Masks in the Clinical Center Past/Present/Future

Alison Han

Hospital Epidemiology Service

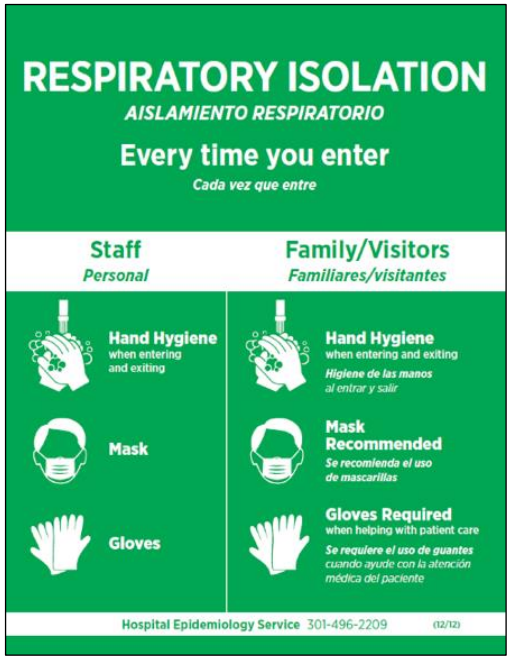
October 18, 2024

Timeline

- Past (pre-pandemic)
- Past (early pandemic)
- Present
- Future

Transmission-based Precautions

- Additional precautions to prevent infection transmission



Transmission-based Precautions: Masks and Respirators

- Transmission by respiratory droplets

Examples:
- Influenza
- Respiratory Syncytial virus (RSV)
- Rhinovirus

- Airborne transmission

Examples:
- Measles
- Tuberculosis

COVID-19 Pandemic

January 2020

- Laboratory-confirmed cases reported outside of China
- Confirmation of person-to-person spread
- Travel advisories, enhanced screening procedures, quarantine of returning travelers
- Declared Public Health Emergency (WHO, CDC)

February 2020

- CDC test available, noted to have problems
- Likely community spread in the U.S.

March 2020

- Declared a pandemic (WHO)
- Travel restrictions
- Shutdown of schools, restaurants, cancellation of large gatherings and public events, stay-at-home orders (states)

Source: https://www.cdc.gov/museum/timeline/covid19.html

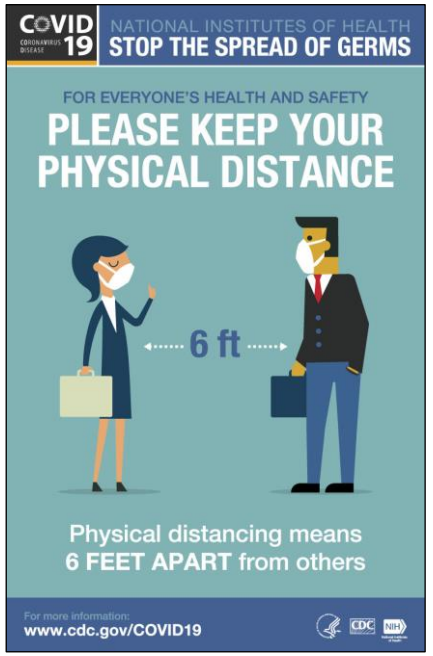
COVID-19 Pandemic

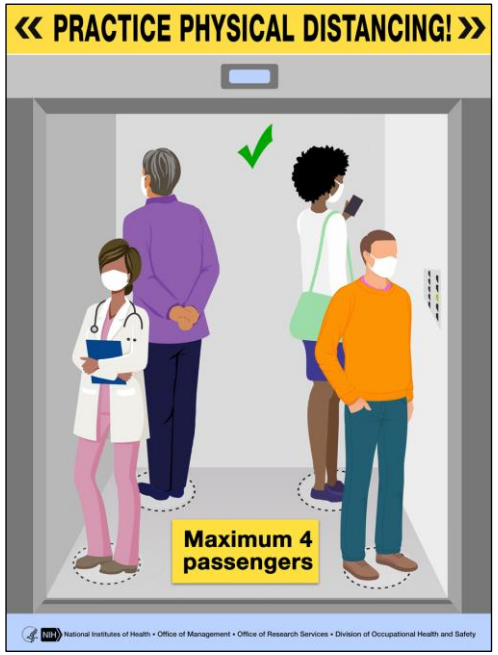
At NIH and at the Clinical Center (selected timeline)

- March 3, 2020: Testing available
- March 16, 2020: Staff teleworking
- April 2, 2020: Surgical masks to enter the Clinical Center
- May 21, 2020: Asymptomatic testing for staff

NIH Clinical Center Mitigation Strategies

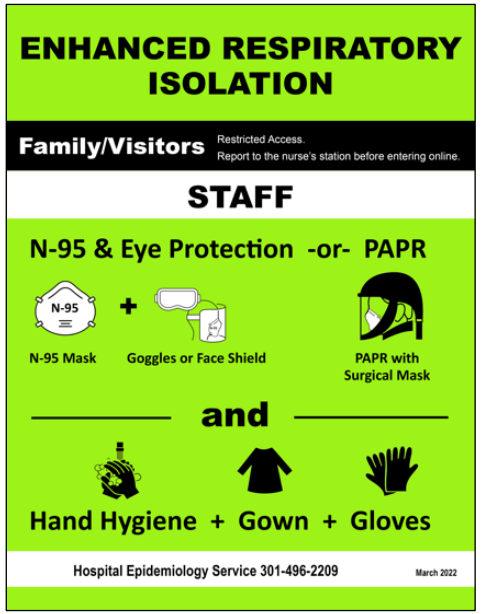
- Universal masking
- Physical distancing
- Screening: symptomatic, asymptomatic
- Isolation and Quarantine





Changes to patient care activities

- Staff:
  - Universal masking
  - Eye protection when within 6 feet of patients
  - Enhanced respiratory isolation of patients:
    - Suspected COVID-19
    - Confirmed COVID-19
    - High-risk contact of confirmed COVID-19 case
- Patients
  - Screening prior to and at arrival
  - Admissions testing
  - Visitor restrictions
  - Admissions testing of rooming in visitors
  - Pre-aerosol-generating procedure (AGP) testing
  - COVID-19 unit



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[Intervention Review]

Physical interventions to interrupt or reduce the spread of respiratory viruses

Tom Jefferson[1], Liz Dooley[2], Eliana Ferroni[3], Lubna A Al-Ansary[4], Mieke L van Driel[5,6], Ghada A Bawazeer[7], Mark A Jones[2], Tammy C Hoffmann[2], Justin Clark[2], Elaine M Beller[2], Paul P Glasziou[2], John M Conly[8,9,10]

[1]Department for Continuing Education, University of Oxford, Oxford OX1 2JA, UK. [2]Institute for Evidence-Based Healthcare, Bond University, Gold Coast, Australia. [3]Epidemiological System of the Veneto Region, Regional Center for Epidemiology, Veneto Region, Padova, Italy. [4]Department of Family and Community Medicine, King Saud University, Riyadh, Saudi Arabia. [5]General Practice Clinical Unit, Faculty of Medicine, The University of Queensland, Brisbane, Australia. [6]Department of Public Health and Primary Care, Ghent University, Ghent, Belgium. [7]Department of Clinical Pharmacy, College of Pharmacy, King Saud University, Riyadh, Saudi Arabia. [8]Cumming School of Medicine, University of Calgary, Room AGW5, SSB, Foothills Medical Centre, Calgary, Canada. [9]O'Brien Institute for Public Health and Synder Institute for Chronic Diseases, Cumming School of Medicine, University of Calgary, Calgary, Canada. [10]Calgary Zone, Alberta Health Services, Calgary, Canada

Cochrane Database of Systematic Reviews 2023, Issue 1. Art. No.: CD006207.
DOI: 10.1002/14651858.CD006207.pub6.

