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Compounding Health Risks and Increased Vulnerability to SARS-CoV-2 for Racial and Ethnic Minorities and Low Socioeconomic Status Individuals in the United States

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Abstract

Recent clinical SARS-CoV-2 studies link diabetes, cardiovascular disease, and hypertension to increased disease severity. In the US, racial and ethnic minorities and low socioeconomic status (SES) individuals are more likely to have increased rates of these comorbidities, lower baseline health, limited access to care, increased perceived discrimination, and limited resources, all of which increase their vulnerability to severe disease and poor health outcomes from SARS-CoV-2. Previous studies demonstrated the disproportionate impact of pandemic and seasonal influenza on these populations, due to these risk factors. This paper reviews increased health risks and documented health disparities of racial and ethnic minorities and low SES individuals in the US. Pandemic response must prioritize these marginalized communities to minimize the negative, disproportionate impacts of SARS-CoV-2 on them and manage spread throughout the entire population. This paper concludes with recommendations applicable to healthcare facilities and public officials at various government levels.

Keywords: Coronavirus, COVID-19, comorbidity, race and ethnicity, health disparities

Introduction

The novel human coronavirus, severe acute respiratory syndrome coronavirus (SARS-CoV-2 or COVID-19), was declared a pandemic by the WHO on March 11, 2020[1]. Since the January 15th arrival of the first documented case in the United States, the disease has been rapidly spreading through the country, reaching every state and the District of Columbia (DC) by March 17th. As of April 8, 2020, there have been 554,849 confirmed cases and 21,942 deaths nationwide, with every state, DC, and 4 of 8 territories reporting cases[2].

Rising wealth inequality[3] and persistent social disparities experienced by racial and ethnic minorities in the US[4] lead to significant vulnerability of racial and ethnic minorities and low socioeconomic status (SES) individuals to pandemic events[5]. Already, there have been reports of disproportionate prevalence and severity of SARS-CoV-2 cases among Blacks[6,7,8,9], and American Indians[10]*. Previous research has highlighted the disproportionate impact of the H1N1 Influenza A pandemic[11,12,13,14,15] and seasonal influenza[16,17,18] on both racial and ethnic minorities and low SES individuals.

Existing disparities for racial and ethnic minorities and low SES individuals in the US, combined with evidence of disproportionate impacts of influenza, suggest that SARS-CoV-2 will have a devastating impact on these vulnerable populations. This articles reviews: 1) recent findings related to comorbidities and SARS-CoV-2 case severity, 2) disparities in health and healthcare

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for racial and ethnic minorities in the US, 3) health risks associated with lower SES, and 4) compounding risk at the intersection of low SES and racial and ethnic minority identity. To conclude, recommendations for minimizing the impact of the SARS-CoV-2 pandemic on vulnerable populations are provided for both inside healthcare facilities and at various community organization and government levels.

SARS-CoV-2 Risks for Patients with Comorbidities

From recently available data on patients from the early stages of the outbreak of SARS-CoV-2 in China, it is increasingly apparent that, in addition to older patients[19], patients with comorbidities have a higher likelihood of severe disease and an increased risk of death[20]. Recent studies report a range of 40-63% of severely or critically ill hospitalized patients have comorbidities[19,20,21,22,23], similar to ranges reported for Middle East Respiratory Syndrome coronavirus (MERS-CoV)[24]. Further, patients with severe disease are more likely to have a co-existing illness than patients with non-severe disease[25].

The most common comorbidities reported in these early studies are hypertension, diabetes mellitus, and cardiovascular disease[19,21,25,26], all of which have been correlated to increased mortality risk[19] and severe disease[25] in SARS-CoV-2 patients. Pre-existing cardiovascular disease and diabetes previously have been linked to acute cardiac events and poor health outcomes for patients with influenza and respiratory infections[27,28,29,30,31]. One hypothesis for increased SARS-CoV-2 severity with hypertension and diabetes is that both conditions can be treated with angiotensin-converting enzyme (ACE) inhibitors and angiotensin II type-I receptor blockers (ARBs), which increase the expression of ACE2[32,33]. Because human pathogenic coronaviruses bind to target cells via ACE 2, treatment of hypertension and diabetes with ACE inhibitors and ARBs could facilitate SARS-CoV-2 infection and increase disease severity[34]. Alternative treatments for patients with hypertension and diabetes that do not increase ACE 2 expression may be important to implement[34]. In addition, individual-specific treatment plans to address serious comorbidities alongside pneumonia have been recommended[23].

