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Socially Assigned Race, Reactions to Perceived Racial Discrimination and Type II Diabetes Mellitus

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SOCIALLY ASSIGNED RACE, REACTIONS TO PERCEIVED RACIAL
DISCRIMINATION AND TYPE II DIABETES MELLITUS

by

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Bachelor of Science
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ABSTRACT

Background: Numerous studies have utilized race to document health inequities. As race is considered a social classification of persons based upon physical traits, studies have begun to consider socially assigned race defined as the race/ethnicity perceived by others. Socially assigned race may serve as the basis for differential or unfair treatment of persons ascribed to historically oppressed groups. Socially assigned race may also provide additional insight into racial health disparities, particularly among Latino populations who are commonly defined by their ethnicity. This study assesses the relationship between self-identified and socially assigned race/ethnicity and tests the moderating effects of emotional and physical reactions to perceived racial discrimination.

Methods: A cross-sectional analysis of the 2013 and 2014 Arizona Behavioral Risk Factor Surveillance System was conducted (N=8581). Non-Hispanic white, black and Latino respondents were categorized into groups based upon self-identified-socially assigned race/ethnicity concordance: concordant non-Hispanic white, discordant Latino, concordant Latino and concordant black. The outcome of interest was type II diabetes mellitus (T2DM) ascertained by age of diagnosis and current insulin use. Modified Poisson regression models were fit to estimate prevalence ratios (PR) and 95% confidence intervals (CI) after adjusting for confounders. Experiences of physical and emotional reactions to perceived racial discrimination were assessed as modifiers in the

association between self-identified-socially assigned race/ethnicity and type II diabetes mellitus.

Results: Reports of emotional reactions to perceived racial discrimination were more prevalent among discordant Latinos (10.1%), while concordant black participants were more likely to report physical reactions (6.3%). In fully adjusted models, concordant Latinos were significantly more likely to have T2DM than whites (aPR: 2.05, 95% CI: 1.47, 2.87). Neither emotional nor physical reactions to perceived racial discrimination modified the association between self-identified-socially assigned race/ethnicity categorization and T2DM.

Conclusion: Compared to whites, social assignment as Latino among self-identified Latino respondents is associated with increased risk of T2DM. However, this increased risk was not present among Latinos socially assigned as white and was attenuated among black respondents after adjusting for additional covariates. Socially assigned race/ethnicity may aid in characterizing ethnic/racial health disparities in chronic diseases and targeting interventions to high-risk groups.

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CHAPTER 1

INTRODUCTION

Race is widely considered a social construct that lacks biological meaning (1,2). The most commonly used approach to measure race/ethnicity is via respondent self-identification. To self-identify race and ethnicity, typically respondents are asked to respond to two separate questions. A less commonly used approach to operationalize race/ethnicity is social assignment. Socially assigned (or socially ascribed) race refers to the race/ethnicity that is defined by others. It is particularly helpful as, in addition to characterizing differences in health outcomes by racial categorization, it aids in understanding social exposures, such as discrimination (3). Categorizing people by race and ethnicity, particularly of stigmatized groups (i.e., blacks, Latinos and Native Americans) who have historically been the targets of oppression and exploitation may serve as the basis for differential or unfair treatment. For example, being socially assigned as black or Latino may expose individuals to unique stressors, such as racial discrimination, that are associated with poorer health outcomes (4). By assessing race as a social construct, this research avoids attributing disparities to differences within the racial/ethnic group itself and, instead, attribute these disparities to the group's relationship to the society in which it exists (3). In the United States, Latinos are more likely than any other group to be socially assigned to a race with which they do not self-identify (2). However, there is limited understanding of the relationship between socially

assigned race, perceived racial discrimination and health outcomes among Latinos in the United States.

Several studies have assessed the relationship between socially-assigned race, perceived discrimination, and health outcomes domestically and internationally (5–10). In New Zealand, self-identification and social assignment as the dominant ethnic group (European) was associated with an increased odds of reporting optimal self-rated health (5). Research conducted in the United States has demonstrated that being socially assigned as white has an advantage in overall health status (2,7) and preventive health service utilization (8) among non-whites. Studies focused exclusively on Latinos and the association between socially assigned race and self-rated health (2,10) have also shown variations in health outcomes, with more favorable outcomes for individuals who are socially assigned as white. However, studies examining whether socially assigned race is associated with chronic conditions, such as type II diabetes mellitus (T2DM), remain largely unexplored.

Although Latinos are more likely to have T2DM in comparison to whites, there is much variability among Latinos. For example, T2DM prevalence is lowest among Cubans (9.3%) and highest among Dominicans (18%), Puerto Ricans (18.0%) and Mexicans (18.3%), which approximates the variation range observed between whites and non-Hispanic blacks (11). Given this heterogeneity, it is also possible that Latinos who self-identify as white (or in this case, report being socially assigned as white) will have better T2DM outcomes in comparison to those who are socially assigned as a racially and/or ethnically stigmatized group. Thus, a better understanding of the relationship between socially assigned race and T2DM among Latinos warrants further investigation.

CHAPTER 2

LITERATURE REVIEW

Existing literature typically captures respondent race and ethnicity separately, with ethnicity focusing on Latino/Hispanic origin. The method in which race is measured is critical in assessing and addressing racial health disparities. As race is widely considered a social classification of persons based on the perception of physical traits (1,2,12), studies utilize social assignment to capture respondent race/ethnicity (2,6–9,13,14). This socially assigned race refers to the race/ethnicity that is perceived by others regardless of what a person may self-identify.

In societies with pervasive racial inequalities, being perceived as a member of marginalized racial/ethnic groups (e.g. black, Latino, American Indian) is hypothesized to expose individuals to unique psychosocial stressors, such as racial discrimination, that have been associated with poorer health outcomes (15). Associations between racial discrimination and mental and physical health outcomes have been documented (16); while racial discrimination has also shown strong relationships with residential segregation, employment opportunities and differential exposures to environmental hazards (17). While the health implications of racial discrimination have been explored, it has mostly been through the lens of self-identified race (16,18,19). Research has indicated increased reports of discrimination among Latinos ascribed as Mexican or Latino (9) and the potential differences in Latino health by socially assigned race (2).

These findings highlight the need to examine the effects of ascribed race on experiences of racial discrimination and health outcomes.

2.1 Socially Assigned Race

Socially assigned race is typically measured through respondents' answers to questions such as: "*How do other people usually classify you in this country* (12)," following the idea of race as a societal construct in which classification is based on perception of physical traits rather than self-identification. Concordance, or self-identifying and being socially assigned as the same race, appears to be greatest among individuals that self-identify as white, black or Asian (98.4%, 96.3% and 77.0% respectively.) (7) While discordance, where self-identified and socially assigned race differ, is more prevalent among those who self-identify as Latino (63.0% were socially assigned as Latino, 26.8% white and 3.5% black), American Indian (47.6% were classified by others as white), and Native Hawaiian or other Pacific Islander (NHOPI) (35.1% were socially assigned as NHOPI) (7). Among Latinos, who are categorized by ethnicity and can identify with any racial group, self-identified and socially assigned race differ most often (2,20). Many self-identified Latinos do not identify as any of the racial groups defined in the US Census and are more likely to self-identify as multiracial (2) or "some other race". Additionally, they are typically socially assigned to a race to which they do not self-identify (2). As Cuevas, Dawson and Williams (20) highlight, most Afro-Latinos, who are typically brown or have darker skin tones, self-identify or are socially assigned as black. Racial contestation, or discordance between self-identified and external racial categorization, was also seen to be greatest among Latinos (21). In an effort to combat a homogeneous assessment of Latinos, scholars have suggested

analyzing data by “white Hispanics” and “Hispanics” as “Hispanics who see themselves as white potentially have a very different collective profile” pertaining to factors such as educational attainment, income and health (22).