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IDEAS AND OPINIONS

Annals of Internal Medicine

For Patient Safety, It Is Not Time to Take Off Masks in Health Care Settings

Tara N. Palmore, MD; and David K. Henderson, MD

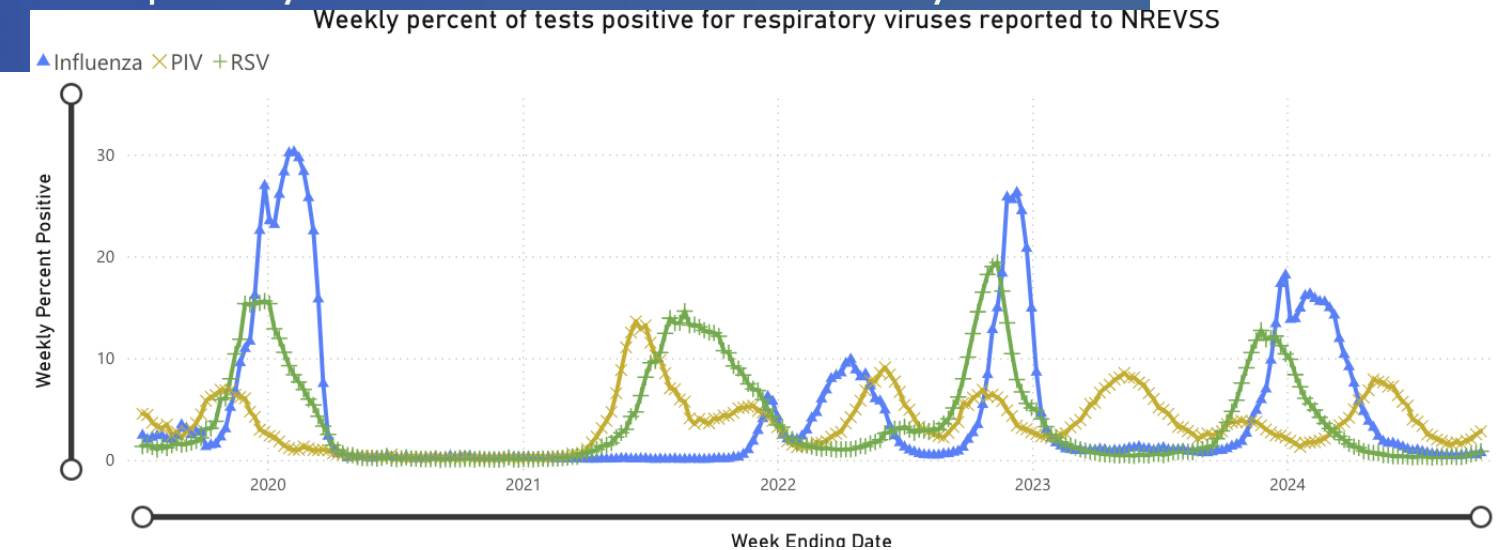
Annals of Internal Medicine

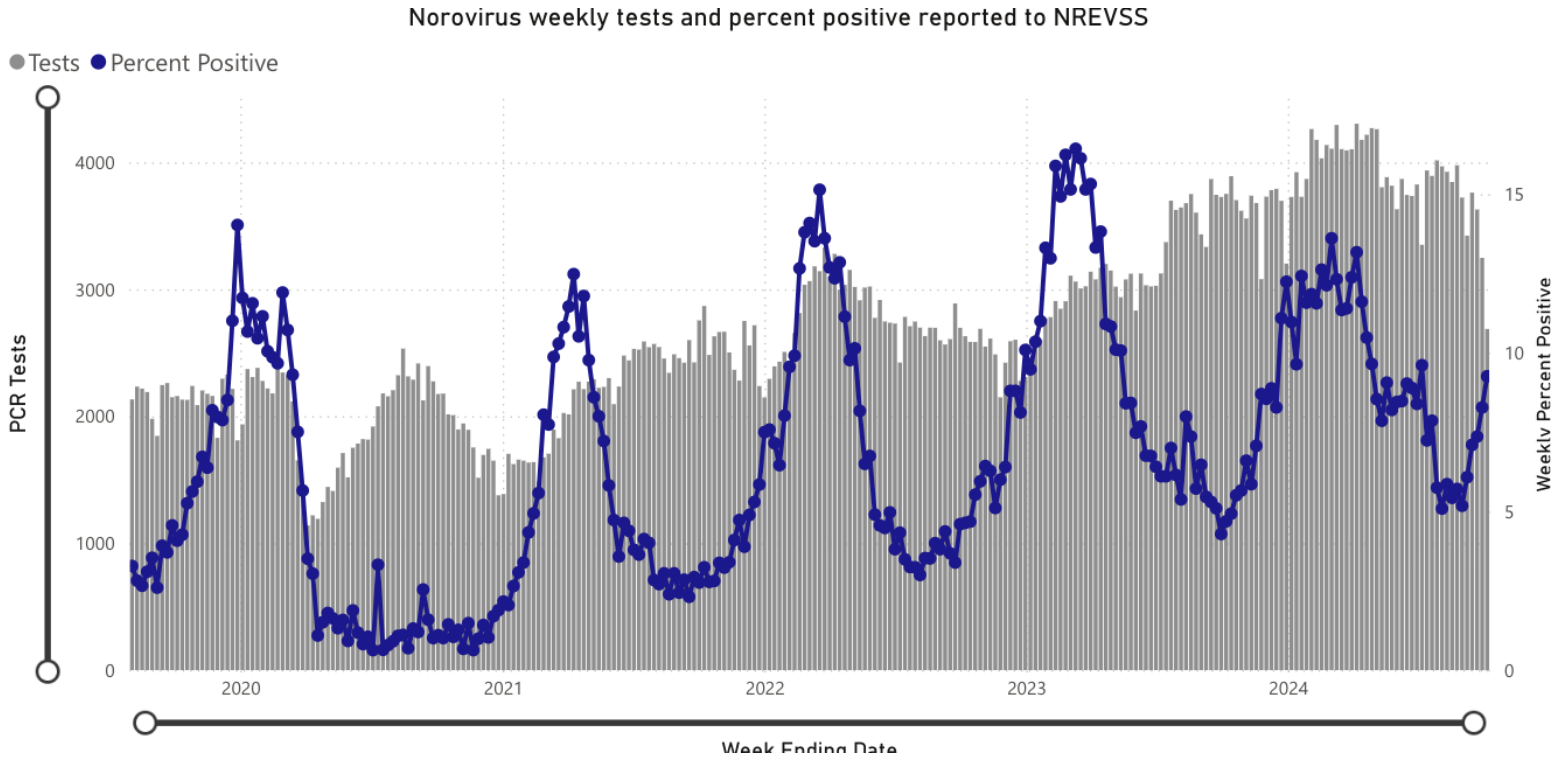
IDEAS AND OPINIONS

Universal Masking in Health Care Settings: A Pandemic Strategy Whose Time Has Come and Gone, For Now

