HHS Public Access

Author manuscript

J Immigr Minor Health. Author manuscript; available in PMC 2016 December 01.

Published in final edited form as:

J Immigr Minor Health. 2016 December ; 18(6): 1284–1291. doi:10.1007/s10903-016-0413-3.

Associations Between Discrimination and Cardiovascular Health Among Asian Indians in the United States

S. B. Nadimpalli[1], **A. Dulin-Keita**[1,3], **C. Salas**[1,4], **A. M. Kanaya**[1,5], and **Namratha R. Kandula**[1,2]

S. B. Nadimpalli: sarahbnadimpalli@gmail.com; A. Dulin-Keita: akilah_dulin_keita@brown.edu; C. Salas: salas5@uic.edu; A. M. Kanaya: alka.kanaya@ucsf.edu; Namratha R. Kandula: nkandula@nm.org

[1]Department of Preventive Medicine, Northwestern University, 680 North Lake Shore Drive, Chicago, IL 60647, USA

[2]Department of General Internal Medicine, Northwestern University, Chicago, IL 60611, USA

[3]Department of Public Health, Brown University, Providence, RI 02903, USA

[4]Department of Psychology, The University of Illinois at Chicago, Chicago, IL 60607, USA

[5]Division of General Internal Medicine, University of California at San Francisco, San Francisco, CA 94115, USA

Abstract

Asian Indians (AI) have a high risk of atherosclerotic cardiovascular disease. The study investigated associations between discrimination and (1) cardiovascular risk and (2) self-rated health among AI. Higher discrimination scores were hypothesized to relate to a higher cardiovascular risk score (CRS) and poorer self-rated health. Asian Indians (n = 757) recruited between 2010 and 2013 answered discrimination and self-reported health questions. The CRS (0–8 points) included body-mass index, systolic blood pressure, total cholesterol, and fasting blood glucose levels of AI. Multiple linear regression analyses were conducted to evaluate relationships between discrimination and the CRS and discrimination and self-rated health, adjusting for psychosocial and clinical factors. There were no significant relationships between discrimination and the CRS ($p \geq .05$). Discrimination was related to poorer self-reported health, $B = -.41$ ($SE = .17$), $p = .02$. Findings suggest perhaps there are important levels at which discrimination may harm health.

Keywords

Discrimination; Cardiovascular health; South Asian Indian; Stress; Self-rated health

Background

Exposure to discrimination may be a lifelong stressor with serious health consequences for racial/ethnic minority groups [1–3]. Discrimination is considered the behavioral

Correspondence to: S. B. Nadimpalli, sarahbnadimpalli@gmail.com.

manifestation of racism in which racial slurs, unequal treatment, harassment, and other forms of differential treatment are directed toward ethnic minority groups. Further, discrimination may operate on institutional or individual levels in which ethnic minority groups are disadvantaged as based on race [2]. Among African Americans, reports of discrimination have been associated with a wide range of cardiovascular-related health outcomes such as depressive symptoms, psychological distress, hypertension, obesity, C-reactive protein, coronary artery calcification, and intima medial wall thickness, and poorer self-rated health [3–7]. Links between discrimination and self-rated health appear to be particularly strong and enduring among a wide range of ethnic minority groups which include Latinos, African Americans, and Asian Americans [2,3]. Therefore, self-rated health may be one of the most salient measures to evaluate how discrimination impacts the health and lives of ethnic minorities. However, Asian Americans, in particular South Asians (SA), have been among the least studied in discrimination and health studies. Discrimination and health studies with SA are important given they are the second fastest growing ethnic group in the US. South Asians are also vulnerable to discrimination given they are often publically perceived as a “Model Minority” [8] group that is not susceptible to social, economic, or health-related problems. However, discrimination is a potent social problem SA face as evidenced by decades of documented hate crimes and immigration-related discriminatory experiences [9, 10]. Most recently, SA have been misperceived as threatening or menacing given inaccurate associations with individuals who act on the behalf of terrorist groups [10]. SA also have a high prevalence of cardiovascular disease and diabetes that is not explained by traditional risk factors, and because they have experienced structural and interpersonal discrimination that has been largely under-recognized [10–12]. For these reasons, discrimination and health studies among SA are needed.

Conceptual Framework

A large body of literature demonstrates that stress is related to the development of ASCVD [13–15]. Chronic exposure to discrimination is conceptualized as a stressor for racial/ethnic minority groups which may trigger physiological stress responses, and ultimately lead to poorer cardiovascular health outcomes [16].

