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Symptom reporting and vaccination status among SARS-CoV-2-positive encounters — Increasing Community Access to Testing, Treatment, and Response program, United States, September 2023–August 2024

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Abstract

On September 12, 2023, the Centers for Disease Control and Prevention’s Advisory Committee on Immunization Practices recommended that all persons aged ≥ 6 months receive 2023–2024 COVID-19 vaccination. This study examines the relationship between vaccination and COVID-19 symptom frequency, using data from the Increasing Community Access to Testing, Treatment, and Response (ICATT) platform. Among 6966 records of first SARS-CoV-2-positive tests collected from September 21, 2023 through August 22, 2024, individuals who received 2023–2024 COVID-19 vaccination consistently reported lower frequencies of 12 symptoms. The adjusted odds of reporting most symptoms were significantly lower among vaccinated participants, especially recent loss of sense of smell or taste (adjusted odds ratio(aOR): 0.39; 95 %CI: 0.29–0.53) and muscle pain (aOR: 0.49; 95 %CI: 0.41–0.59). These findings indicate that receiving

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CRediT authorship contribution statement

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Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

2023–2024 COVID-19 vaccination was associated with significantly lower odds of reporting most COVID-19 symptoms following SARS-CoV-2 infection, highlighting the importance of receiving recommended COVID-19 vaccination to mitigate symptomatic illness.

Keywords

SARS-CoV-2; COVID-19; Vaccines; Infection; Symptoms

1. Introduction

On September 12, 2023, the Centers for Disease Control and Prevention's (CDC) Advisory Committee on Immunization Practices recommended that all persons aged ≥ 6 months receive 2023–2024 COVID-19 vaccination [1]. These monovalent vaccines contained a component from the SARS-CoV-2 Omicron XBB.1.5 lineage and, unlike previous COVID-19 vaccines, did not contain the ancestral SARS-CoV-2 strain. Several studies of COVID-19 vaccines have shown effective protection against severe illness [2–4]; however, little research has been done in the United States on the frequency of reported symptoms by vaccination status among those who test positive for SARS-CoV-2 [5,6]. Previous research investigated presentation of symptoms based on a single combined category of fever or chills, which may fail to account for the variety of symptoms associated with COVID-19, among small sample sizes (approximately 200 individuals). To investigate the association between 2023–2024 COVID-19 vaccination and symptomatic infections, we evaluated the frequency of 12 self-reported symptoms among 6966 vaccinated and unvaccinated individuals who tested positive for SARS-CoV-2.

2. Methods

Increasing Community Access to Testing, Treatment, and Response (ICATT) is a CDC program that contracts with pharmacy chains and laboratories at selected sites nationwide to provide no-cost SARS-CoV-2 testing to people who are uninsured. This analysis includes ICATT tests, as well as cash- and insurance-paid tests, performed at Walgreens locations using methods previously described for vaccine effectiveness studies [7]. Self-reported information was collected from individuals aged ≥ 18 years who registered for SARS-CoV-2 testing online, including COVID-19 vaccination history, sex, race, ethnicity, age, state of residence, presence or absence of symptoms, date of symptom onset, prior SARS-CoV-2 infections, and underlying health conditions. Records for SARS-CoV-2 tests conducted from September 21, 2023 through August 22, 2024, were included in this analysis. Records for each individual's first positive test result during the study period were analyzed. Tests from individuals with self-reported or laboratory-confirmed positive SARS-CoV-2 tests within three months before the first positive test within the study period were excluded to avoid analyzing multiple tests from the same episode of illness. Further, tests from individuals who reported symptom onset more than 14 days prior to the test were excluded. Vaccination was defined as the receipt of at least one 2023–2024 COVID-19 vaccine dose, at least 7 days prior to date of testing. The referent group included tests from people who did not receive a 2023–2024 COVID-19 vaccine dose, regardless of prior COVID-19 vaccination history.

