

# **Texas Risk Assessment for Type 2 Diabetes in Children**

**A Report to the Governor and the 81st Legislature of the State of Texas  
In Fulfillment of SB 415 of the 80th Legislature**



**The University of Texas-Pan American  
Border Health Office**



## **The University of Texas-Pan American Border Health Office**

**Doreen D. Garza, M.P.H., Executive Director**  
**David Salazar, M.S., Associate Director**  
**Gina Garza, Health Education Coordinator**  
**Lissa Alanis, Health Education Coordinator**  
**Denny A. Meline, Health Education Coordinator**  
**Martin Peña, Health Education Coordinator**  
**Robert Puentes, Health Education Coordinator**  
**Amy Ramirez, Health Education Coordinator**  
**Galina Reyes, Health Education Coordinator**  
**Sylvia A. Leal, Administrative Secretary**  
**Sylvia G. Hinojosa, Administrative Clerk**  
**Trini Soto, Community Health Specialist**  
**Cynthia Paslak, Secretary**

# **Texas Risk Assessment for Type 2 Diabetes in Children**

**A Report to the Governor and the 81st Legislature of the State of Texas  
In Fulfillment of SB 415 of the 80th Legislature**



**The University of Texas-Pan American  
Border Health Office**

## TABLE OF CONTENTS

Acknowledgements .....	i
Executive Summary .....	ii
Introduction .....	1
Risk Assessments .....	2
Risk Assessment Process .....	3
Risk Assessment Advisory Committee Recommendations .....	4
ICD-9 701.2 Acquired Acanthosis Nigricans Claims Count .....	6
Program Budget .....	7
Suggested Readings .....	8
Texas Regional Education Service Center Risk Assessment Fact Sheets .....	10

## ACKNOWLEDGEMENTS

The Texas Risk Assessment for Type 2 Diabetes in Children is a legislatively mandated program developed, coordinated, and administrated by The University of Texas Pan-American Border Health Office (BHO). We would like to extend a most grateful thanks to everyone who, through this program, have contributed to help families understand the importance of recognizing risk factors associated with Type 2 diabetes in children.

Foremost, the greatest gratitude is extended to the school nurses, nurse coordinators, and regional school health specialists involved with the risk assessments. Without the time, skills, and efforts of these special people, a child's first line of defense for disease prevention and health promotion would erode. For many children, a school nurse is a child's only form of medical attention.

The University of Texas-Pan American Border Health Office greatly appreciates the support and vision of State Senator Eddie Lucio Jr., D-District 27. Senator Lucio is to be congratulated for authoring SB 415 and for understanding the needs of the program to make the most significant impact possible on the health of children who are assessed through this program. We would also like to thank State Senator Judith Zaffarini, D-District 21 for co-authoring the bill and State Representative Jim McReynolds, D-District 12 for lending his sponsorship.

The Texas Risk Assessment for Type 2 Diabetes in Children is housed and supported by The University of Texas-Pan American and its President, Dr. Blandina Cárdenas and Provost Dr. Paul Sale. Thank you Dr. Cárdenas and Dr. Sale. In addition, the UTPA Border Health Office would like to extend its gratitude to Dr. Cynthia J. Brown, Vice-Provost for Graduate Programs and Academic Centers, for lending her expertise and support to the program and helping the Border Health Office strive for the highest performance standards possible.

The Texas Risk Assessment for Type 2 Diabetes in Children program is also very fortunate to have the advice and guidance of the Risk Assessment for Type 2 Diabetes Advisory Committee that advises the Border Health Office on the growth and direction of the program. This group of professionals and parents are well respected in their fields, understand the populations that are affected by the program, and understand the value of having such a program in place. For their help, we would like to thank:

Doreen D. Garza, MPH  
Executive Director  
UTPA Border Health Office

Alda T. Benavides, Ed.D.  
Superintendent, La Joya ISD

Mary Lou Lujan, RN  
School nurse, Region 18

Victor H. Gonzalez, MD  
Chair, Texas Diabetes Council

Arnoldo F. Benavides  
Principal, Freddy Gonzalez Elementary  
Edinburg CISD

Colleen McHugh, JD  
Regent, The University of Texas System

Lauralea Bauer  
Director of Discipline, Counseling and  
Pregnancy Programs  
Texas Education Agency

Leonides Cigarroa, Jr., MD  
Family Physician  
Texas Medical Association

Stephen W. Ponder, MD, CDE  
Pediatric Endocrinologist and Director,  
Children's Diabetes and Endocrine Center of  
South Texas, Driscoll Children's Hospital  
Texas Pediatric Society

Mary Baumann  
Director of Youth Markets  
American Diabetes Association

Clara Cácares Contreras  
Health Specialist, Region I ESC

Julia Soper, RN  
School nurse, Pharr-San Juan-Alamo ISD

Diana Martinez, RN  
Parent representative

Finally, we would like to thank the UTPA Border Health Office staff for believing in what they do.

## EXECUTIVE SUMMARY

The Texas Risk Assessment for Type 2 Diabetes in Children is a legislatively mandated program developed, coordinated and administrated by The University of Texas Pan-American Border Health Office (BHO). The program assesses children who may be at high risk to develop Type 2 diabetes in Education Service Center Regions 1, 2, 3, 4, 10, 11, 13, 15, 18, 19, and 20, impacting over 1.1 million children yearly. During vision/hearing and scoliosis screenings of 1st, 3rd, 5th, and 7th graders in public and private schools, certified individuals assess children for the acanthosis nigricans marker (AN), a skin condition that signals high insulin levels. Children who are positively identified with the marker undergo additional assessments of body mass index (BMI), BMI percentile, and blood pressure.

The Texas Risk Assessment for Type 2 Diabetes in Children is an important program because it can help identify children who have these risk factors, all of which can increase the propensity for children to develop Type 2 diabetes. Because of the risk assessment, referrals are issued to the parents of these children, alerting each parent of their child's risk factors and encouraging further evaluation from a health professional. Becoming aware of and understanding what the risk factors suggest can stimulate the changes necessary to prevent or delay future health problems for children at risk of developing Type 2 Diabetes and other conditions.

The Texas Risk Factor Assessment for Type 2 Diabetes in Children program educates, trains and certifies school nurses or other individuals who are qualified to become proficient in conducting these assessments. Along with conducting the risk assessment, school nurses are also a valuable resource because they can provide parents with additional information about the health risks associated with Type 2 diabetes, develop an action plan for behavior change, and connect the family to medical care in their community.

During the 80th Texas Legislative session, the legislature passed Senate Bill 415 (SB 415). Senate Bill 415 (SB 415) called for the formation of the Risk Assessment for Type 2 Diabetes Advisory Committee (Advisory Committee) to advise the BHO on the growth and direction of the program. The Advisory Committee made recommendations regarding six matters impacting the program. Those recommendations are presented in this report.

The Texas Risk Factor Assessment for Type 2 Diabetes in Children program also contributes to the state plan for diabetes prevention and control developed by the Texas Diabetes Council by providing statistics and information of risk assessment activities and recommendations for assisting children in Texas at risk for developing Type 2 Diabetes. Important information will be presented on claims data for International Classification of Diseases-9 (ICD-9) Code 701.2 Acquired Acanthosis Nigricans. According to the claims data, the counts significantly increased as the risk assessments were introduced into Texas Public Health Regions where assessments had not been previously conducted. This indicates that parents of children who were identified as at-risk were seeking further health evaluation from their health care providers. As a result, the risk assessments may be effective in getting those children who are identified as at-risk to seek appropriate follow-up testing and may create the "stimulus" for opportunistic screenings conducted in primary health care practices.

Also, the Texas Risk Factor Assessment for Type 2 Diabetes in Children program now provides school administrators with an annual report of the school's risk factor assessments. These reports include information on the total number of students assessed by school grades, the total number of students with the AN marker by school grade, and - of those children with the AN marker - results of BMI and blood pressure assessments. Also included in these reports is the percent participation of the free and reduced school lunch as reported by the Texas Education Agency, the number of children who were issued a risk assessment referral form, and the number of those children that sought the care of a physician. These reports may help schools, in particular School Health Advisory Councils, initiate systems change, assist with other school health initiatives, and improve the school health environment. Risk assessment information is available to school administrators via website by Regional Education Service Center (ESC), school district, and individual school. Risk assessment information for Education Service Center Regions 1, 2, 3, 4, 10, 11, 13, 15, 18, 19, and 20 is included in this report.

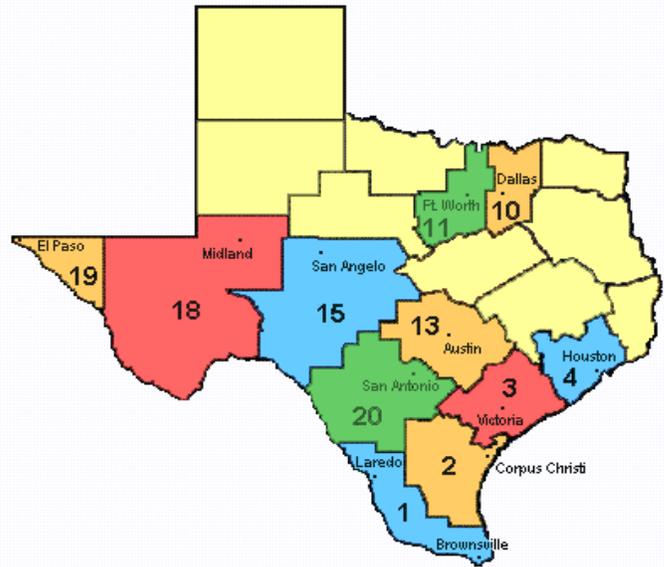
**INTRODUCTION**

The Risk Assessment for Type 2 Diabetes in Children is a legislatively mandated program developed, coordinated, and administrated by The University of Texas Pan-American Border Health Office (BHO). The program assesses children who may be at high risk of developing Type 2 Diabetes in Texas Education Agency Regional Education Service Centers 1, 2, 3, 4, 10, 11, 13, 15, 18, 19, and 20.

**RISK ASSESSMENT MANDATE POPULATION  
(1,3,5, & 7TH GRADES)**

Region 1 (RGV)	113,240
Region 2 (Corpus Christi)	31,890
Region 3 (Victoria)	15,698
Region 4 (Houston)	307,669
Region 10 (Dallas)	212,676
Region 11 (Ft. Worth)	152,586
Region 13 (Austin)	100,977
Region 15 (San Angelo)	13,988
Region 18 (Midland/Odessa)	22,083
Region 19 (El Paso)	51,592
Region 20 (San Antonio)	113,306
<b>Total</b>	<b>1,135,705</b>

Source: Texas Education Agency



During vision/hearing and scoliosis screenings of 1st, 3rd, 5th, and 7th graders in public and private schools, certified individuals assess children for the acanthosis nigricans marker, a skin condition that signals high insulin levels.



Acanthosis Nigricans (AN) is considered a risk factor in the development of Type 2 Diabetes. Assessing for acanthosis nigricans can be useful to help identify children who may be at-risk for developing future health problems. Acanthosis nigricans identification is a simple, non-intrusive method that has been acceptable to children and those conducting the assessments. Source: Smith, WG, Gowanlock, W, Babcock, K, Collings, A, McCarthy, A. Prevalence of Acanthosis Nigricans in First Nations Children in Central Ontario, Canada. *Can J Diabetes* 2004;28(1):410-14.

Children who are positively identified with the marker undergo additional assessments of body mass index (BMI), BMI percentile, and blood pressure.

Referrals are issued to the parents of these children, alerting each parent of their child's risk factors and encouraging further evaluation from a health professional. Becoming aware of and understanding what the risk factors suggest can stimulate the changes necessary to prevent or delay future health problems for children at risk of developing Type 2 Diabetes and other conditions.

## RISK ASSESSMENTS

### ACANTHOSIS NIGRICANS

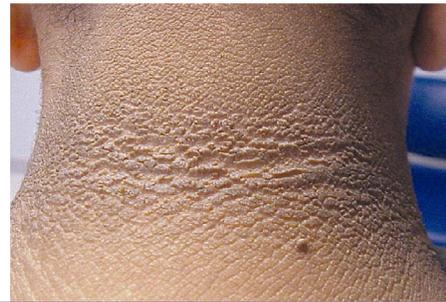
Acanthosis nigricans is a cutaneous marker associated with hyperinsulinemia and insulin resistance and is considered a risk factor for Type 2 Diabetes and other chronic diseases. Because of the increasingly alarming rates of children developing Type 2 Diabetes, acanthosis nigricans assessments are important and can help identify children with high insulin levels who may be at-risk for developing the disease. Children who are positively identified with the AN marker undergo additional assessments of body mass index (BMI), BMI percentile, and blood pressure.

