**Common barriers to vaccination and Suggestions**

* Should Figure 2 and 3 (vaccinated 18-24, vaccinated over 65) use the same format as Figure 1 (all vaccinated)
  + Label colors align with lines or not?
  + Font of the labels should be the same?
  + In Figure 2 (vaccinated 18-24), should I label less or more barriers?
* The time frame for Figure 2 and 3 should end in January 2022 or February 2022
* I am using the Limitation section from “[Vaccine Hesitancy and the J&J Vaccine Suspension](https://delphi.cmu.edu/blog/2021/04/23/vaccine-hesitancy-and-the-jj-vaccine-suspension/)” only adding “The sample size gap cannot be ignored” part, is that okay?
* Also not so sure about the title for the post?

Table

Description automatically generated

Chart, line chart

Description automatically generated

On May 10th, 2021,the Centers for Disease Control and Prevention (CDC) and the Food and Drug Administration expanded the emergency use authorization (EUA) for the Pfizer-BioNTech COVID-19 Vaccine to include adolescents 12 through 15 years of age, amending the EUA originally issued on Dec. 11, 2020 for administration in individuals 16 years of age and older. (<https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-authorizes-pfizer-biontech-covid-19-vaccine-emergency-use>) This declared a new phase of the universal acceptance for vaccination, and another significant step for the United States to return to normality.

By understanding and assisting overcome the barriers to vaccination, one of the major goals for Delphi group has always been helping raise the vaccination rate and resume the normal life. And that’s why, through its COVID-19 Trends and Impact Survey, the Delphi Group started to track COVID vaccination barriers right after FDA’s announcement, to help understand the vaccination barriers by vaccination status and age groups. Delphi’s COVID-19 Trends and Impact Survey is a massive survey distributed daily across the United States through our partnership with Facebook, and with the help of it, we’ve successfully tracked [social distancing](https://delphi.cmu.edu/blog/2021/02/02/home-for-the-holidays-the-impact-of-us-holidays-on-social-behaviors-and-preventative-measures/) and [mask use](https://delphi.cmu.edu/blog/2020/12/13/are-masks-widely-used-in-public/), and gave some thoroughly insights of vaccine hesitancy.

Since May 20th, 2021, we have asked all respondents about whether they have experienced specific barriers to getting the COVID-19 vaccine based on their vaccination status. Combined with their answers on age groups, we can have a general idea of the common barriers to vaccination by vaccination status and age groups, and make monthly comparison from May 2021 to now.

From our finding, based on the different vaccination status and age groups, our survey respondents have encountered different barriers to vaccination. Though, our data does suggest that extra efforts shall be taken to ensure enough availability to vaccination for potential vaccine recipients.

Not surprisingly, CDC has already suggested multiple approaches that can help increase COVID-19

(<https://www.cdc.gov/vaccines/covid-19/health-departments/generate-vaccinations.html#:~:text=Partner%20with%20local%20community%20groups,or%20request%20at%2Dhome%20vaccinations>)

Vaccination, including reaching people where they live, work, learn, pray, play, gather or through existing programs and the internet. For example, CDC mentions providing at-home vaccination for those have difficulty accessing a vaccination, like older adults, is a great way to increase vaccine rate for priority populations. Besides, by offering options including allowing employees to be away during work hours or to taking paid leave to get vaccinated, reimbursing employees for transportation costs, and offering on-site vaccination, employers can help employees get vaccinated. We hope, through this article, we can give more insightful suggestions on how we could make vaccines more available to more potential recipient by different age groups.

Let’s start with the common barriers to vaccination on May, 2021 by vaccination status. First, we ask respondents whether they have been vaccinated or not, and according to their vaccination status, they will be given a list of 12 or 13 specific barriers. Respondents can select multiple reasons, so the numbers do not add to 100%. One thing we also need to notice is the huge sample size disparity between the vaccinated and the unvaccinated, which could possibly affect the accuracy of the measurement for all respondents.

Table

Description automatically generated

(Table 1. May 2021)

As you can see, there are similarities and differences between the common barriers to vaccination for the vaccinated and the unvaccinated. “No vaccines or vaccine appointments” is the top selected barrier for both. Nevertheless, the other two top reasons commonly selected by the vaccinated are “eligibility requirements” and “technical difficulties”, while the unvaccinated select “time didn’t work” and “desired brand not available” most, which is unexpected for us. What is noticeable is that “Have not tried yet” barrier also stands high among the unvaccinated. This is what we would expect to happen in normal circumstances: As more people get vaccinated, the people who remain unvaccinated are those who either don’t want to be vaccinated or haven’t yet been able to.

But these numbers don’t tell the whole story. It’s also very insightful to look at the time trend plot for barriers. The common barriers to vaccination varied throughout the past half year with the announcement for boosters, new policies, the larger population of the vaccinated and so on. In order to have clearer overview on the changes, we plot the trend for the barriers to vaccination for the vaccinated from May, 2021 to February, 2022, and two major discoveries are spotted:

Chart, line chart

Description automatically generated

(Figure 1. All Vaccinated)

Firstly, as we have noticed in the previous May 2021 table, “No vaccines or appointments” really stands out from all the other barriers, and the percentage is as twice high as the second high barrier “Eligibility requirements”. Another thing worth noticing is that November 2021 seems to be an important turning point for many barriers, which is especially obvious for “No vaccines or appointment”. The explanation we have is, on November 19, 2021, CDC expands eligibility for COVID-19 booster shots to all adults, so we were expecting higher demand for vaccination appointments, and thus higher barrier percentage.

https://www.cdc.gov/media/releases/2021/s1119-booster-shots.html

Since we also ask respondents about their age groups, to have more in-depth idea on how each age group was affected by different barriers, we decide to divide our recipients into 4 age groups: 18-24, 25-44, 45-64 and over 65.