Objective/Purpose

The purpose of this study was to explore the cross-sectional association between discrimination and cardiovascular (CV) health among Asian Indian (AI) participants in the Mediators of Atherosclerosis in South Asians Living in America (MASALA) Study. The primary of the ongoing MASALA Study is to determine social, cultural, behavioral, and physiological risk factors for subclinical atherosclerosis among South Asians in the US. Further, MASALA aims to compare Study findings with the racial/ethnic groups represented in the Multi-Ethnic Study of Atherosclerosis. Discrimination was one psychosocial factor measured in MASALA and it is plausible that discrimination-related stress would be associated with several indicators of poorer cardiovascular health (e.g., hypertension, elevated body-mass index, elevated hemoglobin A1C, and high cholesterol) and poorer self-rated health [17–20] among SA studied.

Self-reported health is an important aspect of CV health and may reflect underlying cardiovascular disease that is not detected clinically [18]. In a systematic review and meta-analysis by Mavaddat et al. [18], self-rated health was highly associated with cardiovascular disease mortality and non-fatal cardiovascular disease events. Therefore, we examined associations between discrimination and (1) a physiological-based cardiovascular health risk score as based on blood pressure, body-mass index, hemoglobin A1C, and total cholesterol measurements and (2) overall self-rated health. A positive relationship between discrimination and cardiovascular risk and an inverse relationship between discrimination and self-rated health were hypothesized.

Methods

Sample

The Mediators of Atherosclerosis in South Asians Living in America (MASALA) Study (N = 906) included Bangladeshi, Pakistani, Sri Lankan, Nepali and Asian Indians. Sampling and recruitment methods have been described in detail previously [21]. A random sampling method was applied to several counties surrounding the San Francisco and Chicago areas. Baseline surveys were completed between 2010 and 2013. The MASALA study was approved by institutional review boards at Northwestern University and University of California at San Francisco.

Eligibility criteria for the MASALA baseline study included those who had at least three grandparents originating from South Asia and those who identified as SA. Participants were between the ages of 40 and 84 years of age and were able to speak or read English, Hindi, or Urdu. Exclusion criteria include those free of cardiovascular disease and are detailed in Kanaya et al. [21].

There were two differences between the inclusion criteria for the broader MASALA Study and the current study. For the current study, Asian Indian (AI) MASALA Study participants (n = 757) were isolated for analysis given their experiences and exposure to discrimination may differ from other, unique SA groups. Similarly, only AI born in India were included because there is likely to be variation in discrimination experiences dependent upon foreign born versus US born status [22].

Measures

Discrimination was measured using the widely cited and applied Everyday Discrimination Scale (EDS; [2, 23, 24]). The measurement is comprised of 9 items reflecting general, non-race based experiences of unfair treatment which include receiving poorer service in restaurants/stores or being treated with less courtesy/respect. The EDS was initially scored on a 9–45 point Likert scale with 9 indicating no experiences of discrimination and 45 indicating experiencing various types of discrimination almost every day. The EDS score was then divided into tertiles to evaluate how discrimination experienced at varying levels of intensity may impact cardiovascular health [25]. Low discrimination scores (9–14) were considered those ranging from 9 to 1 standard deviation below mean discrimination scores, medium discrimination scores ranged from 15 to 21 with the upper limit reflecting 1

standard deviation above mean discrimination scores, and high discrimination scores ranged from 22 to 54. Hahm et al. [25] also utilized the tertile approach and established similar cut points in using the EDS to measure discrimination among an Asian American cohort. Although the EDS is often used as a continuous low-to-high discrimination measure, the tertile approach allowed for more nuance in gauging significant differences between low, medium, and high levels of exposure to discrimination.

The majority of discrimination and cardiovascular health studies have focused on individual markers of cardiovascular health (i.e., blood pressure, body-mass index) and have not considered comprehensive cardiovascular health measurements as potential outcomes [26]. A cardiovascular health scale may capture nuances relative to cardiovascular risk that are not detectable through single measures. Therefore, for the purposes of our study, four physiological-based cardiovascular health factors were established using the American Heart Association Simple 7 guidelines [27] to develop the study's cardiovascular risk scale (CRS). Body-mass index, systolic blood pressure, total cholesterol, and fasting blood glucose levels were coded into poor, intermediate, and ideal categories (see Table 1 for coding scheme [27–30]). All physiological values categorized into the poor range were assigned "2s," intermediate values were assigned "1s," and ideal values were assigned "0s." A CRS was obtained by summing across all four physiological health factor values. The final CRS ranged from 0 to 8, with 0 representing ideal cardiovascular health and 8 representing the poorer cardiovascular health. Additionally, if participants reported using medications for hypertension, diabetes, and high cholesterol and had ideal lab values in these categories their scores were coded as 1s (intermediate category) as recommended in the Simple 7 guidelines.

