

# Burden of Influenza Outbreaks in Long-Term Care Facilities in Philadelphia, 2012-2020

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## OBJECTIVES

We aimed to characterize the disease patterns and inter-seasonal variation of influenza virus outbreaks in long-term care facilities (LTCFs) and identify institutional, environmental, and public health interventions associated with differences in outbreak outcomes and characteristics.

## METHODS

We conducted a retrospective, longitudinal study of influenza outbreaks in LTCFs reported to the Philadelphia Department of Public Health (PDPH) over eight consecutive seasons (November 2012 through March 2020). Characteristics of individual outbreaks, facilities, and infection control measures were reported in the PDPH Influenza Outbreak database, while quality measures and other facility-level data were extracted from the CMS Nursing Home Compare (NHC) database. Cases of influenza-like illness (ILI) in residents and staff were reported with associated laboratory data.

### Association of attack rates and implementation of public health interventions in influenza outbreaks

Characteristic (n=128)	Intervention Implemented		Rate difference (95% CI)	p
	Yes	No		
Intervention, median facility attack rate % (IQR)				
Droplet precautions	2.8 (1.2-6.5)	2.3 (1.0-3.4)	0.56 (-0.27 to 1.8)	.176
Antivirals administered	2.5 (1.2-5.1)	2.5 (1.0-6.1)	-0.11 (-1.2 to 0.86)	.833
Surveillance	1.9 (1.0-4.4)	4.3 (2.0-12.7)	-2.0 (-3.8 to -0.66)	.002
Education	1.9 (1.0-3.8)	5.1 (1.8-13.2)	-2.6 (-5.0 to -0.87)	<.001
Cohorting	2.3 (1.2-4.6)	2.7 (1.1-6.2)	0.08 (-0.7 to 1.0)	.879
Admission restrictions	1.9 (1.1-4.1)	2.7 (1.2-6.0)	-0.43 (-1.4 to 0.32)	.290
Visitor restrictions	1.8 (1.0-3.8)	3.1 (1.4-6.6)	-0.79 (-1.9 to -0.01)	.049
Vaccination	1.6 (0.6-4.1)	2.7 (1.3-5.7)	-0.74 (-1.7 to -0.01)	.047

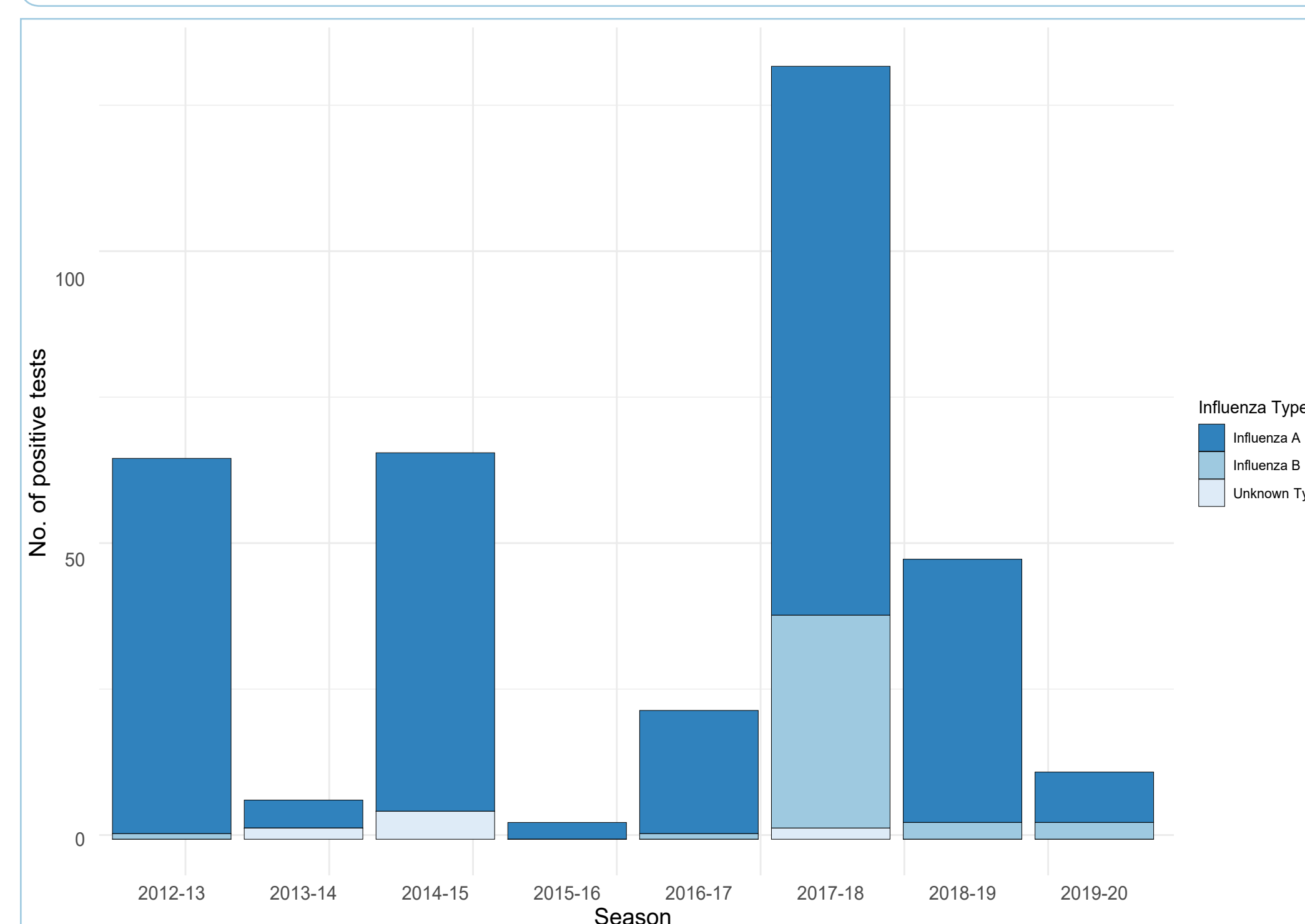
Attack rates calculated for 128 outbreaks due to missing data.

