



Healthy Lifestyle Behaviors and Disparities between the United States mainland compared to Puerto Rico, Guam, and United States Virgin Islands (i. e., United States territories)

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Wendell C. Taylor , *The University of Texas Health Science Center at Houston, School of Public Health, Department of Health Promotion and Behavioral Sciences*, Wendell.C.Taylor@uth.tmc.edu

Dena Shugart , *Memorial Hermann Healthcare System*, dena.shugart@yahoo.com

Raheem J. Paxton , *The University of Alabama, College of Community Health Sciences - Institute of Rural Health Research, Tuscaloosa, Alabama*, rpaxton@ua.edu

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Abstract

Background: No studies have compared the lifestyle behaviors between Puerto Rico, Guam, and the U. S. Virgin Islands to that of the United States mainland. Documenting and addressing health disparities between these geographically and culturally distinct areas are important public health objectives. Differences in health status between and among the United States mainland and territories merit systematic and careful analyses. Methods: Four key healthy lifestyle characteristics include tobacco use, body mass index, physical activity, and fruit/vegetable consumption. Data from the 2009 Behavioral Risk Factor Surveillance System (N=420,481) were used to examine United States mainland and territorial differences among the four key healthy lifestyle behaviors. Descriptive statistics were summarized with chi-square tests for independence and multiple adjusted logistic regression models were used to examine differences in health compliance rates while controlling for age, gender, income, and education. Frequencies determined whether Healthy People 2010 goals were met by each location. Results: Differences were found between the United States mainland and territories for smoking rates, body mass index, physical activity, and consumption of fruit/vegetables. None of the countries met all four Healthy People 2010 goals. Discussion: Even though, each location had unique challenges, Puerto Ricans' health behaviors were significantly less favorable than residents in the other countries. We document prevalence rates and differences by country for each of the four healthy lifestyle characteristics. This study highlights the need for more research in these understudied areas as well as the importance of effective health promotion and disease prevention programs for all United States citizens including the mainland and all territories.

Keywords

health disparities; United States Mainland; United States territories; Healthy Lifestyle Characteristics



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School of Community Health Sciences

University of Nevada, Las Vegas

Healthy Lifestyle Behaviors and Disparities Between the United States Mainland Compared to Puerto Rico, Guam, and U.S. Virgin Islands (i.e., United States Territories)

Wendell C. Taylor, PhD, MPH, The University of Texas Health Science Center at Houston

Dena Shugart, MPH, Memorial Hermann – Texas Medical Center

Raheem J. Paxton, PhD, University of Alabama

Corresponding Author: Wendell C. Taylor, PhD, MPH, Department of Health Promotion and Behavioral Sciences, Center for Health Promotion and Prevention Research, The University of Texas Health Science Center at Houston, School of Public Health, 7000 Fannin Street, Suite 2670, Houston, Texas 77030, Telephone: 713.500.9635, Fax: 713.500.9602, E-mail: Wendell.C.Taylor@uth.tmc.edu

ABSTRACT

Background: No studies have compared the lifestyle behaviors between Puerto Rico, Guam, and the U.S. Virgin Islands to that of the United States mainland. Documenting and eliminating health disparities between these geographically and culturally distinct areas are important public health objectives. Differences in health status between and among the United States mainland and territories merit systematic and careful analyses.

Methods: Four key healthy lifestyle characteristics include tobacco use, body mass index, physical activity, and fruit/vegetable consumption. Data from the 2009 Behavioral Risk Factor Surveillance System (N=420,481) were used to examine United States mainland and territorial differences among the four key healthy lifestyle behaviors. Descriptive statistics were summarized with chi-square tests for independence and multiple adjusted logistic regression models were used to examine differences in health compliance rates while controlling for age, gender, income, and education. Frequencies determined whether Healthy People 2010 goals were met by each location.

Results: Differences were found between the United States mainland and territories for smoking rates, body mass index, physical activity, and consumption of fruit/vegetables. None of the locations met all four Healthy People 2010 goals.

Discussion: Even though, each location had unique challenges, Puerto Ricans' health behaviors were significantly less favorable than residents in the other areas. We document prevalence rates and differences by location for each of the four healthy lifestyle characteristics. This study highlights the need for more research in these understudied areas as well as the

importance of effective health promotion and disease prevention programs for all United States citizens including the mainland and all territories.

Keywords: Health disparities; United States mainland; United States territories; Healthy Lifestyle Characteristics

INTRODUCTION

The United States' 2014 population was 318,857,056 people, 77.4% identified as non-Hispanic white and 17.4% identified as Hispanic or Latino, making this group the largest ethnic minority in the country (Colby & Ortman, 2015). Within this population, Puerto Ricans comprise 3.4 million or 8.6 percent of all Hispanics (Aponte, 2009). Although literature examining this subgroup is growing, many questions remain as to why this ethnic group disproportionately experiences greater rates of diseases including diabetes, hypertension, and depression compared to non-Hispanic whites (Chavez, Sha, Persky, Langenberg, & Pestano-Binghay, 1994; Lai et al., 2009; Ramos, 2005; Whitman, Silva, & Shah, 2006). Two other groups of United States citizens whose health is commonly understudied are Guamanians and Virgin Islanders. Puerto Rico, Guam, and the U.S. Virgin Islands are United States territories and their residents are citizens of the United States. Despite this fact, there are limited data about these underrepresented populations.

