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Multimorbidity and COVID-19 Vaccine and Booster Uptake among Adults in the United States

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ABSTRACT

Background and Objectives: While prior research has linked individual chronic conditions to higher COVID-19 vaccine uptake, little is known about how multimorbidity influences both primary vaccine series and booster uptake. This study aims to evaluate the association between multimorbidity and COVID-19 vaccination and booster behaviors among adults in the United States.

Methods: A cross-sectional analysis was conducted using the 2022 Medical Expenditure Panel Survey (MEPS), a nationally representative dataset. Adults aged ≥18 years with complete data on vaccination, booster status, and chronic conditions were included (n = 17,172). COVID-19 vaccination and booster statuses were self-reported. Chronic disease conditions were categorized as none, one, or two or more chronic conditions (i.e., multimorbidity). Covariates included age, sex, race and ethnicity, social determinants of health, pain level, and lifestyle variables. Survey-weighted logistic regression models were used to estimate unadjusted and adjusted odds ratios (AOR) for vaccine and booster uptake associated with multimorbidity.

Results: After adjusting for all covariates, adults with multimorbidity had significantly higher odds of receiving the primary COVID-19 vaccine series compared to those with a single chronic condition (AOR = 1.28, 95% CI: 1.07–1.53, p = 0.0045). In contrast, multimorbidity was not significantly associated with booster uptake (AOR = 0.95, 95% CI: 0.81–1.12, p = 0.5458).

Conclusions: Multimorbidity is independently associated with increased uptake of the primary COVID-19 vaccine series but not with booster vaccination. These findings highlight the need for targeted strategies to promote booster uptake among individuals with multiple chronic conditions.

Keywords: Multimorbidity, COVID-19, Vaccination, Medical Expenditure Panel Survey

Introduction

There is robust scientific evidence demonstrating that COVID-19 vaccination substantially reduces the risk of SARS-CoV-2 infection, severe disease, hospitalization, and mortality among adults.[1] However, waning immunity following the primary vaccine series, the emergence of novel viral variants, and evolving public health guidance have underscored the critical importance of receiving booster doses to maintain vaccine-induced protection.[2,3] Despite these well-documented benefits, a considerable proportion of adults have not completed the initial vaccine series or received recommended booster doses. For instance, as of November 2024, only 17.9% of eligible adults in the United States had received a COVID-19 vaccine for the 2024–25 respiratory virus season, which includes the annual booster dose recommended by the Advisory Committee on Immunization Practices (ACIP) of the United States Centers for Disease Control and Prevention.[4]

Numerous studies have examined the demographic, socioeconomic, and attitudinal factors associated with COVID-19 vaccine uptake.[5] These investigations have consistently identified associations between vaccination and age, sex, educational attainment, income, access to healthcare, and beliefs regarding vaccine safety and personal risk perception.[6] For instance, older adults, individuals with higher education levels, and those with consistent access to healthcare services are generally more likely to complete the vaccine series.[7] Among individuals with chronic conditions, the benefits of COVID-19 vaccination are particularly pronounced. In addition to reducing acute illness severity, emerging evidence suggests that vaccination may decrease the risk of developing post-acute sequelae, including long COVID.[8,9] Prior research has indicated that adults with chronic illnesses tend to show higher rates of vaccine acceptance compared to those without such conditions, especially in high-income countries.[10,11]

However, most of the existing literature has focused on single chronic conditions in isolation.[12,13] Far less is known about the role of multimorbidity in associated with vaccine-related behaviors, particularly regarding booster uptake. As populations age, multimorbidity has become increasingly prevalent and represents a growing concern for public health systems worldwide.[14] Individuals with multimorbidity face heightened vulnerability to infectious diseases, diminished physiological resilience, and greater healthcare needs.[15-17] Understanding how multimorbidity influences vaccine uptake is therefore essential to guiding targeted immunization strategies, reducing disparities, and supporting those at highest risk.

