Inter Tribal Council of Arizona, Inc.

Vaccine Assessment Report and Uptake Strategies

Tribal Epidemiology Center

Vaccine Assessment and Uptake Strategies Report

IHS Phoenix-Tucson Service Areas

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TO: Tribal Leader and Tribal Health Director

FROM: Inter Tribal Council of Arizona, Inc.
Maria Dadgar, Executive Director

RE: *Vaccine Assessment Report and Uptake Strategies Report: IHS Phoenix-Tucson Service Areas*

On behalf of the Inter Tribal Council of Arizona, Inc. (ITCA) Tribal Epidemiology Center (TEC), I am pleased to present the *Vaccine Assessment Report and Uptake Strategies Report: IHS Phoenix-Tucson Service Areas*.

This assessment report was prepared to supplement vaccine efforts for public health workers in the Indian Health Service (IHS) Phoenix and Tucson Service Areas. The TEC utilized publicly available data from 2013 to 2023 to construct the report.

This assessment report demonstrates vaccine attitudes, popular public information sources, and leveraging digital sources to develop vaccine uptake strategies.

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Glossary

Ecological scan: a general review of resources in an environment to determine availability or limitations

Comment bombing: reposting a comment several times to increase content ratings/views; make a long post to stop other posts from being read; make an idea, opinion, response more seen than others

Gaslighting: a form of manipulation to make someone question their ability to think clearly, sense of reality, and memories

Grey literature review: review of literature not available in publications commonly used by the public, i.e. newspapers, magazines, journals, and books

Hesitancy: the behavior of delaying or waiting

Lived experience: real life personal encounter

Pandemic fatigue: feeling exhausted or demotivated about COVID-19 related matters

Personal belief exemption: exception from a requirement that conflicts with personal beliefs not related or associated with a religious group, system, or belief

Religious exemption: exception from a requirement that conflicts with sincerely held religious beliefs, practices, or observances without undue hardship on operations

Trolling: to antagonize (others) by deliberately posting inflammatory, irrelevant, or other disruptive content

Vaccine confidence: the belief that vaccines work and are safe

Vaccine legacy: pertaining to how long the vaccine has existed, been in use, and outcomes

Purpose

The purpose of the Vaccine Assessment and Strategies Report is to provide information for Tribal health departments in the IHS Phoenix-Tucson Indian Health Service Areas. This report focuses on vaccine hesitancy, vaccine accessibility, and uptake strategies. It demonstrates the trends in vaccine attitudes and administrations using data and information acquired via ecological scan, literature review, and social media and internet scans. The assessment methods utilized for this report were selected for the ease of information accessibility, can be conducted at any time, require minimal training and management, contain no breach of protected or confidentiality policies, and are easily replicated.

Introduction

Vaccine hesitancy is not a novel public health challenge. It has existed as long as vaccines have, thus vaccine advocates have developed and employed strategies to encourage vaccine uptake. This report covers strategies used by other relevant entities addressing vaccine hesitancy and misinformation.

The information in this report is derived from ecological scan, literature reviews, and social media and internet scans of the IHS Service Areas. The literature review only includes articles from reputable scientific journals that evaluate the environmental and psychological factors of vaccine hesitancy and evidence-based strategies.

The ecological scan includes an internet search of IHS Phoenix-Tucson Service Areas and Tribal clinics in Arizona, Utah, and Nevada. The scan provides a general assessment of vaccine accessibility to surrounding communities as well as vaccine information.

Social media and internet scans include YouTube, Facebook, and Instagram. Only social media posts related to vaccines were reviewed by entering “vaccine” and “#vaccine.” The first ten results and the first twenty comments on posts were read to evaluate public attitudes. Music videos were viewed but excluded if lyrics, imagery, or comments were not related to the healthcare nature of vaccines.

Vaccine Hesitancy

Since there is no universal definition for vaccine hesitancy, this report will utilize the SAGE Working Group description. It refers to vaccine hesitancy as the “delay in acceptance or refusal of vaccination despite availability of vaccination services.”[1] Vaccine hesitancy can be invoked by personal beliefs, experience, or social influence[1-4]. A person’s cultural and religious values may lead to vaccine hesitancy[5]. Some individuals may have experienced an adverse reaction to a vaccine and consequently refuse vaccines as a whole[6].

A survey conducted by the Public Religion Research Institute and Interfaith Youth Core reported that 10% of Americans reject the COVID-19 vaccine due to religious beliefs[7]. The internet scan revealed that some adults were willing to quit their jobs or be terminated, rather than adhere to vaccine mandates. Some states extended unemployment aid for those terminated due to vaccine mandates[7-9].

An article published in the American Academy of Pediatrics reported an increase in religious exemptions for kindergarteners from 2011-2018[10]. Religious exemptions increased where personal belief exemptions were not permitted[7-11]. However, in some cases, nonmedical exemptions decreased overall in the absence of personal belief exemptions[7-11]. Additionally, homeschooling was utilized as an alternative to traditional schooling[7-9].

The internet has made information sharing easier over the last ten years[12]. The amount of informational transactions is impossible to monitor, thus adding to the vaccine hesitancy conundrum. Misinformation has been one of the primary hindrances to vaccine uptake[12]. Vaccine opponents have leveraged the power of the internet to support their narrative that vaccines are ineffective and dangerous[12].

Vaccine opposition influencers are not a new concept. They have been active since the late 1700's[5]. The most notable mainstream vaccine opposition was Andrew Wakefield, a former British doctor and researcher[5]. His published works claimed the measles, mumps, and rubella (MMR) vaccine causes autism[5]. His papers were published in The Lancet and cited by avid vaccine opponents[5]. After an investigation, Wakefield's works were found to be fraudulent, unfounded, and incorrect[5]. The study was retracted and removed from The Lancet, however, the idea had already been firmly set that vaccines are harmful[5]. Influential people like Oprah Winfrey, Jenny McCarthy, and Robert F. Kennedy, Jr. strengthen anti-vaccine ideas[5].

Public notoriety is not the only influence in anti-vaccine promotion. Many social media users perpetuate misinformation[5-12]. The level of influence varies among anti-vaccine social media users, but the impact is similar in magnitude[5-12].

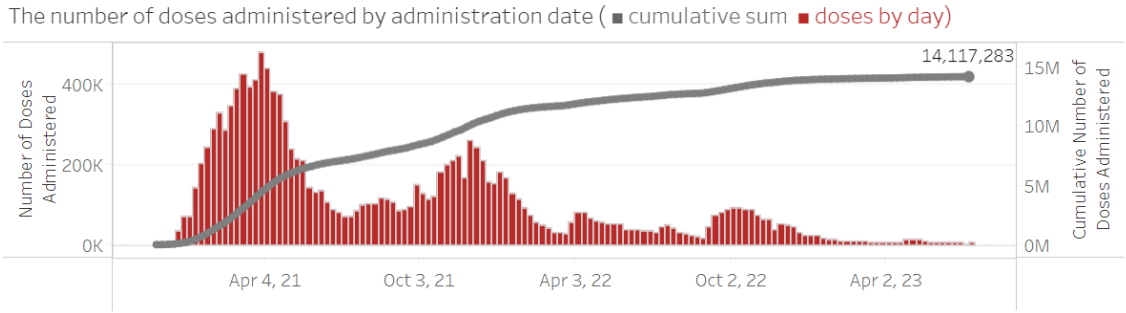
Vaccine Assessment

Vaccine Availability and Coverage

The COVID-19 vaccine has been available through IHS and the Arizona Department of Health Services (AZDHS) since December 2020[13]. Vaccines were made available at chain pharmacies such as CVS, Walgreens, Fry's Food and Drug, and Walmart[1]. Popup clinics in dental facilities, schools, and event venues administered vaccines as supplies increased[13]. Additionally, private physician practices offered the COVID-19 vaccines[14].

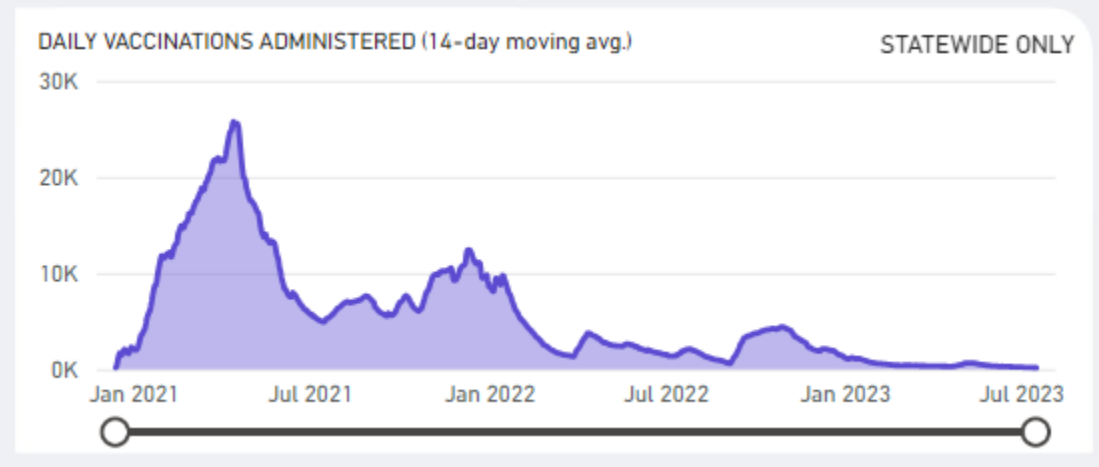
Figures 1-5 display and compare COVID-19 vaccination coverage among state and AI/AN populations in Arizona, Nevada, and Utah. Figures 6-21 show vaccination coverage for adults, adolescents, and children. Race and ethnicity categories were aggregated or filter options were not available for figures 6-21.

