

# A Single Wisconsin High School Students' Projected Uptake of COVID-19 Vaccines at the Onset of Its Emergency Use Authorization

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## ABSTRACT

**Introduction:** This study assessed high-school students' anticipated COVID-19 vaccine uptake following the US Food and Drug Administration Emergency Use Authorization – before its availability to adolescents – and compared it to current national vaccination rates in similar age groups.

**Methods:** A web-based survey was conducted in January 2021. Data were analyzed using SurveyMonkey and SPSS. Predictors of vaccine willingness were explored.

**Results:** One hundred twenty of 407 students responded, with 70% indicating willingness to receive the COVID-19 vaccine. Current data from the Centers for Disease Control and Prevention show a 72.2% uptake among the 12- to 17-year age group. Students with a general belief in vaccinations and those who self-identified as liberal were more willing to receive the vaccine.

**Discussion/Conclusions:** High school students exhibited positive attitudes towards COVID-19 vaccines, with acceptance influenced by general vaccine beliefs, political affiliation, and projected uptake rates aligned with national data.

## INTRODUCTION

In response to the COVID-19 pandemic, pharmaceutical companies swiftly developed vaccines to decrease the spread and severity of the viral infection, aiming for widespread vaccination as the avenue toward herd immunity. Two notable milestones were the Pfizer/BioNTech and Moderna's mRNA vaccines, which received Emergency Use Authorization by the US Food and Drug Administration in December 2020. Their high levels of efficacy and safety ignited enthusiasm among medical professionals worldwide.<sup>1,2</sup>

While the medical community's embrace of these vaccines

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is well-documented, there is a paucity of high school student-led research on high school students' perceptions of and attitudes toward the COVID-19 vaccine. This demographic, with its distinct social and behavioral attributes, is crucial for the understanding of acceptance of public health measures.

High school students have a foundational grasp of essential principles and concepts pertaining to the COVID-19 pandemic.<sup>3</sup> Our initiative aimed to explore the minds of high school students in a single Wisconsin high school to understand their perspectives on vaccines in general and, more specifically, their willingness to receive the COVID-19

vaccine following an election cycle, given that political affiliations can influence vaccination intention.<sup>4</sup> We sought to identify the influence of their political leanings and examine if personal experiences, such as knowing someone diagnosed with COVID-19, had any bearing on their decision to get vaccinated.

From reported data since the onset of the pandemic to May 11, 2023, it has been found that children represented 17.9% of total cumulated COVID-19 cases, and according to the Centers for Disease Control and Prevention, it was expected that in 2023, the United States would most likely see greater hospitalizations from respiratory illnesses than in seasons before the pandemic, underscoring the importance of assessing vaccine intent.<sup>5,6</sup>

We hoped to gain insights that would allow us to align vaccine outreach efforts more effectively in this age group, especially in the context of COVID-19 and respiratory illnesses, thereby tailoring future vaccination strategies more effectively to their needs and views. This research contributes to the growing body of literature on vaccine acceptance, adding an important

layer of understanding by focusing on a select demographic in medical and health research.

## METHODS

A 21-question electronic survey was administered to high school students using the Survey Monkey web application (San Mateo, California; <http://www.surveymonkey.com>). The researchers independently generated survey questions and employed the Likert scale to assess opinions and attitudes. To validate the questions and minimize survey fatigue, the team enlisted 5 high school students from a nonparticipating high school, a faculty member from a local medical college, and participating high school administrators to select the most important queries. The final survey was deemed comprehensible, allowed for the maintenance of anonymity, and the questions were appropriate for high school students.

The high school's Scientific Review Committee gave the approval to send out the survey. Parental approval was not required, and teachers were available to answer questions. The survey was administered during the school day solely via an invitation to participate anonymously through a link provided within the high school's private network portal, where students received a notification to choose to participate in this survey among other available student-designed surveys as participation in the school's independent science research program. Respondents were given the option to opt out of any question in the survey.