The United States mainland and the territories of Puerto Rico, Guam, and U. S. Virgin Islands have a curious relationship (i.e., legally classified as unincorporated). They belong to the United States but are not incorporated as one of the 50 states. Most territories in the United States have their own separate laws, taxes, and representative (self) government (Roberts, 2017). However, individuals living in these territories are U.S. citizens yet they cannot vote for president (Cottle, 1995; Murriel, 2016; Perez, 2002; Pupillo, 2014; Ramos, 2005; Roberts, 2017; Steckelberg & Esteban, 2017). Territorial citizens elect nonvoting delegates to the U.S. House of Representatives and get no representation at all in the Senate (Pupillo, 2014; Steckelberg & Esteban, 2017). Although they cannot vote on the House floor, the delegates can address the House, sit and vote in congressional committees, and introduce legislation (Steckelberg & Esteban, 2017). Most residents do not pay federal income tax; but, they do pay many other federal taxes, including Social Security and Medicare (Pupillo, 2014; Roberts, 2017; Steckelberg & Esteban, 2017). Recently, Puerto Rico voted overwhelmingly to apply for statehood (Roberts, 2017). This ambivalent relationship may affect the health status of these residents. Considering this perspective, the health status of individuals living in these territories and how their health compares to individuals living on the mainland is an understudied and yet an important area of research (Felix, Bailey, & Zahran, 2015; Marynak, 2017; Ogilvie, Patel, Narayan, & Mehta, 2018).

Morbidity & Mortality Weekly Reports include the District of Columbia, Guam, Puerto Rico, and U.S. Virgin Islands in its surveillance of health behaviors. For example, state laws regarding indoor public use, retail sales, and prices of electronic cigarettes among the United States and its territories was published in 2017 (Marynak et al., 2017). However, few published studies have compared differences related to health between the United States mainland and its territories. There are two notable exceptions. In 2015, a study assessed differences in asthma prevalence between Hispanic adults living in Puerto Rico and Hispanic adults of Puerto Rican descent living in the United States. These authors concluded that asthma was more prevalent among Puerto Rican Americans than Hispanics in Puerto Rico (Felix, Bailey, & Zahran, 2015). In 2018, a study

compared the prevalence and secular trends of four recommended diabetes care practices in the United States territories to the 50 United States and District of Columbia. The four diabetes care practices were biannual HbA1c tests, attendance at diabetes education classes, daily self-monitoring of blood glucose, and receipt of annual foot examination. These authors concluded that the United States territories lagged behind the United States mainland in diabetes care practices. Policies are needed to improve diabetes care practices in the United States territories (Ogilvie, Patel, Narayan, & Mehta, 2018).

To our knowledge, there are no studies that compare key healthy lifestyle behaviors/characteristics between residents of the United States mainland and territories. Specifically, we were interested in studying compliance to a healthy weight (i.e., BMI ≥ 18.5 to $< 25 \text{ kg/m}^2$), physical activity (i.e., ≥ 150 minutes of moderate- to vigorous- physical activity/week), fruit and vegetable consumption (i.e., ≥ 5 servings/day), and abstinence from smoking. No research studies were found that directly compared the rates of these four Healthy Lifestyle Characteristics.

Documenting and understanding health disparities are important public health objectives. Where you live, work, and play affects your health status. Disparities are major contributors to chronic conditions and premature mortality. The Institute of Medicine (2012) emphasizes the importance of reducing and eliminating health disparities and promoting equity as critical public health objectives (McGuire, 2012).

Therefore, it is important to study and document health disparities. Furthermore, to target health disparities, it is important to understand differences and similarities among health behaviors between citizens in the mainland and its territories. Among the four Healthy Lifestyle Characteristics, the three research questions were:

1. What are similarities and differences between citizens of the mainland and the three United States territories (i.e., Puerto Rico, Guam, and the U.S. Virgin Islands)?
2. What are similarities and differences among the three United States territories?
3. Do the United States mainland and the three territories meet the Healthy People's 2010 target goals for the four Healthy Lifestyle Characteristics?

We hypothesized that:

1. Citizens of United States mainland will report greater adherence to healthy lifestyle characteristics than citizens of the territories.
2. Citizens of the United States mainland will meet more of the Healthy People's 2010 target goals than citizens of the territories.

Achieving Healthy People 2010 goals is an important objective while documenting and understanding any health disparities among different populations are equally important objectives. Public health and government officials can consider changing existing programs or implementing new programs based on whether goals are met.

METHODS

Behavioral Risk Factor Surveillance System (BRFSS)

The data set used for these analyses was the 2009 Behavioral Risk Factor Surveillance System (BRFSS), administered by the Centers for Disease Control and Prevention (CDC). The BRFSS was initiated in 1984 and by 2001, 50 states, the District of Columbia, Puerto Rico, Guam, and the U.S. Virgin Islands were participating (Centers for Disease Control and Prevention, 2008). The BRFSS is a cross-sectional survey of randomly selected individuals living throughout the

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United States and territories. Standardized questionnaires were administered to individuals using both landlines and cell phones. One randomly selected individual from each household with a landline is selected to participate, whereas participants with cell phones are treated as a one-person household. The standardized questionnaires are designed to estimate the prevalence of select health and risk behaviors as well as preventive health practices. The validity and reliability of the BRFSS data have been reported and are comparable to other health surveys including the National Health Interview Survey (Centers for Disease Control and Prevention, 2008; 2009). All data are weighted and ranked according to the following socio-demographic characteristics: age, race/ethnicity, and gender. However, recent studies have expanded these variables to include characteristics such as marital status and home ownership (Centers for Disease Control and Prevention, 2012).

