

COVID-19 Healthcare Inequity: Lessons Learned from Annual Influenza Vaccination Rates to Mitigate COVID-19 Vaccine Disparities

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The COVID-19 pandemic has infected 33 million Americans and resulted in more than 600,000 deaths as of late Spring 2021. Black, Indigenous, and Latinx (BIL) people are disproportionately infected, hospitalized, and dying. Effective vaccines were rapidly developed and have been widely available in the United States since their initial rollout in late 2020-early 2021 but vaccination rates in BIL communities have remained low compared with non-BIL communities. Limited access to the vaccine, lack of customized information, and mistrust of the medical system, all contribute to vaccine hesitancy and low vaccination rates. Regrettably, COVID-19 is not the only vaccine-preventable illness with racial/ethnic inequities. Similar inequities are seen with the seasonal influenza vaccine. We review the racial/ethnic health disparities in COVID-19 illness and vaccination rates and what inequities contribute to these disparities. We use evidence from the seasonal influenza vaccination efforts to inform potential strategies to attenuate these inequities. The development of effective and sustainable strategies to improve vaccination rates and reduce factors that result in health inequities is essential in managing current and future pandemics and promoting improved health for all communities.

The World Health Organization (WHO) declared COVID-19, the disease caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), a pandemic on March 11, 2020. Travel bans, social/physical distancing, and mask guidelines were implemented heterogeneously around the world. Hospitals in affected regions were quickly overwhelmed and resources stretched near or beyond capacity. By August 2020,

COVID-19 was the third-leading cause of death in the United States [1]. Early in the pandemic it was clear that there was greater morbidity and mortality for older populations [2]. However, as the number of cases and deaths rose, racial/ethnic health inequities were also identified. Black, Indigenous, and Latinx (BIL) people were disproportionately infected, hospitalized, and dying [3,4]. Immunization against COVID-19 is critical to end the

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Abbreviations: COVID-19, Coronavirus disease-2019; SARS-CoV-2, Severe acute respiratory syndrome coronavirus 2; BIL, Black/Indigenous/Latinx; FDA, Food and Drug Administration; CDC, Center for Disease Control and Prevention.

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Table 1. Race/ethnicity Proportions for Cases and Deaths from COVID-19 as of June 1st, 2021, as Reported by the CDC COVID Tracker. Percentages Displayed Represent Data for which the Demographic Variable of Interest is Known [3]

	% of US population	Total cases	Total deaths
Non-Latinx Black	13%	11%	14%
Latinx	18%	29%	19%
Indigenous (American Indian/Alaska Native)	0.7%	1%	1%
Non-Latinx Asian	6%	3%	4%
Native Hawaiian/Pacific Islander	0.2%	0.3%	0.2%
Multiple/Other	2%	5%	4%
Non-Latinx White	60%	50%	59%

pandemic, especially for BIL communities.

Unfortunately, history is replete with previous vaccination efforts whose reach was limited due to health inequities. Current vaccination rates among BIL communities remains disproportionately low. Immunizations to end the pandemic are only successful with high rates of acceptance, access, and uptake of vaccinations for the entire population. We first review the health inequities for BIL populations with COVID-19. We then explore lessons learned to identify and mitigate health disparities for COVID-19 vaccination, informed by factors affecting influenza vaccine disparities in the past.

HEALTH INEQUITIES IN COVID-19

The first wave of COVID-19 peaked in the spring of 2020 with >25,000 new cases every week in the US [3]. BIL communities accounted for more cases and deaths relative to their population (Table 1); the 20% of US counties with a majority of Black residents accounted for 52% of cases and 58% of deaths attributed to COVID-19 [5]. By July 2020, hospitalization rates and death rates per 10,000 were 24.6 and 5.6 for Black patients, 30.4 and 5.6 for Latinx patients, and 7.4 and 2.3 for White patients, respectively [6]. Indigenous people were also getting infected and dying at a disproportionate rate to their population [3]. In the second COVID-19 wave (winter 2020-2021), there were more than 200,000 new cases in the US each week. BIL people again had the highest death rates, this time led by deaths among Indigenous people, followed by Latinx people [3,7]. Disparities in access to health care, care for chronic conditions, and occupational hazards, have been the primary explanatory drivers of health disparities leading to excess burden of disease and death among BIL communities [8].