### BODY MASS INDEX

Body Mass Index (BMI) is a measurement that helps determine overweight status by using a mathematical formula that takes into account a child's age, height, and weight. After BMI is calculated for children and teens with acanthosis nigricans, the BMI number is plotted on Center for Diseases Control and Prevention (CDC) BMI-for-age growth charts. A child with a BMI greater or equal to the 95th percentile has a greater chance of maintaining obesity into adulthood. This is also significant since studies have shown that BMI above the 95th percentile is associated with elevated blood pressure, hyperlipidemia, and obesity-related disease and mortality. Children whose BMI falls between the 85th and 94th percentile should be evaluated carefully and should be given particular attention to secondary complications of obesity. BMI categories are identified as obese, overweight, normal, and underweight.

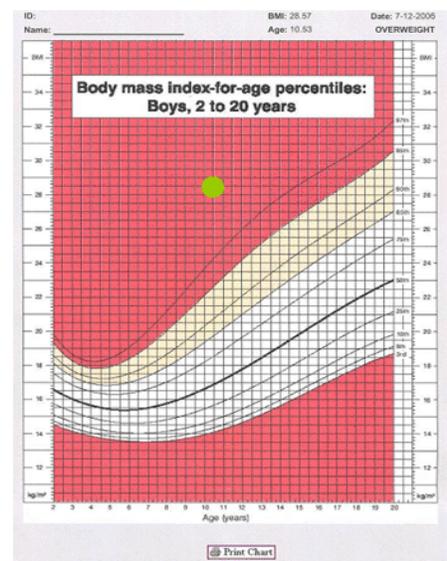
### BLOOD PRESSURE

Hypertension increases the risk for cardiovascular disease and is a complication of obesity. Hypertension has also been associated with insulin resistance and hyperinsulinemia. Elevated blood pressure in childhood correlates with hypertension in early adulthood, supporting the need to track blood pressure in children. Certified personnel perform two blood pressure measures on children who have the AN marker. Blood pressure is taken on the child's right arm in a controlled environment, giving three to five minutes of rest in between each reading as recommended by the National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. The blood pressure categories are identified as **hypertensive**, **prehypertensive**, or **normal**.



Acanthosis nigricans reliably defines a subgroup of obese children with hyperinsulinemia and insulin resistance, the early abnormality of metabolic syndrome and Type 2 Diabetes.

Source: Guran, T, Turan, S, Akcay, T, Bereket, A. Significance of acanthosis nigricans in childhood obesity. *Journal of Paediatrics and Child Health*. 2008. 44 (338-341).



The Risk Factor Electronic System used by certified personnel conducting the risk assessments provides users with a printable CDC growth chart. BMI is plotted on the growth chart and includes BMI category.



The blood pressure categories are identified as **hypertensive**, **prehypertensive**, or **normal**. This process is simplified by the Risk Factor Electronic System (RFES) which takes the raw blood pressures and interprets them instantly.

## RISK ASSESSMENT PROCESS



During vision/hearing and scoliosis screenings of 1st, 3rd, 5th, and 7th graders in public and private schools, certified individuals assess children for the acanthosis nigricans marker, a skin condition that signals high insulin levels. Children who are positively identified with the marker undergo additional assessments of body mass index (BMI), BMI percentile, and blood pressure.

Certified individuals make medical referrals for children with AN, which include BMI, BMI percentile, and blood pressure.



Risk assessment referrals are issued to the parents of these children, alerting each parent of their child's risk factors and encouraging further evaluation from a health professional. Becoming aware of and understanding what the risk factors suggest can stimulate the changes necessary to prevent or delay future health problems for children at risk of developing Type 2 Diabetes and other conditions.

School: \_\_\_\_\_ Date: \_\_\_\_\_  
 Student's Name: \_\_\_\_\_ Grade: \_\_\_\_\_

Dear Parents/Estimados padres de familia:

While observing the health of your child, the school nurse has noted the following symptoms/signs which should be brought to your attention. *(La enfermera de la escuela ha observado los siguientes síntomas/señales que pueden ser de alto riesgo para la salud de su hijo(a), requerimos de su atención).*

**"ACANTHOSIS NIGRICANS"**

Acanthosis Nigricans is a light-brown to black, velvety, rough or thickened lesion on the surface of the skin. It is usually found around the neck, axillae and over the knuckles. Acanthosis Nigricans can be a primary marker that may signal high insulin levels, which can lead to insulin resistance and may develop into type 2 diabetes.  
*(Acanthosis Nigricans es una marca oscura visible en la superficie de la piel --alrededor del cuello, axilas y nudillos de los dedos--. Las marcas de acanthosis nigricans indican altos niveles de insulina en el cuerpo; y son primeras señales para futuro desarrollo de la diabetes tipo 2 y otras complicaciones para la salud.)*

The observations are as follows:  
*(Las observaciones son las siguientes:)*

Height: _____	Weight: _____	BMI: _____
Avg. Blood Pressure: _____		Blood Pressure Level: _____
Acanthosis Nigricans Present (Y/N): _____		

Please take this form with you when you take your child to your physician.  
*(Presente esta forma a su médico).*  
 School Nurse \_\_\_\_\_

\* \* \*

The school system would appreciate comments from parents and doctors regarding Acanthosis Nigricans. Information provided will be helpful for the nurse to better serve your child.  
*(Se tomaran en cuenta todos sus comentarios para asistir mejor la salud de su hijo(a)).*

Doctor's diagnosis, treatment or/and recommendations.  
*(Diagnóstico médico y/o recomendaciones)*  
 \_\_\_\_\_

Parent's comments: *(Comentario de padres de familia)*  
 \_\_\_\_\_

Please sign and return this form to the school nurse.  
*(Favor de firmar y devolver esta forma a la enfermera de la escuela)*

Doctor's signature \_\_\_\_\_ Date \_\_\_\_\_  
 Parent's signature \_\_\_\_\_ Date \_\_\_\_\_



## **RISK ASSESSMENT ADVISORY COUNCIL RECOMMENDATIONS**

During the 80th Texas Legislative session, the legislature passed Senate Bill 415 (SB 415). This bill, which details the Risk Assessment for Type 2 Diabetes in Children program and its responsibilities, called for the formation of the Risk Assessment for Type 2 Diabetes Advisory Committee (Advisory Committee) to advise the BHO on the growth and direction of the program. In accordance with SB 415, and no later than September 1 of each even-numbered year, the Advisory Committee is required to make recommendations to the BHO regarding six matters impacting the program. The following report details the Advisory Committee's recommendations for each of the six items specified in SB 415:

**1. Recommend the person who should be responsible for conducting risk assessment activities under this chapter for schools that do not employ a school nurse;**

The Advisory Committee recommends that, in the absence of a school nurse, schools may subcontract for risk assessment services or assign a designated school employee to conduct the assessments, record and report the assessment information to the BHO, and refer and follow-up with children identified as being at risk. Individuals who conduct these assessments must receive training and certification from the BHO.

**2. Advise the office on the age groups that would benefit most from the risk assessment activities under this chapter;**

The Advisory Committee recommends that 9th grade students be included in the risk assessment program. Students in this grade may be experiencing puberty, which has been identified as important in the development of Type 2 diabetes in children.

**3. Recommend a method to record and report the number of children who are identified in the risk assessment process as being at risk for having or developing Type 2 diabetes and who qualify for the national free or reduced-price lunch program established under 42 U.S.C. Section 1751 et seq.;**

The Risk Assessment for Type 2 Diabetes in Children Advisory Committee recommends that information on the total percentage of students enrolled who qualify for national free or reduced-price lunch program for school districts be included by the BHO in the school district risk assessment activity reports. Currently, information on individual student national free or reduced-price lunch program participation is not readily accessible to those individuals conducting risk assessments. In the future, the Advisory Committee will investigate other methods of recording and reporting the number of children that are identified at-risk for having or developing Type 2 diabetes and who qualify for the national free or reduced-price lunch program.

**4. Recommend a deadline, which may not be later than the first anniversary of the date the advisory committee submits a recommendation to the office under this section, by which the office shall implement the advisory committee's recommended risk assessment activities, surveillance methods, reports, and quality improvements;**

In order to allow sufficient time for implementation and training, the Advisory Committee recommends the BHO implement the Advisory Committee's recommendations no later than September 1, 2009.

## **RISK ASSESSMENT ADVISORY COUNCIL RECOMMENDATIONS**

**5. Contribute to the state plan for diabetes treatment developed by the council under Section 103.013 by providing statistics and information on the risk assessment activities conducted under this chapter and recommendations for assisting children in this state at risk for developing Type 2 diabetes;**

The Advisory Committee recommends that the BHO contribute to the state plan by providing the Texas Diabetes Council with statistical information obtained through the risk assessment program.

**6. Recommend any additional information to be included in the report required by Section 95.004.**

The Advisory Committee recommends no additional information to be included in the individual risk assessment reports required by Section 95.004 of the Texas Health and Safety Code.

This report is submitted to the UTPA Border Health Office pursuant to Section 95.006 (i) of the Texas Health and Safety Code.

## **Texas Risk Assessment for Type 2 Diabetes in Children Advisory Committee**

Doreen D. Garza, MPH  
Executive Director  
UTPA Border Health Office

Victor H. Gonzalez, MD  
Chair, Texas Diabetes Council

Lauralea Bauer  
Director of Discipline, Counseling and Pregnancy  
Programs  
Texas Education Agency

Mary Baumann  
Director of Youth Markets  
American Diabetes Association

Alda T. Benavides, Ed.D.  
Superintendent, La Joya ISD

Arnoldo F. Benavides  
Principal, Freddy Gonzalez Elementary  
Edinburg CISD

Leonides Cigarroa, Jr., MD  
Family Physician  
Texas Medical Association

Clara Cácares Contreras  
Health Specialist, Region I ESC

Diana Martinez, RN  
Parent representative

Mary Lou Lujan, RN  
School nurse, Region 18

Colleen McHugh, JD  
Regent, The University of Texas System

Stephen W. Ponder, MD, CDE  
Pediatric Endocrinologist and Director  
Children's Diabetes and Endocrine Center of South Texas  
Driscoll Children's Hospital  
Texas Pediatric Society

Julia Soper, RN  
School nurse, Pharr-San Juan-Alamo ISD

## ICD-9 701.2 ACQUIRED ACANTHOSIS NIGRICANS CLAIMS COUNT

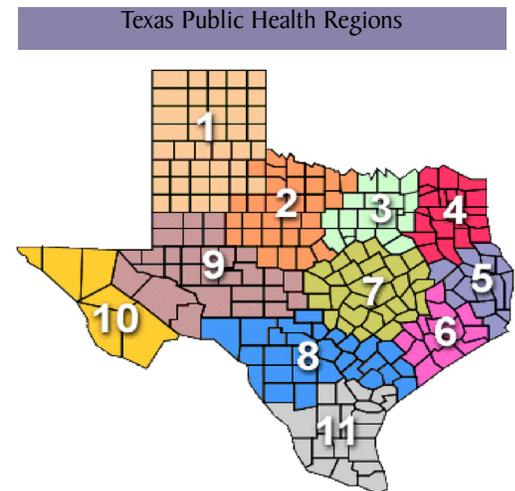
To understand the impact of the Texas Risk Assessment for Type 2 Diabetes in Children program, Texas Department of State Health Services Medicaid/CHIP claims data was obtained for years 1999 to 2003, sourcing International Classification of Diseases (ICD-9) Code 701.2 Acquired Acanthosis Nigricans claims count. This data would help address whether school nurse referrals were being followed up by parents with health care providers.

During the inception years of the Texas Risk Assessment for Type 2 Diabetes in Children program, 1999-2001, the assessments were mainly conducted in Texas Public Health Regions 10 and II. For years 1999 and 2000, Acquired Acanthosis Nigricans ICD-9 code 701.2 increased from 2,848 to 10,090 claims ( $p < .001$ ). This marked a 254% increase between those years. Claims count between years 2000 and 2001 increased by only 7%, increasing from 10,090 to 10,810 ( $p < .001$ ).