Erica S. Shenoy, MD, PhD; Hilary M. Babcock, MD, MPH; Karen B. Brust, MD; Michael S. Calderwood, MD, MPH; Shira Doron, MD; Anurag N. Malani, MD; Sharon B. Wright, MD, MPH; and Westyn Branch-Elliman, MD, MMSc

The National Respiratory and Enteric Virus Surveillance System (NREVSS)





Source: https://www.cdc.gov/nrevss/php/dashboard/index.html#cdc_tools_technologies_features-nrevss-dashboard

Influenza B

- Influenza B generally infects humans (two reports in seals)
- Influenza B/Yamagata lineage not detected after March 2020
  - Removed from 2024-2025 influenza vaccine
  - Influenza B/Victoria lineage, Influenza A (H1N1) and (H3N2) in the 2024-2025 trivalent influenza vaccine

Infection Control & Hospital Epidemiology (2022), 1–6
doi:10.1017/ice.2022.31

SHEA

Sharp decline in rates of community respiratory viral detection among patients at the National Institutes of Health Clinical Center during the coronavirus disease 2019 (COVID-19) pandemic

Michele E. Woolbert MPH[1], Christine D. Spalding BSN[1], Ninet Sinaii PhD, MPH[2], Brooke K. Decker MD[1], Tara N. Palmore MD[1] and David K. Henderson MD[1]

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January 2015 - March 2021:

- Compare trends in respiratory virus infections before and during the COVID-19 pandemic

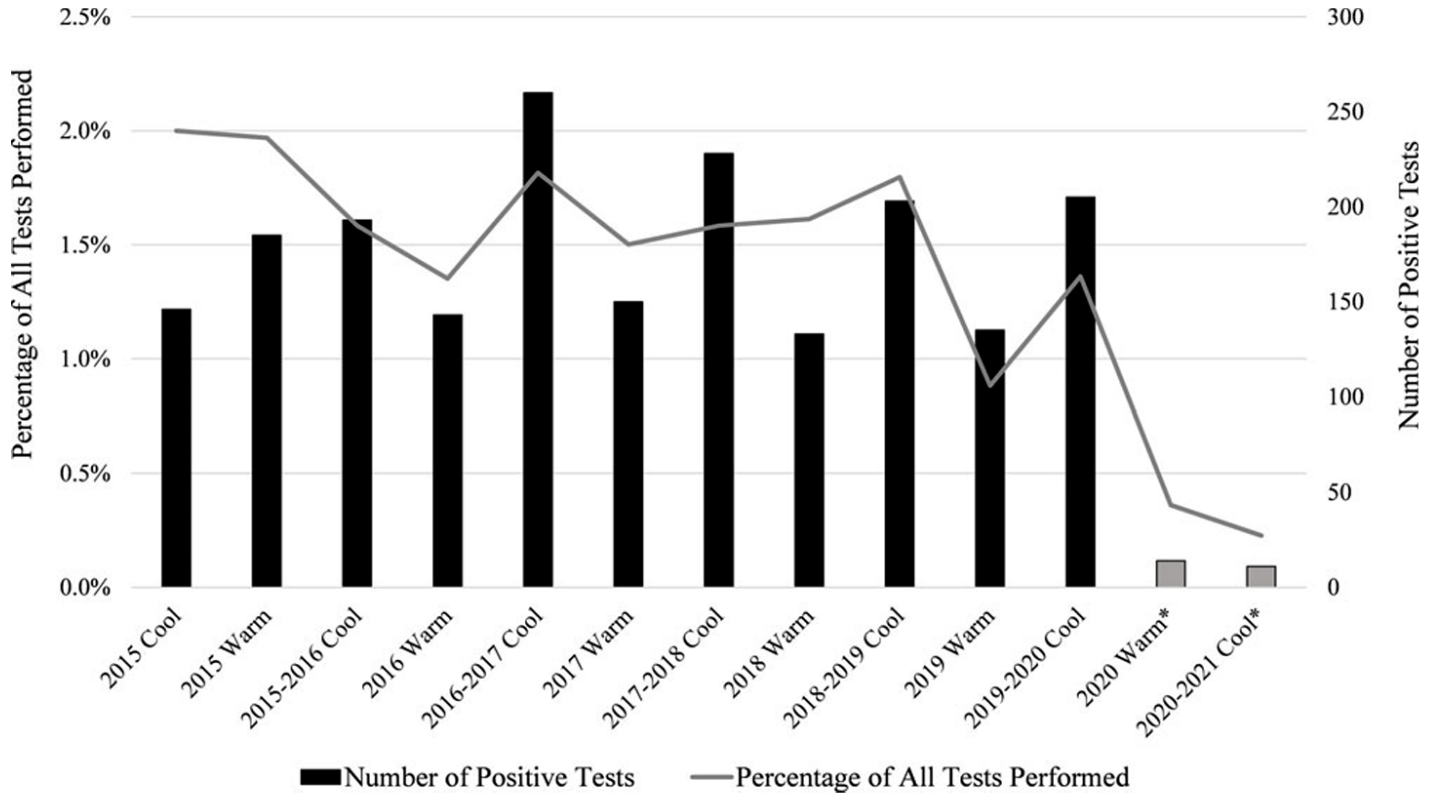
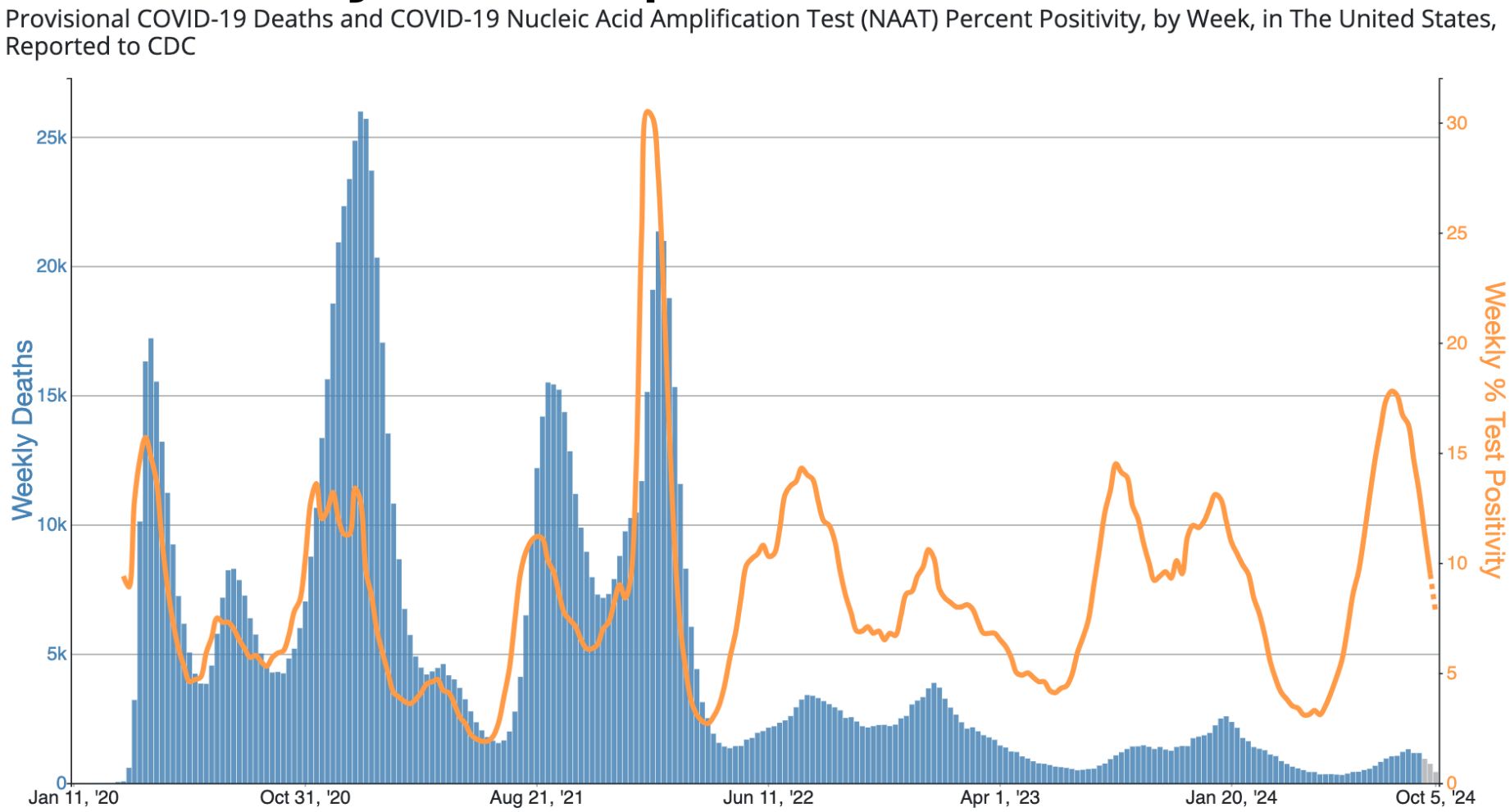