## RESULTS

A total of 131 influenza outbreaks were reported among 56 facilities, leading to 1196 cases of ILI, 227 influenza-associated hospitalizations, and 20 deaths. A total of 116 (88.5%) influenza outbreaks were laboratory-confirmed, with influenza A predominating (78%). A range of 2-63 individuals were affected per outbreak (median 5; IQR, 3-10), and the resident attack rate was 3.0% (IQR, 1.6-7.4). ILI-associated deaths were reported in 13 (11%) of outbreaks.

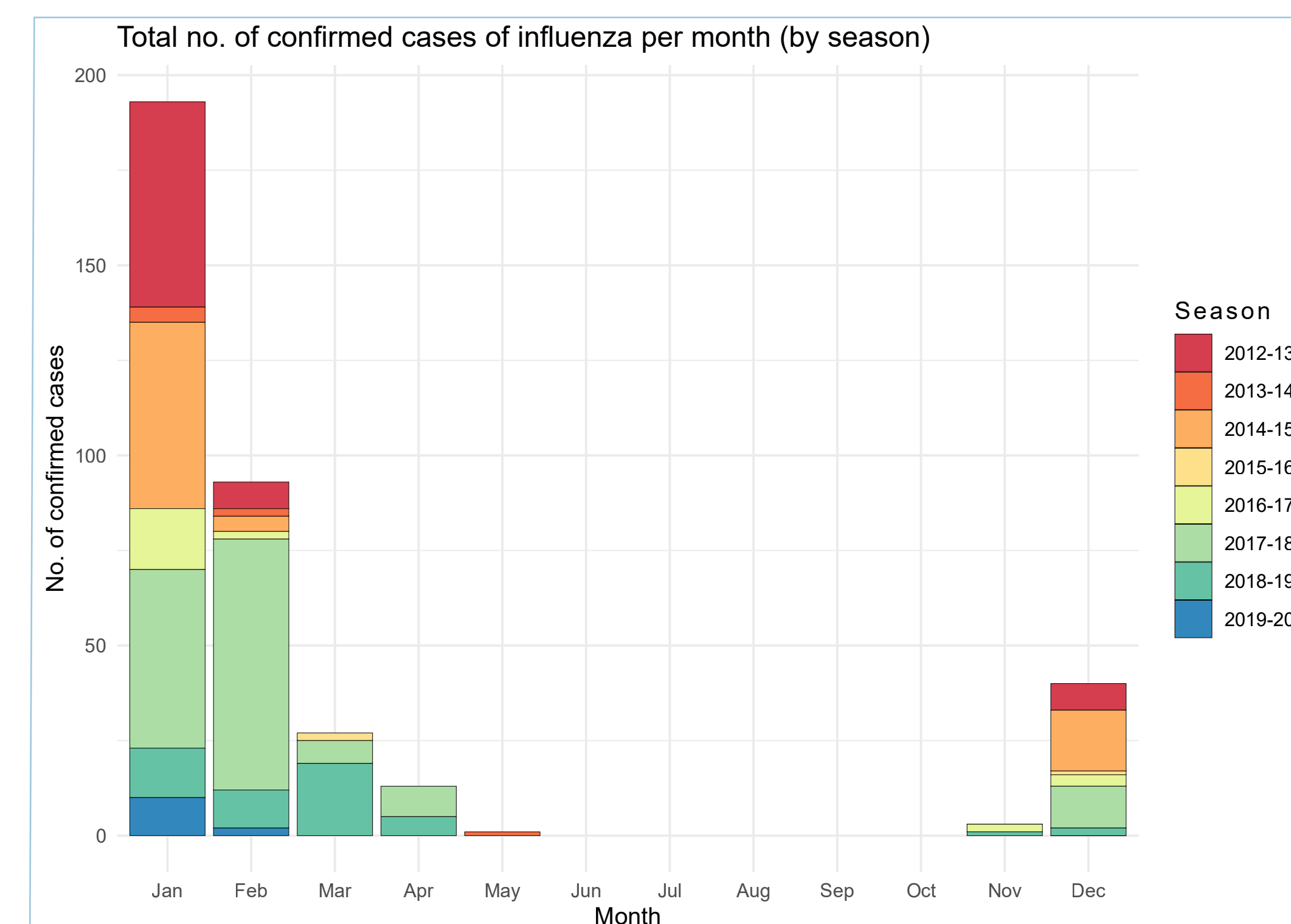
Among the 56 unique facilities that reported influenza outbreaks, 45 (79%) were skilled nursing facilities (SNFs), and 32 (56%) were for-profit facilities. SNFs were associated with a greater number of outbreaks compared to other facilities ( $p<.001$ ), with 120 (92%) of outbreaks occurring among SNFs. The median rate of influenza vaccination among staff was 80% (IQR, 52-95).

Among facilities that reported multiple outbreaks compared to facilities that reported only a single outbreak, the number of beds was significantly greater, 178 versus 120 ( $p=.048$ ). Lower total attack rates were associated with public health measures for surveillance (1.9% vs 4.3%,  $p=0.0015$ ), education (1.9% vs 5.1%,  $p<0.001$ ), visitation restrictions (1.8% vs 3.1%,  $p=0.049$ ), and vaccination policies (1.6% vs 2.7%,  $p=0.047$ ). Smaller outbreaks were associated with implementation of droplet precautions (3 vs 6 cases per outbreak,  $p=0.007$ ), antiviral treatment and prophylaxis (3 vs 6,  $p=0.034$ ), and admission restrictions (4 vs 7,  $p=0.015$ ). Vaccination was implemented in 24% of outbreaks. No public health measures were associated with a significant decrease in the median number of outbreaks experienced by a facility.



**Figure 1.** No. of confirmed cases of influenza by season and influenza type, 2012-2020.

## Non-pharmacological public health measures and vaccination policies may reduce the size and severity of influenza outbreaks in long-term care facilities.



**Figure 2.** Total no. of confirmed cases of influenza, cumulative by month and compared by annual influenza season (November through April).

## CONCLUSIONS

This is the first large descriptive study of influenza outbreaks in Philadelphia's LTCFs. Larger facility size was associated with a greater frequency of outbreaks. There was substantial inter-seasonal variation in outbreak size. Certain public health measures may reduce the size and severity of influenza outbreaks in LTCFs. Facility vaccination may be an under-utilized intervention. These results support the consistent utilization of recommended infection prevention strategies.