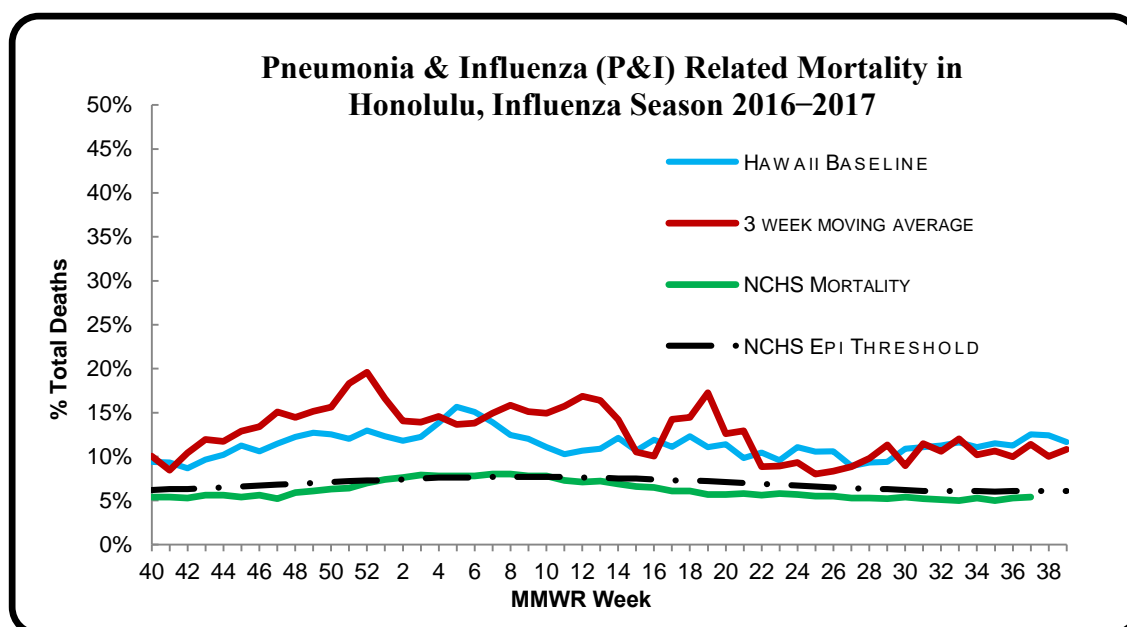

Figure 4. Pneumonia and influenza (P&I) related mortality in Honolulu by MMWR week for the 2016–17 influenza season

Additionally, influenza-associated pediatric deaths have been a nationally notifiable condition since 2004. While no such deaths were reported in Hawaii during the 2016–17 season, 110 were reported nationally to CDC, which was comparable to the average number of pediatric deaths for the past five influenza seasons (109; p=0.9681).[6]

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[4] The Hawaii historical baseline (%ILI and %P&I) is the average of 3-week moving averages over the preceding five flu seasons of historical (2011–2012, 2012–2013, 2013–2014, 2014–2015, and 2015–2016).

[5] Each week, the National Center for Health Statistics (NCHS) collects death certificates from state vital statistics offices for virtually all deaths occurring in the United States. The number of those for which pneumonia or influenza was listed as the underlying or contributing cause of death are reported. The percentage of deaths related to pneumonia and influenza (P&I) are compared with a seasonal baseline and epidemic threshold value calculated for each week

[6] FluView, accessed 1/5/2018: https://gis.cdc.gov/GRASP/Fluview/PedFluDeath.html

III. LABORATORY SURVEILLANCE:

During the 2016–17 influenza season, the State Laboratories Division (SLD) of the Hawaii Department of Health (HDOH) tested 1,836 specimens for influenza. Specimen submissions have steadily increased over the past several years, and an algorithm was developed to accommodate the high specimen volume, reduce turnaround time, optimize data quality, and improve utilization of limited resources. DOCD drafted a list with criteria[7] to prioritize specimens for confirmatory testing at SLD. Within the constraints of resources and funding, specimens meeting these criteria were forwarded to SLD for confirmatory testing.

TOTAL SPECIMENS TESTED FROM ALL LABORATORIES, 2016–2017: 47,881			
SPECIMENS TESTING POSITIVE, 2016–2017: 9,053 (18.9%)			
MEDIAN SPECIMEN POSITIVITY FOR THE PAST FIVE SEASONS: 5,124 (11.3%)			
TESTING TYPE	RAPID ANTIGEN ONLY	32,264	67.4%
	CONFIRMATORY (RT-PCR OR VIRAL CULTURE)	15,617	32.6%
INFLUENZA TYPING	A	6,668	13.9%
	B	2,385	5.0%
INFLUENZA A SUB-TYPING	2009 H1N1	49	0.1%
	OTHER H1 STRAIN	1	0.002%
	INFLUENZA A (H3)	916	1.9%
INFLUENZA B GENOTYPING	VICTORIA	84	0.2%
	YAMAGATA	193	0.4%

Table 4. Testing, typing and subtyping for influenza during the 2016–2017 season

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[7] The list of priority specimens includes: hospitalized patients with acute respiratory distress syndrome [ARDS] or x-ray confirmed pneumonia; travelers with international travel history within 10 days of onset; specimens submitted by sentinel providers; specimens collected from healthcare workers, pregnant women, or women up to 6 weeks post-partum; those with underlying medical conditions; and patients presenting with unusual or severe manifestations of influenza infection.

