5-2012

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Recommended Citation

Salinas, J. J., Abdelbary, B., Wilson, J., Hossain, M., Fisher-Hoch, S., & McCormick, J. (2012). Using the Framingham Risk Score to evaluate immigrant effect on cardiovascular disease risk in Mexican Americans. Journal of health care for the poor and underserved, 23(2), 666–677. https://doi.org/10.1353/hpu.2012.0058

Published in final edited form as:
J Health Care Poor Underserved. 2012 May ; 23(2): 666–677. doi:10.1353/hpu.2012.0058.

Using the Framingham Risk Score to Evaluate Immigrant Effect on Cardiovascular Disease Risk in Mexican Americans

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Abstract

Background—This study uses the Framingham Risk Score (FRS) for 10-year cardiovascular disease (CVD) to evaluate differences between Mexican American immigrants and the U.S.-born population.

Methods and Results—Data from the Cameron County Hispanic Cohort (N=1,559). Average total risk scores were generated by age group for each gender. Regression analysis was conducted adjusting for covariates and interaction effects. Both women and men in the CCHC sample who were long-term immigrant residents (mean FRS scores women 4.2 with p<.001 vs. men 4.0 with p<.001) or born in the U.S. (mean FRS scores women 4.6 with p<.001 vs. men 3.3 with p<.001) had significantly higher risk scores than immigrants who had only been in this country for less than 10 years. The interaction model indicates that differences between immigrant and native-born Mexican Americans are most greatly felt at lowest levels of socioeconomic status for men in the CCHC.

Conclusions—This study suggests that in terms of immigrant advantage in CVD risk, on whom, where, and how the comparisons are being made have important implications for the degree of difference observed.

Keywords

Framingham risk score; Mexican American; risk factors; immigrant; cardiovascular disease

Cardiovascular diseases (CVD) are among the leading causes of mortality for both men and women in the United States.[1] African Americans have the highest mortality rates from CVD, followed by non-Hispanic Whites and then Mexican Americans.[2] Since Mexican Americans are more likely to live in poverty than non-Hispanic Whites, the fact that they have lower CVD mortality is unusual because it has been linked to economic disadvantage in other ethnic groups.[3] Immigration is a common explanation for the lower CVD mortality among

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Conflict of interest: None

Mexican Americans,[4] since over 50% of Mexican Americans are born in Mexico, and immigrants are known to have better health and mortality outcomes than their native-born counterparts.[5–8] In fact, Mexican American immigrants have been observed to have lower subclinical vascular disease than non-Hispanic Whites and U.S.-born Mexican Americans, and, lower biological risk factors for CVD and mortality (such as triglycerides and cholesterol).[9–10] Moreover, when comparing U.S.-born and immigrant Mexican American cardiovascular mortality to that of non-Hispanic Whites, it is only the immigrants who have the advantage over the non-Hispanic Whites.[4]

Immigration is an economic process in which people come to a new country in search of opportunities to improve the quality of life for them and their families.[11] Mexican American immigrants to the U.S. are exposed to occupational hazards,[12] discrimination,[13] and separation from their families.[14] As immigrants stay in the U.S., their economic situation may improve as they find better jobs, gain legal residency, and establish familial ties or social networks in their new country.[11] These changes in socioeconomic standing may also correspond to changes in health status that may contribute to cardiovascular disease and risk.[15] However, socioeconomic advancement depends on economic environment.[16] In predominantly poor areas, such as in the U.S.-Mexico border region, the economic trajectory observed for immigrants may not be typical of economic trajectories in general, thereby resulting in differentials in CVD risk.