In 2001, the Texas Risk Assessment for Type 2 Diabetes in Children program expanded the assessments to include Texas Public Health Regions 8 and 9, including partial areas of Regions 6 and 7. For years 2001 and 2002, the claims count increased from 10,810 to 15,524 ( $p < .001$ ). A 44% increase in claims count was seen between those years. Claims count between years 2002 and 2003 increased from 15,524 to 19,605 ( $p < .001$ ), yielding a 26% increase.

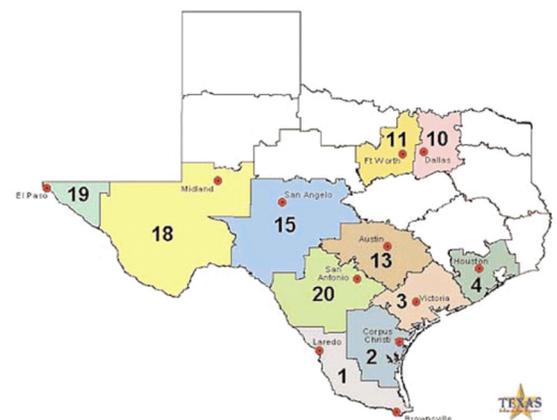
**Table 1. ICD-9 Code 701.2 Acquired Acanthosis Nigricans Claims Among Children 0-17 Years Old, Texas Medicaid SFY 1999-2003**

Region	1999	2000	2001	2002	2003
1 Panhandle	3	15	22	28	70
2 North Plains	0	2	16	58	123
3 North Central	20	24	39	53	104
4 Northeast	20	18	10	30	39
5 East	18	21	17	26	31
6 Southeast	23	33	58	231	604
7 Central	10	17	40	89	217
8 Southwest	125	455	760	1,851	2,288
9 West	26	48	66	362	456
10 Far West(Mountain)	7	192	148	550	701
11 Rio Grande Valley	2,583	9,217	9,457	11,988	14,837
Unknown	13	48	177	258	135
<b>Total</b>	<b>2848</b>	<b>10,090</b>	<b>10,810</b>	<b>15,524</b>	<b>19,605</b>



According to the claims data, the counts significantly increased as the risk assessments were introduced into Texas Public Health Regions where assessments had not been previously conducted. This may indicate that parents of children who were identified as at-risk were seeking further health evaluation from their health care providers. As a result, the risk assessments may be effective in getting those children who are identified as at-risk to seek appropriate follow-up testing and may create the "stimulus" for opportunistic screenings conducted in primary health care practices.

Texas Education Agency Regional Education Service Center Risk Assessment for Type 2 Diabetes in Children



## PROGRAM BUDGET

The Texas Risk Assessment for Type 2 Diabetes in Children program is supported by funds from the Texas State Legislature provided to The University of Texas-Pan American Border Health Office . The following is a detailed expense account of fiscal year 2007-2008.

The Texas Risk Assessment for Type 2 Diabetes in Children program budget is **\$292,605**.

A total of **\$155,088** is allocated to pay the salaries of 4 FTE Health Education Coordinators, 1 FTE secretary, partial support for an Risk Factor Electronic System (RFES) programmer, and two part-time direct wage employees. The coordinators are responsible for training approximately 5,000 school nurses and providing them with technical assistance with the Risk Factor Electronic System. These coordinators also participate in health fairs, participate as members of School Health Advisory Councils, and assist in other risk assessment-related requests. The secretary assists the coordinators with directing phone calls and making all travel and meeting arrangements. The part-time RFES programmer assists in with configuration of the RFES, updating the program, implementing any changes as necessary. The part-time employees are students who assist the coordinators with preparing all the training packets, copies, mail-outs, and data entry.

A total of **\$83,165** is allocated for operating and maintenance. This includes the professional printing of educational material for school nurses ( bilingual brochures, posters, videos). It also supports the purchase of computers and software, maintenance for office vehicles, consumable office supplies, postage, and telephone.

A total of **\$54,352** is allocated for travel. This includes both ground and air travel, lodging and meal per diem for coordinators to carry out responsibilities in the risk assessment mandated regions. These funds are also used for travel expenses related to continuing education for staff regarding relevant children's health related issues.

## SUGGESTED READINGS

- Allison, DB, Fontaine, KR, Manson, JE, Stevens, J, VanItallie, TB. Annual Deaths Attributable to Obesity in the United States. *JAMA* 2000;282:1530-1538
- American Diabetes Association. Type 2 Diabetes in Children and Adolescents. *Pediatrics* 2000;105(3):671-680
- Barlow, SE, Dietz, WH. Obesity Evaluation and Treatment: Expert Committee Recommendations. *Pediatrics* 1998;10(3):e29
- Bent, KN, Shuster, GF, Hurley, JS, Frye, D, Loffin, P, Brubaker, C. Acanthosis Nigricans as an Early Clinical Proxy Marker of Increased Risk of Type II Diabetes. *Public Health Nursing* 1998;15:415-421
- Bonet, B, Viana, M, Sánchez-Vera, I, Quintanar, A, Martínez, J, Espino, M. Adipose tissue and liver lipid metabolism in obese children: role of the body mass index and the presence of acanthosis nigricans. *Diabetic Medicine* 2007;24:1192-1198
- Brickman, WJ, Binns, HJ, Jovanovic, BD, Kolesky, S, Mancini, AJ, Metzger, BE. Acanthosis Nigricans: A Common Finding in Overweight Youth. *Pediatric Dermatology* 2007;24(6):601-606
- Campagna, AF, Pettitt, DJ, Engelgau, MM, Burrows, NR, Geiss, LS, Valdez, R, Beckles, GLA, Saaddine, J, Gregg, EW, Williamson, DF, Narayan, KMV. Type 2 diabetes among North American children and adolescents: An epidemiologic review and a public health perspective. *The Journal of Pediatrics* 2000;136:664-672
- Cook, VV, Hurley, and JS. Prevention of Type 2 Diabetes in Childhood. *Clinical Pediatrics* 1998;37:123-130
- Dabelea, D, Pettitt, DJ, Jones, KL, Arslanian, SA. Type 2 Diabetes Mellitus in Minority Children and Adolescents: An Emerging Problem. *Pediatric Endocrinology* 1999;28:709-729
- Drobac, S, Brickman, W, Smith, T, Binns, HJ. Evaluation of a Type 2 Diabetes Screening Protocol in an Urban Pediatric Clinic. *Pediatrics* 2004;114(1):141-148
- Gahagan, S, Silverstein, J, Committee on Native American Child Health and Section on Endocrinology. Prevention and Treatment of Type 2 Diabetes Mellitus in Children, With Special Emphasis on American Indian and Alaska Native Children. *Pediatrics* 2003;112(4):e328-e346
- Gilkison, C, Stuart, CA. Assessment of patients with acanthosis nigricans skin lesion for hyperinsulinemia, insulin resistance, and diabetes risk. *Nurse Practitioner* 1992;17(2):26-43
- Guran, T, Turan, S, Akcay, T, Bereket, A. Significance of acanthosis nigricans in childhood obesity. *Journal of Paediatrics and Child Health*. 2008. 44 (338-341).
- Hamiel, OP, Standiford, D, Hamiel, D, Dolan, LM, Cohen, R, Zeitler, S. The Type 2 Family: A Setting for Development and Treatment of Adolescent Type 2 Diabetes Mellitus. *Arch Pediatric Adolescence Med* 1999;153:1063-1067
- Hardin, DS. Screening for Type 2 Diabetes in Children with Acanthosis Nigricans. *Diabetes Educator* 2006;32(4):547-552
- Hermanns-Le, T, Francois Hermanns, J, Pierard, GE. Juvenile Acanthosis Nigricans and Insulin Resistance. *Pediatric Dermatology* 2002;19(1):12-14
- Jones, LH, Ficca, M. Is Acanthosis Nigricans a Reliable Indicator for Risk of Type 2 Diabetes? *J Sch Nursing* 2007;23(5):247-251
- Kiernan, M, Winkleby, MA. Identifying Patients for Weight-Loss Treatment. An Empirical Evaluation of the NHLBI Obesity Education Initiative Expert Panel Treatment Recommendations. *Arch Intern Med* 2000;160:2169-2176
- Kong, AS, Williams, RL, Smith, M, Sussman, AL, Skipper, B, Hsi, AC, Rhyne, RL. Acanthosis Nigricans and Diabetes Risk Factors: Prevalence in Young Persons Seen in Southwestern US Primary Care Practices. *Ann Fam Med* 2007;5(3):202-208
- Kuczmarski, RJ, Flegal, KM, Campbell, SM, Johnson, CL. Increasing prevalence of overweight among U.S. adults: the National Health and Nutrition Examination Surveys. *JAMA* 1994;272:205-211
- Ludwig, DS, Majzoub, JA, Al-Zahrani, A, Dallal, GE, Blanco, I, Roberts, SB. High Glycemic Index Foods, Overeating, and Obesity. *Pediatrics* 1999;103:3
- Maitra, SK, Rowland Payne, CME. The obesity syndrome and acanthosis nigricans. Acanthosis nigricans is a common cosmetic problem providing epidemiological clues to the obesity syndrome, the insulin-resistance syndrome, the thrifty metabolism, dyslipidaemia, hypertension and diabetes mellitus type II. *Journal of Cosmetic Dermatology* 2004;3:202-210
- Mokdad, AH, Serdula, MK, Dietz, WH, Bowman, BA, Marks, JS, Koplan, JP. The Spread of the Obesity Epidemic in the United States, 1991-1998. *JAMA* 1999;282:1519-1522

## SUGGESTED READINGS

- Mukhtar, Q, Cleverley, G, Voorhees, R, McGrath, J. Prevalence of Acanthosis Nigricans and Its Association With Hyperinsulinemia in New Mexico Adolescents. *J Adolesc Health* 2001;28: 372-376
- Must, A, Spadano, J, Coakley, EH, Field, AE, Colditz, G, Dietz, WH. The Disease Burden Associated with Overweight and Obesity. *JAMA* 1999;282:1523-1529
- National Association of School Nurses. Position Statement: Caseload Assignments. June 1972
- National Association of State Boards of Education. Policy Update. 2000;8(10)
- National Task Force on the Prevention and Treatment of Obesity. Overweight, Obesity, and Health Risk. *Arch Intern Med* 2000;160:898-904
- Neufeld, ND, Raffel, LJ, Landon, C, Chen, YDI, Vadheim, CM. Early Presentation of Type 2 Diabetes in Mexican-American Youth. *Diabetes Care* 1998;21:80-86
- Pediatrics. The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents: National High Blood Pressure Education on Children and Adolescents 2004;114: 555-576
- Pediatrics. Update on the 1987 Task Force Report on High Blood Pressure in Children and Adolescents: A Working Group Report for the National High Blood Pressure Education Program 1996;98(4):649-657
- Nationwide Children's Hospital. Pediatric Obesity: Nationwide Children's Hospital Helping Children Live Healthier Lifestyles. *Pediatric Directions* 2007;31
- Perez Gomez, G, Huffman, FG. Risk Factors for Type 2 Diabetes and Cardiovascular Diseases in Hispanic Adolescents. *J Adolesc Health* 2008;43:444-450
- Peterson, K, Silverstein, J, Kaufman, F, Warren-Boulton, E. Management of Type 2 Diabetes in Youth: An Update. *American Family Physician* 2007;76(5):658-664
- Pettitt, DJ, Moll, PP, Knowler, WC, Mott, DM, Nelson, RG, Saad, MF, Bennett, PH, Kottke, BA. Insulinemia in Children at Low and High Risk of NIDDM. *Diabetes Care* 1993;16:608-615
- Pihoker, C, Scott, CR, Lensing, SY, Cradock, MM, Smith, J. Non-Insulin Dependent Diabetes Mellitus in African-American Youths of Arkansas. *Clinical Pediatrics* 1998;37:97-102
- Pinhas-Hamiel, O, Dolan, LM, Daniels, SR, Stanford, D, Khoury, PR, Zeitler, P. Increased incidence of non-insulin-dependent diabetes mellitus among adolescents. *Journal of Pediatrics* 1996;128:608-615
- Reaven, GM. Role of insulin resistance in human diseases. *Diabetes* 1988;37:1595-1607
- Rhodes, SK, Shimoda, KC, Wald, R, et al. Neurocognitive deficits in morbidly obese children with obstructive sleep apnea. *Journal of Pediatrics* 1995;127:741-744
- Rieder, J, Santoro, N, Cohen, HW, Marantz, P, Coupey, SM. Body Shape and Size and Insulin Resistance as Early Clinical Predictors of Hyperandrogenic Anovulation in Ethnic Minority Adolescent Girls. *J Adolesc Health* 2008;43:115-124
- Rosenbloom, AL, House, DV, Winter, WE. Non-Insulin Dependent Diabetes Mellitus (NIDDM) in Minority Youth: Research Priorities and Needs. *Clinical Pediatrics* 1998;37:143-152
- Rosenbloom, AL, Joe, JR, Young RS, Winter, WE. Emerging Epidemic of Type 2 Diabetes in Youth. *Diabetes Care* 1999;22:345-354
- Rosenbloom AL, Silverstein JH. Type 2 Diabetes in Children & Adolescents: A Guide to Diagnosis, Epidemiology, Pathogenesis, Prevention, and Treatment. Alexandria, Virginia: American Diabetes Association, Inc 2003
- Scott, CR, Smith, JM, Cradock, MM, Pihoker, C. Characteristics of youth-onset noninsulin-dependent diabetes mellitus and insulin-dependent diabetes mellitus at diagnosis. *Pediatrics* 1997;100:84-91
- Shwartz, RA. Acanthosis Nigricans. *Journal of the American Academy Dermatology* 1994;31:1-19
- Slyper, AH. Childhood obesity, adipose tissue distribution, and the pediatric practitioner. *Pediatrics* 1998;102(1):e4
- Smith, WG, Gowanlock, W, Babcock, K, Collings, A, McCarthy, A. Prevalence of Acanthosis Nigricans in First Nations Children in Central Ontario, Canada. *Can J Diabetes* 2004;28(1):410-14.

