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COVID-19, Unhealthy lifestyle behaviors and chronic disease in the United States: Mapping the social injustice overlay

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In many instances, individuals/organizations/institutions/governments make the mistake of assessing a situation from a siloed perspective, focusing on one factor that is part of a much larger, multifactorial construct. Our view of and approach to well-being and health care often adopt this siloed approach, when, in fact, health outcomes are almost never explained in this fashion.[1,2] Rather, health outcomes are explained by complex, multifactorial interrelationships that either lead to positive or negative effects. We recently published a commentary on one such complex, multifactorial interrelationship at a point when the United States (US) passed one million deaths due to the coronavirus 2019 (COVID-19) pandemic.[3] In the previous commentary, we used US maps to illustrate COVID-19 deaths, unhealthy lifestyle behaviors, and heart disease deaths were all most prevalent in the same region of the US – the southeast. This mapping approach impactfully demonstrated what we quickly learned and, in truth, have known for decades – health outcomes are not explained in a siloed fashion. In this case, unhealthy lifestyle behaviors significantly increase the risk for chronic conditions, such as heart disease and their associated untoward events (e.g., heart attack, heart failure and premature mortality). During the COVID-19 pandemic, it quickly became apparent that the risk of poorer outcomes with viral infection (e.g., hospitalization, mechanical ventilation, death) was higher among those individuals with a history of unhealthy lifestyle behaviors and one or more chronic disease diagnoses.[1,3–5] The high prevalence of unhealthy lifestyle behaviors in the US is a primary driver for the chronic disease pandemic we were living with prior to COVID-19 and, as such, the pump was primed for catastrophic outcomes during the viral pandemic from which we are slowly recovering. Unfortunately, given viral variants and the emergence of long COVID,[6] that recovery will be long and painful. The complex, multifactorial interrelationships amongst unhealthy lifestyle behaviors, chronic disease and COVID-19 are a new syndemic,[7] the epicenter of which in the US appears to be in the southeast region of the country.[3] However, describing this syndemic only in the context of unhealthy lifestyle behaviors, chronic disease, and COVID-19 is incomplete and would cause us to continue the mistaken siloed approach. In fact, there are additional complex and multifactorial socioeconomic, race and health equity components to this syndemic.[7,8] Previous research has already indicated underserved communities and underrepresented individuals have been disproportionately impacted by COVID-19 with far worse outcomes in those who are infected.[5,9,10] This commentary once again uses a US mapping approach to illustrate these issues and points toward social injustice to be a common source epidemic for the unequal distribution of poor COVID-19 outcomes across society.

The Centers for Disease Control (CDC) houses a wealth of surveillance data that can be used to illustrate the incidence and prevalence of numerous factors related to health outcomes. Figs. 1–7 illustrate US data on: 1) Percent of the population without a high school diploma; 2) Median household income; 3) Percent of the population in the Supplemental Nutrition Assistance Program; 4) Percent of the population with no health insurance; 5) Percent of the population below the poverty level; 6) An index of income inequality; and 7) The percent of the population across race/ethnicity who are Black/African American. As in our previous commentary[3], the epicenter of issues related to low