Fig. 1. Detection of all respiratory pathogens among NIH Clinical Center patients from January 2015–March 2021.* indicates the COVID-19 period; compared to the COVID-19 reference period (2020 warm period and 2020–2021 cool period), the rates for all of the previous year and seasonal periods were substantially higher ($P < .001$; $P = .002$ for 2019 warm period).

COVID-19 Deaths and Percent Positivity in the U.S., January 2020-present



Centers for Disease Control and Prevention. COVID Data Tracker. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2024, October 15. https://covid.cdc.gov/covid-data-tracker

Source: https://covid.cdc.gov/covid-data-tracker/#trends_weeklydeaths_testpositivity_00

Lifting of select mitigation strategies

- April 10, 2023
  - Pre-AGP testing (previously required)
  - Quarantine of international travelers who are not fully vaccinated (previously required)
  - Testing prior to travel (previously recommended)
- May 8, 2023
  - COVID-19 unit on 5SE-N closed so patients with suspected or confirmed COVID-19 stayed in their home units
- June 5, 2023
  - Masks required in patient care areas only
  - Masks optional in non-patient care areas

Admission Testing for Respiratory Viruses

- Testing for SARS-CoV-2 testing on admission since 2020
- November 2022 - April 2023 and September 2023-May 2024
  - Testing for Influenza A, Influenza B, RSV
- Goal: early identification → transmission-based precautions→ prevent infection transmission

P-713

Two Seasons of Admissions Screening for Influenza and RSV Among a Highly Immunocompromised Patient Population

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Alison Han, MD[1], David K. Henderson, MD[1]

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Background

Influenza and respiratory syncytial virus (RSV) are respiratory viruses that can cause serious complications in immunocompromised patients. To facilitate early detection and prompt isolation of infected patients during the 2022-23 and 2023-24 fall/winter seasons, the NIH Clinical Center (CC), a clinical research hospital serving a significantly immunocompromised patient population, augmented routine symptom screening with influenza and RSV testing of all patients on admission (**Figure 1**).

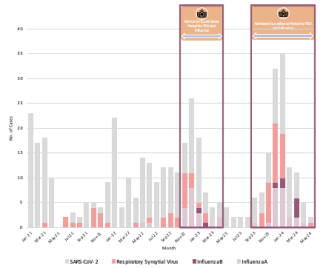

Figure 1. Incidence of Asymptomatic and Symptomatic Influenza A, Influenza B, RSV and SARS-CoV-2 at the NIH Clinical Center, 1/2021 through 5/2024

Methods

From 5/2020 to 5/2024, all patients were screened for SARS-CoV-2 on admission to our hospital. During the time periods, November 2022 – April 2023 and September 2023 – May 2024, Influenza A, B and RSV screening was added. Orders were autogenerated and all four tests performed from a single nasopharyngeal swab (NP) collected from each patient on admission.

NP Swabs collected from patients admitted were placed in Viral Transport Media (VTM) and sent to our Microbiology lab for testing. All swabs were tested on the Panther Fusion® FluA/B/RSV Assay (Hologic, Inc.) or the Xpert® Xpress CoV-2/Flu/RSV test. Medical chart reviews and discussions with patient care providers elucidated whether cases identified on admission were symptomatic or asymptomatic.

Results

Of 3197 NP swabs collected from patients admitted to our hospital during active admission surveillance periods, 19 (0.59%) infections were identified; 7 (0.22%) with Influenza A, 11 (0.34%) with RSV and 1 (0.03%) with Influenza B. All but 2 infections were detected between the months of November to January (**Figure 2**).

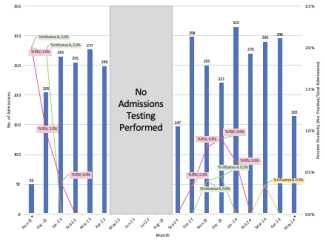

Figure 2. Detection of Influenza and RSV Infections in Clinical Center Patients on Admission and Percent Positivity, By Month, 11/27/22 - 4/30/23 and 9/13/23 - 5/19/24

*Admissions testing not performed for the entirety of the month

Ten patients (53%) screened negative for symptoms but subsequently disclosed symptoms. Eight (42%) were asymptomatic on admission but disclosed a recent history of an upper respiratory infection (URI) and four (21%) disclosed a recent history of exposure to someone with a URI. Nine (47%) patients were asymptomatic (**Table 1**).

	Total Influenza A (n=7)	% Influenza A	Total Influenza B (n=1)	% Influenza B	Total RSV (n=11)	% RSV	Total	% Influenza A, Influenza B, or RSV (n=19)
No Evidence of Symptoms on Admission	3	43%	1	100%	5	45%	9	47%
Evidence of Symptoms on Admission	4	57%	0	0%	6	55%	10	53%
Recent History of URI	4	57%	0	0%	4	36%	8	42%
Recent History of Known Exposure	2	29%	0	0%	2	18%	4	21%

Table 1. Retrospective Review of Asymptomatic Case Detections

Results

Beginning week 40 through week 5, 32 influenza infections, and 46 RSV infections were identified among Clinical Center patients, with infections peaking similar to nationwide rates of detection (**Figures 3 and 4**).