Given the increased prevalence of racial discordance of the Latino population, the use of ascribed race may better capture and define racial health differences. Factors that shape a person’s socially assigned race are determined by the societies in which they reside (i.e. socioeconomic stratification, social institutions, treatment by others, stereotypes, norms and beliefs (10)). Socially assigned race also includes the “implications of being categorized racially by others (10)” providing a more unique insight into the ways in which white advantage influences health. Racial categorization may contribute to differential access to opportunities and differential treatment that may in turn affect health outcomes. Though some research has worked to assess socially assigned race, racial discrimination and/or health among Latinos (2,9,10,23), findings have been inconsistent and only three have focused on the U.S. Latino population specifically (2,9,10).

2.2 Socially Assigned Race and Racial Discrimination

Racial tensions and discriminatory practices are deeply engrained in US history. Discrimination against Native American, Asian, black and Latino populations have been documented (24–28). Associations between perceived racial discrimination and health have been strongest with mental health outcomes, but also exist with physical health (15,17,19). Discrimination due to one’s race, whether it be institutionalized, personally mediated or internalized (12), has been theorized to affect health through social stress (29) and biopsychosocial (30) models. Social stress models propose that disadvantaged

social positioning leads to increased exposure to social stressors (such as prejudices and discrimination) and decreased access to resources to cope with these additional stressors which in turn affect mental and physical health (4,29). The biopsychosocial model of racism as a stressor, proposed by Clark et al. (30), theorizes that the perception of an interaction as racist results in exaggerated stress responses, both psychologically and physiologically, that are driven by socioeconomic status, coping mechanisms, and other behavioral factors.

While self-identified race is primarily used in studies that have assessed differences in reports of perceived racial discrimination (4,18,31), some research has utilized socially assigned race. MacIntosh et al. (8) found that, compared to those socially assigned as members of marginalized racial/ethnic groups, persons ascribed as white had lower odds of healthcare discrimination (OR: 0.27, 95% CI: 0.22, 0.33). Other work by Vargas and collaborators (9), has illustrated that respondents who are socially assigned as being of Mexican origin, whether they self-identify as such or not, were more likely to experience higher levels of discrimination relative to Latinos ascribed as white.

Domestically and abroad, the relationship between socially assigned race and experiences of racial discrimination remain consistent with literature using self-identified race (5,6,8,9). Utilizing socially assigned race in place of, or in conjunction with, self-identified race allows us to capture intraracial differences and the role of white advantage within the heterogeneous Latino population. To my knowledge, no study has yet examined the relationship between perceived racial discrimination and T2DM as it relates to Latinos.

2.3 Socially Assigned Race and Health

Researchers have begun to use socially assigned race in an effort to ascertain whether health advantages or disadvantages can be identified. Studies have found that being socially assigned as white, regardless of self-identification, confers an advantage in self-rated health (5–7). Some studies have found that these associations between socially assigned race and reported health are attenuated after accounting for reported experiences of racial discrimination (5,6). This suggests that experiences of racial discrimination may help explain some of the disparities seen between marginalized racial/ethnic groups and whites. Additionally, advantages have been documented among those ascribed as white in the engagement of positive health behaviors (such as increased use of primary healthcare (13) and receiving influenza and pneumococcal vaccinations (8)).

In studies assessing only self-identified Latinos, contradictory findings have been observed. Garcia et al. (10) found that ascribed race (being viewed as Latino, Mexican or white) was not significant in predicting self-rated health when skin color and discriminatory experiences were included, though skin color and reporting experiences of racial discrimination remained associated with poorer self-reported health status. While Vargas et al. (2) reported no overall advantage in self-rated health among self-identified Latinos ascribed as white compared to those who reported being ascribed as Latino/Hispanic. In their findings, being socially assigned as white and having greater odds of better health depended on nativity, country of origin, and citizenship. Though the above studies have utilized socially assigned race to assess the effects of discordance on overall health among Latinos, no study to date has focused specifically on physical health outcomes such as diabetes.

2.4 Type II Diabetes Mellitus among Latinos: Nationally and in Arizona

It is estimated that 29.1 million people in the US (9.3% of the population) have diabetes (32), which contributes to substantially to morbidity, mortality, and can lead to other comorbid conditions (33,34). The prevalence of cardiometabolic risk factors (specifically, obesity and diabetes) among Latinos has been documented and has been reported as consistently greater than that of non-Hispanic whites (35,36). Latinos are two times as likely to develop T2DM as non-Hispanic whites (32,36) and mortality from diabetes is 50% greater among Latinos relative to whites (37).

In Arizona, the increased prevalence of obesity, physical inactivity and poor diet has contributed to the near doubling of persons reporting diagnosis with T2DM (38). The economic cost of diabetes in Arizona as of 2011 is estimated to be \$3.3 billion in medical bills and indirect costs (38). Furthermore, the prevalence of adult diabetes as of Arizona's most recent Diabetes Burden Report is greater than at the national level (38). As Latinos comprise approximately 30% of the population of Arizona (38) and have greater incidence and mortality from diabetes, insight into subpopulations that may have increased risk may provide further guidance in targeting interventions, funding and informing healthcare providers.

2.5 Discrimination, Diabetes and Cardiovascular Health

Among Latinos with poorly controlled diabetes, 58.8% reported at least one experience of discrimination (39). The previously mentioned pathways in which discrimination is posited to affect health suggest that discrimination may be an important determinant in health and health related outcomes (40). Findings from research assessing the effects of discrimination on depressive symptoms and diabetes-related distress (DRD)

among African Americans and Latinos found that more frequent discrimination was associated with significantly greater depressive symptoms for both groups and higher DRD among Latinos (41). Additionally, perceived experiences of discrimination among patients with diabetes has been suggested to influence health behaviors and quality of life (42). Of the cited studies, only one focuses specifically on racial/ethnic discrimination on cardiovascular health (43); while others utilize an everyday discrimination scale that assess overall discrimination or discrimination attributed to other factors, including race/ethnicity (39,41). Though these studies provide insight into the effects of discrimination on diabetes, depression, and other measures of cardiovascular health, no study to date has assessed these factors utilizing socially assigned race. Additionally, the questions within the measures utilized for assessing everyday discrimination fail to ascertain whether respondents had stress responses, such as emotional or physical reactions, due to perceived discrimination.

While the aforementioned studies have focused on an overall measure of health, it is important to establish whether associations exist between socially assigned race and chronic health outcomes such as T2DM among Latinos. As Latinos are the fastest growing racial/ethnic group in the United States, projected to comprise 30% of the US population by 2050 (35), identifying whether the prevalence of diabetes differs by ascribed race and experiences of perceived racial discrimination may aid in targeting populations at greater risk of developing T2DM. Additionally, the use of socially assigned race may provide a more nuanced characterization of the prevalence of diabetes among Latinos, which may be beneficial in the assessment of other chronic health outcomes among such a heterogeneous population.