This study aims to examine the association between multimorbidity and COVID-19 vaccine uptake, including both completion of the primary series and booster receipt, using nationally representative data from the 2022 Medical Expenditure Panel Survey (MEPS). Although the acute phase of the COVID-19 pandemic formally ended in mid-2023, SARS-CoV-2 continues to pose a significant threat, particularly to adults with multimorbidity who remain at elevated risk for severe outcomes and long-term complications. In 2025, evaluating vaccine uptake patterns from 2022 remains critical: it reveals persistent gaps in protection among multimorbid populations, informs strategies to optimize vaccine delivery in future outbreaks, and helps health systems anticipate resource needs for high-risk groups. Moreover, retrospective insights into 2022 vaccination behaviors can guide ongoing policy refinement, equity-focused outreach, and preparedness for emerging variants or other respiratory pandemics.

Methods

STUDY DESIGN AND DATA SOURCE

This cross-sectional study utilized data from the 2022 Medical Expenditure Panel Survey (MEPS), a nationally representative survey of non-institutionalized civilian households in the United States. MEPS employs a complex, multistage probability sampling design to collect person-level information on healthcare access, preventive services, treatment utilization, and healthcare expenditures. We focused on 2022

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as it represents the first full calendar year following the broad authorization of COVID-19 booster doses, offering insight into real-world uptake as vaccination shifted from emergency rollout to routine preventive care.

ANALYTICAL SAMPLE: INCLUSION AND EXCLUSION CRITERIA

The analytic sample included adults aged 18 years and older. We excluded individuals with missing data on COVID-19 vaccination or booster status, as well as those not observed for the full calendar year. After applying these criteria, the final unweighted sample comprised 17,172 adults.

PRIMARY OUTCOMES

Two primary outcomes were assessed: 1) COVID-19 primary vaccination status (Yes/No), indicating whether the respondent received the initial vaccine series; and 2) COVID-19 booster status (Yes/No), indicating whether the respondent received at least one booster dose. Both outcomes were self-reported through MEPS survey instruments. Booster status was assessed only among those eligible and interviewed during relevant survey rounds.

KEY EXPLANATORY VARIABLE: MULTIMORBIDITY

The primary independent variable was multimorbidity, defined as the number of self-reported chronic health conditions. Respondents were asked whether a healthcare provider had ever diagnosed them with any of the following: arthritis, asthma, coronary artery disease, cardiac arrhythmia, cancer, chronic kidney disease, chronic obstructive pulmonary disease (COPD), dementia, diabetes mellitus, hyperlipidemia, hypertension, HIV, hepatitis, osteoporosis, depression, bipolar disorder, stroke, substance use disorder, or schizophrenia.

OTHER COVARIATES

Additional explanatory variables included demographic characteristics (age, sex, race/ethnicity), social determinants of health (education level, poverty status, food security, employment status, usual source of care, marital status, and U.S. Census region), and health behavior indicators (pain interference, physical activity, cigarette smoking status).

DATA ANALYSIS

All analyses accounted for the complex survey design of MEPS. Sampling weights, strata, and primary sampling units provided by AHRQ were applied according to analytic guidelines to ensure nationally representative estimates. We used weighted frequencies and row percentages to estimate the prevalence of vaccine and booster uptake across covariate categories. Rao–Scott chi-square tests assessed bivariate associations, adjusting for the survey design.

Booster uptake analyses were limited to adults who received the primary vaccine series, with "not vaccinated" retained as a third category to maintain consistency across comparisons. Unadjusted logistic regression models were used to estimate odds ratios (ORs) and 95% confidence intervals (CIs) for associations between explanatory variables and each outcome. To assess the independent effect of multimorbidity, we constructed multivariable logistic regression models, adjusting for all covariates to generate adjusted odds ratios (AORs) and 95% CIs. Missing values in covariates were handled by missing-indicator categories. Statistical significance was defined using a two-sided alpha of 0.05. All analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC) with survey procedures.

Results

GENERAL CHARACTERISTICS OF THE STUDY POPULATION

Table 1 displays the profile of adults in the US in terms of demographics, SDOH, and lifestyle practices. The unweighted sample included 17,172participants, representing approximately 254 million adults in the US with adequate distribution across all covariates. Among all participants, 51.2% were female, 60.9% were NHW, and 40.5% had multimorbidity (Table 1).

