8-2022

Disparities and Attitudes Toward Sars Cov2 Vaccine Among People with Disabilities

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Recommended Citation

UNIVERSITY OF NEBRASKA MEDICAL CENTER

COLLEGE OF PUBLIC HEALTH (COPH)

EPIDEMIOLOGY

CAPSTONE EXPERIENCE PROJECT

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SUMMER, 2022

DISPARITIES AND ATTITUDES TOWARD SARS COV2 VACCINE AMONG PEOPLE

WITH DISABILITIES

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Section 1: Abstract

The pandemic caused by SARSCOV2 that began in late 2019 posed a significant public health challenge for communities worldwide. The pandemic negatively impacted people's health, economy, and living conditions. Pharmaceutical companies worldwide have begun a race against time to invest in vaccine development to control and eliminate the worst outcomes of the COVID 19 associated disease. Scientific research resulted in several effective vaccines being developed and authorized for use in people (Salmeron Ríos S et al.).

Public health agencies like the Center for Disease Control and Prevention (CDC) prioritized high-risk populations for vaccination. This process is meant to accomplish the equitable distribution of the vaccine to different demographics of the population (Hatton C, Bailey T, et al.). The CDC considered people living in an institutionalized setting at high risk for covid 19 infection; therefore, those populations have been prioritized for the SARS COV2 vaccine. Many disabled individuals not living in large group housing have been excluded from those priorities. Disabled folks are affected by COVID 19 infections in a significantly higher proportion than the general population. The cases of COVID 19 disease among disabled people have a higher likelihood of suffering from severe outcomes compared to the general population. (Yoon WH et al.).

 This research aims to study factors that affect SARS COV2 vaccination in the disabled population. It evaluated if there is a disparity in COVID 19 vaccinations among the disabled population in the United States. Furthermore, the study assessed and compared attitudes toward vaccines by disabled people and the general population. The study used data from household pulse surveys collected by the United States Census Bureau as part of the National Center for

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Health Statistics (NCHS) to conduct surveys on the effect of the pandemic on the general

population.

The proportion of vaccinated individuals with memory limitations was lower than the proportion

of vaccination for individuals with other functional limitations. Moreover, income, educational

attainment, marital status, household size, mental health services, health insurance status, age

and race are variables that impact the population's vaccination proportion. Also, disabled people

are less likely than none disabled to be vaccine hesitant. If they do, they are more likely to reject

the vaccine for concern about side effects and lack of trust in authority or the vaccine

Section 2: Chapter 1 – Background, introduction and Literature Review

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS COV 2) or COVID 19 pandemic,

first reported in late 2019, was declared a global pandemic by the World Health Organization

(WHO) in March 2020. The disease spread worldwide quickly and has resulted in millions of

cases, with high morbidity and mortality rates. According to the latest data in the last week of

October 2021, more than 45.4 million COVID 19 cases and 735,000 COVID 19-related deaths

occurred in the United States alone. The total death toll was about five million globally (CDC,

OCT 2021).

Several safe and effective vaccines were developed to reduce disease impact on the population.

They became available less than a year after the first SARS COV 2 infection case was reported.

In the United States, vaccines became available to the general population in November 2020.

Three vaccines received emergency use authorization from the Food and Drug Administration

(FDA): BioNTech/Pfizer, Moderna, and Johnson& Johnson. The first two utilize mRNA

technology to deliver the viral protein material to the host immune cells to generate immunity.

The latter uses disabled adenovirus to deliver the SARS COV 2 protein material to the host

immune cells. It was proven that vaccines protect against severe consequences of the COVID 19

disease. (Salmeron Ríos S, Mas Romero M, et al.).

The CDC has a surveillance system to monitor vaccine uptake and equity in the general

population. However, there is no surveillance system for the disabled population besides the

household Pulse Survey (CDC OCT 2021).

People with disabilities are at high risk of COVID 19 infections because their living conditions

and needs require close contact with many caregivers. They are more susceptible to disease as

some disabled individuals have barriers that make it challenging to follow social distancing and

other COVID 19 protective guidelines. These barriers include, among many other things, the need for assistance with personal hygiene, difficulty with change in routine, and declining physical and cognitive abilities (CDC, OCT 2021).

In addition, many individuals with disabilities often have conditions that make them more susceptible to severe outcomes if they contract COVID 19. These conditions include diabetes, obesity, cancer, and heart diseases. These conditions significantly exacerbate COVID 19 morbidity and mortality; most of the COVID 19 severe illnesses and deaths are due to comorbid conditions (Williamson EJ, McDonald HI, Bhaskaran K., et al.)

Although disabled individuals are less likely to be vaccine-hesitant, they are under-vaccinated compared to the non-disabled population. Due to their disability, they could be in a disadvantaged position to obtain the vaccine even if they strongly desire to be vaccinated. Several barriers exist, including lack of transportation, absence of vaccine promotion programs specific to disabled population needs, and inadequate information about or access to vaccine centers. (Ryerson AB, Rice CE, Hung MC, Patel SA., et al.) (Epstein S, Ayers K. et al.)

Though currently, available literature indicates that people with disabilities are under-vaccinated compared to the non-disabled population, little is known about the vaccination rate among the disabled population. There are known discrepancies in the attitudes toward the vaccine for disabled people and the general population. No extensive studies have been conducted to evaluate the outcome of vaccine uptake for different demographics. Moreover, the vaccination distribution for different demographics of the disabled population is not well known. (Ryerson AB, Rice CE, Hung MC, Patel SA., et al.).

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Section 3: Chapter 2 Research Question

This study will address three main questions related to the SARS COV2 vaccine among the disabled population as well as the general population in the United States:

i. Does the vaccination status of disabled individuals depend on the disability type of that individual?

ii. What factors impact vaccination for COVID 19 in the disabled population? Are those factors different for the general population?

iii. What are the attitudes toward the SARS COV2 vaccine for disabled and non-disabled populations?

The objectives of this research involve: 1) determining whether a disparity of SARS COV2 vaccination exists among the disabled population in the United States, 2) investigating the decision for immunization with the COVID19 vaccine and attitudes toward the vaccine and 3, comparing the vaccination status of disabled people and the general population.

The Centers for Disease Control and Prevention (CDC) has a surveillance system on vaccine equity among different racial and age groups for the general population. That data indicates that the Black population is the least vaccinated among racial groups, and the people between 12 and 24 years are the least vaccinated age group. (CDC, OCT 2021).

The significance of this research is that knowledge from the study findings will help create public health programs to increase vaccine uptake in areas of disparity. There is a need for similar research to understand the gap in access to healthcare among the disabled population. Such findings will assist in allocating resources to reduce disparity and vaccine hesitancy in the community. They will also assist in the design of future vaccine promotion programs explicitly directed toward the disabled population.

The study will analyze the household pulse Survey data collected between July 21, 2021, and October 11, 2021. It will evaluate if the type of disability, age, educational attainment, use of mental health services, marital status, health insurance status, household income, number of members of households, and race/ethnicity of the disabled individual are associated with the vaccination status of the disabled individuals. The hypothesis is that an individual's disability type and other demographic variables affect attitudes and vaccination status for SARS COV2. The null hypothesis is that disability type and other demographic variables have no effect on attitudes and immunization status for SARS COV2.

The Household Pulse Survey is a 20-minute online survey studying how the coronavirus pandemic impacts households across the United States from a social and economic perspective. The survey asked participants many questions about how the pandemic influenced different living conditions. Topics covered in the Pulse survey include childcare, education, employment, energy use, food security, health, housing, spending, child tax credit payments, COVID 19 vaccine, and many more (NCHS), OCT 2021).

In the Pulse survey, the responses for the following questions (i-iv) determined disability types assigned to each disabled person. The approach followed the Washington Group functioning, which has four responses for each functional question: NO, YES with some difficulties, YES with many difficulties, and cannot do at all. A person is considered disabled if they answered (YES) to the functional question with a lot of difficulties or cannot do it at all.

  i.   Do you have difficulty seeing even when you wear glasses?

 ii.   Do you have difficulty hearing even when using a hearing aid?

iii.   Do you have difficulty remembering or concentrating?

iv.   Do you have difficulty walking or climbing stairs?

Disability types were classified into four groups: hearing, vision, mobility, and cognitive disabilities. If the participant responded YES with a lot of difficulties or cannot do at all to any of the above questions, they were assigned to the corresponding disability group. If the participant indicated they belonged to more than one disability group, they were assigned randomly to all disability categories, depending on their responses to the questions.

The pulse survey has collected vaccination data and attitudes toward SARS COV 2 vaccine for the disabled and non-disabled population. In addition to the type of disability, demographic information like race, age, gender, educational attainment, mental health counsel, household income, health insurance status, and vaccination status are collected during the survey. Data is collected in phases. The first phase of the data collection started on April 23, 2020, and the data is collected ongoing for the duration of the pandemic.

Section 4: Chapter 3 – Data and Methods

The data used for analysis is extracted from the household pulse survey on demographics and health indicator variables. A household pulse survey collects data from adults aged 18 years and older. The survey gathers data from a random sample of households stratified by state and the top fifteen metropolitan areas; large population centers in the United States represent different geographical regions. Data are weighted to represent total persons aged 18 and older living within households to minimize possible bias resulting from non-response and incomplete survey data.

The US Census Bureau collects data in phases beginning with phase one: April 23, 2020, – July 21, 2020, phase two: August 19, 2020, – October 26, 2020, and phase three: October 28, 2020, – March 29, 2021. Two additional phases are denoted as phases 3.1 and 3.2. Data used in this analysis were collected between July 21 and OCT 11, 2021. That covers phase 3.2 of the data collection periods. Data were collected bi-weekly in spreadsheet tables with different tables combined to generate a representative table of the data collection period—six separate tables representing weeks 34 through 39 (twelve weeks) of data collection periods. Random 1042642 samples of households were sent survey materials every other week online by email, followed up with reminders sent by text messages and emails. The total sampled households during the entire 3.2 phase were 6255852, with an average response rate of about 6.1%, or 382908 participants; about 12.8% or 48951 were disabled individuals.

Missing data was evaluated and included in the analysis as missing/ did not report (code 88) or question seen, but category not selected (code 99). Some were considered complete responses if they had sufficient partial responses to the survey questions. A simple hot deck imputation

technique was used on variables age, gender, race, Hispanic origin, and education attainment. On average, missing data (code 88 plus code 99) represent about 14.6% of the responses received.

Explanatory (independent) variables analyzed in the study include age, race, gender, educational attainment, mental health services, household income, health insurance, marital status, difficulty hearing, difficulty seeing, difficulty remembering or concentrating, and difficulty walking or climbing stairs. The outcome (dependent) variable will be vaccination status, receiving at least one dose of covid 19 vaccine from any FDA-approved vaccines. Attitudes toward the vaccine will be assessed from the responses to the question: Once a vaccine to prevent COVID 19 is available to you, would you intend on getting the vaccine? If not, why not get the vaccine?

Age was separated into five categories: 18-25, 26-40,41-55, 56-65, and >65 years old. Furthermore, disability type was classified into four groups: Vision, hearing, mobility, and cognitive. In addition, race or ethnicity was categorized into five groups: Hispanic versus non-Hispanic, White, Black, Asian, and other/multiracial. Similarly, educational attainment will be classified into four groups: less than high school, high school or GED, some college/ associate degrees, and bachelor's degree or higher. In addition,, Marital status categories include married, widowed, divorced/separated, never married, and did not report. Household income is the 2020 income reported by the participant. Health insurance types are private employer-provided or private other and government types like Medicare or Medicaid.

Data was analyzed using SAS on demand for academic's software. Descriptive statistics were used to analyze the independent variables included in the study to summarize the data of the study participants. Analyzed variables include age, gender, race, educational attainment, income, hearing, seeing, difficulty remembering or concentrating, difficulty walking or climbing stairs, household income, health insurance status, marital status, and mental health counseling services.

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Moreover, descriptive statistics will describe the relationship between demographics and attitudes toward the vaccine. Multiple logistic regression models were used to study the relationship between vaccination status and the independent variables. Similarly, descriptive statistics were used to analyze responses about respondents' attitudes toward COVID 19 vaccines. In addition, a logistic regression model was applied to compare the vaccination status of disabled individuals to those without disabilities.

The odds of vaccination were compared for the variables investigated in the study. The analysis aimed to determine if the difference in vaccination status between independent variables is statistically significant. Moreover, the study evaluated if any of the variables studied, were associated with the vaccination status of the disabled individual. In addition, it will determine the attitudes toward the vaccine for the disabled population and compare them to those of the non-disabled general population.

A logistic regression model was applied to evaluate the significance of the predicted estimates to that of the vaccination status of the participants with a P-value at a significance level of <0.05. In addition, Odds ratios of vaccination were compared in different variables to those of reference variables from the same category. A stepwise logistic regression model was used to evaluate the significance level of the variables: income, education, race, age, gender at birth, marital status, household size, insurance status, and the use of mental health services in the descriptive statistics data analysis. The goodness of fit was analyzed to study the appropriateness of the model to produce valid estimates. The percent concordance was more than 69.6%, with the percent discordant <30.4%. The under comparison were dependent variable and independent variables. First, the response variable (received vaccine) was evaluated against the independent variables in the data using the pro-GLM select procedure applying the stepwise method. That resulted in

eliminating variables not contributing to model goodness like gender at birth, age, and race being Hispanic variables (graph10 and table2). Then, the logistic regression model with the remaining variables were refit using proc logistic procedure.

PUBLIC HEALTH COMPETENCIES

One of the primary duties of the public health community is disease prevention, and vaccines are the best tools used for disease prevention. Competency, MPHF3, is a public health foundational competency. Conversely, competencies EPIMPH2 and EPIMPH4 are epidemiology concentration competencies. The study used a national survey to generate public health information from survey data to identify an issue that concerns the public health community. In addition, the study focused on the disabled population because they are more vulnerable to SARS COV2 infection and would substantially benefit more from the vaccine. This aspect of the research addressed concentration competency EPIMPH2.

In addition, data were analyzed using SAS software, to analyze and interpret the study findings. Statistical methods and software use cover both foundational MPHF3 and concentration EPIMPH4 competencies. Therefore, this study's research methodology has addressed the foundational and concentration competencies.

Section 5: Chapter 4 – Results

The total number of study participants was 382908. About 59.6% were females, and 40.4% were

males. The mean age was 53 years, with minimum age of 18 years and maximum age 88 yrs.

The racial distribution of the study participants was about 82% white, 9.4% Hispanic, 8.2%

Black, 5.2% Asian, and 4.6% other or mixed race. About 54.6% of the participants hold at least a

Batchelor's degree or higher. Similarly, about 58% of the participants were married. About

55.4% of the participants reported income equal to or above $74999.00. In addition, most of the

households (88.6%) are comprised of four individuals or fewer.

During the survey, about 87.3% of the respondents indicated they received at least one dose of

the COVID19 vaccine, about 11.5% did not get a vaccine, and about 1.2% did not respond to the

vaccine question. (Table 1 below & in the appendix) summarizes the frequency, percentages of

demographics, and variables analyzed in the study.

Table 1 Vaccination frequencies, and percentages compared to demographics

Demographic	Total	Percent	Vaccinated		Unvaccinated		Unknown	
Race			Total	Percent	Total	Percent	Total	Percent
Hispanic	35990	9.4	30385	84.43	5045	14.02	560	1.56
White	314278	82.02	275291	87.59	35014	11.14	3973	1.26
Black	31228	8.16	26103	83.59	4768	15.27	357	1.14
Asian	19873	5.19	18852	94.86	838	4.22	183	0.92
Other	17529	4.58	14064	80.23	3239	18.48	226	1.29
Education								
less high school	2346	0.61	1629	69.44	668	28.47	49	2.09
some high school	4989	1.3	3550	71.16	1366	27.38	73	1.46
high school graduate or equivalent (GED)	43977	11.49	34026	77.37	9307	21.16	644	1.46
some college without degree	81953	21.4	67783	82.71	13076	15.96	1094	1.33
Associate degree	40602	10.6	33921	83.55	6143	15.13	538	1.33
Bachelor's degree	110166	28.77	100135	90.89	8721	7.92	1310	1.19
Graduate or professional degree	98875	25.82	93266	94.33	4578	4.63	1031	1.04
Marital Status								
Married	222140	58.01	198600	89.4	22226	10.01	1314	0.059

Widowed	21608	5.64	19759	91.44	1692	7.83	157	0.73
Divorced	57382	14.99	49800	86.79	7234	12.61	348	0.61
Separated	6685	1.75	5304	79.34	1341	20.06	40	0.6
Never married	70453	18.4	59157	83.97	11056	15.69	240	0.34

*Table 1 with full variables in Appendix. Hispanic vs non-Hispanic. has own variable.