Data Manipulation

Because the Centers for Disease Control and Prevention's definitions of overweight and obesity vary for individuals at different stages of the life cycle, excluded from the analysis were pregnant women and persons aged 21 years and younger, for a total sample of 420,481. Total household income was re-categorized to low (less than \$35,000 per year), middle (\$35,000 to less than \$75,000), and high (\$75,000 or more); these income thresholds have been reported in earlier studies (Taylor, Paxton, Fischer, & Bellows, 2015). To ensure that we had a sufficient sample size to estimate differences between areas, participants who reported "did not know" or refused to answer were included as a separate category.

Four Healthy Lifestyle Characteristics

Reeves and Rafferty (2005) proposed four Healthy Lifestyle Characteristics: non-smoking, maintaining a healthy weight, daily consumption of five fruits and vegetables, and participation in moderate-intensity physical activity ≥ 30 minutes at least 5 days per week. These Healthy Lifestyle Characteristics were selected because of their importance in chronic disease prevention and reduction of all-cause mortality (Reeves & Rafferty, 2005).

Statistical Analysis

All analyses were performed in SAS, version 9.4 (SAS Institute, Cary, NC), with significance set at $P < 0.05$ a priori (SAS Institute, 2017). The data were summarized within each group using descriptive statistics that included means and standard deviations (i.e., PROC SURVEYMEANS), frequencies and percent (i.e., PROC SURVEYFREQ), and chi-squared tests (i.e., PROC SURVEYFREQ). Multiple adjusted logistic regression models (i.e., PROC SURVEYLOGISTIC) were used to examine differences in health compliance rates while controlling for age, gender, income, and education. Frequencies determined whether Healthy People 2010 goals were met by each location. All analyses were conducted in 2017. This research was exempt from Institutional Review Board approval because there was no contact with human participants.

RESULTS

Descriptive characteristics

Study participants were on average 48 years old, non-Hispanic white (69%), had not completed a four-year degree (64%), married (64%), employed (59%), and female (51%). In addition, greater than one-third of the participants reported a total household income between \$35,000 and \$75,000 (37%). Compliance rates to behavioral goals were highest for cigarette use (79%), followed by physical activity (49%), weight (35%, as measured by body mass index), and

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fruit and vegetable intake (24%). Descriptive statistics for the study population are reported in Table 1 and compliance rates for Healthy People 2010 recommendations are in Table 2.

Differences among areas of residence by socio-demographic characteristics

Table 1: Study Characteristics by Location of Residence							
	Mean or Frequency	Percent total sample	Mainland	Guam	Puerto Rico	U.S. Virgin Islands	P-value
Mean Age	48.3 (0.1)		48.3 (0.1)	43.1 (0.5)	47.3 (0.3)	46.3 (0.4)	0.001
Race by residence							<0.001
Whites	331349	68.6%	69.45%	6.66%	0.77%	14.23%	
Blacks	33264	10.1%	10.21%	1.33%	0.17%	67.29%	
Hispanics	28681	14.6%	13.62%	3.04%	98.76%	14.43%	
Other	22979	6.7%	6.72%	88.97%	0.30%	4.05%	
Marital status by residence							<0.001
Married	239022	63.7%	63.86%	62.46%	54.42%	47.80%	
Not Married	179991	36.3%	36.14%	37.54%	45.58%	52.20%	
Employment status by residence							<0.001
Employed	210727	58.6%	58.76%	65.53%	47.66%	68.51%	
Not Employed	208047	41.4%	41.24%	34.47%	52.34%	31.49%	
Sex by residence							0.233
Male	160053	48.8%	48.80%	50.67%	47.54%	46.74%	
Female	260428	51.2%	51.20%	49.33%	52.46%	53.26%	
Education by residence							<0.001
College Graduate	142518	36.2%	36.29%	28.47%	31.54%	27.01%	
Not College Graduate	276859	63.8%	63.71%	71.53%	68.46%	72.99%	
Income by residence							<0.001
<35k	106717	23.1%	22.67%	22.03%	55.67%	29.63%	
35-<75k	161127	36.6%	36.74%	44.00%	20.89%	39.20%	
75+k	98376	26.6%	28.90%	16.42%	4.28%	18.26%	
Don't Know/Refused	53887	11.8%	11.68%	17.53%	19.17%	12.90%	

Several socio-demographic characteristics differed by location of residence (Table 1). Significant differences were observed for all socio-demographic variables except gender (P = 0.233). The U.S. Virgin Islands had the highest employment rates (69%) and proportion of Blacks (67%), but also had the lowest marriage rates (48%, All P < 0.001). The United States mainland had the largest population of college graduates (36%) and individuals with a total household income of \$75,000 or more (All P < 0.001). Puerto Rico had the largest population of Hispanics (99%) and population of those in the lowest income category (i.e., <\$35,000; 56%, All P < 0.001).

Differences among locations of residence and health behaviors

Differences in prevalence of health behaviors are reported in Table 2. Compliance to fruit and vegetable consumption (29%) and non-smoking (93%) was highest in the U.S. Virgin Islands (All $P < 0.001$). The United States mainland had the highest physical activity compliance (49%), while Puerto Rico had the lowest physical activity compliance rates (27%, $P < 0.001$). Also, Puerto Rico had the lowest fruit and vegetable compliance rates (18%; $P < 0.001$) and Guam had the largest proportion of adults with a healthy body mass index (BMI) (37%, $P < 0.001$) (Centers for Disease Control and Prevention regards a healthy body mass index (BMI) as ≥ 18.5 to ≤ 25 kg/m²).