2.6 Aims, Research Questions and Hypotheses

The availability of the Reactions to Race in the 2013 and 2014 Arizona Behavioral Risk Factor Surveillance System (BRFSS) provides a unique opportunity to apply this theory and assess socially assigned race and reactions to perceived racial discrimination among a large sample of Latinos. Additionally, the availability of information pertaining to the diabetes status, insulin use and age of diagnosis of respondents allows for a unique assessment using socially assigned race/ethnicity. The present study aims to use these data to assess whether an association exists between ascribed race, perceived racial discrimination and T2DM.

Aim 1: To examine the distribution of reactions to perceived racial discrimination by socially assigned race/ethnicity.

Research question: Do differences exist in the distribution of emotional and physical reactions due to perceived racial discrimination by SI-SA race/ethnicity?

Hypothesis: Latino/as viewed by others as being Latino (concordant) are more likely to report experiencing emotional and physical reactions compared to whites, while discordant Latino/as are no different from whites in reporting emotional and physical reactions.

Aim 2: To assess the relationship between socially assigned race and diabetes.

Research question 1: Does a relationship exist between SI-SA race/ethnicity and T2DM?

Hypothesis 1: Discordant Latinos will have risks of diabetes similar to that of non-Hispanic whites and concordant Latinos will have increased risk of diabetes compared to non-Hispanic whites.

Research question 2: Is the relationship between SI-SA race/ethnicity and T2DM modified by reactions to perceived racial discrimination?

Hypothesis 2: Concordant Latinos who experience emotional or physical reactions will have increased risk of T2DM.

CHAPTER 3

METHODOLOGY

3.1 Data

The Arizona Behavioral Risk Factor Surveillance System (BRFSS)

The Behavioral Risk Factor Surveillance System is a cross-sectional telephone survey of non-institutionalized adults aged 18 years or older. In 1984, data collection, funded by the Centers for Disease Control and Prevention (CDC), began in an effort to gain state-specific data on behavioral risk factors accompanying premature morbidity and mortality (44). While the BRFSS initially collected data from 15 states, it has grown to include all 50 US states, the District of Columbia, and other US territories.

Data from the 2013 and 2014 Arizona BRFSS was utilized to conduct the analyses for this study. These years include core questionnaire data such as sociodemographic variables (e.g. age, sex, marital status, income, educational attainment and health insurance status), information about health behaviors (e.g. tobacco and alcohol use, screening use, diet) and chronic conditions (e.g. hypertension, coronary heart disease, asthma, cancer). In the selected years of the AZ BRFSS, the optional *Reactions to Race* module is included which contains questions pertaining to socially assigned race, experiences of perceived racial discrimination and reactions to perceived differential race-based treatment. The response rates for the 2013 and 2014 AZ BRFSS were 39.5% and 41.6% respectively, which are comparable to national estimates (45,46).

The analysis is limited to non-Hispanic white, non-Hispanic black and Latino (n=17432) respondents. Any ‘don’t know/not sure’ responses were coded as missing. Of the eligible respondents, those with missing responses for socially assigned race (n=8347), diabetes (n=17) and both emotional and physical reactions (n=70) were excluded. Respondents thought to not have T2DM, including participants reporting gestational diabetes (n=66), pre-diabetes (n=126) and diagnosis under the age of 30 while currently taking insulin (n=42) were excluded. Latino respondents who reported being socially assigned as black, Asian, Native Hawaiian or other Pacific Islander, American Indian or Alaska Native and some other group (n=84) were excluded due to being racially categorized as another marginalized racial/ethnic group. The focus on Latinos socially assigned as Latino or white allows for the assessment of whether ‘white advantage’ exists. Due to the small sample of blacks who reported being socially assigned as something other than black (n=9), they were not included in the analysis. Similarly, white participants reporting being socially assigned as other racial/ethnic groups were excluded due to small sample sizes (n=91). Respondents with at least one response to the *Reactions to Race* variables remained, resulting in an analytic sample of 8581 persons. As this study involved secondary analysis of publicly available and de-identified data, the institutional review board at the University of South Carolina considered it exempt from human subjects review.

3.2 Definition of Variables

Outcome

Self-reported diabetes

Diabetes status was collected as participants' yes or no response to "Has a doctor, nurse, or other health professional ever told you that you had diabetes?" Additionally, the age at which diabetes was diagnosed ("How old were you when you were told you have diabetes?") and insulin use ("Are you now taking insulin?") are used to establish whether the respondent is reporting type I or type II diabetes mellitus. Participants meeting both of the following criteria: reporting age of diagnosis < 30 years and no current insulin use are considered as having T2DM. Additionally, individuals reporting diagnosis at ≥ 30 years are classified as having T2DM (47).

Exposure

Socially assigned race

A composite self-identified and socially assigned race/ethnicity (SI-SA) variable is the primary variable of interest. Self-identification of race was ascertained from responses to two questions: 1) "Are you Hispanic, Latino/a, or Spanish origin?" (yes/no) and 2) "Which one of these groups would you say best represents your race?" (white, black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, other). Respondents who gave affirmative responses to the first question were coded as Latino/Hispanic. Respondents that self-identified as a race other than Latino, non-Hispanic black or non-Hispanic white were excluded from the analysis. Socially assigned race was collected as responses to: "How do other people usually classify you in this country? Would you say: white, black or African American, Hispanic

or Latino, Asian, Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native, or some other group?” A composite variable was created among respondents identifying whether self-identified and socially assigned race/ethnicity (SI-SA) are concordant or discordant and responses were categorized as concordant non-Hispanic white, concordant non-Hispanic black discordant Latino, and concordant Latino. Concordant non-Hispanic whites serve as the referent group.

Effect modifier

Reactions to Perceived Racial Discrimination

In addition to the socially assigned race question, the optional *Reactions to Race* module includes questions pertaining to perceived differential treatment due to the respondent’s race, as well as emotional or physical reactions to race-based treatment. This analysis will focus on experiences of emotional or physical reactions to perceived racial discrimination as a proxy for a stress response. Emotional reactions were collected from responses to: “Within the past 30 days, have you experienced any physical symptoms, for example, a headache, an upset stomach, tensing of your muscles, or a pounding heart, as a result of how you were treated based on your race?” Physical reactions were ascertained from “Within the past 30 days, have you felt emotionally upset, for example angry, sad, or frustrated, as a result of how you were treated based on your race?” Responses to both questions were collected as yes or no.

Covariates

To account for factors that may confound the association between socially assigned race and T2DM (48,49), analyses were adjusted for several covariates. Sociodemographic factors included variables such as age (18-35, 36-55, older than 55), sex, education, marital status (‘married or partnered’, ‘divorced, widowed or separated’

and ‘never married’), income and employment status (‘employed’, ‘unemployed’, ‘student/homemaker’, ‘retired’). Educational and income groupings were available in the AZ BRFSS data. Education was categorized as did not graduate high school, graduated high school, some college, and graduated from college. Income was grouped as < \$15,000, \$15,000 - \$25,000, \$25,000 - \$35,000, \$35,000 - \$50,000, and \geq \$50,000. Health-related factors included health insurance coverage, having a regular source as a health care provider, smoking status (current, former and never), physical activity, and BMI. Health insurance coverage, having a regular source as a health care provider and physical activity were analyzed as yes or no responses. Physical activity, calculated in the BRFSS, was coded from respondents’ report of physical activity or exercise during the past 30 days other than their regular job. BMI was categorized as ‘under/normal weight,’ ‘overweight’ and ‘obese.’ Additionally, questionnaire language and survey year were included as potential confounders in the association between SI-SA race/ethnicity and T2DM. Prior studies have found that acculturation status has resulted in subgroup differences among Latinos (2). Since the BRFSS does not have detailed measures of acculturation, the language in which the questionnaire was completed is used as a proxy (50).