Disabled population and vaccination

About 4.2% of the participants reported they have difficulty in mobility or cannot move at all.

Similarly, about 4.1% of the participants reported difficulty remembering or lack of cognitive

ability. Moreover, about 1.9% of the participants reported hearing challenges or could not hear at

all. Finally, about 2.6% of the participants reported vision difficulties or not being able to see.

About 12.8% of the participants fall in one or more of the indicated disability categories – see

Table 1. About 7.4% of the participants reported more than one disability. Those people were

categorized in all categories they reported disability for.

Descriptive statistics comparing vaccination rate and limitation level of vision, hearing, memory,

and mobility are shown in Figure1. People who indicated they could not remember at all had the

lowest vaccination proportion of 63.13%, with an odds ratio of 0.887 (95% CI=0.818-0.960;P-

value=0.0031) compared to people without any memory difficulties, while people with limited or

no mobility have the highest vaccination proportion among disabled population of 81.25%. The

odds ratio is 1.003 with (CL=0.956-1.052) and (P=0.8958) compared to people without mobility

difficulties.

Table 2. Regression analysis comparing vaccination status for different variables with 95% confidence interval and P value <0.05.

| Effect | Odds Ratio Estimates | | | |
	Point Estimate	95% Wald Confidence Limits		P value
Race White vs Other	0.998	0.984	1.012	0.7705
Black vs Other	0.73	0.717	0.742	<.0001
Asian vs Other	0.709	0.695	0.723	<.0001
Education less high school vs grad	0.17	0.164	0.177	<.0001
some high school vs grad	0.183	0.179	0.188	<.0001
high school graduate vs grad	0.231	0.228	0.233	<.0001
some college vs grad	0.649	0.643	0.655	<.0001
Assoc vs grad	0.662	0.655	0.67	<.0001
Bach vs grad	0.955	0.946	0.963	<.0001
Marital status Married vs separated	0.931	0.91	0.952	<.0001
Widowed vs separated	0.96	0.936	0.985	0.0021
Divorced vs separated	1.037	1.013	1.061	0.0026
Never married vs Separated	0.631	0.617	0.646	<.0001
Marital Status -99 vs 4	0.905	0.864	0.948	<.0001
Mental health services(received) MH_SVCS 2 vs 1	1.026	1.015	1.037	<.0001
MH_SVCS -88 vs 1	1.051	1.022	1.081	0.0005
MH_SVCS -99 vs 1	1.024	0.963	1.088	0.4537
Need mental health but not received MH_NOTGET 2 vs 1	1.033	1.022	1.045	<.0001
MH_NOTGET -99 vs 1	1.101	1.028	1.178	0.0056
Health insurance type PRIVHLTH 2 vs 1	1.048	1.038	1.057	<.0001
PRIVHLTH 3 vs 1	0.961	0.944	0.977	<.0001
PUBHLTH 2 vs 1	0.959	0.951	0.966	<.0001
PUBHLTH 3 vs 1	1.009	0.995	1.024	0.2085
Vision limitation SEEING no dif vs cannot do	1.697	1.574	1.829	<.0001
SEEING some dif vs cannot do	1.769	1.641	1.907	<.0001
SEEING a lot of dif vs cannot do	1.824	1.689	1.969	<.0001

|				
SEEING -88 vs 4	1.483	1.355	1.623	<.0001
SEEING -99 vs 4	1.8	1.622	1.999	<.0001
Hearing limitation HEARING no dif vs cannot do	0.939	0.881	1.002	0.0567
HEARING some dif vs cannot do	0.936	0.878	0.999	0.0469
HEARING a lot of dif vs cannot	0.932	0.87	0.997	0.0414
HEARING -99 vs 4	1.029	0.944	1.122	0.5171
Cognitive limitation REMEMBERING no dif vs cannot do	0.887	0.818	0.96	0.0031
REMEMBERING some dif vs cannot do	0.865	0.799	0.937	0.0004
REMEMBERING a lot of dif vs cannot do	0.858	0.792	0.93	0.0002
REMEMBERING -99 vs 4	0.848	0.76	0.947	0.0033
Mobility limitation MOBILITY no dif vs cannot do	1.003	0.956	1.052	0.8958
MOBILITY some dif vs cannot do	1.01	0.962	1.059	0.6982
MOBILITY a lot of dif vs cannot do	1.017	0.968	1.069	0.5031
MOBILITY -99 vs 4	0.924	0.837	1.021	0.121
Income INCOME <25000 vs >200000	1.038	1.021	1.055	<.0001
INCOME 25000-34999 vs >200000	0.999	0.982	1.016	0.8821
INCOME 35000-45999 vs >200000	0.995	0.979	1.011	0.5218
INCOME 50000-74999 vs >200000	0.997	0.983	1.011	0.7029
INCOME 75000- 99999 vs >200000	1.005	0.991	1.019	0.4909
INCOME 100000-149999 vs >200000	1.001	0.988	1.014	0.9049
INCOME 150000-199999 vs >200000	0.997	0.981	1.012	0.6787
INCOME -88 vs 8	0.95	0.932	0.967	<.0001
INCOME -99 vs 8	0.989	0.968	1.012	0.3531
Total household number THHLD_NUMPER 1 vs 10	4.93	4.74	5.128	<.0001
THHLD_NUMPER 2 vs 10	2.515	2.419	2.614	<.0001
THHLD_NUMPER 3 vs 10	1.978	1.902	2.057	<.0001
THHLD_NUMPER 4 vs 10	1.803	1.733	1.875	<.0001
THHLD_NUMPER 5 vs 10	1.642	1.577	1.709	<.0001
THHLD_NUMPER 6 vs 10	1.533	1.469	1.599	<.0001
THHLD_NUMPER 7 vs 10	1.405	1.339	1.473	<.0001
THHLD_NUMPER 8 vs 10	1.184	1.117	1.254	<.0001
THHLD_NUMPER 9 vs 10	1.142	1.057	1.233	0.0008
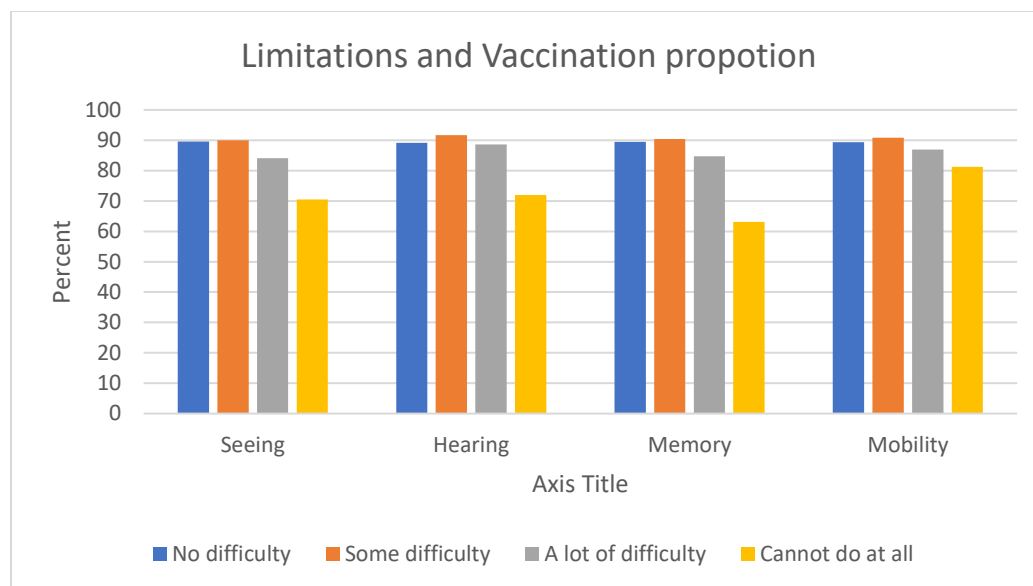
Figure 1 Vaccination proportion and functional limitation categories.

Factors impacting vaccination

Frequency and percent of vaccination were analyzed for the following variables: income, education, race, age, gender at birth, marital status, household size, insurance status, age, and the use of mental health services. Income correlated with vaccination status; people with income higher than 200000 were 95.66% vaccinated while people with income less than 25000 were 80.22% vaccinated, odds ratio=1.038 and (CI=1.021-1.055) (P-value<.0001) as illustrated in figure 2.
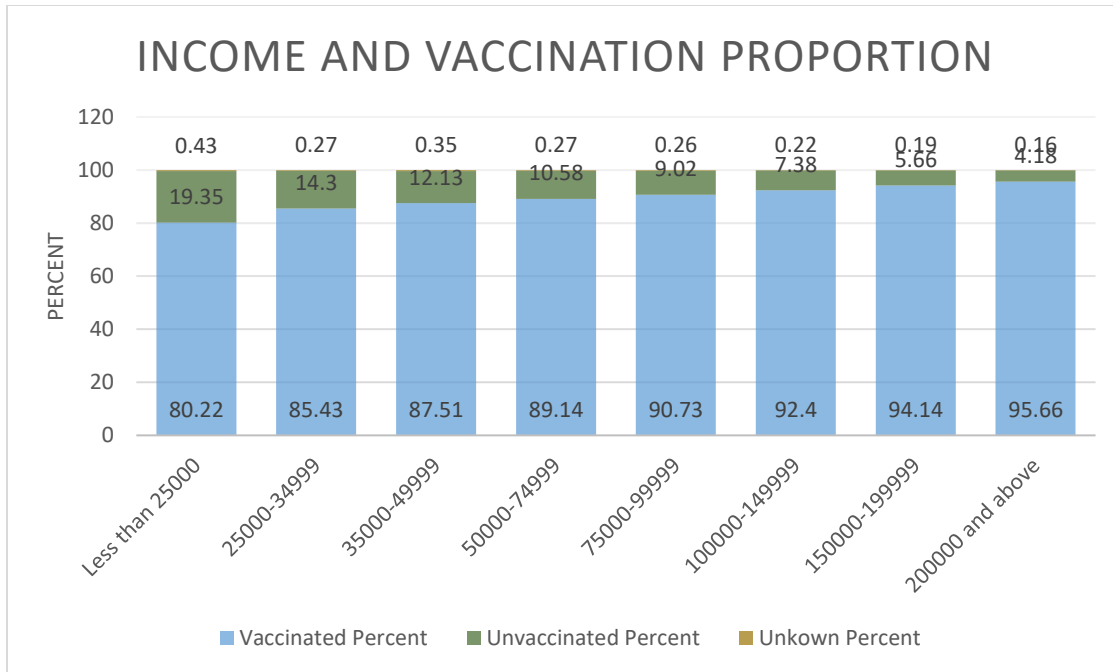
Figure 2 Income and vaccine proportion.

Smaller household size was associated with a higher vaccination proportion as shown in Figure 3. Two-person household members vaccination proportion is 89.74 % while for households with ten members vaccination proportion was only 66.36% with an odd ratio of 2.515 and (CL=2.419-2.614) and (P-value<0.0001).
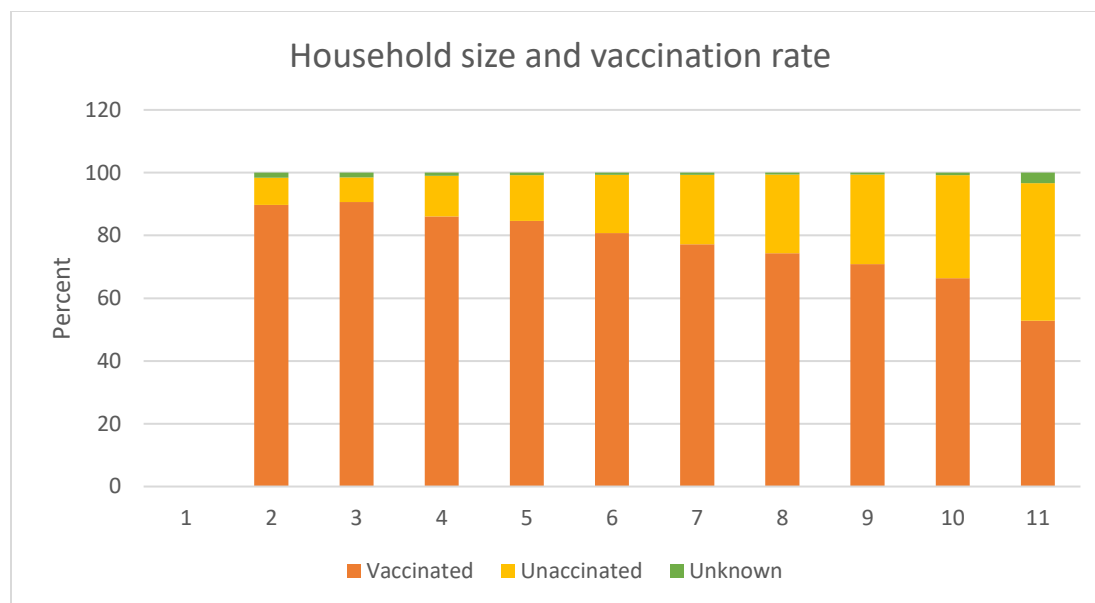
Figure 3 Household size and vaccine proportion.

Similarly, higher educational attainment was associated with a higher vaccination rate as shown in figure 4. People with a graduate degree were vaccinated 94.33% compared to 69.44% for those with less than high school. The odd ratio between the two groups was 0.17 (CL=0.164-0.177) and (P<0.0001). Moreover, on marital status widowed and married people has the highest vaccination proportion 91.4% and 89.4% respectively as shown in figure 5 with the odds ratio comparing groups married and never married of 0.931 and (CL=0.910-0.952) with (P-value<0.0001).