Safe and highly effective vaccines were rapidly developed and tested. By December 2020, the Food and Drug Administration (FDA) approved the first vaccines to protect against serious COVID-19 infection, and

as of June 1st, 2021, 52% of US adults have been fully vaccinated [9]. However, vaccination development and distribution again perpetuated inequities experienced by BIL populations. Examining disparities in influenza vaccination campaigns among BIL communities may help understand root causes of these disparities and identify potential strategies for overcoming inequities.

INFLUENZA VACCINATION IN BIL COMMUNITIES

In the 2019-2020 flu season, there were 38 million confirmed flu cases, 400,000 hospital visits, and 22,000 flu-related deaths [10]. Between 2009 and 2019, hospitalization rates for BIL communities were nearly double compared with Whites (68/100,000 vs. 38/100,000) with similar disparities for Indigenous people (48/100,000) and Latinx communities (44/100,000) [10]. As a result, vaccination is especially important for these communities, yet influenza vaccination rates are disproportionately low among BIL communities. During the 2019-2020 flu season, 53% of White adults were vaccinated, compared with 41% of Black adults and 38% of Latinx adults [11,12]. Interestingly, vaccination rates for BIL children is equal to or higher than White children. For example, in the 2018-2019 flu season, 60% of Black children and 66% of Latinx children were vaccinated compared with 61% of White children. This is likely related to pediatric vaccination programs, like the federally-funded Vaccines for Children program, that deliver free vaccines to all children. These data suggest that insurance status perpetuates lower vaccination rates among adult BIL populations, but can be overcome with population health-based strategies [13]. Less access to primary care and delaying medical care due to cost also results in lower vaccine uptake [12]. Medical mistrust, health literacy, and lived experiences with discrimination in healthcare settings also contribute to lower flu vaccination rates [14-16].

FACTORS ASSOCIATED WITH RACIAL INEQUITIES IN VACCINATION RATES

Vaccine hesitancy, defined as the delay in acceptance or refusal of immunization despite availability, is highest among Black and Latinx people. A major contributing factor to vaccine hesitancy is mistrust of the health care system and clinical research. The US has a long history of exploitation and unethical conduct towards the Black community. Most notoriously, in the syphilis study at Tuskegee, investigators withheld curative treatment from hundreds of Black men for decades after the discovery of penicillin in order to study the natural history of the disease. This is just one example of the many experimental exploitations of BIL communities littered throughout US history [17]. There has also been lesser known medical malpractices such as eugenics laws and other ethical violations that disproportionately impacted Latinx [18] and indigenous communities [19-21].

Racism and provider bias also influence medical treatment for BIL communities and undermine trust for many members of the BIL population, despite efforts to improve ethical standards of human research. Race is a sociopolitical construct that provides a disadvantage to people of color. Racism is associated with poorer mental and physical health outcomes and negative patient experiences with the healthcare system. Self-reported experiences of racism by patients resulted in higher levels of mistrust, lower levels of satisfaction, and decreased engagement with the healthcare system, resulting in delayed medical care, lack of adherence to treatments or avoidance with the healthcare system altogether [22]. Systemic racism, which is embedded in laws and regulations, leads to discrimination in health care (as well as education, employment, housing, criminal justice, etc.) [23-26]. Systemic racism in the US is a fundamental contributor to health disparities in the BIL communities but is beyond the scope of this review.

Implicit biases of health care providers also contribute to health disparities. A systematic review analyzed 15 studies assessing implicit racial/ethnic bias among health care providers, and low to moderate levels of bias were found, with positive bias towards White people, and negative biases towards Black, Latinx, and dark-skinned people. There is also bias against non-English speakers and those that speak English with an accent, that can result in negative stereotypes and prejudice [27]. Implicit bias affects patient-provider interactions, treatment decisions, and patient health outcomes [28].

