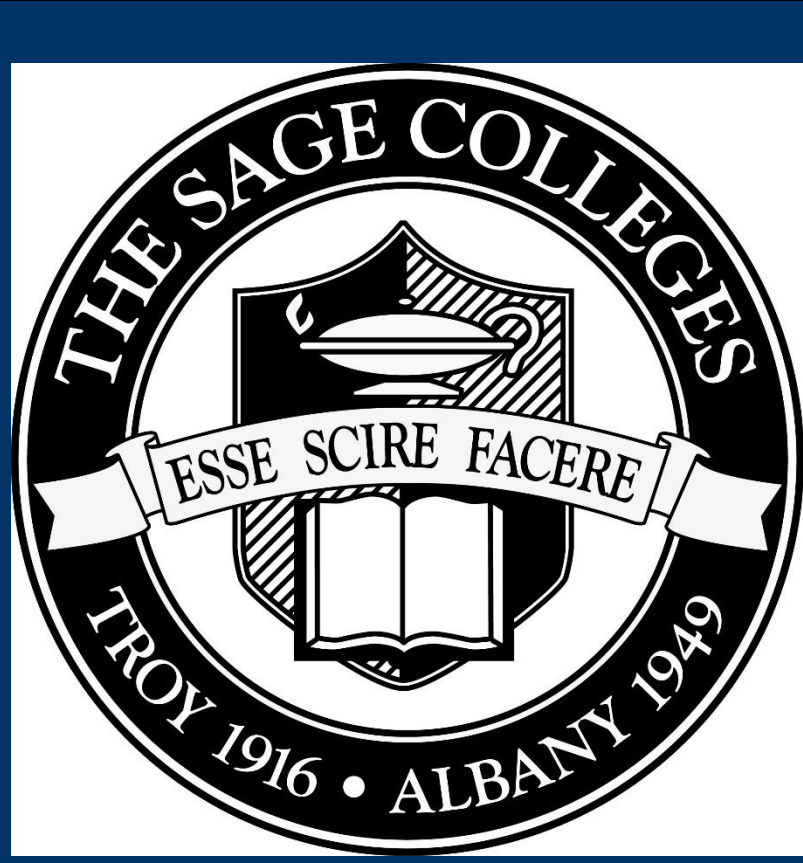


Examining the Confluence of Race/Ethnicity with Diabetes Education and its Effects on Self-Care Behaviors: Glucose Monitoring and Checking Feet for Sores or Irritations

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INTRODUCTION

- Diabetes is a chronic condition that has serious implications on one's health if not properly managed
- A thorough literature review revealed that minority populations, specifically non-Hispanic Black and Hispanic Americans suffer the most, with both increased rates and complications (Gucciardi et al., 2013)
- Diabetes education can be empowering, leading to increased healthy self-care practices (Juarez et al., 2022)
- While there have been multiple small-scale studies looking at methods of provision of diabetes education, there is no generalizable research demonstrating that different racial/ethnic groups who receive diabetes education practice higher levels of self-care behaviors as a result of the education
- This research study seeks to gain a better understanding of the confluence between diabetes education, diabetes self-management behaviors, and the differences among people from different racial/ethnic groups
- US diabetes rates: Non-Hispanic Black: 12.1%, Hispanic: 11.8%, Non-Hispanic Asian: 9.5%, Non-Hispanic White: 7.4% (CDC,2022b)

DATA AND METHODS

- A secondary source was used to gather quantitative data- The Behavioral Risk Factor Surveillance System (BRFSS)- (2019, 2020, and 2021)
- BRFSS is a phone survey (landlines or cellular phones) developed by the Centers for Disease Control (CDC) in collaboration with state health departments (CDC, 2022a)
- The survey is conducted monthly, data is aggregated and disseminated annually (CDC, 2022a)
- It includes all 50 US states and US territories (CDC, 2022a)
- BRFSS employs stratified random sampling, using random digit dialing (CDC, 2022a)
- BRFSS also utilizes iterative proportional fitting (raking)to reduce bias and increase representativeness (CDC, 2022a)
- The respondents reside in college or private housing (CDC, 2022a)
- State health department employees and contractors conduct the surveys (CDC, 2022a)
- The CDC evaluates and processes the data, weighing or adjusting as needed to improve representativeness (CDC, 2022a)
- In 2011 cellular phones were added to improve survey validity (CDC, 2022a)