During the SARS-CoV-2 testing registration process, individuals were able to report up to 12 symptoms they were experiencing (e.g., cough, fever, chills, congestion/runny nose, muscle pain, headache, fatigue, sore throat, shortness of breath, vomiting, recent loss of sense of smell or taste, and diarrhea). Adjusted odds ratios (aOR) with 95 % confidence intervals (95 % CI) were calculated to estimate associations between each of the 12 symptoms and 2023–2024 COVID-19 vaccination. Multivariable logistic regression models adjusted for age (continuous), sex, race and ethnicity, length of time in days from symptom onset to test date (continuous), social vulnerability index score of pharmacy site census tract, U.S. Department of Health and Human Services (HHS) region² of ICATT pharmacy site, calendar week of test (categorical variable), and underlying conditions (presence of one or more vs. absence of any).

Statistical analyses were performed in R (version 4.4.2 R Foundation for Statistical Computing, Vienna, Austria). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy (see e.g., 45C.F.R. part 46; 102(l) (2), 21C.F.R. part 56; 42 U.S.C. §241(d), 5 U.S.C. §552a, 44 U.S.C. §3501 et seq.).

3. Results

A total of 6966 records of positive SARS-CoV-2 tests from 2965 sites across 48 states, Puerto Rico and Washington, D.C. met the inclusion criteria, including 643 (9 %) tests from those who received 2023–2024 COVID-19 vaccination and 6323 (91 %) from those who did not receive a 2023–2024 COVID-19 vaccine dose (Table 1). Of those who received 2023–2024 COVID-19 vaccination, 313 (49 %) were White, non-Hispanic, while 2088 (33 %) of those who did not receive a 2023–2024 COVID-19 vaccine dose were White, non-Hispanic. Additionally, 48 % of individuals who received the vaccine reported at least one underlying medical condition, compared to 33 % of those who did not receive it. Individuals with receipt of 2023–2024 COVID-19 vaccination arrived for testing a median of 2 days after symptom onset, while individuals who did not receive a 2023–2024 COVID-19 vaccine arrived for testing a median of 3 days after symptom onset.

The most commonly reported symptoms were cough (79 %), congestion or runny nose (75 %), headache (67 %), sore throat (67 %), and fatigue (62 %) (Fig. 1). The proportions of individuals reporting each of the 12 symptoms were consistently lower among those who received 2023–2024 COVID-19 vaccination compared with those who did not receive a 2023–2024 COVID-19 vaccine dose (range of differences: 2 % to 19 %). When estimating the associations between symptom reporting and vaccination status, those with receipt of 2023–2024 vaccination had significantly lower adjusted odds of reporting each of the symptoms other than congestion/runny nose, sore throat, and vomiting compared to the those who did not receive 2023–2024 COVID-19 vaccination. The significantly lower odds of symptoms among those who received 2023–2024 COVID-19 vaccination ranged from 61 % for recent loss of sense of smell or taste (aOR: 0.39; 95 % CI: 0.29–0.53) to 30 % for fatigue (aOR: 0.70; 95 % CI: 0.58–0.83). Notably, the odds of reporting of chills (aOR:

² <https://www.hhs.gov/about/agencies/iea/regional-offices/index.html>

0.52; 95 % CI: 0.43–0.62) or fever (aOR: 0.51; 95 % CI: 0.42–0.61) were similarly lower among those who received 2023–2024 COVID-19 vaccination compared to those who did not receive a 2023–2024 COVID-19 vaccine.

4. Discussion

In this analysis of national pharmacy testing data and persons with positive SARS-CoV-2 results, the odds of reporting most of the common symptoms of COVID-19 [8] were significantly lower for those who had received 2023–2024 COVID-19 vaccination compared with those who had not. The odds of reporting chills or fever were almost 50 % lower for those who received 2023–2024 COVID-19 vaccination compared to those who did not. This finding aligns with previously published data, showing a reduction in risk of febrile conditions (defined as fever, feverishness, chills, or a measured temperature higher than 38 °C) among those who received a full or partial primary series of original monovalent mRNA COVID-19 vaccines compared to those who were unvaccinated in a population with SARS-CoV-2 [5,6].