The school where the survey was administered draws students from Milwaukee, Wisconsin, and 19 surrounding ZIP codes. From January 19 through January 23, 2021, 407 high school students received the survey link through their high school portal. The survey was voluntary and without incentive.

Results were saved on a password-protected computer with extra security measures on SurveyMonkey. The participants and the authors did not have access to information that could identify individual participants during or after data collection. Predictors of the willingness to receive the COVID-19 vaccine were determined by calculating odds ratios and 95% confidence intervals using statistical online calculators.

## RESULTS

Of 407 students invited to participate, 120 responded, representing a 29.48% response rate. The self-reported demographic breakdown of respondents was 61.34% European American, 5.88% Latino/Hispanic, 4.20% African American, 0.68% Native American, and 10.92% Asian-American (Table 1). The overall demographic of the high school student population at the time of the survey consisted of 62.1% European American, 6.88% Latino/Hispanic, 7.4% African American, 1.23% Native American, and 11.1% Asian-American students. In comparison, the broader Milwaukee area's demographics include 64% White,

**Table 1.** Demographic Characteristics of Wisconsin High School Student Survey Respondents

Characteristics	No. of Respondents	Percent
Current year in high school (n=120)		
Freshman	3730.83	
Sophomore	1915.83	
Junior	3428.33	
Senior	30	25.00
Gender (n=120)		
Male	5445.00	
Female	60	50.00
Other	65.00	
Race and Ethnicity (n=119)		
European American	7361.34	
African-American	54.20	
Latino/Hispanic American	75.88	
Asian American	1310.92	
Middle Eastern American	43.36	
Native American	21.68	
Multiracial American	97.56	
Other	65.04	
Political identification (n=119)		
Very liberal	1512.61	
Liberal	4840.34	
Centrist	108.40	
Conservative	22	18.49
Very conservative	43.36	
Independent	1411.76	
Apolitical	65.04	
Socioeconomic class (n=120)		
Upper	3630.00	
Upper Middle	50	41.67
Middle	30	25.00
Working	21.67	
Lower	21.67	

12% Hispanic, 15% Black, 0% Native American, and 4% Asian, with a margin of error of 10%.<sup>7</sup>

Views on the seasonal influenza immunization and COVID-19 vaccines are summarized in Table 2. More than 80% (83.33%) of respondents reported a high level of belief in vaccinations in general, 13.33% indicated moderate belief, and 2.50% reported no belief. Furthermore, 76.47% said that they routinely receive the optional seasonal influenza vaccine. When queried about the COVID-19 vaccine, 70% planned to receive it when eligible and available.

At the time the survey was conducted, respondents were not eligible to receive the COVID-19 vaccine. Figure 1 illustrates the influence of political views on vaccine beliefs, trust, safety perceptions, and vaccination plans. Among respondents, political ideology leaned left, with 40.34% identifying as liberal and 12.61% as very liberal; 18.49% and 3.36% identified as conservative and very conservative, respectively; and 11.76% claimed independence. When correlating political views and vaccine attitudes, all very liberal respondents and 75% of very conservative respon-

**Table 2.** Opinion and Knowledge of Influenza and COVID-19 Vaccines in Wisconsin High School Student Survey Respondents