COVID-19 VACCINE UPTAKE

We observed significant differences in COVID-19 vaccine uptake across different age groups and education levels. Vaccination prevalence was 76.2% among individuals aged 18–34 in comparison to

93.5% among those aged 75 and older (p<0.001, Table 2). Similarly, those with less than a high school education had a vaccination rate of 73.6%, compared to 93.0% among college graduates (p<0.001, Table 2). Individuals in the high-income group showed higher vaccination rates than those in the lowest income category (89.7% versus 73.7%, p<0.001, Table 2). Other notable disparities were observed by food security and smoking status. Individuals experiencing food insecurity had lower vaccination rates (71.6%) compared to those with high food security (85.1%, p<0.001, Table 2). Among daily smokers, only 66.0% were vaccinated versus 85.3% of non-smokers (p<0.001, Table 2).

Table 1. Description of Adults aged 18 years or Older Using Medical Expenditure Panel Survey, 2022

	N	Wt.%		N	Wt.%
All	17,172	100			
Chronic Conditions			Health Insurance Coverage		
Multimorbidity	8,213	40.5	Private	10,352	67.2
1 chronic condition	3,499	22.2	Pubic	5,498	25.3
No chronic condition	5,460	37.3	Private	1,322	7.5
Sex			Usual source of care (USC)		
Female	9,284	51.2	Yes, USC	11,969	66.9
Male	7,888	48.8	No USC	4,645	29.2
Age			Marital status		
18-34 years	3,777	28.9	Married	8,227	50.6
35-44 years	2,631	16.9	Widow	1,501	6.5
45-54 years	2,593	15.5	Separated/Divorced	2,803	12.9
55-64 years	3,053	16.1	Never married	4,640	30.1
65-74 years	3,035	13.3			
75 years or older	2,083	9.3			
Race and ethnicity			Region		
NHW	9,861	60.9	Northeast	2,731	17.3
NHB	2,455	12.1	Midwest	3,452	20.4
Hispanic	3,398	17.5	South	6,607	38.8
Other	1,458	9.5	West	4,382	23.5
Education			Depression		
Less than high school	2,536	12.3	Yes	1,651	9.0
High school	4,900	28.0	No	15,521	91.0
Some college	3,675	23.3			
College	5,934	35.7			
Employment			Anxiety		
Employed	10,335	67.1	Yes	1,881	10.3
Not employed	6,821	32.7	No	15,291	89.7
Poverty level			Cigarette Use		
Poor	2,634	10.3	Every day	1,358	7.4
Near poor	2,998	14.9	Some days	687	3.7
Middle income	4,758	29.3	Not at all	14,975	87.9
High income	6,782	45.5			
Food security			Exercise		
Yes	13,140	77.0	5x per week	8,540	51.4
No	2,540	12.9	Other	8,430	47.3

Notes: Based on 17,172 adults aged 18 years and older, did not have missing data in COVID-19 vaccination or COVID-19 booster vaccination and observed throughout the year. Missing data for the following variables are not presented in the table: education, employment status, food security, exercise, and cigarette smoking. Wt. Weighted;

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Table 2. Description of Adults (Age≥18 years) by COVID-19 Vaccination Status (Row Percent) Using Medical Expenditure Panel Survey, 2022