Chart, line chart

Description automatically generated

(Figure 2. Vaccinated 18-24)

For the age group 18-24, consistent with the all vaccinated, November 2021 is also a turning point for many barriers, which is obvious for top 3 barriers: “no vaccines or appointments”, “can’t get time off” and “time didn’t work”. This is totally understandable, because the majority of this age group consists of students and hour-based workers, and their time is usually inflexible. To look more closely, both “no vaccines or appointments” and “time didn’t work” barriers increase a lot since November 2021, thus we suggest add more appointments every time a new vaccination is introduced. Since “can’t get time off” basically fluctuates, this suggests that adding more flexible “vaccination” time-off for hour-based workers and students should be considered to raise vaccination rate in the long term.

Chart, line chart

Description automatically generated

(Figure 3. Vaccinated over 65)

Also consistent with the all vaccinated, in the age group over 65, November 2021 is also a turning point for many barriers, indicating the introduce of booster also causes effect on the age group over 65. Given the top selected two barriers align with what we are expected, this age group will experience trouble making appointments online for vaccination. (Another possible explanation for this is that the releasing time at the start period of online appointment for vaccination is usually 12a.m., which is not an ideal time for people who is over 65). Though “technical difficulties” decreases a lot from May to February, but it still remains to be a major problem compared with other barriers. Thus, we suggest provide more convenient vaccine appointments/ services for people aged over 65.

As mentioned in the very beginning of the article, cases for the unvaccinated can be different from the vaccinated. Since the most barriers of the unvaccinated just fluctuate, instead, look just the most recent data collected on January 2022 as below:

Table

Description automatically generated

(Table 2. Jan 2022)

The picture is very consistent across all unvaccinated age groups. Aside from “other” and “have not tried yet”, the top selected for 18-24 years and 25-44 years is “can’t get time off”, and for both 45-64 years and over 65 years, it is “can’t travel to vaccination site”. In addition to providing more available vaccination services for more sites, we also suggest distribute evenly vaccination supplies of different brands and provide more choices for potential vaccine recipients, noting that “desired brands not available” exceed 10% across all age groups.

## Limitations

As with any scientific study, there are limitations to the results seen above. Here are a few important things to keep in mind:

* **We’re surveying Facebook users.** While we [weight survey responses](https://arxiv.org/abs/2009.14675) to ensure their age and gender distribution matches the United States population, our respondents do tend to be more educated than the national average, which the weights do not correct for.
* **The survey is voluntary.** Facebook draws a random sample of active users every day and invites them to take the survey via a promotion in their News Feed. Many people don’t respond to the invitation, and while the Facebook-provided survey weights attempt to account for this by using models to predict the probability each user will respond, there may still be unobserved biases remaining.
* **The sample size gap cannot be ignored.** Since Facebook assigns the survey randomly to their users, and as the vaccinated population gets larger, we are expecting the sample size gap between the vaccinated and the unvaccinated remains the same or even widens.
* **Survey responses are simplifications.** Our respondents can select barriers from a list, but ticking boxes can’t fully represent the complexity of their beliefs and the other realistic reasons that may affect their actions. Also, their responses may not always match their behavior: a respondent who says they “have not tried yet” get vaccinated may decide to get vaccinated when a desired brand dose is offered to them.

One result of these biases is that our estimate of the percent of Americans who have already received a COVID vaccine is too high when compared against official CDC data. So while our survey can detect changes over time, it’s possible there’s a consistent upwards bias to some of our vaccine barriers for all respondents.

## Conclusions

Based on the vaccination barriers of survey responses from hundreds of thousands of Facebook users, we divide them by two vaccination status and four age groups. While there is disparity between the vaccinated and the unvaccinated, the most common barrier for both is “no vaccines or appointments”, and the scenario remains the same from May 2021 to February 2022 for all the vaccinated age groups. This may suggest we should take extra efforts to ensure access to vaccines for potential vaccine recipients. On the top of that, November 2021 appears to be a turning point, since then, the percentages for many barriers have raised. Noting it is when the eligibility for COVID-19 booster shots expands to all adults, extra availability for vaccination and service may be ensured whenever a new dose is introduced.

To take a closer look, for the vaccinated 18-24 years, “time didn’t work” and “can’t get time off” stand high among the barriers, while for the vaccinated over 65 years, “technical difficulties” has diminished considerably but remains relatively high. There are no magic solutions, but we are suggesting offering more “vaccination time-off” for students and time-based workers, and offering more convenient vaccine appointments/ services for people aged over 65.

Nonetheless, different from the vaccinated, among all the unvaccinated age groups, “desired brands not available” is commonly selected. Thus, we propose evenly distribute vaccine supplies between different brands to provide diverse options for potential vaccine recipients.