3.3 Statistical Analysis

Descriptive data were summarized using frequency analyses (proc surveyfreq). The distributions of sociodemographic characteristics, as well as behavioral and health-related factors were analyzed by socially assigned race utilizing chi-square tests to determine the significance. Logistic regression was used to conduct bivariate analysis

between SI-SA race/ethnicity and emotional and physical reactions with p-values reported from two-sided t-tests.

Typically, log-binomial regression models are used to approximate prevalence ratios. However when this method was attempted, estimates were on the “boundary of the perimeter space” (51,52) which prevented the model from converging. Poisson regression models are a suggested alternative in this situation, however the variance must be altered otherwise the confidence intervals will be overestimated (51). Robust variance estimates used with Poisson models allow for accurate point and confidence interval estimations and an easier interpretation of binary outcomes using cross-sectional data compared to logistic regression (prevalence odds ratio) (51). Studies have shown that both the robust Poisson and the log-binomial models yield relatively unbiased estimates of the prevalence ratio (51,52).

Generalized estimating equations (GEE) were used to estimate Poisson regression models with robust error variance estimates. We assumed exchangeable correlation and compared results to models assuming independent correlation to find no difference in the inferences between the two associated models. Models assessed the relationship between SI-SA race/ethnicity and T2DM and sequentially adjusted for age, sex and survey year (model 1); model 1 + education, marital status, income, employment and questionnaire language (model 2); model 2 + health care provider, health insurance status, smoking status, physical activity and BMI (model 3). We separately conducted moderation analyses, testing for interaction between emotional and physical reactions and SI-SA race/ethnicity in the fully adjusted model (model 3), using $p=0.10$ as the level of significance. Prevalence ratios (PR) and 95% confidence intervals (CI) are reported.

SAS version 9.4 (SAS Institute, Cary, NC, USA) was used to for all statistical analysis to account for the complex sampling design and weighting of the BRFSS (53). The BRFSS uses raking, also referred to as iterative proportional fitting, to create a weight for each observation to allow inference on weighted models to apply to the overall population (53). This unique weighting of the data requires the use of a final weight, strata weight, and primary sampling unit for proper data analysis (54).

Sensitivity analyses

The distribution of self-identified race among Latinos was assessed to ascertain whether this coincides with reported socially assigned race. Previous literature has illustrated that most Latinos identify as white when “Hispanic/Latino” is not an option, but fewer report social assignment as the same (55). Additionally, self-identified race among Latinos who reported being socially assigned as white was shown to vary (55). Results are shown in Appendix A.

CHAPTER 4

RESULTS

4.1 Descriptive Analyses

Table 4.1 presents the weighted percentages of sample demographic characteristics. Non-Hispanic white respondents comprised 68.8% of the sample, followed by concordant Latinos (22.3%), discordant Latinos (5.1%) and non-Hispanic blacks (3.8%). Among the 8581 eligible respondents, the prevalence of T2DM was 10.9%. The majority of the sample were female, employed, covered by health insurance, married or partnered and had some college education. Both concordant and discordant Latinos were younger than white and black respondents (42.0% and 42.3% of respondents were between 18 and 35 years of age, respectively, $p < .0001$). Sociodemographic and health-related behavioral factors varied between the groups with concordant Latinos having lower income, educational attainment and health insurance coverage, and more likely to be current smokers compared to the rest of the sample. There were no significant differences among whites, blacks, concordant and discordant Latinos in the prevalence of T2DM ($p = 0.2159$).

Illustrated in Figure 4.1 are the distributions of reported reactions to perceived racial discrimination. Greater reports of emotional reactions to perceived racial discrimination were seen among discordant Latinos (10.1%, $p = 0.0036$), followed by concordant Latinos (9.3%, $p < .0001$) and blacks (8.9%, $p = 0.0045$) which were significantly greater than reports from whites (3.5%). Physical reactions to perceived

racial discrimination were greatest among black respondents (6.3%), followed by concordant Latinos (5.4%). White and discordant Latinos had similar prevalence of physical reactions (1.9% and 1.8%, respectively.) Both concordant Latinos and blacks had significantly greater reports of physical reactions compared to whites ($p < .0001$ and $p = 0.0020$, correspondingly).

4.2 Statistical Analyses

The results of the multivariable Poisson regression analysis examining the relationship between SI-SA race/ethnicity and T2DM are displayed in Table 4.2, with estimates for all covariates shown in Table B.1. When only adjusting for age, sex and survey year (model 1), both concordant Latinos (aPR: 2.22, 95% CI: 1.52, 3.24) and blacks (aPR: 1.73, 95% CI: 1.05, 2.84) had increased risk of T2DM compared to whites. After adjusting for socioeconomic factors and questionnaire language (model 2), the association among blacks was not significant, while the risk among concordant Latinos was remained (aPR: 2.25, 95% CI: 1.63, 3.11). Lastly, after adjusting for health behavior variables (model 3), the increased risk between SI-SA race/ethnicity and T2DM for concordant Latinos relative to whites was attenuated, but remained significant (aPR: 2.05, 95% CI: 1.47, 2.87). No other significant differences were noted.

Emotional and physical reactions to perceived racial discrimination were assessed as modifiers of the association between SI-SA race/ethnicity and T2DM. Interactions between SI-SA race/ethnicity and emotional and physical reactions were not significant in fully adjusted models ($p = 0.6187$ and $p = 0.5779$, respectively). Results are not shown.

Table 4.1: Sample characteristics of respondents by SI-SA race/ethnicity, weighted percentages, Arizona Behavioral Risk Factor Surveillance System (BRFSS) 2013-2014