## SUGGESTED READINGS

Strauss, RS. Childhood Obesity and Self-Esteem. *Pediatrics* 2000;105:1

Stuart, CA, Driscoll, MS, Kurt, LF, Gilkison, CR, Sudah, S, Smith, MM. Acanthosis Nigricans. *Journal of Basic and Clinical Physiology and Pharmacology* 1998;9(2-4):407-418

Stuart, CA, Gilkison, CR, Smith, MM, Bosma, A, Keenan, BS, Nagamani, M. Acanthosis nigricans as a risk factor for non-insulin dependent diabetes mellitus. *Clinical Pediatrics* 1998;73-79

Stuart, CA, Pate, CJ, Peters, EJ. Prevalence of acanthosis nigricans in an unselected population. *American Journal of Medicine* 1989;87:269-272

Stuart, CA, Smith, MM, Gilkison, CR, Shaheb, S, Stahn, RM. Acanthosis nigricans among Native Americans: an indicator of high diabetes risk. *American Journal of Public Health* 1994;84(11):1839-1842

Troiano, RP, Flegal, KM, Kuczmarski, RJ, Campbell, SM, Johnson, CL. Overweight prevalence and trends for children and adolescents. The National Health and Nutrition Examination Surveys, 1963 to 1991. *Archives of Pediatric Adolescent Medicine* 1995;149:1085-1091

US Department of Health and Human Services. *Physical Activity and Good Nutrition: Essential Elements for Good Health At-A-Glance 2000*. US Department of Health and Human Services, Center for Disease Control and Prevention 2000

Villas, P, Chen, Z, Garza, D, Salazar, D. An electronic system to assist schools in determining the health risk of students. *Am J Health Studies* 2006;2(1):57-61

Villas, P, Salazar, D, Garza, D, Villagomez, N, Lightner, T. Acanthosis Nigricans in Youth: A Type 2 Diabetes Marker. *Texas Journal of Rural Health* 2000;18(1):52-58

Young, KT, Dean, HJ, Flett, B, Steiman, PW. Childhood obesity in a population at high risk for type 2 diabetes. *The Journal of Pediatrics* 2000;136:365-369

Zwillich, CW. Is Untreated Sleep Apnea a Contributing Factor for Chronic Hypertension? *JAMA* 2000;283:1880-1881

Texas Regional Education Service Center  
Risk Assessment Fact Sheets

The Risk Assessment for Type 2 Diabetes in Children is a legislatively mandated program developed, coordinated, and administered by The University of Texas-Pan American Border Health Office (BHO). The program assesses children who may be at high risk of developing Type 2 Diabetes. During vision/hearing and scoliosis screenings of 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, and 7<sup>th</sup> graders in public and private schools, certified individuals assess children for the acanthosis nigricans (AN) marker, a skin condition that signals high insulin levels. Children who are positively identified with the marker undergo additional assessments of body mass index (BMI), BMI percentile, and blood pressure. Referrals are issued to the parents of these children. They help alert each parent of what the risk factors are and what changes will be necessary to prevent or delay future health problems for children at risk of developing Type 2 Diabetes and other health conditions.

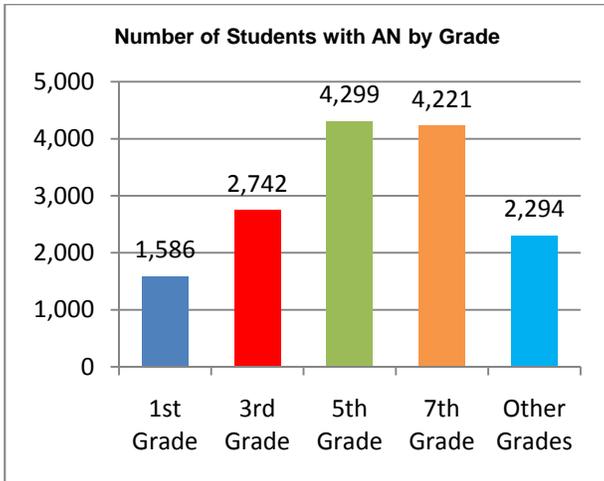
The following results are for the assessments conducted in your region:

**Demography**

Total Number of Students Assessed: **129,644**    Number of Students Referred: **12,941**    % of Students on Free and Reduced Lunch: **85.0%**  
 Total Number of Students with AN: **15,142**    Number of Students Seen Physician: **2,654**

**Acanthosis Nigricans**

Acanthosis nigricans (AN) is a skin condition that is frequently seen on the nape of the neck. It appears as a dark/black, rough, or velvety area on the surface of the skin. The AN marker is important because it most often signals high insulin levels circulating within the body. The AN marker is considered a risk factor in the development of Type 2 Diabetes.

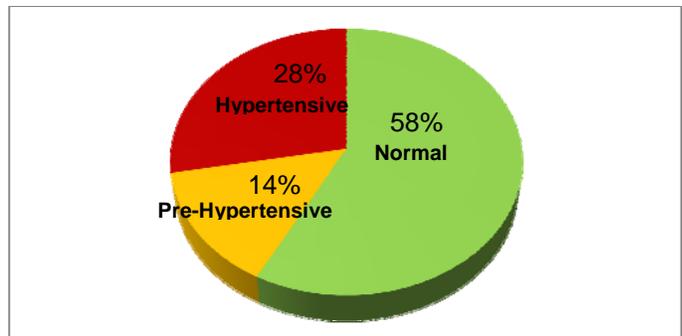


**Blood Pressure**

Hypertension has also been associated with insulin resistance and hyperinsulinemia, which is important for children with the AN marker. Elevated blood pressure in childhood correlates with hypertension in early adulthood, supporting the need to measure blood pressure in children.

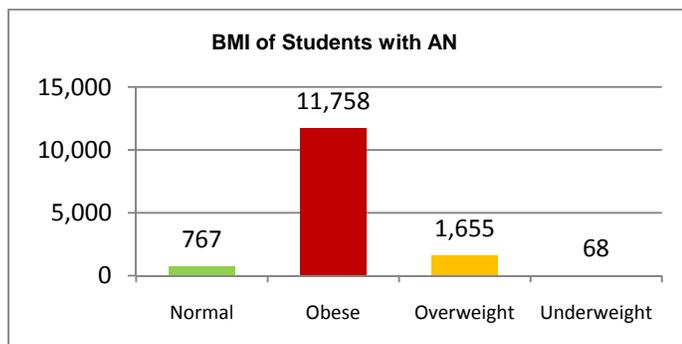
	1st	3rd	5th	7th	Other Grades	Female	Male
<b>Normal</b>	961	1,655	2,410	1,980	1,061	4,250	3,817
<b>Pre-Hypertensive</b>	188	317	601	603	303	967	1,045
<b>Hypertensive</b>	290	637	1,015	1,300	655	1,865	2,032

**Blood Pressure of Students With AN**



**Body Mass Index**

A high Body Mass Index (BMI) for age percentile is also considered a risk factor for the development of Type 2 Diabetes. BMI is calculated using the student's height and weight. The BMI percentiles are determined by the Center for Disease Control BMI for age percentile growth charts. The percentiles are separated into four categories: **Underweight**, **Normal**, **Overweight**, and **Obese**. In the development of Type 2 Diabetes, special emphasis is placed on the At-Risk of Overweight and Overweight categories.



	1 <sup>st</sup>	3 <sup>rd</sup>	5 <sup>th</sup>	7 <sup>th</sup>	Other Grades
<b>Normal</b>	67	106	202	229	163
<b>Obese</b>	1,312	2,315	3,386	3,088	1,657
<b>Overweight</b>	74	224	531	571	255
<b>Underweight</b>	10	22	14	14	8

\* Includes high schools, charter schools, and private schools and excludes incomplete data sources. **Source:** Texas Education Agency

The Risk Assessment for Type 2 Diabetes in Children is a legislatively mandated program developed, coordinated, and administered by The University of Texas-Pan American Border Health Office (BHO). The program assesses children who may be at high risk of developing Type 2 Diabetes. During vision/hearing and scoliosis screenings of 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, and 7<sup>th</sup> graders in public and private schools, certified individuals assess children for the acanthosis nigricans (AN) marker, a skin condition that signals high insulin levels. Children who are positively identified with the marker undergo additional assessments of body mass index (BMI), BMI percentile, and blood pressure. Referrals are issued to the parents of these children. They help alert each parent of what the risk factors are and what changes will be necessary to prevent or delay future health problems for children at risk of developing Type 2 Diabetes and other health conditions.

The following results are for the assessments conducted in your region:

## Demography

Total Number of Students Assessed: **30,243**

Number of Students Referred: **1,983**

% of Students on Free and

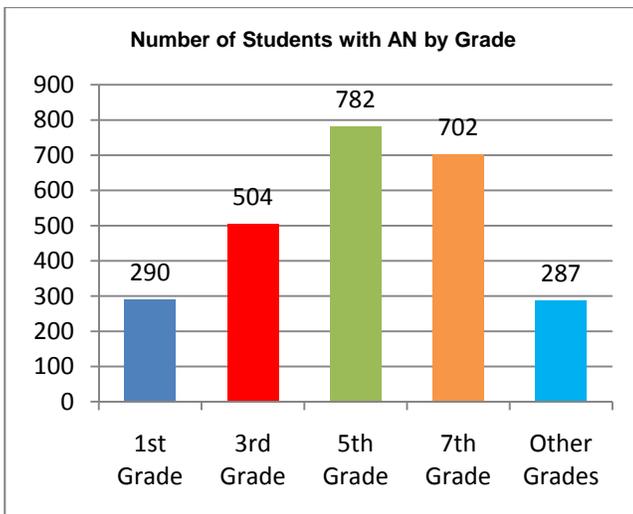
Total Number of Students with AN: **2,565**

Number of Students Seen Physician: **392**

Reduced Lunch: **61.9%**

## Acanthosis Nigricans

Acanthosis nigricans (AN) is a skin condition that is frequently seen on the nape of the neck. It appears as a dark/black, rough, or velvety area on the surface of the skin. The AN marker is important because it most often signals high insulin levels circulating within the body. The AN marker is considered a risk factor in the development of Type 2 Diabetes.

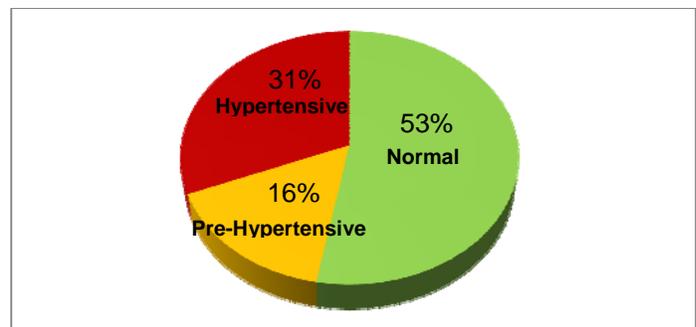


## Blood Pressure

Hypertension has also been associated with insulin resistance and hyperinsulinemia, which is important for children with the AN marker. Elevated blood pressure in childhood correlates with hypertension in early adulthood, supporting the need to measure blood pressure in children.