Fig. 1. Arizona number of doses administered by administration date[15]



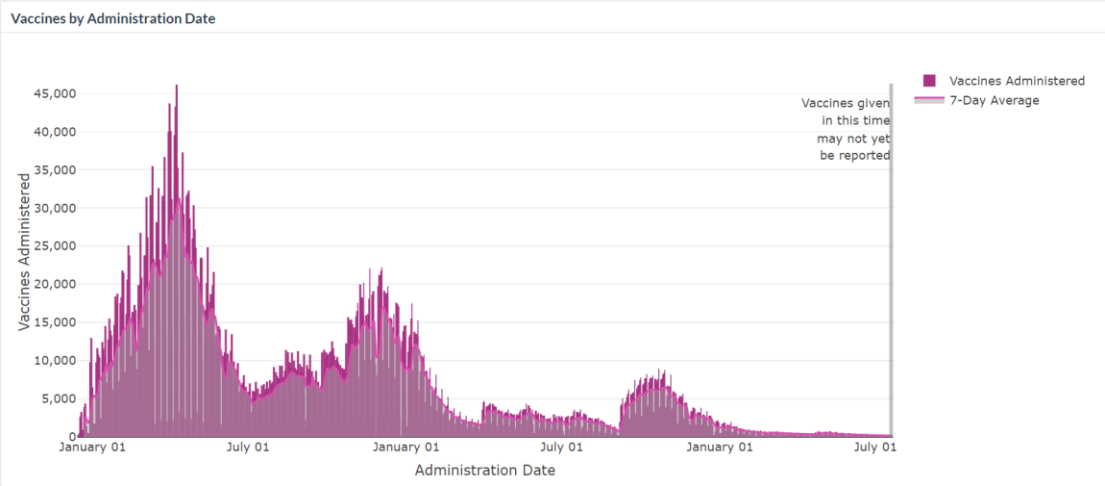
Number of doses administered daily and cumulative number of doses administered from April 2021 to April 2023. The numbers include nonresidents that received doses in Arizona.
Note: Reprinted from AZDHS COVID-19 Data Vaccine Administration.
https://www.azdhs.gov/covid19/data/index.php#vaccine-admin

Fig. 2. Nevada Daily COVID-19 vaccinations administered[16]



This graph displays daily vaccine doses administered and cumulative number of doses administered in total eligible population since April 2021 to April 2023.
Note: Reprinted from Nevada Department of Health and Human Services.
https://app.powerbigov.us/view?r=eyJrIjoiMjA2ZThiOWUtM2FlNS00MGY5LWFmYjUtNmQwNTQ3Nzg5N2I2IiwidCI6ImU0YTM0MGU2LWI4OWUtNGU2OC04ZWFhLTE1NDRkMjcwMzk4MCJ9

Fig. 3. Utah COVID-19 by administration date[17]



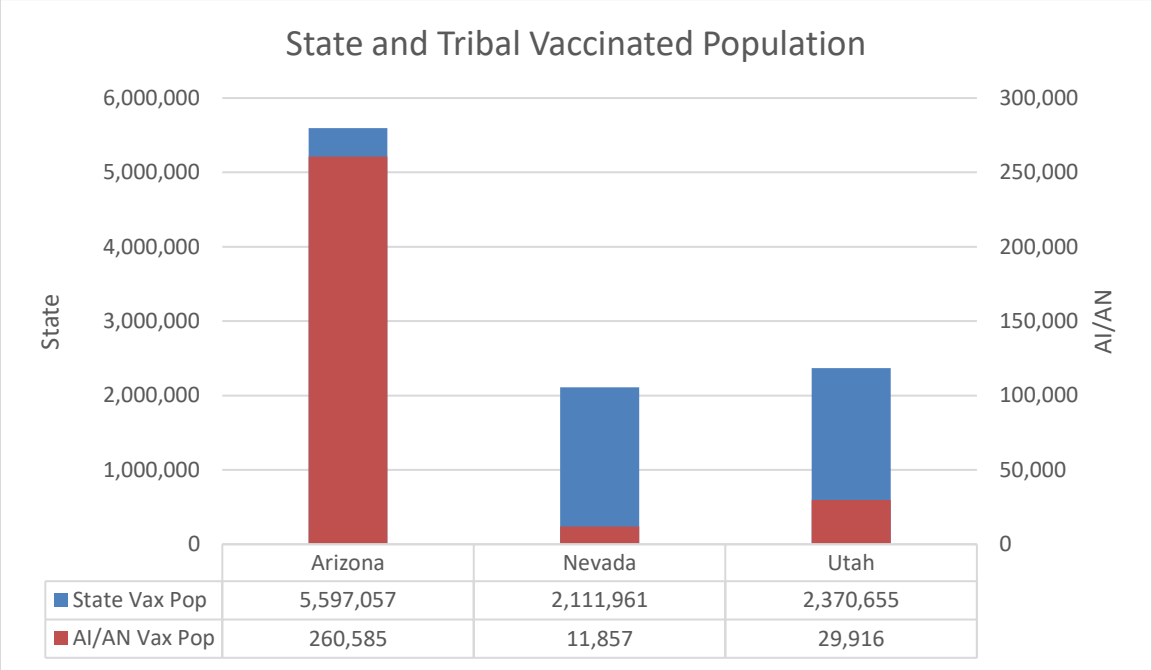
The figure shows number of vaccines administered and 7-day average since January 2021 to July 2023.
Note: Reprinted from Utah Coronavirus Dashboard. https://coronavirus-dashboard.utah.gov/vaccines.html

Table 1. AI/AN COVID-19 Vaccine for AZ, NV, UT

State	State Vax Population	AI/AN Vax Population of State	AI/AN Total Vax Eligible Population	AI/AN Vax Population % of AI/AN
Arizona[15]	5,597,057	260,585 (4.7%)	294,184	88.6%
Nevada[16]	2,111,961	11,857 (0.6%)	35,608	33.3%
Utah[17]	2,370,655	23,996 (1.01%)	29,916*	80.21%

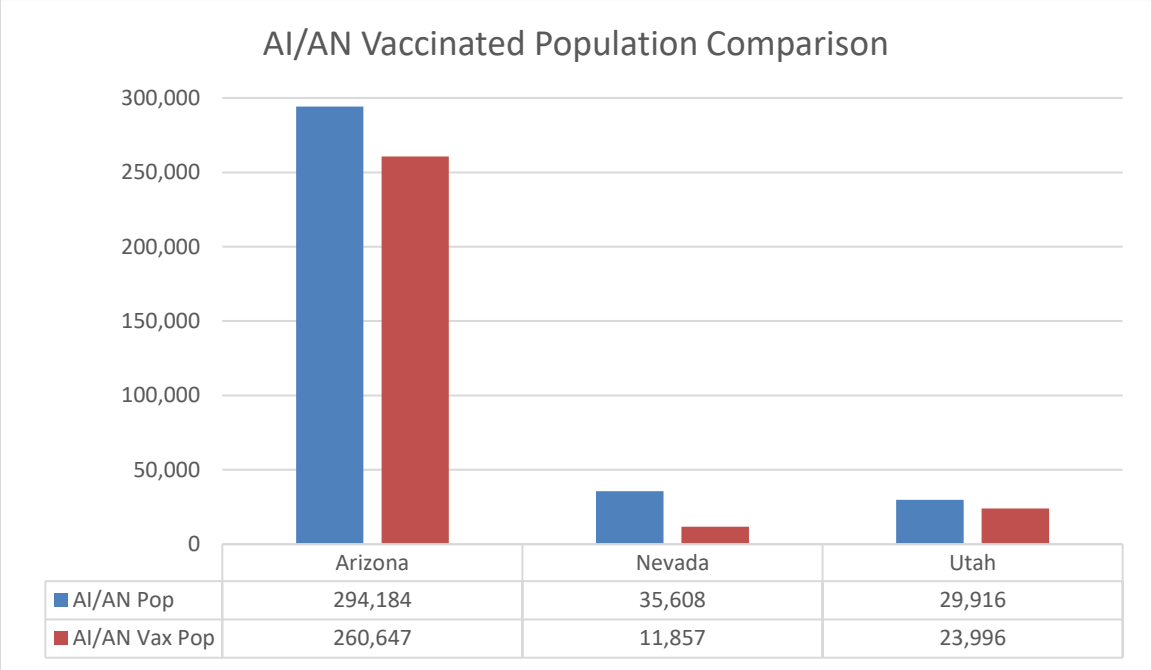
The table compares the number of eligible people that received at least one dose of the COVID-19 vaccine among aggregated state population and AI/AN population.
Note: *Use caution when considering this value. The eligible population was not available at the data source. Other data sources were not comparable due to different time of measure and race/ethnicity categorization. Value obtained by multiplying AI/AN Vax Population of State by AI/AN Vax Population % of AI/AN.

Fig. 4. AI/AN and State Vaccinated Population Comparison for AZ, NV, UT



The figure is a visual comparison of eligible people that received at least one dose of the COVID-19 vaccine among aggregated state population and AI/AN population.

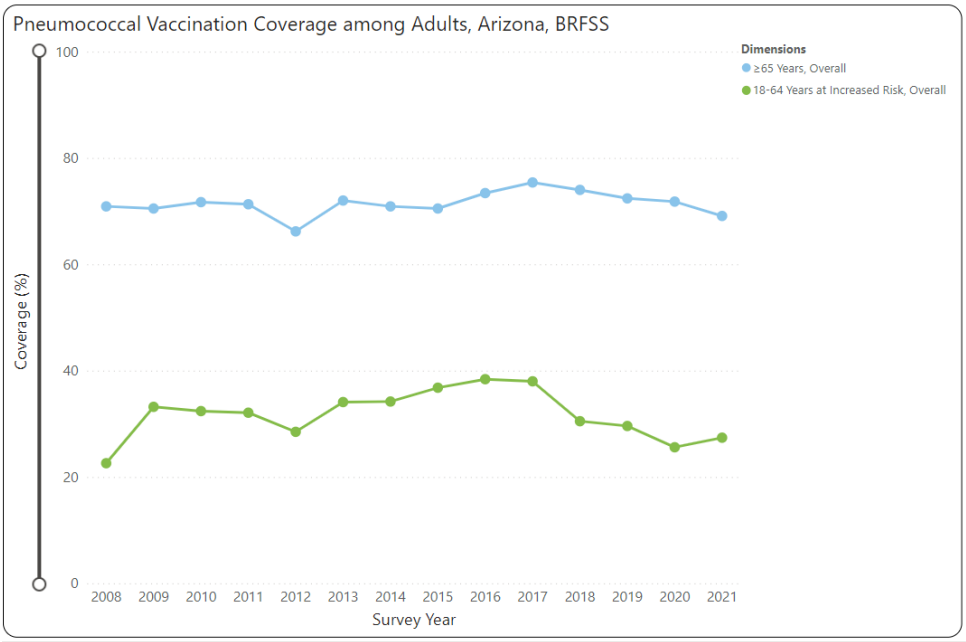
Fig. 5. AI/AN Vaccinated Population Comparison for AZ, NV, UT



	Arizona	Nevada	Utah
AI/AN Pop	294,184	35,608	29,916
AI/AN Vax Pop	260,647	11,857	23,996

This figure shows the number of AI/AN that have received at least one dose of COVID-19 vaccine compared to the total AI/AN population.