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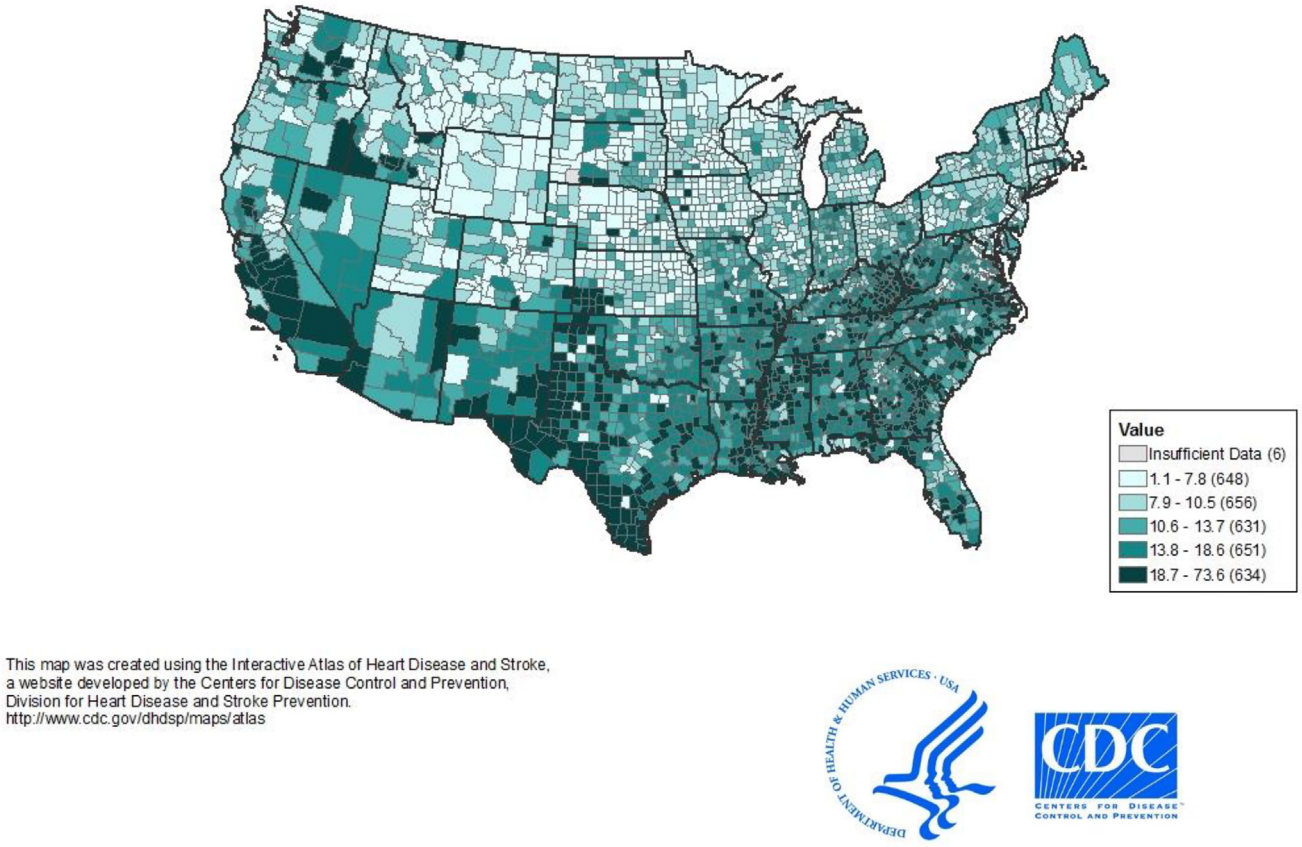

Fig. 1. Percentage without high school diploma, ages 25+, 2015-2019 (5-year).