The current study makes use of the Framingham Risk Score (FRS) for 10-year CVD risk to evaluate risk in Mexican Americans living in South Texas on the U.S.-Mexico border. The Framingham Risk Score (FRS)[17] is a tool that was created by the Framingham Heart Study[17] to predict 10-year CVD risk in the general population living in the United States. Risk factors for CVD are weighted and compiled into an overall score. This score has been used to test the predictability of CVD onset within 10 years, and mortality from CVD, with high reliability.[18] The FRS has also been used in a number of studies to determine the association with other CVD indicators. For example, Park *et al.* 2010 examined the relationship between inflammatory markers and the FRS for coronary artery disease (CAD) 10-year risk.[19] Participants with low-grade systemic inflammation and hyperhomocysteinemia had higher 10-year risk for CAD. Moreover the FRS has been shown to correlate with whole-body magnetic resonance angiography (WB-MRA) that evaluates arterial vasculature and the atherosclerosis score index (ASI).[20]

Several studies have examined racial and ethnic differences in CVD risk,[21–23] and a few studies have used the FRS to evaluate differences in cardiovascular risk between immigrants and U.S.-born people in the Mexican origin population.[24,25] However, comparisons between short-term immigrants, long-term immigrants and the U.S.-born have not been fully explored in this population. This study will provide insight into socioeconomic factors that may be responsible for the anomalous fact that Mexican Americans have unusually low CVD mortality rates despite their high rates of poverty by comparing CVD risk in short-term immigrants, long-term immigrants, and U.S.-born Mexican Americans.

Data collection for this study occurred in Brownsville, Texas, which is located in the Rio Grande Valley (RGV); the four counties contained in the southernmost tip of Texas bordering Mexico. Eighty-seven percent of the population is of Mexican descent,[26] nearly 90% of residents report Spanish as the language most often spoken at home,[27] and approximately 31.9% of the population of Brownsville are immigrants.[28] Although Brownsville is one of the fastest-growing regions of the country, it is home to the poorest of the U.S. poor, ranking among the lowest in the nation in *per capita* income with one-third of residents living below the poverty line.[27] In addition, about one third of its residents over 25 years of age have less than a ninth-grade education, which is about four times higher the

national average.[26] The primary objectives of this study are therefore to establish 10-year CVD risk in a sample of poor Mexican Americans living in a border city and to determine the effect of years in the U.S. in this region by economic status and life-course stage on CVD risk.

Methods

Study population and sample

The Cameron County Hispanic Cohort (CCHC) is the data source for this analysis. The CCHC is a sample of community-residing, Mexican-origin adults 18 years of age and older. The sample was chosen using multi-stage cluster design from randomly selected first and third socioeconomic quartile census tracts in the city of Brownsville, Texas, which is located on the U.S.-Mexico border.[29]

The total sample consists of 2,000 subjects in the CCHC; however, due the age range to construct the FRS (i.e., 30 to 75 years) and missing data in 12 subjects, 1,559 subjects are used for the present analysis. In order to adjust for the sample selection methodology, sampling weights were used in all analyses. In addition to adjusting for the sampling weights, the estimates from the regression are also adjusted for potential strata and clustering effects.

The FRS for 10-year CVD risk was constructed using the algorithm from the Framingham Heart Study.[17] The risk score was constructed using actual measured blood pressure and cholesterol and high-density lipoprotein values taken from fasting blood samples from the participants.[29] In addition, untreated and treated systolic blood pressure was determined by whether participants were on anti-hypertensive medications. Subjects were assigned a weighted score for their age, diabetes status, cholesterol level, high-density lipoproteins (< 40), systolic blood pressure (treated and untreated), gender, and whether they smoked at the time of interview. For example, a man who was a current smoker would be given four points, while a female smoker would be assigned three points. Additionally, a man who was 35 would be given two points, while a 65-year old man would be given 12 points. All points were added and an overall FRS was assigned to each participant in both samples. A higher overall score indicates a higher 10-year CVD risk. Mexican Americans were coded as U.S.-born, immigrant less than 10 years in U.S., and immigrant 10 or more years in the U.S. Education was measured as high school graduate (yes/no) and income as less than $10,000, $10,000 to $19,999, and $20,000 or more. In order to evaluate life-course stage variation a categorical variable was created: early adulthood (30–39 years), middle age (40–60 years) and old age (61–75 years). In addition the following health conditions were included as descriptive indicators in Table 2: diabetes, high cholesterol, hypertension, and current smoker.