The distribution by age group for the specimens tested and positive specimens is shown below (Figure 5). For the 47,881 specimens tested, the distribution by age group was fairly uniform, although those aged >65 yrs represented the highest proportion (25%). Those aged 5 to 24 yrs made up the largest proportion of positive influenza specimens (31%).
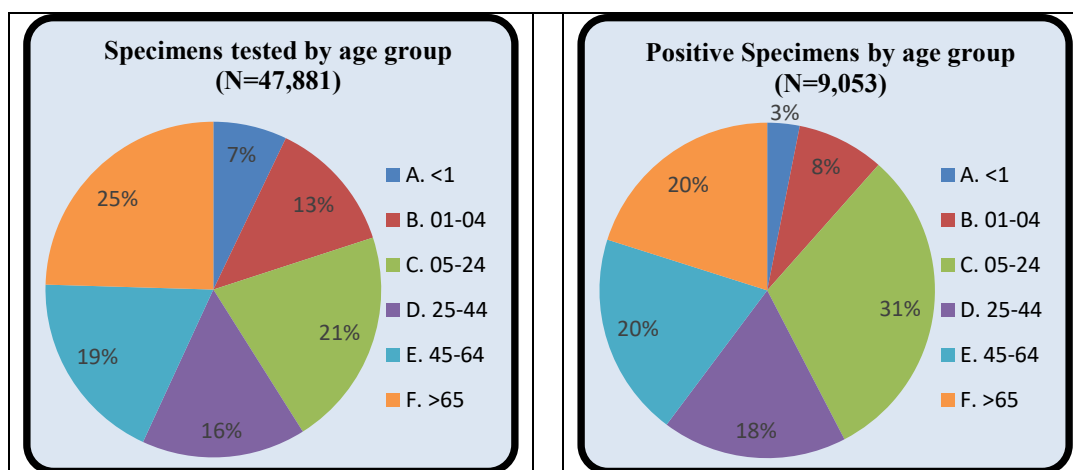

Figure 5. Age (yrs) group distribution of influenza specimens tested and positive cases during the 2016–2017 season

IV. AIRPORT SURVEILLANCE:

HDOH introduced passive airport influenza surveillance in collaboration with CDC's Daniel K. Inouye International Airport Quarantine Station and Daniel K. Inouye Airport Medical Response staff during the 2005–2006 influenza season. Travelers meeting clinical criteria[8] are consented for testing and then swabbed at the airport. Specimens were tested at SLD by RT-PCR for influenza as well as for other respiratory viruses via a Luminex xTAG respiratory virus panel (Luminex Corporation, Austin, TX). During the 2016–2017 season, 2 air travelers[9] meeting clinical criteria were swabbed and tested. Both specimens were negative for influenza and other respiratory pathogens[10] tested.

V. AVIAN INFLUENZA:

No cases of avian influenza infection in humans were identified in the United States during the 2016–2017 influenza season. As of the end of the 2016–2017 influenza season, human cases of avian influenza A (H5N1) have been detected in 16 countries since surveillance began in 2003. A total of 860 cases and 454 deaths have been identified globally; the countries with the highest numbers of A (H5N1) infected cases were Egypt, Indonesia, Viet Nam, Cambodia, and China. These five countries represented 795 (92.4%) of the total cases and 418 (92.5%) of the total deaths reported. Of the 4 patients with WHO-confirmed avian influenza A (H5N1) during the 2016–2017 season, 2 (50.0%) died. Since 2013, 1,564 laboratory-confirmed cases of human infection with avian influenza A(H7N9) viruses, including at least 612 deaths, have been reported to WHO[11].

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[8] Clinical criteria were defined as a fever or history of fever (i.e., body temperature 100˚F or greater) plus one or more of the following symptoms: headache, muscle aches, sore throat, cough, chills, malaise, and/or vomiting.
[9] Denominator data are currently unavailable.
[10] Luminex Corporation, Austin, TX. Luminex RVP detects: adenovirus, human metapneumovirus, influenza A (Matrix/H1/H3), influenza B, RSV A, RSV B, rhinovirus, coronavirus 229E, coronavirus HKU1, coronavirus NL63, coronavirus OC43, parainfluenza 1–4, and bocavirus.
[11] WHO, accessed on 3/7/2018: http://www.who.int/influenza/human_animal_interface/Influenza_Summary_IRA_HA_interface_10_30_2017.pdf?ua=1