Chronic lung or respiratory system disease[19,21,26], cerebrovascular disease[21,25], chronic kidney disease[19] and a history of smoking[21] are other comorbidities reported in patients with more severe cases of SARS-CoV-2. Of these comorbidities, chronic lung disease and chronic kidney disease significantly correlate with increased mortality risk[19]. Notably missing from studies is concrete information on the effect of asthma on SARS-CoV-2 severity, which has been attributed to the low prevalence in the general population in China[26]. Generally, the presence of any comorbidity increased the risk of severe illness and mortality for SARS-CoV-2 hospitalized patients[20,25,26]. In one study, 23% of SARS-CoV-2 critically ill patients had aggravated disease that was attributed to their original comorbidity[23]. Previous work demonstrated that diabetes, hypertension, obesity, and cardiovascular disease correlate with case severity of other coronaviruses, including MERS-CoV[24] and influenza illness[35,36]. Recent studies have also demonstrated that SARS-CoV-2 infections can cause damage to various organs (i.e. heart, liver, and kidneys) and organ systems (i.e. blood and immune)[21,37]. Damage to organs and organ systems that are already compromised by comorbidities likely contributes to the complication of organ system and organ failure[19-22].

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It is important to note that data from hospitalized patients does not reflect the total disease burden of the general population, in which an estimated 80% of total SARS-CoV-2 cases are likely mild[38] and do not require hospitalization. However, data on hospitalized patients provides insight into which subpopulations are more vulnerable to severe disease and higher mortality risk.

Elevated Risk for Severe SARS-CoV-2 for Racial and Ethnic Minorities in the United States

Elevated Risks for Seasonal Influenza, Pneumonia, and Respiratory Infections

Disparities in morbidity and mortality for racial and ethnic groups have been previously identified in respiratory diseases, including pneumonia and seasonal influenza[39,40,41]. The US has a long history of health disparities for seasonal and pandemic influenza, with higher mortality rates for Black vs. non-Hispanic white (NHW) populations reported from the 1918-1919 influenza pandemic[42,43] through to modern day[5,16,44]. Hospitalization rates for Black and Hispanic children are higher than those of NHWs for respiratory syncytial virus, seasonal influenza, and parainfluenza viruses[17]. Further, rates of respiratory viral infections are higher for Apache Indians, Alaska Natives and Blacks than for NHWs[45]. These aforementioned differences align with the larger trend that influenza-associated pneumonia and pandemic influenza-related deaths are more common in racial and ethnic minority populations[16,40,46,47].

The increased risks to racial and ethnic minorities in the United State in the current SARS-CoV-2 pandemic are similar to those highlighted during the 2009 H1N1 novel influenza A pandemic. An estimated 60.8 million cases of H1N1 with 274,304 hospitalizations and 12,469 deaths occurred in the US from April 2009 to April 2010[48]. The current SARS-CoV-2 pandemic has caused more deaths in the US in under 3 months (21,942 deaths as of April 13, 2020[2]), demonstrating the increased severity of the current pandemic and underlining the need to examine and apply past lessons to protect vulnerable populations.

Severe cases of H1N1 in the United States were found to disproportionately impact racial and ethnic minorities, as noted through age-adjusted hospitalization rates and deaths[11,12,49]. Hospitalizations related to H1N1 were most common for American Indians and Alaska Natives[12], though Hispanics and Blacks also were hospitalized at higher rates than NHWs[12,49]. In fact, American Indians were 2.6 times more likely to be hospitalized than NHWs[13], while Alaska Native and Asian/Pacific Islanders were 2-4 times likely to be hospitalized than NHWs during the H1N1 pandemic[14]. Overall, severe disease and death from H1N1 was 4 times higher for American Indians and Alaska Natives than for all other racial and ethnic groups combined[11]. This trend of increased hospitalization of indigenous populations relative to the general population was also true in Canada, New Zealand, and Australia[50,51,52]. As related to their proportion of the general population, pediatric deaths due to H1N1 in the United States were notably high for Hispanics and Asian/Pacific Islanders and lower than expected among NHWs[12]. Suggested causes for the disproportionate effect of H1N1 on racial and ethnic minorities include higher rates of comorbidities, lower baseline health, increased environmental exposure, lower vaccination rates, increased poverty, and reduced access to quality care[12,13,15,31,51].