Analysis

Due to the fact that sex-specific scores are generated using the FRS, all analysis is conducted separately for men and women. Descriptive statistics were generated using STATA 11 SE [30] by sex and age group. Average total risk scores were generated by age group for each sex. Regression analysis was conducted adjusting for covariates and interaction effects. Because the FRS score was normally distributed and had negative values, an OLS regression was conducted in STATA using the svy:reg command. Additionally, because age is part of the FRS algorithm, we conducted a separate regression analysis by life-course stage to evaluate age-specific effects on immigrant status. Sampling weights were used to adjust for sampling design and clustering effects are accounted for using STATA.[30]

Results

Table 1 shows demographic and selected health conditions for the CCHC participants. There are significantly lower proportions of male and female immigrants who are high school graduates compared with U.S.-born males and females. As seen in Table 1, the majority of U.S.-born earn less than $20,000, and the majority of immigrants earn less than $10,000 a year. These statistics illustrate the overwhelming disadvantage of being an immigrant that has been previously documented.[27]

In Table 1, statistics on self-reported conditions are presented by sex and immigration status. Mexican American immigrants who have been in the U.S. less than 10 years have the lowest prevalence of diabetes. However, immigrants who have been in the U.S. 10 or more years have a higher prevalence of diabetes than the people who are U.S.-born. In terms of CVD, immigrants in the U.S. less than 10 years have the lowest prevalence of high cholesterol and hypertension for both sexes. However, differences are only significant for hypertension in men. Immigrant women have the lowest percentage of smokers, while male immigrants who have lived in the U.S. for less than 10 years have the highest. These differences, however, are not statistically significant. Finally, for both men and women, immigrants who have lived in the United States for less than 10 years have the lowest average FRS, while immigrants in the U.S. 10 years or longer had the highest.

Table 2 presents stratified by sex regression coefficients for total FRS. There is a protective effect of high school graduation on FRS, whereas women who graduated from high school had, on average, scores 3.2 ($p<.001$) less than their non-graduate counterparts. Similarly, men with high school diplomas had scores 2.0 ($p<.01$) points less than their counterparts. Both women and men in the CCHC sample who were in the U.S. less than 10 years had significantly lower FRS scores than the U.S. born (women −2.7 ($p<.01$), men −2.3 ($p<.05$)). However, immigrant men in the U.S. 10 years or longer had on average 1.55 ($p<.01$) higher FRS scores than the U.S. born. For men, with respect to income, FRS scores were significantly lower than the reference category for $20,000 or greater ($\beta= -2.7$ $p<.05$) and for missing ($\beta= -2.8$, $p<.05$).

An interaction model did not yield significant effects for education, but did for income for men only. Figure 1 displays adjusted FRS score interaction effects for immigrant status by income level for men. There are two important patterns that can be gleaned from this figure. First, immigrants in the U.S. less than 10 years have FRS scores at or below 10 in all income groups. Second, immigrants in the U.S. for less than 10 years have substantially lower FRS scores than both U.S.-born and immigrants in the U.S. for 10 years or longer, in the less than $10,000 income category and the $10,000 to $19,999 income category, but not the $20,000 or more category. Moreover, FRS scores for immigrants in the US for more than 10 years and the U.S.-born in the two lowest income categories are both much higher than immigrants in the U.S. less than 10 years.

In order to evaluate any life-course specific differences between immigrants and U.S.-born people, regression analysis was conducted stratified by age group and gender (Table 3). For both women and men, significant differences by nativity can be observed but only for those participants who were between the ages of 40 to 60 years. Women immigrants who have been in the U.S. less than 10 years have significantly lower Framingham Risk Scores than the US born (−1.54, $p=.004$). Additionally, for men who are immigrants living in the U.S. less than 10 years, on average, scored 2.18 ($p=.004$) less than the U.S.-born. Immigrant men in the U.S. 10 years or longer scored on average 1.10 points less, however the relationship was only marginally significant ($p=.096$).