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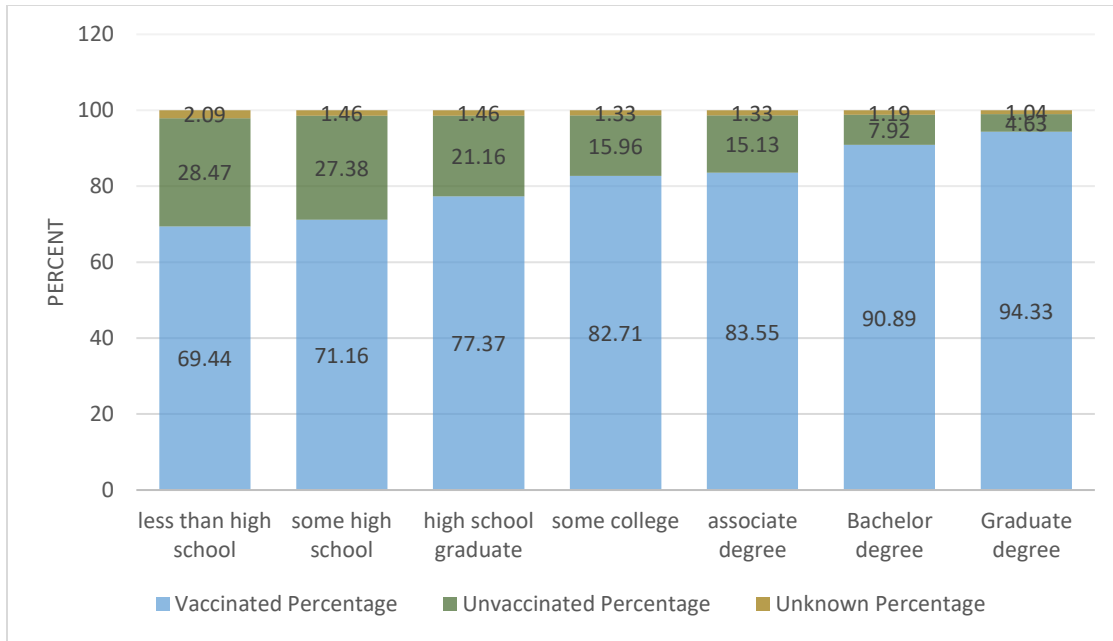
Figure 4. Education attainment and percent vaccination.
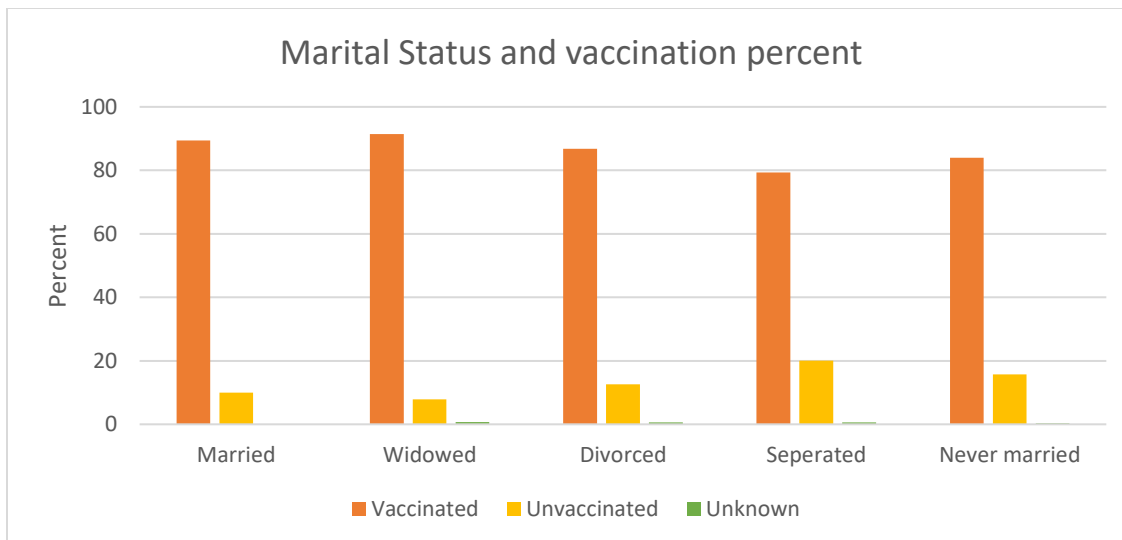
Figure 5. Marital status and vaccine proportion.

Similarly, Asian has the highest vaccination proportion, 94.86% among racial groups with an

odds ratio of 0.998 and (CL=0.984-1.012) with (P-value<0.0001) compared to people belonging

to the Other-or mix racial category as shown in figure 6. However, vaccination rate for males and females were comparable, with a vaccination percentage of 87.88% and 86.92% respectively as shown in figure 7.
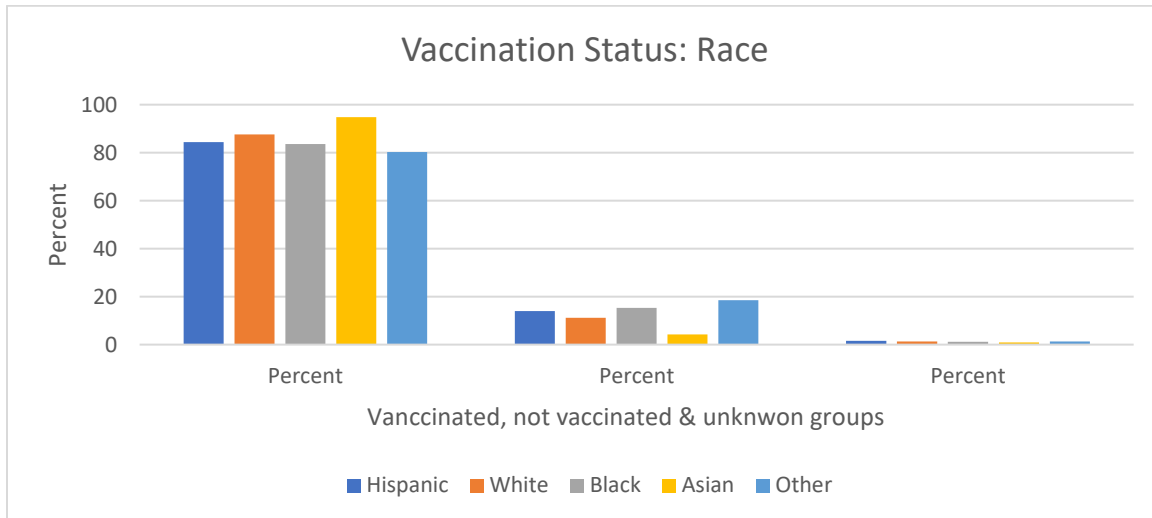
Figure 6. Percent vaccinated, not vaccinated, and unknown
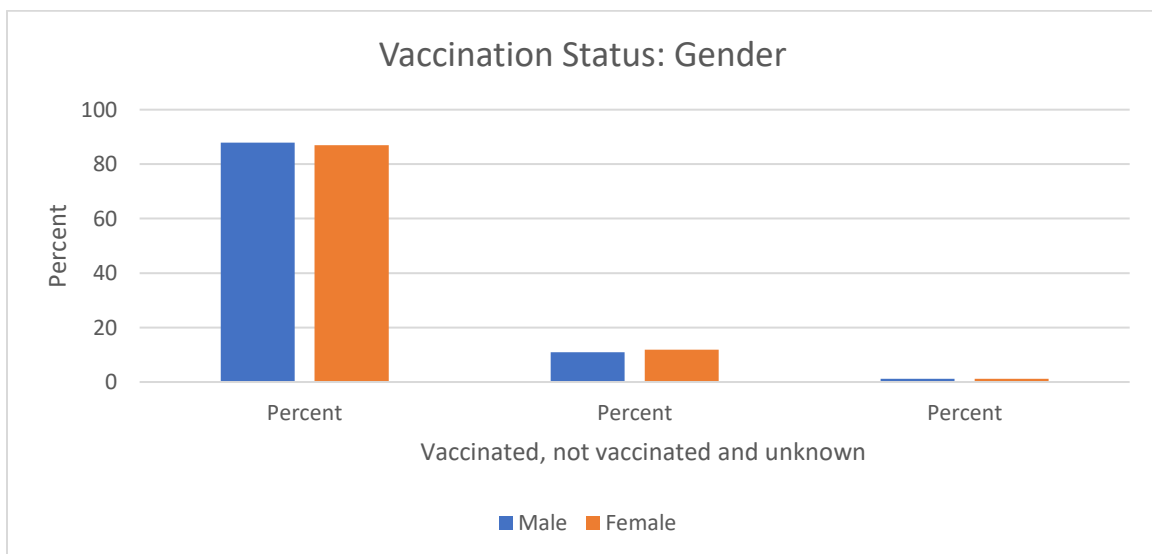
Figure 7. Percent vaccinated, not vaccinated, and unknown

Finally, People who received mental health services have a higher vaccination proportion than people who did not receive mental health services. Vaccination proportion was 91.64% and 89.06% respectively with odds ratio of 1.026 and (CL=1.015-1.037) and (P-value<.0.0001). People who needed mental health services but did not get services have lower vaccination proportion 88.49% with odds ratio of 1.033 with (CL=1.022-1.045) and (P-value<0.0001). Moreover, people without private health insurance had a lower vaccination proportion of 82.29% compared to people with private and public health insurance with vaccination proportion of 91.0of 3% and 90.69% respectively as shown in figure 8.
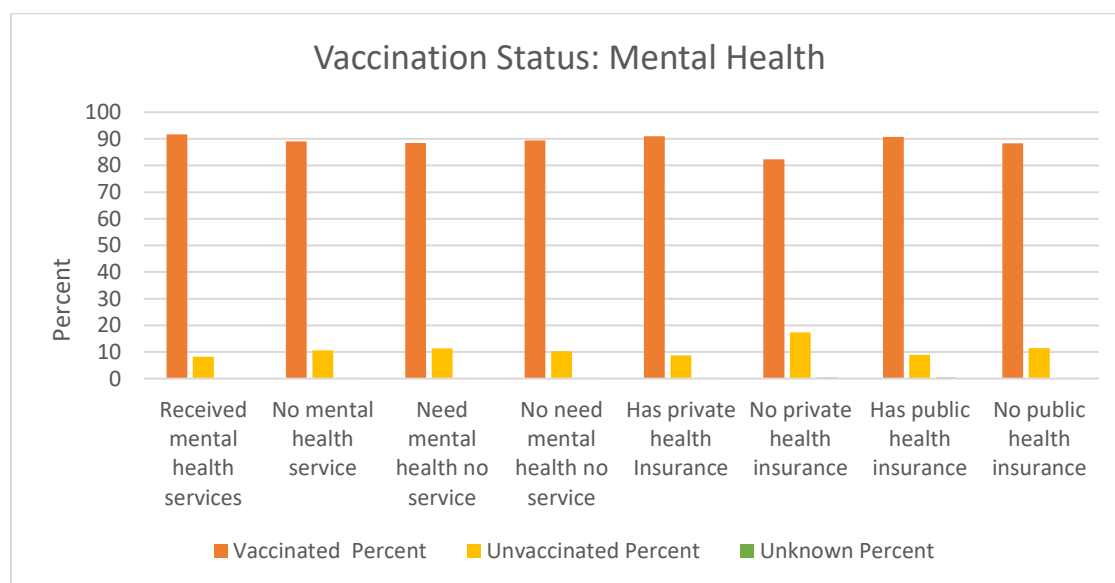
Figure 8. Relation between mental health services, health insurance status and vaccination percent.

Attitudes toward the vaccine

The responses to the question about intention to get the vaccine for those who were not vaccinated at the time of the survey is shown in figure 10 a. The most common response was

those who indicated they will definitely not get a vaccine 5.14%. Also, about 2.31% responded

they will probably not get a vaccine and 2.19% were not sure. On the other hand, only less than

2% of the surveyed individuals indicated they will probably or definitely will get the vaccine.
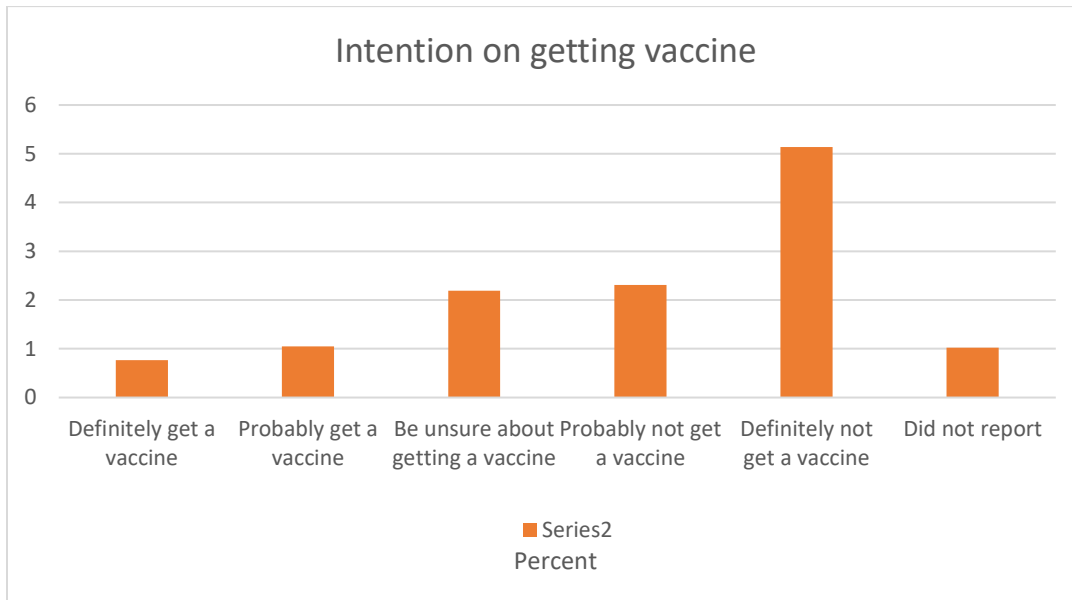
Figure 9 a. Proportion of vaccine hesitancy.
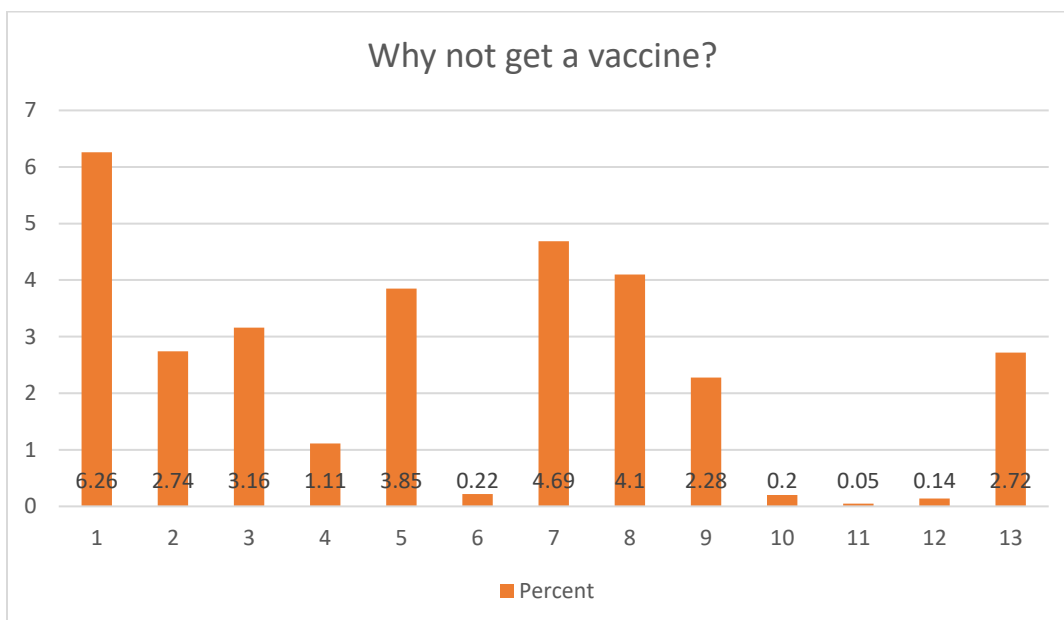
Figure 9 b. Reason for not getting the vaccine (see table 3).

Furthermore, the frequency and percent counts were used to evaluate the attitudes toward vaccine for people who did not get COVID19 vaccine at the time of the survey. Table 4 shows 13 different responses to the question why not get the vaccine? Responses from the entire study participants are shown in figure 9 a. The concerns for possible side effects were indicated as a most common reason not to receive the vaccine; with 6.26%. Furthermore, not trusting the vaccine or the government was the second and third reason for lack of interest in the vaccine with a rate of 4.69% and 4.1% respectively. The respondent who indicated they will wait to make sure the safety of the vaccine was 3.85% followed by people who believe they don't need the vaccine with about 3.16%. The rest of the responses were less than 3% as shown in figure 9 b.

Figures 10,11,12, and 14 show descriptive statistics considering the limitation level of the respondent to the questions would you intend on getting a vaccine? If not, why not get the vaccine? On the intent of getting the vaccine, more people with remembering limitations indicated that they definitely or probably will get the vaccine with 6.78% and 5.50% respectively. On the other hand, a higher proportion of people without remembering limitations about 74% responded that probably they will not get the vaccine. Moreover, for people who cannot remember at all, the main reason for not getting the vaccine was not trusting the government with 19.53% followed by not trusting the vaccine at 18.35%. While about 17% of people without memory limitations indicated they are concerned about the side effects of the vaccine, followed closely by people who indicated other reasons for declining to take the vaccine 16.84%. All other remembering limitation responses were less than 15% as shown in graph 11b.

