

ORIGINAL REPORTS: DIABETES

TREND ANALYSIS OF DIAGNOSED DIABETES PREVALENCE AMONG AMERICAN INDIAN/ALASKA NATIVE YOUNG ADULTS — UNITED STATES, 1994–2007

Objective: In this study, we build on the previous findings of increased diabetes prevalence among American Indian/Alaska Native (AI/AN) young adults, by studying the rate at which annual prevalence estimates of diagnosed diabetes increased from 1994 to 2007.

Design and Setting: For this study, BRFSS data for 1994–2007 from the 50 states, District of Columbia, Puerto Rico, Guam, and the Virgin Islands were analyzed.

Participants: Only non-institutionalized adults aged 18 years and older were eligible to participate in the Behavioral Risk Factor Surveillance System survey.

Main Outcome Measures: To examine the existence and strength of a trend, we analyzed plots and Spearman's rank correlation coefficients of annual prevalence estimates for each group of young adults. Mantel-Haenszel tests were employed to study the relationship of diagnosed diabetes prevalence and race (AI/AN, non-Hispanic White), while controlling for the time periods 1994–2000 and 2001–2007. To quantify increases in the disparity of diagnosed diabetes prevalence and race (AI/AN, non-Hispanic White), odds risk ratio estimates were employed to approximate corresponding prevalence ratio estimates for the time periods 1994–2000 and 2001–2007.

Results: Employing Spearman's test for trend resulted in observing, during 1994–2007, statistically significant increasing trends in the annual prevalence estimates of diagnosed diabetes among AI/AN and non-Hispanic White young adults. AI/AN young adults, on average, were 1.7 (95%CI; [1.12, 2.63]) times more likely than non-Hispanic White young adults to be diagnosed with diabetes during 1994–2000 and 2.5 (95% CI; [1.93, 3.32]) times more likely during 2001–2007.

Conclusion: The findings in this study suggests that the disparity in the estimated prevalence of diagnosed diabetes between AI/AN and NHW young adults widened steadily from 2001 to 2007. (*Ethn Dis.* 2009;19:276–279)

Key Words: BRFSS, Diabetes, American Indian/Alaska Native

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INTRODUCTION

American Indian/Alaska Native (AI/AN) adults have been reported to be twice as likely as non-Hispanic White adults to have diabetes¹ and diabetes prevalence estimates among the Pima Indians of Arizona have been recorded as the highest in the world.² Diabetes is a disease that affects people of all ages; yet, recent studies have reported increased prevalence of diabetes in AI/AN children and young adults.³ The public health implication of early onset of diabetes is an increase in the duration of diabetes and an increased risk of developing early onset of heart disease, loss of vision, and the amputation of limbs.⁴ Young adults diagnosed with diabetes at age 20 are anticipated to lose, on average, approximately 17 potential years of life.⁵

In this study, we build on the previous findings of increased diabetes prevalence among AI/AN young adults by studying the rate at which annual prevalence estimates of diagnosed diabetes increased from 1994 to 2007. Of particular interest, is the extent that the

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*Young adults diagnosed with diabetes at age 20 are anticipated to lose, on average, approximately 17 potential years of life.*⁵

disparity in the prevalence of diagnosed diabetes between AI/AN and non-Hispanic White young adults has widened from 2001 to 2007.

METHODS

To evaluate trends in the prevalence of diagnosed diabetes among AI/AN young adults and, as a comparison population, non-Hispanic White young adults, cross-sectional data from the Behavioral Risk Factor Surveillance System (BRFSS) surveys were analyzed. BRFSS is a state-based, random-digit-dialed telephone survey of the noninstitutionalized, US civilian population aged ≥ 18 years. For this study, BRFSS data for 1994–2007 from the 50 states, District of Columbia, Puerto Rico, Guam, and the Virgin Islands were analyzed.