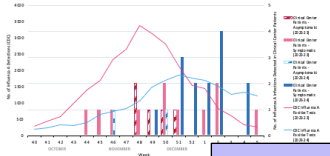

Figure 3. Influenza A Detections Among Clinical Ce… CDC Detections Reported by U.S. Public Health … 2022-23 and 2023-24 Seas…

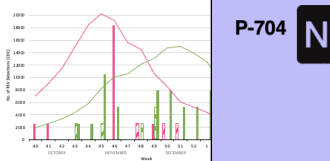

Figure 4. RSV Detections Among Clinical Center … CDC Detections Reported by U.S. Public Health L… 2022-23 and 2023-24 Season

Of 2619 Nasopharyngeal swabs collec… asymptomatic and symptomatic patien… high community transmission, Novemb… 23, 2023-24), 252 tested positive for a… 28.6% of those represented influenza … (**Figure 5**).

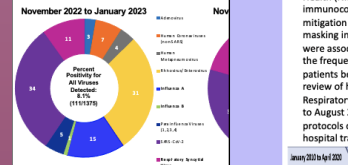

Figure 5. Respiratory Viruses Detected Among… 2022-23 and 2023-24 Sea…

Discussion

- Patients identified with influenza or RSV on admission were immediately isolated, limiting opportunity for spread among our vulnerable patient population; additionally 3 received prompt treatment (Oseltamivir) for influenza A, reducing severity of illness.
- Masking was mandatory in our patient care areas through May 2024 concomitant with admission surveillance testing. Both are parts of a multi-layered strategy to prevent nosocomial transmission.
- Admission screening is an opportunity to identify cases when symptoms are not recognized or before symptoms appear, but transmission to others is possible.
- Some patients disclosed symptoms or recent exposures

P-704

Sustained Decline in the Incidence of Hospital-acquired Influenza A/B, Parainfluenza, and Respiratory Syncytial Virus (RSV) Infections at the NIH Clinical Center

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Background

Respiratory viral infections can result in significant morbidity and mortality for immunocompromised patients[1]. The role of masking in hospitals to reduce the spread of respiratory infections remains controversial. The National Institutes of Health (NIH) Clinical Center (CC) serves a substantially immunocompromised population and implemented COVID-19 mitigation measures starting in March 2020, and universal masking in April 2020 (Figure 1). COVID-19 mitigation strategies were associated with a decline, both in the community and in the frequency of viral respiratory infections detected in NIH CC patients between April 2020 and March 2021.[2] A retrospective review of hospital-acquired Influenza A/B, Parainfluenza, and Respiratory Syncytial Virus (RSV) infections from January 2010 to August 2024 was conducted to determine if masking protocols could have contributed to a sustained reduction in hospital transmission of selected respiratory viruses.

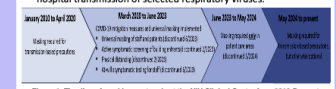


Figure 1: Timeline of masking protocols at the NIH Clinical Center from 2010-Present

Methods

- Positive respiratory specimens collected from 1/2010 to 8/2024 were identified by querying a clinical surveillance system.
- Disease incubation periods were established from the literature: Influenza A/B: 1 day, Parainfluenza: 3 days, and RSV: 4 days.[3]
- Chart reviews were conducted to determine symptom onset and history of a respiratory viral infection.
- Patients with repeat positives with the same virus within 30 days and participants in RSV and Influenza challenge studies were excluded.
- Quantitative data analysis was performed using SAS v9.4. Longitudinal analyses used generalized linear modeling for Poisson distribution and compared the pre-implementation of masking to the implementation of masking and beyond periods. Data reported as frequencies and percentages and incidence rates per 1000 patient days were computed based on the hospital census.

Results

Of the 125 hospital-acquired respiratory infections identified from 1/2010 to 8/2024, 36% were Influenza A/B, 34% was Parainfluenza, and 30% were RSV (Figure 2).

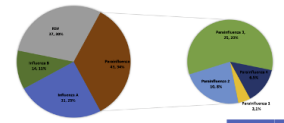


Figure 2: Hospital-acquired respiratory virus infections 1/2010-8/2024

Respiratory Virus	Average time from admission to symptom onset and/or positive test	Median time from admission to symptom onset and/or positive test	Minimum to maximum time from admission to symptom onset and/or positive test
Influenza A/B	35 days	15 days	3-278 days
Parainfluenza	37 days	20 days	5-196 days
RSV	31 days	14 days	4-167 days

Table 1: Time from admission to symptom onset and/or positive test

The incidence of all hospital-acquired respiratory virus infections significantly declined (P<0.001) from the pre-implementation of masking compared to masking and beyond (Figure 3). The incidence of each virus also significantly declined: P<0.001 for Influenza A/B (Figure 4), P=0.020 for Parainfluenza (Figure 5), and P=0.019 for RSV (Figure 6) during the same time periods.

Figure 3: Incidence of All hospital-acquired respiratory virus infections from 1/2010-8/2024

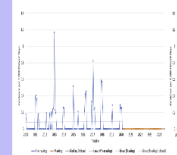


Figure 4: Incidence of hospital-acquired Influenza A/B from 1/2010-8/2024

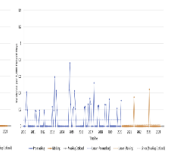


Figure 5: Incidence of hospital-acquired Parainfluenza from 1/2010-8/2024

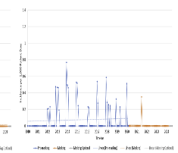


Figure 6: Incidence of hospital-acquired RSV from 1/2010-8/2024

Conclusions

- Masking was temporally associated with a decline in hospital-acquired respiratory viral infections.
- Patients developed symptoms and/or tested positive for a respiratory virus an average of a month after their admission (Table 1).
- The NIH CC performed asymptomatic Influenza A/B and RSV testing on admission for patients and their rooming visitors during 11/2022 to 4/2023 and 9/2023 to 5/2024, this early detection program could have influenced hospital-acquired transmission of these respiratory viruses.
- This was a small retrospective review at a clinical research hospital with a substantially immunocompromised population. Results may not be generalizable to other hospitals.
- While incidence rates were computed based on patient census, fluctuations in patient census with a noted decline during and post the COVID-19 pandemic could have influenced hospital-acquired respiratory virus transmission.
- This retrospective analysis demonstrates that in our healthcare setting of immunocompromised patients, implementing masking can be a contributing factor in the sustained decline in the incidence of hospital-acquired Influenza A/B, Parainfluenza, and RSV.