	Total Sample	Mainland	Guam	Puerto Rico	U.S. Virgin Islands	P-value
Fruit and vegetable compliance						<0.001
Met recommendation	24%	23.76%	23.58%	17.52%	28.65%	
Did not meet recommendations	76%	76.24%	76.42%	82.48%	71.35%	
Physical activity compliance						<0.001
Met recommendation	49%	48.83%	46.07%	27.17%	43.09%	
Did not meet recommendations	51%	51.17%	53.93%	72.83%	56.91%	
Overweight and obesity						<0.001
Healthy BMI (≥ 18.5 to < 25 kg/m ²)	35%	34.58%	37.44%	32.26%	33.55%	
Unhealthy BMI (> 25.0)	65%	65.42%	62.56%	67.74%	66.45%	
Smoking goal						<0.001
Non-smokers	79%	81.78%	74.64%	89.04%	93.33%	
Smokers	21%	18.22%	25.36%	10.96%	6.67%	

Adjusted for confounders, comparisons among locations of residence and health behaviors

Tobacco use. When compared to the United States mainland, the odds of not smoking was higher for the U.S. Virgin Islands ($P < 0.01$) and Puerto Rico ($P < 0.01$), but lower for Guam ($P < 0.001$).

Overweight and obesity. When compared to the United States mainland, the odds of meeting guidelines for overweight and obesity was lower for Puerto Rico ($P < 0.05$), but not significantly different for the U.S. Virgin Islands ($P > 0.05$) and Guam ($P > 0.05$).

Fruit and vegetable intake. When compared to the United States, the odds of meeting guidelines for fruit and vegetable intake was greater for the U.S. Virgin Islands ($P < 0.01$), not significantly different for Guam ($P > 0.05$), and lower for Puerto Rico ($P < 0.01$).

Physical activity. When compared to the United States mainland, the odds of meeting physical activity guidelines were lower for Puerto Rico ($P < 0.01$) and the U.S. Virgin Islands ($P = 0.012$), but not significantly different for Guam ($P > 0.05$).

Table 3. Adjusted Odds Associated with Select Health Behaviors by Location of Residence				
	Mainland	Guam	Puerto Rico	U.S. Virgin Islands
Fruit and vegetable compliance				
Odds ratio 95% CI	-1-	1.08 (0.91 – 1.28)	0.73 (0.65 – 0.81)	1.39 (1.23 – 1.57)
Physical activity compliance				
Odds ratio 95% CI	-1-	0.88 (0.76 – 1.03)	0.44 (0.40 – 0.49)	0.83 (0.74 – 0.93)
Overweight and obesity				
Odds ratio 95% CI	-1-	1.14 (0.97 – 1.32)	0.87 (0.79 – 0.96)	0.96 (0.86 – 1.09)
Smoking goal				
Odds ratio 95% CI	-1-	0.79 (0.66 – 0.94)	2.59 (2.24 – 2.99)	3.86 (3.12 – 4.79)

Healthy People 2010 target goals

Puerto Rico (11%) and the U.S. Virgin Islands (6.7%) were the only two locations to meet the Healthy People 2010 target goal of $\leq 12.0\%$ of the adult population being non-smokers in 2009. The United States mainland and Guam continue to have high reported rates of smokers at 18.2% and 25.4%, respectively. None of the four locations met the Healthy People 2010 target goals of 60% of the adult population achieving a healthy BMI, increasing the proportion of persons aged two and older who consumed at least two fruits per day (75.0%) and three vegetables per day (50.0%) or increasing the proportion of adults who engaged in regular moderate-intensity physical activity for at least 30 minutes per day to at least 50.0%. Puerto Ricans reported the lowest rates of participation in moderate-intensity physical activity (27.2%).

Summary

Hypothesis one – (citizens of United States mainland will report greater adherence to healthy lifestyle characteristics than citizens of the territories). For hypothesis one, there was support for physical activity; two of the three territories (i.e., Puerto Rico and the U.S. Virgin Islands) had lower odds of meeting the guidelines; for one territory, there was no difference (i.e., Guam). There was limited support for healthy body mass index; one of the three territories (i.e., Puerto Rico) had lower odds of meeting the standard; there was no difference for two territories (i.e., U.S. Virgin Islands and Guam). There was no support for fruit and vegetable consumption. U.S. Virgin Islands had greater odds to meet the guidelines; no difference for Guam; lower odds for Puerto Rico. For smoking, there was no support for hypothesis one; two of three territories (i.e., U.S. Virgin Islands and Puerto Rico) had greater odds of not smoking than the United States mainland. Overall, there was partial support (two of the four characteristics) for hypothesis one.

Hypothesis two – (citizens of the mainland will meet more of the Healthy People’s 2010 target goals than citizens of the territories). For all four lifestyle characteristics, there was no support for hypothesis two. For three of the four Healthy People 2010 goals (i.e., healthy body mass index, fruit and vegetable consumption, and physical activity) none of the areas met the standard. Puerto Rico and the U.S. Virgin Islands had smoking rates less than 12% and met the Healthy People 2010 standard for not smoking. Overall, none of the locations achieved all four Healthy People 2010 target goals for non-smoking, maintaining a healthy weight, consuming fruits

and vegetables, or participating in regular, moderate-intensity physical activity.

DISCUSSION

The most significant differences between the mainland and territories were the percentages of those with a healthy body mass index and those who consumed recommended servings of fruits and vegetables. Significantly lower proportions of fruit and vegetable consumption and participation in recommended physical activity were reported in Puerto Rico compared to the mainland. A greater number of U.S. Virgin Islanders and U.S. mainlanders reported participation in regular physical activity than Puerto Ricans. While there were similarities in some of the rates comparing the mainland to each one of the territories, comparing the territories collectively to the mainland revealed several statistically significant differences. When comparing the three territories to each other, Puerto Rican's participation in the Healthy Lifestyle Characteristics was much lower than Guam's or the U.S. Virgin Islands' except for non-smoking rates.

