Open Forum Infectious Diseases

PERSPECTIVES

Precipitous Fall in Common Respiratory Viral Infections During COVID-19

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In the midst of the coronavirus disease 2019 (COVID-19) pandemic, we were surprised to find that all other respiratory viral infections fell precipitously. The difference in respiratory viral infections during the 16-week period of our peak COVID-19 activity in 2020 (Centers for Disease Control and Prevention weeks 14–29) was significantly lower than during the same period in the previous 4 years (a total of 4 infections vs an average of 138 infections; $P < .0001$). We attribute this to widespread use of public health interventions including wearing face masks, social distancing, hand hygiene, and stay-at-home orders. As these interventions are usually ignored by the community during most influenza seasons, we anticipate that their continued use during the upcoming winter season could substantially blunt the case load of influenza and other respiratory viral infections.

Keywords. COVID-19; public health response; respiratory infections.

Although influenza virus, respiratory syncytial virus, and common coronavirus infections generally peak during the winter months in temperate climates [1, 2], these viruses circulate year-round in the tropics. But even in northern latitudes, some respiratory viruses, such as enterovirus, rhinovirus, and parainfluenza viruses, can be detected throughout the year. The occurrence of all these infections has been accepted as inevitable, and except for vaccination strategies in the case of influenza virus infections, these infections have never been aggressively addressed by community-wide implementation of other measures with proven efficacy such as widespread use of face masks, hand hygiene, and social distancing.

The sudden appearance of a novel coronavirus in China in December 2019 and its explosion into the coronavirus disease 2019 (COVID-19) pandemic have prompted several public health interventions in an attempt to control the spread of COVID-19. In response to the alarming rise in COVID-19 cases in Connecticut, the Connecticut Governor and State Department of Health issued a series of infection prevention orders to mitigate the pandemic beginning in March 2020 (Table 1). Shortly after these restrictions were promulgated, we noted a precipitous fall in all other respiratory viral infections in our community, suggesting that these public health measures were very effective in controlling the spread of many respiratory viruses, including influenza.

METHODS

Stamford Hospital, a 305-bed community hospital in southwestern Connecticut, serves a primary service area of ~150 000 people. The hospital has had an active respiratory viral pathogen testing program since 2004 under the direction of the Infectious Diseases Department and the Microbiology Laboratory. An average of 4809 tests for respiratory viruses were performed annually from 2015 to 2019. The majority of samples were submitted by the hospital's emergency department, urgent care center, and inpatient services, with a smaller proportion referred from private physician offices and city clinics. Influenza and RSV testing was performed by physician order without restriction using the GeneXpert (Cepheid, Sunnyvale, CA, USA) Flu/RSV polymerase chain reaction (PCR) platform. Testing for other respiratory viruses was performed using the Biofire (Salt Lake City, UT, USA) Multiplex Respiratory PCR Panel by physician order after infectious diseases service approval. All testing was performed daily in the Stamford Hospital Microbiology Laboratory on clinical samples submitted in viral transport medium (VTM; Bartels ViraTrans, Bray, Ireland). Viral diagnostic yield was maximized by requiring bilateral nasopharyngeal and throat swabs inoculated into the same VTM vial during the years 2015–2019. Due to a shortage of swabs in 2020 because of the COVID-19 pandemic, most samples for RSV/flu and other respiratory viruses were obtained using a single nasopharyngeal swab in VTM.

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Table 1. Emergency Orders Issued by Connecticut State Governor Lamont

Date	Order
3/12/20	Limits on social gatherings to 250 and limits on nursing home visitation
3/15/20	Cancelation of public school classes
3/16/20	Closure of bars, gyms, movies; limitations on restaurant inside dining
3/18/20	Closure of shopping malls
3/22/20	Remote working mandate for nonessential businesses
3/26/20	Restriction of social and recreational gatherings to 5 people
3/28/20	Provision for elimination of congregate housing for homeless people
4/2/20	Prohibition of nonessential lodging
4/7/20	Mandatory rules for safe workplaces in essential business
4/17/20	Face coverings required in public places if unable to socially distance
5/1/20	Provision for remote participation in municipal and (later) corporate meetings