Questions and Answers	No. of Respondents	%	Questions and Answers	No. of Respondents	%
Do you believe in getting vaccines? (n=120)			Do you personally know anyone who has died from COVID-19? (n=120)		
To a great extent	100	83.33	Yes	28	23.33
Somewhat	16	13.33	No	92	76.67
Very little	1	0.83	Do you trust the science that has gone into making the COVID-19 vaccine? (n=119)		
Not at all	3	2.50	To a great extent	71	59.66
Did you take the flu vaccine? (n=119)			Somewhat	42	35.29
Yes	91	76.47	Very little	3	2.52
No	28	23.53	Not at all	3	2.52
Do you plan to get or did you already receive the flu vaccine (shot or nasal spray) this flu season? (n=120)			The COVID-19 vaccine has been developed at “warp speed” due to the nature of this pandemic and its economic implications. Do you think that this vaccine will be safe? (n=119)		
Yes	94	78.33	Yes	64	53.78
No	26	21.67	Not sure	47	39.50
Do you plan on receiving the COVID-19 (coronavirus) vaccine if it becomes available to you and if you’re eligible for it this year? (n=120)			No	8	6.72
Yes	84	70.00	Do you think that the COVID-19 vaccine will be effective in preventing the spread of this disease by the summer 2021? (n=120)		
No	10	8.33	Very likely	26	21.67
Not sure but I plan on using my parents’ help in making the decision	17	14.17	Somewhat likely	74	61.67
Not sure but I plan on using my doctor’s help in making the decision	9	7.50	Not likely	20	16.67
If you do not believe in getting vaccines in general, why are you are hesitant? (check ALL that apply) (n=25)			Are any of your family members willing to take the COVID-19 vaccine when it becomes available to them this year? (n=120)		
Lack confidence in vaccine effectiveness	6	24.00	Yes	106	83.33
Lack confidence in vaccine safety and concerned about side effects	14	56.00	No	5	4.17
Lack confidence in the government and health care policymakers	8	32.00	Not sure	9	7.50
Perceive low risk of acquiring vaccine preventable diseases	5	20.00	Will minor side effects like fever, chills, headache, muscle ache, or the pain of injection site deter you from taking the COVID-19 vaccine? (n=119)		
Lack convenience in access to immunizations including time, place, and cost	2	8.00	Yes	9	7.56
History of serious side effects from vaccines or its contents	4	16.00	No	98	82.35
Religious reason	0	0.00	Not sure	12	10.08
Fear of vaccines	3	12.00	Do you think that widespread use of the COVID-19 vaccine will bring an end to the pandemic? (n=119)		
Other	5	20.00	Very likely	63	52.94
Are your political views similar to one of your parents? (n=119)			Somewhat likely	44	36.97
Yes	83	69.75	Not Likely	12	10.08
No	22	8.49	The currently available Pfizer COVID-19 vaccine received emergency use authorization by the FDA in December 2020 for people 16 years and older. Do you think they should have included 14 and 15-year-old children in the vaccine trial? (n=118)		
Not sure	14	11.76	Yes	30	25.42
Do you personally know anyone who has been diagnosed with COVID-19? (n=120)			No	37	31.36
Yes	111	92.50	Unsure	51	43.22
No	9	7.50			

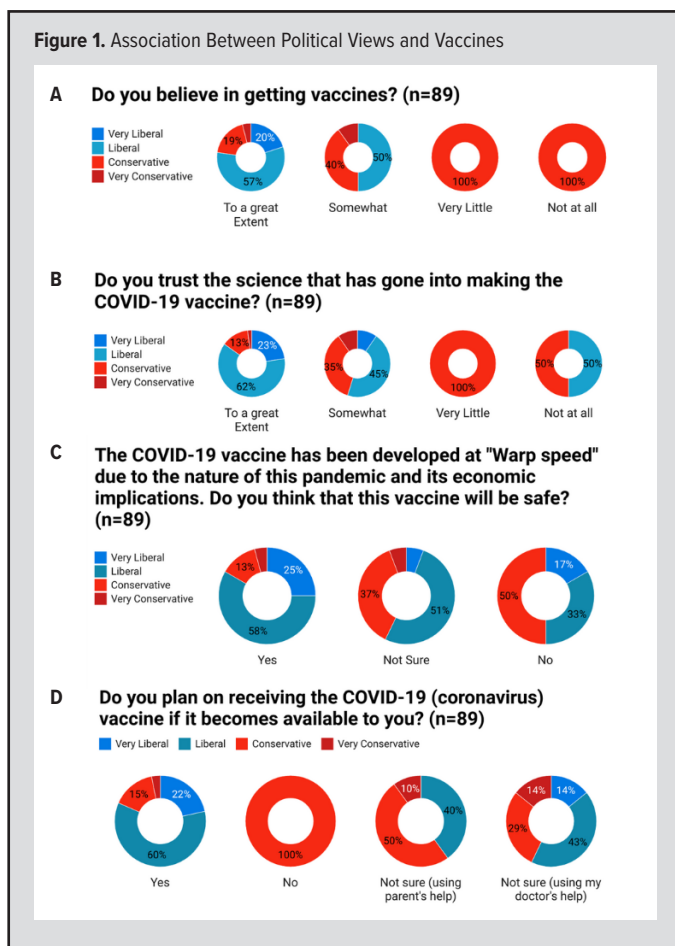
dents indicated they believed highly in vaccination (Figure 1A). Furthermore, 80% of very liberal respondents said they trusted vaccine science, compared to 25% of very conservative respondents (Figure 1B). On the topic of vaccine safety, given its swift development, 53.78% of respondents said they considered it safe, 39.5% were unsure, and 6.72% considered it unsafe (Figure 1C). Liberal respondents were more willing than conservative respondents to receive the COVID-19 vaccine (OR 3.47; 95% CI, 1.26-9.56) (Figure 1D).