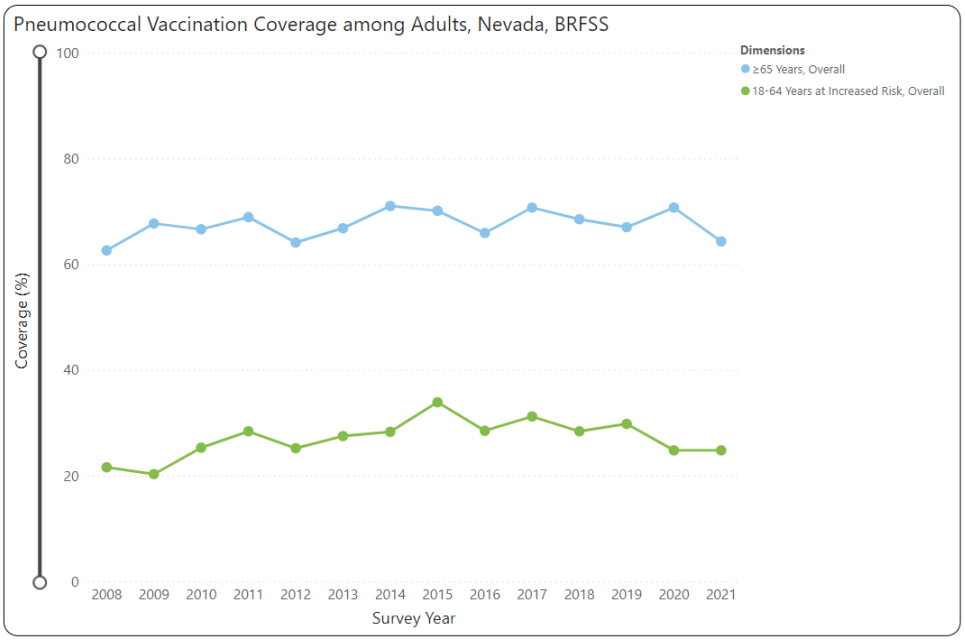
Fig. 6. Arizona Pneumococcal Vaccination Coverage among Adults, BRFSS[18]



The figure shows pneumococcal vaccinated adults in Arizona from 2008 to 2021. Race and ethnicity are aggregated in the values.

Note: Figure replicated from Centers for Disease Control and Prevention (CDC). Vaccination Coverage among Adults. https://www.cdc.gov/vaccines/imz-managers/coverage/adultvaxview/data-reports/general-population/index.html

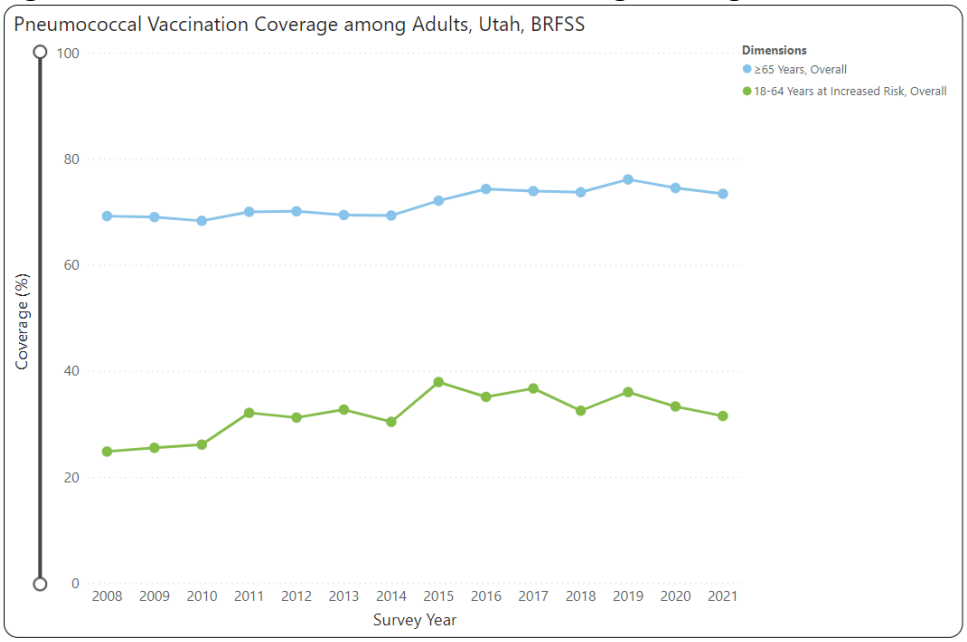
Fig. 7. Nevada Pneumococcal Vaccination Coverage among Adult, BRFSS[18]



The figure shows pneumococcal vaccinated adults in Nevada from 2008 to 2021. Race and ethnicity are aggregated in the values.

Note: Figure replicated from CDC. Vaccination Coverage among Adults. https://www.cdc.gov/vaccines/imz-managers/coverage/adultvaxview/data-reports/general-population/index.html

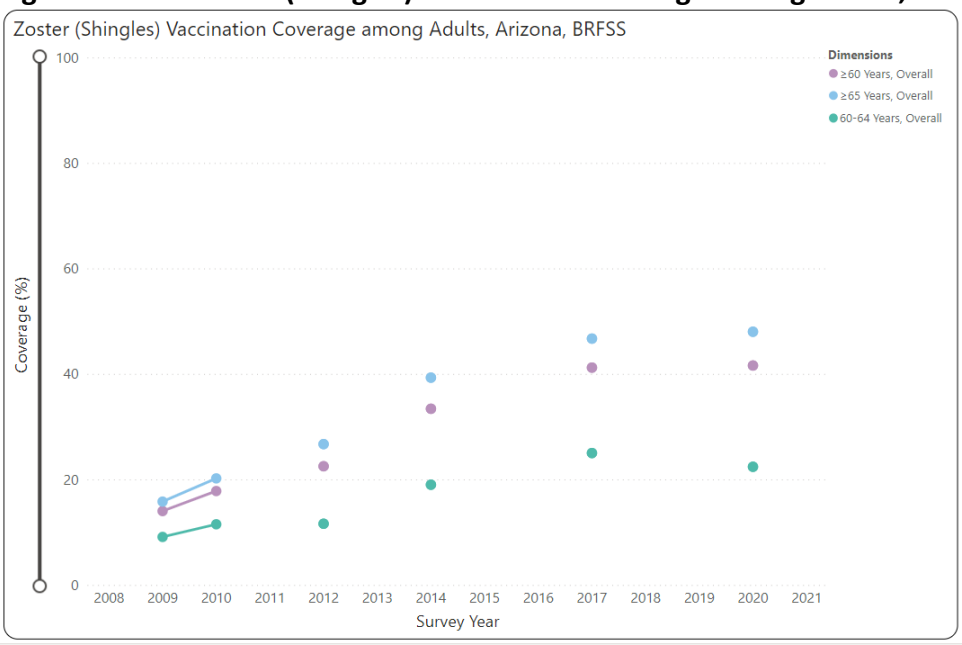
Fig. 8. Utah Pneumococcal Vaccination Coverage among Adults, BRFSS[18]



The figure shows pneumococcal vaccinated adults in Utah from 2008 to 2021. Race and ethnicity are aggregated in the values.

Note: Figure replicated from CDC. Vaccination Coverage among Adults. https://www.cdc.gov/vaccines/imz-managers/coverage/adultvaxview/data-reports/general-population/index.html

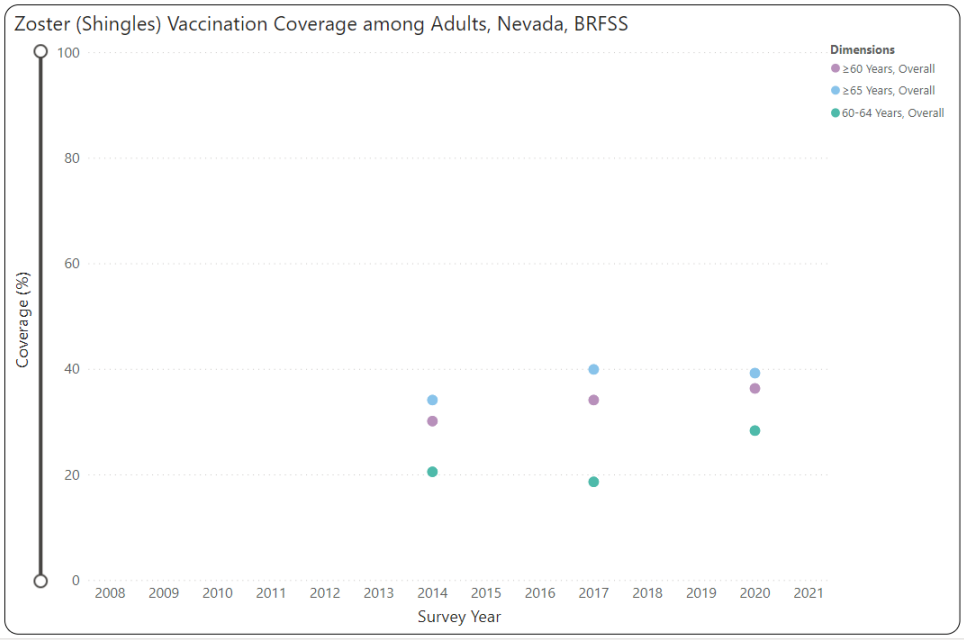
Fig. 9. Arizona Zoster (Shingles) Vaccination Coverage among Adults, BRFSS[18]



The figure shows zoster (shingles) vaccinated adults in Arizona from 2008 to 2021. Race and ethnicity are aggregated in the values.

Note: Figure replicated from CDC. Vaccination Coverage among Adults. https://www.cdc.gov/vaccines/imz-managers/coverage/adultvaxview/data-reports/general-population/index.html

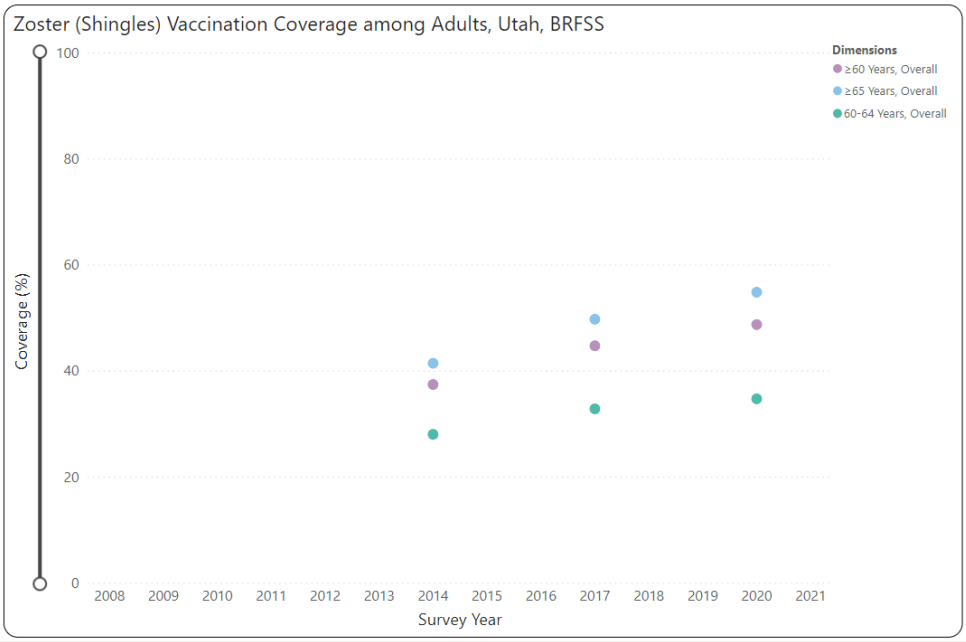
Fig. 10. Nevada Zoster (Shingles) Vaccination Coverage among Adults, BRFSS



The figure shows zoster (shingles) vaccinated adults in Nevada from 2008 to 2021. Race and ethnicity are aggregated in the values.

