MILLIMAN BRIEF

The mysterious case of the missing influenza season

Ellyn M. Russo, MS
Thomas Pu, MHI
David V. Williams
Melody Craff, PhD, MBA, MB BChir, MS, MA, FAHM
Jennifer R. Cohen, FSA, MAAA

Did the influenza virus, too, follow stay-at-home orders for 2020-21?

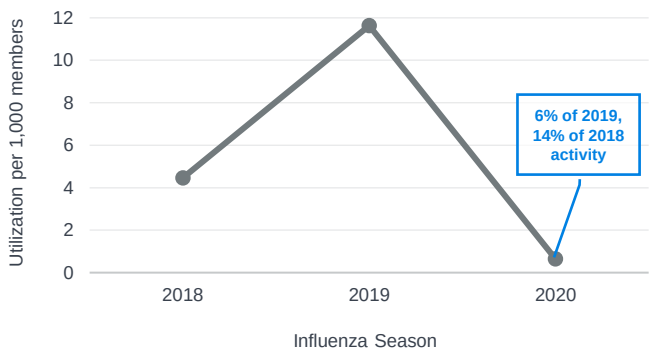
The U.S. healthcare delivery system is accustomed to seasonal variation in the demand for acute care related to infection from influenza viruses. Such infection and its sequela have been associated with as many 800,000 hospitalizations and 62,000 deaths even with 40% to 50% vaccination coverage per year for the past decade.[1,2] That is, until 2020 and the pandemic caused by the novel coronavirus SARS-Cov-2 (COVID-19).

Reported hospitalizations and deaths likely associated with influenza for 2020-21 are well below estimates of even the mildest of prior seasons.[3] Early insights of this were first illuminated in mid-2020 for the expected start of the season in the southern hemisphere, with Australia, Chile, and South Africa reporting a total of 51 influenza positive specimens, or 0.06%, of 83,307 tests performed from April through July 2020.[4] Interseasonal circulation of influenza in the United States was at historical lows, with the U.S. Centers for Disease Control and Prevention (CDC) reporting a weekly median of 0.20% of samples testing positive in May through August 2020 versus 2.35% for these months in 2019 and 1.04% in 2018.

Hypotheses to explain this at the time focused on the increase in preventive measures that reduce viral transmission, including social distancing, the use of personal protective equipment (PPE), and improved hygiene measures. As the current influenza season shifted to the northern hemisphere, infectious disease experts continued to warn that influenza viruses were still circulating and a sudden surge in infection was possible.[5] It remains unclear whether the impact of preventive measures against COVID-19 can fully explain the dramatic reduction in the identified burden of influenza. We sought to understand how differences among other key indicators, including influenza vaccination and diagnostic testing, may be contributing to this unprecedented season.

We analyzed the Milliman MedInsight® Emerging Experience research data set, which currently contains healthcare administrative claims data for approximately 18 million lives in the United States, including those covered by commercial employer-sponsored insurance, Patient Protection and Affordable Care Act (ACA) plans, Medicaid, Medicare fee-for-service (FFS), and Medicare Advantage. We studied September through December of the most recent two (2018 and 2019) as well as the current (2020) influenza seasons. We found that influenza office visit, emergency department, and hospital inpatient utilization rates were significantly lower in 2020 than 2019 by 94% and 2018 by 86%, comparatively (see Figure 1).

FIGURE 1: INFLUENZA OFFICE VISIT, EMERGENCY DEPARTMENT, AND HOSPITAL INPATIENT UTILIZATION PER 1,000 MEMBERS OVERALL AND BY PAYER TYPE FOR SEPTEMBER THROUGH DECEMBER OF THE MOST RECENT THREE INFLUENZA SEASONS



	INFLUENZA UTILIZATION PER 1,000 MEMBERS		
PAYER TYPE	2018	2019	2020
Weighted Average	4.5	11.6	0.6
Commercial	3.2	8.6	0.6
Medicaid	7.7	20.4	0.8
Dual-eligible	2.6	5.0	0.6
Medicare Advantage	1.7	2.5	0.3
Medicare Fee-for-Service	2.3	4.0	0.6

See Methods section for measure definitions.

Did enhanced awareness of vaccination, given the anticipation of a vaccine against COVID-19, increase influenza vaccination? Has influenza been underreported due to a lack of testing? Or, did our efforts to reduce the transmission of SARS-Cov-2 result in an unintentional win-win against both viruses at once?