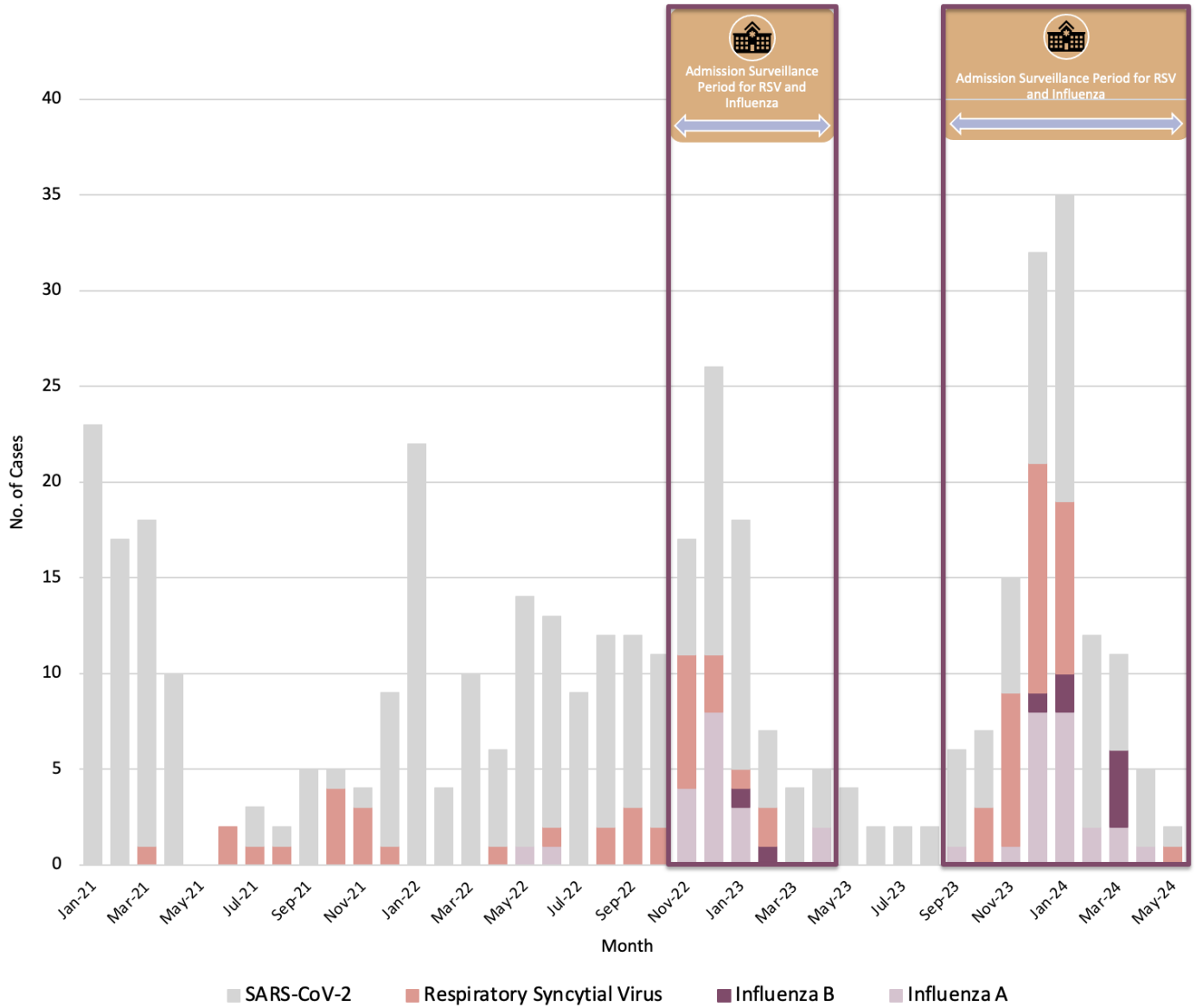
Acknowledgements

This research was funded by the NIH Clinical Center. We thank the NIH Clinical Center patients and staff, including Laboratory Medicine and Nursing Departments.

References

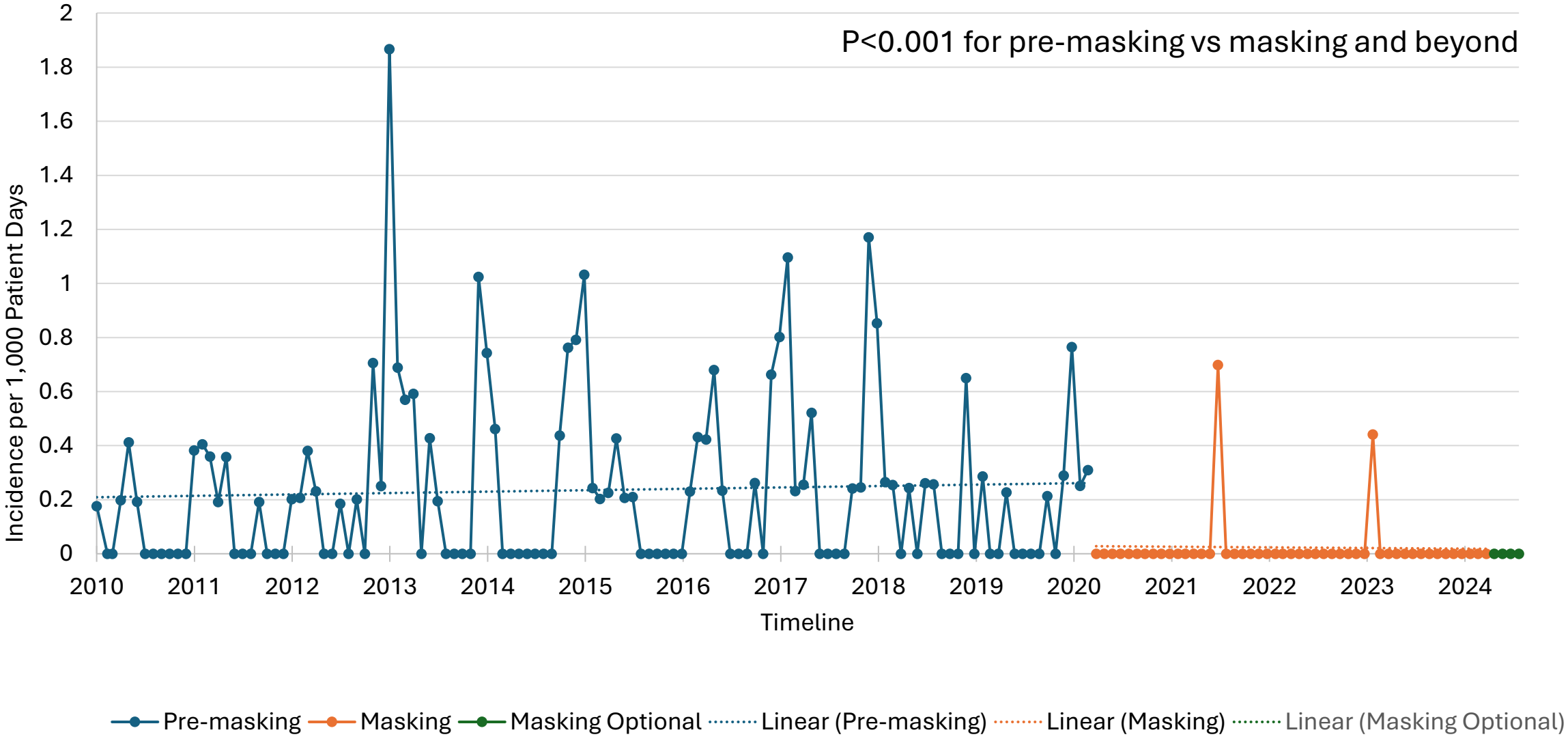
1. Couch RB, England JA, Whimbey E. Respiratory viral infections in immunocompetent and immunocompromised persons. Am J Med. 1997 Mar 17;102(3A):2-9; discussion 25-6. doi: 10.1016/s0002-9343(97)00003-x. PMID: 10868136; PMCID: PMC7124320.
2. Woolbert ME, Spalding CD, Sinaii N, Decker BK, Palmore TN, Henderson DK. Sharp decline in rates of community respiratory viral detection among patients at the National Institutes of Health Clinical Center during the coronavirus disease 2019 (COVID-19) pandemic. *Infection Control & Hospital Epidemiology*. 2023;44(1):62-67. doi:10.1017/ice.2022.31
3. Lessler J, Reich NG, Brookmeyer R, Perl TM, Nelson KE, Cummings DA. Incubation periods of acute respiratory viral infections: a systematic review. Lancet Infect Dis. 2009 May;9(5):291-300. doi: 10.1016/S1473-3099(09)70069-6.PMID: 19393959; PMCID: PMC4327893.