Note: Figure replicated from CDC. Vaccination Coverage among Adults. https://www.cdc.gov/vaccines/imz-managers/coverage/adultvaxview/data-reports/general-population/index.html

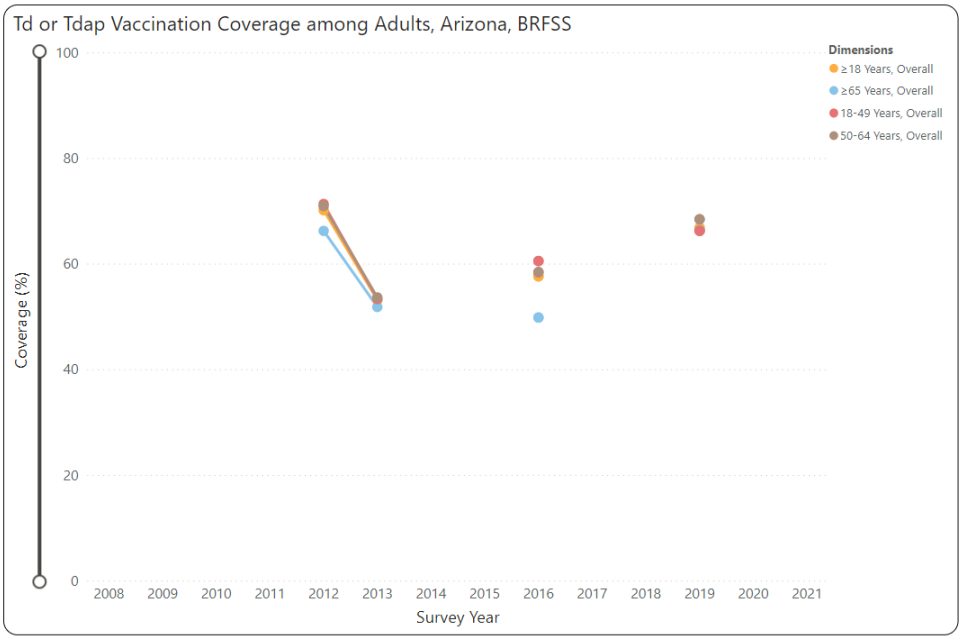
Fig. 11 . Utah Zoster (Shingles) Vaccination Coverage among Adults, BRFSS[18]



The figure shows zoster (shingles) vaccinated adults in Utah from 2008 to 2021. Race and ethnicity are aggregated in the values.

Note: Figure replicated from CDC. Vaccination Coverage among Adults. https://www.cdc.gov/vaccines/imz-managers/coverage/adultvaxview/data-reports/general-population/index.html

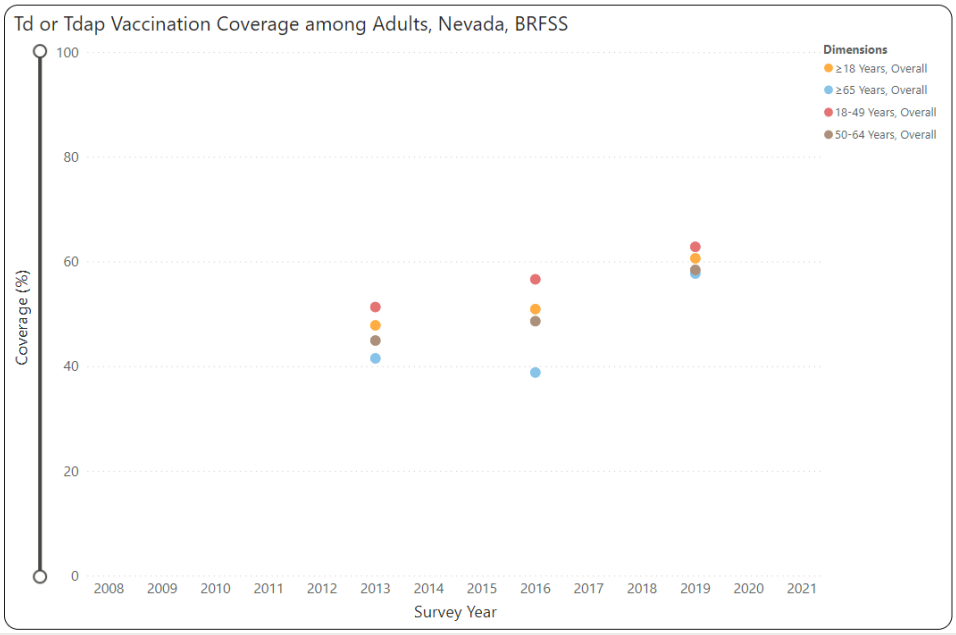
Fig. 12. Arizona Td or Tdap Vaccination Coverage among Adults, BRFSS[18]



The figure shows Td or Tdap vaccinated adults in Arizona from 2008 to 2021. Race and ethnicity are aggregated in the values.

Note: Figure replicated from CDC. Vaccination Coverage among Adults. https://www.cdc.gov/vaccines/imz-managers/coverage/adultvaxview/data-reports/general-population/index.html

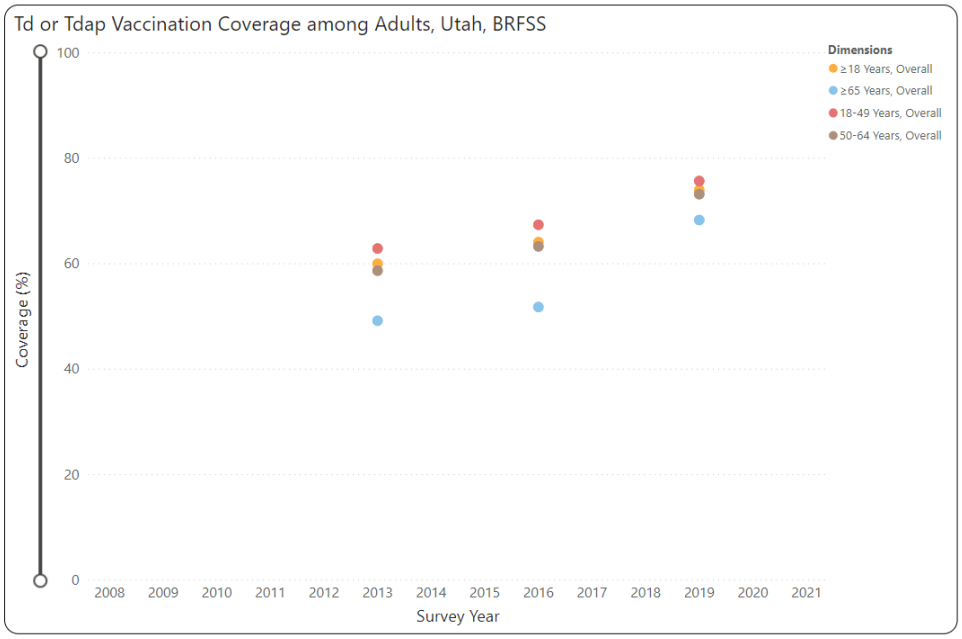
Fig. 13. Nevada Td or Tdap Vaccination Coverage among Adults, BRFSS[18]



The figure shows Td or Tdap vaccinated adults in Nevada from 2008 to 2021. Race and ethnicity are aggregated in the values.

Note: Figure replicated from CDC. Vaccination Coverage among Adults. https://www.cdc.gov/vaccines/imz-managers/coverage/adultvaxview/data-reports/general-population/index.html

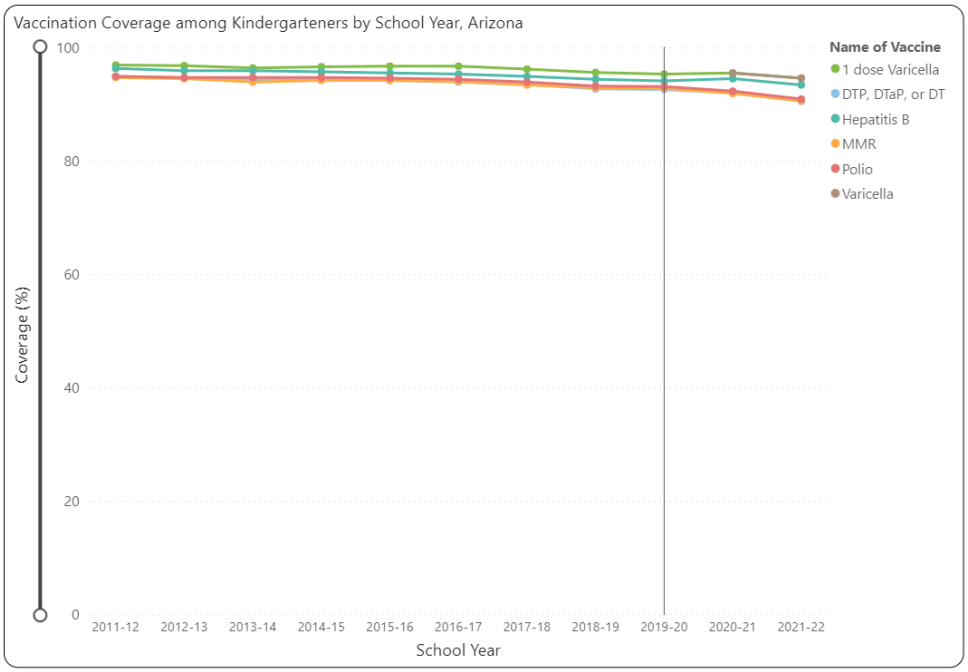
Fig. 14. Utah Td or Tdap Vaccination Coverage among Adults, BRFSS[18]



The figure shows Td or Tdap vaccinated adults in Utah from 2008 to 2021. Race and ethnicity are aggregated in the values.