Discussion

The purpose of this study was to evaluate differences in duration of time in the U.S. by socioeconomic status and life course stage in CVD risk in poor Mexican Americans living in South Texas on the U.S.-Mexico border. Poverty in and of itself is a risk factor for CVD,[31] at the same time, Mexican American immigrants have been observed as having lower CVD than the U.S.-born.[9–10] Findings from this study are consistent with previous studies that immigrants who lived in the U.S. for less than 10 years had lower FRS scores than U.S.-born people as well as immigrants who lived in the U.S. for more than 10 years, however this difference appears to be primarily among the middle-aged, or subjects between the ages of 40 to 60. Previous research on CVD in the Mexican American population has relied on one source of data or only looked at immigrants compared with U.S.-born Hispanic Americans or non-Hispanic Whites, ignoring duration of time in the United States or life-course stage.[32] For example, Morales *et al.* 2009[32] using the Hispanic Health And Nutrition Examination Survey (HANES) and National Health And Nutrition Examination Survey (NHANES) data did stratify analysis by sex observed temporal differences in the effect of immigrant status between the Hispanic HANES (1982–1984) and the NHANES data (1999–2004), however did not find within-survey differences between immigrant and U.S.-born Mexican Americans. Morales *et al.* 2009[32] did not take into account length of time in the U.S., which in the present study revealed differences between short-term and long-term immigrants.

Previous studies have compared Mexican American immigrants with U.S.-born Mexian Americans or non-Hispanic Whites have usually combined both sexes in the analysis, [4] a major shortcoming. For example, Stern *et al.*[4] using data from the San Antonio Heart Study did not find significant difference between U.S.-born and immigrant Mexican Americans in several risk factors, including previous heart attacks, stroke, blood pressure, and cholesterol or body mass index. By using sex-stratified analysis the findings from this study revealed an effect from income on the relationship between immigrant status and the FRS 10-year CVD risk for men only. Socialization differences and immigration patterns may explain these differences. For example, Mexican American men have been found to have higher undiagnosed metabolic conditions than their female counterparts.[33]

While education provided little clue to differences between immigrants and the U.S.-born, there were stark differences in the lowest-income groups. Increased income was associated with lower FRS 10-year CVD risk in the CCHC sample. The interaction model suggests that differences between immigrant and native-born Mexican Americans are greatest at lowest levels of socioeconomic status for men in this study. These may be due to a number of factors, such as smoking behaviors, obesity, and dietary behaviors or diabetes differentials that may exist between poor immigrant and U.S.-born Mexican Americans. For example among poor Mexican Americans living in the Texas-Mexico border region, immigrants had significantly different nutritional beliefs.[15] However, few studies have fully explored these possibilities. Most studies of CVD disparities have focused only on country of birth.[4,10] One exception is Gallo *et al.*[34] who used the Multi-Ethnic Study of Atherosclerosis (MESA) study data to evaluate subclinical vascular disease. Gallo *et al.*'s study demonstrated that there was a modestly significant interaction effect of acculturation and socioeconomic status on subclinical vascular disease. However, again, Gallo *et al.*'s[34] study did not stratify by sex. Sex-specific acculturation associations have been found in self-reported hypertension, smoking, and disability, and in mortality among higher-income older Mexican Americans.[35] The findings from the current study provide added evidence that immigrant advantage for men in CVD risk is related to socioeconomic status. Future studies on cardiovascular and other diseases should include socioeconomic interactions with duration of residency in the United States in the analysis.

The FRS for 10-year CVD risk is an instrument that has been used in previous studies to demonstrate risk, correlations, and disparities in various groups.[17,36] In this study the FRS is used to compare groups by immigrant status and income in cross-sectional data. Nevertheless, having longitudinal or mortality data to confirm the speculation of 10-year risk in this population would be very beneficial. Although other studies have measured the reliability of this instrument in predicting subsequent disease or mortality on other populations and Hispanic groups (e.g., Puerto Ricans), [18] no study has done so in the Mexican American population. Doing so would provide greater insight into the CVD paradox of this population. In addition, this study did not include contextual variables, such as socioeconomic conditions or access to health care services that would provide greater understanding of the influence of social context on CVD risk in the Mexican American population living in the United States.

Despite its limitations, this study provides insight into CVD risk in the Mexican American population in the United States. Low-income Mexican American men who are U.S.-born or long-term resident immigrants carry a high burden of CVD risk. Middle-aged short-term immigrant men and women may have an advantage over their U.S. born peers. Despite paradoxical trends in cardiovascular disease and mortality in Mexican Americans as a whole, poverty continues to exert its influence on this ethnic group.