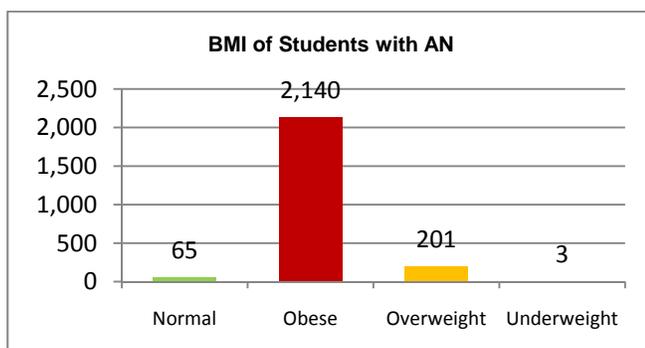
	1st	3rd	5th	7th	Other Grades	Female	Male
<b>Normal</b>	152	282	360	359	108	693	568
<b>Pre-Hypertensive</b>	40	67	123	114	38	199	183
<b>Hypertensive</b>	84	132	206	218	103	360	383

**Blood Pressure of Students With AN**



## Body Mass Index

A high Body Mass Index (BMI) for age percentile is also considered a risk factor for the development of Type 2 Diabetes. BMI is calculated using the student's height and weight. The BMI percentiles are determined by the Center for Disease Control BMI for age percentile growth charts. The percentiles are separated into four categories: **Underweight**, **Normal**, **Overweight**, and **Obese**. In the development of Type 2 Diabetes, special emphasis is placed on the At-Risk of Overweight and Overweight categories.



	1 <sup>st</sup>	3 <sup>rd</sup>	5 <sup>th</sup>	7 <sup>th</sup>	Other Grades
<b>Normal</b>	11	13	14	18	9
<b>Obese</b>	253	443	624	595	225
<b>Overweight</b>	12	29	64	79	17
<b>Underweight</b>	0	3	0	0	0

The Risk Assessment for Type 2 Diabetes in Children is a legislatively mandated program developed, coordinated, and administered by The University of Texas-Pan American Border Health Office (BHO). The program assesses children who may be at high risk of developing Type 2 Diabetes. During vision/hearing and scoliosis screenings of 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, and 7<sup>th</sup> graders in public and private schools, certified individuals assess children for the acanthosis nigricans (AN) marker, a skin condition that signals high insulin levels. Children who are positively identified with the marker undergo additional assessments of body mass index (BMI), BMI percentile, and blood pressure. Referrals are issued to the parents of these children. They help alert each parent of what the risk factors are and what changes will be necessary to prevent or delay future health problems for children at risk of developing Type 2 Diabetes and other health conditions.

The following results are for the assessments conducted in your region:

## Demography

Total Number of Students Assessed: **13,346**

Number of Students Referred: **776**

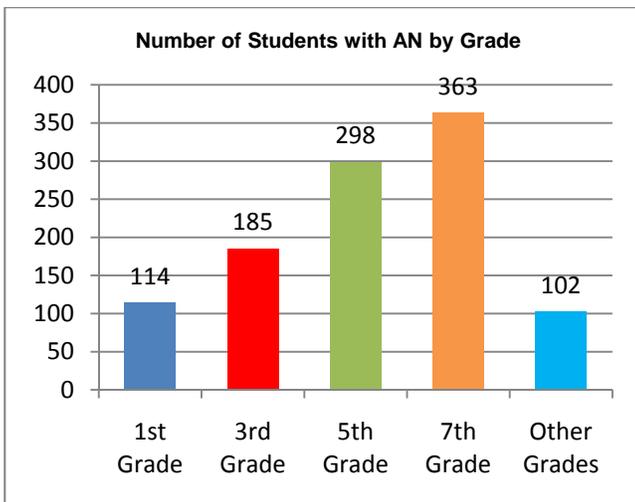
% of Students on Free and Reduced Lunch: **57.1%**

Total Number of Students with AN: **1,062**

Number of Students Seen Physician: **151**

## Acanthosis Nigricans

Acanthosis nigricans (AN) is a skin condition that is frequently seen on the nape of the neck. It appears as a dark/black, rough, or velvety area on the surface of the skin. The AN marker is important because it most often signals high insulin levels circulating within the body. The AN marker is considered a risk factor in the development of Type 2 Diabetes.

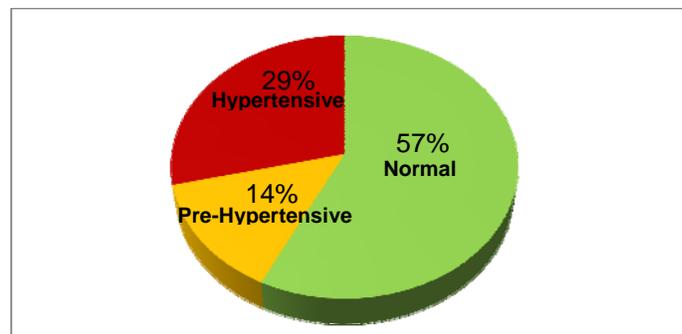


## Blood Pressure

Hypertension has also been associated with insulin resistance and hyperinsulinemia, which is important for children with the AN marker. Elevated blood pressure in childhood correlates with hypertension in early adulthood, supporting the need to measure blood pressure in children.

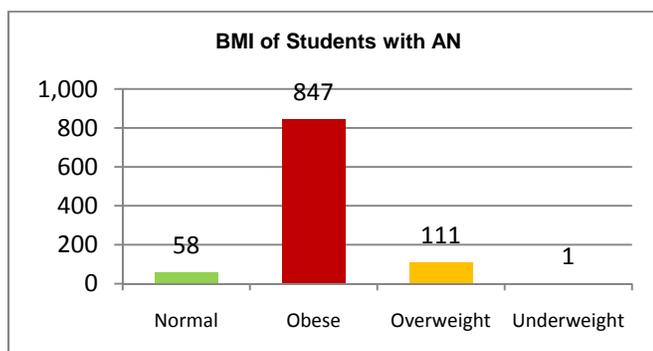
	1st	3rd	5th	7th	Other Grades	Female	Male
<b>Normal</b>	61	96	153	215	55	319	261
<b>Pre-Hypertensive</b>	18	31	48	39	6	88	54
<b>Hypertensive</b>	31	55	85	79	41	152	139

Blood Pressure of Students With AN



## Body Mass Index

A high Body Mass Index (BMI) for age percentile is also considered a risk factor for the development of Type 2 Diabetes. BMI is calculated using the student's height and weight. The BMI percentiles are determined by the Center for Disease Control BMI for age percentile growth charts. The percentiles are separated into four categories: **Underweight**, **Normal**, **Overweight**, and **Obese**. In the development of Type 2 Diabetes, special emphasis is placed on the At-Risk of Overweight and Overweight categories.



	1 <sup>st</sup>	3 <sup>rd</sup>	5 <sup>th</sup>	7 <sup>th</sup>	Other Grades
<b>Normal</b>	7	12	18	20	1
<b>Obese</b>	100	160	236	257	94
<b>Overweight</b>	3	11	35	55	7
<b>Underweight</b>	0	0	0	1	0

The Risk Assessment for Type 2 Diabetes in Children is a legislatively mandated program developed, coordinated, and administered by The University of Texas-Pan American Border Health Office (BHO). The program assesses children who may be at high risk of developing Type 2 Diabetes. During vision/hearing and scoliosis screenings of 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, and 7<sup>th</sup> graders in public and private schools, certified individuals assess children for the acanthosis nigricans (AN) marker, a skin condition that signals high insulin levels. Children who are positively identified with the marker undergo additional assessments of body mass index (BMI), BMI percentile, and blood pressure. Referrals are issued to the parents of these children. They help alert each parent of what the risk factors are and what changes will be necessary to prevent or delay future health problems for children at risk of developing Type 2 Diabetes and other health conditions.

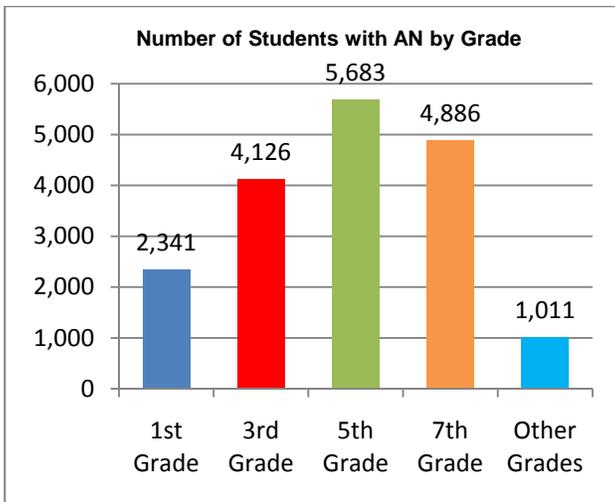
The following results are for the assessments conducted in your region:

**Demography**

Total Number of Students Assessed: **274,962**    Number of Students Referred: **14,781**    % of Students on Free and Reduced Lunch: **54.1%**  
 Total Number of Students with AN: **18,047**    Number of Students Seen Physician: **2,158**

**Acanthosis Nigricans**

Acanthosis nigricans (AN) is a skin condition that is frequently seen on the nape of the neck. It appears as a dark/black, rough, or velvety area on the surface of the skin. The AN marker is important because it most often signals high insulin levels circulating within the body. The AN marker is considered a risk factor in the development of Type 2 Diabetes.

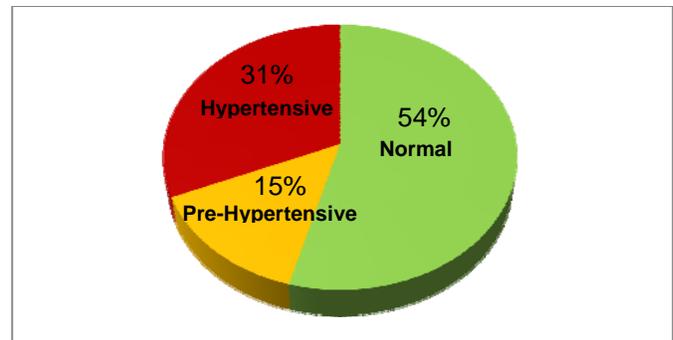


**Blood Pressure**

Hypertension has also been associated with insulin resistance and hyperinsulinemia, which is important for children with the AN marker. Elevated blood pressure in childhood correlates with hypertension in early adulthood, supporting the need to measure blood pressure in children.

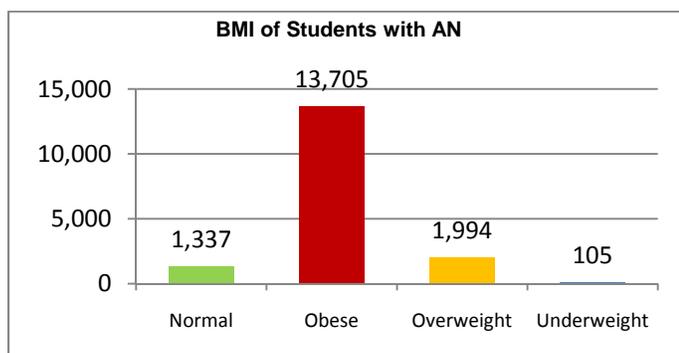
	1st	3rd	5th	7th	Other Grades	Female	Male
<b>Normal</b>	1,450	2,289	2,807	2,232	483	4,955	4,306
<b>Pre-Hypertensive</b>	266	540	835	691	124	1,281	1,175
<b>Hypertensive</b>	477	1,151	1,766	1,702	261	2,766	2,591

**Blood Pressure of Students With AN**



**Body Mass Index**

A high Body Mass Index (BMI) for age percentile is also considered a risk factor for the development of Type 2 Diabetes. BMI is calculated using the student's height and weight. The BMI percentiles are determined by the Center for Disease Control BMI for age percentile growth charts. The percentiles are separated into four categories: **Underweight**, **Normal**, **Overweight**, and **Obese**. In the development of Type 2 Diabetes, special emphasis is placed on the At-Risk of Overweight and Overweight categories.