Comparing willingness to receive the influenza vaccine with the COVID-19 vaccine, 75.53% of respondents who planned to receive the flu vaccine were also willing to receive the COVID-19 vaccine. In contrast, only 50% of those not planning to receive

the flu vaccine were willing to get the COVID-19 vaccine (OR 3.09; 95% CI, 1.25-7.60).

In examining the impact of personal experience with COVID-19, 92.50% of respondents knew someone diagnosed with the disease, and 28.33% knew someone who had died from it. We found no statistically significant difference in vaccine willingness between those who knew someone diagnosed with or who died from COVID-19 versus those who did not. Of those who knew someone diagnosed with COVID-19, 70.27% were willing to get vaccinated, compared to 66.67% who did not (OR 1.18; 95% CI, 0.28-5.01). Among those who knew someone who died of COVID-19, 64.29% were willing to get vaccinated, versus 71.24% of those who did not (OR 0.71; 95% CI, 0.30-1.65).

**Figure 1.** Association Between Political Views and Vaccines



## DISCUSSION

The novelty in our study lies in exploring the perspectives of high school students toward the COVID-19 vaccine during a critical period when the vaccine was yet to be made available to this age group. Our findings revealed a general willingness among the majority of students to receive this new immunization, providing early insight into their acceptance. Interestingly, this willingness echoed the national vaccination rates witnessed at the end of the COVID-19 public health emergency, with a vaccine uptake of at least 1 dose in 72.2% of individuals aged 12 to 17 years and contributes to how views may influence future vaccination decisions.<sup>8</sup>

These insights bear substantial significance for public health strategies and vaccine outreach efforts. Understanding that political beliefs could impact vaccine acceptance among adolescents suggests the utility of targeted, nonpartisan communication in elevating vaccination rates in this demographic. However, despite the valuable insights, our study is not without limitations, such as the lower response rate and the focus on 1 geographic area (albeit with students from 19 different ZIP codes), potentially limiting the generalizability of the results. Future research could benefit from a more diverse and larger sample size to corroborate our findings.

## CONCLUSIONS

This study underscores the importance of understanding adolescents' perceptions of vaccines, especially during a public health crisis. Our insights contribute to the existing literature and guide the development of effective vaccination strategies targeting this pivotal demographic.

This study, capturing high school students' attitudes towards COVID-19 vaccination, indicates a general willingness to receive it prior to its availability in this age group. For clinicians, educators, and public health clinicians, the key insights include addressing concerns about vaccine safety and effectiveness, as 56% of hesitant respondents cited these as reasons. Engaging parents in vaccine discussions is crucial, as many students look to them for guidance. Additionally, information campaigns might focus on addressing misconceptions about vaccine development speed and side effects, as these were prominent concerns. This approach can potentially increase vaccination rates among adolescents, contributing to broader public health objectives

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