Smoking

The proportion of non-smoking United States mainlanders was significantly lower than the proportion of non-smoking U.S. Virgin Islanders and Puerto Ricans. The high non-smoking rates may be the result of extensive anti-tobacco campaigns and local government crackdown on tobacco use in the U.S. Virgin Islands (Bly, 2006). In fact, the U.S. Virgin Islands' Health Department has become the enforcer of the smoke-free air law passed in 2011 (Associated Press, 2016). Another factor to consider as to why the smoking prevalence is greater on Guam could be the long, predominant history of military presence. The military represents approximately 15,000 individuals or nearly 9 percent of the total island population (Lee, 2009). Research shows that military personnel have been actively targeted by tobacco companies for decades, resulting in high rates of tobacco usage among this population (Arvey & Malone, 2008; Smith, & Malone, 2009). Importantly, big tobacco has been targeting youth in developing countries for decades (Doku, 2010). While Guam is not a developing area, Asians are heavily targeted with tobacco advertisement (Muggli, Pollay, Lew, & Joseph, 2002).

Body Mass Index

A healthy body mass index (BMI) is generally accepted as ≥ 18.5 to ≤ 25 kg/m². Having a BMI between 25.1 and 29.9 is considered unhealthy and individuals are classified as overweight. Individuals with a BMI ≥ 30.0 are considered obese and at high risk for multiple health problems (American Heart Association, 2010a; Centers for Disease Control and Prevention, 2009). None of the locations met the Healthy People 2010's target goal of 60.0 percent of the adult population having a healthy weight (United States Department of Health and Human Services, 2009). To reduce BMI, consuming fruits and vegetables and regular physical activity are essential (American Heart Association, 2010b; United States Department of Health and Human Services, 2009). One consideration for the overall healthier BMI levels reported in Guam versus the mainland and other two territories is that the natives' traditional diet primarily consists of rice and grains. Although literature suggests that the Guamanian diet has been influenced by American culture, Guamanians still tend to gravitate to their predominantly vegetarian diet with some meats, seafood, and lots of grains (Pollock, 1986; Pobocik, Trager, & Monson, 2008). Pobocik et al. (2008) even suggested that Guamanians consumption of more frequent meals throughout the day may decrease the tendency for overweight and obesity (Pobocik, Trager, & Monson, 2008).

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Not surprising that the greater rates of unhealthy body mass indices in Puerto Rico compared to the mainland and the other two territories are consistent with lower reported consumption of fruits and vegetables and lower reported participation in physical activity compared to the mainland and the other two territories. The literature consistently shows that Puerto Ricans, both on the mainland and the island, struggle with high rates of overweight and obesity (Aponte, 2009; Ho et al., 2006; Ryan, 2007; Whitman, Silva, & Shah, 2006). These rates often lead to many health problems in this population including Type II diabetes (Aponte, 2009; Coustasse, Bae, Arvidson, Singh, & Trevino, 2009). Researchers have implicated several possible factors which likely contribute to these rates including culture, the traditional Latino diet (Associated Press, 2016; Diaz, Mainous, & Pope, 2007; Ryan, 2007; Viladrich, Yeh, Bruning, & Weiss, 2009), greater costs for healthier foods such as fruits and vegetables in Puerto Rico and the decreased intake of such foods (Immink, Sanjur, & Burgos, 1983). Moreover, the influence of American cuisine and the influx of fast food restaurant chains onto the island (Gans, 2002; Ramirez, 1991) have been cited as factors. Furthermore, Puerto Ricans reported lower rates of physical activity than any other location in the Behavioral Risk Factor Surveillance System (Chowdhury et al., 2007; Kilmer et al., 2008). Researchers have found that Puerto Ricans on the mainland as well as the island report more sedentary lifestyles (Ho, 2006; Melnik, Spence, & Hosler, 2006; Tucker, Bermudez, & Castaneda, 2000).

Fruit and Vegetable Consumption

Of the four locations, U.S. Virgin Islanders consumed more fruits and vegetables than any of the other areas while reported fruit and vegetable consumption on Guam was similar to mainlanders. This finding may be because of the abundance of agricultural products available on the islands including many different fruits. The consistently mild temperatures coupled with volcanic soil allow for optimum growing conditions in very fertile soil (Arnalds & Stahr, 2004; Shoji & Takashasi, 2002). As previously discussed, the Guamanian diet is largely vegetarian which might account for the greater rate of fruit and vegetable consumption (23.6%) in this population as compared to the Puerto Ricans (17.5%) whose diet is high in fat, carbohydrates, and sugars as noted earlier. The overall rates of fruit and vegetable consumption among the United States mainland, Guam, and the U.S. Virgin Islands, although greater than Puerto Rico's rates of consumption, did not meet the Healthy People 2010 goal of a 50.0% to 75.0% consumption rate (United States Department of Health and Human Services, 2009).