HYPOTHESIS 1: VACCINATION INCREASED

Influenza virulence is determined by several factors, including characteristics of the circulating viruses influenced by antigenic drift (small mutations to the virus that make it possible to evade existing immunity) and nonhuman reservoirs (habitats in which the virus normally multiplies). Vaccination against influenza remains the most effective tool in reducing the burden associated with its virulence.[5,6] Despite expected variance in vaccination effectiveness, as matching which viruses the vaccine protects against is imperfect at times, the elimination of influenza through vaccination has not yet been achieved.[7-9]

Thus, vaccination advisory committees, including CDC's, continued to emphasize the importance of vaccination against influenza despite the persistence of low levels of influenza illness as months passed.[5] Upwards of 198 million doses of influenza vaccine are expected to be distributed in the United States this season, representing an increase of more than 10% over the prior year, for which annual population growth was only half a percent.[10-12]

We found that vaccination rates for 2020 through December were slightly lower (ranging from 8% for the commercial market to 25% lower for Medicare Advantage) than those of 2019 and 2018 regardless of payer type (see Figure 2). This challenges a conclusion that attributes the lack of illness due to infection entirely to vaccination against influenza.

FIGURE 2: INFLUENZA VACCINATION PER 100 MEMBERS BY PAYER TYPE FOR SEPTEMBER THROUGH DECEMBER OF THE MOST RECENT THREE INFLUENZA SEASONS

	INFLUENZA SEASON		
PAYER TYPE	2018	2019	2020
Weighted Average	28.4	27.6	21.8
Commercial	17.6	17.7	16.1
Medicaid	11.8	11.8	9.9
Dual-eligible	29.4	29.3	22.5
Medicare Advantage	59.1	55.1	44.3
Medicare Fee-for-Service	95.3	96.0	75.9

See Methods section for measure definitions.

HYPOTHESIS 2: TESTING DECREASED

Speculation that diagnostic testing for SARS-Cov-2 replaced testing for influenza suggests infection due to influenza could be underreported and/or occurring with infection from SARS-Cov-2 but not tested for nor detected. This phenomenon was perhaps more apparent at the start of the COVID-19 pandemic in which data from clinical laboratories in the United States indicated a 61% decrease in specimens submitted for influenza testing and a 98% decrease in specimens testing positive for March 1 through May 16, 2020 (end of prior influenza season, post-initiation of the COVID-19 pandemic) as compared to September 29, 2019, through February 29, 2020 (start of prior influenza season, pre-initiation of the COVID-19 pandemic).[4]

We observed a reduction in diagnostic testing for influenza rates for 2020 as compared to the prior two years regardless of payer type, yet the ratio of testing to influenza-related utilization was more than three times, and for some more than six times, as high for 2020 as compared to 2019 and 2018 (see Figure 3). It seems unlikely, therefore, that true influenza cases are being missed due to a decrease in testing.

FIGURE 3: INFLUENZA TESTS PER 1,000 MEMBERS BY PAYER TYPE FOR SEPTEMBER THROUGH DECEMBER OF THE MOST RECENT THREE INFLUENZA SEASONS

	INFLUENZA SEASON		
PAYER TYPE	2018	2019	2020
Weighted Average	22.3	36.1	12.4
Commercial	21.4	36.6	13.1
Medicaid	31.5	49.3	12.7
Dual-eligible	9.6	13.0	7.9
Medicare Advantage	10.6	13.3	6.3
Medicare Fee-for-Service	14.0	20.6	14.2

See Methods section for measure definitions.

HYPOTHESIS 3: TRANSMISSION AVOIDED

Most countries using transmission-reduction measures have experienced a decrease in the basic reproduction number (R_0) for SARS-Cov-2, or expected number of cases directly generated by one case in a population where all individuals are susceptible to infection.[13] As R_0 has been reduced, growth in the frequency of COVID-19 cases has been contained, perhaps by as much as 50% to 75%.

Both SARS-Cov-2 and influenza are believed to be transmitted mainly through respiratory droplets. Given this similarity, measures intended to decrease COVID-19 transmission, including social distancing, masks, hand washing, and reducing social interaction while ill, are thus also expected to significantly decrease influenza transmission. The substantial decline in the rate of healthcare utilization for (or related to) influenza across all payer types supports the hypothesis that these transmission-reducing measures are likely significantly disrupting illness caused by infection from influenza in addition to SARS-Cov-2.