	Vaccinated	Not vaccinated	p		Vaccinated	Not vaccinated	p
	N (Wt.%)	N (Wt.%)			N (Wt.%)	N (Wt.%)	
All	14,430 (83.4)	2,742 (16.6)					
Chronic Conditions			<0.001	Cigarette Use			<0.001
Multimorbidity	7,272 (88.7)	941 (11.3)		Every day	927 (66.0)	431 (34.0)	
1 chronic condition	2,886 (82.3)	613 (17.7)		Some days	514 (74.9)	173 (25.1)	
No chronic condition	4,272 (78.3)	1,188 (21.7)		Not at all	12,865 (85.3)	2,110 (14.7)	
Sex			<0.001	Usual source of care (USC)			<0.001
Female	7,896 (85.2)	1,388 (14.8)		Yes, USC	10,422 (87.0)	1,547 (13.0)	
Male	6,534 (81.6)	1,354 (18.4)		No USC	3,544 (75.4)	1,101 (24.6)	
Age			<0.001	Marital status			<0.001
18-34 years	2,811 (76.2)	966 (23.8)		Married	7,219 (86.6)	1,008 (13.4)	
35-44 years	2,100 (79.0)	531 (21.0)		Widow	1,328 (88.4)	173 (11.6)	
45-54 years	2,158 (83.7)	435 (16.3)		Separated/Divorced	2,314 (82.3)	489 (17.7)	
55-64 years	2,635 (87.5)	418 (12.5)		Never married	3,568 (77.5)	1,072 (22.5)	
65-74 years	2,778 (92.2)	257 (7.8)		Region			<0.001
75 years or older	1,948 (93.5)	135 (6.5)		Northeast	2,439 (89.6)	292 (10.4)	
Race and ethnicity			0.006	Midwest	2,837 (81.5)	615 (18.5)	
NHW	8,281 (82.7)	1,580 (17.3)		South	5,341 (79.3)	1,266 (20.7)	
NHB	2,006 (82.2)	449 (17.8)		West	3,813 (87.2)	569 (12.8)	
Hispanic	2,848 (84.1)	550 (15.9)		Depression			<0.001
Other	1,295 (88.2)	163 (11.8)		Yes	1,464 (88.6)	187 (11.4)	
Education			<0.001	No	12,966 (82.9)	2,555 (17.1)	
Less than high school	1,916 (73.6)	620 (26.4)		Anxiety			<0.001
High school	3,777 (75.8)	1,123 (24.2)		Yes	1,639 (87.5)	242 (12.5)	
Some college	3,068 (83.2)	607 (16.8)		No	12,791 (82.9)	2,500 (17.1)	
College	5,565 (93.0)	369 (7.0)					
Employment			<0.001	Exercise			0.411
Employed	8,581 (82.4)	1,754 (17.6)		5x per week	7,196 (83.0)	1,344 (17.0)	
Not employed	5,834 (85.4)	987 (14.6)		Other	7,067 (84.0)	1,363 (16.0)	
Poverty level			<0.001	Food security			<0.001
Poor	1,980 (73.7)	654 (26.3)		Yes	13,140 (85.1)	1,859 (14.9)	
Near poor	2,348 (75.9)	650 (24.1)		No	2,540 (71.6)	654 (28.4)	
Middle income	3,926 (80.8)	832 (19.2)					
High income	6,176 (89.7)	606 (10.3)					

Notes: Based on 17,172 adults aged 18 years and older, did not have missing data in COVID-19 vaccination or COVID-19 booster vaccination and observed throughout the year. Missing data for the following variables are not presented in the table: education, employment status, food security, exercise, and cigarette smoking. Statistically significant group differences by COVID-19 vaccination status were determined using the Rao-Scott chi-square tests. NHW: Non-Hispanic White; NHB: Non-Hispanic Black, Wt. Weighted;

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COVID-19 BOOSTER UPTAKE

Booster uptake exhibited similar but more pronounced disparities across covariate groups. Differences by age, education, and income were greater than those observed for initial vaccine uptake. Booster coverage ranged from 61.1% among younger adults (18–34) to 88.7% among those aged 75 and older (p<0.001, Table 3). Educational attainment was also associated with booster uptake (61.8% among those with less than high school vs. 82.0% among college graduates, p<0.001, Table 3). Booster uptake by income ranged from 66.4% in the low-income group to 79.5% in the high-income group (p<0.001, Table 3). Larger within-group differences in booster uptake were also seen for food security, smoking status, number of chronic conditions, marital status, and usual source of care (p<0.001, Table 3).

