



Unique Cardiovascular Disease Risk Factors in Hispanic Individuals

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Abstract

Purpose of Review This review summarizes contemporary data on unique cardiovascular disease (CVD) risk factors in Hispanic individuals in the USA, and how addressing these factors is important in addressing health equity.

Recent Findings Recent studies have shown high rates of traditional CVD risk factors in Hispanic individuals such as obesity, hypertension, diabetes, hyperlipidemia, and emerging CVD risk factors like hypertensive disorders of pregnancy, psychological stress, and occupational exposures. However, most studies fail to consider the significant heterogeneity in risk factor burden and outcomes in atherosclerotic CVD by Hispanic subgroup. Heart failure and rhythm disorders are less well studied in Hispanic adults, making risk assessment for these conditions difficult. High levels of CVD risk factors in Hispanic youth given an aging Hispanic population overall highlight the importance of risk mitigation among these individuals.

Summary In brief, these data highlight the significant, unique burden of CVD risk among Hispanic individuals in the USA and predict a rising burden of disease among this growing and aging population. Future CVD research should focus on including robust, diverse Hispanic cohorts as well as specifically delineating results for disaggregated Hispanic groups across CVDs. This will allow for better risk assessment, prevention, and treatment decisions to promote health equity for Hispanic patients.

Keywords Cardiovascular risk factors · Hispanic · Occupational risk factors · Risk assessment · Hispanic youth

Introduction

The Hispanic population is rapidly growing in the USA, having grown by 23% to 62.1 million individuals (of 331 billion total individuals in the USA) over the last decade as

compared to 4.3% growth of other ethnic groups [1]. Cardiovascular (CV) disease (CVD) remains the leading cause of death in this group, affecting 42.7% of Hispanic women and 52.3% of Hispanic men [2]. Understanding CVD risk factors, especially those unique to these individuals, and CVD burden in Hispanic patients in the USA is therefore crucial for ensuring the provision of high-quality healthcare to this large community and health equity. Importantly, the diverse makeup, experiences, and social and economic challenges of Hispanic individuals in the USA contributes to unique CVD risk factors that are often overlooked.

Terminology: Hispanic and Latinx

The terms Hispanic and Latinx are often used interchangeably but have distinct etiologies. The term “Latinx,” or “Latino/a/x” is based on geography, identifying individuals who are of Latin American and Caribbean descent specifically. This includes those from non-Spanish speaking countries such as Belize and Brazil [3, 4]. The descriptor “Hispanic” is derived from the term “Hispania,” which historically referred to the present-day geographic region of Spain, and is used to describe those with descent from Spain or other Spanish-speaking countries [4, 5]. For many, this term is felt to be

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more culturally appropriate and all-encompassing, focusing on a shared language rather than geography. Controversy surrounding the word “Hispanic” centers around concerns regarding a connotation of colonialism [6]. Meanwhile, the word “Latinx” is a newer generational term, increasing inclusivity for those who may identify as gender non-binary [6]. While there is disagreement regarding which terminology is more appropriate [7], one recent survey noted that half of Hispanic individuals have no preference; of those who did, most preferred the term “Hispanic.” [8] For the purposes of this paper, we will preferentially use the term “Hispanic” rather than “Latinx,” acknowledging that the preferred term continues to evolve and vary within the community based on cultural and ideological norms. It is also important to emphasize that our discussion of Hispanic individuals refers to an ethnicity, and therefore may span a variety of racial groups (White, Black, Asian, multiracial, etc.).

Hispanic Population in the USA

There are over 62 million Hispanic individuals in the USA, constituting over 18% of the US population [9]. In the USA, the ten largest Hispanic groups are Mexican, Puerto Rican, Salvadoran, Cuban, Dominican, Guatemalan, Columbian, Honduran, Spaniard, and Ecuadorian [10]. Furthermore, the Hispanic population is the most rapidly expanding racial or ethnic group in the USA. It is thought that 30% of the US population by 2050 will be comprised of Hispanic individuals [11, 12]. Importantly, the Hispanic population in the USA is significantly younger than the non-Hispanic (NH) White (NHW) population; the median age is 27 years, and only 6% of Hispanic individuals are older than 65 years old compared to 15% of NHW individuals [10].