Prevalence of SARS-CoV-2 Relevant Comorbidities

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Disparities in outcomes for racial and ethnic minorities have partially been attributed to higher prevalence of underlying health conditions (i.e. comorbidities)[11], some of which have now been linked to more severe SARS-CoV-2 illness, like diabetes, cardiovascular disease, and hypertension. Rates of diabetes in the US are high, with CDC projections that about 40% of US adults will develop diabetes during their lifetime[53]. The prevalence of diabetes among adult American Indians or Alaska Natives, Blacks, Hispanics, and Asian Americans is higher than that of NHWs[54,55,56,57] with many of these issues concentrated in the southern, Appalachian region of the US[53]. National reported rates of diabetes are even higher for American Indians or Alaska Natives[53-55]. Higher rates of diabetes in American Indians were linked to increased severity of H1N1 cases[58]. While rates of diabetes for Asian-Americans are only slightly higher than those of NHWs, diabetes prevalence is much higher for the Native Hawaiian and other Pacific Island (NHOPI) subgroup[59,60,61]. Higher rates of diabetes among racial and ethnic minorities is linked to their commonly lower SES. In previous research, elevated rates of Type II diabetes have been found in neighborhoods, across racial and ethnic groups, that have poorer resources for physical activity and healthy foods[62].

Cardiovascular disease, hypertension, and more severe related outcomes have also been reported as more common among US ethnic minorities[63,64], though cardiovascular disease affects ethnic groups differently. For Blacks, cardiovascular disease rates are slightly lower than those of NHWs for males, but are much higher for females[65]. Regardless of prevalence, Blacks have higher hospitalization rates and greater risk of death due to cardiovascular disease than NHWs[65,66,67]. Specifically for hypertension, Blacks have higher rates across every age category than all other commonly measured racial groups[68]. The increased burden of hypertension and heart failure on Black populations occurs earlier compared to NHWs[69,70], suggesting that the commonly cited age predictor of risk for SARS-CoV-2[71] may not apply equally across racial groups[70]. High rates of hypertension are also well-documented for indigenous US populations, as compared to the general population[72,73]. When separated from the larger Asian racial category, it is apparent that NHOPI are one of the highest risk populations for cardiovascular and cardiometabolic diseases[59]. NHOPI women experience higher frequency of hypertension and high cholesterol than NHWs and other ethnic groups[74,75], while incidence of hypertension is highest in Native Hawaiians[73,76,77]. Further, mortality of Native Hawaiians due to cardiovascular disease occurs an average of 7.5 years earlier than other ethnic groups. In contrast, studies have found that the US Hispanic population is less likely to have cardiovascular disease and suffer severe outcomes than NHWs[65,78], though the prevalence of risk factors described in other studies[79] suggests an incomplete picture of Hispanic cardiovascular disease[78]. Further racial diversity within the Hispanic population must be considered[80]. For example, previous studies have suggested that Hispanics of Caribbean descent have similar hypertension and cardiac hypertrophy as Blacks[78,81].

While there is currently insufficient data to determine if asthma is a compounding risk factor for SARS-CoV-2, asthma is well known to increase the severity of seasonal and pandemic influenza[82]. Asthmatic children with influenza consistently have higher rates of hospitalizations, outpatient visits, and antibiotic courses than children without asthma[83,84]. During the H1N1 pandemic influenza, rates of intensive care admission, hospitalization, and pneumonia diagnoses for asthmatic children were even higher[82]. In the US, approximately 8% of adults and children have asthma, with higher than average prevalence for Blacks (10.7%); American Indians, Alaska

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Natives and Native Hawaiians (10.4%); and Puerto Ricans (14%)[85]. Some arguments for disparities in asthma prevalence include lower SES, poorer home environmental conditions, and disparate social stressors[86]. Based on the past trends of increased morbidity and mortality of asthmatics from seasonal and pandemic influenza, asthma is likely a comorbidity of concern for SARS-CoV-2.