This analysis had several limitations. First, the sample comprises individuals who were administered SARS-CoV-2 tests at pharmacy locations. Differences in testing behaviors, such as reliance on over-the-counter (at-home) tests instead of utilizing tests administered at pharmacy locations that may be related to symptoms or vaccination history, could have introduced selection bias. Test-negative design studies lessen this potential selection bias by only including tests from persons who had at least one symptom, thereby only including people arriving for testing for the same reasons. Second, both recent vaccination status and previous infection histories were self-reported, raising the possibility of recall bias and potential misclassification errors. However, we only compared those with recent 2023–2024 COVID-19 vaccination to those without 2023–2024 COVID-19 vaccination rather than relying on recall of previous doses. Furthermore, the frequency of past infections is likely underestimated [9] As of December 2023, research has shown that 87.2 % of US adults have experienced a SARS-CoV-2 infection [10], yet only 58 % of this ICATT sample reported a prior infection. To reduce bias, we excluded tests from individuals with a self-reported or lab-confirmed positive SARS-CoV-2 test within three months before the first positive test within the study period and consider all adults in this sample to have had at least one prior illness. Third, this study did not measure protection against progression to infection, as it only includes those who were both symptomatic and SARS-CoV-2-positive. Fourth, approximately 11 % of the data were missing information to determine vaccination status and were not included in the analysis. Of the sample that had determinable vaccination status, 2 % were missing necessary covariables for the adjusted models and were also excluded from analyses. Finally, because data collection occurred at pharmacies situated in areas with higher social vulnerability, our sample may not represent the U.S. population in general.

This analysis demonstrates that receipt of 2023–2024 COVID-19 vaccination may reduce common symptoms associated with SARS-CoV-2 infection, which further emphasizes the benefits of receiving the recommended COVID-19 vaccination not only to prevent severe disease, but also to mitigate symptomatic illness [11].

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Role of the funder/sponsor

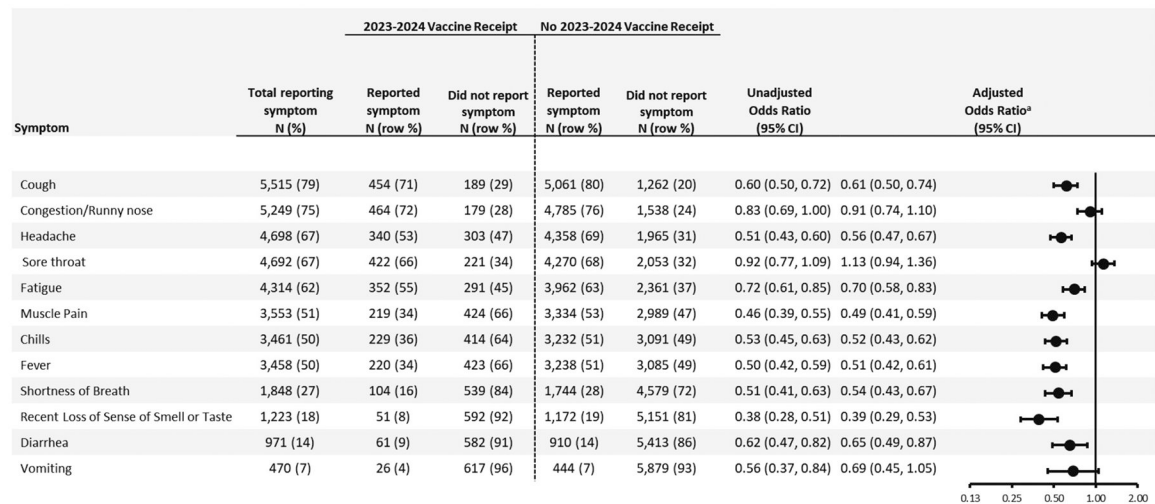
CDC was involved in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, and approval of the manuscript; and decision to submit the manuscript for publication. CDC controlled publication decisions.

Data availability

The data that has been used is confidential.