Omar
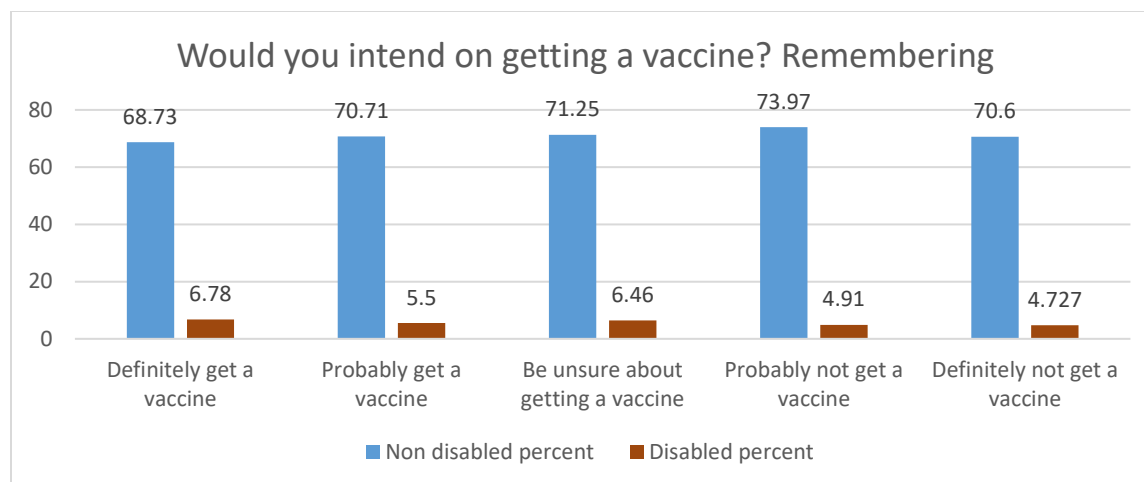
Figure 10 a. Hesitancy in remembering group.
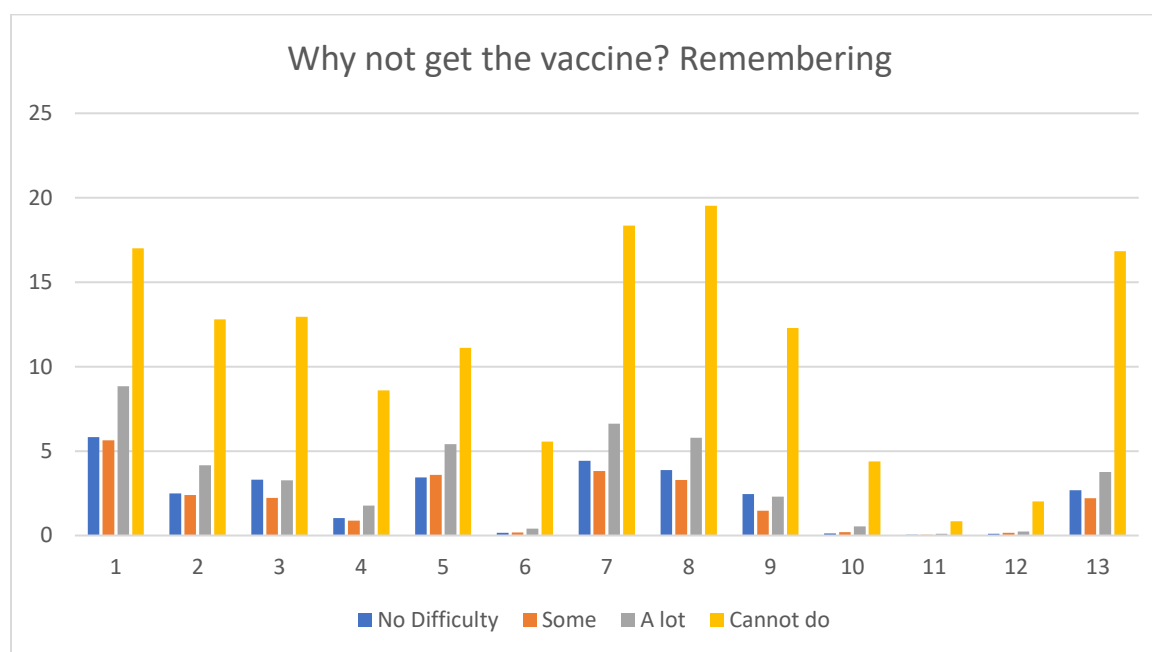
Figure 10 b. why not get the vaccine in remembering group.

Also, higher proportion of people with limitation seeing indicated that definitely they will get the vaccine 5.17% versus 3.89% who said they will definitely will not get the vaccine. In contrast people without seeing limitation most of the respondent 76.11% and 72.18% indicated they will probably or definitely will not get the vaccine. The main reason for vision disabled people to

reject the vaccine is lack of trust for the vaccine and government 15.44% followed by concern about the side effects of the vaccine 13.6%. While people without vision limitations the main reason for rejecting the vaccine is a concern about vaccine side effects about 11.6% in figures 11 a and 11 b.
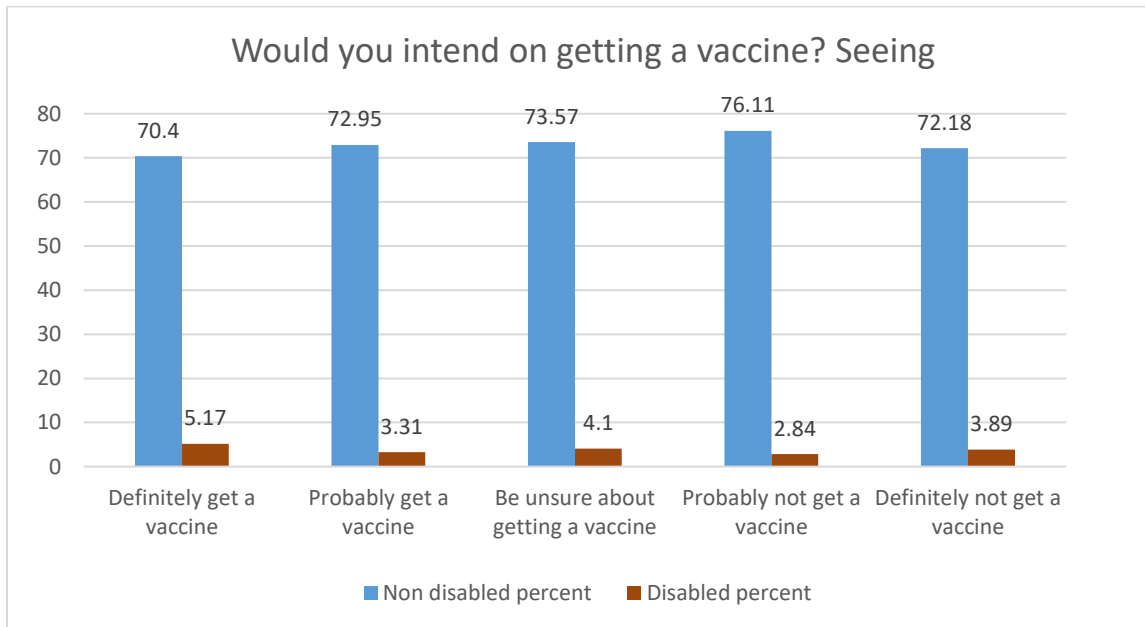
Figures 11 a. Hesitancy in Vision group
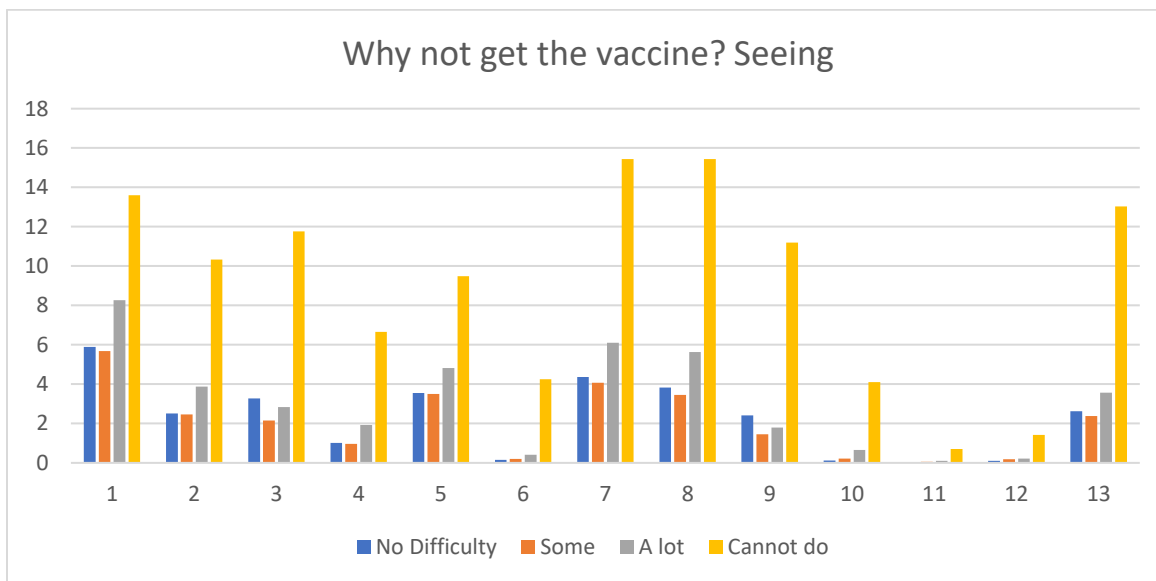
Figure 11 b. why not get the vaccine in vision group.

Omar

In addition, for people with mobility limitations higher number of the unvaccinated 7.73% indicated they will definitely get the vaccine versus only 4.91% who said definitely they will not get the vaccine. In contrast 75.22% of the unvaccinated people without mobility limitation said they will probably will not get the vaccine. The main reason was like previous respondent for lack of trust and concern for side effects figures 12 a, and 12 b.
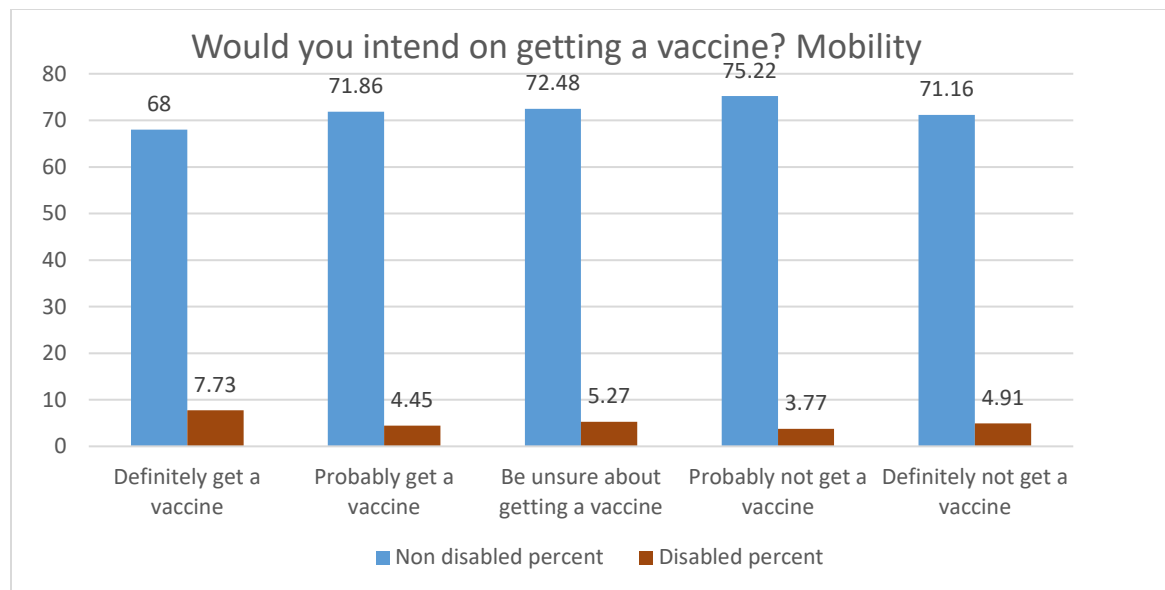
Figure 12 a. Hesitancy in mobility group.
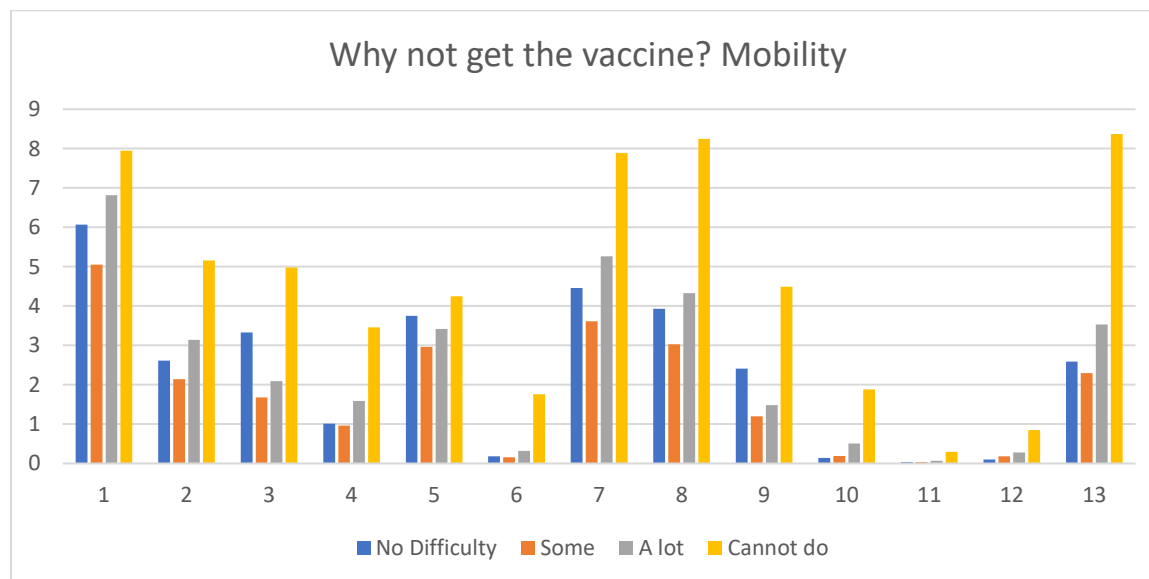
Figure 12 b. Why not get the vaccine in mobility group.