CV Health of Hispanic Individuals in the USA

As the leading cause of death among Hispanic individuals in the USA, CVD causes significant morbidity and mortality among this group. The overall prevalence of CVD, including coronary artery disease, angina, and myocardial infarction among Hispanic individuals in the USA is 8.2% [2]. This group also has high rates of other types of CVD, including stroke (prevalence of 2.4% among men, 1.7% among women), heart failure (HF) (prevalence of 2.4% among men, 1.7% among women), and peripheral artery disease (lifetime risk 22%) [2, 13]. These conditions are associated with significant healthcare expenditures in this group, with an estimated cost of \$6025 per person each year [14]. Mitigating CVD risk among Hispanic individuals is therefore important to curb rising morbidity, mortality, and healthcare expenditures.

Addressing the Hispanic Paradox

Despite the prevalence of CVD among Hispanic individuals in the USA, outcomes are often surprisingly favorable. CV mortality has been repeatedly shown to be lower in

Hispanic patients compared to NHW patients [15, 16]. This is despite the significant burden of CVD risk factors as well as socioeconomic barriers to care often faced by Hispanic and immigrant groups [17, 18]. These unexpected findings have been dubbed “the Hispanic paradox.” Multiple theories have been proposed to elucidate the surprising observation, among them: (1) The acculturation theory proposes that first generation Hispanic immigrants often follow healthier diets and use less tobacco and alcohol [17, 19], (2) The healthy immigrant hypothesis presumes first generation immigrants are younger and healthier by virtue of their pursuing migration [17, 19], although this has recently been challenged by new data showing poorer CV outcomes among foreign-born Hispanic adults compared to US-born Hispanic adults [20, 21], and (3) The salmon bias theory suggests that mortality rates of US Hispanic adults are often underreported due to immigrants returning to their home country in their older age, although some contrasting data have refuted this in a cohort of Mexican American immigrants [22].

There is much controversy surrounding the Hispanic paradox. Many studies used to validate these theories have relied on homogeneous Mexican American cohorts, lack disaggregated or geographic-specific data, and do not address the well-established disparities in treatment faced by Hispanic patients [18, 22]. Furthermore, because the Hispanic population is aging, there is thought that outcomes may worsen in future years [18]. Recent work has already begun to demonstrate a breakdown in the mortality advantage of Hispanic individuals in the USA. Death certificate data from the state of California from 2019 to 2020 shows increased rates of mortality among Hispanic adults compared to NHW adults due in part to COVID-19 but also as a result of heart disease and diabetes mellitus (DM) [23]. Furthermore, despite data on the impact of acculturation [17, 19], changes in the generational landscape and fluidity of the acculturative process of Hispanic adults over time brings this data into question. These findings demonstrate that the Hispanic paradox, while important to consider, lacks substantial evidence-based underpinnings, and may be discredited soon by the changing landscape of CV outcomes in the Hispanic population. As such, a comprehensive characterization of unique Hispanic CVD risk factors and the role of acculturation in the development of these risk factors is critical in understanding future CVD prevalence and mortality that may downturn previously observed survival advantages.

Traditional CVD Risk Factors among Hispanic Individuals in the USA

Hispanic individuals have high rates of traditional CVD risk factors (Fig. 1). Data from the Hispanic Community Health Study/Study of Latinos (HCHS/SOL) collected from 2008

to 2011 revealed that the most prevalent risk factor among Hispanic men in the USA was hypercholesterolemia, followed by obesity, smoking, and hypertension (HTN) [24, 25]. Among Hispanic women in the USA, the most prevalent risk factor was found to be obesity, followed by hypercholesterolemia, and HTN [24, 25]. Importantly, prevalence rates varied by Hispanic subgroup, highlighting the importance of disaggregating data [24, 25].