Physical Activity

Individuals living in Guam reported greater percentages of healthy body mass indices as well as greater participation in regular physical activity as compared to Puerto Rico and the U.S. Virgin Islands. Again, the high military presence on Guam is a possible explanation, particularly for physical activity, when comparing Guam versus Puerto Rico and the U.S. Virgin Islands. As noted earlier, military personnel have been actively targeted by tobacco companies. However, it is known and documented that military personnel have a standard appearance policy to which they must conform (Naghii, 2006). Not only is it desirable for soldiers to look physically fit, better health means greater capability to perform job requirements as well as reduced healthcare costs related to overweight and obese personnel (Naghii, 2006). In order to help soldiers maintain a healthy BMI, military drills that include physical activity are a consistent part of their day. The significant differences in reported physical activity participation levels between U.S. Virgin Islanders versus mainlanders and Guamanians may be attributed to the extremely high rates of

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poverty as well as low education levels among U.S. Virgin Islanders. Research indicates 28.9% of the U.S. Virgin Islands' population lives below the poverty line and the U.S. Virgin Islands ranks 192 out of 233 countries with adults in the labor force, with as much as 13% of the island's workers being unemployed (Central Intelligence Agency, 2017; U.S. Virgin Islands Bureau of Economic Research, 2016).

Limitations

Limitations are that the variables selected from the Behavioral Risk Factor Surveillance Survey (BRFSS) were self-reported. Participants may have over- or under- estimated their consumption of fruits and vegetables as well as physical activity. Additionally, participants could have over- or under-estimated their height and weight which would affect their calculated BMI. Another limitation is that the survey was conducted via telephone. This procedure may have excluded willing participants who did not have a home telephone number. To account for this possibility, the data were weighted to maximize generalizability to the entire population.

Strengths

Strengths of the study are using the only known national survey with data available to analyze all four locations. The use of the same dataset ensures consistency and validity. Potential confounders such as gender, age, education, and income levels were controlled for in this analysis. This research is the first known study to compare the four characteristics (considered essential for health) between the mainland and three United States territories. We recommend future studies replicate the procedures in this study with Healthy People 2020 and more recent versions of BRFSS when all four areas and all four health behaviors are included which has not been the case since 2009. Longitudinal studies can evaluate trends over time and assess the effectiveness of health promotion initiatives. In addition, the analysis used in this study can be applied to other areas related to the United States such as American Samoa and Northern Mariana Islands.

CONCLUSION

Because of their status as territories of the United States, Puerto Ricans as well as Guamanians have frequently struggled with a lack of parity when compared to their peers on the mainland (Crespo et al., 2002; Kinzer, 2006; Landale & Oropesa, 2002; Perez, 2002; Pimentel, 2008; Statham, 1998; Roman, 2002). Results of this study confirmed some differences between the mainland population's health and that of territorial residents. Additionally, this research found that none of the locations achieved all Healthy People 2010 target goals for non-smoking, maintaining a healthy weight, consuming fruit and vegetables, or participating in regular, moderate-intensity physical activity.

Furthermore, using the four healthy lifestyle characteristics, Puerto Ricans' health experiences were different (less favorable) compared to the residents of the United States mainland, Guam, and the U.S. Virgin Islands. Fundamental needs such as shortages of health care, funding inequities, and costs of living require urgent attention (Pupillo, 2014). As Puerto Ricans recover from Hurricane Maria (September 2017) and strive to establish stability, long range planning can prioritize the environment, programs, and policies to promote healthy lifestyles. The curious relationship between the territories and the United States mainland is amplified by debates in the United States Congress about funding to Puerto Rico for category 4 – Hurricane Maria.

Overall, this research supports the need for continued public health promotion and disease prevention programs. The findings demonstrate the need for ongoing programs that provide

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education and effective interventions to promote healthy lifestyle behaviors for all United States citizens, including the mainland and all territories.

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REFERENCES

- American Heart Association (AHA). (2010a). *Body composition tests*. Retrieved from <http://www.americanheart.org/presenter.jhtml?identifier=4489>
- American Heart Association (AHA) (2010b). *The American Heart Association's diet and lifestyle recommendations*. Retrieved from <https://www.heart.org/en/healthy-living/healthy-eating/eat-smart/nutrition-basics/aha-diet-and-lifestyle-recommendations>
- Aponte, J. (2009). Diabetes-related risk factors across Hispanic subgroups in the Hispanic health and nutritional examination survey (1982-1984). *Public Health Nursing, 26*(1), 23-38.
- Arnalds, O., & Stahr, K. (2004). Volcanic soil resources: Occurrence, development, and properties. *Catena, 56*, 1-2. doi:10.1016/j.catena.2003.10.001
- Arvey, S. R., & Malone, R. E. (2008). Advance and retreat: Tobacco control policy in the U.S. military. *Military Medicine, 173*(10), 985-991.
- Associated Press. (2016, December 23). *US Virgin Islands to crack down on smoking in public places*. Retrieved from <http://www.dailymail.co.uk/wires/ap/article-4062580/US-Virgin-Islands-crack-smoking-public-places.html>
- Bly, L. (2006, November 24). Smoking gets snuffed out. *USA Today*. Retrieved from <https://www.usatoday.com>.
- Centers for Disease Control and Prevention (2009). *Defining overweight and obesity*. Retrieved from <https://www.cdc.gov/obesity/adult/index.html>
- Centers for Disease Control and Prevention. (2008). *BRFSS data quality, validity, and reliability*. Retrieved from https://www.cdc.gov/brfss/publications/data_qvr.htm
- Centers for Disease Control and Prevention. (2009). *Overview: BRFSS 2009*. Retrieved from https://www.cdc.gov/brfss/annual_data/2009/pdf/overview_09.pdf
- Centers for Disease Control and Prevention. (2012). Methodological changes in the behavioral risk factor surveillance system in 2011 and potential effects on prevalence estimates. *Morbidity and Mortality Weekly Reports, 61*(22), 410-413.
- Central Intelligence Agency (CIA). (2017). *The World Fact book: Central America and Caribbean: Virgin Islands*. Retrieved from <https://www.cia.gov/library/publications/the-world-factbook/geos/vq.html>
- Chavez, N., Sha, L., Persky, V., Langenberg, P., & Pestano-Binghay, E. (1994). Effect of length of U.S. residence on food group intake in Mexican and Puerto Rican women. *Journal of Nutrition Education, 26*(2), 79-86.