Influence of Systemic Racism on Baseline Health

Systemic racism experienced by racial and ethnic minorities in the US has been found to exacerbate comorbidities, influence medical care, and create pervasive differences in wealth. Overall, social conditions are considered fundamental causes of disease, as access to resources is well documented to allow for avoiding risk and minimizing disease consequences[87]. Limited access to information, good jobs without toxic exposure, health benefits, healthy foods, and well-supported, safe living options all combine to produce inequality in disease prevalence and health risk factors. Further, intentionally placed hazardous sites near communities of color and lower income communities result in increased pollution exposure[88], which has been linked to prevalence of health risk factors, like hypertension[89].

Perceived discrimination and experienced racism have been linked to higher incidence of diabetes, cardiovascular disease, hypertension, and respiratory problems[90], all of which could compound disease from SARS-CoV-2. Further, recurrent experiences of discrimination generate negative, stress-related physiological and psychological responses, which can significantly impact health[91,92], like by increasing the risk for heart disease, diabetes, and infection, as seen in Blacks[93]. Exposure to social stressors and environmental adversity, which has been linked to elevated risk of cardiovascular disease and other comorbidities for Blacks[94], creates higher allostatic loading (or "weathering") for Blacks than NHWs, even when adjusting for SES[95].

Perception of racism by Black patients also decreases healthcare trust[96,97], which can decrease the efficacy of provided care or patient-implementation of preventative treatment[98,99]. And this perception is supported by findings that the majority of non-Blacks in the US exhibit implicit biases against Blacks[100]. Knowledge of historical racism in medicine, particularly forced and/or risky experimentation and medical trials[101,102], may also contribute to patient distrust of modern medical practitioners, creating an additional barrier to care. Negative effects of discrimination on health have been more extensively studied in the US for Black Americans, but are reported for other racial and ethnic minority groups[91,103,104]. For example, more perceived racism has been correlated with self-reported hypertension in Native Hawaiians[105]. Centuries of discrimination, disenfranchisement, and perceived second-class status of indigenous populations in their own homeland due to colonial legacies[106,107,108], have been linked to poor health outcomes[109,110,111]. Further, for American Indians, microaggressive experiences with their healthcare providers correlate with self-reported heart attack history[112]. It is worth noting that elevated stress due to discrimination for immigrants has been correlated with lower health baselines[113,114] and is likely compounded by stressors of immigration status or acculturation. Finally, in addition to perceived discrimination, systemic effects of racism like neglect and disinvestment in segregated communities increases community exposure to environmental toxins[115], which can influence cardiovascular disease[116], incidence of diabetes[62], hypertension[117], and respiratory health[118].

Racism and Discrimination in Medical Care

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Documented disparities in medical care for racial and ethnic minorities are critical to consider when facing a national medical crisis, like SARS-CoV-2. In recent years, healthcare disparities for Black Americans (as compared to NHWs) have been more prominently highlighted, such as higher maternal mortality rates[119], decreased likelihood of children to receive antibiotics[120], decreased likelihood of finger re-attachment for children[121], and increased use of limb amputation to treat lower extremity ischemia (restriction in blood supply)[122]. In pneumonia-related hospitalizations, Blacks and other minorities have been observed to be 70-80% less likely to receive antimicrobial agents within 8 hours of arrival at a hospital than NHWs[123]. Early identification and timely treatment of critical cases of SARS-CoV-2 is vital for reducing disease severity and preventing spread[21], so biases in care could have significant consequences. It is important to note that the literature is divided upon whether or not implicit biases of clinicians translate to different treatment recommendations or care[124,125,126], though existing studies generally confirm an implicit preference for NHWs over Blacks[127,128,129]. Efforts to treat without acknowledging race or ethnicity (i.e. colorblindness[130]) or individual-level education to combat bias[131] have limited positive impact, so the recommendation is commonly individualized, patient-centered care[132]. In a pandemic situation where clinicians are overburdened, a more effective strategy may be regular reminders to clinicians of the existence of racial and ethnicity implicit biases[133] and, where possible, oversight of treatment practices.

Socioeconomic Status (SES) as a Health Risk Factor

Low socioeconomic status (SES) is a universal risk factor for disease in the US[134,135] and exacerbates health outcomes for racial and ethnic minorities. Generally, health inequalities in the US improve with income or education level[136,137], which is partially attributed to healthcare access[5]. Rising wealth inequality in the US[3] expands existing health disparities by limiting access to resources to avoid health risks or minimize disease impacts[87]. Lower SES individuals are more likely to be admitted to the hospital for short-term complications of diabetes, hypertension, congestive heart failure, and asthma[138], all comorbidities of concern for SARS-CoV-2. Significant decreases in the number of hospitals serving rural, low income populations[139] has reduced access to care. The intensity of treatment needed for patients during the H1N1 pandemic (e.g. mechanical ventilation) was significantly associated with a lack of or delayed antiviral treatment[13], underscoring the importance of improving access to care for low SES individuals during the SARS-CoV-2 pandemic. In addition to access difficulties, lower income individuals have also reported perceived discrimination[140] which, as previously mentioned, increases stress and decreases baseline health.