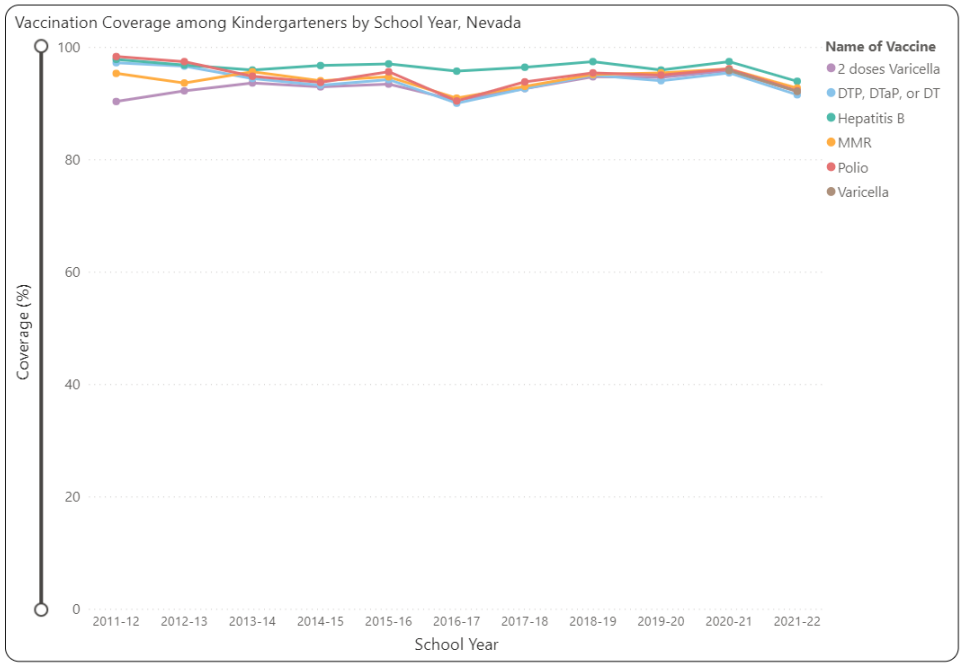
Note: Figure replicated from CDC. Vaccination Coverage among Adults. https://www.cdc.gov/vaccines/imz-managers/coverage/adultvaxview/data-reports/general-population/index.html

Fig. 15. Arizona Vaccination Coverage among Kindergarteners by School Year[19]



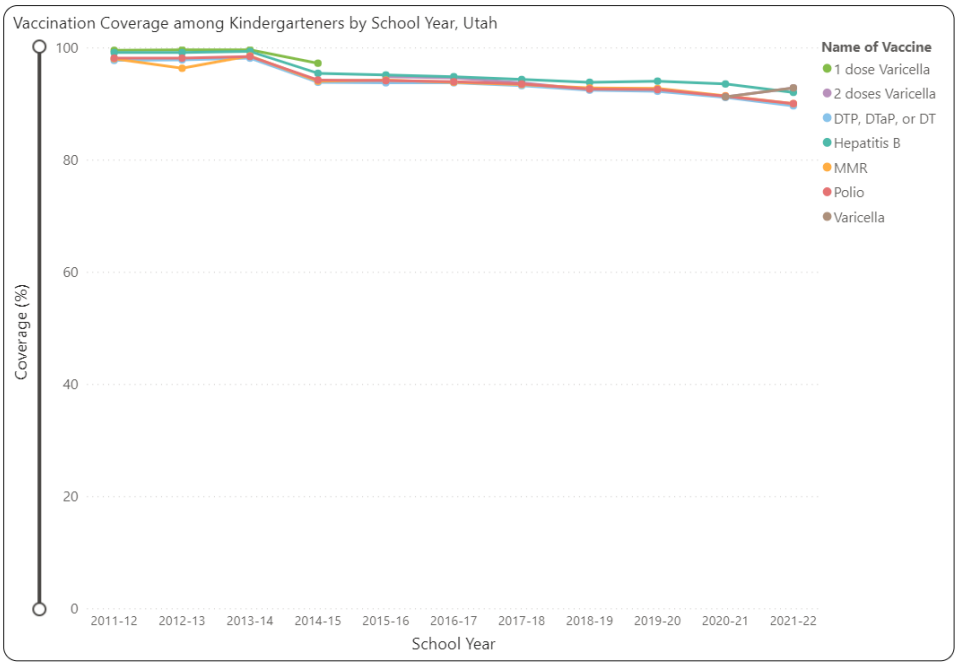
The figure shows vaccination coverage for Arizona kindergarteners by school year from 2011 to 2022. Race and ethnicity are aggregated in the values.
Note: Figure replicated from CDC. Vaccination Coverage among Adults. https://www.cdc.gov/vaccines/imz-managers/coverage/schoolvaxview/data-reports/index.html

Fig. 16. Nevada Vaccination Coverage among Kindergarteners by School Year[19]



The figure shows vaccination coverage for Nevada kindergarteners by school year from 2011 to 2022. Race and ethnicity are aggregated in the values.
Note: Figure replicated from CDC. Vaccination Coverage among Adults.
https://www.cdc.gov/vaccines/imz-managers/coverage/schoolvaxview/data-reports/index.html

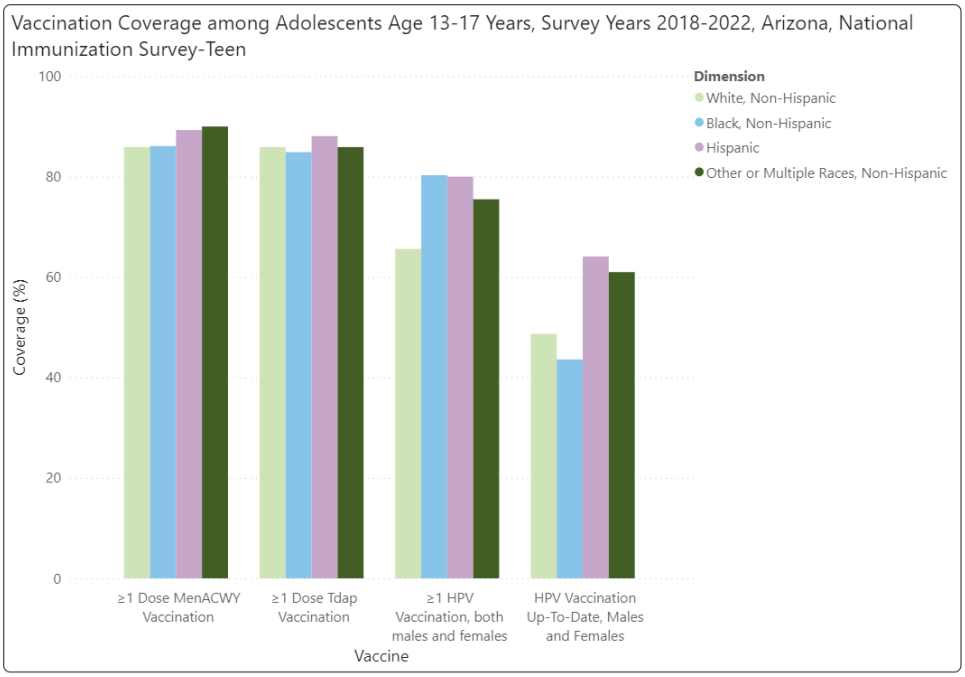
Fig. 17. Utah Vaccination Coverage among Kindergarteners by School Year[19]



The figure shows vaccination coverage for Utah kindergarteners by school year from 2011 to 2022. Race and ethnicity are aggregated in the values.

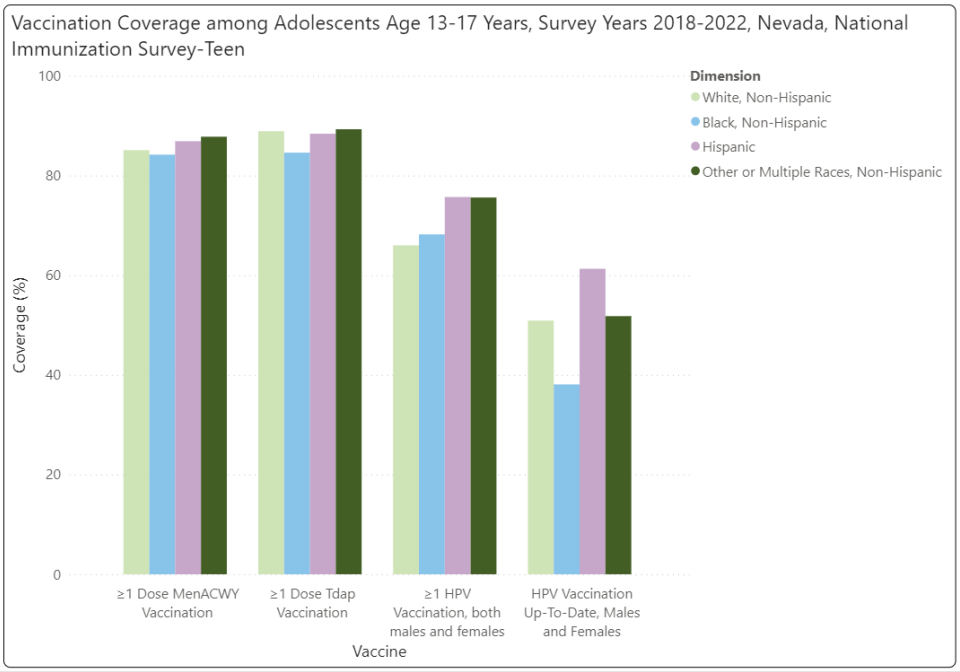
Note: Figure replicated from CDC. Vaccination Coverage among Adults.
https://www.cdc.gov/vaccines/imz-managers/coverage/schoolvaxview/data-reports/index.html

Fig. 18. Arizona Vaccination Coverage among Adolescents Age 13-17 Years, 2018-2011, National Immunization Survey-Teen[20]