Given established links between self-rated health and cardiovascular indicators, self-rated health is conceptualized as a potentially understudied aspect of cardiovascular health for AI [4]. Self-rated health was measured by asking participants to rate their health on a continuous scale of 1–10, with 1 being poor health and 10 being excellent health. A categorical measure of self-rated health (excellent, very good, good, fair, and poor) was avoided given there is a wide range of variability in how those of ethnic minority status and foreign born perceive these categories of health [31].

Covariates—We included several factors that may be related to cardiovascular health as covariates in the analysis: age in years, sex, education (having earned a bachelor's degree versus not), working outside the home versus not, study site (Chicago versus San Francisco), total combined family income per household (low as <$39,999/year, moderate as between $40,000–$74,999, and high as >$75,000), being married or living with a partner versus not, depressive symptoms, number of years lived in the US, a traditional cultural beliefs scale, social support, and English language proficiency.

The traditional beliefs scale was a continuous measure asking participants how much they wished SA cultural traditions would be practiced in the U.S. Examples of these cultural traditions centered upon food related activities (fasting, eating traditional SA foods like chapattis and daal) and partaking in arranged marriage practices [32]. The scale had a Cronbach's alpha coefficient was .81 and ranged from 0 to 28 with lower scores reflecting

high cultural beliefs (low acculturation) and higher scores reflecting lower cultural beliefs (higher acculturation; [32]).

Social Support was measured using a continuous scale assessing low social support (0) to high social support (24). Questions evaluated whether participants had someone there when they needed help with various problems [33]. A Cronbach's alpha of .88 was established for this scale. The Center for Epidemiological Studies Depression (CES-D), 20-item scale was utilized to evaluate depressive symptoms among participants and ranged from 0 to 60 points [34]. The CES-D had a Cronbach's alpha of .65. The English language proficiency scale evaluated participants' ability to speak English, read hospital materials with ease, and learn about their medical condition. A continuous measure reflected low English language proficiency to high English language proficiency.

Health behaviors and chronic health conditions were also measured and included as covariates in analyses. These behaviors included smoking status, fruit and vegetable intake per day, and physical activity. Smoking status was treated as a 0–2 continuous scale where 0 = never smoked, 1 = former smoker, and 2 = current smoker. Fruit and vegetable intake was measured by summing the number of fruits and vegetables consumed per week with a list of 34 fruits and vegetables which included "other fruits" and "other vegetables" items. Physical activity was measured on a 0–2 point scale by assigning a point for participants who walked for exercise per day and a point for those who participated in either moderate or heavy effort in conditioning activities. Scores were then reverse coded to reflect 0 as ideal physical activity, 1 as intermediate physical activity, and 2 as a poor level of physical activity. Fruit and vegetable intake and the physical activity scales were treated as continuous covariates. Chronic health conditions included the incidence if having or not having asthma, arthritis, depressive symptoms, cancer, diabetes, hypertension, liver disease, and kidney disease.

Statistical Analyses

The SPSS version 22 software was used for all analyses. Descriptive statistics and normality assumptions were established. Bivariate correlations in the Pearson's correlation matrix did not exceed the .70 level, signifying a lack of multicollinearity among variables [35]. Low, medium, and high levels of discrimination were dummy coded. Low levels of discrimination category was used as the referent group for all multivariate analyses.

Two separate multiple linear regression analyses were examined to evaluate relationships between (1) self-reported discrimination and the physiologically-based CRS, and (2) self-reported discrimination and self-rated health. Moderation effects for gender were tested in analyses with significant main findings. Four additional multiple logistic regressions were employed to evaluate potential relationships between discrimination and the odds of having any one of the four individual components of the CRS (elevated body-mass index, elevated systolic blood pressure, elevated total cholesterol, and elevated fasting blood glucose levels). The following control measures were included in analyses: age, sex, education, working outside the home versus not, study cite, family income, use of antidepressant medications, years in the US, traditional cultural beliefs, social support, and English language proficiency. The discrimination and CRS analysis was also adjusted for health behaviors related to

cardiovascular health. The discrimination and self-rated health analysis was adjusted for chronic conditions.