Positive feedback loops between disease burden and poverty, as seen in simple combined economic and host-pathogen system models, demonstrate the increased risk of poor health for low income individuals both during and after the SARS-CoV-2 pandemic. Lower SES individuals have greater exposure risk, as they are more likely to use public transportation[141] and may work in essential jobs that continue amid social distancing measures[142]. Jobs common for lower SES individuals (e.g. service industry) have fewer labor protections, like paid sick leave[143,144], and are more likely to terminate during a quarantine, thus limiting the ability to stockpile food and water. Ensured job security or income replacement would limit the negative effects of quarantine measures on already vulnerable populations and, thereby, encourage quarantine compliance[145]. Further, in the US, where health insurance is commonly tied to employment[146], job loss can mean health insurance loss and limited healthcare access. It must be

noted that, in SARS-CoV-2 studies published from China, treatment costs were covered by medical insurance[21]. Outcomes may be very different in the US due to high treatment costs that could particularly devastate lower income individuals.

Hospitalizations in the US among children and adults for seasonal influenza and 2009 H1N1 were found to increase with poverty[13,15,18,147]. A model of influenza spread that incorporated increasing susceptibility with decreasing SES closely matched the increased early influenza rate in high-poverty census tracts observed during the 2009 H1N1 pandemic[148]. Modeled influenza spread in Delhi demonstrated that, by ignoring the attributes of slums (lower income, crowding, etc.) and their 20% higher infection rate, risk is underestimated, leading to underestimation of infections in the larger population[149]. Current predictions for the spread of SARS-CoV-2 in the US should include disparities due to low income and SES to more accurately predict disease burden for more vulnerable communities.

The Intersection of Socioeconomic Status, Race, and Ethnicity

The effects of low SES on health are compounded for racial and ethnic minorities[150,151,152,153,154]. Blacks and Hispanics in the US are reported to have poverty levels 2-3 times higher than those of NHWs[155]. While the broad Asian category is often reported to have a comparable level of poverty to the NHW population, Asian subpopulations like Hmong, Laotian, and Cambodian groups have income levels similar to Black and American Indian populations[156]. Some studies demonstrated reduced race- and ethnicity-related health disparities when controlling for SES[157,158], but racial and ethnic minorities (especially Blacks) often still have significantly higher risk of poor health[159,160] and environmental hazard exposure[88], even across high income levels[161].

Lower access to preventative healthcare for racial and ethnic minorities as compared to NHWs[12], is inferred from lower vaccination rates and later stage cancer diagnoses[162,163]. Higher density, racially-segregated communities with more limited resources also have diminished access to care[115,164], though lower mortality has occasionally been linked to high density Mexican- and Cuban-American neighborhoods[165]. In contrast, rural location, combined with low SES, limits healthcare access (i.e. low utilization rates) for US indigenous communities[166]. Difficulties in accessing care are also reported by NHOPI, who are overrepresented in lower SES levels[167]. Low SES racial and ethnic minority communities may also have limited English proficiency and require translator services[5], which are likely be limited during a pandemic. In the H1N1 pandemic, disparities in access to care, in conjunction with low vaccination rates and higher underlying chronic disease, increased disease severity and susceptibility to complications for racial and ethnic minorities[168].

Protecting Vulnerable Communities in SARS-CoV-2 Response

It has been previously shown when methods are implemented to prevent and treat disease, health disparities related to SES and racial and ethnic groups increase[169]. Deliberate care must be taken to enact policy changes both inside healthcare facilities and at all government levels to ensure SARS-CoV-2 prevention and treatment does not neglect or exacerbate existing disparities in social conditions and health risks of vulnerable communities[87,157,169]. Though this paper specifically addresses the US, health disparities are globally pervasive. Efforts to protect vulnerable populations in all nations during this pandemic will be critical for managing the spread and effects of SARS-CoV-2 throughout the entire population.