Recent population data from the 2021 American Heart Association Statistics Update shows that Hispanic men and women have higher rates of obesity (prevalence of 44.0% and 46.2%, respectively) when compared to their NHW counterparts (prevalence 40.7% and 38.7%, respectively) [2, 26]. Similarly, they have high rates of HTN (prevalence of 50.6% among Hispanic men, 40.8% among Hispanic women), hyperlipidemia (prevalence of LDL-C \geq 130 of 33.5% among Hispanic men, 23.8% among Hispanic women), and diagnosed DM (prevalence of 15.1% among Hispanic men, 14.1% among Hispanic women) [2]. Hispanic individuals in the USA also have high rates of cigarette use. The average prevalence of cigarette use in SOL was 25.7% among Hispanic men and 15.2% among Hispanic women with significant variation by country of origin. While about one-third of Puerto Rican adults in this study reported smoking cigarettes, only 11% of Dominican adults did [25]. Importantly, because many Hispanic patients disproportionately face barriers to routine healthcare access and underdiagnosis [11], this data may be underestimating the rates of traditional CVD risk factors in the US Hispanic population. Limited healthcare access among Hispanic adults is reflected in evidence showing low rates of awareness of risk factors such as hypercholesterolemia (50.7%) [27], HTN(52%) [2], and diabetes (58.7%)

[28]. In fact, Hispanic men and women have lower rates of HTN awareness, treatment, and control than NHW individuals, highlighting the additive risk and health inequity present in this population due to poor understanding and management of predisposing conditions (Fig. 2) [2]. In accordance with this, a recent study found that Hispanic adults have poor control of CVD risk factors, especially those with three or more major CVD risk factors [29].

Sex-Specific CVD Risk Factors among Hispanic Individuals in the USA

CVD risk factors among women are becoming increasingly well-recognized as important contributors to adverse CV outcomes, including in Hispanic women (Fig. 1) [30–34]. Adverse pregnancy outcomes, including gestational diabetes, preterm delivery, and hypertensive disorders of pregnancy, among others, have been included in recently published US guidelines on CV risk assessment [33, 34]. The prevalence of gestational diabetes among Hispanic women is estimated at 6.6%, higher than that of NHW (5.3%) and NH Black (NHB) (4.8%) women [35]. Hispanic women have also been found to have high rates of preeclampsia, higher than those of NHW women despite having better overall pregnancy outcomes consistent with the Hispanic paradox [36]. Rates of preterm delivery among Hispanic women in 2018 were 9.7%, which is slightly higher than those of NHW women (9.1%) yet lower than those of NHB women (14.1%) [37]. This trend was demonstrated on prior data from 2012 to 2014 as well [38]. Rates of hypertensive disorders of pregnancy are lower in Hispanic women (10.6%) than NHB

Fig. 1 Cardiovascular disease risk in Hispanic individuals in the USA. CVD cardiovascular disease, HTN hypertension, DM diabetes mellitus, AF atrial fibrillation, SVT supraventricular tachycardia, VT ventricular tachycardia, SCD sudden cardiac death, HF heart failure