Acknowledgments

This work was supported in part by DMID Contract 09-0032 Vaccine and Treatment Evaluation Unit N02A1025465, MD000170 P20 funded from the National Center on Minority Health and Health disparities (NCMHD), and the University of Texas Houston Health Sciences Center, Center for Clinical and Translational Science CCTS-CTSA award 1U54RR023417-01 funded by the National Center for Research Resources (NCRR) and the American Heart Association Beginning Grant-in-Aid Grant 10BGIA3080006.

References

1. Centers for Disease Control and Prevention. Deaths and mortality. Atlanta, GA: Centers for Disease Control and Prevention; 2010. Available at: http://www.cdc.gov/nchs/fastats/deaths.htm
2. Centers for Disease Control and Prevention. Heart disease facts and statistics. Atlanta, GA: Centers for Disease Control and Prevention; 2012. Available at: http://www.cdc.gov/heartdisease/statistics.htm
3. Markides KS, Eschbach K. Aging, migration, and mortality: current status of research on the Hispanic paradox. J Gerontology B Psychol Sci Soc Sci. 2005 Oct; 60(Spec 2):68–75.
4. Stern MP, Wei M. Do Mexican Americans really have low rates of cardiovascular disease? Prev Med. 1999 Dec; 29(6 Pt 2):S90–5. [PubMed: 10641824]
5. Anderson, NB.; Bulatao, RA.; Cohen, B., editors. Critical perspectives on racial and ethnic differences in health in late life. Washington, DC: National Academies Press; 2004. p. 227-66.
6. Cho Y, Frisbie WP, Hummer RA, et al. Nativity, duration of residence, and health of Hispanic adults. Intern Migration Rev. 2004 Spring;38(1):184–211.
7. Singh GK, Siahpush M. Ethnic-immigrant differentials in health behaviors, morbidity, and cause-specific mortality in the United States: an analysis of two national data bases. Hum Biol. 2002 Feb; 74(1):83–109. [PubMed: 11931581]
8. McDonald JT, Kennedy S. Insights into the healthy immigrant effect: health status and health service use of immigrants to Canada. Soc Sci Med. 2004 Oct; 59(8):1613–27. [PubMed: 15279920]
9. Peek MK, Cutchin MP, Salinas JJ, et al. Allostatic Load among Non-Hispanic Whites, Non-Hispanic Blacks, and people of Mexican origin: effects of race, ethnicity, nativity, and acculturation. Am J Public Health. 2010 May; 100(5):940–6. [PubMed: 19834005]
10. Crimmins EM, Kin JK, Alley DE, et al. Hispanic paradox in biological risk profiles. Am J Public Health. 2007 Jul; 97(7):1305–10. [PubMed: 17538054]