	1 <sup>st</sup>	3 <sup>rd</sup>	5 <sup>th</sup>	7 <sup>th</sup>	Other Grades
<b>Normal</b>	271	292	354	376	44
<b>Obese</b>	1,749	3,279	4,386	3,551	740
<b>Overweight</b>	172	404	666	671	81
<b>Underweight</b>	10	19	19	48	9

\* Includes high schools, charter schools, and private schools and excludes incomplete data sources. **Source:** Texas Education Agency

The Risk Assessment for Type 2 Diabetes in Children is a legislatively mandated program developed, coordinated, and administered by The University of Texas-Pan American Border Health Office (BHO). The program assesses children who may be at high risk of developing Type 2 Diabetes. During vision/hearing and scoliosis screenings of 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, and 7<sup>th</sup> graders in public and private schools, certified individuals assess children for the acanthosis nigricans (AN) marker, a skin condition that signals high insulin levels. Children who are positively identified with the marker undergo additional assessments of body mass index (BMI), BMI percentile, and blood pressure. Referrals are issued to the parents of these children. They help alert each parent of what the risk factors are and what changes will be necessary to prevent or delay future health problems for children at risk of developing Type 2 Diabetes and other health conditions.

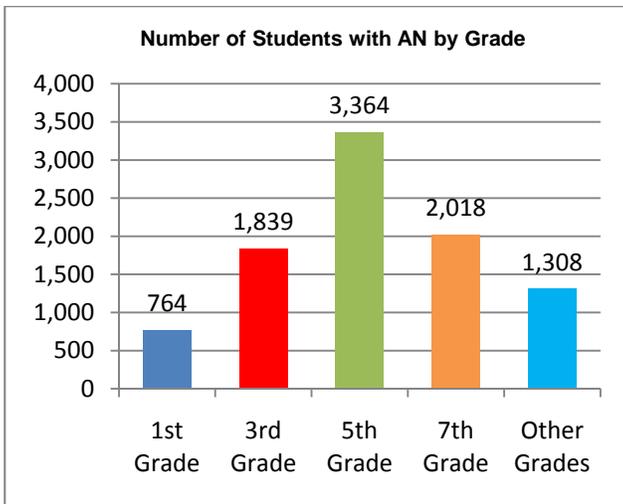
The following results are for the assessments conducted in your region:

**Demography**

Total Number of Students Assessed: **158,410**    Number of Students Referred: **7,385**    % of Students on Free and Reduced Lunch: **51.1%**  
 Total Number of Students with AN: **9,293**    Number of Students Seen Physician: **867**

**Acanthosis Nigricans**

Acanthosis nigricans (AN) is a skin condition that is frequently seen on the nape of the neck. It appears as a dark/black, rough, or velvety area on the surface of the skin. The AN marker is important because it most often signals high insulin levels circulating within the body. The AN marker is considered a risk factor in the development of Type 2 Diabetes.

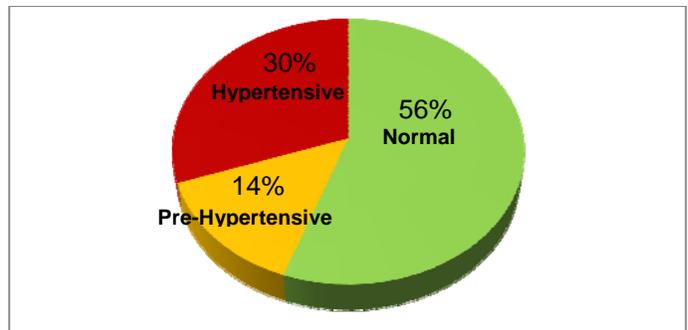


**Blood Pressure**

Hypertension has also been associated with insulin resistance and hyperinsulinemia, which is important for children with the AN marker. Elevated blood pressure in childhood correlates with hypertension in early adulthood, supporting the need to measure blood pressure in children.

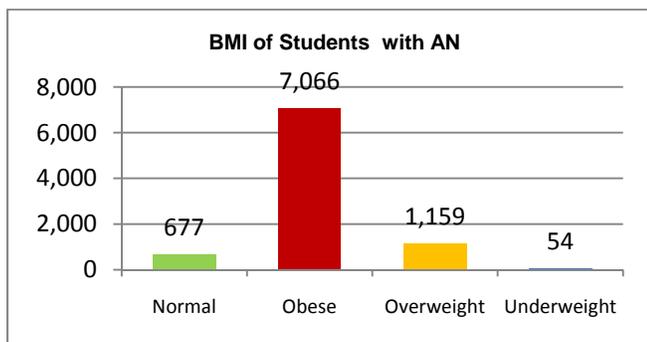
	1st	3rd	5th	7th	Other Grades	Female	Male
<b>Normal</b>	456	1,078	1,837	968	621	2,754	2,206
<b>Pre-Hypertensive</b>	95	242	509	279	145	663	607
<b>Hypertensive</b>	174	443	905	717	475	1,489	1,225

**Blood Pressure of Students With AN**



**Body Mass Index**

A high Body Mass Index (BMI) for age percentile is also considered a risk factor for the development of Type 2 Diabetes. BMI is calculated using the student's height and weight. The BMI percentiles are determined by the Center for Disease Control BMI for age percentile growth charts. The percentiles are separated into four categories: **Underweight**, **Normal**, **Overweight**, and **Obese**. In the development of Type 2 Diabetes, special emphasis is placed on the At-Risk of Overweight and Overweight categories.



	1 <sup>st</sup>	3 <sup>rd</sup>	5 <sup>th</sup>	7 <sup>th</sup>	Other Grades
<b>Normal</b>	48	97	240	186	106
<b>Obese</b>	618	1,473	2,564	1,461	950
<b>Overweight</b>	59	174	440	317	169
<b>Underweight</b>	2	25	10	1	16

\* Includes high schools, charter schools, and private schools and excludes incomplete data sources. **Source:** Texas Education Agency

The Risk Assessment for Type 2 Diabetes in Children is a legislatively mandated program developed, coordinated, and administered by The University of Texas-Pan American Border Health Office (BHO). The program assesses children who may be at high risk of developing Type 2 Diabetes. During vision/hearing and scoliosis screenings of 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, and 7<sup>th</sup> graders in public and private schools, certified individuals assess children for the acanthosis nigricans (AN) marker, a skin condition that signals high insulin levels. Children who are positively identified with the marker undergo additional assessments of body mass index (BMI), BMI percentile, and blood pressure. Referrals are issued to the parents of these children. They help alert each parent of what the risk factors are and what changes will be necessary to prevent or delay future health problems for children at risk of developing Type 2 Diabetes and other health conditions.

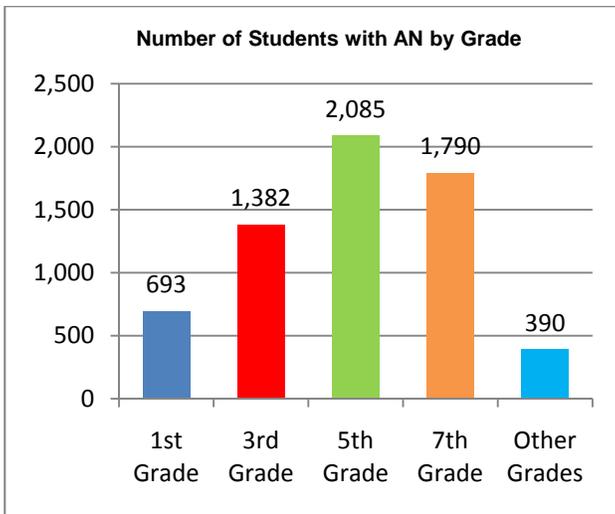
The following results are for the assessments conducted in your region:

**Demography**

Total Number of Students Assessed: **125,481**    Number of Students Referred: **5,088**    % of Students on Free and Reduced Lunch: **40.7%**  
 Total Number of Students with AN: **6,340**    Number of Students Seen Physician: **742**

**Acanthosis Nigricans**

Acanthosis nigricans (AN) is a skin condition that is frequently seen on the nape of the neck. It appears as a dark/black, rough, or velvety area on the surface of the skin. The AN marker is important because it most often signals high insulin levels circulating within the body. The AN marker is considered a risk factor in the development of Type 2 Diabetes.

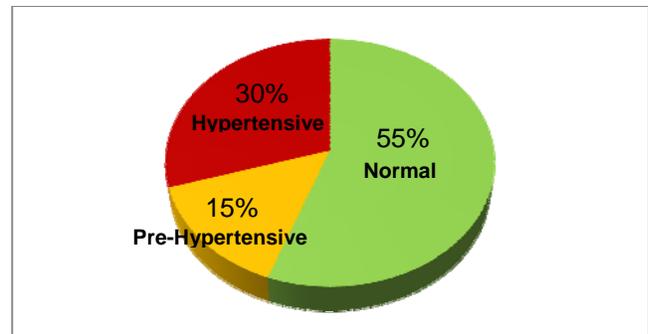


**Blood Pressure**

Hypertension has also been associated with insulin resistance and hyperinsulinemia, which is important for children with the AN marker. Elevated blood pressure in childhood correlates with hypertension in early adulthood, supporting the need to measure blood pressure in children.

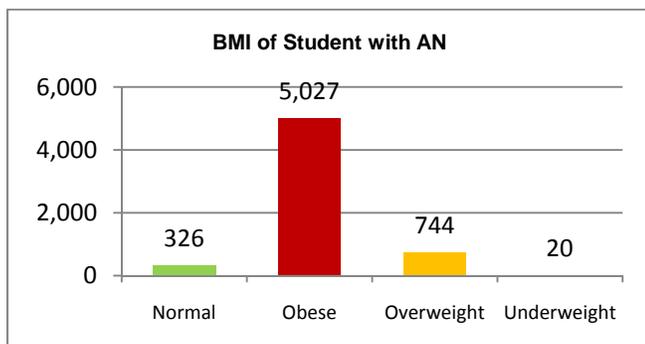
	1st	3rd	5th	7th	Other Grades	Female	Male
<b>Normal</b>	423	777	1,068	935	190	1,848	1,545
<b>Pre-Hypertensive</b>	88	172	339	238	57	434	460
<b>Hypertensive</b>	139	401	627	511	136	933	881

**Blood Pressure of Students With AN**



**Body Mass Index**

A high Body Mass Index (BMI) for age percentile is also considered a risk factor for the development of Type 2 Diabetes. BMI is calculated using the student's height and weight. The BMI percentiles are determined by the Center for Disease Control BMI for age percentile growth charts. The percentiles are separated into four categories: **Underweight**, **Normal**, **Overweight**, and **Obese**. In the development of Type 2 Diabetes, special emphasis is placed on the At-Risk of Overweight and Overweight categories.



	1 <sup>st</sup>	3 <sup>rd</sup>	5 <sup>th</sup>	7 <sup>th</sup>	Other Grades
<b>Normal</b>	37	78	111	77	23
<b>Obese</b>	564	1,124	1,623	1,395	321
<b>Overweight</b>	51	144	301	208	40
<b>Underweight</b>	4	7	3	6	0

\* Includes high schools, charter schools, and private schools and excludes incomplete data sources. **Source:** Texas Education Agency

The Risk Assessment for Type 2 Diabetes in Children is a legislatively mandated program developed, coordinated, and administered by The University of Texas-Pan American Border Health Office (BHO). The program assesses children who may be at high risk of developing Type 2 Diabetes. During vision/hearing and scoliosis screenings of 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, and 7<sup>th</sup> graders in public and private schools, certified individuals assess children for the acanthosis nigricans (AN) marker, a skin condition that signals high insulin levels. Children who are positively identified with the marker undergo additional assessments of body mass index (BMI), BMI percentile, and blood pressure. Referrals are issued to the parents of these children. They help alert each parent of what the risk factors are and what changes will be necessary to prevent or delay future health problems for children at risk of developing Type 2 Diabetes and other health conditions.