Literature Review

- "Diabetes is a chronic condition whose long-term prognosis is highly dependent on the self-care behaviors of the affected people" (Hermanns et al.,2020,p.436)
- There has been an increase in diabetes-related non-traumatic lower extremity amputation in the US (Makiling and Smart, 2019)
- Education is the key to preventing and detecting foot ulcers and complications from them (ADA,2022).
- Self-glucose monitoring is "key for achieving glycemic targets" (ADA,2022,p.s85)
- Both CGM and blood glucose monitoring (BGM)-" AKA fingerstick" is beneficial in guiding patients about food choices, activities, prevention of hypoglycemia, and medication management and are essential elements of taking insulin (ADA,2022)
- According to Heidemann et al., 2016, poor glycemic control in African and Hispanic Americans occur "independent of insurance status, income or access to PCP" (Taylor,2017, p. 246)
- Asian Americans surveyed in BRFSS are often overweight, but not obese, and have a higher education than the majority, however, were screened for DM less than other ethnic groups (Tung et al., 2016)
- A large, cross-sectional, population-based survey using a protocol similar to BRFSS evaluated diabetes self-management including foot checks and self-glucose monitoring. Diabetes education was identified as improving self-efficacy and ultimately diabetes self-management (Juarez et al, 2022).
- Education benefits are significant including decreased hospitalizations, reduced anxiety, improved emotional well-being, and enhancement of self-care behaviors (Yen and Leasure, 2019)

RESEARCH DESIGN

- Hypothesis:** Diabetes education influences self-efficacy and self-care behaviors differently among different racial/ethnic groups
- Sample Size:** 28,686,355
- Limitations:** The BRFSS does not address children, and does not apply to incarcerated or institutionalized. The answers are subjective to the interpretation of those surveyed. It is voluntary, available only in Spanish and English, and to those with a landline or cell phone (linked to income). The survey does not specify the method, topics, or frequency of diabetes education. It also does not assess if the education was provided by a credentialed diabetes education specialist (CDC,2022a).
- Methodology:** An exploratory analysis was done to determine which ethnic group differed most from the others in determining a reference group. Two "At Risk" indexes were created (Foot Check Control Index and Blood Glucose Control Index) based on findings from analysis of each control variable with the two dependent variables (weekly foot checks and weekly glucose monitoring). The data guiding the index development were control variables resulting in the fewest feet and blood glucose checks. Linear Regression analysis was performed on the bivariate ethnicity/race and receiving diabetes education or not (independent variable and moderator variable) on each self-care behavior. Linear Regression was utilized, which included the controls for the multivariate analysis.
- Dependent Variables:** Number of times blood glucose checked weekly
Number of times feet are checked for sores or irritations weekly
- Independent Variables:** Non-Hispanic (NH) Black Hispanic
Non-Hispanic (NH) Asian
Non-Hispanic (NH) White
- Moderator Variable:** Took diabetes educator class on self-management (y or n)
- Control Variables:** Gender, Annual Income (50K and over or under 50K), College or no college, Health insurance or no insurance
Self-Reported Health (good-excellent or poor) (Key Control)

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- Glucose monitor
 - Medications
 - Daily foot checks
 - Exercise
 - Carbohydrate portions
 - Cost
 - Work
 - Stress
 - Illness
 - Family/Friends

Discrete Variables			
Ethnicity/Race	Weighted %	Weighted Total	
Hispanic No Class	9.1	2605245	
Hispanic Class	6.2	1772204	
Black-NH No Class	8.2	2338311	
Black-NH Class	10.3	2955100	
White-NH No Class	29.9	8578992	
White-NH Class	34.4	9869211	
Asian-NH No Class	1.1	329557	
Asian-NH Class	0.8	237735	
Total:	100.0	28686355	
Attended Diabetes Class	51.8	15328009	
Gender-Male	50.6	42908787	
Income (Over or Under 50K annually)	26.5	22478397	
Have Health Insurance	93.1	77831409	
No Health Insurance	6.9	5734879	
College	50.6	42748148	
No College	49.4	41769341	
Health Status (Good to excellent health)	58.1	49133325	
Continuous Variables			
	Average	Minimum	Max (limit 210/wk)
Blood Glucose Tests Weekly	9.3	0	210
Foot Checks Weekly	5.5	0	210
Feet Control Index	2.3	0	4
Blood Glucose Control Index	1.4	0	4

ANALYSIS OF WEEKLY BLOOD GLUCOSE

Analysis Comparing to Asian-NH- No Diabetes Class and Effect on Weekly Self-Blood Glucose Checks

Ethnicity/Race	Bivariate Analysis			Multivariate Analysis			
	Unstandardized Coefficients	t	Sig.	Unstandardized Coefficients	t	Sig.	
Constant	6.011	279.891	0.00	Constant	7.972	299.883	0.00
Hispanic No Class	0.924	40.432	0.00	Hispanic No Class	0.283	10.381	0.00
Hispanic Attended	5.103	217.891	0.00	Hispanic Attended	4.68	168.035	0.00
White-NH No Class	1.295	59.162	0.00	White-NH No Class	1.213	46.26	0.00
White-NH Attended	5.532	253.297	0.00	White Attended	5.421	207.172	0.00
Black-NH No Class	2.058	89.556	0.00	Black-NH No Class	1.021	37.224	0.00
Black-NH Attended	4.529	199.782	0.00	Black-NH Attended	4.589	169.6	0.00
Asian Attended	1.897	56.976	0.00	Asian Attended	2.029	48.448	0.00
Good to Excellent Health	-1.924	-410.133	0.00	Good to Excellent Health	-2.333	-431.29	0.00
Blood Glucose Control Index	-0.51	-162.557	0.00	Blood Glucose Control Index	-0.251	-79.049	0.00