Results

Slightly more men (n = 408) than women (n = 349) participated in the study. The age range of participants was 40–83 years old and the average age was 56 (SD = 9) years. The majority of participants were highly educated (93.9% with bachelor's degrees) and all participants were born in India (Table 2). Due to 24 individuals missing family income data, 733 participants were included in the final analyses. The average level of discrimination reported was M = 14.90 (SD = 5.96); 56% of participants scored low (range 9–14), 33 % of participants reported medium levels of discrimination (range 15–21), and 11 % of participants scored high (range 22–54) on the EDS. Participants scored an average of 3.33 (SD = 1.46) on the CRS and an average of 7.66 (SD = 1.35) on the self-rated health scale.

Table 3 reflects that the CRS and self-rated health scales were correlated (r = −.076, p <.05). Discrimination was significantly associated with age (−.084, p <.05), social support (−.35, p <.05), depressive symptoms (.39, p < .001), and self-rated health −.17, p <.001). Table 4 presents the F-values and relevant coefficients for the main discrimination and health (i.e., physiological and self-rated health) analyses. The results from the first regression analysis (i.e., Model 1) show that discrimination was not associated with the CRS, F(18, 688) = 2.317, p = .002, [for participants reporting medium levels of discrimination relative to those reporting low levels of discrimination: B = .18 (SE = .13), p = .14; for those reporting high discrimination relative to those reporting low discrimination: B = −.010 (.19), p = .96]. In an additional analysis with medium levels of discrimination as the referent group, there was no significant relationship between those reporting medium levels of discrimination relative to those reporting high levels of discrimination on the discrimination and CRS pathway (p >. 05).

Model 2 presents the results for self-rated health. In the second regression analysis, participants reporting high levels of discrimination had poorer self-rated health relative to those reporting low discrimination (B = −.42 (SE = .17), p = .02). However, for participants reporting medium levels of discrimination self-rated health was not poorer relative to those reporting low levels of discrimination: B = −.11 (SE = .11), p = .31. In an additional analysis with medium levels of discrimination as the referent group, there was no significant relationship between those reporting medium levels of discrimination relative to those reporting high levels of discrimination on the discrimination and self-rated health pathway (p >.05). Sex did not modify the relationship between discrimination and self-rated health (p > .05).

Finally, links between discrimination and the individual components of the CRS were evaluated using logistic regression analyses. When compared to low levels of discrimination, medium levels of discrimination were associated with an increased odds of hypertension as defined by >120 mmHg systolic, >80 mmHg diastolic, or those treated to goal [Chi square = 121.47, p <.001 with df = 18; Exp(B) = 1.61, (SE = .30), p = .02]. Higher levels of discrimination were not associated with increased odds of hypertension relative to low levels

of discrimination $p > .05$). Discrimination was not associated with elevated BMI, fasting blood glucose, or total cholesterol at the $p = .05$ level.

Discussion

The overall objectives of this study were to examine whether perceived discrimination was associated with cardiovascular and self-rated health among a sample of foreign born AI. A link between discrimination and the CRS was expected given the well-documented history of discrimination AI have endured [10] and the prevalence of pre-established associations between discrimination and CV risk factors among other racial/ethnic minority populations [5, 7, 36, 37]. It was posited that exposure to discrimination would be a chronic stressor for AI and ultimately manifest through poorer cardiovascular health. In contrast to single cardiovascular health measure studies [5, 7], the CRS included several cardiovascular risk factors and was therefore expected to detect more nuance in relating discrimination scores with overall cardiovascular health. One possible explanation for these null findings may be that AI tend to report among the lowest levels of discrimination in comparison to other ethnic minority groups [2, 3, 23]. Low discrimination scores among AI in this study may have lacked the variability necessary to detect relationships between discrimination and the CRS. According to Williams et al. [38], certain levels of discrimination may be related to various alterations in health. Specifically, perhaps higher levels of discrimination exposure trigger physiological stress processes and manifest as cardiovascular risk factors. Conversely, lower levels of discrimination exposure may primarily influence mental health, as measured through self-report. The current study analysis demonstrated that high levels of discrimination (relative to low) were related to poorer self-reported health but medium levels of discrimination (relative to low) were not related to poorer self-reported health. This may suggest that higher exposure to discrimination has worse health effects than lower exposure to discrimination. However, perhaps because discrimination reports were overall low in the current study, discrimination was primary linked with self-rated health.