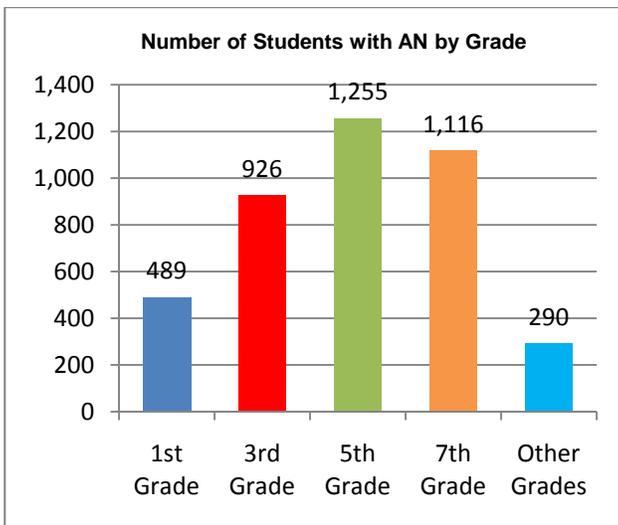
The following results are for the assessments conducted in your region:

**Demography**

Total Number of Students Assessed: **78,329**      Number of Students Referred: **3,431**      % of Students on Free and Reduced Lunch: **43.7%**  
 Total Number of Students with AN: **4,076**      Number of Students Seen Physician: **520**

**Acanthosis Nigricans**

Acanthosis nigricans (AN) is a skin condition that is frequently seen on the nape of the neck. It appears as a dark/black, rough, or velvety area on the surface of the skin. The AN marker is important because it most often signals high insulin levels circulating within the body. The AN marker is considered a risk factor in the development of Type 2 Diabetes.

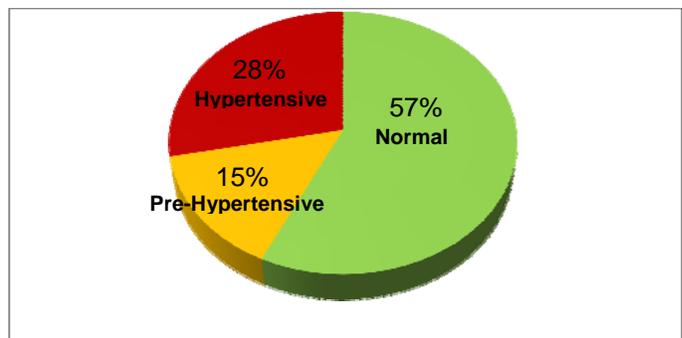


**Blood Pressure**

Hypertension has also been associated with insulin resistance and hyperinsulinemia, which is important for children with the AN marker. Elevated blood pressure in childhood correlates with hypertension in early adulthood, supporting the need to measure blood pressure in children.

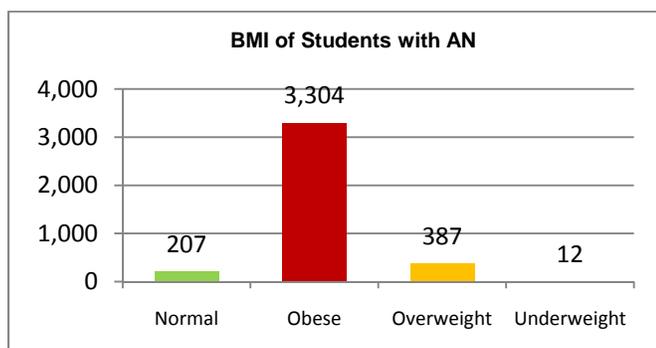
	1st	3rd	5th	7th	Other Grades	Female	Male
<b>Normal</b>	274	543	689	540	171	1,208	1,009
<b>Pre-Hypertensive</b>	84	124	192	139	34	293	280
<b>Hypertensive</b>	113	229	330	349	76	537	560

**Blood Pressure of Students With AN**



**Body Mass Index**

A high Body Mass Index (BMI) for age percentile is also considered a risk factor for the development of Type 2 Diabetes. BMI is calculated using the student's height and weight. The BMI percentiles are determined by the Center for Disease Control BMI for age percentile growth charts. The percentiles are separated into four categories: **Underweight**, **Normal**, **Overweight**, and **Obese**. In the development of Type 2 Diabetes, special emphasis is placed on the At-Risk of Overweight and Overweight categories.



	1 <sup>st</sup>	3 <sup>rd</sup>	5 <sup>th</sup>	7 <sup>th</sup>	Other Grades
<b>Normal</b>	17	58	55	56	21
<b>Obese</b>	422	775	1,001	873	233
<b>Overweight</b>	32	67	155	106	27
<b>Underweight</b>	1	4	4	1	2

\* Includes high schools, charter schools, and private schools and excludes incomplete data sources. **Source:** Texas Education Agency

The Risk Assessment for Type 2 Diabetes in Children is a legislatively mandated program developed, coordinated, and administered by The University of Texas-Pan American Border Health Office (BHO). The program assesses children who may be at high risk of developing Type 2 Diabetes. During vision/hearing and scoliosis screenings of 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, and 7<sup>th</sup> graders in public and private schools, certified individuals assess children for the acanthosis nigricans (AN) marker, a skin condition that signals high insulin levels. Children who are positively identified with the marker undergo additional assessments of body mass index (BMI), BMI percentile, and blood pressure. Referrals are issued to the parents of these children. They help alert each parent of what the risk factors are and what changes will be necessary to prevent or delay future health problems for children at risk of developing Type 2 Diabetes and other health conditions.

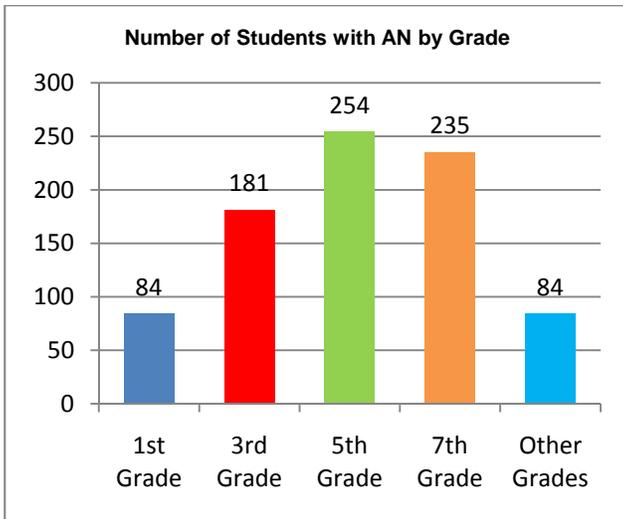
The following results are for the assessments conducted in your region:

**Demography**

Total Number of Students Assessed: **12,260**      Number of Students Referred: **791**      % of Students on Free and Reduced Lunch: **58.8%**  
 Total Number of Students with AN: **838**      Number of Students Seen Physician: **148**

**Acanthosis Nigricans**

Acanthosis nigricans (AN) is a skin condition that is frequently seen on the nape of the neck. It appears as a dark/black, rough, or velvety area on the surface of the skin. The AN marker is important because it most often signals high insulin levels circulating within the body. The AN marker is considered a risk factor in the development of Type 2 Diabetes.

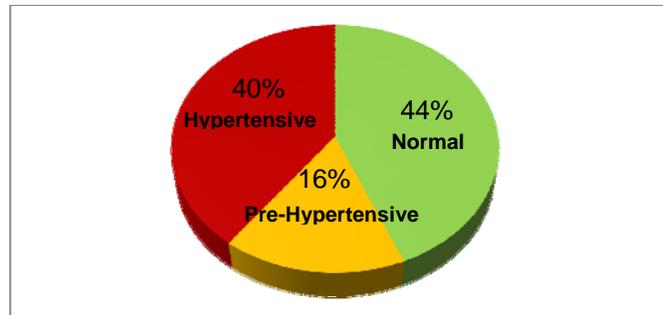


**Blood Pressure**

Hypertension has also been associated with insulin resistance and hyperinsulinemia, which is important for children with the AN marker. Elevated blood pressure in childhood correlates with hypertension in early adulthood, supporting the need to measure blood pressure in children.

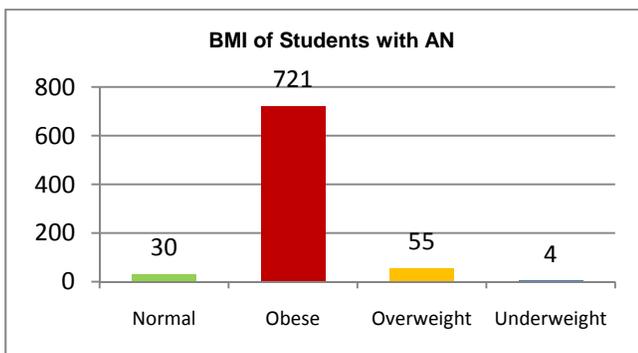
	1st	3rd	5th	7th	Other Grades	Female	Male
<b>Normal</b>	35	83	104	80	52	181	173
<b>Pre-Hypertensive</b>	15	21	47	41	10	77	57
<b>Hypertensive</b>	27	70	92	114	19	170	152

**Blood Pressure of Students With AN**



**Body Mass Index**

A high Body Mass Index (BMI) for age percentile is also considered a risk factor for the development of Type 2 Diabetes. BMI is calculated using the student's height and weight. The BMI percentiles are determined by the Center for Disease Control BMI for age percentile growth charts. The percentiles are separated into four categories: **Underweight**, **Normal**, **Overweight**, and **Obese**. In the development of Type 2 Diabetes, special emphasis is placed on the At-Risk of Overweight and Overweight categories.



	1 <sup>st</sup>	3 <sup>rd</sup>	5 <sup>th</sup>	7 <sup>th</sup>	Other Grades
<b>Normal</b>	1	5	11	4	9
<b>Obese</b>	72	159	209	214	67
<b>Overweight</b>	4	10	20	16	5
<b>Underweight</b>	0	0	3	1	0

\* Includes high schools, charter schools, and private schools and excludes incomplete data sources. **Source:** Texas Education Agency

The Risk Assessment for Type 2 Diabetes in Children is a legislatively mandated program developed, coordinated, and administered by The University of Texas-Pan American Border Health Office (BHO). The program assesses children who may be at high risk of developing Type 2 Diabetes. During vision/hearing and scoliosis screenings of 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, and 7<sup>th</sup> graders in public and private schools, certified individuals assess children for the acanthosis nigricans (AN) marker, a skin condition that signals high insulin levels. Children who are positively identified with the marker undergo additional assessments of body mass index (BMI), BMI percentile, and blood pressure. Referrals are issued to the parents of these children. They help alert each parent of what the risk factors are and what changes will be necessary to prevent or delay future health problems for children at risk of developing Type 2 Diabetes and other health conditions.

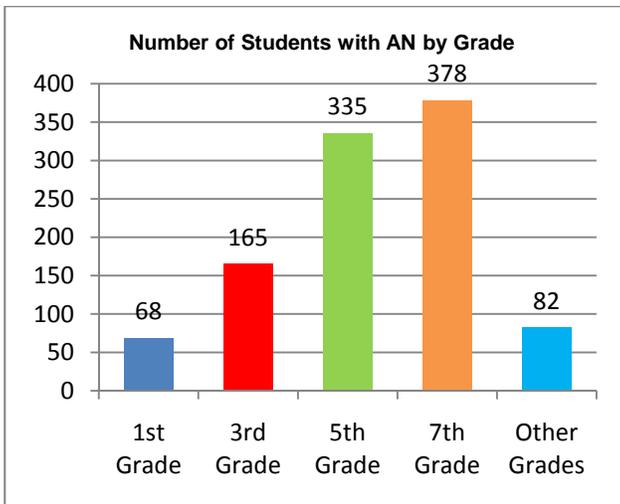
The following results are for the assessments conducted in your region:

**Demography**

Total Number of Students Assessed: **16,448**      Number of Students Referred: **803**      % of Students on Free and Reduced Lunch: **55.5%**  
 Total Number of Students with AN: **1,028**      Number of Students Seen Physician: **145**

**Acanthosis Nigricans**

Acanthosis nigricans (AN) is a skin condition that is frequently seen on the nape of the neck. It appears as a dark/black, rough, or velvety area on the surface of the skin. The AN marker is important because it most often signals high insulin levels circulating within the body. The AN marker is considered a risk factor in the development of Type 2 Diabetes.