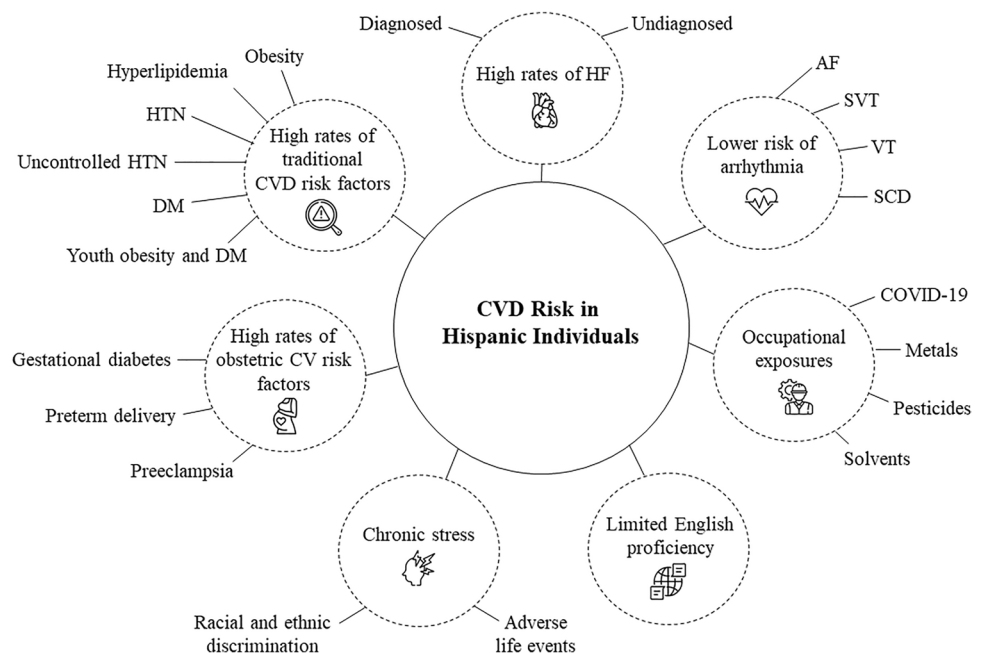
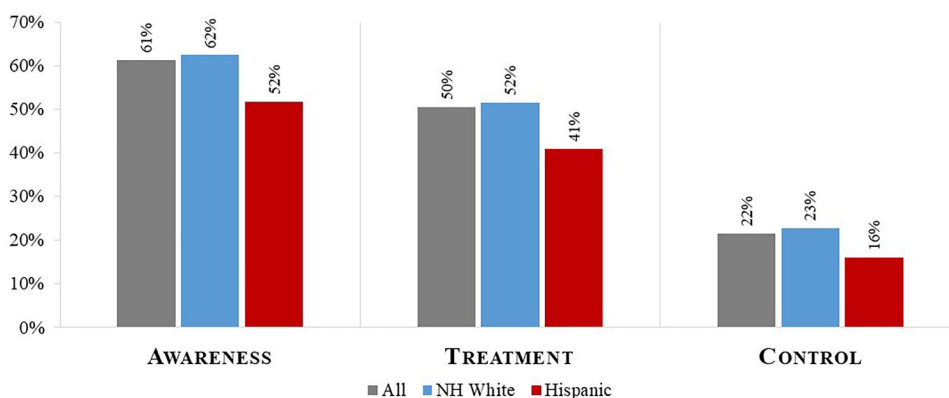


Fig. 2 Extent of awareness, treatment, and control of high blood pressure by race/ethnicity among adults in the USA [2]. *NH* Non-Hispanic



(16.7%) or NHW women (13.4%) [39]. Apart from these established rates of adverse pregnancy outcomes among Hispanic women, there may be additional risk given the high prevalence of obesity [2, 26]. Increased body mass index increases risk of preeclampsia, gestational HTN, gestational diabetes, and preterm labor [40, 41].

Disaggregation of CVD Risk in Hispanic Individuals in the USA

While disaggregated Hispanic data is still scarce, a handful of studies have found differential risk by Hispanic subgroup. The HCHS/SOL data has provided the benchmark for more granular, disaggregated data among Hispanic individuals. In this study, all of the aforementioned traditional CVD risk factors were stratified by Hispanic subgroup (Mexican, Puerto Rican, Dominican, Cuban, Central American, South American) [24]. Central American, Cuban, and Dominican individuals had the highest rates of HTN, and Central American individuals were noted to have the highest rates of hypercholesterolemia [24]. DM was most prevalent in Mexican participants [24]. Puerto Rican participants had the highest rates of obesity, and Cuban participants had the highest rates of smoking [24].

There are few recent studies that have disaggregated large-scale population data making it difficult to evaluate more recent trends in CVD risk factors by subgroup. One recent study investigated rates of HTN among a diverse cohort from 2008 to 2017, similarly finding that Cuban and Dominican men and women were at higher risk of HTN than Mexican American men and women [42], as was demonstrated by the HCHS/SOL data. Updated demographic disaggregation of smoking prevalence among Hispanics also reveals important variations in risk. While Hispanic individuals are less likely to smoke cigarettes overall when compared to NHW, NHB, American Indian/Alaska Native, and Native Hawaiian/Pacific Islander individuals, the prevalence of smoking varies within the Hispanic community, ranging from 15.6% in Central or South Americans to 28.5% in Puerto Ricans [43].