	Total (n=8581)	White (Non- Hispanic) (n=7201, 68.8%)	Discordant (Latino – White) (n=274, 5.1%)	Concordant (Latino – Latino) (n=895, 22.3%)	Black (Non- Hispanic) (n=211, 3.8%)	p-value ^a
Age						<.0001
18–35	26.9	21.3	42.3	42.0	18.3	
36–55	34.2	31.8	35.2	39.1	48.2	
> 55	38.9	46.9	22.5	19.0	33.5	
Sex						0.7301
Male	47.9	47.1	53.2	48.9	49.8	
Female	52.1	52.9	46.8	51.1	50.2	
Education						<.0001
Did not graduate HS	15.0	6.4	22.8	40.5	11.5	
HS graduate	25.2	24.9	22.9	26.1	29.4	
Some College ^b	35.8	39.1	40.4	24.7	35.1	
College graduate ^b	24.0	29.6	14.0	8.7	24.0	
Employment						<.0001
Employed	49.9	48.4	56.0	53.1	49.5	
Unemployed	13.7	11.3	13.4	20.0	21.0	
Student/Homemaker	13.9	11.6	16.1	21.2	10.0	
Retired	22.5	28.8	14.5	5.6	19.5	
Income						<.0001
< \$15,000	10.5	7.4	16.8	18.9	10.6	
\$15,000 - \$25,000	18.8	14.1	21.7	33.8	14.2	
\$25,000 - \$35,000	12.1	10.9	10.8	15.8	13.5	
\$35,000 - \$50,000	15.8	15.9	16.2	14.5	20.3	
≥ \$50,000	42.8	51.7	34.5	17.0	41.4	
Marital status						<.0001
Married/Partnered	58.2	60.0	51.2	58.3	35.2	
Not married	21.8	23.3	18.0	15.9	32.5	
Never married	20.0	16.7	30.7	25.8	32.3	
Health insurance						<.0001
Covered	82.8	89.6	81.8	62.2	81.9	
Not covered	17.2	10.4	18.2	37.8	18.1	
Smoking status						<.0001
Current smoker	15.4	15.3	11.0	17.1	14.2	
Former smoker	28.1	32.0	16.3	20.4	20.6	
Never smoked	56.4	52.8	72.7	62.5	65.2	
BMI						<.0001
Under/normal weight	37.4	40.1	36.1	31.7	21.7	
Overweight	34.5	35.5	35.0	29.5	44.7	
Obese	28.0	24.4	28.9	38.8	33.6	
Leisure time physical activity						0.0037
Yes	75.9	78.5	76.0	70.0	62.9	
No	24.1	21.5	24.0	30.0	37.1	
Questionnaire language						<.0001 ^c
English	89.3	99.7	83.6	58.9	100.0	
Spanish	10.7	0.3	16.4	41.1	0.0	
T2DM						0.2159
Yes	10.9	9.9	11.4	13.2	15.3	
No	89.1	90.1	88.6	86.8	84.7	
Survey Year						0.4200
2013	64.0	64.2	57.6	63.6	69.5	
2014	36.0	35.8	42.4	36.4	30.5	

Abbreviations: HS – high school, BMI – body mass index

^a: calculated using Chi-square tests; ^b:includes technical school; ^c: Non-Hispanic black respondents are excluded from this test as the cell count was less than 5

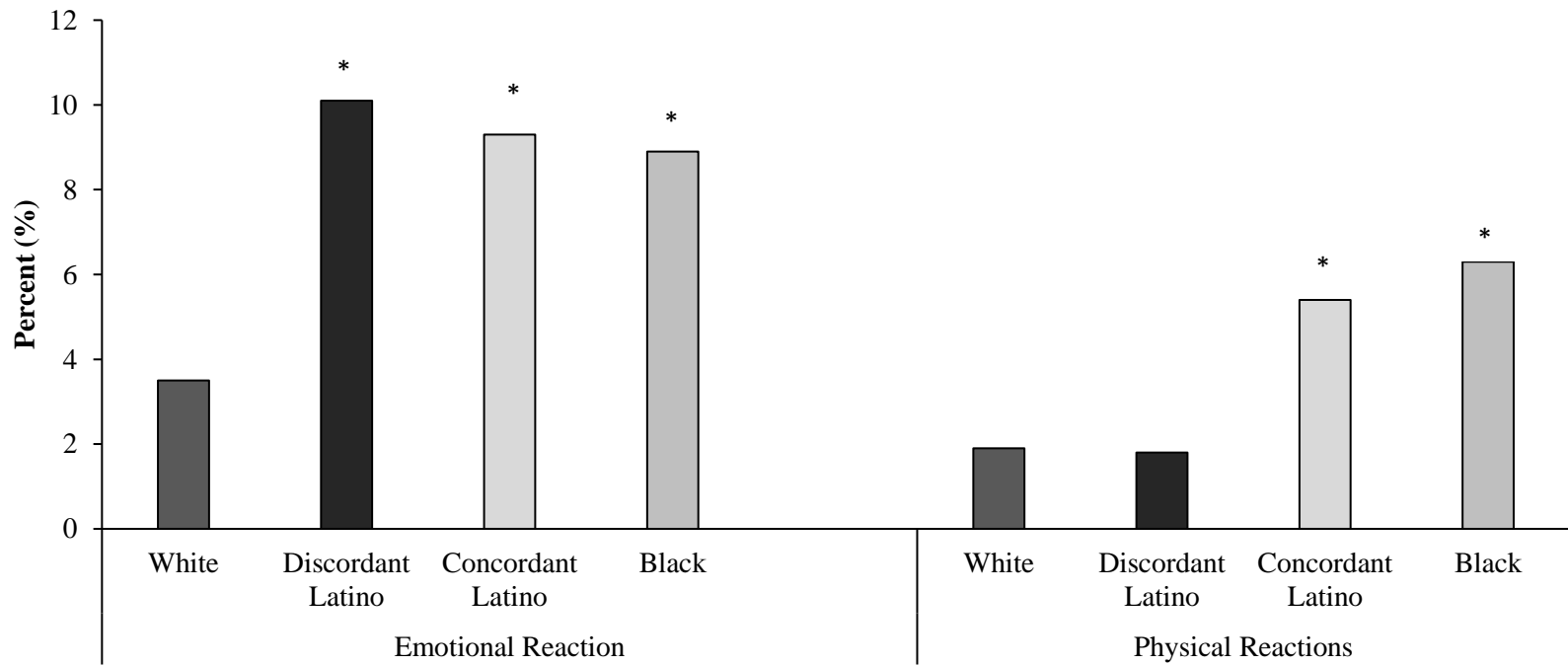


Figure 4.1 Distributions of physical and emotional reactions to perceived racial discrimination, Arizona Behavioral Risk Factor Surveillance System (BRFSS) 2013-2014, (*) indicates significance ($p < 0.05$), non-Hispanic whites are the referent group

Table 4.2: Poisson regression models predicting type II diabetes mellitus by self-identified and socially assigned (SI-SA) race/ethnicity concordance status, Arizona Behavioral Risk Factor Surveillance System (BRFSS) 2013-2014

SI-SA race/ethnicity	White		Discordant Latino (L-W)		Concordant Latino (L-L)		Black	
	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Model 1 ^a	1.00	(ref)	1.69	0.95, 2.99	2.22	1.52, 3.24	1.73	1.05, 2.84
Model 2 ^b	1.00	(ref)	1.58	0.91, 2.75	2.25	1.63, 3.11	1.41	0.86, 2.34
Model 3 ^c	1.00	(ref)	1.53	0.86, 2.70	2.05	1.47, 2.87	1.21	0.71, 2.06

a: adjusted for age, sex and survey year

b: adjusted for age, sex, survey year, income, educational attainment, marital status, employment status, and questionnaire language

c: adjusted for age, sex, survey year, income, educational attainment, marital status, employment status, questionnaire language, health insurance coverage, personal physician, smoking status, leisure time physical activity and BMI.

CHAPTER 5

DISCUSSION

This study examined whether there was an association between SI-SA race/ethnicity and T2DM using data from the Arizona BRFSS (2013, 2014). The study also assessed whether experiences of physical or emotional reactions to perceived racial discrimination modifies the association between SI-SA race/ethnicity and T2DM. The findings from this study suggest that being socially assigned as Latino was associated with increased risk of T2DM, even after adjusting for sociodemographic, health-related factors and acculturation.