Finally, for hearing limitation slightly higher proportion of them 2.77% said they definitely will not get the vaccine versus 2.43% who said they will definitely get the vaccine. Also, higher proportion of people without hearing limitation 77.21% indicated they will probably will not get the vaccine. The reason for not getting the vaccine was mainly lack of trust and concern for the side effect figures 13 a, 13 b.
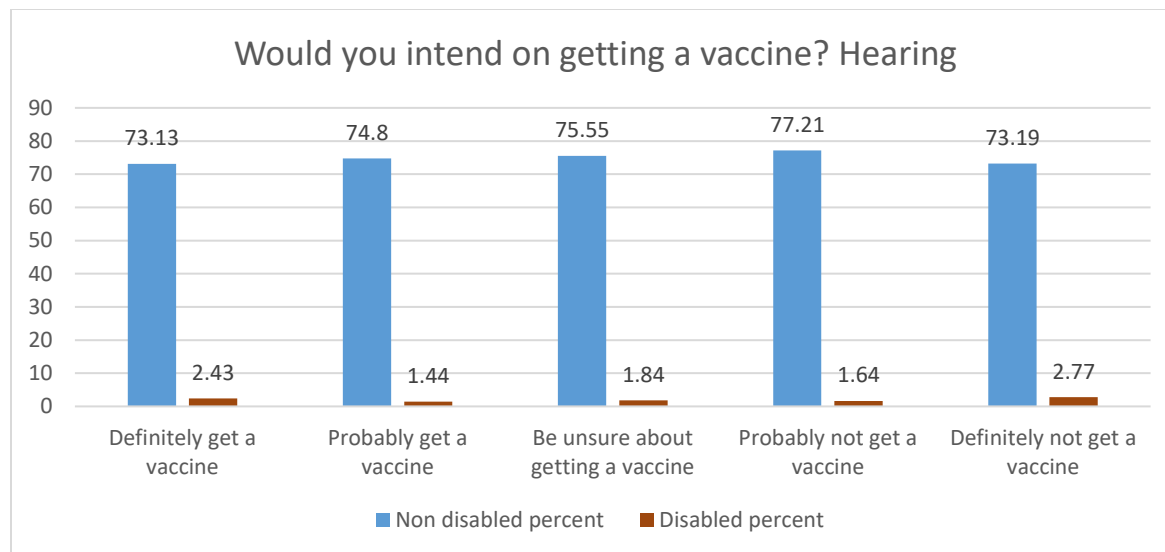
Figures 13 a. Hesitancy in hearing group.
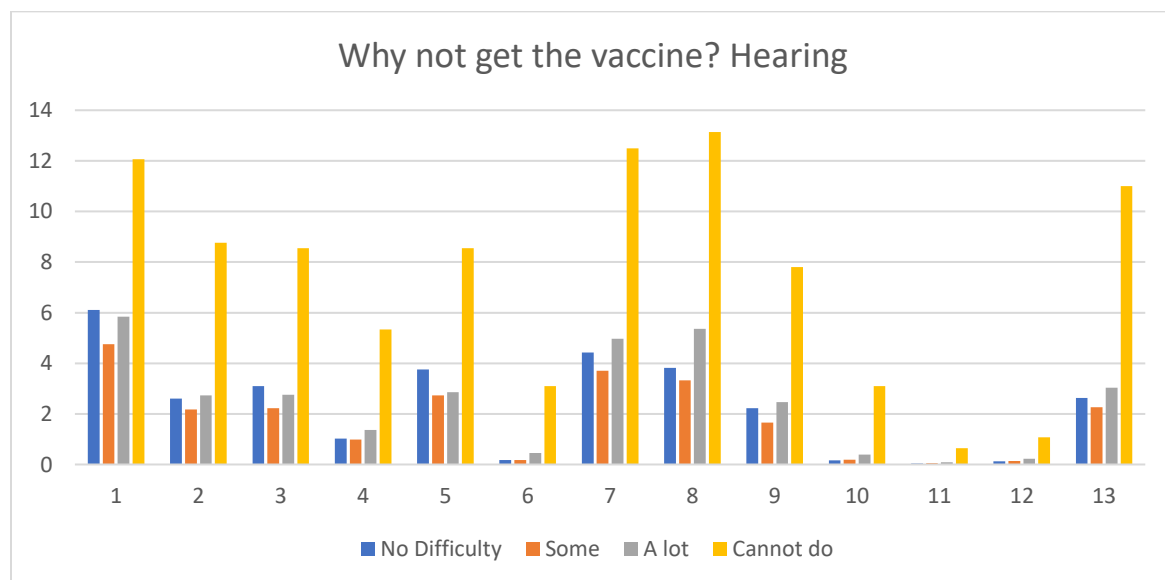
Figures 13 b. Why not get the vaccine in hearing group.

Table 3. Reason for not getting a vaccine.

Why not get the vaccine?

1. I am concerned about possible side effects of a COVID-19 vaccine

2. I don't know if a COVID-19 vaccine will protect me

3. I don't believe I need a COVID-19 vaccine

4. My doctor has not recommended it

5. I plan to wait and see if it is safe and may get it later

6. I am concerned about the cost of a COVID-19 vaccine

7. I don't trust COVID-19 vaccines

8. I don't trust the government

9. I don't think COVID-19 is that big of a threat

10. It's hard for me to get a COVID-19 vaccine

11. I believe one dose is enough to protect me

12. I experienced side effects from the dose of COVID-19 vaccine I received

13. Other

Age was another variable analyzed in the study. The mean age for vaccinated people was 54 years, while the mean age for the unvaccinated group was 45 yrs. Most individuals vaccinated were in the age group 41-55 years, followed by people older than 65 years with 28% and 26% vaccination proportions, respectively, as shown in figure 14 and table 4. In contrast, people between 18 and 25 were the least vaccinated group, with a vaccination proportion of only 3.5%.

agegroup	Frequency	Percent	Cumulative Frequency	Cumulative Percent
18-25	13518	3.54	13518	3.54
26-40	80136	20.99	93654	24.53
41-55	106795	27.97	200449	52.50
56-65	81057	21.23	281506	73.72
>65	100333	26.28	381839	100.00
Frequency Missing = 1069				
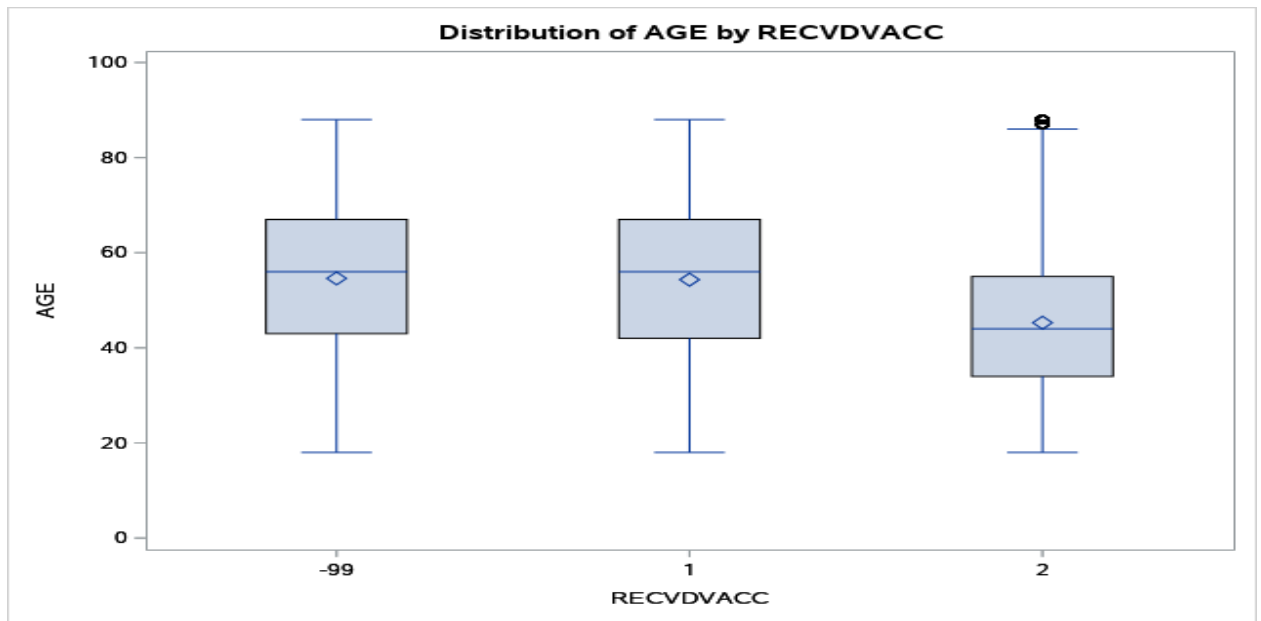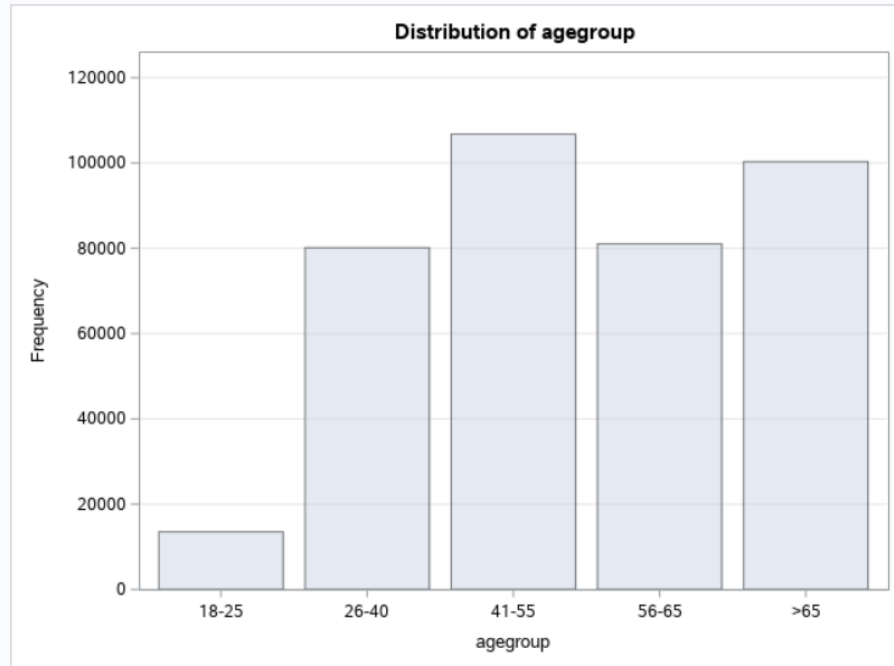
Figure 14 Vaccination and age: Received vaccine=1, not vaccinated=2, unknown vaccination status=-99.

Table 4. Vaccination proportion by disability level and age group.

Age group and limitation	Vaccine proportion by limitation level			
	No difficulty	Some difficulty	A lot of difficulties	Cannot do at all
Mobility				
18 - 25	80.19	79.69	79.55	45.83
26 - 40	83.19	79.29	69.88	65.93
41 - 55	87.82	84.27	78.46	73.16
56 - 65	92.92	91.01	86.66	86.03
>65	96.08	96.17	93.79	86.03
Seeing				
18 - 25	79.88	81.59	73.61	58.97
26 - 40	83.44	82.26	76.51	67.08
41 - 55	87.23	87.04	81.91	72.08
56 - 65	92.61	91.59	86.46	79.65
>65	96.04	95.99	91.57	69.23
Remembering				
18 - 25	76.87	83.03	85.13	61.54
26 - 40	82.29	84.97	81.08	62.22
41 - 55	86.8	87.99	83.17	64.09
56 - 65	92.11	92.49	88.31	74.12
>65	95.81	96.33	93.08	57.72
Hearing				
18 - 25	80.05	81.74	76.67	67.16
26 - 40	83.27	81.69	68.84	65.09
41 - 55	87.24	85.74	79.69	69.26
56 - 65	92.34	91.41	88.76	82.44
>65	95.88	96.33	94.21	71.77

Similarly, in the disabled population, the under-vaccination of the young population was most apparent in the age group 18-25, particularly for those who are disabled in remembering and seeing limitations. The vaccination proportion for limitation cannot see at all was lowest for the younger (18-25) and older (>65) groups, being 59% and 69%, respectively. However, remembering limitations cannot do at all; older people have the lowest vaccination proportion, only 57.7%. Moreover, mobility limitations cannot do at all; younger people have only a

vaccination proportion of 45.8%. Appendix 2 has the complete descriptive tables and boxplots comparing different age groups, limitation functions, and vaccination proportions. On the other hand, multi-disability frequency distribution was analyzed in the data. About 28485 or 7.4% of the study participants reported having more than one disability. As shown below in figure 15.

The FREQ Procedure

multidisability	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	28485	7.44	28485	7.44
2	354423	92.56	382908	100.00

Distribution of multidisability
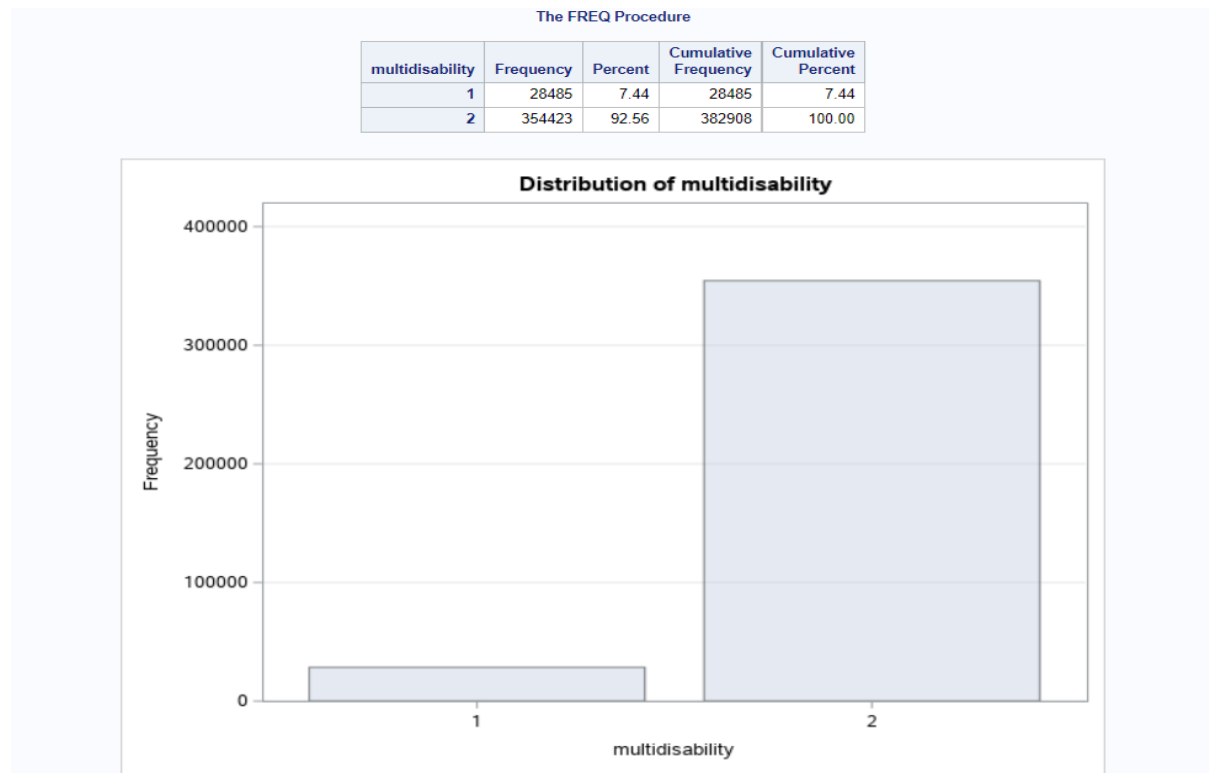
Figure 15 frequency distribution of multi-disability in the study participants. Multi-disability=1, no multi-disability=2.

Section 6: Chapter 5 – Discussion

This paper evaluated the questions related to COVID 19 vaccines in the disabled population and compared the findings to the general population's vaccination status:

1. Vaccination proportion for the disabled population uses a level of limitation following the Washington group on functioning to assign disability categories.

2. Factors impacting vaccination were evaluated.

3. Attitudes toward the COVID-19 vaccine were evaluated.

Frequency and percentages compared vaccination rates for the variables analyzed after that logistic regression model was used to analyze receiving the vaccine as a response variable and variables in table 2 as predictor variables.

Gender at birth, race being Hispanic, and age were excluded from the final model as differences in vaccination were insignificant. Their exclusion did not impact the model's goodness of fit.

Vaccination and disabled population

The comparison between limitation level and vaccination shows variability in vaccination rate for different groups. Among the groups with a lot of difficulties or cannot do at all in each limitation category (disabled). The people with a lot of memory difficulties or no memory at all had the lowest vaccination proportion, followed by hearing limitations, seeing limitations, and mobility limitations in order of low to high vaccination proportion. The people in the categories of disability for the limitation in memory, seeing, and hearing has at least double of not vaccination proportion compared to the people who indicated no or some limitation (figure 1). The odds of vaccination were lower for no /or limited memory groups by 0.887 compared to the same group without/some limitation. The result was significant in all three groups and their corresponding categories. Only people with mobility limitations have a vaccination proportion

that is not significantly different from those without limitations. One plausible explanation for

the high vaccination rate for people with mobility limitations compared to people with other

limitation groups is that those populations benefited from vaccine promotion programs and were

exposed to vaccine awareness campaigns more often than other disability groups.