Disaggregation by place of birth is also an important factor to consider in these populations, as acculturation factors impact CVD risk. As mentioned previously, poorer CVD outcomes have been documented in foreign-born compared to US-born Hispanic individuals [21]. This disparity is thought to be related, in part, to limited English proficiency (LEP) (Fig. 1) [21]. LEP has been associated with reduced reporting of angina and CVD awareness [44], lower likelihood of therapeutic anticoagulation [45], and overall reduced use of healthcare resources suggesting limited healthcare access [46]. Recent US Census data show that 13.5% of individuals in the USA speak Spanish at home, and about 38.6% of those have LEP [47]. The provision of culturally and linguistically concordant care with Spanish speaking clinicians and the use of interpreter services is incredibly important to mitigate risk attributable to LEP in the Hispanic population. Given the importance of acculturative stress, disaggregation of Hispanic cohorts by place of birth and LEP in future studies is crucially important to better characterize risk in the heterogeneous US Hispanic population.

Psychological and Occupational CVD Risk Factors among Hispanic Individuals in the USA

Apart from the well-established CVD risk factors discussed above, there also exists a variety of emerging psychological and occupational risk factors that uniquely affect Hispanic individuals in the USA (Fig. 1). Hispanic adults face high rates of discrimination, adverse life events, and chronic stressors [48]. Stress has been consistently linked to CV health [49]. Recent data has shown that chronic stress may increase rates of HTN among Hispanic individuals [50]. Hispanic individuals also face barriers to achieving health equity that are rooted in structural racism and discrimination. These factors include immigration policies, housing, and overrepresentation in certain aspects of the workforce.

For example, a study from HCHS/SOL documented that occupational exposures to solvent, pesticide, and metal faced by Hispanic workers is associated with CVD [51, 52]. Those

with exposure to solvents had a 32% increased prevalence of HTN, while those with exposure to metals had 3.8 times increased prevalence of atrial fibrillation [51, 52]. Pesticide exposure was found to increase risk of coronary artery disease (prevalence ratio 2.2), cerebrovascular disease (prevalence ratio 1.4), and atrial fibrillation (prevalence ratio 5.9) [51, 52]. There is thought to be higher risk of occupational exposures among Hispanic workers due to language barriers impeding appropriate safety training and fear of job loss among the immigrant or undocumented population [51]. While further studies are needed to validate these risk factors, this preliminary data reveals important associations that distinctly impact Hispanic and immigrant workers in the USA. Another emerging risk factor related to occupation is the inability to achieve recommended weekly physical activity levels, which is known to be protective against DM [53–55]. Hispanic individuals are less physically active when compared to NHW individuals, both via leisure activity and occupational activity, placing them at increased risk for DM, a known CVD risk factor [53].

More recently, increased occupational exposure to COVID-19 has been observed among Hispanic individuals in the US [56]. Hispanic adults are 4 to 7.5% more likely to serve as essential workers, demonstrating their increased risk of exposure to COVID-19 [56]. Given the known various CV effects of COVID-19 infection [57], this may also be considered a novel occupational risk factor for certain forms of CVD.

Risk Assessment in Hispanic Individuals in the USA

Aggregate measures of CV risk, such as atherosclerotic cardiovascular disease (ASCVD) algorithms based on pooled cohort equations (PCE) [33], and tools developed using the Framingham Heart Study or Cohorts for Heart and Aging Research in Genomic Epidemiology-Atrial Fibrillation (CHARGE-AF) consortium are often useful for clinical decision-making and adoption of prevention strategies [58]. However, the validation of these tools and variations in risk among disaggregated Hispanic cohorts are important factors to consider when employing these in the care of Hispanic patients.

ASCVD Risk in Hispanic Adults

The widely adopted guidelines for ASCVD risk stratification and primary prevention were created by the American College of Cardiology and the American Heart Association Work Group using PCE [33]. Importantly, however, the PCE are validated only in NHW and NH African-American men and women, making it difficult to accurately extrapolate these risk assessment tools to Hispanic men and women [33, 59]. These equations have been shown to overestimate

risk in multiethnic cohorts [60], making their applicability to Hispanic populations somewhat unreliable. A 2019 study by Rodriguez et al. evaluated the accuracy of the PCE in a racially and ethnically diverse population, ultimately finding that ASCVD risk was overestimated for NHW, African American, Asian, and Hispanic individuals by 20% to 60% [61]. The degree of overestimation was variable among disaggregated Asian and Hispanic groups [61], further demonstrating the limitations of current ASCVD risk assessment methods in heterogeneous Hispanic populations.