Figure 1. Incidence of Asymptomatic and Symptomatic Influenza A, Influenza B, RSV and SARS-CoV-2 at the NIH Clinical Center, 1/2021 through 5/2024



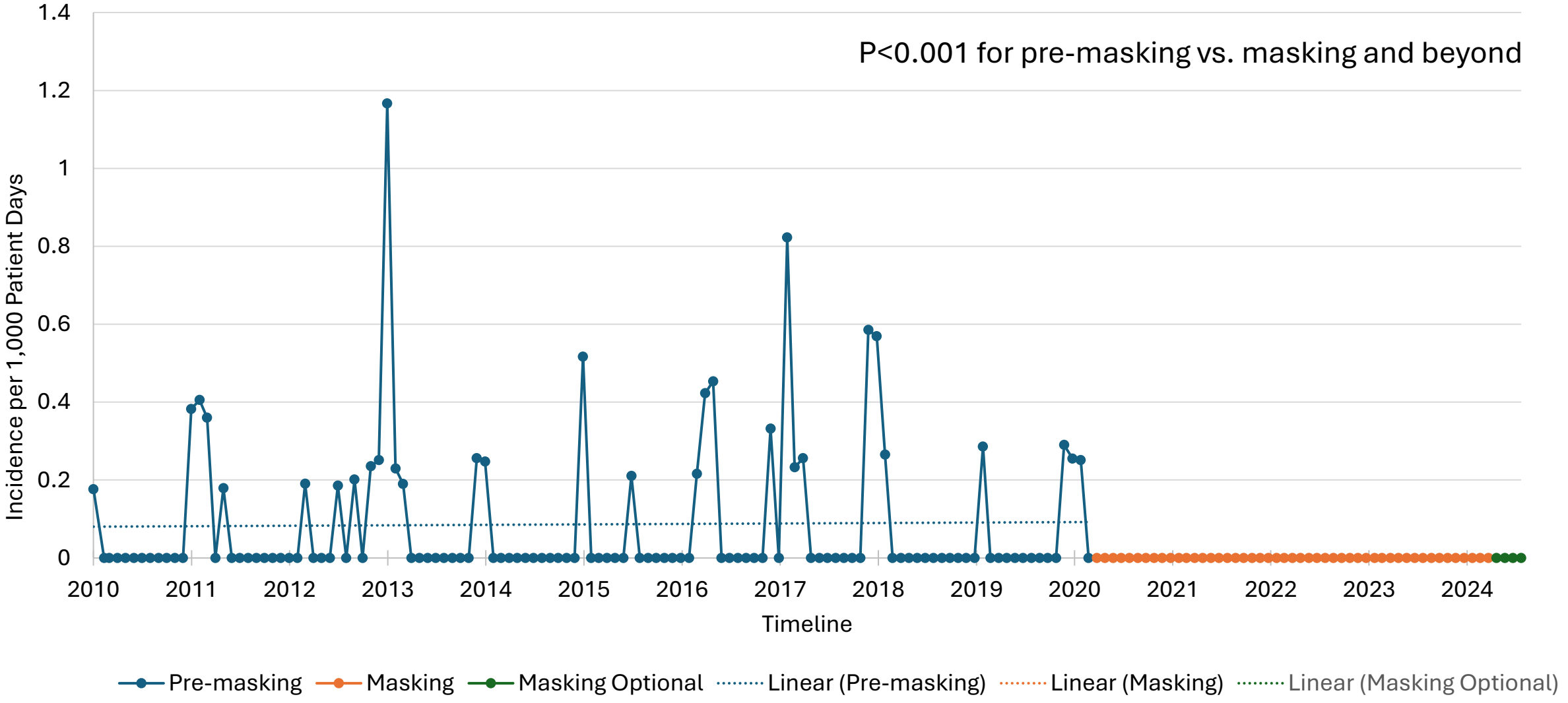
Source: Robin Odom, IDWeek 2024 P-713

Figure 3: Incidence of All hospital-acquired respiratory virus infections from 1/2010-8/2024



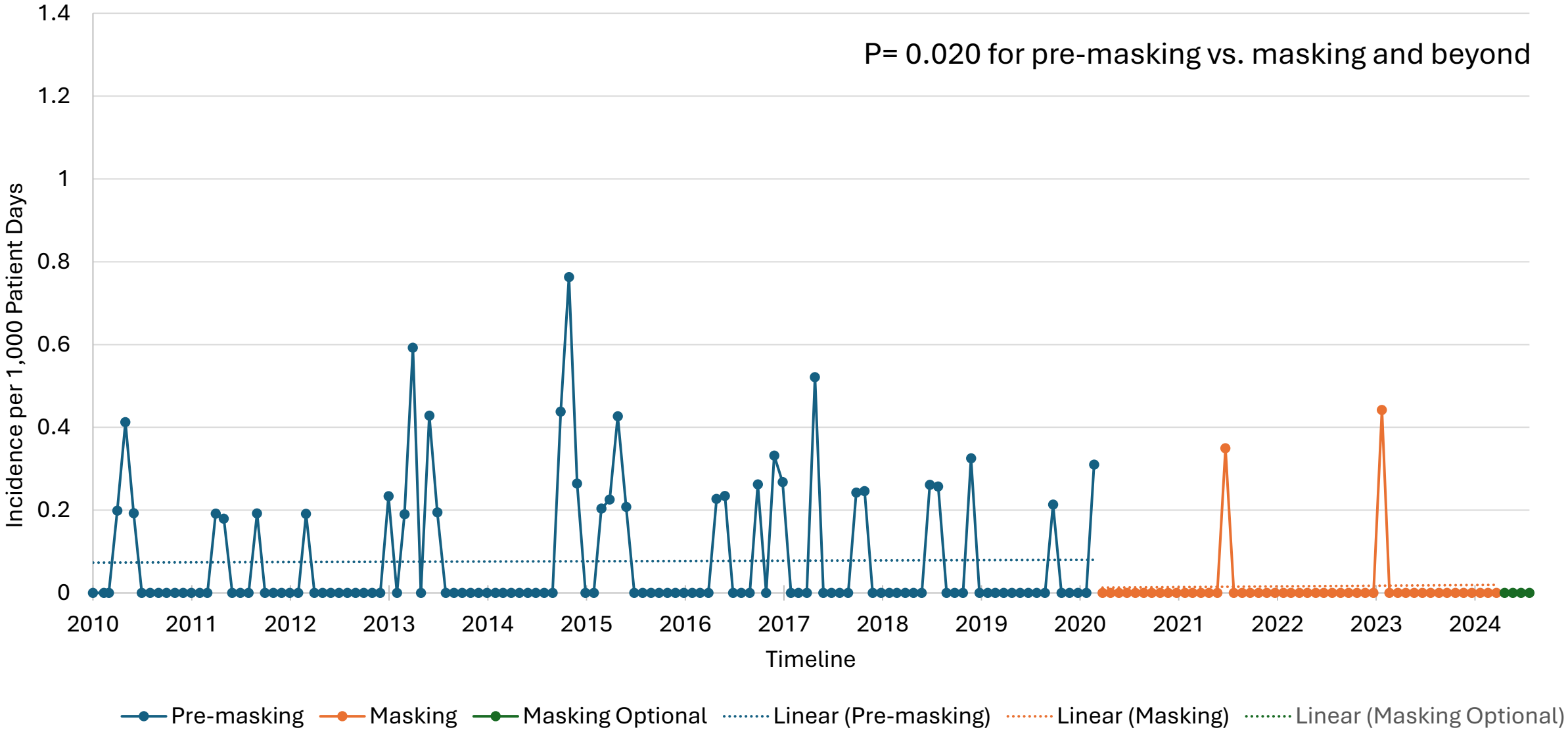
Source: LaToya Forrester, IDWeek 2024 P-704