What factors impact the vaccination rate?

 Income, as one of the factors considered for analysis, indicated significant differences in

vaccination rate between people with income >\$200000 and those making <\$25000. In the rest

of the income categories, as shown in figure 2, vaccination proportion resulted in a positive

direct proportion between income level and vaccination; however, the differences between the

vaccination rate of the reference income group compared to income levels between \$25000-

\$199999 were not statistically significant. Although the vaccine was offered free of charge for

everyone, people with higher income may have better access to the vaccine because of other

socioeconomic factors, such as having access to transportation to the vaccine site.

Household size was strongly correlated with the vaccination rate. In all households, the

vaccination proportion was inversely proportional to household size (graph 4). the highest

vaccination rate was in smaller household groups. The reference group was the group with ten

member households, and differences in vaccination rates were statistically significant when

compared to all household sizes. The odds ratio of vaccination for one and two-members

households were 4.930 and 2.515, respectively, which could be translated into the probability of

vaccination for one and two households were 0.83 and 0.72, respectively. In contrast probability

of vaccination for 8 and 9 households was only 0.54 and 0.54. Bigger household sizes and low

vaccination proportions could be due to children not being included in this study as participants

were > 18 years. A study with children's participation will show the relationship between household size and vaccination rates.

Education is another variable that indicates a relationship between the vaccination rate and education level. A Higher Education level was associated with an increased vaccination rate. The odds ratio of vaccination between graduate degree holders and people with less than a high school education level was 0.170. The odds ratio of graduate and bachelor's degree holders was 0.955. The probability of vaccination for the less than high school education level was 0.15, while the probability of vaccination for bachelor's degree holders was 0.49. Findings that higher educational attainment people have a higher proportion of immunization are not surprising. People with higher education generally have better health outcomes in all health parameters, as indicated by evidence of better living conditions and improved health indicators. They are more likely to make healthy choices and have a higher life expectancy.

The marital status vaccination rate showed a significant difference between the reference group separated compared to all other groups in marital status categories. The odds ratio between the separated group and widowed group was 0.960. that meant separated group members have 0.960 fewer chances for vaccination compared to the widowed group, which has the highest vaccination rate in marital status categories. Higher vaccination proportion for the married could be due to couples encouraging each other. Similarly, widowed people are more likely to be older people who become qualified for the vaccine early.

Race and gender at birth were another two variables analyzed in the data. There were no statistically significant differences in vaccination rate for gender at birth. In contrast, the result was mixed for the race variable. People classified as Other racial or mixed racial groups were used as a reference group, and their vaccination rate was compared to the rest of the racial

groups, as shown in figure 6. The regression result produced a statistically significant difference comparing the reference category (Other-race) to Asian and Black. In contrast, the result was not statistically significant, comparing the reference category (Other-race) to Hispanic and White. The odds of vaccination were the highest among the Asian and the lowest among Black groups.

Mental health services in this category, people who obtained mental health services were compared to those people who did not receive mental health services. Results indicated statistically significant differences in vaccination rates between those who got mental health services and those who did not. Similarly, the vaccination rate of the people who needed mental health services and did not receive mental health services as compared to people who did not need mental health services vaccination rate was statistically significant between the two groups. Obtaining mental health services was correlated with a higher vaccination rate. Perhaps mental health counseling alleviates some of the anxiety associated with the vaccine.

Health insurance. There were significant differences in vaccination proportion between private health insurance and those without private health insurance. Likewise, there was a significant difference between the groups with public insurance and those who didn't have public health insurance. Among the population with health insurance, the vaccination proportion was similar, and there was no difference between private and public health insurance (graph 9). Although COVID 19 vaccine was offered free of charge for all the population without consideration for health insurance status, people with health insurance have a higher vaccination proportion, perhaps due to people with health insurance having better access to healthcare services.

Age was another variable associated with vaccination proportion. In general, older people have a higher vaccination proportion than younger people. That could be due to older people being eligible for the

vaccine early in the vaccine rollout. In addition, COVID 19 disease has the worst outcome in the older population. They are more likely than the younger population to have some of the underlying health conditions associated with severe outcomes for the infection. Therefore, they tend to be more vaccine conscious than the younger population.

A significant number of disabled people reported more than one disability. Those who has more than one disability were categorized in all limitation categories they reported. Level of limitation was self-reported which could result in response bias. Evaluating the relationship between vaccination status and having multiple disabilities was beyond the objective of this paper; however, it could be a future topic worth exploring.

Attitudes toward COVID 19 vaccine

In the survey, people who did not get the vaccine were further asked to respond to two main questions: did you plan to get a vaccine? If not, why did they not get the vaccine? Most of the respondents to the first question indicated that they would affirmatively not get a vaccine. A lesser group was either unsure or said it probably would not get the vaccine. Moreover, only about 2% said they definitely and/or probably will get a vaccine. Overall, more than 10% of the respondents were hesitant about the vaccine. In general, disabled people were less hesitant and more likely to indicate they would definitely and/or probably will get the vaccine, except for hearing limitations; more people in this limitation category indicated they definitely would not get the vaccine. In contrast, people without a disability were consistently more hesitant and were more likely to indicate they would probably and/or definitely will not get the vaccine.

Responses to the second question fall into one in table 3 and graph 10 b. Concerns about side effects and not trusting the authorities or the vaccine made up the majority of the reasons to deny

getting the vaccine. The takeaway from that is there is room for the public health community to address those concerns transparently to build trust and educate the public about the importance of the vaccine for the well-being of society.

The disabled population, as shown in graphs 11-14, are more likely than none disabled people to be concerned about the side effects of the vaccine and distrust the vaccine and authorities. Further studies are needed to investigate why disabled people distrust vaccine safety and authorities.

STRENGTH AND LIMITATION

The strength of the research includes a large sample size representing different demographics and regions. Stratification and weighing samples during data collection minimized selection biases. Similarly, variables representing disabled individuals were stratified for the type of disability, race, and age during analysis. In contrast, research limitations include the online survey data collection method may produce sampling bias that could lead to over or underestimating certain variables. Also, since the data used in this study were from national survey data collected for a wide range of purposes, many of the responses with missing values lack clarity on the reason for the missing responses. Moreover, the survey was conducted in English and Spanish, limiting the participation of people who do not speak those languages.

Section 7: Conclusion

In conclusion, people with a cognitive disability have lower vaccination proportions than those with other functional limitations, followed by vision and hearing disabilities. The vaccination proportion of the mobility limitation groups is the highest among the disabled groups; they have a vaccination proportion that is not statistically different from people without mobility limitation.

Furthermore, people with functional disabilities are vaccinated in a lower proportion as opposed to people without functional limitations. However, the difference in vaccination proportion is statistically significant for the vision and cognitive limitations only.

Moreover, income, educational attainment, marital status, household size, mental health services, health insurance status, age, and race influence vaccination proportion.

Finally, disabled people are less likely than none disabled to be vaccine-hesitant; if they do, they are more likely to reject the vaccine due to a concern pertaining to side effects or a lack of trust in authority.

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Section 9: Appendix 1

Table 2 Vaccination frequencies, and percentages compared to demographics

Demographic	Total	Percent	Vaccinated		Unvaccinated		Unknown	
Race			Total	Percent	Total	Percent	Total	Percent
Hispanic*	35990	9.4	30385	84.43	5045	14.02	560	1.56
White	314278	82.02	275291	87.59	35014	11.14	3973	1.26
Black	31228	8.16	26103	83.59	4768	15.27	357	1.14
Asian	19873	5.19	18852	94.86	838	4.22	183	0.92
Other	17529	4.58	14064	80.23	3239	18.48	226	1.29
Education								
less high school	2346	0.61	1629	69.44	668	28.47	49	2.09
some high school	4989	1.3	3550	71.16	1366	27.38	73	1.46
high school graduate or equivalent(GED)	43977	11.49	34026	77.37	9307	21.16	644	1.46
some college without degree	81953	21.4	67783	82.71	13076	15.96	1094	1.33
Associate degree	40602	10.6	33921	83.55	6143	15.13	538	1.33
Bachelor's degree	110166	28.77	100135	90.89	8721	7.92	1310	1.19
Graduate or professional degree	98875	25.82	93266	94.33	4578	4.63	1031	1.04
Marital Status								
Married	222140	58.01	198600	89.4	22226	10.01	1314	0.059
Widowed	21608	5.64	19759	91.44	1692	7.83	157	0.73
Divorced	57382	14.99	49800	86.79	7234	12.61	348	0.61
Separated	6685	1.75	5304	79.34	1341	20.06	40	0.6
Never married	70453	18.4	59157	83.97	11056	15.69	240	0.34
Gender at birth								
Female	228380	59.64	198513	86.92	27024	11.83	2843	1.24
Male	154528	40.36	135797	87.88	16835	10.89	1896	1.23
Income								
Less than 25000	32191	8.41	25823	80.22	6229	19.35	139	0.43
25000-34999	25943	6.78	22163	85.43	3710	14.3	70	0.27
35000-49999	32115	8.39	28105	87.51	3896	12.13	114	0.35
50000-74999	51421	13.43	45839	89.14	5441	10.58	141	0.27
75000-99999	43425	11.34	39398	90.73	3915	9.02	112	0.26
100000-149999	55923	14.6	51672	92.4	4129	7.38	122	0.22
150000-199999	27558	7.2	25944	94.14	1561	5.66	53	0.19
200000 and above	33705	8.8	32242	95.66	1408	4.18	55	0.16
Income not reported	80627	21.05						
Household size								
1	66305	17.32	59505	89.74	5734	8.65	1066	1.61
2	150961	39.42	136802	90.62	11934	7.91	2225	1.47
3	65205	17.03	56130	86.08	8400	12.88	675	1.04
4	56512	14.76	47803	84.59	8280	14.65	429	0.76

5	25478	6.65	20575	80.76	4727	18.55	176	0.69
6	10470	2.73	8085	77.22	2318	22.14	67	0.64
7	3807	0.99	2830	74.34	954	25.06	23	0.6
8	1614	0.42	1143	70.82	462	28.62	9	0.56
9	648	0.17	430	66.36	213	32.87	5	0.77
10	1908	0.5	1007	52.78	837	43.87	64	3.35
Limitations in mobility								
No difficulty	249812	65.24	241515	89.19	28484	10.52	787	0.29
Some difficulty	61220	15.99	44229	91.66	3866	8.01	157	0.33
a lot of difficulty	14422	3.77	5740	88.66	703	10.86	31	0.48
Cannot do at all	1648	0.43	674	72.01	258	27.56	4	0.43
Not responded	55806	14.57						
Limitations in remembering or concentrating								
No difficulty	206201	53.85	184476	89.46	21068	10.22	657	0.32
Some difficulty	105109	27.45	94998	90.38	9830	9.35	281	0.27
a lot of difficulty	14905	3.89	12626	84.71	2233	14.98	46	0.31
Cannot do at all	594	0.16	375	63.13	213	35.86	6	1.01
Not responded	56099	14.65						
Limitation in hearing								
No difficulty	270786	70.72	241515	89.19	28484	10.52	787	0.29
Some difficulty	48252	12.6	44229	91.66	3866	8.01	157	0.33
a lot of difficulty	6474	1.69	5740	88.66	703	10.86	31	0.48
Cannot do at all	936	0.24	674	72.01	258	27.56	4	0.43
Not responded	56460	14.74						
Limitations in seeing								
No difficulty	227896	59.52	204176	89.59	23045	10.11	675	0.3
Some difficulty	89182	23.29	80225	89.96	8687	9.74	270	0.3
a lot of difficulty	9266	2.42	7793	84.1	1431	15.44	42	0.45
Cannot do at all	706	0.18	498	70.54	200	28.33	8	1.13
Not responded	55858	14.59						
Received mental health services								
YES	37414	9.77	34287	91.64	3056	8.17	71	0.19
NO	298139	77.86	265525	89.06	31635	10.61		0.33
Unknown	47355	12.37	71	0.19	979	0.33	73	0.21
Needed mental health but not get one								
YES	34846	9.1	308835	88.49	3938	11.3	73	0.21
NO	300952	78.6	265525	89.06	31635	10.61	979	0.33
Unknown	47110	12.31						
Private health insurance								
Yes	258973	67.63	235743	91.03	22528	8.7	702	0.27
No	62760	16.39	51647	82.29	10843	17.28	270	0.43
Unknown	61175	15.98						

Omar

Public health insurance								
Yes	130434	34.06	118288	90.69	11685	8.96	461	0.35
No	183503	47.92	162025	88.3	20997	11.44	481	0.26
Unknown	68971	18.01						
Received vaccine								
YES	334310	87.31						
NO	43859	11.45						
Unknown	4739	1.24						

- * Hispanic vs non-Hispanic was separate variable.

Appendix 2: Age variable, Limitation level and vaccine distribution

MOBILITY=1

Frequency Percent Row Pct Col Pct	Table of agegroup by RECVDVACC			
		RECVDVACC(RECVDVACC)		
agegroup	-99	1	2	Total
18-25	7 0.00 0.08 0.97	7110 2.85 80.19 3.19	1749 0.70 19.73 6.81	8866 3.56
26-40	121 0.05 0.20 16.83	50215 20.14 83.56 22.53	9760 3.92 16.24 37.98	60096 24.11
41-55	186 0.07 0.25 25.87	65112 26.12 87.82 29.22	8846 3.55 11.93 34.43	74144 29.74
56-65	189 0.08 0.38 26.29	46583 18.69 92.92 20.90	3359 1.35 6.70 13.07	50131 20.11
>65	216 0.09 0.39 30.04	53848 21.60 96.08 24.16	1982 0.80 3.54 7.71	56046 22.48
Total	719 0.29	222868 89.40	25696 10.31	249283 100.00
Frequency Missing = 529				

MOBILITY=2

Frequency Percent Row Pct Col Pct	Table of agegroup by RECVDVACC			
		RECVDVACC(RECVDVACC)		
agegroup	-99	1	2	Total
18-25	2 0.00 0.31 1.09	514 0.84 79.69 0.93	129 0.21 20.00 2.37	645 1.05
26-40	8 0.01 0.16 4.37	3975 6.50 79.26 7.16	1032 1.69 20.58 18.94	5015 8.20
41-55	38 0.06 0.30 20.77	10732 17.54 84.27 19.32	1966 3.21 15.44 36.09	12736 20.82
56-65	53 0.09 0.34 28.96	14390 23.52 91.01 25.90	1369 2.24 8.66 25.13	15812 25.84
>65	82 0.13 0.30 44.81	25944 42.40 96.17 46.70	952 1.56 3.53 17.47	26978 44.09
Total	183 0.30	55555 90.80	5448 8.90	61186 100.00
Frequency Missing = 34				

Distribution of AGE by RECVDVACC
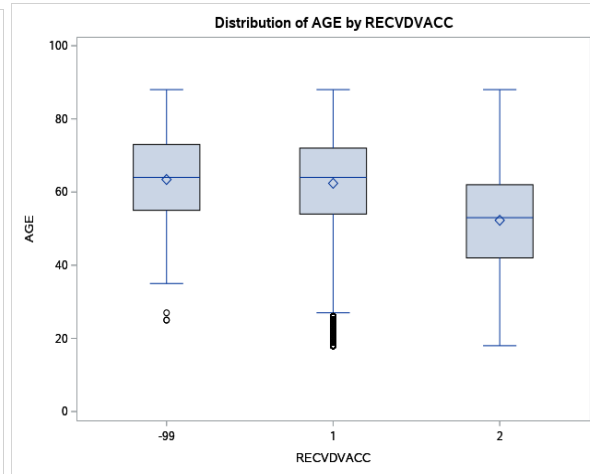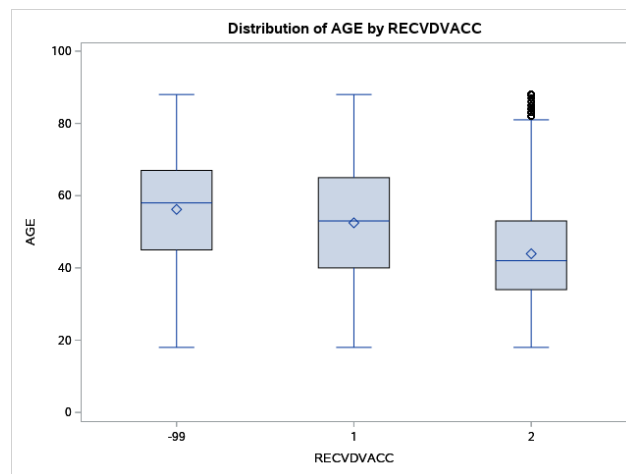
Appendix 2 a. Rec'd vaccine=1, no vaccine=2. No limitation=1, some limitation=2, a lot of limitation=3, cannot do at all=4.

