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Are the U.S. territories lagging behind in diabetes care practices?

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ABSTRACT

Aims: Although U.S. territories fall within the mandate outlined by Healthy People 2020, they remain neglected in diabetes care research. We compared the prevalence and secular trends of four recommended diabetes care practices in the U.S. territories of Guam, Puerto Rico, and the U.S. Virgin Islands to the 50 United States and D.C. ("U.S. States") in 2001–2015.

Methods: Data were from 390,268 adult participants with self-reported physician diagnosed diabetes in the Behavioral Risk Factor Surveillance System. Diabetes care practices included biannual HbA1c tests, attendance of diabetes education classes, daily self-monitoring of blood glucose, and receipt of annual foot examination. Practices were compared by U.S. territory and between territories and U.S. states. Multivariable models accounted for age, sex, education, and year.

Results: Of adults with diagnosed diabetes, 7% to 11% in the U.S. territories engaged in all four recommended diabetes care practices compared with 25% for those, on average, in U.S. states. Relative to the U.S. states, on average, the proportion achieving biannual HbA1c testing was lower in Guam and the U.S. Virgin Islands (45.6% and 44.9% vs. 62.2%), while annual foot examinations were lower in Puerto Rico (45.9% vs 66.1% in the U.S. states). Diabetes education and daily glucose self-monitoring were lower in all three territories.

Conclusions: U.S. territories lag behind U.S. states in diabetes care practices. Policies aimed at improving diabetes care practices are needed in the U.S. territories to achieve Healthy People 2020 goals and attain parity with U.S. states.

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1. Introduction

As in the United States, diabetes is an important public health problem in the U.S. territories, and the prevalence of diabetes in the U.S. territories (Guam, Puerto Rico, the U.S. Virgin Islands (USVI), American Samoa, and the Northern Mariana Islands) ranges from a low of 9.6% in Guam to a high of 16.4% in Puerto Rico [1]. Much evidence indicates that the risk of diabetes complications, such as cardiovascular disease, retinopathy, neuropathy, and nephropathy, could be reduced through engagement in evidence-based diabetes preventative care practices [2–4]. Specifically, recommended measures of processes of practices to prevent diabetes complications include but are not limited to testing glycosylated hemoglobin (HbA1C) twice a year, attending formal diabetes education classes, daily glucose monitoring, and obtaining an annual foot examination. While the uptake of these practices at the population-level is suboptimal across the U.S. [5–8], prior data indicate that U.S. territories lag behind U.S. states in several practices. For example, in the early 2000s, Puerto Rico lagged behind in diabetes education, daily glucose monitoring, and annual foot examinations [9,10], while Guam lagged behind in HbA1c and daily glucose monitoring [11].

The Healthy People program outlines 10-year national objectives for diabetes care alongside other measures to improve the health of all Americans. Although U.S. territories fall within the mandate of Healthy People 2020, we are not aware of published studies that have examined diabetes care practices in U.S. territories nor recent comparisons of progress in U.S. territories compared with U.S. states. To address this gap in the literature, we estimated the prevalence and secular trends of diabetes preventive care practices in three of the five inhabited U.S. territories, Guam, Puerto Rico, and the USVI, and compared them to U.S. States from 2001 to 2015.

2. Methods

Initiated by the Centers for Disease Control & Prevention (CDC), the Behavioral Risk Factor Surveillance Survey (BRFSS) is the world's largest telephone-based survey system and has been run by state health departments since 1984. It is a cross-sectional survey conducted annually with per-year respondents ranging from 212,510 in 2001 to 506,467 in 2011. It consists of a core question set that all states and included territories complete and optional modules that individual states and territories may elect to complete. Previous research has found that the majority of BRFSS questions have moderate reliability and validity [12].

Our sample consisted of respondents aged 18 and older who were sampled in one of the annual surveys conducted from 2001 through 2015 by BRFSS, reported prior diagnosis of diabetes by a physician, and provided a response for at least one of the key diabetes preventive care practices. The survey was not conducted in Guam in 2004–2006, Puerto Rico in 2005, or USVI in 2011–2015. The final analytic sample included data from 390,268 respondents with diabetes (377,022 in U.S. states, 1444 in Guam, 9578 in Puerto Rico, and 2224 in USVI).

The outcomes for this study were four binary indicators of diabetes care as defined by the Healthy People 2020 diabetes objectives in BRFSS. Although Healthy People 2020 includes additional diabetes care indicators, they are measured in datasets beyond BRFSS and do not provide information about the U.S. territories. The four outcomes used in this study included the respondent's report of past-year biannual HbA1c testing, any formal diabetes education, daily glucose monitoring, and receiving a foot examination. Each of the four diabetes practices was assessed with a single question. A final composite indicator summarized whether an individual engaged in all four practices.

Place of residence was the primary exposure of interest. Place of residence was categorized into four groups: (1) all 50 U.S. states and the District of Columbia (reference), (2) Guam, (3) Puerto Rico, and (4) USVI.

All analyses were weighted and accounted for the complex survey design of the BRFSS. We described demographic characteristics including age (18–99 years), sex (men versus women), race (Non-Hispanic White, Non-Hispanic Black, Non-Hispanic Asian, other Non-Hispanic, or Hispanic), and education (<9 years, Grades 9–11, Grade 12/GED, 1–3 years of college, or 4 or more years of college) by place residence. The age-adjusted proportion achieving each diabetes preventative care practice was calculated in the four locations annually and in three time periods: 2001–2005, 2006–2010, and 2011–2015. Age adjustment was conducted using the direct method of standardization with weights from the 2010 U.S. Census Bureau population stratified into five age groups: 18–24, 25–34, 35–44, 45–64, and 65+. Multiple logistic regression models were used to estimate the relative odds of engaging in each diabetes care practice for each territory compared to U.S. states after adjustments for sex, age, education, and survey year. Race/ethnicity was not included in these models due to collinearity with place of residence. In sensitivity analyses, we additionally adjusted for age at diabetes diagnosis and examined the proportion achieving the SMBG recommendation by insulin use status.

3. Results

Table 1 describes the characteristics of respondents with diagnosed diabetes in U.S. territories and states for the 2001–2015 period. There were notable differences in demographic composition across the US territories. Approximately 30% of those residing in Puerto Rico and 22% of those in the USVI had not completed ninth grade, while only 8% of those in the U.S. states had not completed ninth grade. Nearly all respondents in Puerto Rico reported being Hispanic and 70% of respondents in the USVI reported being non-Hispanic black.

The age-adjusted proportion achieving the four diabetes care practices in three time periods are shown in Table 2. In each period, 23% to 26% of the population with diabetes in the US states met all four care goals. In comparison, 6% to 11% of the population in any of the territories met all four care goals in any given time period. Among the territories, there was no consistent pattern in the best or worst performer. Across time periods, a lower percentage of people with diabetes in Guam, Puerto Rico, and the USVI were meeting recommendations for

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