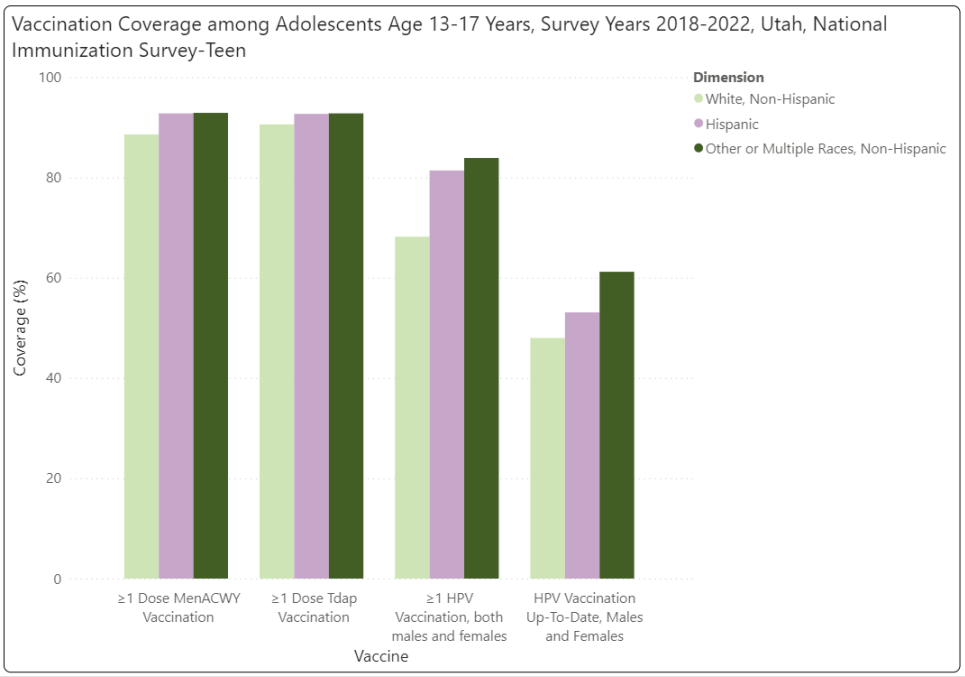
The figure shows vaccination coverage for Arizona vaccination coverage for adolescents age 13-17 for school years 2018 to 2022. Race and ethnicity are aggregated in some values.
Note: Figure replicated from CDC. Vaccination Coverage among Adolescents (13-17).
https://www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/data-reports/index.html

Fig. 19. Nevada Vaccination Coverage among Adolescents Age 13-17 Years, 2018-2011, National Immunization Survey-Teen[20]



The figure shows vaccination coverage for Nevada vaccination coverage for adolescents age 13-17 for school years 2018 to 2022. Race and ethnicity are aggregated in some values.
Note: Figure replicated from CDC. Vaccination Coverage among Adolescents (13-17). https://www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/data-reports/index.html

Fig. 20. Utah Vaccination Coverage among Adolescents Age 13-17 Years, 2018-2011, National Immunization Survey-Teen[20]



The figure shows vaccination coverage for Utah vaccination coverage for adolescents age 13-17 for school years 2018 to 2022. Race and ethnicity are aggregated in some values.
Note: Figure replicated from CDC. Vaccination Coverage among Adolescents (13-17).
https://www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/data-reports/index.html

Vaccine Availability Ecological Scan

A scan of vaccine programs and services available in the IHS Phoenix-Tucson Service Areas was conducted. The IHS website was used to identify vaccine services in the designated Service Units. The scan was performed via an internet search to assess how easy it is for the public to locate information. Vaccine accessibility was also evaluated by the scan.

Pharmacy and immunization clinic accessibility is depicted in Figures 22.a. – 24.b. Many Tribal clinics in Arizona (10) and many Arizona IHS clinics (5) posted on their websites that they have pharmacies. Few Tribal clinics in Arizona (7) and few Arizona IHS clinics (1) posted on their websites that they have immunizations. Few Tribal clinics in Nevada (5) and none of the Nevada IHS clinics (0) posted on their websites that they have pharmacies. Few Tribal clinics in Nevada (1) and none of the Nevada IHS clinics (0) posted on their websites that they have immunizations. None of the Tribal clinics in Utah (0) and none of the Utah IHS clinics (0) posted on their websites that they have pharmacies. Many Tribal clinics in Utah (4) and none of the Utah IHS clinics (0) posted on their websites that they have immunizations.

Arizona

Fig. 21.a. Pharmacy availability in IHS clinics (N=8) and Tribal clinics (17)

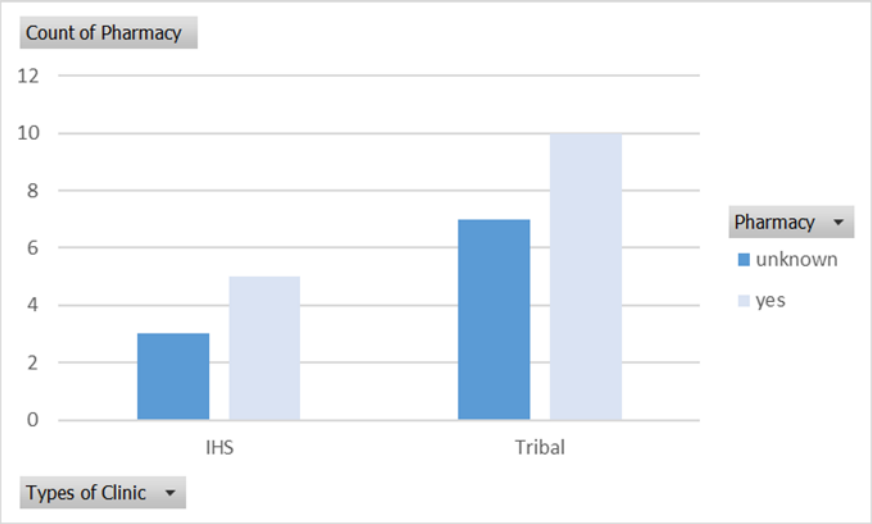
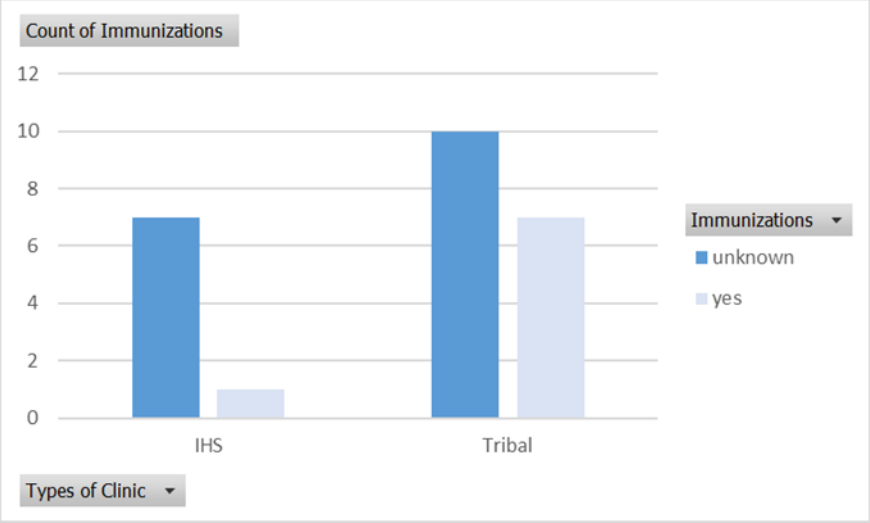


Fig. 21.b. Immunization availability in IHS clinics (N=8) and Tribal clinics (17)



Nevada

Fig. 22.a. Pharmacy availability in IHS clinics (N=1) and Tribal clinics (12)

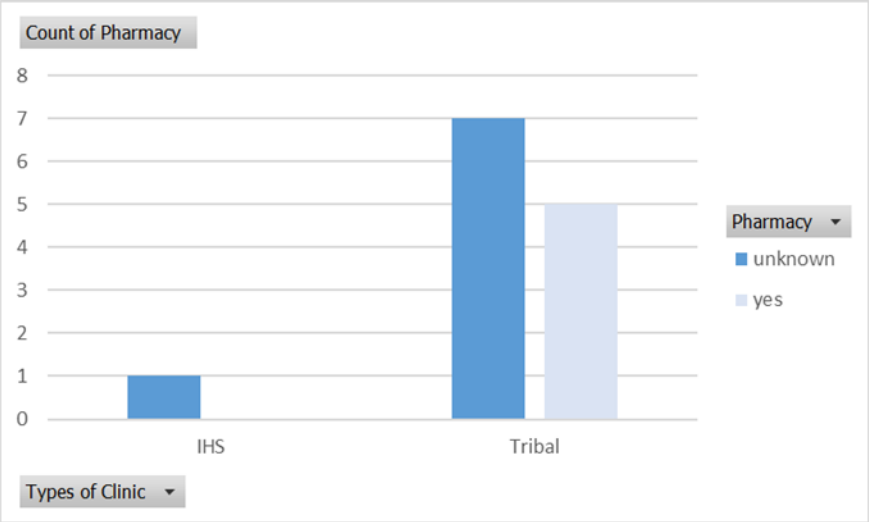
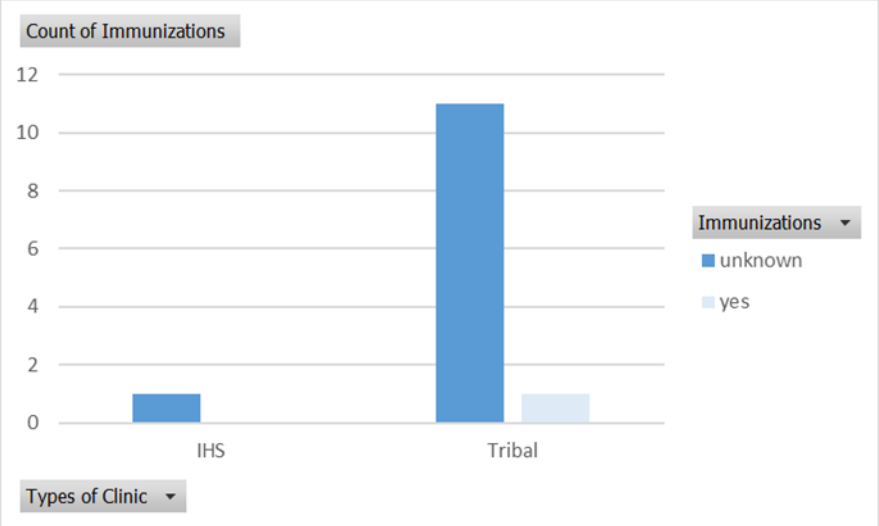


Fig. 22.b. Immunization availability in IHS clinics (N=1) and Tribal clinics (12)



Utah

Fig. 23.a. Pharmacy availability in IHS clinics (N=1) and Tribal clinics (5)