Generally, both Latino and black respondents reported more reactions to perceived racial discrimination relative to whites. These findings are consistent with previous literature that has shown increased reports of experiences of racial discrimination among members of these groups (9,56–58). Differences in the reports of reactions to perceived racial discrimination among discordant and concordant Latinos may be partially attributed to differences in citizenship status, time in the US, or sociodemographic factors (9,58). Given the increasingly anti-immigrant political environment in the United States, Latinos are especially more vulnerable to discrimination, specifically in Arizona with one of the most restrictive immigration policies (SB 1070) (50). However, the prevalence of emotional reactions was significantly greater among discordant Latinos compared to whites (10.1% and 3.5%,

p=0.0036) which differs from the aforementioned hypothesis. It is possible that being socially assigned as white results in increased exposure to conversations that include discriminatory ideals that would not be expressed in front of perceived members of marginalized racial/ethnic groups. This should be examined in future research. Research has demonstrated that Latinos who self-identify or report being socially assigned as white have a different socioeconomic profile compared to other Latinos (such as higher educational attainment and income) (55). Such increases in socioeconomic status have been associated with increased contact with whites and increased reports of stereotyping and racial discrimination (59) and may be associated with the increased report of emotional reactions.

Physical reactions were greatest amongst black (6.3%) and concordant Latino respondents (5.4%) compared to whites (1.9%, $p=0.0020$ and $p<.0001$ respectively). Yet, the report of physical reactions among discordant Latinos is not significantly different from whites. These findings are important in that they highlight differences in reactions to perceived racial discrimination that would otherwise be hidden if Latinos were assessed monolithically. Such differences between blacks and concordant Latinos compared to whites suggest that being socially assigned as a member of a historically oppressed racial/ethnic group is associated with a differential burden of physical reactions to perceived racial discrimination. The similarities among white and discordant Latinos could partially be attributed to coping mechanisms. Research has shown that coping strategies and personality types moderate the relationship between racial discrimination and physical responses (60). It is possible that the higher socioeconomic status (i.e. higher income than concordant Latinos, greater percentage reporting some

college education) and insurance coverage of discordant Latinos afford some advantage in access to coping strategies that mitigate the effects of perceived racial discrimination (61).

The findings from the adjusted regression models support our hypothesis as they show concordant Latinos to have a greater risk of T2DM than non-Hispanic whites, even after adjusting for potential differences in risk factors. This is consistent with prior research which identified increased risk of T2DM among Spanish-speaking Latinos (62). Additionally, no significant differences in T2DM risk were observed between discordant Latinos and whites. These findings are similar to existing work that has assessed ‘white advantage’ in self-rated health and found no significant difference in reporting good health among self-identified non-whites that were socially assigned as white compared to white respondents (5,7). The increased T2DM risk among black respondents relative to whites was not significant after adjusting for confounders; suggesting that the sociodemographic and behavioral factors included in the analysis explain the association. Our findings speak to the effects of racialization on exposure to factors that improve or worsen health outcomes (5). However, it is possible that our null findings among discordant Latino and black participants are attributed to small sample sizes for both groups (n=274 and 211, respectively).

Furthermore, given the results of the moderation analysis, physical or emotional stress associated with perceived racial discrimination does not appear to modify the association between SI-SA race/ethnicity and T2DM (hypothesis 2, aim 2). It is possible that neither physical nor emotional reactions act as modifiers in the relationship between SI-SA race/ethnicity and T2DM. As mentioned above, coping styles may buffer the

effects of such reactions (61). Null findings could also be attributed to small sample sizes reporting emotional (n=308) and physical reactions (n=183). To our knowledge, there is no other study evaluating this moderation. However, research has found physical and emotional reactions to perceived racial discrimination to be associated with decreased preventive service utilization (63). Studies have also reported perceived racial discrimination as a stressor that influences health (17,19,64), though these did not specifically assess emotional or physical reactions.

This study has numerous strengths, with the first being that it uses the best available data to answer the research question. Limited data exists on socially assigned race, reactions to perceived racial discrimination and health outcomes, particularly in nationally conducted surveys such as the BRFSS. Additionally, the findings of this study contribute novel information to the literature utilizing both SI-SA race/ethnicity to understand how health outcomes vary by external racial categorization. As prior studies have utilized socially assigned race to assess relationships in self-rated health (2,5,7,10), this study assesses the relationship with a chronic health outcome (T2DM). Furthermore, this study describes the prevalence of emotional and physical reactions to perceived racial discrimination among Latinos, contributing to the existing work that has characterized experiences of discrimination utilizing socially assigned race (8,9). Lastly, Latinos comprise approximately 30% of the population in Arizona (67).

While this study has its strengths, it is not without limitations. First, the study uses data from one state, Arizona, which has a Latino population that is primarily of Mexican origin/descent (67). This results in a less heterogeneous population of Latino respondents to which these findings can apply. Thus, findings may not be generalizable to a diverse

sample of the population. However, approximately 65% of the US population are of Mexican origin/descent (Vargas 2015). In addition, Arizona is considered an immigrant receiving state. Moreover, due to the cross-sectional nature of the data used, causality between any of the variables examined cannot be determined. Due to limitations of data availability on confounders such as nativity, time in the US or citizenship status was not possible though studies have identified differences in health outcomes by these variables (2). The availability of other cardiometabolic factors (e.g. cholesterol, hypertension) during the same years of the *Reactions to Race* module was also limited. Additionally, using objective measures of T2DM may remove potential sources of bias, though studies have shown that self-report of diabetes is a valid measure to capture diabetes status (68). To add, data from the BRFSS are commonly used for baseline targets for state and national public health prevention programs. Lastly, emotional and physical reactions to perceived racial discrimination are assessed as one-time events within the past 30 days. Utilizing the frequency or chronicity of such reactions may provide more insight into the association between reactions to perceived racial discrimination and T2DM. Despite these limitations, these findings can be used to generate hypotheses on the importance of perceived race among Latinos and how socially assigned race influences health and health-related outcomes.

The findings highlight the differences in T2DM risk by SI-SA race/ethnicity and experiences of emotional and physical reactions to perceived racial discrimination. The analysis of T2DM risk by SI-SA race/ethnicity provides support for disadvantages in health attributed to external classification of race, particularly among concordant Latinos. Our results also demonstrate the need for more research examining the relationships

between socially assigned race, racial discrimination and other health related outcomes. Future research should focus on repeated assessment of physical and emotional reactions to perceived racial discrimination, generally and specifically pertaining to socially assigned race. Additionally, the present study highlights the importance of the relational dimension of race (i.e. socially assigned race) to properly characterize ethnic/racial health inequities among groups that may not identify with the extant categorization of race. Research should continue this methodology and build upon this work by additionally assessing whom respondents think of when answering the question: “How do other people usually classify you in this country?” or using interviewer ascribed race/ethnicity. Future research should also examine the relationship between SI-SA race/ethnicity and T2DM in states with larger populations of black respondents. For the 2013 and 2014 AZ BRFSS, black respondents made up approximately 4% of the sample, thus states with a larger non-Hispanic black population may observe different associations (65,66).

Increased use of socially assigned race in conjunction with self-identification of race/ethnicity provides a greater insight in how perceived race/ethnicity may affect a range of health and sociodemographic outcomes. Understanding factors associated with increased risk of disease allows for the improved implementation of interventions and helps target resources to high-risk populations.