43 Healthy Lifestyle Behaviors and Disparities Between the United States Mainland Compared to Puerto Rico, Guam, and United States Virgin Islands – Taylor et al.

- Chowdhury, P. P., Balluz, L., Murphy, W., Wen, X., Zhong, Y., Okoro, C.,...Mokdad, A. (2007). Surveillance of certain health behaviors among states and selected local areas – United States, 2005. *Morbidity and Mortality Weekly Reports*, 56(SS-4), 1-8.
- Colby, S. L., & Ortman, J. M. (2015). Projections of the size and composition of the U.S. population: 2014 to 2060. In U.S. Department of Commerce Economics and Statistics Administration, U.S. Census Bureau, *Population estimates and projections current population reports* (pp. 25-1143).
- Cottle, A. L. (1995). Silent citizens: United States territorial residents and the right to vote in presidential elections. *University of Chicago Legal Forum*, 1995(1), Article 11. Retrieved from <http://chicagounbound.uchicago.edu/uclf/vol1995/iss1/11>
- Coustasse, A., Bae, S., Arvidson, C., Singh, K. P., & Trevino, F. (2009). Disparities in ADL and IADL disabilities among elders of Hispanic subgroups in the United States: Results from the national health interview survey 2001-2003. *Hospital Topics: Research and Perspectives on Healthcare*, 87(1), 15-23.
- Crespo, C. J., Garcia Palmieri, M. R., Perdomo, R. P., McGee, D. L., Smit, E., Sempos, C. T., ...Sorlie, P. D. (2002). The relationship of physical activity and body weight with all-cause mortality: Results from the Puerto Rico heart health program. *Annals of Epidemiology*, 12(8), 543-552.
- Diaz, V. A., Mainous, A. G., & Pope, C. (2007). Cultural conflicts in the weight loss experience of overweight Latinos. *International Journal of Obesity*, 31, 328-333.
- Doku, D. (2010). The tobacco industry tactics – a challenge for tobacco control in low and middle-income countries. *African Health Sciences*, 10(2), 201-203.
- Felix, S. E. B., Bailey, C. M., & Zahran, H. S. (2015). Asthma prevalence among Hispanic adults in Puerto Rico and Hispanic adults of Puerto Rican descent in the United States – results from two national surveys. *Journal of Asthma*, 52(1), 3-9.
- Gans, K. M., Burkholder, G. J., Upegui, D. I., Risica, P. M., Lasater, T. M., & Fortunet, R. (2002). Comparison of baseline fat-related eating behaviors of Puerto Rican, Dominican, Colombian, and Guatemalan participants who joined a cholesterol education project. *Journal of Nutrition Education and Behavior*, 34(4), 202-210.
- Ho, G. Y. F., Qian, H., Kim, M. Y., Melnik, T. A., Tucker, K. L., Jimenez-Velazquez, I. Z.,...Sorlie, P. D. (2006). Health disparities between island and mainland Puerto Ricans. *Revista Panamericana De Salud Pública*, 19(5), 331-339.
- Immink, M. D., Sanjur, D., & Burgos, M. (1983). Nutritional consequences of U.S. migration patterns among Puerto Rican women. *Ecology of Food and Nutrition*, 13, 139-148.
- Kilmer, G., Roberts, H., Hughes, E., Li, Y., Valluru, B., Fan, A.,...Jiles, R. (2008). Surveillance of certain health behaviors among states and selected local areas – Behavioral Risk Factor Surveillance System (BRFSS), United States, 2006. *Morbidity and Mortality Weekly Reports*, 57(SS-7), 1-10.
- Kinzer, S. (2006). Cruel realities: The American conquest of Guam. *World Policy Journal*, 23(2), 100-104.
- Lai, C. Q., Tucker, K. L., Choudhry, S., Parnell, L. D., Mattei, J., Garcia-Bailo, B.,...Ordovas, J. M. (2009). Population admixture associated with disease prevalence in the Boston Puerto Rican health study. *Human Genetics*, 125(2), 199-209.

44 Healthy Lifestyle Behaviors and Disparities Between the United States Mainland Compared to Puerto Rico, Guam, and United States Virgin Islands – Taylor et al.