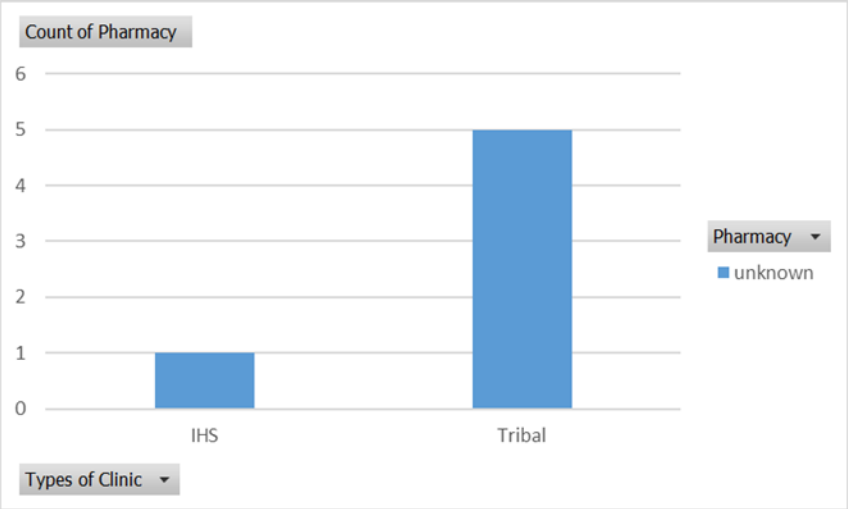
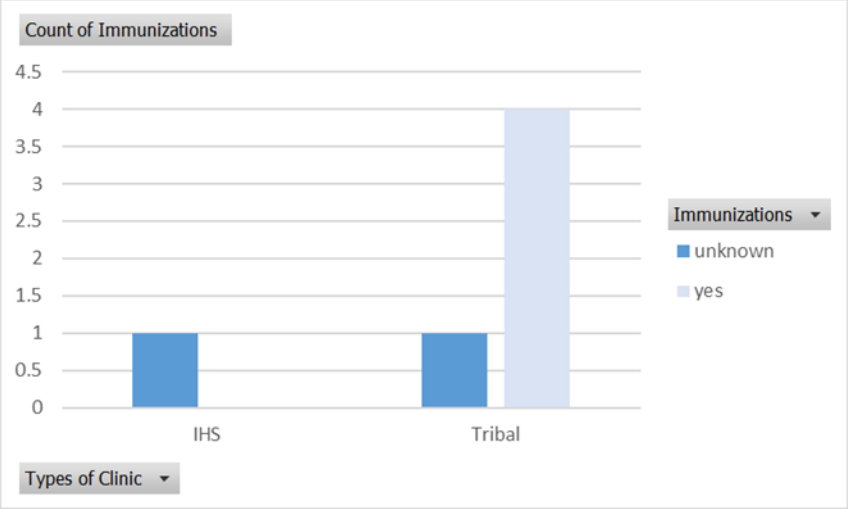


Fig. 23.b. Immunization availability in IHS clinics (N=1) and Tribal clinics (5)



Literature Review

Coronavirus Disease 2019 (COVID-19)

According to many sources, the public's opinion is that COVID-19 should have been approached differently[5,12,21]. Fear-mongering, whether purposefully or inadvertently, intensified the public's stress[5,12,21]. Panic and discourse increased as images of empty shelves circulated daily. Social media perpetuated misinformation and unsubstantiated information[5,12,21].

The process of validating information caused a delay in dissemination, making it seem that information was being withheld or manipulated[5,12]. By the time experts reported COVID-19 information, misinformation had already made it to the public with convincing language and rhetoric[5,12,21].

A grey literature review was completed via PubMed, the National Institute of Health (NIH.gov), the U.S. Department of Health and Human Services (HHS), and Google Advance to evaluate the general attitude toward vaccines. Vaccine legacy is the most significant value in vaccine confidence[5,6,12,21]. COVID-19 is a novel disease and the vaccine is new to the lay public. They are accustomed to vaccines taking years to be developed[10,21]. Despite technological advancements, people are still hesitant to apply such benefits to vaccine development. The handling of vaccine information and language were contributing factors driving the relationship in an unfavorable direction[12]. Phrases and terms like "A virus of the unvaccinated," "plandemic," "scamdemic," "true blood," "sheep," "jabbed," "poison," "cupcaked," "tin hat/head," and "5-dimensional chess player," have added to the challenge. The division between pro-vaccine and anti-vaccine has infiltrated support systems. The virus and vaccines were politicized, which is more of a personal preference than a matter of public health and safety[5,12].

Some people did not think the disease was as serious as it was presented by health officials[5,12]. The low risk of contracting the disease was a result of publically perceived health status, non-vaccine prevention measures, and others people's vaccination decisions[5,12]. Decreases in reported cases led people to believe the threat was over[5,12]. Pandemic fatigue also contributed to hesitancy[5,12].

Internet Scan

The internet scan was conducted to evaluate content consumed by the public and their responses. The aim is to provide perspective on existing attitudes and motives, not make any conclusions. The internet scan includes YouTube, Instagram, and Facebook. Only the first 10 vaccine-relevant videos and posts were viewed. The first twenty comments were evaluated for vaccine attitude. If the content had more than twenty comments, only the first twenty comments were reviewed. Comments that expressed vaccine support were counted as "Yes." Comments with anti-vaccine sentiments were counted as "No." Comments that were vague, confusing, posing questions, or not related directly to vaccines were counted as "N/A." Content emojis were weighed as content engagement and not vaccine attitude. "Vaccine" and "#vaccine" were searched on YouTube and Facebook. No results returned for "vaccine" on Instagram. Control for date was inconsistent. YouTube allowed for one year historical retrieval but videos older than one year from the search date were included. Facebook allowed historical retrieval as far back as 2004. Instagram did not have a date control option. YouTube

and Facebook rendered results for “vaccine” and “#vaccine.” The “#vaccine” could not be controlled for the date on Facebook. Only videos that were predominately related to vaccines were reviewed.

A cumulative summary of the tables shows that more comments were against vaccines than for vaccines. It should be noted that the scan does not and is not intended to conclude that the majority of the public is against vaccines or hesitant. There are several uncontrolled and unaccounted variables in this scan, i.e., small sample size, trolling, comment bombing, fear of judgment for being vaccinated, and avoidance of negative responses. The purpose of the scan is to demonstrate the usefulness of reviewing social media sources to assess vaccine attitudes. Reviewing content and comments can provide some understanding of vaccine fears or hesitancy. It can also help construct effective messaging that counters misinformation or misinterpretation of information. Table 2.1 – 2.7 displays the scan results.

Table 2.1

YouTube Engagement Sample				
Term	Comments	No	Yes	N/A
Vaccine	43,704	87	14	77
#Vaccine	35,704	102	3	71

Table 2.2

YouTube “Vaccine” Video Review Sample							
Video	Year	Comments	No	Yes	Neither	Likes	Views
Move Along: A song about vaccine mandates - YouTube	2021	10,401	3	7	10	127K	2.5M
Woman Dies 4 days after getting COVID Vaccine | Post Vaccine Deaths - YouTube	2021	12,674	15	0	5	69K	4.9M
Doctor Dies After Getting COVID Vaccine Post Vaccine Deaths - Doctor Mike Hansen - YouTube	2022	3,182	15	0	5	7K	227K
Why are more Americans declining COVID-19 vaccine boosters? - YouTube	2023	61	14	1	5	10	1.9K
'She Cannot Be The Secretary Of Labor': Mary Miller Hammers Biden Nom Julie Su Over Vaccine Mandates - YouTube	2023	396	7	0	13	1.5K	46K

Joe Rogan Hails RFK JR On Covid, SLAMS MSM Ties With Big Pharma - YouTube	2023	1,080	3	0	17	3.7K	139K
New York State Dept. of Health clarifies COVID-19 vaccine mandate repeal process - YouTube	2023	4 (only 3 visible)	1		2	1	694
Encephalitis After COVID-19 Vaccine Administration: Perspectives - YouTube	2023	3,324	11	2	7	9.5K	361K
Post-vac syndrome: 'There is no such thing as a vaccine without side effects' | DW News - YouTube	2023	349	5	4	11	398	17K
Vaccine brain injury - YouTube	2023	12,235	18	0	2	57K	866K

Table 2.3

YouTube "#Vaccine" Video Review Sample							
Video	Year	Comments	No	Yes	N/A	Likes	Views
What is a Vaccine? - YouTube	2021	2,271	0	2	18	76K	8.4M
COVID-19 mRNA Vaccine: Will It Change My DNA? - YouTube	2021	3,967	2	1	17	17K	1.1M
Latest research on vaccine side effects, immune reaction and thrombosis risks | COVID-19 Special - YouTube	2021	8,734	15	0	5	16K	2.8M
#DeSantis Flip Flop On #Covid #Vaccine - YouTube	2022	2,699	12	0	8	5.4K	247K
FDA Vaccine Advisor Warns Against #COVID Boosters for Healthy Young People - NTD Good Morning - YouTube	2023	1,898	20	0	0	17K	296K
Yikes: WSJ *Just* Exposed Covid Vaccines - YouTube	2023	141	19	0	1	13K	207K
Melanoma vaccine trial appears to reduce skin cancer recurrence - YouTube	2023	1	1	0	0	22	994

Vaccination and multiple sclerosis - YouTube	2023	12,053	19	0	1	44K	931K
#Trump vs. #DeSantis on vaccines - YouTube	2023	1,991	0	0	20	20K	620K
NHS Worker who witnessed vaccinated patients suffer - YouTube	2023	2,049	18	0	2	0	268K

Table 2.4

Facebook "Vaccine" 2018 Post Review Sample												
Topic	Like	Ha	Care	Love	Angry	Sad	Wow	Share	Comment	No	Yes	N/A
Vaccine death	35	0	0	1	42	208	11	99	20	6	0	14
Pro childhood vaccines	2,483	2	0	506	10	109	3	1.1K	174	1	9	10
Autism by vaccine	175	0	0	22	3	1	13	103	8	2		6
Vaccine safety	3	0	0	0	0	0	0	0	5	2	0	3
Polio vaccine	25	0	0	0	2	0	2	25	8	0	2	6
Vaccines	530	0	0	18	0	0	2	227	37	3	12	5
Infant Hep B vaccines	192	0	0	3	65	37	5	208	83	10	0	20
Vaccine Injury	118	1	0	14	1	6	16	268	27	3	2	15
Vaccine decisions: Epi Triangle	95	0	0	11	0	0	4	79	12	4	0	5
HPV vaccine injury	118	0	0	5	4	19	4	2.9K	13	9	0	4

Table 2.5

Facebook "Vaccine" 2020 Post Review Sample												
Topic	Like	Ha	Care	Love	Angry	Sad	Wow	Share	Comment	No	Yes	N/A
Childhood Vaccines	80	1	13	0	2	117	8	13	25	1	12	7
COVID vaccine injury	89	0	173	4	1	213	21	41	1.7K	4	0	16
Anti-vaccine	139	3	0	1	0	41	0	30	18	2	3	13
Doctor dies after COVID vaccine	68	1	30	0	2	128	14	62	115	9	0	11
Dear anti-vax parents	1.9K	8	4	252	1	0	0	201	113	1	11	8
Anti-vaccine	17	0	3	4	0	1	0	0	30	20	0	0
COVID vaccine injury	52	0	7	0	0	12	0	1	0	15	0	5
Tiffany Dover	48	0	1	0	0	3	20	21	20	5	0	15
Anti-COVID vaccine	76	1	19	13	0	1	24	1	24	20	0	3
Anti-vaxxers making up stuff	122	19	0	3	0	0	17	14	17	0	11	6