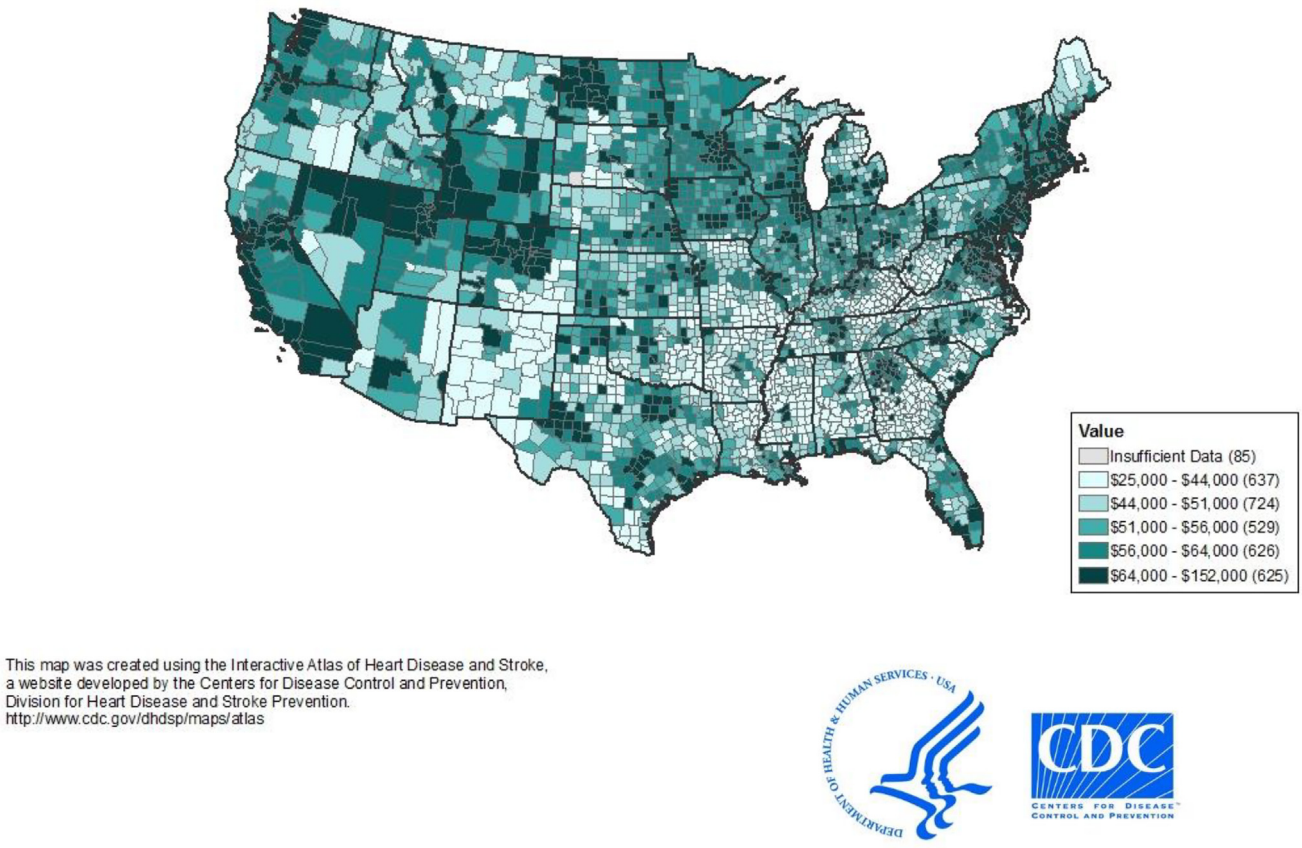

Fig. 2. Median household income, 2018.