11. Bean, FD.; Stevens, G. America's newcomers and the dynamics of diversity. Vol. Chapter 6, 8. New York, NY: Russell Sage Foundation; 2003.
12. Villarejo D. The Health of the U.S. hired farm worker. Annu Rev Public Health. 2003; 24:175–93. [PubMed: 12359914]
13. Finch BK, Kolody B, Vega WA. Perceived discrimination and depression among Mexican-origin adults in California. J Health Soc Behav. 2000 Sep; 41(3):295–313. [PubMed: 11011506]
14. Salgado de Snyder, VN.; Díaz-Guerrero, R. Enduring separation: the psychosocial consequences of Mexican migration to the United States. In: Adler, LL.; Gielen, UP., editors. Migration: immigration and emigration in international perspective 2003. Westport, CT: Praeger; 2002.
15. Montoya JA, Salinas JJ, Barroso CS, et al. Nativity and nutritional behaviors in the Mexican origin population living in the U.S.-Mexico border region. J Immigr Minor Health. 2011 Feb; 13(1):94–100. [PubMed: 20401536]
16. Singh GK, Siahpush M, Hiatt RA, et al. Dramatic increases in obesity and overweight prevalence and body mass index among ethnic-immigrant and social class groups in the United States, 1976–2008. J Community Health. 2011 Feb; 36(1):94–110. [PubMed: 20549318]
17. Framingham Heart Study. General cardiovascular disease: 10-year risk. Framingham, MA: Framingham Heart Study; 2011 Oct. Available at: http://www.framinghamheartstudy.org/risk/gencardio.html
18. D'Agostino RB Sr, Grundy S, Sullivan LM, et al. Validation of the Framingham coronary heart disease prediction scores: results of a multiple ethnic group's investigation. JAMA. 2001 Jul; 286(2):180–7. [PubMed: 11448281]
19. Park CS, Ihm SH, Yoo KD, et al. Relation between C-reactive protein, homocysteine levels, fibrinogen, and lipoprotein levels and leukocyte and platelet counts, and 10-year risk for cardiovascular disease among healthy adults in the USA. Am J Cardiol. 2010 May; 105(9):1284–8. [PubMed: 20403480]
20. Lehrke S, Egenlauf B, Steen H, et al. Prediction of coronary artery disease by a systemic atherosclerosis score index derived from whole-body MR angiography. J Cardiovasc Magn Reson. 2009 Sep.11:36. [PubMed: 19761595]
21. Kieltyka L, Urbina EM, Tang R, et al. Framingham risk score is related to carotid artery intima-media thickness in both White and Black young adults: the Bogalusa heart study. Atherosclerosis. 2003 Sep; 170(1):125–30. [PubMed: 12957690]
22. Kwagyan J, Hussein S, Xu S, et al. The relationship between flow-mediated dilatation of the brachial artery and intima-media thickness of the carotid artery to Framingham risk scores in older African Americans. J Clin Hypertens (Greenwich). 2009 Dec; 11(12):713–9. [PubMed: 20021528]
23. Matthews KA, Sowers MF, Derby CA, et al. Ethnic differences in cardiovascular risk factor burden among middle-aged women: study of women's health across the nation (SWAN). Am Heart J. 2005 Jun; 149(6):1066–73. [PubMed: 15976790]
24. De Heer HD, Balcazar HG, Rosenthal EL, et al. Ethnic pride and cardiovascular health among Mexican American adults along the U.S.-Mexico border. Hispanic J Behav Sci. 2011 Apr.
25. De Heer HD, Balcazar HG, Castro F, et al. A path analysis of a randomized Promotora de Salud cardiovascular disease-prevention trial among at-risk Hispanic adults. Health Educ Behav. 2011 Jun.
26. U.S. Census Bureau. 2005–2007 American Community Survey 3-Year Summary file: technical documentation. Washington, DC: U.S. Census Bureau/American Community Survey office; 2009. Available at: http://txsdc.utsa.edu/Resources/ACS/2007/SF/TechDoc/ACS_2005-2007_3-Year_SF_Tech_Doc.pdf
27. U.S. Census Bureau. State and county quickfacts: Texas. Washington, DC: U.S. Census Bureau; 2003. Available at: http://quickfacts.census.gov/qfd/states/48000.html
28. U.S. Census Bureau. Selected social characteristics in the United States: American community survey 1 year estimate. Washington, DC: U.S. Census Bureau; 2010. Available at: http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_1YR_DP02&prodType=table

29. Fisher-Hoch SP, Rentfro A, Salinas J, et al. Socioeconomic status and prevalence of obesity and diabetes in a Mexican American community, Cameron County, Texas, 2004–2007. Prev Chronic Dis. 2010 May.7(3):A53. [PubMed: 20394692]

30. Stata Corp 10 SE. College Station, TX: StataCorp; 2009.

31. Franks P, Tancredi DJ, Winters P, et al. Including socioeconomic status in coronary heart disease risk estimation. Ann Fam Med. 2010 Sep-Oct;8(5):447–53. [PubMed: 20843887]

32. Morales LS, Leng M, Escarce JJ. Risk of cardiovascular disease in first and second generation Mexican-Americans. J Immigr Minor Health. 2011 Feb; 13(1):61–8. [PubMed: 19466546]

33. Salinas J, McCormick JB, Rentfro A, et al. The missing men: high risk of disease in men of Mexican origin. Am J Mens Health. 2011 Jul; 5(4):332–40. [PubMed: 20930218]

34. Gallo LC, de los Monteros KE, Allison M, et al. Do socioeconomic gradients in subclincal atherosclerosis vary according to acculturation level? analyses of Mexican-Americans in the multi-ethnic study of atherosclerosis. Psychosom Med. 2009 Sep; 71(7):756–62. [PubMed: 19661194]