Table 2.6

Facebook "#Vaccine" 2023 Post Review Sample												
Topic	Like	Ha	Care	Love	Angry	Sad	Wow	Share	Comment	No	Yes	N/A
Former anti-vaxxers	7	5	0	0	0	2	0	1	12	3	1	8
US HHS Immunity against COVID fades over time	55	32	2	5	5	0	0	12	89	12	2	6
CDC Keep children up to date on COVID vaccine	153	38	6	18	13	0	1	36	74	14	2	4
BioNTech faces first German lawsuit over alleged COVID vaccine side effects	70	14	1	6	1	2	7	47	80	12	0	8
NBC NY Updated Covid vaccines need to target XBB Omicron variants this fall	1	5	0	0	0	0	0	3	0	0	0	0
Bloomberg: India investigates reports of Covid portal breach, data leak	9	0	0	0	0	0	0	1	3	0	0	3
The Daily Beast: Banned anti-vax "menace' is back and selling 'vaccine cures'	5	2	0	0	14	0	2	5	46	6	2	12
WHO: Vaccine-preventable diseases include:	2.3K	420	34	259	45	5	9	783	1.9K	9	3	8
WHEC TV: State health department not enforcing vaccine mandate for healthcare workers while working to repeal it	3	0	0	0	2	0	0	1	6	3	1	2
CDC COVID vaccine for immunocompromised	166	45	14	5	5	2	1	41	147	6	1	13

Table 2.7

Instagram "#Vaccine" 2023 Review Sample					
Topic	Like	Comment	No	Yes	N/A
vaccine for cancers and heart disease could be ready by end of 2030	40,360	169	2	0	18
Jamie Foxx	23	10	2	0	8
One-shot chikungunya vaccine found safe, effective in first phase 3 trial, Lancet study	580	5	0	1	4
Get your shingles vaccine	14	not listed	0	2	3
if abortion is murder, the letting your child die of a preventable disease …	3,306	113	0	7	13
Please get the COVID booster	67	10	0	1	9

Genocideblog.com	75	7	4		3
The first c-19 vaccine was given without any safety data	599	61	13	0	7
covid vax injury	38	16	3	0	11
Donald J. Trump	4,168	208	4	1	15

Strategies to overcome vaccine hesitancy

Understand the source of hesitancy[5]. Some people view vaccinations to be against their religion or personal devotion[5]. Another reason for hesitancy is governmental mandates. Although each state is authorized by law to mandate vaccines, some who oppose vaccine mandates feel they are an act of restriction on civil rights and liberties[5]. Unvaccinated or under-vaccinated children are not allowed to attend school[22,23]. Individuals can experience adverse reactions that can be traumatizing as well[6]. Many of these reaction stories are shared with a loud enough voice that they appear as if they are experienced by the majority. These are all factors that should be considered when developing vaccine uptake strategies[6]. Common strategies are included below.

Community Rapid Assessment[24]. Zambia's Ministry of Health utilized community rapid assessment to investigate and address COVID-19 vaccine declines in 2021[24]. This approach evaluated vaccine attitudes based on the heterogeneity of communities[24]. Survey results were used to understand what social and behavioral changes could be addressed to improve vaccine coverage[24]. The target population was segmented by attitudes and motivations[24]. Specific interventions were employed that appealed to each segment's drivers[24].

Health workers learned what the respondents knew, believed, and thought about vaccines[6,24]. The survey also gauged what factors would increase the respondent's likelihood of getting vaccinated[24]. General themes talked about lived or secondary experiences, making access to vaccines easier (where and when to get vaccinated), involving trusted community figures/entities (religious leaders, teachers, local businesses), and having a presence with vulnerable populations (hangouts, living facilities, convenience stores)[24]. Vaccine advocates should find out where people get their information and who they trust[6,21,24]. Additionally, they should listen to conversations, acting as a facilitator to stay on topic, not to promote vaccine uptake[6,25].

Intensification of Integrated Immunization (3iS) Outreach. The 3iS outreach is a direct approach that takes vaccines to the targeted populations[24]. The Ministry of Health of Iraq implemented the 3iS outreach to address suboptimal COVID-19 and routine vaccination coverage[24]. Some known causes were, "vaccine hesitancy, disbelief in or perceived low threat

posed by the virus in the country's predominately young population, weak disincentives for remaining unvaccinated, and mistrust in government[24]."

The 3iS outreach included an outreach team that mobilized vaccination opportunities throughout low-coverage communities and populations[24]. The team consisted of two vaccinators, two registrars, a data entry officer, and a community mobilizer[24]. Community members were engaged at schools, shopping centers, and their homes[24]. Mobile clinics and vaccination points were established within communities as well[24]. The intervention was launched in February 2022 and continues on a quarterly basis[24]. This approach resulted in 149,000 zero-dose children resuming routine vaccinations and 4.4 million vaccines delivered. The country reached 93% DTP3 and 88% measles vaccination coverage by October 2022[24].

Human-centered Design (HCD). HCD approaches problem-solving through the lens of the target population or end user[24]. It focuses on human factors that influence the problem and other confounding challenges[24]. This approach was implemented in Ghana in 2022 to address COVID-19 vaccine disparities[24]. COVID-19 vaccine coverage was low despite half of eligible Ghanaians' agreement with getting vaccinated and an inventory to administer at least one dose to 88% of eligible persons[24]. Stakeholders and partners conducted rapid inquiries with vaccinators and those being vaccinated during a workplace booster event, at a government health center, and a mobile vaccination site in the local market[24]. Two factors were discovered: 1) convenience: people will get vaccinated when it is convenient for them, 2) accessibility: location, time, and other accessibility information needs to be easy to read, consistent, and readily available[24]. Tailored posters and signs were made to make vaccination sites recognizable as well as accessibility information[24].

Risk Communication and Community Engagement (RCCE). The rapid spread of COVID-19 in India prompted health officials to implement the RCCE initiative to reach underserved and underrepresented communities[24]. Eleven states and 70 districts were surveyed to design a community-led intervention that would appeal to marginalized communities[24]. The initiative included 560 community fellows that provided remote and marginalized communities with relevant, current, and accurate COVID-19 information and resources[24]. The initiative reached 100,000 households and increased the vaccine rate to 25%[24].

Design appropriate messaging. Customizing messages to a specific audience connects with the receivers[25-27]. Connections can be made emotionally, culturally, and logically[6,27]. Use empathetic informal language that focuses on the humanity of the audience[6,25,26]. Limit focusing on disease outcomes and highlight the benefits of vaccines[6]. Avoid making presumptive statements such as, "You want the best for your children, don't you?" This can be perceived as gaslighting or judgmental[6,26]. Explore promotional images of the audience and use similar styles in messaging[6,26].

Educate the audience[6]. Make sure strategies include elements of education[6,26]. Providing accurate information about vaccines subtly combats misinformation and anti-vaccine rhetoric[6,26]. Keep educational elements simple but effective. Focus on one educational element at a time. Equipping the public with unbiased information is an invaluable tool in vaccine uptake[6,26]. Instead of telling them to get vaccinated, give them the tools to make informed decisions[6,26]. This prevents the sense that vaccines are being forced on them[6,26].

Use crowdsourcing and digital disease detection (DDD) for focused efforts[2]. Monitoring social media posts and health department surveillance systems can indicate potential outbreaks[2]. Preventative efforts can be concentrated in the area or population[2]. DDD also improves targeted efforts as it specifies demographics that can be leveraged in developing relevant messaging or other interventions[2]. Caution should be taken when employing DDD to protect individual privacy[2]. This form of data mining should be geared toward identifying, preventing, and/or controlling potential outbreaks and not to expose individual identity[2].

Lean on and equip trusted sources. Some people base their vaccine decision-making on the recommendations of their primary care or other medical professionals[26,28]. Others value the advice of family, friends, and community leaders (as inferred from the social media scan). What both groups seem to agree on is the approach should not be aggressive, rushed, or authoritative[6,25,26]. Some social media comments about vaccine regret were that they felt "bullied" or "forced" into getting vaccinated. When trusted sources are identified, equip them with the skills and resources to approach vaccine discussions[6,26]. People need to feel empowered and that they have the ability to make the best decision for their own health and well-being[6,21].

Utilize existing toolkits. Toolkits are versatile resources that include strategies, educational materials, community products, and resources for healthcare workers. There are several vaccine confidence and uptake toolkits available. Determine the approach, audience, and desired outcome to choose the best toolkit. Toolkits can be used as they are or customized to fit the intervention.

Recognize and encourage local/community influencers. Influencers do not have to have a huge public following[6,25,26,28]. They can be members of the local community with a reputable standing[28]. These individuals should be supported in their efforts and recognized for their influence[28]. Allow them to utilize their method of influence. They should not be persuaded to advocate publicly if they are not willing but should be supported if they choose to expand their influence publicly.

Support vaccinated people. They may feel uncertain about their decision to get or have their children vaccinated[6,26]. The internet scan revealed damaged relationships between

pro- and anti-vaccination groups. This may be the same for vaccinated and unvaccinated people.

Summary

Hesitancy is not solely a matter of refusal but stems from a deeper psychological basis. There are many factors to consider when addressing vaccine hesitancy. Not all hesitancy cases can be handled the same. Understanding the underlying causes of vaccine hesitancy is essential to improving vaccine uptake.

Reviewing vaccine-related content provides insight into the type of information the public is consuming. Social media platforms and simple Google searches have become a place where most people seek information and answers. It is just as important to be aware of the language and tactics employed by vaccine opponents and the vaccine-hesitant. Advocates should also aim to include education in efforts. Rather than avoiding the use of technical terms completely, give an explanation. Since most laypersons will consult the internet, vaccine advocates should optimize these engagement opportunities. This may require additional staffing to monitor comment sections for questions, concerns, or misinformation. Social media scans can also expose gaps in availability, accessibility, and knowledge.

There are many approaches to vaccine uptake. However, vaccine uptake strategies should include the cause of hesitancy and address the humanistic factors. This not only improves the quality of efforts but also helps connect with the audience. Acknowledging the causes of hesitancy presents a sense of compassion directed toward the person and not a campaign focused on disease. When people feel valued, trustworthy relationships are built, which is a key component in vaccine uptake.

Messaging should be adaptive and balanced between lived experiences and evidence-based. Lived experience messages should convey the benefits of vaccinations as well as the possible consequences. It is crucial to promote success and a hopeful lived experience. Fatal outcomes do not need to be avoided but communicated minimally to prevent the perception of fear-mongering. Evidence-based messaging is important in proving safety, effectiveness, and efficacy. Make evidence-based messaging relatable to the target population. Include elements familiar to their environment and simplify statistics.

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