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The Hispanic Paradox in Cardiovascular Disease and Total Mortality

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ABSTRACT

Health statistics and epidemiologic studies have shown that Hispanics live longer than Non Hispanic Whites, despite a high prevalence of cardiovascular disease (CVD) risk factors and an average low socioeconomic status, both strong predictors of CVD and mortality. This phenomenon has been dubbed "The Hispanic paradox" and has been demonstrated in old and contemporary cohorts. To date, no factor has been identified that could explain this phenomenon, but socio demographic factors, dietary intake and genetic predisposition have been proposed as possible explanations for the Hispanic paradox. As with the French paradox, where French were found to have a lower rate of coronary heart disease (CHD), helped to identify the role of the Mediterranean diet and wine consumption in the prevention of CHD, the Hispanic paradox could help identify protective factors against CHD. This article describes the current evidence supporting the existence of the Hispanic paradox and provides a brief review on the possible explanations.

Hispanic or Latinos have been defined by the United States (US) census as "a person of Cuban, Mexican, Puerto Rican, South or Central American or other Spanish cultures or origin regardless of race." The US census showed that of the 308.7 million people living in the US 50.5 million (16%) were Hispanic.[1] By 2012, this figure increased to just over 53 million. The Hispanic population remains one of the groups with the highest poverty rate in the US, surpassed only by African Americans (AA), despite the fact that there have been reports of middle class growth. This translates into less access to health care, making them a high-risk population. For some authors this risk varies when referring to immigrants with legal residency status, whether permanent or temporary, inasmuch as it tends to signify better economic and social situation, compared to those who enter the country illegally.[2] Immigration status becomes a decisive factor in health. Moreover, a longer permanence in the country is related to an increase in different medical conditions. Compared with non-Hispanic whites (NHW), Hispanics display a worse cardiovascular disease (CVD) risk profile including higher rates of central obesity, physical inactivity, type II diabetes mellitus, atherogenic dyslipidemia lower levels of education, and lower socioeconomic status. All these factors have been associated with CVD morbidity and mortality in the general population. However, despite the high prevalence of CVD risk factors, Hispanics have been shown to have lower rates of CVD and better life expectancy. This phenomenon has been known as the Hispanic paradox.

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Abbreviations and Acronyms
AA = African Americans
CHD = Coronary heart disease
CVD = cardiovascular disease
NHW = non Hispanic whites
PA = physical activity
US = United States

The Hispanic paradox

It has been demonstrated that the health status of Hispanics is more similar to the health status of NHW than to the more socioeconomically coinciding AA.[3] Several epidemiologic studies have shown that Hispanics have lower rates of coronary heart disease (CHD) events and lower CVD and total mortality[4–8] than NHW after adjusting for age and sex and comorbidities. A recent meta-analysis confirms those findings.[9] Census statistics have also demonstrated that Hispanics have longer life expectancy when compared with NHW and even longer than AA for both men and women as illustrated in Fig 1.[1] Fig 2 compares all-cause and CVD mortality rates among races/ethnicities.[10]

Hispanics have either a similar or a higher prevalence of major CVD risk factors when compared with NHW, with the exception of smoking rates in women, which are lower.[11] Central obesity, a major CVD risk factor is extremely prevalent among Hispanics, particularly women. Lack of health insurance is known to affect indicators of health and wellbeing and is related to higher all-cause mortality,[12] and many Hispanics are uninsured. Uninsured rates among Hispanics are as high as 37%, with the exception of the Puerto Rican subgroup that is covered by Medicaid benefits. For those with insurance, cultural, linguistic and sociodemographic factors affect the quality of care Hispanics receive.[13]

The reason for this seemingly unexpected finding has been supported by several theories related to Hispanic nutritional, geographic, genetic and psychosocial characteristics. However, the exact mechanism to explain this phenomenon remains unclear.[14]

Hispanic behavioral characteristics: the Acculturation theory and the healthy immigrant hypothesis

Acculturation is defined as the process of adaptation to a new culture assessed by the integration to the new country's values, behaviors, beliefs and attitudes.[15] Some immigrant groups in the US that follow a lifestyle similar to the culture of origin, tend to have better CVD outcomes. However, second and third generation Hispanics, who are generally more acculturated, have incorporated behavioral, nutritional and other factors that may erase any potential advantage in terms of CVD risk rendering the "Acculturation theory". The diet of the less acculturated Hispanics, consists of smaller amounts of calories, an appropriate amount of protein, fiber and carbohydrates with low saturated fat than that recorded for NHW.[13,16] After comparing first and second generation Hispanics, the number of meals consisting of fast food, sugary drinks and saturated fats increases.[17]