IMPLICATIONS AND LIMITATIONS

Our findings provide additional evidence that influenza-related morbidity was significantly lower through December 2020 of the current season than could reasonably be expected for even a mild season despite slight reductions in influenza vaccination and testing rates. This is a positive outcome at present. Implications regarding future influenza resurgence or virulence are currently unknown.

We analyzed data through December 2020, the most recent available, yet the months studied represent less than half of a typical season in the United States. An early report from CDC suggested that changes to typical influenza vaccination behavior as a result of COVID-19 were unlikely among the U.S. general population, with rates at least as high as or higher than prior seasons expected.[13] Vaccination rates are, historically, 86% of the total for the season by the end of December, and data updates provided by CDC do not suggest a shift in the timing of vaccine receipt, nor diagnostic testing or disease burden.[3,15-19]

We measured pneumonia utilization as this diagnosis frequently follows infection from influenza. For example, the percentage of deaths due to influenza and pneumonia reported by CDC was driven by the former prior to 2020.[1] We observed that such utilization was lower as compared to prior seasons for payer types comprised predominantly of individuals of younger age groups and higher for payer types comprised of those of older age groups (see Figure 4). This is similar to differences in the burden of SARS-Cov-2 infection, which disproportionately affects older age groups. We believe this finding supports the validity of our data source to elucidate patterns in utilization by diagnosis.

FIGURE 4: PNEUMONIA OFFICE VISIT, EMERGENCY DEPARTMENT, AND INPATIENT HOSPITAL UTILIZATION PER 1,000 MEMBERS BY PAYER TYPE FOR SEPTEMBER THROUGH DECEMBER OF THE MOST RECENT THREE INFLUENZA SEASONS

	INFLUENZA SEASON		
PAYER TYPE	**2018**	**2019**	**2020**
Weighted Average	11.2	12.4	9.1
Commercial	6.6	7.8	5.9
Medicaid	12.8	15.0	7.6
Dual-eligible	31.8	35.0	39.6
Medicare Advantage	26.9	26.9	30.1
Medicare Fee-for-Service	31.1	31.6	32.5

See Methods section for measure definitions.

The data set analyzed represents a convenience sample of claims data occurring during the most recent three influenza seasons for insured individuals from all 50 states and may not be generalizable to all individuals with similar health insurance coverage nationally. Claims data can only detect encounters with healthcare professionals and therefore excludes influenza or influenza-like symptoms for which no services were sought. It is also possible that the payer and geographic distributions changed year to year. Finally, we did not measure influenza vaccination, tests, or illness for individuals who are uninsured.

METHODS

The study population included individuals continuously enrolled for the six months prior to September 1 of each influenza season. Payer types were categorized as commercial—health maintenance organization (HMO), preferred provider organization (PPO), ACA, and other—with upwards of 2 million; Medicaid (HMO, PPO, other) with more than 1 million; Dual (Medicaid-Medicare dual eligibility) with 80,000; Medicare Advantage with more than 300,000; and Medicare FFS with around 400,000 enrollees.

Vaccination against influenza was identified by the presence of a Current Procedural Terminology (CPT) code of 90630, 90653-8, 90660-4, 90666-8, 90672-3, 90685-9, G0008, G9141-2, and/or Q2033-9; or International Classification of Diseases, Tenth Revision, Procedure Coding System (ICS-10-PCS) code of 3E01340 and/or 3E02340. CPT codes of 87610, 87275-6, 87400, 87501-3, 87631-3, 87636, 87637, and 87804 were used to identify diagnostic testing for influenza. International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) diagnosis codes for influenza included J09, J10, J11, and for pneumonia J12, J13, J14, J15, J16, J17, and J18. Utilization included office visits, emergency department visits, and inpatient admissions with a diagnosis among the first 10 positions. Findings were not risk- or acuity-adjusted.

For additional information on MedInsight, please visit medinsight.milliman.com.

ENDNOTES

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CONTACT

Melody Craff
melody.craff@milliman.com

Ellyn Russo
ellyn.russo@milliman.com

David Williams
david.williams@milliman.com