Young adults were defined as persons aged 18–34 years. Respondents who reported being AI/AN and not of Hispanic, Latino, or Spanish descent were considered to be AI/AN; respondents who reported being White and not of Hispanic, Latino, or Spanish descent were considered to be non-Hispanic White. Diabetes status was

assessed by asking respondents, "Have you been told by a doctor that you have diabetes?" For the years 1994–2003, the answers were coded "yes," "yes, but female told during pregnancy," "no," "do not know," or "refused." For the years 2004–2007, the answers were coded "yes," "yes, but female told during pregnancy," "no," "no, pre-diabetes or borderline diabetes," "do not know," or "refused." For these analyses, replies of "yes, but female told during pregnancy" and "no, pre-diabetes or borderline diabetes" were coded as not having diabetes. Responses coded as "do not know" or "refused" were excluded from the analyses.

Statistical Analysis

To visually assess the existence of increasing trends in diagnosed diabetes prevalence, annual prevalence estimates of diagnosed diabetes among AI/AN and non-Hispanic White young adults for each calendar year during 1994–2007 were plotted. The visual inspection was then followed by a formal classical test for trend. Spearman's rank correlation test for trend was employed to test for a statistical association between the rankings of annual prevalence estimates as it corresponded to rankings of corresponding calendar years. This non-parametric test checks the null hypothesis that the Spearman correlation coefficient for a specific population is equal to zero or no correlation. For the purposes of these analyses, Spearman correlation coefficients approaching the value of one, denotes strong associations between increases in annual prevalence estimates with respect to increases in corresponding calendar years.

Mantel-Haenszel tests were employed to study the relationship of diagnosed diabetes prevalence and race (AI/AN, non-Hispanic White), while controlling for the time periods 1994–2000 and 2001–2007. To quantify changes in the disparity of diagnosed diabetes prevalence and race (AI/AN,

non-Hispanic White), odds risk ratio estimates were employed to approximate corresponding prevalence ratio estimates for the time periods 1994–2000 and 2001–2007.

Data were weighted to the respondent's probability of selection, and adjusted for nonresponse and telephone coverage bias, per the respondent's age, sex, and race. To account for the complex survey design, SAS callable SUDAAN 9.0 was used to calculate all prevalence estimates, standard errors, and ensuing confidence intervals.

The 1994–2007 BRFSS median response rates ranged from a minimum 48.9% in 2000 to a maximum 69.9% in 1994. The number of completed questionnaires for AI/AN young adults ranged from a minimum 534 in 1996 to a maximum 1,388 in 2005. The number of completed questionnaires for non-Hispanic White young adults ranged from a minimum 24,465 in 1994 to a maximum 43,569 in 2004.

RESULTS

During 1994–2007, annual prevalence estimates for both racial groups increased overall (Table 1). During this time period, the minimum and maximum estimated prevalence of diagnosed diabetes among AI/AN young adults was 1.0% in 1996 and 4.4% in 2006. As a comparison, the minimum and maximum estimated prevalence of diagnosed diabetes among non-Hispanic White young adults was 0.7% in 1997 and 1.3% in 2005. As shown in Figure 1, beginning in 2001 we observed a widening in the disparity in the annual prevalence estimates of diagnosed diabetes between AI/AN and non-Hispanic White young adults.

A formal test for trend resulted in observing statistically significant increasing trends in the annual prevalence estimates of diagnosed diabetes among AI/AN and non-Hispanic White young adults during 1994–2007. Among AI/

AI/AN young adults, on average, were 1.7 times more likely than non-Hispanic White young adults to be diagnosed with diabetes during 1994–2000 and 2.5 times more likely during 2001–2007

AN young adults, we observed a Spearman correlation value of 0.74 ($P=.0025$); among non-Hispanic White young adults we observed a Spearman correlation value of 0.90 ($P<.0001$).

AI/AN young adults, on average, were 1.7 (95%CI; [1.12, 2.63]) times more likely than non-Hispanic White young adults to be diagnosed with diabetes during 1994–2000 and 2.5 (95% CI; [1.93, 3.32]) times more likely during 2001–2007. Statistically significant differences in annual prevalence ratios at the 5% confidence level were observed among AI/AN vs non-Hispanic White young adults from 2001 to 2004 and 2006 to 2007; whereas no statistically significant differences were observed prior to 2001.