Importantly, self-rated health was associated with discrimination among AI in this study. This is an important finding given the associations of self-rated health with increased morbidity and mortality [39]. Self-rated health may be thought of as one aspect of health and often provides rich insight into the physiological health of individuals. However, we found no association between discrimination and physiological health as measured by the CRS. The self-rated health measure may have accessed an important aspect of CV health that was not detected through objective, clinical measures in this study [18]. Perhaps additional physiological measures should be tested as outcome variables in further discrimination and AI analyses. In the current study, one significant finding supports continued analyses e.g. for those experiencing medium (versus low) levels of discrimination there appeared to be a link between discrimination and increased odds of hypertension. Although the MASALA Study measures a wide range of physiological markers, perhaps additional biomarkers may be tested in relationship to discrimination. Further studies may measure discrimination in relationship to C-reactive protein or other inflammatory markers associated with stress among AI.

Another explanation for study findings may be that self-rated health captures the impact of discrimination in a way that is not yet manifested through physical health among AI immigrants. Given AIs studied were immigrants, they may not have the same level of lifelong discrimination exposure as AI born in the US. Future studies may evaluate differences between discrimination and physiological health but levels of time lived in the US, or length of time exposure to discrimination.

Strengths

This study has several key strengths. This study identified one South Asian subgroup, AI who shared similar characteristics such as age and immigrant status, for analyses. Although there have been empiric links between discrimination and mental health among SA (e.g., [23, 40]), to our knowledge, this is the only study that has tested an association between discrimination and a continuous, physiological-based measure among AI.

Weaknesses

There are some study limitations. Generalizability of this study is limited to middle-age to older Asian Indians who emigrated from India. The high socioeconomic status of AIs in the MASALA study also does not represent the full spectrum of AI immigrants to the US. Temporal ordering is an issue in that perhaps having a poorer perception of health or hypertension led to increased perceptions of discrimination. The reliability coefficient of .65 for the CES-D scale falls slightly below the .7 α level as recommended by Tabachnick and Fidell [35] and may be less than ideal. However, there are few psychosocial instruments, including the CES-D, specially designed and tailored to the experiences of SA. The development of psychosocial instruments reliable and valid for SA are needed. For example, the EDS may not capture discrimination experiences SA uniquely face (discrimination as based on wearing traditional or ethnic clothing). Longitudinal studies would provide additional support for study findings. Multi-item self-rated health scales would bolster positive findings between discrimination and health among AI.

Contributions to the Literature

Although further studies are needed, significant findings between discrimination and self-rated health and null findings between discrimination and the CRS may suggest that a certain level of discrimination exposure is necessary to be detected through physiological-based outcomes. Future studies may expand upon our findings by using a longitudinal study designs and/or ethically-driven, in-vivo experiments such as those conducted with other ethnic minority groups on this topic [41–43]. Encouraging AI to report discriminatory experiences to appropriate authorities or advocacy organizations may provide necessary data to ameliorate the effect of discrimination among AI. Workplace efforts should focus on implementing anti-discrimination policies. Health promotion efforts are needed given the expanding body of literature confirming how discrimination negatively influences the health of many ethnic minority groups, which now more clearly includes Asian Indians.

Acknowledgments

The MASALA study was supported by the NIH grant The MASALA study was supported by the NIH Grant #1RO1 HL093009. Data collection at UCSF was also supported by NIH/NCRR USCF-CTSI Grant Number UL1RR024131. This research was also funded by The National, Heart, Lung, and Blood Institute of the National Institutes of Health under Award Number T32HL069771. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute of Health.