35. Salinas JJ, Sheffield KM. English language use, health and mortality in older Mexican Americans. J Immigr Minor Health. 2011 Apr; 13(2):232–8. [PubMed: 19621260]

36. Nucifora G, Schuijf JD, van Werkhoven JM, et al. Relation between Framingham risk categories and the presence of functionally relevant coronary lesions as determined on multislice computed tomography and stress testing. Am J Cardiol. 2009 Sep; 104(6):758–63. [PubMed: 19733707]

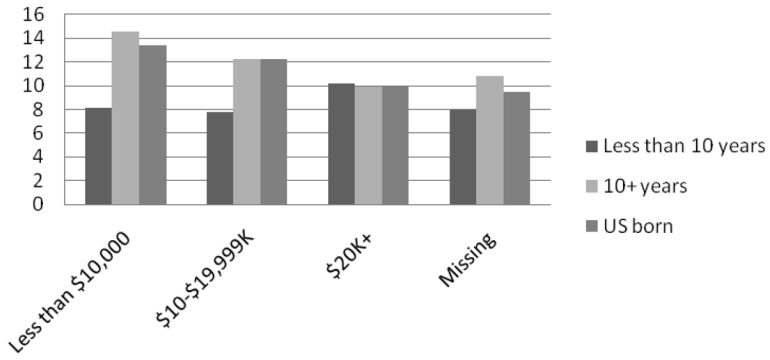

Figure 1.
Framingham Risk Score by Income and Immigrant Status for the CCHC Men

Table 1

Demographic characteristics and health condition prevalence for the CCHC sample (univariate).

	Women				Men			
	<10	**10+**	**US Born**	**p-value**	**<10**	**10+**	**US Born**	**p-value**
Total (n(%))	225 (21.9)	556 (53.4)	273 (24.7)		127 (22.9)	197 (38.1)	181 (39.1)	
High School Graduate (yes=1) (n(%))	65 (31.8)	157 (27.6)	149 (56.3)	.000	48 (38.7)	60 (30.0)	131 (77.9)	.000
Age (mean ± s.d.)	42.9 (11.2)	51.4 (11.9)	46.0 (13.2)	.000	43.2 (11.4)	52.8 (10.8)	45.5 (12.1)	.000
Income (n(%))								
<$10,000	73 (32.3)	198 (38.5)	69 (25.5)	.000	36 (25.1)	51 (27.1)	20 (7.6)	.008
$10,000–$19,000	53 (25.1)	159 (26.6)	64 (21.9)		34 (24.1)	54 (26.8)	54 (33.2)	
$20,000+	21 (9.1)	83 (12.7)	77 (33.1)		18 (14.0)	45 (18.9)	64 (31.0)	
Missing	78 (33.5)	116 (22.2)	63 (19.6)		39 (36.9)	47 (27.3)	43 (28.1)	
No Health Insurance (n(%))	214 (93.5)	440 (75.8)	162 (55.9)	.000	109 (86.0)	128 (61.4)	90 (50.5)	.000
Health Conditions (n(%))								
Obese	126 (52.8)	311 (54.5)	170 (58.3)	.677	54 (43.1)	86 (40.8)	102 (56.8)	.099
Diabetes	23 (8.7)	105 (18.6)	43 (14.7)	.013	12 (8.9)	45 (25.2)	33 (16.3)	.002
High Cholesterol	84 (32.4)	233 (40.7)	85 (30.4)	.068	53 (43.7)	95 (46.5)	79 (42.9)	.754
Hypertension	50 (22.1)	176 (33.1)	80 (29.5)	.117	16 (14.8)	52 (29.7)	57 (23.4)	.049
Current Smoker	21 (7.2)	52 (7.5)	26 (10.4)	.212	47 (33.8)	50 (26.0)	50 (32.7)	.286
Framingham Risk Score (mean ± s.e.)	7.38 (.21)	11.9 (.13)	10.7 (.17)	.000	9.34 (.31)	12.2 (.07)	11.3 (.17)	.000

Table 2

Multivariate OLS Regression results for the Framingham Risk Score.