Table 3. Description of Adults (Age ≥ 18 years) by COVID-19 Booster Status Using Medical Expenditure Panel Survey, 2022

	Booster	No Booster	p		Booster	No Booster	p
	N (Wt.%)	N (Wt.%)			N (Wt.%)	N (Wt.%)	
All	10,741 (73.1)	3,689 (26.9)		Health insurance coverage			<0.001
Chronic Conditions			<0.001	Private	6,942 (74.9)	2,131 (25.1)	
Multimorbidity	5,881 (79.9)	1,391 (20.1)		Public	3,347 (73.4)	1,111 (26.6)	
1 chronic condition	2,115 (73.9)	771 (26.1)		No Insurance	452 (50.2)	447 (49.8)	
No chronic condition	2,745 (64.3)	1,527 (35.7)		Cigarette Use			<0.001
Sex			0.006	Every day	579 (60.6)	348 (39.4)	
Female	5,921 (74.3)	1,975 (25.7)		Some days	333 (61.1)	181 (38.9)	
Male	4,820 (71.9)	1,714 (28.1)		Not at all	9,741 (74.4)	3,124 (25.6)	
Age			<0.001	Usual source of care (USC)			<0.001
18-34 years	1,661 (61.1)	1,150 (38.9)		Yes, USC	8,136 (76.8)	2,286 (23.2)	
35-44 years	1,395 (66.3)	705 (33.7)		No USC	2,261 (63.1)	1,283 (36.9)	
45-54 years	1,506 (71.2)	652 (28.8)		Marital status			<0.001
55-64 years	2,037 (78.4)	598 (21.6)		Married	5,610 (76.8)	1,609 (23.2)	
65-74 years	2,407 (87.1)	371 (12.9)		Widow	1,102 (83.8)	226 (16.2)	
75 years or older	1,735 (88.7)	213 (11.3)		Separated/Divorced	1,702 (71.2)	612 (28.8)	
Race and ethnicity			<0.001	Never married	2,326 (64.4)	1,242 (35.6)	
NHW	6,461 (75.4)	1,820 (24.6)		Region			<0.001
NHB	1,385 (67.2)	621 (32.8)		Northeast	1,948 (77.4)	491 (22.6)	
Hispanic	1,857 (65.5)	991 (34.5)		Midwest	2,148 (73.4)	689 (26.6)	
Other	1,038 (79.6)	257 (204)		South	3,673 (67.7)	1,668 (32.3)	
Education			<0.001	West	2,972 (77.8)	841 (22.2)	
Less than high school	1,222 (61.8)	694 (38.2)		Depression			0.006
High school	2,594 (67.1)	1,183 (32.9)		Yes	1,151 (77.3)	313 (22.7)	
Some college	2,197 (70.0)	871 (30.0)		No	9,590 (72.7)	3,376 (27.3)	
College	4,658 (82.0)	907 (18.0)		Anxiety			0.004
Employment			<0.001	Yes	1,273 (77.0)	366 (23.0)	
Employed	6,038 (70.0)	2,543 (30.0)		No	9,468 (72.7)	3,323 (27.3)	
Not employed	4,692 (79.3)	1,142 (20.7)		Exercise			0.522
Poverty level			<0.001	5x per week	5,410 (73.7)	1,786 (26.3)	
Poor	1,320 (66.4)	660 (33.6)		Other	5,210 (72.5)	1,857 (27.5)	
Near poor	1,628 (66.5)	720 (33.5)		Food security			<0.001
Middle income	2,759 (97.5)	1,167 (32.5)		Yes	8,590 (74.6)	2,691 (25.4)	
High income	5,034 (79.5)	1,142 (20.5)		No	1,203 (60.8)	683 (39.2)	

Notes: Based on 14, 430 adults aged 18 years and older, who received COVID-19 vaccination, without missing data on booster and observed throughout the year. Missing data for the following variables are not presented in the table: education, employment status, food security, exercise, and cigarette smoking. Statistically significant group differences by COVID-19 booster status were determined using the Rao-Scott chi-square tests. NHW: Non-Hispanic White; NHB: Non-Hispanic Black, Wt. Weighted;