Vaccine messaging and access also contribute to disparities in vaccination rates in BIL communities. Language barriers and lack of culturally targeted educational information hinder vaccination messaging [29]. Access to vaccines due to health insurance status also impedes equi-

ty in vaccination, with Black and Latinx adults less likely to be insured. Lack of universal paid sick leave contributes to concerns about missing work due to vaccine side effects, as well as worry about out-of-pocket vaccination expenses. BIL persons may also feel uncomfortable accepting vaccinations if they are not able to get vaccinated from a place they trust. Further, reliance on web-based vaccine registration systems disadvantages communities with less access to technology. Black and Latinx adults are less likely to own a computer or have high speed internet at home (57-58%) compared to 86% of White adults [30]. Indigenous people also have this barrier: 1 in 5 reservation residents has no internet at home [31].

COVID-19 VACCINATION DEVELOPMENT AND ALLOCATION

BIL Representation in COVID-19 Vaccination Trials

With factors suppressing successful flu vaccination efforts of BIL communities established, we next examine racial/ethnic disparities in COVID-19 vaccination efforts. Despite outreach efforts and intentional recruiting strategies, BIL persons were underrepresented subjects in clinical trials [32]. Although Black people make up 13% of the US population, they historically make up less than 5% of enrollees in vaccine trials [33]. Regulatory agencies like FDA encourage greater diversity in clinical trials and require participant-reported race and ethnicity data be collected [34]. For COVID-19 vaccine trials, specific calls to prioritize racial/ethnic minority enrollment were heard, given the disparate burden of the pandemic on these populations [35,36]. Both the Pfizer and Moderna COVID-19 vaccine trials made efforts to increase racial diversity among trial participants with some success, especially among Latinx communities. While Black participation reached historic highs for vaccine trials (9-10%), they remained underrepresented relative to their portion of the total US population and their share of COVID-19 morbidity (Table 2). Participation of Indigenous people in the COVID-19 vaccine trials also remained low, with only the Navajo Nation and the White Mountain Apache Tribe participating in the trials despite 20 other federally-recognized tribes [37]. The persistent underrepresentation of BIL persons in clinical trials limits the ability of healthcare providers to accurately estimate the risks and benefits of vaccination in BIL communities. Without adequate representation in trials, the validity and generalizability of the results are reasonably called into question by the communities most at risk for serious disease and death.

Attitudes Towards COVID-19 Vaccination

Suboptimal vaccine trial enrollment among BIL

Table 2. Percentage of Trial Participants by Self-identified Racial/ethnic Groupings Compared with Percentage of that Group in the US Population as of June 1st, 2021 [3,50,51]

	% of US population	% participants in Pfizer trial	% participants in Moderna trial
Black	13.0%	9.0%	10.0%
Latinx	18.0%	28.0%	21.0%
Indigenous (American Indian/Alaska Native)	0.7%	0.5%	0.8%
White	60.0%	83.0%	79.0%

communities was anticipated. A survey conducted between June and December of 2020 asked participants 1) their level of willingness to participate in COVID-19 vaccine trials, 2) how likely they would be to get vaccinated, and 3) their level of medical mistrust. Black participants were least likely to agree to participate in the vaccine trial or to get vaccinated if offered. Medical mistrust scores were also highest among Black participants, followed by those who identified as Hispanic [38]. Factors contributing to vaccine hesitancy for COVID-19 are not intractable and updated studies from October 2020 to March 2021 suggest improved public trust and uptake in vaccinations. However, rates of mistrust remain highest in those who identify as Black or Hispanic [39]. There are also some tribal leaders that have expressed concerns about the safety of the vaccine, limiting the acceptance among Indigenous people [40].