Smoking is the leading cause of premature death in the US,[18] however, the overall prevalence of cigarette smoking is

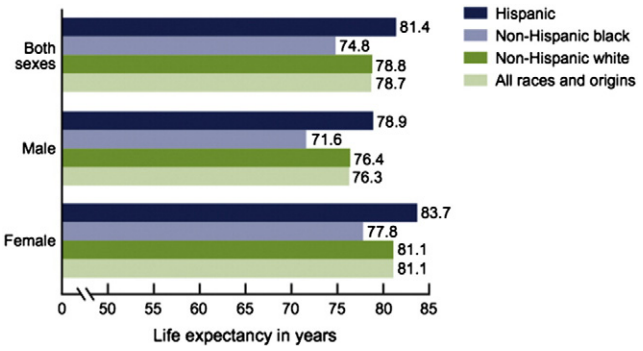

Fig 1 – Life expectancy at birth, by Hispanic origin, race for non-Hispanic population, and sex: United States, preliminary 2011. Adapted from the Center of Disease Control[1]

lower for Hispanics than for NHW's. Nonetheless, this behavioral advantage disappears as acculturation deepens.[19] Women of Hispanic origin smoke less than Hispanic men and non-Hispanic women.[20,21] In a recent multicenter prospective study assessing Hispanics, the prevalence of smoking approached 26%, being the highest among Puerto Rican and Cuban men[11] and the lowest among Dominicans. Fenelon et al. assessed the role of smoking and the relative decrease in expected mortality affecting Hispanic populations, reaching the conclusion that this might be a major contributor to the longevity advantage.[22] However, studies have shown that CVD mortality among Hispanics persists even after adjusting for smoking and other CVD risk factors.[4–8]

When addressing alcohol consumption, Hispanic males and females have less history of alcohol use than NHW,[23] as do teenagers born in foreign soil compared to US born.[24] Family and religion influences are possible explanations for this, as Latino families strongly discourage alcohol abuse.[25] Acculturation evidence is contradictory, with some studies showing association with heavier drinking and other data demonstrating no influence on drinking.[26] Acculturation-related stress drinking portrays a significant variance when adjusted for income and education and it has become a target for preventive intervention strategies.[27] Because moderate alcohol consumption has been associated with lower rates of CVD and with longer survival, the lower drinking rates among Hispanics could not explain the paradox, and if anything, would reinforce it.

Hispanics are more sedentary than non-Hispanic whites. The National health and nutrition examination survey (NHANES) reported lower levels of physical activity (PA) in Hispanics.[28] The San Luis Valley Diabetes study showed similar results.[29] The prospective Study of Latinos reported that only about half of Hispanic adults adhere to the recommendations by the U.S. Department of Health and Human services, to do ≥150 min a week of moderate or vigorous PA.[30] These data showing lower levels of PA among Hispanics when compared with NHW cannot explain the paradox.

Healthy migrant hypothesis

The healthy migrant hypothesis implies that Hispanics who decide to migrate are younger and healthier than those who