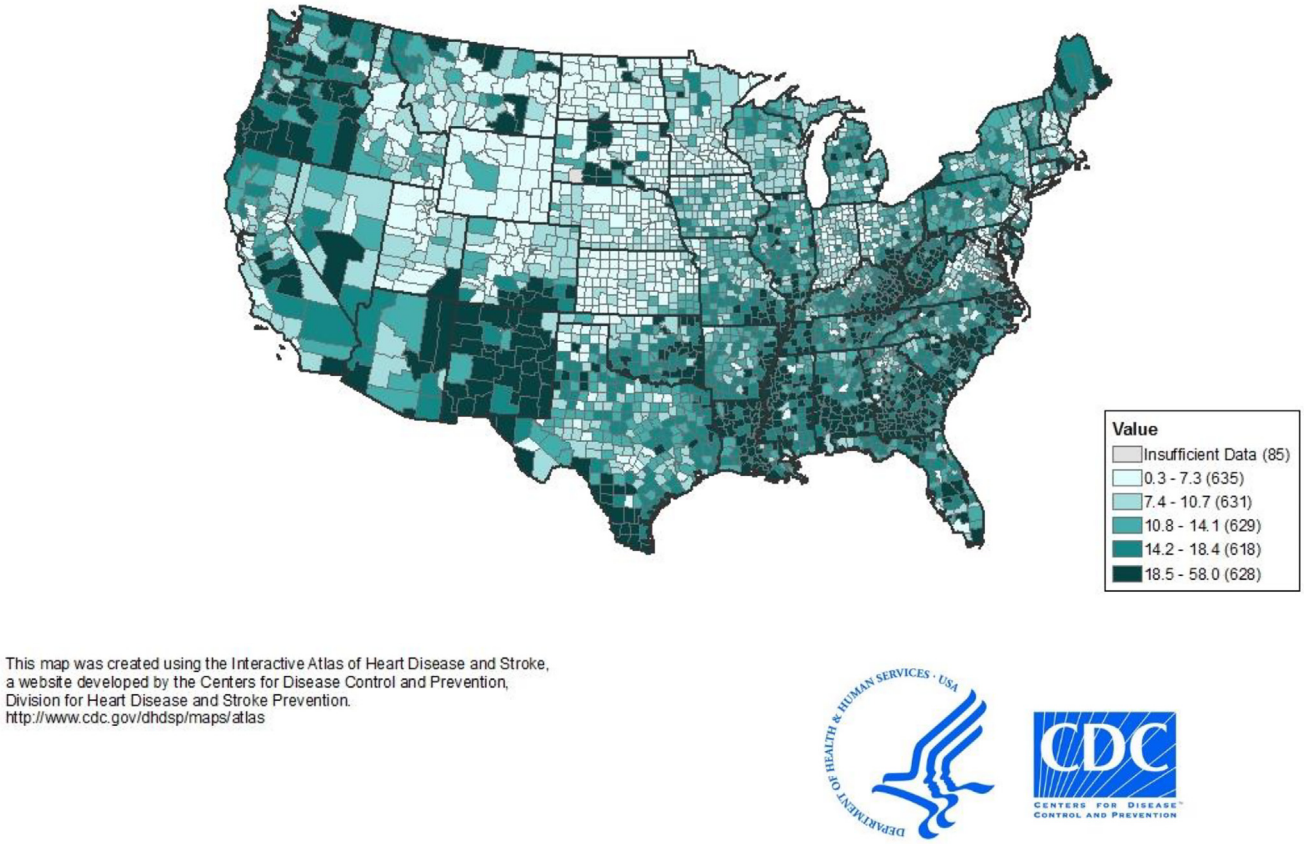

Fig. 3. Percentage food stamp/supplemental nutrition assistance program recipients, 2015-2019 (5-year).