References

- [1]. Centers for Disease Control and Prevention. Interim Clinical Considerations for Use of COVID-19 Vaccines in the United States. 2024. 2024 [cited 2025 January 16]; Available from: <https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html>.
- [2]. DeCuir J, et al. *Interim effectiveness of updated 2023–2024 (monovalent XBB.1.5) COVID-19 vaccines against COVID-19-associated emergency department and urgent care encounters and hospitalization among immunocompetent adults aged ≥18 years - VISION and IVY networks, September 2023–January 2024*. MMWR Morb Mortal Wkly Rep 2024;73(8):180–8. [PubMed: 38421945]
- [3]. Wilson A, et al. Evaluating the effectiveness of mRNA-1273.815 against COVID-19 hospitalization among adults aged ≥18 years in the United States. Infect Dis Ther 2025;14(1):199–216. [PubMed: 39708059]
- [4]. Link-Gelles R, et al. Interim estimates of 2024–2025 COVID-19 vaccine effectiveness among adults aged ≥18 years - VISION and IVY networks, September 2024–January 2025. MMWR Morb Mortal Wkly Rep 2025;74(6):73–82. [PubMed: 40014628]
- [5]. Thompson MG, et al. Prevention and attenuation of Covid-19 with the BNT162b2 and mRNA-1273 vaccines. N Engl J Med 2021;385(4):320–9. [PubMed: 34192428]
- [6]. The HEROES-RECOVER Network. Association of mRNA vaccination with clinical and Virologic features of COVID-19 among US essential and frontline workers. JAMA 2022;328(15):1523–33. [PubMed: 36255426]
- [7]. Ciesla AA, et al. Effectiveness of booster doses of monovalent mRNA COVID-19 vaccine against symptomatic SARS-CoV-2 infection in children, adolescents, and adults during omicron subvariant BA.2/BA.2.12.1 and BA.4/BA.5 predominant periods. Open Forum Infectious Disease 2023;10(5).
- [8]. U.S. Centers for Disease Control and Prevention. Symptoms of COVID-19. 2025 [cited 2025 March 21]; Available from: <https://www.cdc.gov/covid/signs-symptoms/index.html>; 2024.
- [9]. Clarke KEN, et al. Seroprevalence of infection-induced SARS-CoV-2 antibodies - United States, September 2021–February 2022. MMWR Morb Mortal Wkly Rep 2022;71(17):606–8. [PubMed: 35482574]
- [10]. U.S. Centers for Disease Control and Prevention. 2022–2023 Nationwide COVID-19 Infection- and Vaccination-Induced Antibody Seroprevalence (Blood donations) [cited 2025 July 30]; Available from: <https://covid.cdc.gov/covid-data-tracker/#nationwide-blood-donor-seroprevalence-2022>; 2023.
- [11]. U.S. Centers for Disease Control and Prevention. Interim Clinical Considerations for Use of COVID-19 Vaccines Currently Approved or Authorized in the United States. 2024 [cited 2025 March 18]; Available from: <https://www.cdc.gov/vaccines/covid-19/clinical-considerations/covid-19-vaccines-us.html>; 2024.



a. Adjusted for: age, sex, race and ethnicity, length of time in days from symptom onset to test date, social vulnerability index score of pharmacy site census tract, Health and Human Services region of pharmacy site, calendar week of test (modeled as a categorical variable), and underlying conditions (presence vs. absence).

Note: Regions are defined by U.S. Department of Health and Human Services and include only states and territories with ICATT sites. U.S. Virgin Islands (Region 2) and American Samoa, Federated States of Micronesia, Guam, Marshall Islands, Northern Mariana Islands, and Palau (Region 9) were not included because they did not have pharmacies participating in ICATT. <https://www.hhs.gov/about/agencies/iea/regional-offices/index.html>.

Fig. 1.

Frequencies of reporting common COVID-19 symptoms among individuals with SARS-CoV-2-positive tests and adjusted odds ratios for symptoms among individuals with and without receipt of 2023–2024 COVID-19 vaccination, respectively, Increasing Community Access to Testing, Treatment, and Response, September 2023 – August 2024.

Table 1

Characteristics of persons testing positive for SARS-CoV-2 at a pharmacy participating in the Increasing Community Access to Testing, Treatment, and Response program, by 2023–2024 COVID-19 vaccination status.