Country	2003-2009*		2010-2014**		2015		2016		2017		Total	
	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths
Azerbaijan	8	5	0	0	0	0	0	0	0	0	8	5
Bangladesh	1	0	6	1	1	0	0	0	0	0	8	1
Cambodia	9	7	47	30	0	0	0	0	0	0	56	37
Canada	0	0	1	1	0	0	0	0	0	0	1	1
China	38	25	9	5	6	1	0	0	0	0	53	31
Djibouti	1	0	0	0	0	0	0	0	0	0	1	0
Egypt	90	27	120	50	136	39	10	3	3	1	359	120
Indonesia	162	134	35	31	2	2	0	0	1	1	200	168
Iraq	3	2	0	0	0	0	0	0	0	0	3	2
Lao People's Democratic Republic	2	2	0	0	0	0	0	0	0	0	2	2
Myanmar	1	0	0	0	0	0	0	0	0	0	1	0
Nigeria	1	1	0	0	0	0	0	0	0	0	1	1
Pakistan	3	1	0	0	0	0	0	0	0	0	3	1
Thailand	25	17	0	0	0	0	0	0	0	0	25	17
Turkey	12	4	0	0	0	0	0	0	0	0	12	4
Viet Nam	112	57	15	7	0	0	0	0	0	0	127	64
Total	468	282	233	125	145	42	10	3	4	2	860	454

Table 5. Laboratory-confirmed avian influenza A (H5N1) cases, by year and county, as reported to the World Health Organization, 2003–2017[12]

APPENDIX 1: ADDITIONAL INFORMATION

For more information regarding local and national influenza surveillance programs, visit the following sites.

Centers for Disease Control and Prevention	General Influenza: **http://www.cdc.gov/flu/about/disease/index.htm** National ILI and P&I Data: **http://www.cdc.gov/flu/weekly/fluactivitysurv.htm** Vaccine Virus Selection: **http://www.cdc.gov/flu/about/season/vaccine-selection.htm**
Flu.gov	General Influenza Information: flu.gov
HDOH Flu and Pneumonia	General Influenza: http://health.hawaii.gov/docd/disease_listing/influenza-flu/ Surveillance: http://health.hawaii.gov/docd/resources/reports/influenza-reports/ To find out more information or join the sentinel physician program, email: DOH.Influenza.Surveillance@doh.hawaii.gov
World Health Organization	General Global and Local Influenza: http://www.who.int/topics/influenza/en/ Avian Influenza: http://www.who.int/influenza/human_animal_interface/avian_influenza/en/

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[12] WHO, accessed on 1/5/2017: http://www.who.int/influenza/human_animal_interface/2017_10_30_tableH5N1.pdf?ua=1

<u>**APPENDIX 2: MMWR WEEK**</u>
Please refer to the table below to interpret data presented by MMWR week.

MMWR WEEK	2016	2017
1	1/9/2016	1/7/2017
2	1/16/2016	1/14/2017
3	1/23/2016	1/21/2017
4	1/30/2016	1/28/2017
5	2/6/2016	2/4/2017
6	2/13/2016	2/11/2017
7	2/20/2016	2/18/2017
8	2/27/2016	2/25/2017
9	3/5/2016	3/4/2017
10	3/12/2016	3/11/2017
11	3/19/2016	3/18/2017
12	3/26/2016	3/25/2017
13	4/2/2016	4/1/2017
14	4/9/2016	4/8/2017
15	4/16/2016	4/15/2017
16	4/23/2016	4/22/2017
17	4/30/2016	4/29/2017
18	5/7/2016	5/6/2017
19	5/14/2016	5/13/2017
20	5/21/2016	5/20/2017
21	5/28/2016	5/27/2017
22	6/4/2016	6/3/2017
23	6/11/2016	6/10/2017
24	6/18/2016	6/17/2017
25	6/25/2016	6/24/2017
26	7/2/2016	7/1/2017
27	7/9/2016	7/8/2017
28	7/16/2016	7/15/2017
29	7/23/2016	7/22/2017
30	7/30/2016	7/29/2017
31	8/6/2016	8/5/2017
32	8/13/2016	8/12/2017
33	8/20/2016	8/19/2017
34	8/27/2016	8/26/2017
35	9/3/2016	9/2/2017
36	9/10/2016	9/9/2017
37	9/17/2016	9/16/2017
38	9/24/2016	9/23/2017
39	10/1/2016	9/30/2017
40	10/8/2016	10/7/2017
41	10/15/2016	10/14/2017
42	10/22/2016	10/21/2017
43	10/29/2016	10/28/2017
44	11/5/2016	11/4/2017
45	11/12/2016	11/11/2017
46	11/19/2016	11/18/2017
47	11/26/2016	11/25/2017
48	12/3/2016	12/2/2017
49	12/10/2016	12/9/2017
50	12/17/2016	12/16/2017
51	12/24/2016	12/23/2017
52	12/31/2016	12/30/2017
53		