References

1. Brondolo E, Rieppi R, Kelly KP, Gerinet W. Perceived racism and blood pressure: a review of the literature and conceptual and methodological critique. Ann Behav Med. 2003; 25:55–65. [PubMed: 12581937]
2. Gee GC, Ro A, Shariff-Marco S, Chae D. Racial discrimination and health among Asian Americans: evidence, assessment, and directions for future research. Epidemiological Review. 2009; 31:130–51.
3. Paradies Y. A systematic review of empirical research on self-reported racism and health. Int J Epidemiol. 2006; 35:888–901. [PubMed: 16585055]
4. Arruda GO, Santos Ade L, Teston EF, Cecilio HP, Radovanovic CA, Marcon SS. Association between self-reported health and sociodemographic characteristics with cardiovascular diseases in adults. Revista de Escola de Enfermagem. 2015; 49:61–8.
5. Lewis TT, Everson-Rose SA, Powell LH, Matthews KA, Brown C, Karavolos K, Sutton-Tyrrell K, Jacobs E, Wesley D. Chronic exposure to everyday discrimination and coronary artery calcification in African-American women: the SWAN Heart Study. Psychosom Med. 2006; 68:362–8. [PubMed: 16738065]
6. Pascoe EA, Richman LS. Perceived discrimination and health: a meta analytic review. Psychol Bull. 2009; 135:531–54. [PubMed: 19586161]
7. Troxel WM, Matthews KA, Bromberger JT, Sutton-Tyrrell K. Chronic stress burden, discrimination, and subclinical carotid artery disease in African American and Caucasian women. Health Psychol. 2003; 22:300–9. [PubMed: 12790258]
8. Kwon, H.; Au, W. Model minority myth. In: Chen, EW.; Yoo, GJ., editors. Encyclopedia of Asian American issues today. Santa Barbara: ABC-CLIO LLC; 2010. p. 221-30.
9. Chen TY. Hate violence as border patrol: an Asian American theory of hate violence. Asian Law Journal. 2000; 7:69.
10. New York City Commission on Human Rights. Discrimination against Muslims, Arabs, and South Asians in New York City since 9/11. 2003. Retrieved from http://www.nyc.gov/html/cchr/pdf/sur_report.pdf
11. Asian Population Demographics/Largest Asian Growth. 2010. Retrieved from: Proximityone.com
12. Hess GR. The forgotten Asian Americans: the East Indian community in the United States. Pacific Historical Review. 1974; 43:576–96.
13. Enas EA, Mehta J. Malignant coronary artery disease in young Asian Indians: thoughts on pathogenesis, prevention and therapy. Clin Cardiol. 1995; 18:131–5. [PubMed: 7743682]
14. Enas EA. High rates of CAD in Asian Indians in the United States despite intense modification of lifestyle: what next? Curr Sci. 1998; 74:1081–6.
15. McEwen BS. Protection and damage from acute and chronic stress, allostasis, and allostatic load overload and relevance to the pathophysiology of psychiatric disorders. Annals of the New York Academy of Science. 2004; 1032:1–7.
16. Williams DR, Mohammad SA. Discrimination and racial disparities in health: evidence and needed research. J Behav Med. 2009; 32:20–47. [PubMed: 19030981]
17. Krantz DS, Manuck SB. Acute psychophysiologic reactivity and risk of cardiovascular disease: a review and methodologic critique. Psychol Bull. 1984; 96:435–64. [PubMed: 6393178]
18. Mavaddat N, Parker RA, Sanderson S, Mant J, Kinmonth AL. Relationships of self-rated health with fatal and non-fatal outcome in cardiovascular disease: a systematic review and meta-analysis. PLoS ONE. 2014; 9(7):e103509.doi: 10.1371/journal.pone.0103509 [PubMed: 25076041]