Distribution of COVID-19 Vaccines to BIL Communities

Following emergency use authorization of the COVID-19 vaccines, the Advisory Committee on Immunization Practices, an independent panel of medical and health experts, provided recommendations and guidance to the CDC regarding vaccine use and allocation. Their goal was to strategically examine COVID-19 disease burden and create a plan to mitigate health inequities in vaccine distribution. A phased allocation plan was created. Phase 1a prioritized those with high risk of exposure or high risk of morbidity and mortality: health care personnel and residents of long-term care facilities. The subsequent phases included essential workers, age 75 and older, and those with high-risk medical conditions [41]. Efforts to address racial inequities of COVID-19 were also made through the Federal Retail Pharmacy Program, a collaboration between the federal government and 21 national pharmacy partners and networks, to increase access of COVID-19 vaccines across the US, 40% of which are in underserved areas. The Health Center COVID-19 Vaccine Program allocates doses directly to community-based health care centers, which receive federal funding to provide primary care in underserved areas, that sign up to administer the vaccine. Over 91% of

these health center patients live at or below 200% of the poverty level, defined as income less than \$17,000 annually for a single-person household in 2020. Although both efforts do not specifically target the BIL communities, it prioritizes people who suffer from the social determinants of health that are highly prevalent in BIL communities due to systemic racism. Public figures also encouraged the BIL communities to get vaccinated, including leaders of historically black colleges and universities, artists like Spike Lee, and President and First Lady Barack and Michelle Obama. Similarly, for Indigenous communities, a tribal consultation was initiated to seek input from tribal leaders on the COVID-19 vaccination plan [42].

Despite the efforts made to encourage and provide access to COVID-19 vaccines, current vaccination rates among BIL communities remain disproportionately low. As of June 1st, 2021, fully vaccinated persons are only 9% Black, 14% Latinx, and 1% Indigenous, compared with 63% of Whites. However, recent national data (June 2021) show increasing vaccination rates in Latinx and Black communities. Thirty percent of vaccines administered during that month have gone to Latinx people and 12% to Black people [9,43]. These trends suggest a narrowing of racial gaps in vaccination. However, the share of vaccinations in BIL people is still less than their share of cases and deaths. For example, in California, 29% of vaccinated people are Latinx, but they make up 63% of cases, 48% of deaths, and 40% of the total population. Tracking vaccinations in BIL communities is also imprecise, with limitations and gaps in vaccination data. For example, there is separate reporting for vaccinations administered through the Indian Health Service, which limits the ability to analyze vaccination rates among the Indigenous communities [43].

WE CAN DO BETTER: STRATEGIES TO IMPROVE INEQUITIES IN VACCINATION RATES

Providing culturally specific messaging and linguistically tailored content may help improve how we inform and promote vaccination to BIL communities. Research shows interventions that include provider counseling and

patient outreach improve influenza vaccination rates [44]. Also, messaging that comes from trusted members of the BIL communities, such as religious leaders and BIL medical professionals can also improve vaccination rates [45]. Partnering with trusted BIL medical professionals also helps address mistrust in these communities. The Institute of Medicine stated greater racial and ethnic diversity among health professional would improve access to and quality of healthcare for all Americans [46]. BIL providers are also more likely than their White peers to serve in medically underserved communities [47]. Prioritizing strategies that will increase the number of BIL health care providers is essential to attenuating future health disparities. The sole emphasis should not be on shifting the focus of BIL communities: listening to communities' voices, educating health care organizations to respectfully engage with BIL communities, and reducing implicit bias can improve trustworthiness of the health-care system.

Improving vaccine access also improves vaccination rates [48]. There is currently adequate supply of the COVID vaccine and it is available free of charge. However, the vaccine is available at specific vaccination sites, and registration to get vaccinated is only done online in some areas. Meeting members of the BIL communities where they are would likely make a significant impact. For example, in San Bernardino County, California, a predominantly Black and Latinx community, a mobile vaccination clinic provided easily accessible COVID vaccinations. The effort partnered with the Inland Empire Concerned African American Churches and Loma Linda University to set up a mobile clinic in a church parking lot. It was promoted by local Black faith leaders who also provided education, advertising, and help with registration [45]. The mobile clinic immunized 417 community members in a 30-day period, 91% of which were Black or Latinx. Drive-through vaccination clinics on Native American reservations have increased vaccination rates among Indigenous people [40]. This demonstrates that collaborative, multi-disciplinary, community-based strategies can be effective in reducing inequities. Supporting research that collects, analyzes, and reports data that highlights how BIL communities are disproportionately impacted and which interventions are feasible in reducing vaccine-preventable illnesses is imperative and likely effective.