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MULTIMORBIDITY ASSOCIATED WITH COVID-19 VACCINE AND BOOSTER UPTAKE

As shown in Table 4, unadjusted binary logistic regression models revealed that adults with multimorbidity had significantly greater odds of completing the primary COVID-19 vaccination series (OR = 1.69; 95% CI: 1.47–1.94; p < 0.001) and receiving at least one booster dose (OR = 1.40; 95% CI: 1.23–1.60; p < 0.001), compared to those with a single chronic condition. Conversely, individuals with no chronic conditions had significantly lower odds of both vaccination (OR = 0.77, 95% CI: 0.68–0.89, *p* < 0.001) and booster uptake (OR = 0.64, 95% CI: 0.56–0.71, *p* < 0.001).

Table 4. Unadjusted Odds Ratios (OR) and Adjusted Odds Ratios (AOR) and 95% Confidence Intervals (CI) from Logistic Regressions on COVID-19 Vaccination and COVID-19 Booster Adults (age ≥ 18 years)

Medical Expenditure Panel Survey, 2022

	COVID-19 Vaccination			COVID-19 Booster Among those Vaccinated (N = 14,430)		
Model 1 - Unadjusted Model						
	OR	**95% CI**	**P-value**	**OR**	**95% CI**	**P-value**
Chronic Conditions						
Multimorbidity	1.69	[1.47 , 1.94]	< 0.001	1.40	[1.23 , 1.60]	<0.001
1 chronic condition (Ref)						
No chronic conditions	0.77	[0.68 , 0.89]	<0.001	0.64	[0.56 , 0.71]	<0.001
Model 2 - Adjusted for age sex, race and ethnicity, SDOH, smoking, and physical activity for COVID vaccination						
Adjusted for age, sex, race and ethnicity, SDOH including health insurance coverage , smoking, and physical activity for COVID Booster						
	AOR	**95% CI**	**P-value**	**AOR**	**95% CI**	**P-value**
Chronic Conditions						
Multimorbidity	1.28	[1.07 , 1.53]	0.0045	0.95	[0.81 , 1.12]	0.5458
1 chronic condition (Ref)						
No chronic conditions	0.86	[0.70, 1.06]	0.1542	0.81	[0.72 , 0.92]	0.0014

Notes: Based on 17,172 adults aged 18 years and older, did not have missing data in COVID-19 vaccination or COVID-19 booster vaccination and observed throughout the year. SDOH included education, employment, poverty status, food security, usual source of care, marital status, and region.

Ref: Reference Group; SDOH: Social determinants of health

In multivariable logistic regression models adjusting for all covariates, multimorbidity remained significantly associated with higher odds of receiving the primary vaccines (AOR = 1.28, 95% CI: 1.07–1.53, *p* = 0.0045). However, this association did not persist in booster uptake. Specifically, multimorbidity was not significantly associated with receipt of a booster dose (AOR = 0.95, 95% CI: 0.81–1.12, *p* = 0.5458), suggesting that while individuals with multiple chronic conditions were more likely to complete the initial vaccine series, their likelihood of receiving a booster was no greater than those with a single chronic condition after adjustment for covariates.

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Discussion

This study examined the relationship between multimorbidity and uptake of the primary COVID-19 vaccine series and booster doses among U.S. adults, using nationally representative data from the 2022 MEPS. Our findings indicate that individuals with multimorbidity had significantly higher odds of completing the primary COVID-19 vaccine series compared to those with only one chronic condition. However, no significant difference in booster uptake was observed between individuals with multimorbidity and those with a single chronic condition. Furthermore, individuals without any chronic conditions did not show significantly different odds of receiving either the primary vaccine series or a booster dose, relative to those with one chronic condition. These results extend existing literature by differentiating levels of chronic disease burden and demonstrating that greater disease burden is associated with higher engagement in preventive health behaviors, particularly primary COVID-19 vaccination. By identifying multimorbidity as an independent predictor of primary vaccine uptake, this study adds important nuance to our understanding of vaccine behavior in the context of chronic illness.