Arrhythmia Risk in Hispanic Adults

Hispanic adults are at lower risk of both AF and supraventricular tachycardia than NHW adults (Fig. 1) [62–64]. Risk assessment algorithms such as those from the Framingham Heart Study and CHARGE-AF consortium have been validated in Hispanic patients, providing an accurate tool for AF risk stratification among Hispanic adults [58]. While validated in Hispanic patients at large, disaggregation is not reported, making it difficult to know if this tool is appropriate to use in all Hispanic subgroups. More novel risk tools, such as the ECHO-AF score [65], do not report the ethnic breakdown of their study cohorts, preventing validated use in Hispanic populations. Among the well-established risk factors for AF incorporated into these risk algorithms are age, HTN, DM, obesity, myocardial infarction, coronary artery disease, and HF. Interestingly, a recent study among a cohort of postmenopausal women has shown that these risk factors confer a higher attributable risk to Hispanic individuals compared to NHW individuals (65.6% in Hispanic individuals versus 50.3% in NHW individuals) [66]. The higher attributable risk in Hispanic adults was corroborated in a subsequent study from 2018 on AF and HF in a diverse cohort [64]. In brief, while some risk assessment tools for AF have been validated in Hispanic patients, differential risk in this population has also been observed which is important to consider when making clinical decisions for Hispanic patients at risk for AF.

Ventricular arrhythmia and ectopy risk is significantly understudied in the Hispanic population, with most recent, landmark studies on these topics consisting of only NHW and NHB participants or not reporting the ethnic makeup of their cohorts [67–69]. One study, however, reported lower frequency of ventricular tachycardia in Hispanic individuals compared to NHW individuals [63]. Well-established risk factors in these homogeneous populations include older age [69–71] and coronary artery disease [68, 72, 73], which may portend an increased risk over time in Hispanic individuals living in the USA, as this population ages in coming years. However, risk calculators or consolidated methods of risk assessment are not widely employed for ventricular arrhythmias. Data from 2018 show that Hispanic men and women

are at lower risk of sudden cardiac death (often attributable to ventricular arrhythmia although not exclusively) than NHW or NHB men and women, but at higher risk than NH Asian/Pacific Islander men and women [2]. However, it is important to note that there is often underreporting of death information in Hispanic, American Indian or Alaska Native, Asian/Pacific Islander individuals [2], which suggests that these statistics may be somewhat unreliable.

Heart Failure Risk in Hispanic Adults

Hispanic men and women in the USA have high rates of HF compared to their NHW and Asian counterparts (Fig. 1) [2]. As discussed above, Hispanic individuals have significantly higher rates of traditional CVD risk factors which predispose to HF, such as HTN, obesity, and DM, among others. The Echocardiographic Study of Latinos (ECHO-SOL) revealed that cardiac dysfunction, especially diastolic dysfunction, is underdiagnosed in Hispanic adults, although data is limited on this topic and heterogeneous based on country of origin [74]. The study included 1818 adults, of which 49.7% were found to have left ventricular systolic or diastolic dysfunction, with 96.1% of these cases being previously unrecognized [74]. Subsequent analyses of ECHO-SOL data have found an association between acculturation and abnormal cardiac structure [75] and estimate that Hispanic adults will carry an increasing burden of HF in the coming years [76]. Risk of HF in Hispanic adults is likely poorly characterized due to underdiagnosis, complicating our understanding of HF risk among Hispanic adults.