COVID-19 cases were defined as individuals with a positive severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) polymerase chain reaction (PCR). PCR tests were performed either in the Stamford Hospital Laboratory using Abbott ID-NOW (Chicago, IL, USA) or Cepheid GeneXpert PCR or were sent to Sunrise Reference Laboratory (Hicksville, NY, USA), Quest Reference Laboratory (Marlborough, MA, USA), or the Connecticut State Department of Health Laboratory (Rocky Hill, CT, USA). The tested population included in-patients (9% of tests), emergency department and urgent care patients (17% of tests), outpatients for both screening and diagnostic reasons (69% of tests), and patients tested through contractual services provided to other institutions, mainly skilled nursing facilities (5% of tests). COVID-19 admissions were defined as patients admitted to Stamford Hospital with a clinically compatible syndrome in association with a positive PCR test.

Study time periods were expressed as Centers for Disease Control and Prevention (CDC) week, which commence with the first complete week in January of the respective year. Records of positive influenza and RSV tests had been prospectively collected since before 2010. Results of Biofire PCR tests had been prospectively collected since 2015, when the test was introduced at Stamford Hospital.

Differences in case counts were compared using chi-square and Fisher exact test calculations for statistical comparison (https://www.socscistatistics.com/tests/).

RESULTS

The first positive SARS-CoV-2 PCR and first COVID-19 case admitted to Stamford Hospital occurred on March 11, 2020 (CDC week 11). Hospital admissions and the number of daily positive PCR tests rose over the next month, peaking in the weeks ending on 4/11/2020 and 4/18/2020 (CDC weeks 15 and 16, respectively). The hospital reached a peak census of 150 COVID-19 patients on April 14, 2020, CDC week 16, and a peak weekly number of positive PCR tests of 716 in CDC week 15.

We analyzed the occurrence of all viral respiratory illnesses diagnosed at Stamford Hospital in the last 5 years during a 16-week period (CDC weeks 14 to 29; approximately the months of April through July), which coincided with high COVID-19 activity and increased use of masks, social distancing, and hand hygiene recommended by the CDC and the Connecticut State Department of Health in 2020. The years were divided into 2 periods: (1) a 4-year period from 2016 to 2019, the "historical seasons," and (2) the 2020 season. During the historical seasons, the Stamford Hospital laboratory diagnosed a total of 327 influenza cases and 223 positive Biofire cases, for an average 138 combined cases per season. During the same period in 2020, only 1 case of influenza (CDC week 14) and 3 positive Biofire cases were seen (a metapneumovirus case in CDC week 14, a coronavirus NL63 in CDC week 15, and an adenovirus in CDC week 23). The differences between the historical seasons and the 2020 season are statistically significant (chi-square value, 41.26; $P < .00001$), illustrated in Figure 1. Only 1.4% of Biofire tests were positive in the 2020 season, compared with 38.9% in the historical seasons (chi-square value, 89.24; $P < .00001$) despite an *increased* volume of testing performed in 2020 (212 tests in 2020 compared with an average of 141 in the historical seasons). Only 1.3% of influenza tests were positive in 2020 compared with 10.8% of tests performed during the same time periods in the historical seasons, but fewer influenza/RSV tests were performed in 2020 compared with the historical seasons (76 compared with an average of 754).

DISCUSSION

Our findings indicate that public health measures to mitigate the spread of SARS-CoV-2 infection in the community were very effective in controlling the spread of all other respiratory viruses, including influenza. These findings are supported by CDC observations showing a dramatic fall in influenza-like illness starting in CDC week 12 [3]. Although airborne transmission of many respiratory viruses has been demonstrated to occur in experimental settings [4, 5] and is widely acknowledged to occur during aerosolizing procedures in hospitals, epidemiologic studies show that these viruses are transmitted in the community by droplet spread and prolonged close contact and that this transmission is reduced by widespread use of face masks and social distancing [6–9].