The lack of a significant association between multimorbidity and booster uptake may reflect broader systemic or behavioral barriers that affect all patient groups regardless of health status.[18,19] Although booster vaccination offers enhanced protection against COVID-19, uptake remains suboptimal, even among those at elevated risk. Commonly cited reasons for not receiving a booster include perceived prior immunity from infection, concerns about side effects or safety, skepticism about additional benefits, and logistical challenges such as access to appointments or transportation.[18,19] While improved clinical management has contributed to reductions in COVID-19-related mortality, the booster dose remains a critical immunologic safeguard, particularly for vulnerable populations. The findings highlight the need for targeted outreach and education to sustain booster uptake engagement, especially among individuals with multimorbidity who were initially more likely to vaccinate but may face declining uptake over time.

The observed associations are consistent with prior studies that have shown individuals with older age, higher socioeconomic status, and higher education are positively related to receiving COVID-19 vaccination.[20,21] Additionally, individuals with chronic illnesses are more likely to accept COVID-19 vaccines due to perceived vulnerability and higher risk of complications.[22,23] Research from high-income countries has indicated that individuals with chronic conditions tend to perceive higher benefits from vaccination, contributing to increased uptake.[24,25] Our findings align with this trend and further elucidate that those with multimorbidity often experience more complex health needs and may be particularly motivated to adopt preventive strategies. These results emphasize the importance of prioritizing high-risk populations in public health initiatives.

While much of the literature has concentrated on single chronic conditions, fewer studies have examined differences in booster uptake by chronic disease burden.[26] This study uniquely highlights that the positive association between multimorbidity and vaccine uptake extends to booster engagement, a behavior shown to be less prevalent among the general population. Moreover, we observed that race and ethnicity had differential associations with vaccination versus booster uptake. For example, while non-Hispanic Black and Latino individuals did not have significantly lower odds of receiving the initial COVID-19 vaccine series, they were significantly less likely to receive a booster dose. These divergent patterns suggest that while initial vaccine outreach may have reached marginalized groups, booster-specific messaging or structural barriers may have contributed to disparities in continued engagement.

A major strength of this study is the use of MEPS data, which is designed to provide nationally representative estimates through rigorous sampling and survey methods. The study benefits from a large sample size, detailed sociodemographic and clinical data, and the ability to assess multiple chronic conditions,

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allowing for a robust analysis of multimorbidity. The inclusion of numerous covariates and sequentially adjusted regression models enhances the reliability of findings and provides insight into the independent association of multimorbidity with vaccine-related outcomes.

However, several limitations should be noted. First, booster uptake was assessed in only one MEPS interview round, limiting study generalizability. The evolving nature of the pandemic, including the emergence of new variants and shifting public health guidance, may have influenced vaccination behavior in ways not fully captured here. Additionally, all data were self-reported, introducing the potential for recall or social desirability bias. The booster group, being a subset of the vaccinated population, introduces an inherent dependency that must be considered when interpreting subgroup analyses. While the variable for "usual source of care" served as a proxy for healthcare access, more direct measures of healthcare utilization could further clarify the role of provider engagement. Future research should explore the motivations and barriers experienced by individuals with varying degrees of health complexity and examine how these insights can inform broader vaccine outreach strategies.

Conclusions

This study provides nationally representative evidence that individuals with multimorbidity are more likely to complete the primary COVID-19 vaccine series but not the subsequent booster dose, compared to those with fewer or no chronic conditions. These findings suggest that initial public health outreach effectively reached populations with higher health burdens, yet important gaps remain in sustaining engagement, particularly for booster uptake. Understanding the behavioral, perceptual, and systemic factors influencing this divergence is essential. Such insights will be critical not only for improving booster coverage among high-risk groups but also for informing equitable and effective vaccination strategies in response to future infectious disease threats.

Author Contribution:

Conception and design (HW and US), Administrative support (US), Provision of study materials or patients (CW and US), Collection and assembly of data (US), Data analysis and interpretation (HW and US), Writing – original draft (CW and HW), Writing –review and editing (CW, HW, and US), and Final approval of manuscript: (CW, HW, and US).

Conflict of 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.

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