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APPENDIX A – SENSITIVITY ANALYSIS

Figure A.1 shows the distribution of self-identified race among Latino respondents. Self-identifying as white (48.3%) or other (33.9%) was most common. Similar to prior findings (55), more Latinos in the sample self-identify as white when Latino is not a racial option, yet, when assessing socially assigned race among Latino respondents (Figure A.2), a smaller percentage (22.0%) report being perceived by others as such. Lastly, Figure A.3 presents the distribution of self-identified race among discordant Latinos (socially assigned as white). This illustrates that not all Latinos who report being socially assigned as white self-identify as the same, with 10.6% identifying as other and 0.4% as American Indian or Alaska Native.

When assessing self-identified race and socially assigned race among Latinos, the findings were consistent with existing literature (55). While many Latinos self-identify as white, fewer reported perception by others as the same. In addition, not all Latino respondents who report being socially assigned as white self-identified as white.

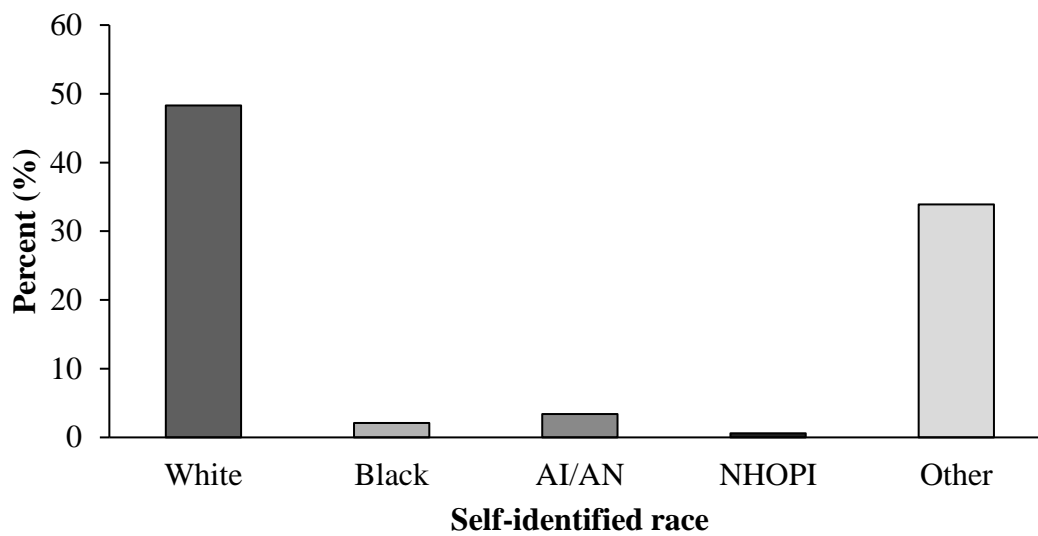


Figure A.1: Distribution of self-identified race among Latino respondents, Arizona Behavioral Risk Factor Surveillance System (BRFSS) 2013-2014; Abbreviations- AI/AN: American Indian/Alaska Native; NHOPI: Native Hawaiian or Other Pacific Islander

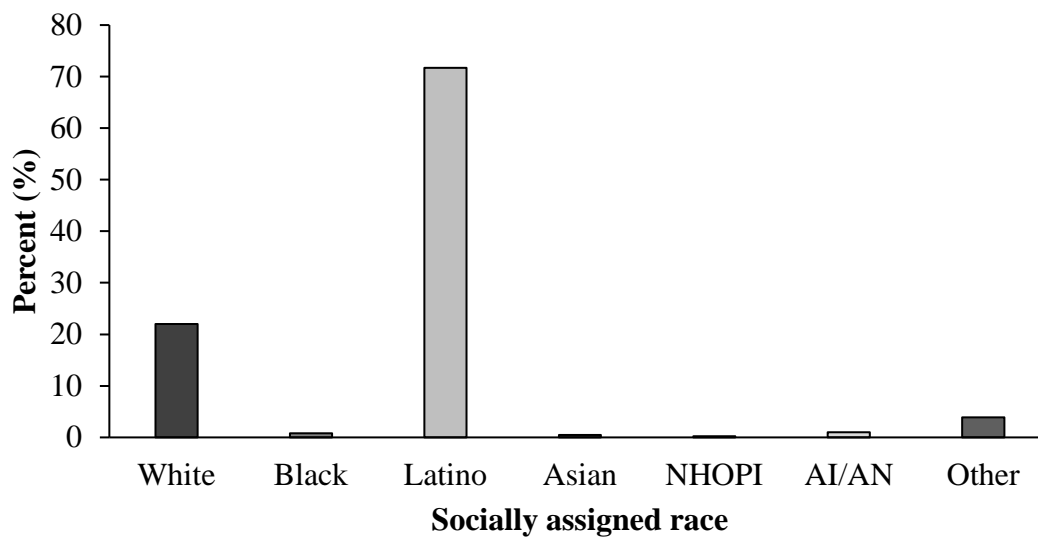


Figure A.2: Distribution of socially assigned race among Latino respondents, Arizona Behavioral Risk Factor Surveillance System (BRFSS) 2013-2014; Abbreviations- AI/AN: American Indian/Alaska Native; NHOPI: Native Hawaiian or Other Pacific Islander

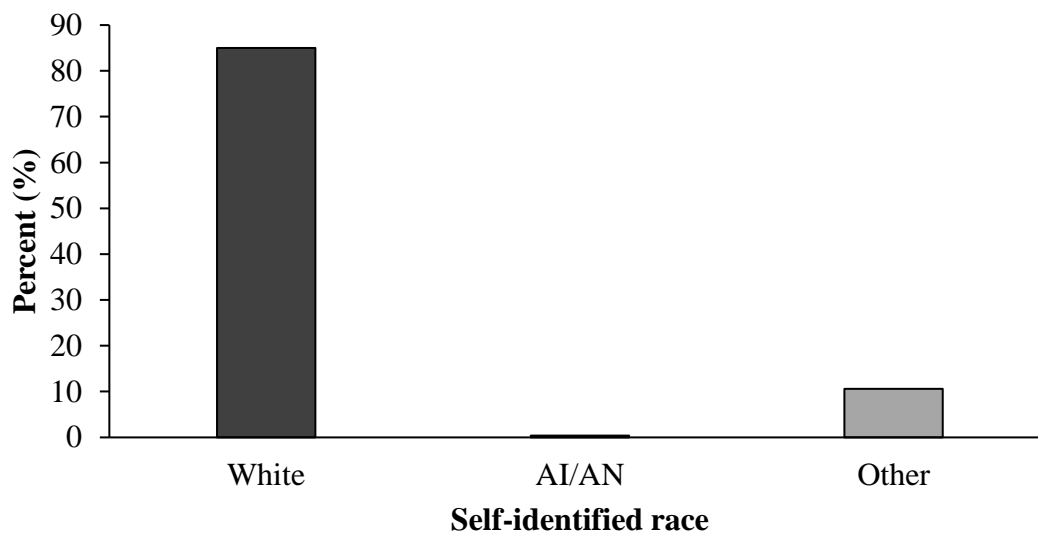


Figure A.3: Distribution of self-identified race among discordant Latinos, Arizona Behavioral Risk Factor Surveillance System (BRFSS) 2013-2014; Abbreviations- AI/AN: American Indian/Alaska Native

APPENDIX B – ADDITIONAL TABLES AND FIGURES

Table B.1 presents prevalence ratios and 95% confidence intervals for all variables included in models predicting T2DM by SI-SA race/ethnicity. Older age remained associated with increased risk of T2DM compared to those aged 18-34. Consistent with existing knowledge of risk factors for T2DM, obesity was associated with increased risk of T2DM (aPR: 3.02, 95% CI: 1.94, 4.68) compared to those under/normal weight in the fully adjusted model (model 3.) Additionally, after adjusting for sociodemographic (model 2, aPR: 0.76, 95% CI: 0.61, 0.96) and health-related factors (model 3, aPR: 0.72, 95% CI: 0.55, 0.93) women had significantly lower risks of T2DM relative to men. Persons who were unemployed had increased risk of T2DM compared to employed individuals (model 2), but this association was not significant after additionally adjusting for health-related behaviors (model 3). Individuals in the ‘not married’ category were significantly more likely than married individuals were to have increased risk of T2DM in the fully adjusted model (model 3.)