Variable	Total	23–24 COVID-19 vaccine receipt ^a	No 23–24 vaccine receipt
	N (column %)	N (column %)	N (column %)
Total, N (row %)	6966 (100)	643 (9)	6323 (91)
Age, Median [IQR]	37 [28;49]	47 [35;62]	36 [28;48]
Sex			
<i>Male</i>	2857 (41)	257 (40)	2600 (41)
<i>Female</i>	4086 (59)	384 (60)	3702 (59)
<i>Missing</i>	23 (0.3)	2 (0.3)	21 (0.3)
Race and ethnicity ^b			
<i>Black or African American, non-Hispanic</i>	1217 (17)	89 (14)	1128 (18)
<i>Hispanic or Latino</i>	2279 (33)	123 (19)	2156 (34)
<i>White, non-Hispanic</i>	2401 (34)	313 (49)	2088 (33)
<i>Other, non-Hispanic</i>	568 (8)	66 (10)	502 (8)
<i>Unknown</i>	501 (7)	52 (8)	449 (7)
HHS testing site region ^c			
1	110 (2)	33 (5)	77 (1)
2	917 (13)	91 (14)	826 (13)
3	279 (4)	43 (7)	236 (4)
4	1511 (22)	96 (15)	1415 (22)
5	853 (12)	99 (15)	754 (12)
6	1874 (27)	105 (16)	1769 (28)
7	159 (2)	16 (2)	143 (2)
8	137 (2)	10 (2)	127 (2)
9	975 (14)	116 (18)	859 (14)
10	151 (2)	34 (5)	117 (2)
Social Vulnerability Index ^d			
Median [IQR]	0.6 [0.3;0.8]	0.5 [0.3;0.8]	0.6 [0.4;0.8]
Mean (std)	0.6 (0.3)	0.5 (0.3)	0.6 (0.3)
Self-reported history of SARS-CoV-2 positive test result			
<i>None</i>	2954 (42)	365 (57)	2589 (41)
<i>Positive > 3 months before current test</i>	4012 (58)	278 (43)	3734 (59)
SARS-CoV-2 test type			
<i>Rapid/point of care molecular test</i>	3495 (50)	227 (35)	3268 (52)
<i>Laboratory-based molecular test</i>	1818 (26)	291 (45)	1527 (24)
<i>Rapid antigen test</i>	1653 (24)	125 (19)	1528 (24)
At least one self-reported chronic underlying condition			
<i>No</i>	4547 (65)	334 (52)	4213 (67)
<i>Yes</i>	2419 (35)	309 (48)	2110 (33)

Variable	Total	23–24 COVID-19 vaccine receipt ^a	No 23–24 vaccine receipt
	N (column %)	N (column %)	N (column %)
Time between symptoms onset and test date ^e			
<i>Median [IQR]</i>	3.0 [2.0;4.0]	2.0 [1.0;4.0]	3.0 [2.0;4.0]
<i>0–1 days</i>	1538 (22)	175 (27)	1363 (22)
<i>2 days</i>	1869 (27)	152 (24)	1717 (27)
<i>3 days</i>	1493 (21)	114 (18)	1379 (22)
<i>4 days</i>	888 (13)	73 (11)	815 (13)
<i>5–14 days</i>	1178 (17)	129 (20)	1049 (17)

HHS: U.S. Department of Health and Human Services

^aMost recent dose received from September 12, 2023 – August 22, 2024, at least 7 days prior to the date of testing

^bPersons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups were categorized as non-Hispanic.

^cRegions are defined by U.S. Department of Health and Human Services and include only states and territories with ICATT sites. U.S. Virgin Islands (Region 2) and American Samoa, Federated States of Micronesia, Guam, Marshall Islands, Northern Mariana Islands, and Palau (Region 9) were not included because they did not have pharmacies participating in ICATT. <https://www.hhs.gov/about/agencies/iea/regional-offices/index.html>.

^dThe Social Vulnerability Index (SVI) is a composite measure that uses U.S. Census Bureau data on 16 social factors to rank social vulnerability by U.S. Census Bureau tract. The scale is from 0 to 1; higher SVIs represent more vulnerable communities. Tests with missing SVI data (<1 % of total) were excluded from all analyses.

^eThe difference in days between self-reported date of symptom onset and date of testing