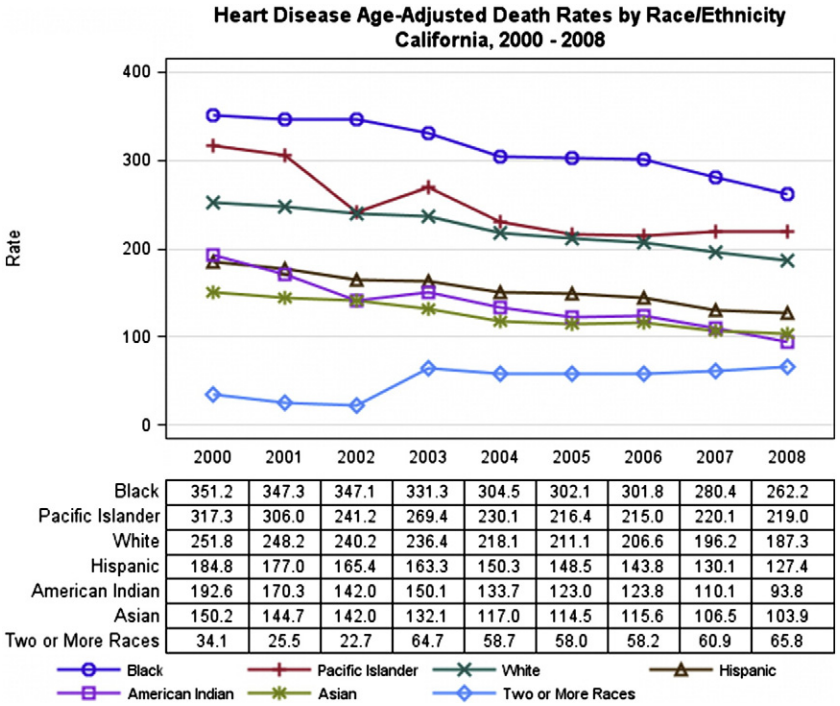

Fig 2 – All-cause and CV mortality rates among races/ethnicities in California. A similar pattern can be observed in the national-level data. Adapted from the California Department of Public Health[10]

do not migrate, giving them an "advantage" over the native population of recipient countries. US data indicate that foreign-born individuals have better health (e.g., self-reported health, less functional limitations and days spent in the hospital) than US-born respondents, and recent Latino immigrants are healthier than those who have been residing in the United States for longer periods.[31] This hypothesis was recently challenged comparing the health of Mexican immigrants to the health of native Mexicans concluding that migrants may display a worse health status than the local population from where they emigrate.[32] However, the acculturation theory would imply that this state of health tends to deteriorate with increased time of residency in the host country.[14,33–36]

Salmon bias hypothesis

The salmon bias theory proposes that Latinos return to their home country to retire or in case of serious illnesses to "die in their home". This could bias the mortality rate by lowering it, as foreign deaths will not be tabulated in the US mortality statistics. The salmon bias theory has often been challenged by authors that had considered it implausible in two subgroups: Cubans, comprised by a large amount of political refugees whose immigration status prohibits them to return to their home country and Puerto Ricans, who usually spend their elderly years in their native country and because it represents a Commonwealth with the US their deaths are recorded in the national statistics. Likewise, newer generations of Hispanic immigrants tend to form settled families and avoid returning to their country.[31,32] The Salmon hypothesis was tested by Abraido-Lanza et al. using data from the National Longitudinal Mortality Study, and they concluded that the salmon bias hypothesis could not explain the lower mortality among Hispanics.[31]

Data reliability

Mortality rate data supporting the Hispanic paradox have been questioned, mainly because of the use of census information in the denominator and death certificates as a source for the numerator. In earlier years The Bureau of Census instituted the use of Spanish surnames to identify people of Hispanic descent. This was later addressed by Ellis et al., who concluded that Hispanic women had higher mortality rates when compared to Hispanic men in part due to omission of identity, as in the case of women losing Hispanic surname as a result of marital status to a non-Hispanic.[37] Before the 1950's a glitch was identified in the way demographic information was collected leading to underreporting of Hispanic status. After 1950 the definition of Hispanic in death certificates included identity. Studies that did not use death certificate information still demonstrated lower mortality rates for Hispanics, so it was concluded that this factor alone would not explain the paradox.[14]

Dietary factors

The variation in dietary patterns between Hispanics and NHW may be a possible explanation for the Hispanic paradox. In comparison to the general U.S. population, consumption of

Table 1 – Influential studies on the Hispanic paradox.