Proc surveyfreq was used to assess differences in the prevalence of T2DM by report of emotional and physical reactions to perceived racial discrimination, with chi-square tests used to ascertain significance differences between T2DM prevalence and such reactions. Results are shown in Figure B.1. Among respondents experiencing emotional reactions, the prevalence of T2DM was approximately 11.0%, however this was not significantly different from respondents that reported no emotional reaction

($p=0.9863$). Roughly 14% of participants that reported physical reactions to perceived racial discrimination had T2DM, though differences in the prevalence of T2DM between respondents reporting physical reactions and those who did not is not significant ($p=0.3159$).

Table B.1: Complete results from Poisson regression models predicting type II diabetes mellitus by self-identified and socially assigned (SI-SA) race/ethnicity, Arizona Behavioral Risk Factor Surveillance System (BRFSS) 2013-2014

	Model 1 ^a		Model 2 ^b		Model 3 ^c	
	PR	95% CI	PR	95% CI	PR	95% CI
SI-SA race/ethnicity						
White	1.00	(ref.)	1.00	(ref.)	1.00	(ref.)
Discordant Latino	1.69	0.95, 2.99	1.58	0.91, 2.75	1.53	0.86, 2.70
Concordant Latino	2.22	1.52, 3.24	2.25	1.63, 3.11	2.05	1.47, 2.87
Black	1.73	1.05, 2.84	1.41	0.86, 2.34	1.21	0.71, 2.06
Age						
18–35	1.00	(ref.)	1.00	(ref.)	1.00	(ref.)
36–55	5.20	1.32, 20.53	5.62	1.76, 17.97	4.05	1.33, 12.30
> 55	12.85	3.40, 48.63	11.95	3.73, 38.24	9.69	3.06, 30.66
Sex						
Male	1.00	(ref.)	1.00	(ref.)	1.00	(ref.)
Female	0.79	0.62, 1.02	0.76	0.61, 0.96	0.72	0.55, 0.93
Education						
Did not graduate HS			1.00	(ref.)	1.00	(ref.)
HS graduate			0.74	0.44, 1.25	0.81	0.47, 1.37
Some College ^d			0.72	0.44, 1.18	0.76	0.48, 1.21
College graduate ^d			0.60	0.37, 1.00	0.72	0.44, 1.16
Employment						
Employed			1.00	(ref.)	1.00	(ref.)
Unemployed			1.80	1.09, 2.98	1.55	0.90, 2.65
Student/Homemaker			0.65	0.34, 1.21	0.70	0.38, 1.30
Retired			1.21	0.89, 1.66	1.14	0.84, 1.56
Income						
< \$15,000			1.00	(ref.)	1.00	(ref.)
\$15,000 - \$25,000			0.91	0.53, 1.57	0.77	0.45, 1.31
\$25,000 - \$35,000			0.86	0.48, 1.54	0.84	0.47, 1.49
\$35,000 - \$50,000			0.73	0.41, 1.31	0.65	0.38, 1.13
≥ \$50,000			0.76	0.43, 1.34	0.66	0.38, 1.15
Marital status						
Married/Partnered			1.00	(ref.)	1.00	(ref.)
Not married			1.27	0.97, 1.66	1.32	1.01, 1.74
Never married			1.22	0.77, 1.93	1.27	0.80, 2.03
Questionnaire language						
English			1.00	(ref.)	1.00	(ref.)
Spanish			0.55	0.25, 1.17	0.70	0.32, 1.51
Survey Year						
2013			1.00	(ref.)	1.00	(ref.)
2014			0.88	0.70, 1.11	0.84	0.67, 1.04
BMI						
Under/normal weight					1.00	(ref.)
Overweight					1.42	0.89, 2.27
Obese					3.02	1.94, 4.68
Leisure time physical activity						
Yes					1.00	(ref.)
No					1.26	0.91, 1.77
Smoking status						
Never smoked					1.00	(ref.)
Former smoker					0.99	0.72, 1.36
Current smoker					1.08	0.67, 1.72
Health insurance						
Covered					1.00	(ref.)
Not covered					0.84	0.45, 1.57
Has a health care provider						
Yes					1.00	(ref.)
No					0.67	0.40, 1.12

Abbreviations: HS: high school; BMI: body mass index

^a: adjusted for age, sex and survey year; ^b: adjusted for model 1 and income, educational attainment, marital status, employment status, and questionnaire language; ^c: adjusted for model 2 and health insurance coverage, having a health care provider, smoking status, leisure time physical activity and BMI; ^d: includes technical school

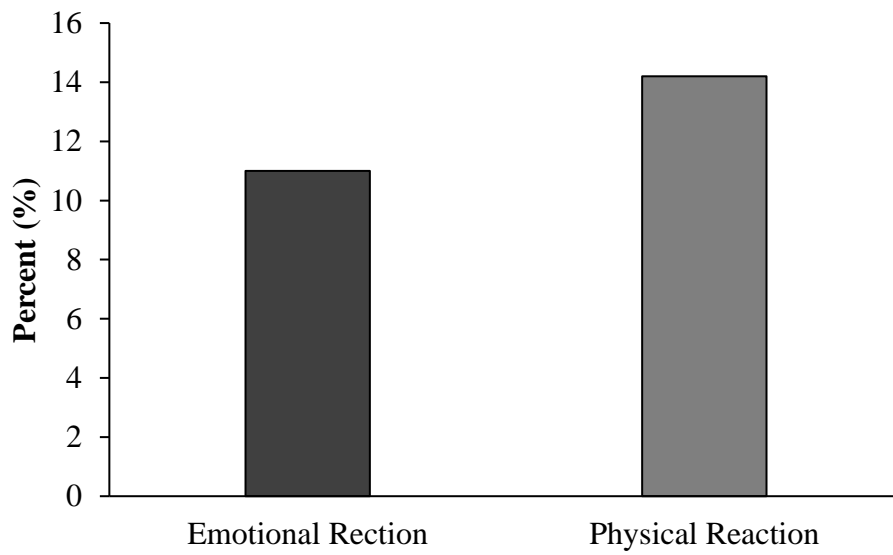


Figure B.1: Prevalence of type II diabetes mellitus by reported reactions to perceived racial discrimination, Arizona Behavioral Risk Factor Surveillance System (BRFSS) 2013-2014