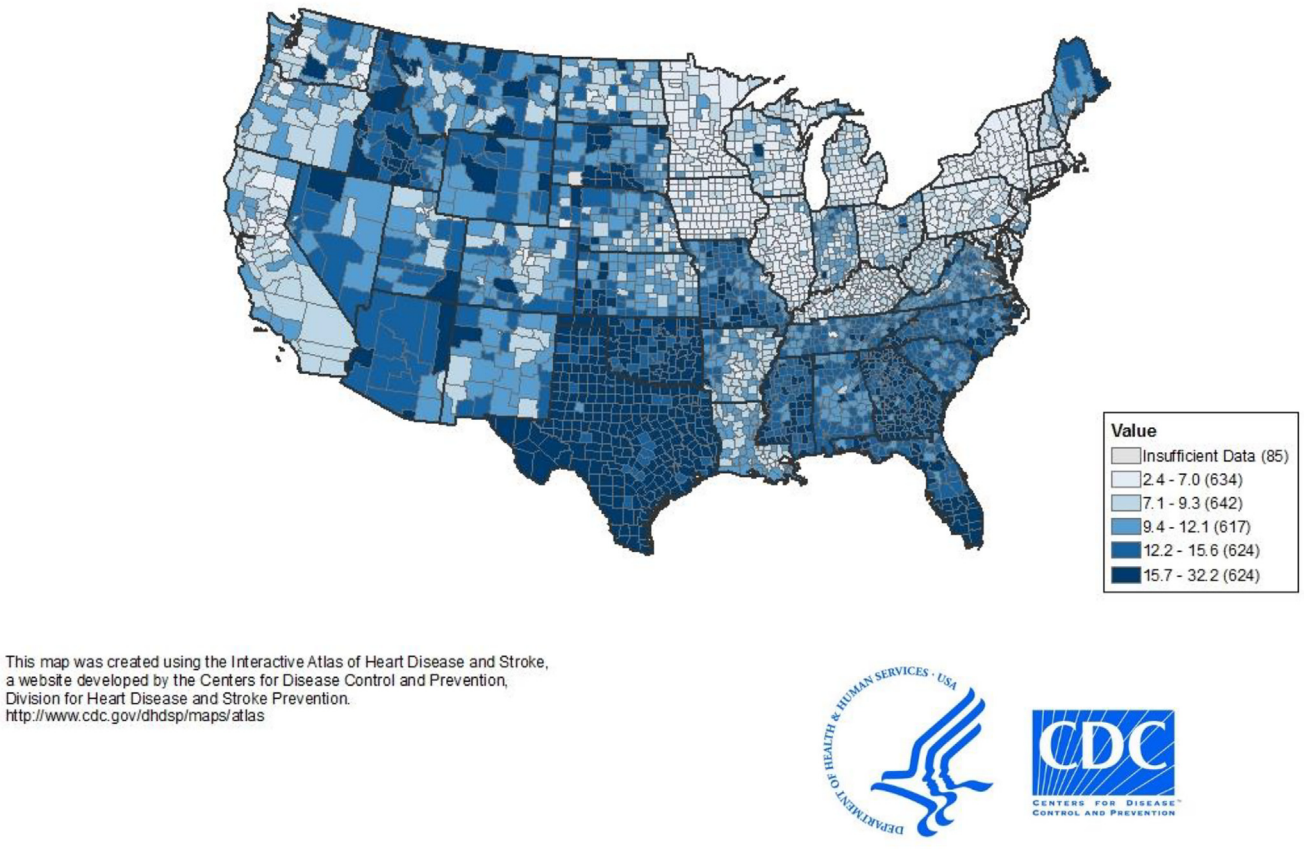

Fig. 4. Percentage without health insurance, under age 65, 2018.

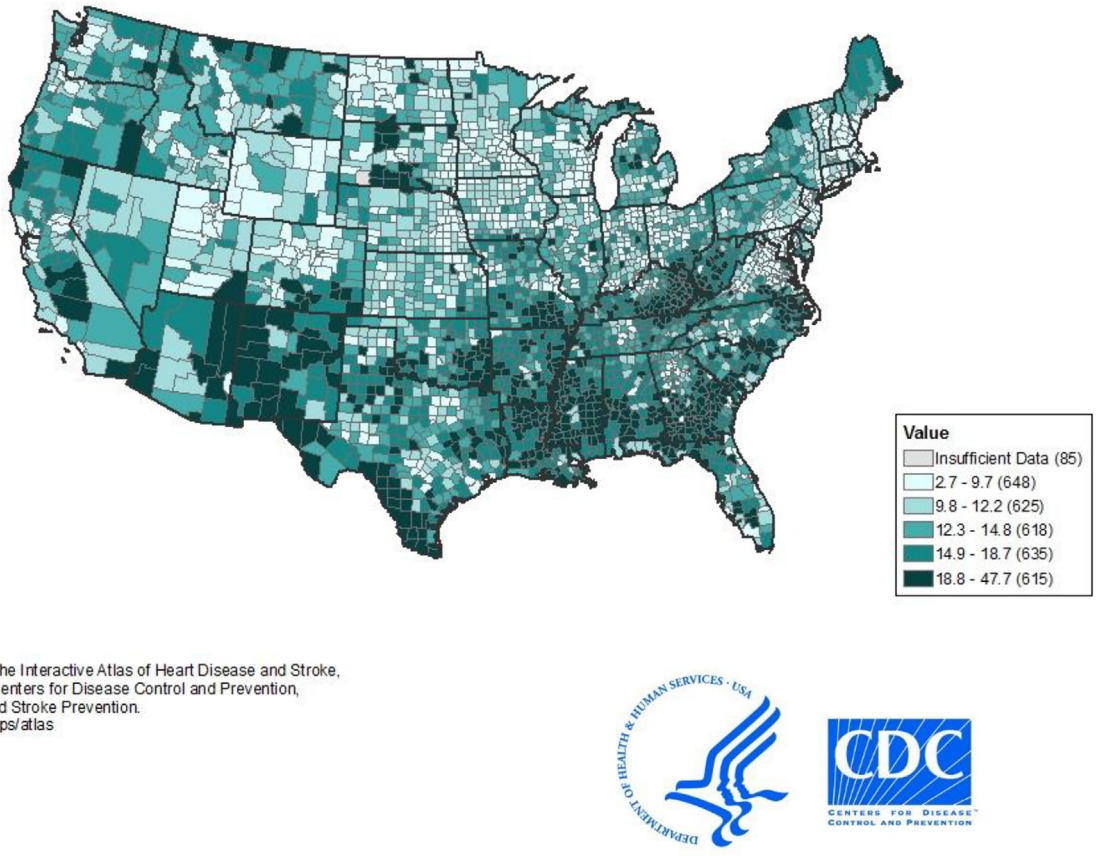

Fig. 5. Percentage living in poverty, all ages, 2018.