Hispanic patients with HF have lower rates of all-cause death and hospitalization compared to NHW patients [77], although prior studies had shown increased risk of hospitalization despite similar risk of death [78]. Additionally, Hispanic veterans were shown to have higher rates of 30-day post-hospitalization all-cause mortality compared to NHW veterans [79]. It is suspected that social determinants of health and Hispanic paradox theories defined above may be relevant in explaining these outcomes. Further studies are needed to clearly delineate HF risk assessment among Hispanic individuals. In many states, Hispanic patients with HF are more likely to die from HF than receive a heart transplant compared to White patients [80]. This is thought to be related to social determinants of health as well as structural inequalities and clinical bias disadvantaging Hispanic patients [80].

Looking to the Future: CVD Risk among Hispanic Youth in the USA

As discussed above, the Hispanic population in the USA is relatively young compared with the NHW population. The number of Hispanic residents in the USA who are ≥ 65 years old is expected to grow by 238% between 2000 and 2030, compared to 83% expected growth for NHW residents [81].

The rising age of this group therefore makes understanding CVD risk among Hispanic youth a critical benchmark for predicting CVD risk among this rapidly growing population.

The propagation of CVD risk factors, specifically obesity, from parents to children in Hispanic communities has been demonstrated in a 2017 study by Carnethon et al. [82]. The odds of having an obese child is 2.39 for obese, Hispanic adults [82]. Apart from the known propagation of risk across generations, Hispanic youth also have high rates of CVD risk factors independently. Hispanic children have the highest rates of obesity among other racial/ethnic groups in the USA [2, 83]. Up to 28.6% of Hispanic males and 23.4% of Hispanic women are obese, compared to 16.2% of NHW males and 14.2% of NHW women ages 2 to 19 years [2, 83]. Accordingly, less healthy dietary behaviors have been observed among Hispanic and lower-income youth [84].

Incidence of Type 1 and 2 DM among Hispanic youth are rising more rapidly than among NHWs over time [85, 86]. This differential trend therefore suggests that the burden of DM in the future will be disproportionate among ethnic groups, which disadvantages Hispanic individuals. Childhood DM has also been shown to increase CV risk, especially in terms of metabolic syndrome risk factors, in youth specifically [87]. Non-alcoholic fatty liver disease (NAFLD) is newly being considered a strong independent CVD risk factor [88], especially in pediatric patients given the increased severity of disease in these cases compared to adult cases [85, 89]. Recent data reveals that those with pediatric NAFLD are 15.2% Hispanic, 10.1% NHW, and 9.7% NHB [90], demonstrating that Hispanic youth carry the largest burden of NAFLD.

Possible contributors to these ethnic disparities in CVD risk among youth in the USA include LEP, financial hardships, food deserts, poor access to healthcare insurance or facilities [85]. The COVID-19 pandemic has unfortunately created more significant financial hardships, decreased access to healthy foods, and made physical activity more difficult for children of historically disenfranchised groups in the US [91]. Therefore, implementation of interventions to address these issues are crucial for mitigating CVD risk among Hispanic youth in the USA [91].

Conclusions

Hispanic individuals in the USA are at high risk of CVD morbidity and mortality, in part due to high rates of predisposing conditions and unique risk factors, such as LEP and well-established psychological stress and occupational exposures. Lack of disaggregation in most studies on Hispanic CV health complicates risk assessment and the use of composite risk algorithms or tools for clinical

decision-making in this population. Hispanic youth also have many CVD risk factors that are often overlooked yet important given the aging population. The Hispanic population in the USA is rapidly growing, making risk mitigation within this group critically important for curbing future CVD morbidity, mortality, and healthcare costs as well as promoting health equity. Some recent community health [92–95] and telehealth [96] programs have made efforts to break down barriers to care in heterogeneous Hispanic populations, serving as flagship examples of interventions created in a culturally competent and evidence-based manner to address differential risk among Hispanic individuals. The creation of similarly successful projects, however, relies heavily on accurate risk categorization in CV literature and trials, which requires inclusion of robust and diverse Hispanic cohorts and disaggregation of Hispanic demographic data. Furthermore, additional evaluation and creation of composite risk assessment tools in Hispanic individuals may provide important information for both clinical decision-making and the creation of community-based interventions to ensure Hispanic CV health equity.

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Declarations

Conflict of Interest Sofia Gomez, MD, Vanessa Blumer, MD, and Fatima Rodriguez, MD, MPH declare that they have no relevant conflicts of interest.

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