MOBILITY=3

Frequency / Percent / Row Pct / Col Pct

Table of agegroup by RECVDVACC

agegroup	-99	RECVDVACC(RECVDVACC) 1	2	Total
18-25	0 0.00 0.00 0.00	70 0.49 79.55 0.56	18 0.12 20.45 0.99	88 0.61
26-40	5 0.03 0.62 7.14	566 3.93 69.88 4.52	239 1.66 29.51 13.15	810 5.62
41-55	16 0.11 0.51 22.86	2473 17.15 78.46 19.74	663 4.60 21.03 36.49	3152 21.86
56-65	24 0.17 0.57 34.29	3669 25.45 86.66 29.28	541 3.75 12.78 29.77	4234 29.37
>65	25 0.17 0.41 35.71	5751 39.89 93.79 45.90	356 2.47 5.81 19.59	6132 42.54
Total	70 0.49	12529 86.91	1817 12.60	14416 100.00

Frequency Missing = 6

MOBILITY=4

Frequency / Percent / Row Pct / Col Pct

Table of agegroup by RECVDVACC

agegroup	-99	RECVDVACC(RECVDVACC) 1	2	Total
18-25	1 0.06 4.17 8.33	11 0.67 45.83 0.82	12 0.73 50.00 4.04	24 1.46
26-40	0 0.00 0.00 0.00	89 5.40 65.93 6.65	46 2.79 34.07 15.49	135 8.20
41-55	2 0.12 0.64 16.67	229 13.90 73.16 17.12	82 4.98 26.20 27.61	313 19.00
56-65	1 0.06 0.25 8.33	338 20.52 85.57 25.26	56 3.40 14.18 18.86	395 23.98
>65	8 0.49 1.03 66.67	671 40.74 86.03 50.15	101 6.13 12.95 34.01	780 47.36
Total	12 0.73	1338 81.24	297 18.03	1647 100.00

Frequency Missing = 1

Distribution of AGE by RECVDVACC

Distribution of AGE by RECVDVACC
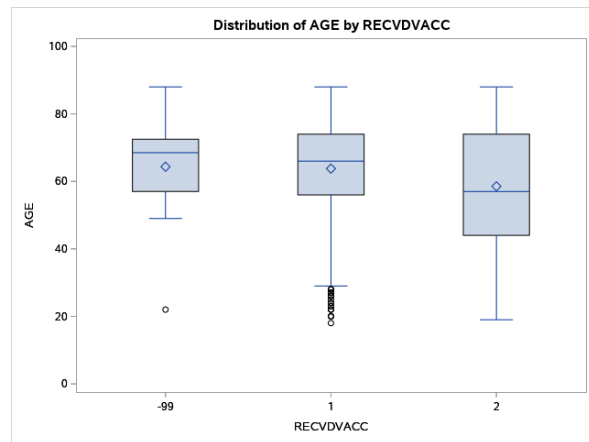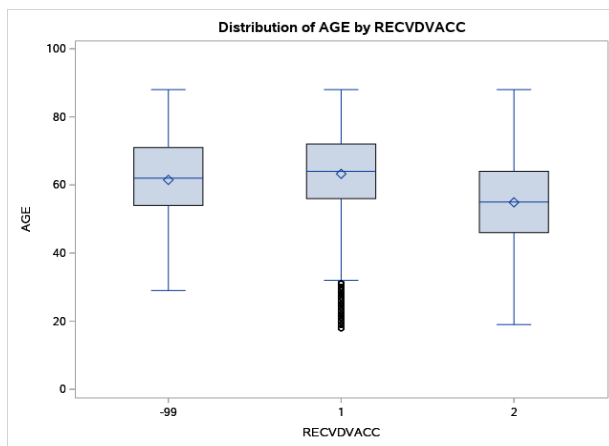
Appendix 2 b. Rec'd vaccine=1, no vaccine=2. No limitation=1, some limitation=2, a lot of limitation=3, cannot do at all=4.

REMEMBERING=1

Frequency Percent Row Pct Col Pct	Table of agegroup by RECVDVACC			
		RECVDVACC(RECVDVACC)		
agegroup	-99	1	2	Total
18-25	6 0.00 0.12 0.91	3779 1.84 76.87 2.05	1131 0.55 23.01 5.38	4916 2.39
26-40	82 0.04 0.21 12.50	32639 15.85 82.29 17.71	6944 3.37 17.51 33.06	39665 19.26
41-55	157 0.08 0.28 23.93	48574 23.59 86.80 26.36	7231 3.51 12.92 34.42	55962 27.18
56-65	184 0.09 0.40 28.05	42356 20.57 92.11 22.99	3442 1.67 7.49 16.39	45982 22.33
>65	227 0.11 0.38 34.60	56909 27.64 95.81 30.89	2259 1.10 3.80 10.75	59395 28.84
Total	656 0.32	184257 89.48	21007 10.20	205920 100.00

Frequency Missing = 281

REMEMBERING=2

Frequency Percent Row Pct Col Pct	Table of agegroup by RECVDVACC			
		RECVDVACC(RECVDVACC)		
agegroup	-99	1	2	Total
18-25	4 0.00 0.11 1.43	2980 2.84 83.03 3.14	605 0.58 16.86 6.18	3589 3.42
26-40	40 0.04 0.18 14.29	18429 17.57 84.97 19.43	3219 3.07 14.84 32.88	21688 20.67
41-55	67 0.06 0.23 23.93	25727 24.52 87.99 27.13	3444 3.28 11.78 35.18	29238 27.87
56-65	77 0.07 0.35 27.50	20246 19.30 92.49 21.35	1568 1.49 7.16 16.02	21891 20.87
>65	92 0.09 0.32 32.86	27458 26.17 96.33 28.95	953 0.91 3.34 9.74	28503 27.17
Total	280 0.27	94840 90.40	9789 9.33	104909 100.00

Frequency Missing = 200
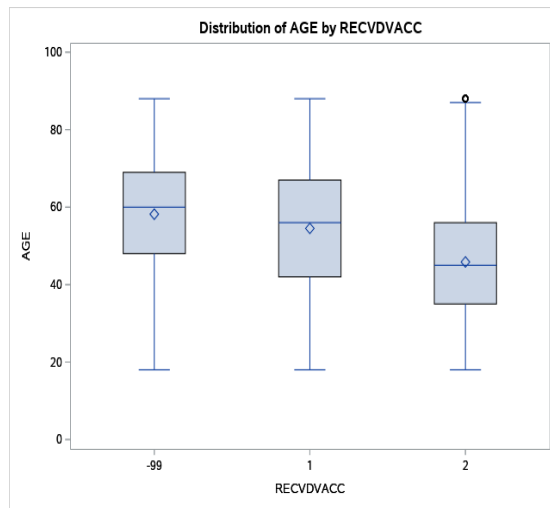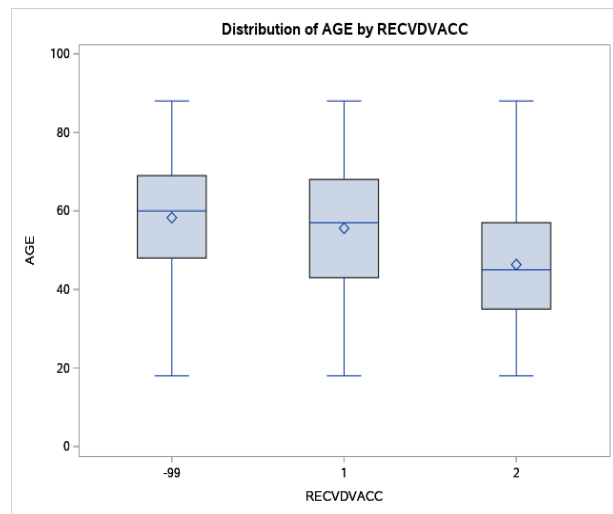
Appendix 2 c. Rec'd vaccine=1, no vaccine=2. No limitation=1, some limitation=2, a lot of limitation=3, cannot do at all=4.

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REMEMBERING=3

Frequency / Percent / Row Pct / Col Pct

Table of agegroup by RECVDVACC

agegroup	-99	1	2	Total
18-25	0 0.00 0.00 0.00	910 6.14 85.13 7.25	159 1.07 14.87 7.18	1069 7.21
26-40	10 0.07 0.22 21.74	3668 24.75 81.08 29.21	846 5.71 18.70 38.18	4524 30.52
41-55	17 0.11 0.35 36.96	4082 27.54 83.17 32.50	809 5.46 16.48 36.51	4908 33.12
56-65	8 0.05 0.31 17.39	2259 15.24 88.31 17.99	291 1.96 11.38 13.13	2558 17.26
>65	11 0.07 0.62 23.91	1640 11.07 93.08 13.06	111 0.75 6.30 5.01	1762 11.89
Total	46 0.31	12559 84.74	2216 14.95	14821 100.00

Frequency Missing = 84

REMEMBERING=4

Frequency / Percent / Row Pct / Col Pct

Table of agegroup by RECVDVACC

agegroup	-99	1	2	Total
18-25	1 0.17 2.56 16.67	24 4.07 61.54 6.43	14 2.38 35.90 6.67	39 6.62
26-40	0 0.00 0.00 0.00	84 14.26 62.22 22.52	51 8.66 37.78 24.29	135 22.92
41-55	1 0.17 0.55 16.67	116 19.69 64.09 31.10	64 10.87 35.36 30.48	181 30.73
56-65	1 0.17 1.18 16.67	63 10.70 74.12 16.89	21 3.57 24.71 10.00	85 14.43
>65	3 0.51 2.01 50.00	86 14.60 57.72 23.06	60 10.19 40.27 28.57	149 25.30
Total	6 1.02	373 63.33	210 35.65	589 100.00

Frequency Missing = 5
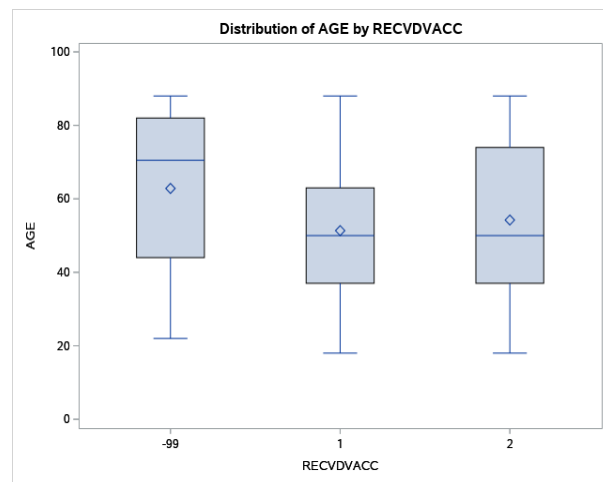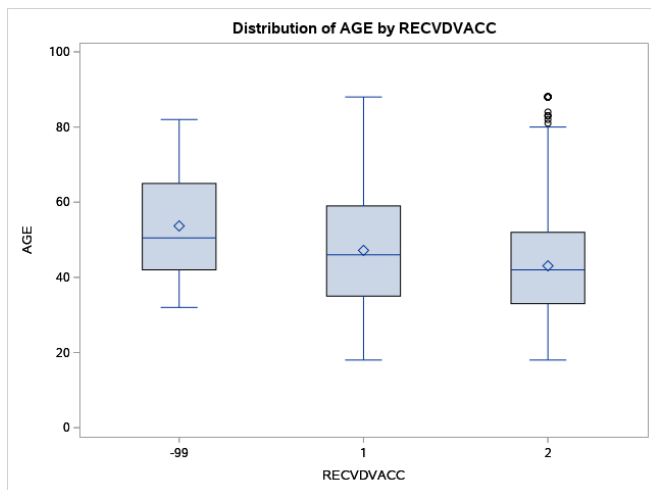

Distribution of AGE by RECVDVACC

Distribution of AGE by RECVDVACC

Appendix 2 d. Rec'd vaccine=1, no vaccine=2. No limitation=1, some limitation=2, a lot of limitation=3, cannot do at all=4.

SEEING=1

	Table of agegroup by RECVDVACC			
Frequency Percent Row Pct Col Pct		RECVDVACC(RECVDVACC)		
agegroup	-99	1	2	Total
18-25	7 0.00 0.10 1.04	5638 2.48 79.88 2.77	1413 0.62 20.02 6.16	7058 3.10
26-40	103 0.05 0.20 15.26	43654 19.19 83.44 21.41	8559 3.76 16.36 37.28	52316 23.00
41-55	163 0.07 0.27 24.15	52478 23.07 87.23 25.74	7522 3.31 12.50 32.77	60163 26.45
56-65	179 0.08 0.39 26.52	42881 18.85 92.61 21.03	3244 1.43 7.01 14.13	46304 20.35
>65	223 0.10 0.36 33.04	59205 26.03 96.04 29.04	2218 0.98 3.60 9.66	61646 27.10
Total	675 0.30	203856 89.61	22956 10.09	227487 100.00
Frequency Missing = 409				

SEEING=2

	Table of agegroup by RECVDVACC			
Frequency Percent Row Pct Col Pct		RECVDVACC(RECVDVACC)		
agegroup	-99	1	2	Total
18-25	2 0.00 0.09 0.75	1844 2.07 81.59 2.30	414 0.46 18.32 4.78	2260 2.54
26-40	29 0.03 0.24 10.82	10007 11.24 82.26 12.49	2129 2.39 17.50 24.60	12165 13.66
41-55	66 0.07 0.25 24.63	23293 26.16 87.04 29.08	3401 3.82 12.71 39.30	26760 30.06
56-65	81 0.09 0.37 30.22	20049 22.52 91.59 25.03	1759 1.98 8.04 20.32	21889 24.58
>65	90 0.10 0.35 33.58	24918 27.99 95.99 31.10	952 1.07 3.67 11.00	25960 29.16
Total	268 0.30	80111 89.98	8655 9.72	89034 100.00
Frequency Missing = 148				

Distribution of AGE by RECVDVACC (SEEING=1)

Distribution of AGE by RECVDVACC (SEEING=2)
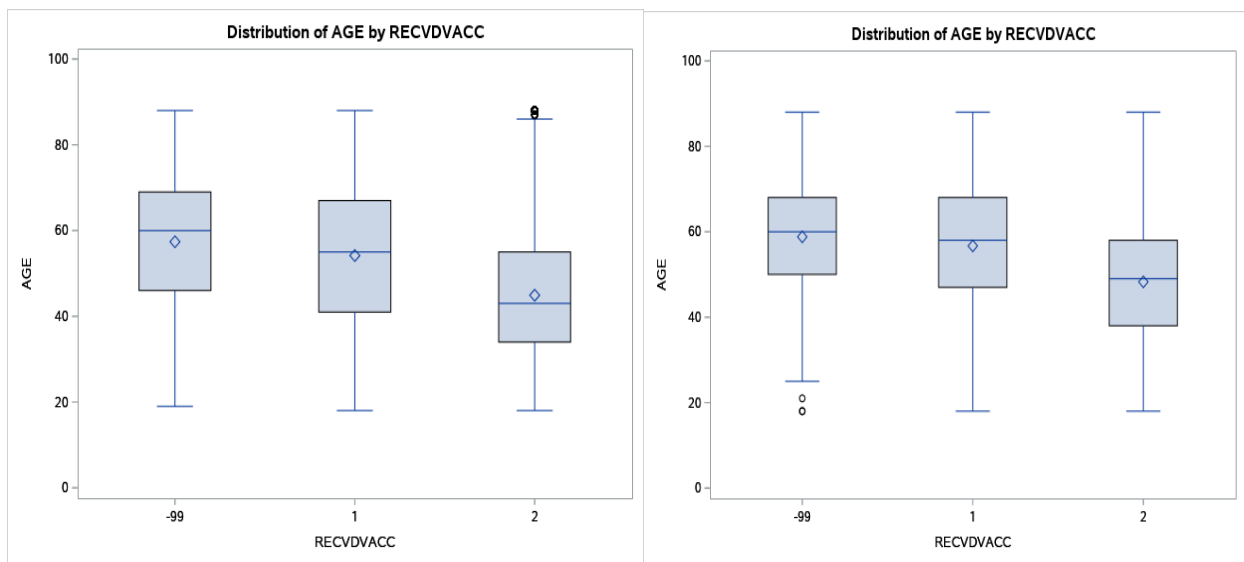
Appendix 2 e. Rec'd vaccine=1, no vaccine=2. No limitation=1, some limitation=2, a lot of limitation=3, cannot do at all=4.