Weekly Blood Glucose Checks

Ethnicity/Race	Attended Diabetes Class	Did NOT Attend Diabetes Class	Magnitude of difference compared with Reference
Hispanic	4.68	0.283	4.397
White NH	5.421	1.213	4.208
Black NH	4.589	1.021	3.568
Asian NH	2.029	Reference	2.029

Reference Group was Asian NH who did not attend diabetes Class

Blood Glucose Control Index

- No College
- Income \$50,000 or more annually
- No health Insurance
- Male gender

ANALYSIS OF WEEKLY FEET CHECKS

Analysis Comparing to Asian-NH No Diabetes Class and Effect on Weekly Feet Checks

Ethnicity/Race	Bivariate Analysis			Multivariate Analysis			
	Unstandardized Coefficients	t	Sig.	Unstandardized Coefficients	t	Sig.	
Constant	2.546	156.156	0.00	Constant	4.145	217.26	0.00
Hispanic No Class	2.834	163.939	0.00	Hispanic No Class	2.588	133.705	0.00
Hispanic Attended	3.845	217.322	0.00	Hispanic Attended	3.505	177.938	0.00
White-NH No Class	2.311	139.19	0.00	White-NH No Class	1.886	101.81	0.00
White-NH Attended	3.113	187.919	0.00	White-NH Attended	2.646	143.347	0.00
Black-NH No Class	3.687	212.121	0.00	Black-NH No Class	2.597	133.912	0.00
Black-NH Attended	4.318	251.633	0.00	Black-NH Attended	3.842	201.333	0.00
Asian Attended	1.168	46.645	0.00	Asian Attended	1.111	37.511	0.00
GoodtoExcellentHealth(B)	-0.943	-275.62	0.00	GoodtoExcellentHealth(B)	-0.712	-184.711	0.00
Feet Index	-0.432	-246.92	0.00	Feet Index	-0.326	-172.717	0.00

Weekly Foot Checks

Ethnicity/Race	Attended Diabetes Class	Did NOT Attend Diabetes Class	Magnitude of difference compared with Reference
Hispanic	3.505	2.588	0.917
White NH	2.646	1.886	0.76
Black NH	3.842	2.597	1.245
Asian NH	1.111	Reference	1.111

Reference Group was Asian NH who did not attend diabetes Class

Feet Index

- Has been to college
- Income \$50,000 or more annually
- Has health Insurance
- Male gender

RESULTS

- Tables 1 and 2 demonstrate the bivariate and multivariate analyses of ethnicity/race, whether a diabetes education class was attended or not, and its implication on the frequency of weekly self-blood glucose monitoring and weekly foot checks. The reference group in this analysis was Asian-Non-Hispanic (NH), who had not received diabetes education.
- The multivariate analyses incorporated a key control variable, **having good to excellent health**, and a **risk factor index** (blood glucose control index or foot check index)-(tables 1a and 2a). These controls demonstrated a clear reduction in self-care behaviors.
- Tables 1b and 2b demonstrate two major findings in this study: the magnitude/strength of having diabetes education on self-care behaviors (based on comparison from the reference group) within each race. The second factor denotes the differences between each race on self-care behaviors in diabetes management: frequency of weekly glucose testing and frequency of weekly checking feet as compared to the reference group.
- Each coefficient represents the weekly frequency of self-care behavior.
- All analyses demonstrated t-values greater than +/- 1.96, with associated p. 0.00, meaning that there is less than a 1 in one thousand chance that the null hypothesis is correct. Therefore, we reject the null and conclude each of these analyses to be statistically significant findings.

Conclusion

KEY FINDINGS:

- Diabetes Education demonstrated clear improvement in self-care behaviors, including a significant increase in weekly self-blood glucose testing in all racial and ethnic groups.
- There is a clear difference in the magnitude of the increase in self-blood glucose monitoring having had DM education across different ethnic/racial groups. High-risk populations, Hispanic and NH Black show a significant increase in self-glucose monitoring having had DM education, 4.397 and 3.568 more frequent blood glucose tests respectively.
- The data demonstrates a modest increase in self-foot checks when having had diabetes education among high-risk populations, Hispanic and NH Black. This information supports further efforts to bring diabetes education to these populations.
- The NH Asian population clearly benefited the **least** from attending diabetes education. Additionally, this group overall ranks **lowest** in both weekly self-foot checks and glucose testing.
- The literature review noted that the NH Asian population is often undiagnosed with DM longer than other ethnic groups (Tung et al., 2016). This data emphasizes the need for further studies surrounding improving diagnosing as well as understanding drivers of self-efficacy in this ethnic group.
- At-risk indexes developed could be useful in identifying factors that are linked to lower rates of self-care behaviors.

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