CONCLUSION AND OUTLOOK

Despite recent trends that suggest improving racial equity in COVID-19 vaccination rates, disparities persist. Lower rates in vaccination leave BIL communities at increased risk for COVID, particularly as new variants spread, limiting the nation's recovery. Efforts are under-

way to continue to narrow this gap. The Biden administration's COVID-19 Health Equity Task Force aims to provide specific recommendations on how to best mitigate inequities caused or exacerbated by the COVID-19 pandemic, and to prevent such inequities in the future [49]. Collaborative efforts that focus on customized outreach to reduce mistrust, hesitancy, and improve access are all important strategies to overcome these inequities. Fighting systemic racism to improve the social determinants of health that are the foundation for these inequities is also essential. Creating effective and sustainable solutions to inequities in vaccination rates will prevent future health disparities for the BIL communities.

REFERENCES

1. Ahmad FB CJ, Miniño A, Anderson RN. Provisional Mortality Data - United States, 2020. March 31st, 2021. Report No.
2. Shahid Z, Kalayanamitra R, McClafferty B, Kepko D, Ramgobin D, Patel R, et al. COVID-19 and Older Adults: What We Know. *J Am Geriatr Soc*. 2020 May;68(5):926–9.
3. CDC. Demographic Trends of COVID-19 cases and deaths in the US reported to the CDC 2021.
4. Xie Y, Bowe B, Maddukuri G, Al-Aly Z. Comparative evaluation of clinical manifestations and risk of death in patients admitted to hospital with covid-19 and seasonal influenza: cohort study. *BMJ*. 2020 Dec;371:m4677.
5. Millett GA, Jones AT, Benkeser D, Baral S, Mercer L, Beyrer C, et al. Assessing differential impacts of COVID-19 on black communities. *Ann Epidemiol*. 2020 Jul;47:37–44.
6. Lopez L 3rd, Hart LH 3rd, Katz MH. Racial and Ethnic Health Disparities Related to COVID-19. *JAMA*. 2021 Feb;325(8):719–20.
7. Rentsch CT, Kidwai-Khan F, Tate JP, Park LS, King JT Jr, Skanderson M, et al. Patterns of COVID-19 testing and mortality by race and ethnicity among United States veterans: A nationwide cohort study. *PLoS Med*. 2020 Sep;17(9):e1003379.
8. Baciú A NY, Geller A, et al. The Root Causes of Health Inequity. National Academies of Sciences, Engineering, and Medicine, 2017.
9. CDC. COVID-19 Vaccinations in the United States 2021 [cited 2021 June 1st]. Available from: <https://covid.cdc.gov/covid-data-tracker/#vaccinations>
10. CDC. Rates of Influenza Hospitalization 2021. Available from: <https://gis.cdc.gov/GRASP/Fluview/FluHospRates.html>
11. CDC. Flu Vaccination Coverage, United States, 2019-20 Influenza Season 2019. Available from: <https://www.cdc.gov/flu/fluview/coverage-1920estimates.htm>
12. Brewer LI, Ommerborn MJ, Nguyen AL, Clark CR. Structural inequities in seasonal influenza vaccination rates. *BMC Public Health*. 2021 Jun;21(1):1166.
13. Santibanez TA, Lu PJ, O'Halloran A, Meghani A, Grabowsky M, Singleton JA. Trends in childhood influenza vaccination coverage—U.S., 2004-2012. *Public Health Rep*. 2014 Sep-Oct;129(5):417–27.
14. Quinn SC. African American adults and seasonal influenza