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While this paper does not explicitly address disability status or LGBTQ identity, both should be noted as factors that can increase vulnerability. Particularly in rural areas where critical services are more expensive and less specialized[170,171], individuals with disability will likely experience greater difficulties in accessing basic necessities (food, water, etc.) and attaining care. Further, individuals with mental and physical disabilities in the US have reported perceived discrimination in healthcare[140,172] and additional barriers in communication, accessing local services, and service eligibility[173,174,175]. Individuals with disability status are also likely to have low SES[137,176] and other secondary health conditions[177]. Perceived discrimination when accessing health services has also been reported by LGBTQ individuals[178]. LGBTQ individuals are more likely to have lower SES, disability status, and poor physical health conditions[179,180,181] and face structural barriers to accessing care[182,183]. And, as for SES, discrimination related to healthcare for both disability status and LGBTQ identity is more likely for racial and ethnic minorities[140,178].

The following recommendations have been inspired by the many public health experts and scholars cited in this article. Decision-makers and stakeholders are also encouraged to read additional sources with thorough reviews on risks for vulnerable populations and concrete recommendations[5,142,184].

Recommendations

For Hospital Administrators, Health Practitioners, and Infectious Disease Specialists

- Treatments for SARS-CoV-2 patients with comorbidities, like diabetes and hypertension, should be individualized to prevent worsening of the initial comorbidity and the overall health of the patients. Consider incorporating treatments for initial comorbidities that do not increase the expression of ACE2.
- In healthcare facilities, practitioners should be reminded of implicit bias in medical care and its potential negative impact on patient outcomes, particularly for racial and ethnic minorities, LGBTQ individuals, and people with disabilities. When possible, oversight of emergency care can be incorporated to ensure consistent care, even as practitioners become overwhelmed with the SARS-CoV-2 caseload.
- Collect extensive data on treatments and outcomes. Aggregate the data for regular analysis of possible disparities in severity of cases and poor outcomes for racial and ethnic minorities and low SES individuals. Real-time discoveries of disparities can inform shifts in care in hospitals and changes in communication or resource distribution outside the hospitals. Results should be communicated in a timely manner to the public, as is being done in Illinois, Michigan, and North Carolina.
- Incorporate the increased risk factors for racial and ethnic minorities and low SES individuals in predictive models of SARS-Cov-2 spread to improve accuracy and highlight high risk regions of disease and disease disparity.

For Public Officials, Public Health Strategists, and Community Leaders

- Public health warnings and vulnerability classifications for SARS-CoV-2 should reflect the higher comorbidities and increased risks for racial and ethnic minorities and low SES individuals. Emphasize the increased risk of severe cases to these populations. Additional

emphasis should be made to these populations of their increased risk of more severe cases of SARS-CoV-2

- Social policies should be put in place to minimize economic burdens (e.g. rent/mortgage, bill, and student loan freezes and/or forgiveness, health insurance (universal healthcare, public option or premiums paid), income replacement, encouragement to employers to commit to rehire individuals post-pandemic, etc.), which will improve compliance with quarantine.
- Invest funding heavily in community healthcare systems that serve racial and ethnic minorities and low SES individuals, where the need will be greatest.
- Increase accessibility of testing for vulnerable communities (including remote testing), considering the various barriers to access they may face (e.g. public transportation reliance).
- When a vaccine is released, plan for distribution through a variety of venues like private pharmacies, doctor's offices, mobile community health centers, soup kitchens, and transit points to increase accessibility of the vaccine and limit crowding at hospitals and clinics.
- Increase access to primary care (facilities or remote) for low SES and racial and ethnic minority individuals, who are more likely to rely on hospitals for primary care than Non-Hispanic white counterparts, to minimize hospital transmission of SARS-CoV-2.
- Communicate health risks, recommendations, and current status of the pandemic in relevant, practical, and tailored ways with vulnerable populations. Demonstrate a clear commitment to their well-being to build trust. Ensure that information is available in multiple languages and is disseminated over various relevant platforms for maximum reach. Engage community leaders, local service providers, and activists for these vulnerable subpopulations in communication efforts to both share information and gather concerns and feedback that can inform evolving pandemic mitigation efforts.

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*For context, in this article, the racial definition Black is used for literature referring to Non-Hispanic Blacks and African-Americans living in the United States. The term American Indian is used to refer to indigenous people in the continental United States.

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