19. Wellen KE, Hotamisligil GS. Inflammation, stress, and diabetes. Journal of Clinical Investigation. 2005; 115:1111–9. [PubMed: 15864338]
20. Wilson, PWF.; Kannel, WB. Hypertension, other risk factors and the risk of cardiovascular disease. In: Laragh, JH.; Brenner, BM., editors. Hypertension: Pathophysiology, Diagnosis and Management. 2nd. NY: Raven Press; 1995. p. 99-114.
21. Kanaya AM, Kandula N, Herrington D, Budoff MJ, Hulley S, Vittinghoff E, Liu K. Mediators of Atherosclerosis in South Asians Living in America (MASALA) Study: objectives, methods, and cohort description. Clin Cardiol. 2013; 36:713–20. [PubMed: 24194499]
22. Lauderdale DS, Wen M, Jacobs EA, Kandula NR. Immigrant perceptions of discrimination in health care: the California Health Interview Survey 2003. Med Care. 2006; 44:914–20. [PubMed: 17001262]
23. Tummala-Narra P, Alegria M, Chen C. Perceived discrimination, acculturative stress, and depression among South Asians: mixed findings. Asian American Journal of Psychology. 2012; 3:3–16.
24. Williams DR, Yu Y, Jackson JS, Anderson NB. Racial differences in physical and mental health: socio-economic status, stress, and discrimination. Journal of Health Psychology. 1997; 2:335–51. [PubMed: 22013026]
25. Hahm CH, Ozonoff A, Gaumond J, Sue S. Perceived discrimination and health outcomes: a gender comparison among Asian-Americans nationwide. Women's Health Issues. 2010; 20:350–8. [PubMed: 20800771]
26. Lewis TT, Williams DR, Tamene M, Clark CR. Self-reported experiences of discrimination and cardiovascular disease. Current Cardiovascular Risk Reports. 2014; 8(365):1–15.
27. Lloyd-Jones DM, et al. Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's Strategic Impact Goal through 2020 and beyond. Circulation. 2010; 121:586–613. [PubMed: 20089546]
28. Go AS, Mozaffarian D, Roger VL, Benjamin EJ, Berry JD, Borden WB, et al. Heart disease and stroke statistics 2013 update: a report from the American Heart Association. Circulation. 2013; 127(1):e6–e245. [PubMed: 23239837]
29. Hsu WC, Araneta MRG, Kanaya AM, Chiang JL, Fujimoto W. BMI cut points to identify at-risk Asian Americans for type 2 diabetes screening. Diabetes Care. 2015; 38:150–8. [PubMed: 25538311]
30. Nathan DM, Kuenen J, Borg R, Zheng H, Schoenfeld D, Heine RJ. Translating the A1C assay into estimated average glucose values. Diabetes Care. 2008; 31:1473–8. [PubMed: 18540046]
31. Kandula NR, Lauderdale DS, Baker DW. Differences in self-reported health among Asians, Latinos, and non-Hispanic whites: the role of language and nativity. Ann Epidemiol. 2007; 17:191–8. [PubMed: 17320786]
32. Kanaya AM, Ewing SK, Vittinghoff E, Herrington D, Tegeler C, Mills C, Kandula NR. Acculturation and Subclinical Atherosclerosis among U.S. South Asians: findings from the MASALA study. Journal of Clinical and Experimental Research in Cardiology. 2014; 1:1–9.
33. Investigators ENRICHED. Enhancing recovery in coronary heart disease patients (ENRICHED): study design and methods. Am Heart J. 2000; 139:1–9. [PubMed: 10618555]
34. Radloff L. The CES-D Scale: a self-report depression scale for research in the general population. Appl Psych Meas. 1977; 1:385–401.
35. Tabachnick, BG.; Fidell, LS. Using multivariate statistics. 5th. New York: Allyn and Bacon; 2007.
36. Beatty DL, Matthews KA, Bromberger JT, Brown C. Everyday discrimination prospectively predicts inflammation across 7-years in racially diverse midlife women: study of women's health across the nation. Journal of Social Issues. 2014; 70:298–314. [PubMed: 25342861]
37. Brondolo E, Hausmann LRM, Jhalani J, Pencille M, Atencio-Bacayon J, Kumar A, et al. Dimensions of perceived racism and self-reported health: examination of racial/ethnic differences and potential mediators. Ann Behav Med. 2011; 42:14–28. [PubMed: 21374099]
38. Williams DR, Neighbors HW, Jackson JS. Racial/ethnic discrimination and health: findings from community studies. Am J Public Health. 2003; 93:200–8. [PubMed: 12554570]
39. Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty seven community studies. J Health Soc Behav. 1997; 38:21–37. [PubMed: 9097506]

40. Yoshihama M, Bybee D, Blazevski J. Day-to-day discrimination and health among Asian Indians: a population-based study of Gujarati men and women in Metropolitan Detroit. J Behav Med. 2012; doi: 10.1007/s10865-0119375

41. Clark R. Perceived racism and vascular reactivity in black college women: moderating effects of seeking social support. Health Psychol. 2006; 25:20–5. [PubMed: 16448294]

42. Dolezsar CM, McGrath JJ, Herzig AJM, Miller SB. Perceived racial discrimination and hypertension: a comprehensive systematic review. Health Psychol. 2014; 1:20–34.