- Landale, N. S., & Oropesa, R. S. (2002). White, Black or Puerto Rican? Racial self-identification among mainland and island Puerto Ricans. *Social Forces*, 81(1), 231-254.
- Lee, J. J. (2009). The marines rush on Guam. *National Journal*, 6. Retrieved from Academic Search Premier Database.
- Marynak, K., Kenemer, B., King, B. A., Tynan, M. A., MacNeil, A., & Reimels, E. (2017). State laws regarding indoor public use, retail sales, and prices of electronic cigarettes — U.S. States, Guam, Puerto Rico, and U.S. Virgin Islands. *Morbidity and Mortality Weekly Reports*, 66(49), 1341-1347.
- McGuire, S. (2012). *Accelerating progress in obesity prevention: Solving the weight of the nation*. [No. 3(5)]. Washington, D.C.: The National Academies Press. doi:10.3945/an.112.002733
- Melnik, T. A., Spence, M. M., & Hosler, A. S. (2006). Fat-related dietary behaviors of adult Puerto Ricans, with and without diabetes, in New York City. *Journal of the American Dietetic Association*, 106(9), 1419-1425.
- Muggli, M. E., Pollay, R. W., Lew, R., & Joseph, A. M. (2002). Targeting Asian Americans and Pacific Islanders by the tobacco industry: Results from the Minnesota tobacco document depository. *Tobacco Control*, 11(3), 201-209. doi:10.1136/tc.11.3.201
- Murriel, M. (2016, November 1). Millions of Americans can't vote for president because of where they live. *PRI's The World*. Retrieved from <https://www.pri.org/stories/2016-11-01/millions-americans-cant-vote-president-because-where-they-live>
- Naghii, M. R. (2006). The importance of body weight and weight management for military personnel. *Military Medicine*, 171(6), 550-555.
- Ogilvie, R. P., Patel, S. A., Narayan, K. M. V., & Mehta, N. K. (2018). Are the U.S. territories lagging behind in diabetes care practices? *Primary Care Diabetes*, 12(5), 432-437. doi:10.1016/j.pcd.2018.04.005
- Perez, M. P. (2002). Pacific identities beyond US racial formations: The case of Chamorro ambivalence and flux. *Social Identities*, 8(3), 457-479.
- Pimentel, F. (2008). Poverty, culture and social capital in Puerto Rican urban communities. [Review of the books understanding mainland Puerto Rican poverty; growing old in el barrio; barrio dreams: Puerto Ricans, Latinos and the neoliberal city; and Villa Victoria: The transformation of social capital in a Boston barrio]. *CENTRO Journal*, Spring (1), 230-245.
- Pobocik, R. S., Trager, A., & Monson, L. M. (2008). Dietary patterns and food choices of a population sample of adults on Guam. *Asia Pacific Journal of Clinical Nutrition*, 17(1), 94-99.
- Pollock, N. J. (1986). Food habits in Guam over 500 years. *Pacific Viewpoint*, 27(2), 120-143.
- Pupillo, J. (2014, July 31). Tale of three territories: Guam, Puerto Rico and Virgin Islands chapters face unique challenges. *AAFP News*. Retrieved from <http://www.aafp.org/news/chapter-of-the-month/20140731guam-pr-vichapters.html>
- Ramirez, E. A. (1991). Cardiovascular health in Puerto Ricans compared to other population groups in the United States. *Ethnic Disparities*, 1, 188-199.
- Ramos, B. M. (2005). Acculturation and depression among Puerto Ricans in the mainland. *Social Work Research*, 29(2), 95-105.

45 Healthy Lifestyle Behaviors and Disparities Between the United States Mainland Compared to Puerto Rico, Guam, and United States Virgin Islands – Taylor et al.

- Reeves, M. J., & Rafferty, A. P. (2005). Healthy lifestyle characteristics among adults in the United States, 2000. *Archives of Internal Medicine*, 165(8), 854-857. doi:10.1001/archinte.165.8.854
- Roberts, A. (2017, June 12). Puerto Rico statehood referendum draws big support--but small turnout. *CNN*. Retrieved from <http://www.cnn.com/2017/06/09/us/puerto-rico-statehood-vote-2017/index.html>
- Roman, E. (2002). Reparations and the colonial dilemma: The insurmountable hurdles and yet transformative benefits. *Berkeley La Raza Law Journal*, 13(2), 369-386.
- Ryan, F. (2007, February 1). Two thirds of Puerto Rican population is overweight. *Caribbean Business*, 16-17.
- SAS Institute Inc. (2017). SAS® Certification Prep Guide: Base Programming for SAS®9, Fourth Edition. Cary, NC: SAS Institute Inc.
- Shoji, S., & Takahashi, T. (2002). Environmental and agricultural significance of volcanic ash soils. *Global Journal of Environmental Research*, 6, 113-135.
- Smith, E. A., & Malone, R. E. (2009). Tobacco promotion to military personnel: The plums are here to be plucked. *Military Medicine*, 174(8), 797-806.
- Statham, R. E. (1998). US citizenship policy in the pacific territory of Guam. *Citizenship Studies*, 2(1), 89-104.
- Steckelberg, A., & Esteban, C. (2017, September 28). More than 4 million Americans don't have anyone to vote for them in congress. *The Washington Post*. Retrieved from https://www.washingtonpost.com/graphics/2017/national/fair-representation/?noredirect=on&utm_term=.b15609cb498c
- Taylor, W. C., Paxton, R. J., Fischer, L. S., & Bellows, L. L. (2015). The Healthy Weight Disparity Index: Why we need it to solve the obesity crisis. *Journal of Health Care for the Poor and Underserved*, 26(4), 1186-1199.
- Tucker, K. L., Bermudez, O. I., & Castaneda, C. (2000). Type 2 diabetes is prevalent and poorly controlled among Hispanic elders of Caribbean origin. *American Journal of Public Health*, 90(8), 1288-1293.
- U.S. Virgin Islands Bureau of Economic Research. (2016). *Unemployment rates - U.S. Virgin Islands*. Retrieved from <http://www.usviber.org/unemployment-rate/>
- United States Department of Health and Human Services (2009). *Healthy People 2010*. Retrieved from https://www.healthypeople.gov/2010/Document/HTML/volume2/19Nutrition.htm#_Toc490383123
- Viladrich, A., Yeh, M., Bruning, N., & Weiss, R. (2009). "Do real women have curves?" Paradoxical body images among Latinas in New York City. *Journal of Immigrant Minority Health*, 11, 20-28.
- Whitman, S., Silva, A., & Shah, A. M. (2006). Disproportionate impact of diabetes in a Puerto Rican community of Chicago. *Journal of Community Health*, 31(6), 521-531.