Figure 4: Incidence of hospital-acquired Influenza A/B from 1/2010-8/2024



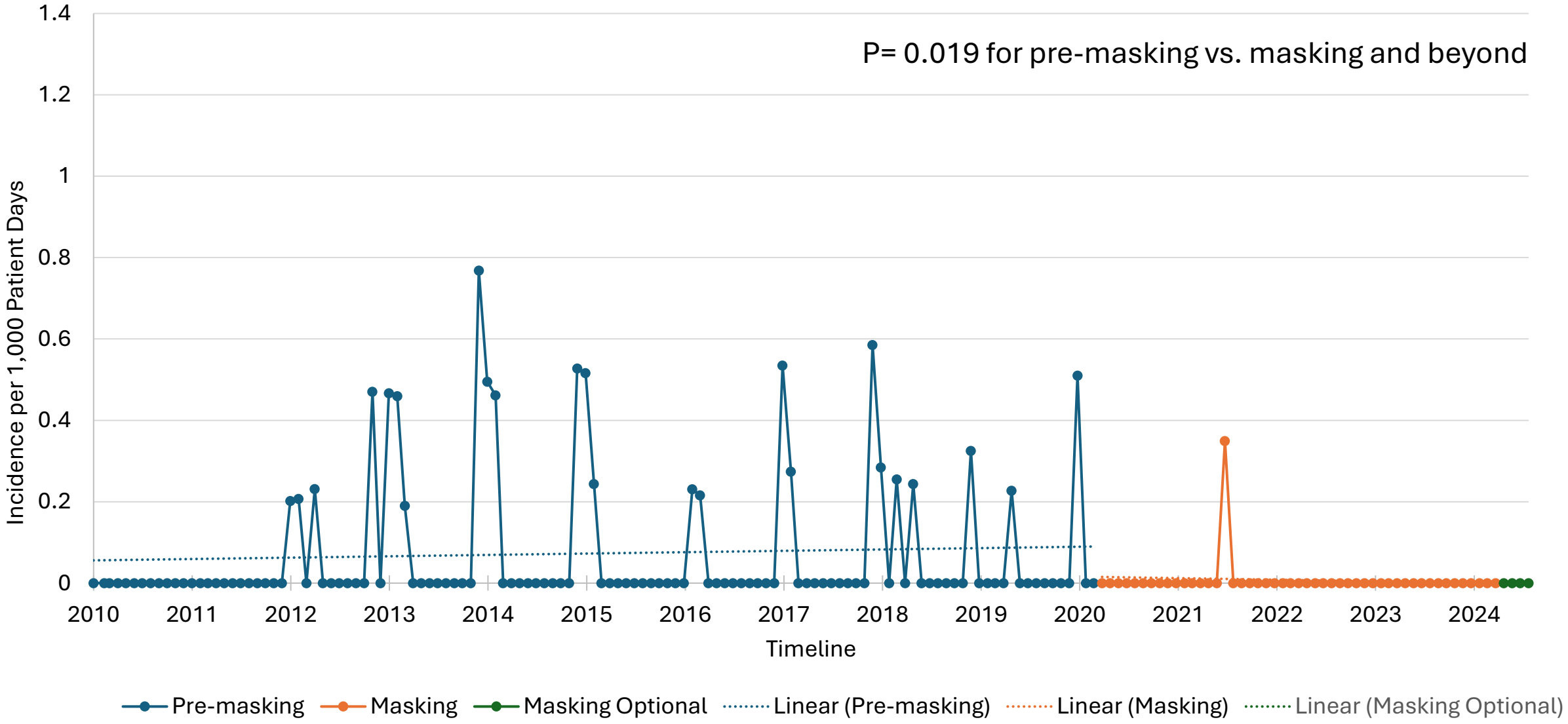
Source: LaToya Forrester, IDWeek 2024 P-704

Figure 5: Incidence of hospital-acquired Parainfluenza from 1/2010-8/2024



Source: LaToya Forrester, IDWeek 2024 P-704

Figure 6: Incidence of hospital-acquired RSV from 1/2010-8/2024



Source: LaToya Forrester, IDWeek 2024 P-704

For the 2024-2025 season

- In consultation with HES, Occupational Medical Service (OMS), Infectious Diseases, Clinical Center Nursing Department (CCND), and public health authorities

- Masking and admission testing (for inpatients and rooming-in visitors) will resume when one of the following occurs and whichever is earliest:
  1) As recommended by public health authorities (e.g., CDC, Maryland Department of Health), OR
  2) NIH weekly review of metrics from Maryland and the region indicating a rise in respiratory virus activity, OR
  3) November 4, 2024 if metrics above do not meet threshold before then
     a) Rationale: Every year activity of seasonal respiratory viruses increase in November
  a) Discontinuation of masking and admission testing will occur when metrics indicate a decline in respiratory virus activity

Conclusions

- COVID-19 and other respiratory virus infections remain a serious threat to Clinical Center patients
- Mitigation strategies for COVID-19 affected transmission of other respiratory viruses
- Masking was temporally associated with a decline in hospital-acquired respiratory viral infections (Influenza A/B, Parainfluenza, RSV) at the Clinical Center

Future

- Routine review of respiratory virus surveillance:
  - Clinical Center
  - Maryland
  - Regional
  - National
- Anticipate seasonal approach to masking and admission testing

Thank you