DISCUSSION

It has been well reported that the prevalence rates of diagnosed diabetes among AI/AN adults has been increasing since 1994.^{3,4} In this article we build upon those results by studying the rate at which annual prevalence estimates of diagnosed diabetes increased from 1994 to 2007 among AI/AN young adults. Our findings revealed rapid increases in the estimated prevalence of diagnosed diabetes in AI/AN young adults beginning in 2001. These findings suggest that the disparity in the estimated prevalence

Table 1. Diagnosed Diabetes Prevalence Estimates (1994–2007)

Year	Non-Hispanic American Indian/Alaskan Native				Non-Hispanic White				PRT	95%CI‡
	Sample Size	Prevalence	Standard Error	95%CI*	Sample Size	Prevalence	Standard Error	95%CI*		
1994	492	1.4	0.7	(0.54, 3.48)	24,421	0.8	0.1	(0.61, 0.93)	1.82	(0.70, 4.75)
1995	487	1.6	0.8	(0.62, 4.02)	25,649	0.9	0.1	(0.72, 1.07)	1.81	(0.70, 4.72)
1996	469	1.0	0.6	(0.33–2.91)	26,593	0.9	0.1	(0.76, 1.13)	1.05	(0.35, 3.21)
1997	545	1.8	1.4	(0.43–7.56)	28,001	0.7	0.1	(0.58, 0.88)	2.59	(0.60, 11.12)
1998	577	1.7	0.8	(0.65–4.39)	29,993	1.0	0.1	(0.83, 1.19)	1.72	(0.65, 4.54)
1999	720	1.6	0.7	(0.74–3.54)	31,696	0.9	0.1	(0.73, 1.05)	1.85	(0.83, 4.16)
2000	1,060	1.1	0.4	(0.57–2.05)	34,915	0.9	0.1	(0.74, 1.01)	1.24	(0.64, 2.41)
2001	970	2.7	0.9	(1.38–5.15)	38,332	1.1	0.1	(0.95, 1.26)	2.5	(1.25, 4.81)
2002	1,039	1.8	0.4	(1.07–2.88)	41,073	1.0	0.1	(0.89, 1.17)	1.7	(1.04, 2.89)
2003	1,112	3.4	1.2	(1.74–6.68)	40,501	1.1	0.1	(0.91, 1.26)	3.2	(1.60, 6.41)
2004	1,221	3.0	1.0	(1.56–5.75)	43,546	1.1	0.1	(0.94, 1.26)	2.8	(1.42, 5.42)
2005	1,386	1.7	0.4	(1.05–2.81)	43,930	1.3	0.1	(1.14, 1.54)	1.3	(0.77, 2.16)
2006	1,177	4.4	1.4	(2.27–8.21)	37,908	1.2	0.1	(0.98, 1.37)	3.8	(1.93, 7.30)
2007	1,320	2.8	0.7	(1.74–4.53)	40,277	1.2	0.1	(1.05, 1.37)	2.4	(1.44, 3.87)

* Diagnosed diabetes prevalence 95% confidence interval.
 † Estimated prevalence ratio of diagnosed diabetes among AI/AN and NHW.
 ‡ Diagnosed diabetes prevalence ratio 95% confidence interval.

of diagnosed diabetes between AI/AN and non-Hispanic White young adults widened steadily from 2001 to 2007.

The accelerated increases in diagnosed diabetes prevalence among AI/AN young adults might be directly related to increasing rates of obesity within that group. In the BRFSS, the estimated prevalence of obesity among AI/AN young adults ranged from a minimum of 12.1% in 1994 to a

maximum of 30.7% in 2006; similarly the estimated prevalence of obesity among non-Hispanic White young adults ranged from a minimum of 10.0% in 1994 to a maximum of 20.7% in 2007. Similarly, the rapid increases in diagnosed diabetes prevalence among AI/AN young adults might also be directly related to increased screening for this disease among AI/AN young adults since 1998.⁶

In 2002, 86% of the diabetes grant programs reported that general screening for diabetes and pre-diabetes was available as compared with 14% before the Special Diabetes Program for Indians.⁶ Early detection, quality care, and effective self-management are the keys to prevent long-term diabetes complications.⁷

The findings in this report are subject to at least three limitations. First, the