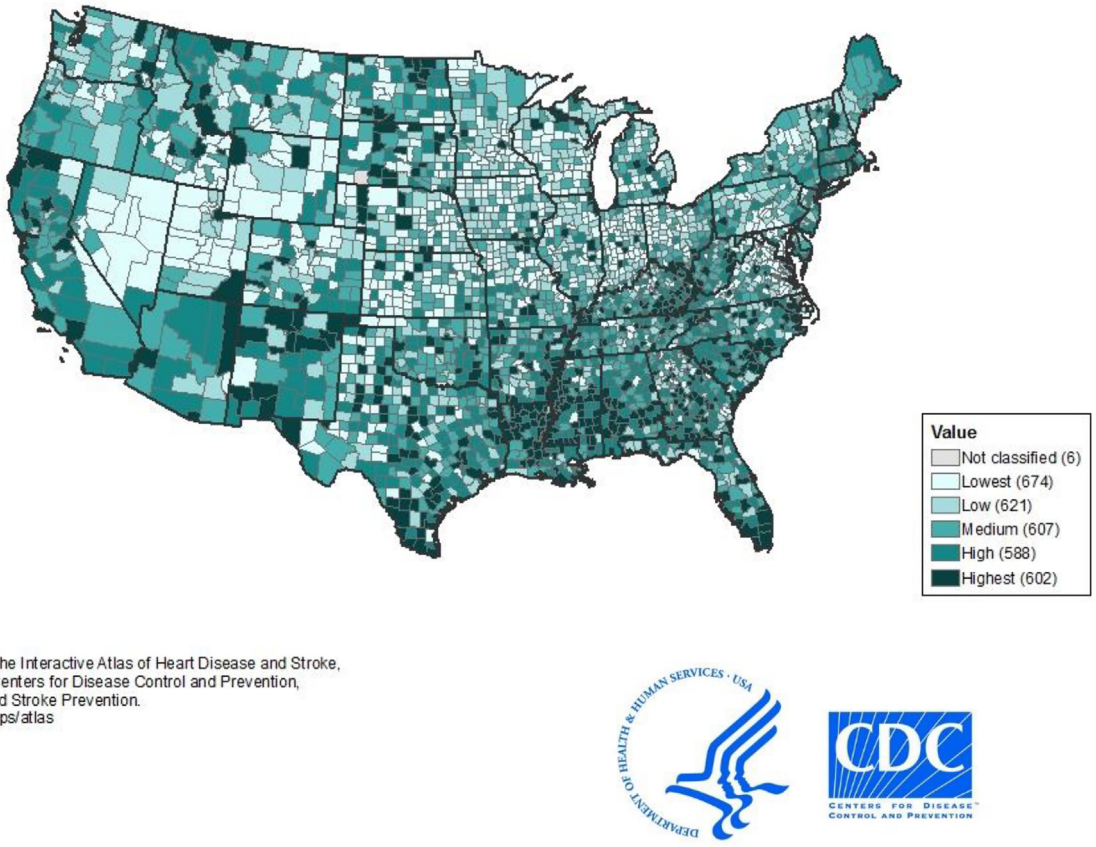

Fig. 6. Income inequality (Gini Index), 2015-2019 (5-year).