Study	Outcomes	Population	Results Compared No NHW	Advantages	Limitations	Opinion
Corpus Christi[49]	CHD mortality	Mexican Americans Non Hispanic whites	Greater CHD mortality in Mexican Americans	Coded death certificates Coronary mortality blinded to ethnicity	Community base study	Against the paradox
San Antonio Study[48]	All cause mortality	Diabetic Mexicans	Greater overall all cause mortality for Mexican American non statistical significance	Ethnic classification algorithm reduces bias	Limits to diabetic patients	Against the paradox
	CVD mortality	Diabetic Mexican Americans	Greater cardiovascular mortality for Mexican American non statistical significance	Includes native and US born Mexicans		
		Diabetic non Hispanic whites	Similar risk on Mexicans			
Northern Manhattan study [8]	Non fatal MI	Self identified Hispanics	Increased prevalence of risk factors among Hispanics	Systematic follow-up	Insufficient demographic data	Supports the paradox on coronary mortality
	CHD mortality		Lower CHD mortality	Decreased risk of Salmon bias	Small quantity of non fatal MI	Supports the paradox on cardiovascular mortality
	CVD mortality		Lower CVD mortality	Multiple outcome analysis	Hispanic health barriers remain present	Against the paradox on non fatal MI
			No difference in non fatal MI	Risk analysis that favored the paradox	Questionable external validity	
Frerichs, R[52]	All cause mortality	Hispanics	Lower all cause mortality	Includes multiple minority populations	Data gathered from U.S. Census	Supports the paradox
	CVD mortality	Non Hispanic whites AA Asians	Lower CVD mortality			
Friss, R[4]	All cause mortality	Hispanics	Increased all cause mortality	Coded death certificates	Data gathered from U.S. Census	Supports the paradox on cardiovascular mortality
	CVD mortality	Non Hispanic whites	Lower CVD mortality			
Iribarren, C[5]	All cause mortality	Hispanics	Lower all cause mortality	Prospective cohort study	Community base study	Supports the paradox
	CVD mortality	Non Hispanic whites	Lower CVD mortality			
Palaniappan, L[46]	All cause mortality	Hispanics	Lower all cause mortality	Includes multiple minority populations	Data gathered from U.S. Census	Supports the paradox
	CHD mortality	Non Hispanic whites AA Asians	Lower CHD mortality			
Sorlie, P[47]	All cause mortality	Hispanics	Lower all cause mortality	Includes multiple minority populations	Data gathered from U.S. Census	Supports the paradox
	CHD mortality	Non Hispanic whites	Lower CHD mortality			
Stern, M[53]	All cause mortality	Mexican Americans	Lower all cause mortality		Hispanic status established by surnames	Supports the paradox
	CHD mortality	Non Hispanic whites	Lower CHD mortality			
	MI mortality		Lower MI mortality			
Wild, S[54]	CHD mortality	Hispanics	Lower CHD mortality	Coded death certificates	Data gathered from U.S. Census and death certificates	Supports the paradox
	Stroke mortality	Non Hispanic whites AA Asians	Lower Stroke mortality			

Abbreviations: NHW = non-Hispanic whites, US = United States, Mexican Americans = US born with Mexican descent, MI = myocardial infarction, CHD = Coronary hearth disease, CVD = Cardiovascular disease

legumes such as beans is greater among Hispanics, especially Mexican and Central American immigrants. Legumes have been shown to carry protective effects against CVD.[38] A major element of the Hispanic diet is beans, which are rich in polyphenols and other substances that enhance endothelial function, reduce oxidative stress and have antiatherogenic properties.[39,40] Intake of fruits also seems to be higher among Hispanics in comparison to NHW. Fruits are protective against many degenerative diseases, including CVD.[41]

Social and family

Another possible explanation for the lower mortality among Hispanics is the presence of nuclear families and high levels of social support.[42] Hispanics retain sympathy, kindness, harmonic relationships, familism and collectivism, which have been considered favorable factors linked to greater physical and emotional well being and lower mortality.[43] Some studies have suggested that this social support, either from family or from friends, is related to lower rates of CVD.[44,45] Unfortunately, no epidemiologic study assessing CVD mortality among Hispanics has tested the potential role these social factors could play to explain the Hispanic paradox.

Conclusions

As demonstrated in Table 1, several research studies have been designed to demonstrate or exclude the existence of a "Hispanic paradox". Some theories trying to explain this paradox include the Salmon Bias, acculturation, lack of data consistency in conjunction with other nutrition and social related factors. Still, to date no factor has been studied at large to fully explain the occurrence of this paradox. While several possible confounders and biases have been evoked as possible contributors to the finding that Hispanics live longer despite having lower socioeconomic status and lacking access to healthcare, the phenomenon represents an opportunity to identify a factor or factors with a potential protective role in CVD. The controversy continues even in more recent epidemiologic studies, some supporting the existence of the Hispanic paradox,[4–8,46,47]others supporting it partially like the Northern Manhattan study[8] and others opposing its existence like San Antonio[48]and Corpus Christi,[49] showing that Hispanics have a similar and even greater mortality than NHW. The Hispanic Community Health Study/Study of Latinos[50] has brought about some new insight to better understand the heterogeneity of sociodemographic and other factors implicated in CVD among Hispanics evaluating the prevalence of such CVD risk factors and the influence of migration, acculturation life styles, genetics and others factors and outcomes.[51] However, this is a "Hispanic-only" study and addition of an NHW control group in future studies will augment the capacity to answer questions linked to the paradox. The concept of the Hispanic paradox should not reduce or minimize concerns about CVD amongst Hispanics in the US, as CVD is generally the first or second cause of death among Hispanics in the US. Therefore, the existence of the Hispanic paradox should not delay the development of interventions to improve CVD health in the Hispanic population.

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Statement of Conflict of Interest

The authors state that they have no conflicts of interest.

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