Where widespread use of face masks, social distancing, and stay-at-home orders have been enforced, COVID-19 cases have been reduced [10–12]. Our data would suggest that it is easier to reduce the spread of other respiratory viruses compared with SARS-CoV-2 infections. Perhaps this is related to the high proportion of asymptomatic and

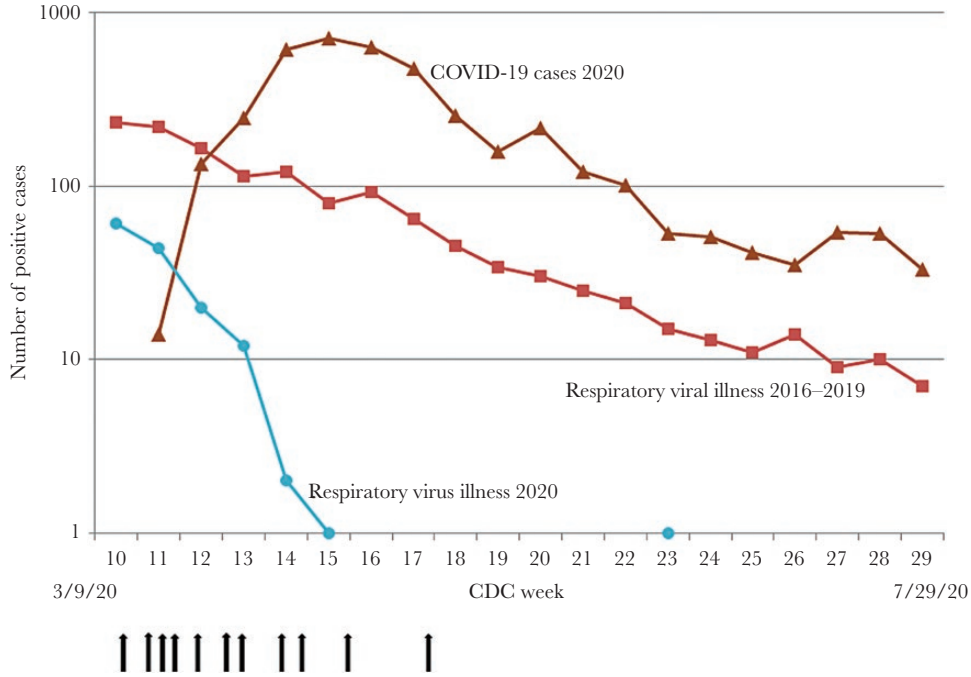

Figure 1. Respiratory viral infections diagnosed in 2020 compared with historical totals during the 4-year period 2016–2019 showing a precipitous fall in all non-COVID-19 infections in 2020. ↑ = Connecticut public health interventions cited in Table 1. Abbreviations: CDC, Centers for Disease Control and Prevention; COVID-19, coronavirus disease 2019.

presymptomatic cases of COVID-19 that result in undetected spread; the longer incubation period compared with influenza, for example; or the higher reproductive capacity of SARS-CoV-2 [13]. Viral pathogenicity, environmental persistence, and propensity for aerosolization may be additional factors. This dramatic drop in other viral respiratory illnesses during the COVID-19 pandemic has been noted elsewhere [3, 14, 15].

It is not possible to say from our data whether social distancing, use of face masks, or hand or environmental hygiene is most important. We do not have data on community compliance with any of these interventions. Nevertheless, based on data published by others [12, 16] we suspect that wearing face masks in the community and hospital is the most important public health intervention to control the spread of any respiratory viral illnesses, including COVID-19.

Our findings are subject to some limitations. They are derived from the observations of a single community. Although we have a relatively diverse community (52% white, 26% Hispanic, and 11% African American in our primary service area) [17], the findings may not be generalizable to all communities. Second, fewer influenza tests were performed in 2020 compared with prior seasons, and these may not fairly represent a complete sampling of influenza-like illnesses in the community. This may be due to fewer patients seeking emergency department care for milder illnesses and the closure of many primary care offices that had been a source of referral tests in prior seasons. However, Biofire testing (which includes influenza) was performed more frequently in 2020 due to a large number of pending COVID-19 cases awaiting PCR test results (an up to 7-day delay in results reporting from reference laboratories). Third, our test collection methods changed from 3 swabs in the historical seasons to a single nasopharyngeal swab in 2020 due to a shortage of supplies, which may have affected the yield of some respiratory viral pathogens.

Based our experience and those of others [3, 14, 15], we are optimistic that with the continued promotion of social distancing and consistent wearing of face masks, in conjunction with widespread influenza vaccination, the 2020–2021 "influenza season" may actually be less severe than predicted. This would allow us to continue our efforts to control the COVID-19 pandemic until, and if, a safe and effective vaccine for this infection becomes available.

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