43. Fang CY, Myers HF. The effects of racial stressors and hostility on cardiovascular reactivity in African American and Caucasian men. Health Psychol. 2001; 20:64–70. [PubMed: 11199067]

Table 1

Cardiovascular risk scale components

Values/codes	Body-mass index (kg/m^2)	Systolic blood pressure[a] (mmHg)	Total cholesterol[a] (mg/dl)	Fasting blood glucose[a]
Ideal (0)	≤23	119 & >	170 & >	0–99
Intermediate (1)	23.1–27.4	120–139	200–239	100–125
Poor (2)	≥27.5	140 & <	240 & <	126 or <

Sources: Go et al. [28], Hsu et al. [29], Nathan et al. [30], Lloyd-Jones et al. [27]

[a]Includes those treated to goal value

Table 2

Demographics of sample

Variable	*n*	%
Age		
40–55	397	52.4
56–70	303	40.0
71–83	57	9.0
Sex		
Female	349	46.1
Male	408	53.9
Education		
Bachelors>	711	93.9
Bachelors<	46	6.1
Income per year		
<$39,999	84	9.3
$40,000–$74,999	93	10.3
$75,000–$99,999	72	7.9
>$100,000	484	53.4
Study site		
Chicago area	339	44.8
San Francisco Bay Area	418	55.2
Marital status		
Married	697	92.1
Unmarried	60	7.9

N = 757. *N* = 733 for income variable

Table 3

Pearson's correlations between continuous variables

Variable	Age	Years lived in US	Traditional cultural beliefs	Social support	English proficiency	CESD	Self-rated health	CRS	Discrimination
	r	*r*	*r*	*r*	*r*	*r*	*r*	*r*	*r*
Age	1	.52**	−.009	−.044	.019	.067	−.040	.14**	−.084*
Years lived in US	.52**	1	.22**	−.054	.045	.039	−.008	.063	.017
Traditional cultural beliefs	−.009	.22**	1	−.025	.013	−.12**	.054	−.028	−.046
Social support	−.044	−.054	−.025	1	−.014	−.47**	.121**	.070	−.35**
English proficiency	.019	.045	.013	−.014	1	−.003	−.007	.023	−.027
CESD	.067	.039	−.12**	−.47**	−.003	1	−.21**	.034	.39**
Self-rated health	−.040	−.008	.054	.121**	−.007	−.21**	1	−.076*	−.17**
Cardiovascular risk scale	.14**	.063	−.028	.070	.023	.034	−.076*	1	−.004
Discrimination	−.084*	.017	−.046	−.35**	−.027	.39**	−.17**	−.004	1

* $p<.05$;

** $p<.01$

J Immigr Minor Health. Author manuscript; available in PMC 2016 December 01.

Table 4

Regression analyses for relationships between discrimination and health (n = 733)

Outcome	Model 1			Model 2		
	Cardiovascular risk score			Self-rated health		
Variable	***B***	***SE B***	***B***	***B***	***SE B***	***B***
Age	.021*	.008	.14	.010	.007	.072
Sex	.055	.13	.019	−.079	.12	−.030
Bachelor's degree	−.22	.24	−.037	.238	.22	.042
Work outside home	.04	.14	.012	.064	.125	.029
Study site	−.25*	.11	−.085	.076	.100	.029
Income >$40 k	.20	.19	.044	−.025	.17	−.006
Income $40 k–$75 k	.08	.18	.019	.24	.16	.059
Years lived in US	.000	.006	−.002	−.003	.006	−.024
CES-D	.014	.009	.069	−.022*	.008	−.12
Social support	.045**	.013	.148	.013	.012	.046
Traditional cultural beliefs (TCB)	.006	.010	.024	.006	.009	.026
Marital status	−.18	.22	−.033	−.17	.20	−.035
English proficiency	.021	.024	.033	−.006	.021	−.010
Fruit/vegetable intake	−.006	.005	−.048			
Physical activity	−.091	.079	−.044			
Smoking status	.14	.16	.036	−.19	.14	−.054
Asthma				−.36	.19	−.070
Arthritis				−.36*	.13	−.11
Cancer				−.041	.31	−.005
Liver disease				−.056	.21	−.010
Kidney disease				.28	.25	.041
Diabetes				.21	.13	.058
Hypertension				−.50**	.11	−.18
Medium Discrimination	.18	.13	.059	−.11	.11	−.040
High Discrimination	−.010	.19	−.002	−.42*	.17	−.10

J Immigr Minor Health. Author manuscript; available in PMC 2016 December 01.

Outcome	Model 1			Model 2		
	Cardiovascular risk score			Self-rated health		
Variable	***B***	***SE B***	***B***	***B***	***SE B***	***B***
R^2		.06			.11	
F-value	F (18, 688) = 2.317 *			F (23, 680) = 3.79 **		

* *p*<.05;

** *p*<.01