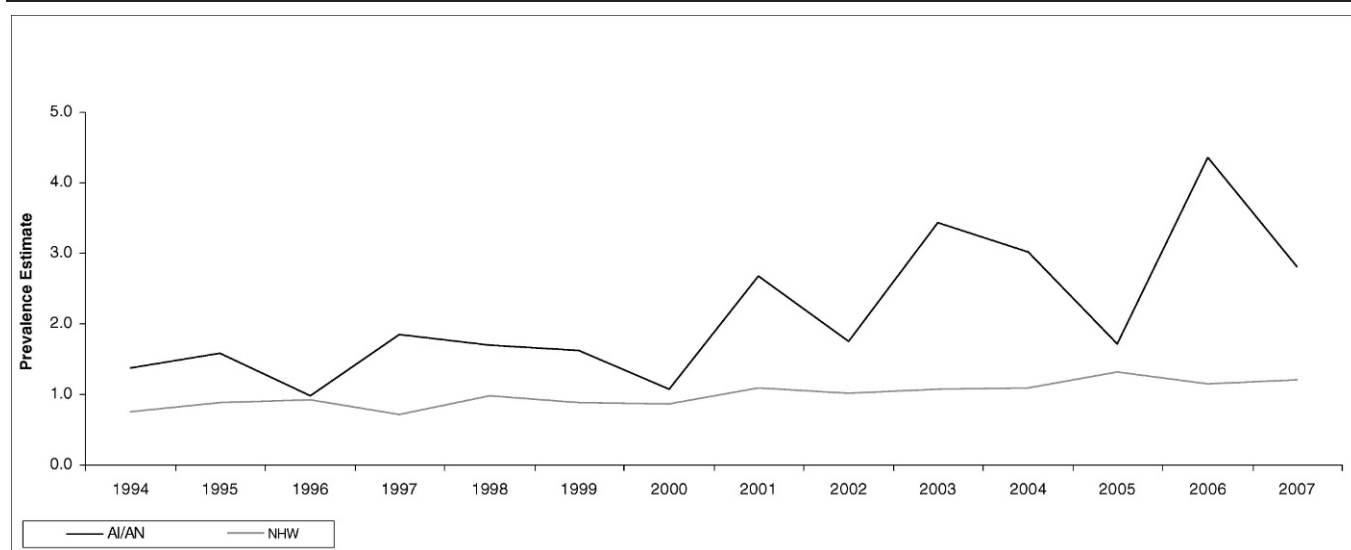


Fig 1. Diagnosed Diabetes Prevalence Estimates (1994–2007) non-Hispanic American Indian and non-Hispanic White young adults

findings are dependent on self reports of diabetes being an accurate report of proper diagnosis by a healthcare professional. A recent study found that self-report cases of diagnosed diabetes matched well with corresponding medical records (66.0% sensitivity and 99.7% specificity).⁸ Second, diabetes prevalence might be higher among persons without residential telephone landlines, a group currently not included in the BRFSS.⁹ AI/AN households are less likely to have residential telephone landlines than are non-Hispanic White households; the gap in diagnosed diabetes prevalence between AI/AN and non-Hispanic White young adults might be wider than the findings reported in this study. Finally, estimates of diagnosed diabetes among AI/AN and non-Hispanic White young adults might underestimate total diabetes prevalence. Results of the National Health and Nutrition Examination Survey from 1999–2000 indicated that for every two persons diagnosed with diabetes, one person with diabetes went undiagnosed.¹⁰

To counter the increasing trend in diabetes prevalence among AI/AN young adults, public health partners, school districts, religious institutions, and civic organizations that serve AI/AN communities should continue to aggressively implement diabetes prevention strategies that promote moderate weight loss, high-fiber and low-fat diets, and an increase in

leisure-time physical activities. Available resources include health promotion material from the National Diabetes Education Program, a joint program of the Centers for Disease Control and Prevention and the National Institutes of Health. In addition, the Indian Health Service supports 399 grant programs through the Special Diabetes Program for AI/AN to treat and prevent diabetes. AI/AN adults who are likely to have diabetes also should be identified through diabetes screening procedures. The American Diabetes Association recommends diabetes screening every 3 years for AI/AN adults who are overweight and aged <45 years and for all adults aged ≥45 years.

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AUTHOR CONTRIBUTIONS

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