	CCHC	
	Women	**Men**
High School Graduate (yes=1)	−3.2*** (−4.80, −1.57)	−2.0* (−3.68, −.372)
Nativity (US Born=ref. cat)		
Less than 10 years	−2.7** (−4.59, −.80)	−2.3* (−4.08, −.593)
10+ years	.98 (−.948, 2.91)	1.55** (.505, 2.60)
Income (<$10,000= ref cat)		
$10,000–$19,000	−.42 (−1.90, 1.06)	−1.2 (−3.54, 1.12)
$20,000+	−1.6 (−3.35, .230)	−2.7* (−4.80, −.679)
Missing	.16 (−1.48, 1.80)	−2.8* (−5.02, −.552)
Constant	11.4*** (8.33, 14.58)	14.3*** (10.9, 17.7)
Interaction Models		
Main effects		
Nativity (US Born=ref. cat)		
Less than 10 years	−1.7 (−4.61, 1.16)	−5.3** (−8.48, −2.12)
10+ years	3.3* (.013, 6.55)	1.2 (−.656, 3.02)
High School Graduate (yes=1)	−1.2 (−3.35, .910)	−2.8 (−5.65, .129)
Income (<$10,000= ref cat)		
$10,000–$19,000	.72 (−1.20, 2.63)	−1.20 (−5.69, 3.29)
$20,000+	−1.4 (−4.04, 1.32)	−3.4* (−6.61, −.157)
Missing	1.1 (−2.19, 4.36)	−3.9** (−6.84, −1.05)
Interaction effects		
Less than 10 years * High School Graduate	−1.1 (−4.21, 2.06)	.68 (−2.61, 3.97)
Less than 10 years * $10,000 to $19,000	−2.2 (−6.46, 2.03)	.91 (−4.29, 6.11)
Less than 10 years * $20,000+	.79 (−2.58, 4.17)	5.5* (.181, 10.8)
Less than 10 years * Missing	.66 (−2.98, 4.30)	3.8* (.050, 7.64)

	CCHC	
	Women	**Men**
10+ Years * High School Graduate	−3.1 (−6.21, .009)	1.6 (−2.20, 5.40)
10+ Years *$10,000 to $19,000	−1.2 (−4.44, 2.01)	−1.2 (−5.09, 2.70)
10+ Years *$20,000+	−.79 (−4.50, 2.91)	−1.3 (−4.20, 1.50)
10+ Years * Missing	−2.2 (−6.46, 2.03)	.08 (−2.15, 2.31)
Constant	6.7*** (3.82, 9.51)	13.4*** (11.2, 15.5)

† Note: Results presented as Beta coefficients with 95% Confidence Interval. Age is not included as a covariate since it is used in the construction of the Framingham Risk Score.

* p <.05,

** p<.01,

*** P<.001

J Health Care Poor Underserved. Author manuscript; available in PMC 2013 June 17.

Table 3

OLS Regression results by age group for the Framingham Risk Score.

	Women			Men		
	Young Adult	**Middle Age**	**Old Age**	**Young Adult**	**Middle Age**	**Old Age**
High School Graduate (yes=1)	−.972 (.081)	−.696 (.053)	.613 (.602)	−.412 (.602)	−1.21 (.084)	−.007 (.992)
Nativity (US Born=ref. cat)						
10+ years	.361 (.369)	−.081 (.881)	−1.84 (.017)	−.113 (.899)	−1.10 (.096)	−.107 (.856)
Less than 10 years	.023 (.964)	−1.54 (.004)	−.680 (.432)	−.196 (.821)	−2.18 (.004)	.026 (.981)
Income (<$10,000= ref cat)						
$10,000–$19,000	.058 (.894)	−.410 (.417)	−1.34 (.211)	−.383 (.668)	−1.17 (.229)	−.528 (.563)
$20,000+	.125 (.845)	−1.90 (.002)	−1.76 (.046)	.620 (.574)	−1.62 (.100)	−3.72 (.002)
Missing	−.007 (.987)	.499 (.232)	−.120 (.884)	.008 (.992)	−1.48 (.106)	−1.69 (.107)

† Note: Results presented as Beta coefficients with p-values in parentheses.

* p <.05,

** p<.01,

*** P<.001