- vaccination: changing our approach can move the needle. *Hum Vaccin Immunother*. 2018 Mar;14(3):719–23.
15. SteelFisher GK, Blendon RJ, Kang M, Ward JR, Kahn EB, Maddox KE, et al. Adoption of preventive behaviors in response to the 2009 H1N1 influenza pandemic: a multi-ethnic perspective. *Influenza Other Respir Viruses*. 2015 May;9(3):131–42.
 16. Quinn SC, Jamison A, Freimuth VS, An J, Hancock GR, Musa D. Exploring racial influences on flu vaccine attitudes and behavior: results of a national survey of White and African American adults. *Vaccine*. 2017 Feb;35(8):1167–74.
 17. Washington H. *Medical apartheid: the dark history of medical experimentation on Black Americans from colonial times to the present*. Doubleday; 2006. 528 pp.
 18. Novak NL, Lira N, O'Connor KE, Harlow SD, Kardias SL, Stern AM. Disproportionate Sterilization of Latinos Under California's Eugenic Sterilization Program, 1920-1945. *Am J Public Health*. 2018 May;108(5):611–3.
 19. Carpio MV. The Lost Generation: American Indian Women and Sterilization Abuse. *Soc Justice*. 2004;31(4 (98)):40–53.
 20. Garrison NA. Genomic Justice for Native Americans: Impact of the Havasupai Case on Genetic Research. *Sci Technol Human Values*. 2013;38(2):201-23. Epub 12/21. <https://doi.org/10.1177/0162243912470009>.
 21. Pacheco CM, Daley SM, Brown T, Filippi M, Greiner KA, Daley CM. Moving forward: breaking the cycle of mistrust between American Indians and researchers. *Am J Public Health*. 2013;103(12):2152-9. Epub 10/17. <https://doi.org/10.2105/AJPH.2013.301480>.
 22. Ben J, Cormack D, Harris R, Paradies Y. Racism and health service utilisation: A systematic review and meta-analysis. *PLoS One*. 2017 Dec;12(12):e0189900.
 23. Mahmud SM, Xu L, Hall LL, Puckrein G, Thommes E, Loiacono MM, et al. Effect of race and ethnicity on influenza vaccine uptake among older US Medicare beneficiaries: a record-linkage cohort study. *Lancet Healthy Longev*. 2021;2(3):e143–53.
 24. Feagin J, Bennefield Z. Systemic racism and U.S. health care. *Soc Sci Med*. 2014 Feb;103:7–14.
 25. Bailey ZD, Krieger N, Agénor M, Graves J, Linos N, Bassett MT. Structural racism and health inequities in the USA: evidence and interventions. *Lancet*. 2017 Apr;389(10077):1453–63.
 26. O'Brien R, Neman T, Seltzer N, Evans L, Venkataramani A. Structural racism, economic opportunity and racial health disparities: Evidence from U.S. counties. *SSM Popul Health*. 2020;11:100564-. <https://doi.org/10.1016/j.ssmph.2020.100564>.
 27. Weyant J. Reducing Implicit Bias Toward Non-Native Speakers of English Via Perspective Taking. *Hisp J Behav Sci*. 2019;41(4):542–9.
 28. Hall WJ, Chapman MV, Lee KM, Merino YM, Thomas TW, Payne BK, et al. Implicit Racial/Ethnic Bias Among Health Care Professionals and Its Influence on Health Care Outcomes: A Systematic Review. *Am J Public Health*. 2015 Dec;105(12):e60–76.
 29. Long A, Mathew S, Alvarez KS, Smartt J, Shah M, Madden C, et al. Co-Created Messaging for Influenza Vaccination in a High-Risk Hispanic Community Provides Groundwork for COVID-19 Vaccine. *Health Equity*. 2021 May;5(1):345–52.
 30. Perrin AT. Smartphones help Blacks, Hispanics bridge some - but not all - digital gaps with Whites Pew Research Center2019. Available from: <https://www.pewresearch.org/fact-tank/2019/08/20/smartphones-help-blacks-hispanics-bridge-some-but-not-all-digital-gaps-with-whites/>
 31. Schapiro A. Coronavirus crisis threatens internet opportunity for Native Americans Reuters2020. Available from: <https://www.reuters.com/article/us-health-coronavirus-usa-rights-trfn/coronavirus-crisis-threatens-internet-opportunity-for-native-americans-idUSKCN24T06B>
 32. Warren RC, Forrow L, Hodge DA Sr, Truog RD. Trustworthiness before Trust - Covid-19 Vaccine Trials and the Black Community. *N Engl J Med*. 2020 Nov;383(22):e121.
 33. Warren RC, Shedlin M, Alema-Mensah E, Obasaju C, Hodge D. Clinical trials participation among African Americans and the ethics of trust: leadership perspectives. *Ethics Med Public Health*. 2019;10:128–38.
 34. FDA. Clinical Trial Diversity 2021. Available from: <https://www.fda.gov/consumers/minority-health-and-health-equity/clinical-trial-diversity>
 35. Rubin EJ, Baden LR, Fauci AS, Morrissey S. Audio Interview: A Covid-19 Conversation with Anthony Fauci. *N Engl J Med*. 2021 Jan;384(4):e22.
 36. Chastain DB, Osae SP, Henao-Martínez AF, Franco-Paredes C, Chastain JS, Young HN. Racial Disproportionality in Covid Clinical Trials. *N Engl J Med*. 2020 Aug;383(9):e59.
 37. Morris A. Tribes were often overlook in COVID-19 vaccine trials, frustrating Indigenous leaders. *Arizona Republic*; 2021.
 38. Thompson HS, Manning M, Mitchell J, Kim S, Harper FWK, Cresswell S, et al. Factors Associated With Racial/Ethnic Group–Based Medical Mistrust and Perspectives on COVID-19 Vaccine Trial Participation and Vaccine Uptake in the US. *JAMA Network Open*. 2021;4(5):e2111629-e. <https://doi.org/10.1001/jamanetworkopen.2021.11629>.
 39. Daly M, Jones A, Robinson E. Public Trust and Willingness to Vaccinate Against COVID-19 in the US From October 14, 2020, to March 29, 2021. *JAMA*. 2021 Jun;325(23):2397–9.
 40. Sanchez GFR. Native Americans and COVID-19 Vaccine Hesitancy: Pathways toward increasing vaccination rates for native communities. University of New Mexico Center for Social Policy. 2021.
 41. CDC. COVID-19 ACIP Vaccine Recommendations. 2021.
 42. Service IH. COVID-19 Vaccine 2020. Available from: <https://www.ihs.gov/coronavirus/vaccine/>
 43. Ndugga N, Hill L, Artiga S, Parker N. Latest data on COVID-19 vaccinations by Race/ethnicity. 2021 June 23, 2021. Report No.
 44. Humiston SG, Bennett NM, Long C, Eberly S, Arvelo L, Stankaitis J, et al. Increasing inner-city adult influenza vaccination rates: a randomized controlled trial. *Public Health Rep*. 2011;126 Suppl 2(Suppl 2):39-47. Epub 2011/08/05. . <https://doi.org/10.1177/00333549111260S206>.
 45. Abdul-Mutakabbir JC, Casey S, Jews V, King A, Simmons K, Hogue MD, et al. A three-tiered approach to address