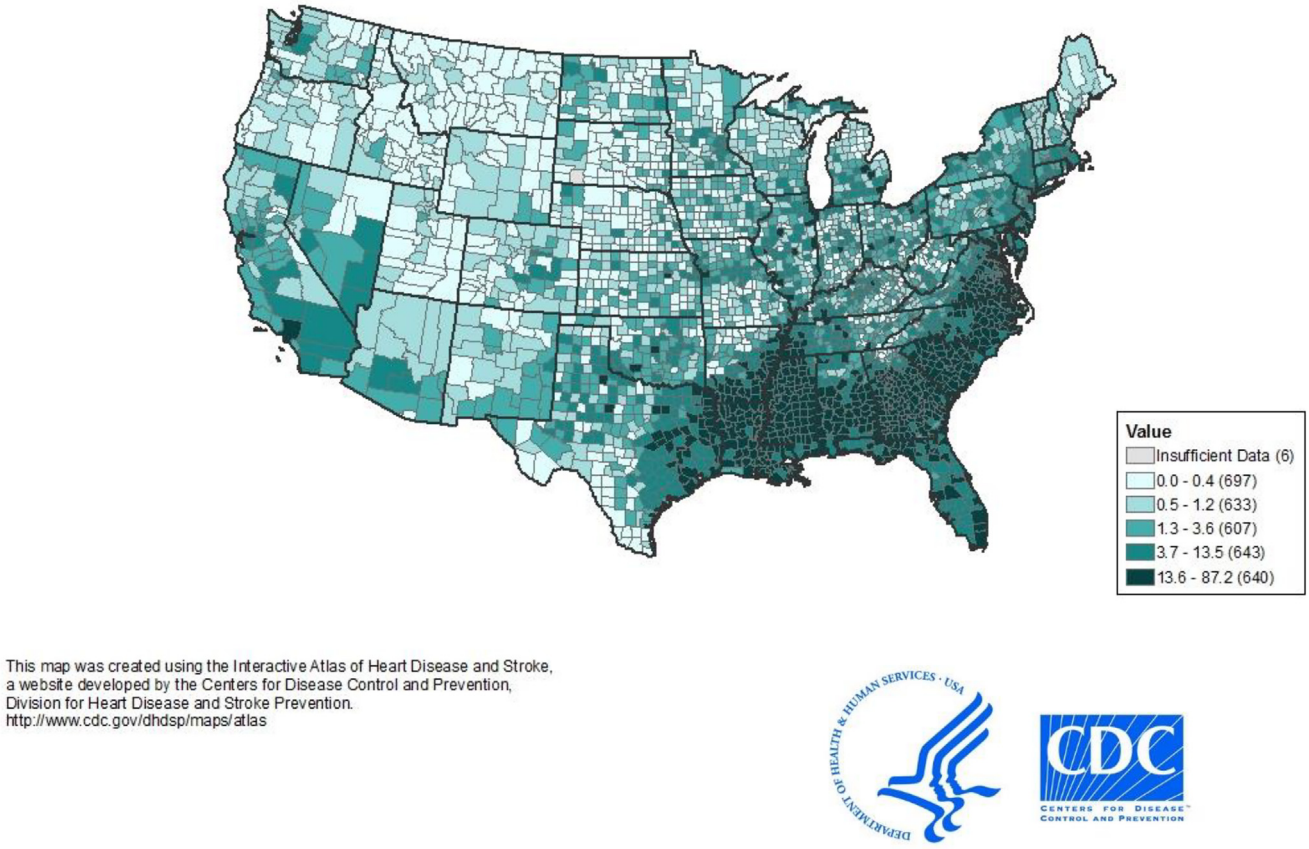

Fig. 7. Black or African American, non-Hispanic Population (%), all ages, 2015-2019 (5-year).

education level, poverty, nutrition assistance, and health inequity is in the southeast US, disproportionately impacting US residents who are Black/African American.

The US maps provided in the current commentary, in combination with the maps provided in our previous publication[3], provide a fuller picture of the syndemic and start to point to an underlying common source epidemic. A reasonable hypothesis that requires urgent attention is as follows: 1) Unhealthy lifestyle behaviors prime the pump for poor health outcomes due to chronic disease and viral infection and 2) Individuals who: a) have lower income and education levels; b) are below the poverty line and require local/state/federal assistance; c) more frequently do not have health insurance; and d) more often are part of an underrepresented minority group, are more likely to have unhealthy lifestyle behaviors and are at higher risk of poor health outcomes, including chronic disease and complicated medical courses with viral infection.[11] The complex, multifactorial interrelationships of this syndemic are undeniable – the maps provided herein and our previous commentary[3] are a sobering illustration. To view these issues in a siloed approach is a disservice to the residents of the US. Social injustice occurs when "the equals are treated unequally and the unequal is treated equally[12]" or when "unfair practices are being carried in the society[13]". In the context of this commentary, it appears clear that US residents in the southeast region, who should be treated equally and be afforded the same basic rights as US residents in other parts of the country, are at higher risk of disproportionately adopting unhealthy lifestyle behaviors that undeniably play a significant role in the poorer health outcomes observed in that region of the country (i.e., higher incidence and prevalence of chronic disease and higher mortality rates associated with chronic disease and COVID-19).[14,15]