SEEING=3

Frequency Percent Row Pct Col Pct	Table of agegroup by RECVDVACC			
	RECVDVACC(RECVDVACC)			
agegroup	-99	1	2	Total
18-25	1 0.01 0.37 2.38	198 2.14 73.61 2.54	70 0.76 26.02 4.89	269 2.91
26-40	4 0.04 0.28 9.52	1091 11.79 76.51 14.02	331 3.58 23.21 23.13	1426 15.41
41-55	12 0.13 0.37 28.57	2663 28.78 81.91 34.22	576 6.22 17.72 40.25	3251 35.13
56-65	11 0.12 0.49 26.19	1961 21.19 86.46 25.20	296 3.20 13.05 20.68	2268 24.51
>65	14 0.15 0.69 33.33	1868 20.19 91.57 24.01	158 1.71 7.75 11.04	2040 22.04
Total	42 0.45	7781 84.08	1431 15.46	9254 100.00

Frequency Missing = 12

SEEING=4

Frequency Percent Row Pct Col Pct	Table of agegroup by RECVDVACC			
	RECVDVACC(RECVDVACC)			
agegroup	-99	1	2	Total
18-25	1 0.14 2.56 12.50	23 3.26 58.97 4.62	15 2.13 38.46 7.54	39 5.53
26-40	2 0.28 1.24 25.00	108 15.32 67.08 21.69	51 7.23 31.68 25.63	161 22.84
41-55	2 0.28 1.02 25.00	142 20.14 72.08 28.51	53 7.52 26.90 26.63	197 27.94
56-65	0 0.00 0.00 0.00	90 12.77 79.65 18.07	23 3.26 20.35 11.56	113 16.03
>65	3 0.43 1.54 37.50	135 19.15 69.23 27.11	57 8.09 29.23 28.64	195 27.66
Total	8 1.13	498 70.64	199 28.23	705 100.00

Frequency Missing = 1

Distribution of AGE by RECVDVACC (SEEING=3) and Distribution of AGE by RECVDVACC (SEEING=4)
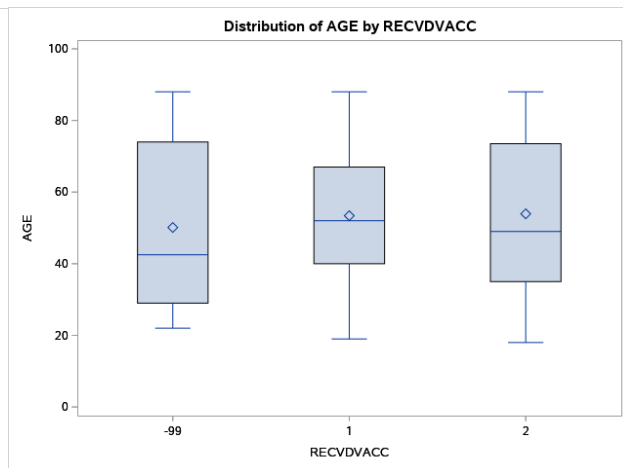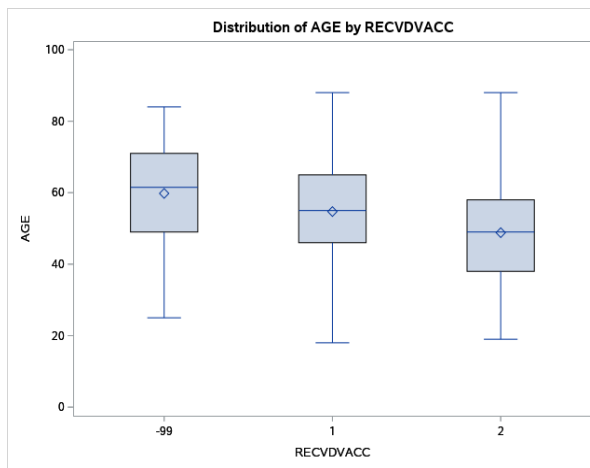
Appendix 2 f. Rec'd vaccine=1, no vaccine=2. No limitation=1, some limitation=2, a lot of limitation=3, cannot do at all=4.

HEARING=1

Frequency / Percent / Row Pct / Col Pct

Table of agegroup by RECVDVACC

agegroup	RECVDVACC(RECVDVACC) -99	1	2	Total
18-25	7 0.00 0.08 0.89	7064 2.61 80.05 2.93	1754 0.65 19.88 6.18	8825 3.27
26-40	121 0.04 0.20 15.41	50925 18.84 83.27 21.12	10109 3.74 16.53 35.63	61155 22.63
41-55	211 0.08 0.27 26.88	69463 25.70 87.24 28.81	9948 3.68 12.49 35.06	79622 29.46
56-65	216 0.08 0.38 27.52	53090 19.64 92.34 22.02	4191 1.55 7.29 14.77	57497 21.27
>65	230 0.09 0.36 29.30	60564 22.41 95.88 25.12	2370 0.88 3.75 8.35	63164 23.37
Total	785 0.29	241106 89.21	28372 10.50	270263 100.00

Frequency Missing = 523

HEARING=2

Frequency / Percent / Row Pct / Col Pct

Table of agegroup by RECVDVACC

agegroup	RECVDVACC(RECVDVACC) -99	1	2	Total
18-25	1 0.00 0.15 0.64	537 1.11 81.74 1.21	119 0.25 18.11 3.08	657 1.36
26-40	11 0.02 0.26 7.01	3497 7.25 81.69 7.91	773 1.60 18.06 20.03	4281 8.88
41-55	24 0.05 0.26 15.29	7922 16.43 85.74 17.92	1294 2.68 14.00 33.53	9240 19.16
56-65	39 0.08 0.35 24.84	10124 21.00 91.41 22.90	912 1.89 8.23 23.63	11075 22.97
>65	82 0.17 0.36 52.23	22120 45.88 96.33 50.05	761 1.58 3.31 19.72	22963 47.63
Total	157 0.33	44200 91.67	3859 8.00	48216 100.00

Frequency Missing = 36

Distribution of AGE by RECVDVACC

Distribution of AGE by RECVDVACC
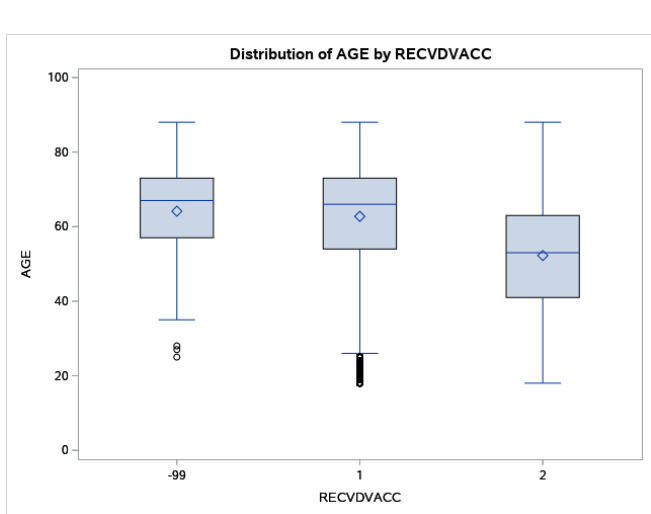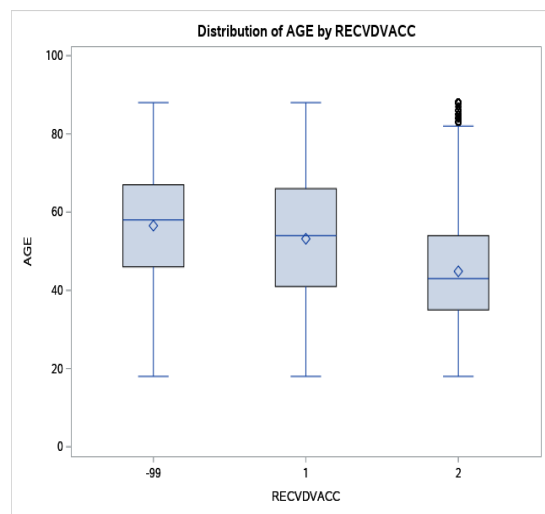
Appendix 2 g. Rec'd vaccine=1, no vaccine=2. No limitation=1, some limitation=2, a lot of limitation=3, cannot do at all=4.

HEARING=3

Frequency
Percent
Row Pct
Col Pct

Table of agegroup by RECVDVACC

agegroup	-99	1	2	Total
18-25	0 0.00 0.00 0.00	46 0.71 76.67 0.80	14 0.22 23.33 2.00	60 0.93
26-40	0 0.00 0.00 0.00	274 4.24 68.84 4.78	124 1.92 31.16 17.71	398 6.15
41-55	4 0.06 0.37 12.90	871 13.47 79.69 15.18	218 3.37 19.95 31.14	1093 16.90
56-65	11 0.17 0.69 35.48	1406 21.74 88.76 24.51	167 2.58 10.54 23.86	1584 24.49
>65	16 0.25 0.48 51.61	3139 48.54 94.21 54.72	177 2.74 5.31 25.29	3332 51.52
Total	31 0.48	5736 88.70	700 10.82	6467 100.00

Frequency Missing = 7

HEARING=4

Frequency
Percent
Row Pct
Col Pct

Table of agegroup by RECVDVACC

agegroup	-99	1	2	Total
18-25	1 0.11 1.49 25.00	45 4.82 67.16 6.71	21 2.25 31.34 8.14	67 7.18
26-40	0 0.00 0.00 0.00	110 11.79 65.09 16.39	59 6.32 34.91 22.87	169 18.11
41-55	0 0.00 0.00 0.00	169 18.11 69.26 25.19	75 8.04 30.74 29.07	244 26.15
56-65	0 0.00 0.00 0.00	169 18.11 82.44 25.19	36 3.86 17.56 13.95	205 21.97
>65	3 0.32 1.21 75.00	178 19.08 71.77 26.53	67 7.18 27.02 25.97	248 26.58
Total	4 0.43	671 71.92	258 27.65	933 100.00

Frequency Missing = 3

Distribution of AGE by RECVDVACC

Distribution of AGE by RECVDVACC
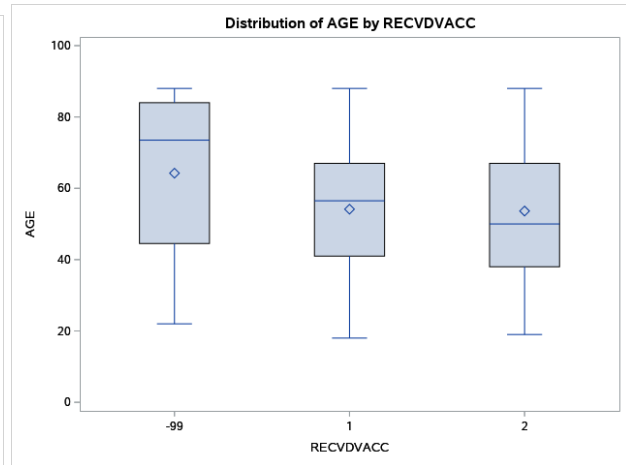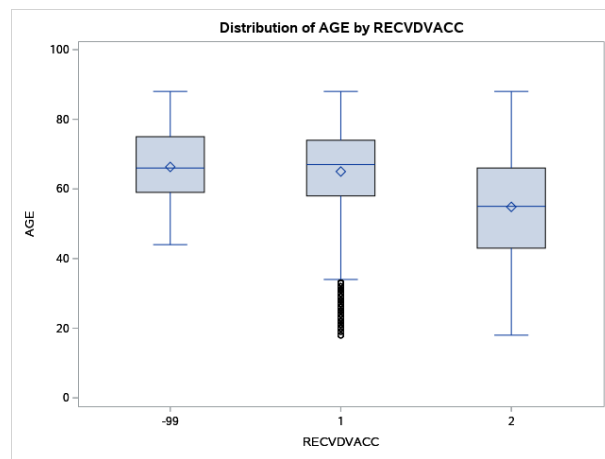
Appendix 2 h. Rec'd vaccine=1, no vaccine=2. No limitation=1, some limitation=2, a lot of limitation=3, cannot do at all=4.

Section 10: Biography & CV

Summary of Qualifications/Profile

Experienced medical technologist with AMT certification, more than twenty years of experience as Medical Laboratory Technologist. Advanced clinical laboratory skills, with commended performance.

Education

Master of Public Health in Epidemiology   **Expected Aug 2022**

University of Nebraska Medical Center, College of Public Health, Omaha, NE

Relevant Coursework: SAS Programming, Analytical Epidemiology, Epidemiological Methods,

Biostatistics I & II,

- Graduate Certificate in public health   **Aug 2015**

    University of Florida college of public health and health professions, Gainesville, FL

- Bachelor of Sciences degree in Medical Technology   **Jun 1997**

        Faculty of Allied Health Sciences and Nursing, Kuwait University, Kuwait.

 Professional Experience

- **Medical Technologist II**   **Mar 2003 - Present**

    Eskenazi Health, Indianapolis, IN

- Collect and prepare specimens and perform laboratory testing used in the diagnosis, treatment, and prevention of disease.

Verify record and report lab results on all performed tests on laboratory information systems. Antibody screen, antibody Identification and crossmatch and profession of blood products to patients.

Manual differential count and other hematological tests. Routine bacteriology and molecular testing.

Ensure compliance with regulatory agencies, hospital Policies and laboratory standard procedures.

Perform quality control testing. Maintenance of automated and manual techniques, in Chemistry, Hematology, Microbiology, and Blood Bank.

Act as a resource person to multitask between various lab sections.

- **Medical Technologist II**   **Feb 2013 – Until present.**

IU Health North Hospital, Carmel, IN (www.iuhealth.org).

Generalist MT in the core lab: Hematology, Chemistry, Coagulation, Urinalysis, and some Microbiology.

- **Medical Technologist,**   **Jan 2007 - Apr 2007**

Hennepin County Medical Center, Minneapolis MN

Generalist MT in the core lab: Hematology, Chemistry, Coagulation, Urinalysis.

- **Medical Technologist**   **Jan 2002 - Jan 2007.**

Westview Hospital, Indianapolis

Laboratory diagnostic tests in the areas: Chemistry, Hematology, Blood Bank, and limited Microbiology. Assisting in phlebotomy. Quality control, calibration, and maintenance.

- **Medical Technologist, Aug 1997 - OCT 2001, Kuwait.**

Amiri Hospital, Ministry of Public Health

Hematology & Blood Bank Techniques, both manual and automated such as: Coulter STKR, ACL2000, Electrophoresis, Enzyme assays, Coagulation Studies, Blood Bank, Cyto-chemistry. Processing specimen for STEM CELL transplant (preserving, freezing, storing). Operating & Maintenance Liquid Nitrogen Freezing system (Cryomed, planner). Automated blood analyzers: coulter MDII, PD Flow cytometer). Clonogenicity Assays. Monitoring the requirements of the Lab.