- barriers to COVID-19 vaccine delivery in the Black community. *Lancet Glob Health*. 2021 Jun;9(6):e749–50.
46. Smedley BD, Stith Butler A, Bristow LR, editors. In the Nation's Compelling Interest: Ensuring Diversity in the Health-Care Workforce. Washington DC: National Academy of Sciences; 2004.
 47. Avakame EF OT, Dixon GL. Antiracism in Academic Medicine: Fixing the Leaky Pipeline of Black Physicians. *ATS Scholar*. 2021;0(0):ats-scholar.2020-0133PS. <https://doi.org/10.34197/ats-scholar.2020-0133PS>.
 48. Stinchfield PK. Practice-proven interventions to increase vaccination rates and broaden the immunization season. *Am J Med*. 2008 Jul;121(7 Suppl 2):S11–21.
 49. About HH. COVID-19 Healty Equity Task Force 2021. Available from: <https://www.minorityhealth.hhs.gov/omh/browse.aspx?lvl=2&lvlid=100>
 50. Polack FP, Thomas SJ, Kitchin N, Absalon J, Gurtman A, Lockhart S, et al.; C4591001 Clinical Trial Group. Safety and Efficacy of the BNT162b2 mRNA Covid-19 Vaccine. *N Engl J Med*. 2020 Dec;383(27):2603–15.
 51. Baden LR, El Sahly HM, Essink B, Kotloff K, Frey S, Novak R, et al.; COVE Study Group. Efficacy and Safety of the mRNA-1273 SARS-CoV-2 Vaccine. *N Engl J Med*. 2021 Feb;384(5):403–16.