The Framingham Heart Study (FHS)[16] was initiated in 1948, initially enrolling 5,209 men and women, 30-62 years of age from Framingham, Massachusetts. The FHS began its third phase in 2001, enrolling the third generation of the original cohort (i.e., grandchildren). The FHS was essential in establishing cardiovascular disease (CVD) risk factors, including high blood pressure, high cholesterol, poor diet, smoking, a sedentary lifestyle, and excess body mass. The goal of the FHS was and is to *observe* a population and determine what factors lead to a higher likelihood of CVD. While valuable, the FHS does not take action to intervene and reduce risk of the population in the real time. We are well past the time where we need to act in large, population-based studies and programs of this nature. Based on our previous commentary[3] in conjunction with the data presenting herein, the epicenter of the unhealthy living-chronic disease-COVID-19-social injustice syndemic is clearly the southeast US. Furthermore, it should be considered that state- and local-level adoption and implementation of laws and regulations that allow for benefits to be experienced equitably across populations regardless of race, education, socioeconomic status, and other social determinants of health. Federal funding of large-scale longitudinal prevention trials that take a proactive, primary prevention approach[2] through healthy living medicine and social programs are desperately needed. Social justice must become a core tenant of this work[7,11] as clarity emerges that social injustice acts as an underlying common source epidemic. A first step in such an endeavor would be to understand the complex interrelationships of this syndemic; performing analyses with a broad view of all factors and ensuring a siloed approach is not taken. For example, it is no longer enough to find an association between physical inactivity and poor health outcomes. We need to know why an individual/community/population are physically inactive in the first place. Taking a causal systems mapping approach[1] would allow us to recognize "complex and multifactorial causes that prevent people from living healthy lifestyles and maintaining them long-term[3]". Understanding the cause in this fashion would allow for the development of interventions that have a

higher likelihood for success. To be more specific, we are in dire need of analyses that help us to understand the aspects of social injustice that lead to a higher prevalence of unhealthy lifestyle behaviors and eventual poor health trajectory.

Certainly, the unhealthy living-chronic disease-COVID-19-social injustice syndemic is not exclusive to the southeast US; this syndemic is a global health crisis.[17–19] The primary focus of the present commentary is to characterize a common source epidemic priority area, i.e., *Syndemic Hot Spot,* that requires attention in the US. Moreover, the unhealthy living-chronic disease-COVID-19 phenotype is a syndemic even without the social injustice overlay; a significant percentage of the population who are not from underserved communities and underrepresented groups are also adversely affected. Unhealthy lifestyle behaviors are the primary wellspring from which this syndemic originates and as such we need to focus on the origination point of this health crisis. In this context, research, using approaches such as causal systems mapping to comprehensively understand the unique interrelationships of this syndemic specific to a population within a specific community is needed on a global scale. This will help guide intervention strategies that can be optimally effective within a specific community that share common characteristics. Solving this issue will not be achieved using a one size fits all approach. Understanding how healthy living medicine can be optimally delivered and adhered to on a local level will take on many shapes and forms with the common theme being moving more and sitting less, eating nutritious foods, maintaining a healthy body weight, and not smoking are essential components of the healthy living medicine polypill.[20,21] The composition and delivery of this polypill must be specific to a local community for optimal potency.

Maps can tell a compelling visual story. The maps presented in this commentary, in conjunction with our previous commentary, make a clear case for an unhealthy living-chronic disease-COVID-19-social injustice syndemic, with the US epicenter being the southeast region. The question is, what are we going to do about it?

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Declaration of Competing Interest

None.

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