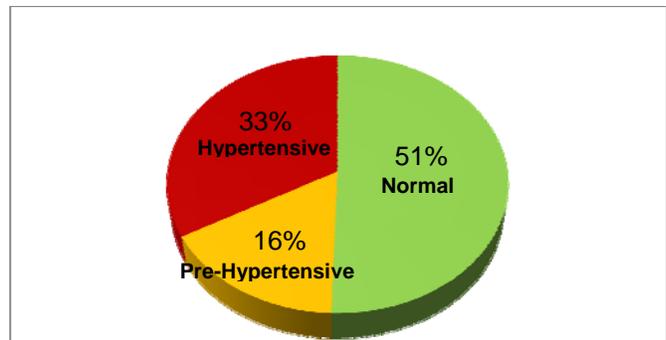


**Blood Pressure**

Hypertension has also been associated with insulin resistance and hyperinsulinemia, which is important for children with the AN marker. Elevated blood pressure in childhood correlates with hypertension in early adulthood, supporting the need to measure blood pressure in children.

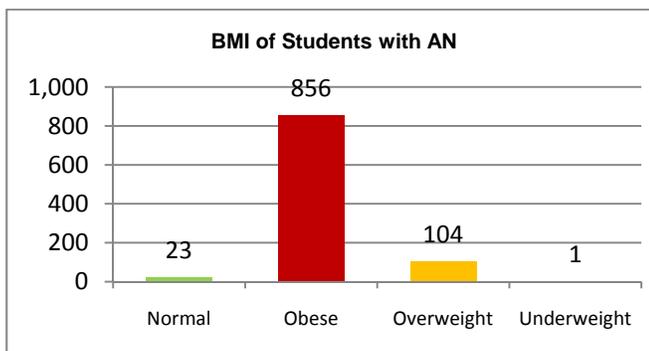
	1st	3rd	5th	7th	Other Grades	Female	Male
<b>Normal</b>	40	82	136	203	35	274	222
<b>Pre-Hypertensive</b>	9	29	74	43	6	88	73
<b>Hypertensive</b>	16	52	121	104	32	166	159

**Blood Pressure of Students With AN**



**Body Mass Index**

A high Body Mass Index (BMI) for age percentile is also considered a risk factor for the development of Type 2 Diabetes. BMI is calculated using the student's height and weight. The BMI percentiles are determined by the Center for Disease Control BMI for age percentile growth charts. The percentiles are separated into four categories: **Underweight**, **Normal**, **Overweight**, and **Obese**. In the development of Type 2 Diabetes, special emphasis is placed on the At-Risk of Overweight and Overweight categories.



	1 <sup>st</sup>	3 <sup>rd</sup>	5 <sup>th</sup>	7 <sup>th</sup>	Other Grades
<b>Normal</b>	3	1	5	9	5
<b>Obese</b>	60	152	296	289	59
<b>Overweight</b>	2	9	31	53	9
<b>Underweight</b>	0	1	0	0	0

\* Includes high schools, charter schools, and private schools and excludes incomplete data sources. **Source:** Texas Education Agency

The Risk Assessment for Type 2 Diabetes in Children is a legislatively mandated program developed, coordinated, and administered by The University of Texas-Pan American Border Health Office (BHO). The program assesses children who may be at high risk of developing Type 2 Diabetes. During vision/hearing and scoliosis screenings of 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, and 7<sup>th</sup> graders in public and private schools, certified individuals assess children for the acanthosis nigricans (AN) marker, a skin condition that signals high insulin levels. Children who are positively identified with the marker undergo additional assessments of body mass index (BMI), BMI percentile, and blood pressure. Referrals are issued to the parents of these children. They help alert each parent of what the risk factors are and what changes will be necessary to prevent or delay future health problems for children at risk of developing Type 2 Diabetes and other health conditions.

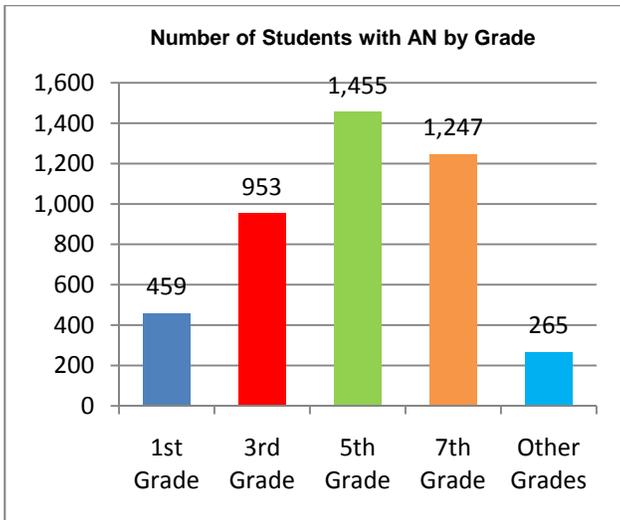
The following results are for the assessments conducted in your region:

**Demography**

Total Number of Students Assessed: **47,445**      Number of Students Referred: **3,712**      % of Students on Free and Reduced Lunch: **76.0%**  
 Total Number of Students with AN: **4,379**      Number of Students Seen Physician: **511**

**Acanthosis Nigricans**

Acanthosis nigricans (AN) is a skin condition that is frequently seen on the nape of the neck. It appears as a dark/black, rough, or velvety area on the surface of the skin. The AN marker is important because it most often signals high insulin levels circulating within the body. The AN marker is considered a risk factor in the development of Type 2 Diabetes.

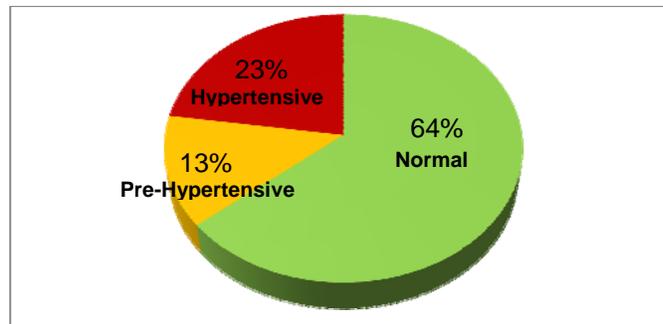


**Blood Pressure**

Hypertension has also been associated with insulin resistance and hyperinsulinemia, which is important for children with the AN marker. Elevated blood pressure in childhood correlates with hypertension in early adulthood, supporting the need to measure blood pressure in children.

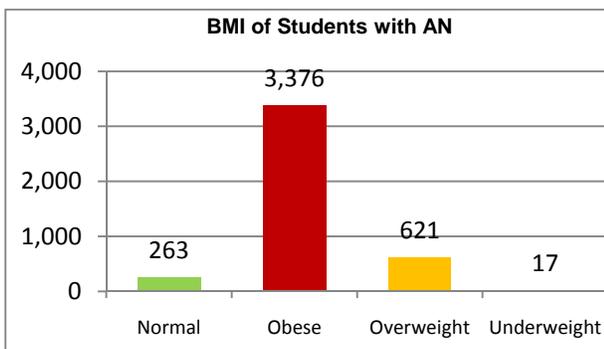
	1st	3rd	5th	7th	Other Grades	Female	Male
<b>Normal</b>	313	632	951	690	141	1,361	1,366
<b>Pre-Hypertensive</b>	37	112	212	174	33	281	287
<b>Hypertensive</b>	82	165	268	365	85	462	503

**Blood Pressure of Students With AN**



**Body Mass Index**

A high Body Mass Index (BMI) for age percentile is also considered a risk factor for the development of Type 2 Diabetes. BMI is calculated using the student's height and weight. The BMI percentiles are determined by the Center for Disease Control BMI for age percentile growth charts. The percentiles are separated into four categories: **Underweight**, **Normal**, **Overweight**, and **Obese**. In the development of Type 2 Diabetes, special emphasis is placed on the At-Risk of Overweight and Overweight categories.



	1 <sup>st</sup>	3 <sup>rd</sup>	5 <sup>th</sup>	7 <sup>th</sup>	Other Grades
<b>Normal</b>	20	42	92	98	11
<b>Obese</b>	383	759	1,101	903	230
<b>Overweight</b>	30	104	240	224	23
<b>Underweight</b>	2	5	1	8	1

\* Includes high schools, charter schools, and private schools and excludes incomplete data sources. **Source:** Texas Education Agency

The Risk Assessment for Type 2 Diabetes in Children is a legislatively mandated program developed, coordinated, and administered by The University of Texas-Pan American Border Health Office (BHO). The program assesses children who may be at high risk of developing Type 2 Diabetes. During vision/hearing and scoliosis screenings of 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, and 7<sup>th</sup> graders in public and private schools, certified individuals assess children for the acanthosis nigricans (AN) marker, a skin condition that signals high insulin levels. Children who are positively identified with the marker undergo additional assessments of body mass index (BMI), BMI percentile, and blood pressure. Referrals are issued to the parents of these children. They help alert each parent of what the risk factors are and what changes will be necessary to prevent or delay future health problems for children at risk of developing Type 2 Diabetes and other health conditions.

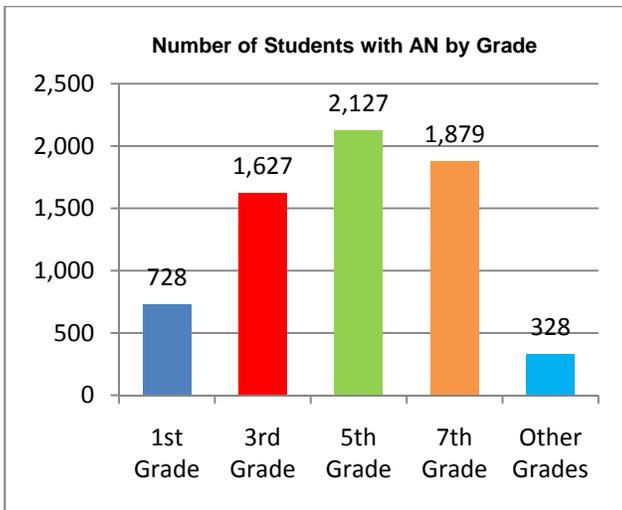
The following results are for the assessments conducted in your region:

**Demography**

Total Number of Students Assessed: **92,674**      Number of Students Referred: **5,247**      % of Students on Free and Reduced Lunch: **62.8%**  
 Total Number of Students with AN: **6,689**      Number of Students Seen Physician: **832**

**Acanthosis Nigricans**

Acanthosis nigricans (AN) is a skin condition that is frequently seen on the nape of the neck. It appears as a dark/black, rough, or velvety area on the surface of the skin. The AN marker is important because it most often signals high insulin levels circulating within the body. The AN marker is considered a risk factor in the development of Type 2 Diabetes.

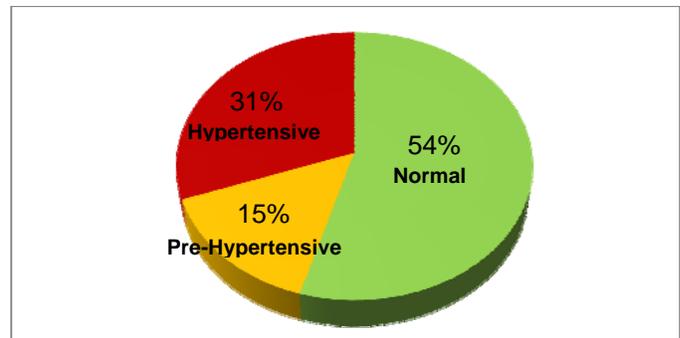


**Blood Pressure**

Hypertension has also been associated with insulin resistance and hyperinsulinemia, which is important for children with the AN marker. Elevated blood pressure in childhood correlates with hypertension in early adulthood, supporting the need to measure blood pressure in children.

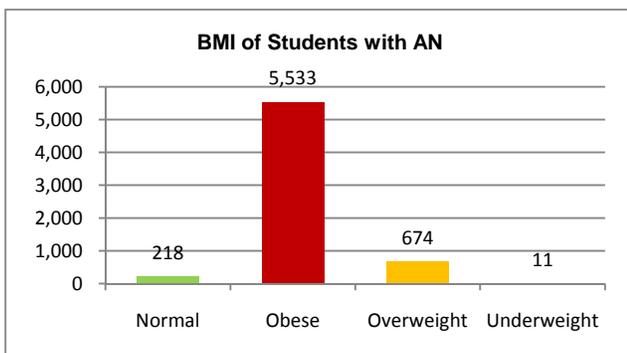
	1st	3rd	5th	7th	Other Grades	Female	Male
<b>Normal</b>	456	932	1,073	869	171	1,905	1,596
<b>Pre-Hypertensive</b>	88	240	328	269	36	481	480
<b>Hypertensive</b>	165	435	638	612	110	968	992

**Blood Pressure of Students With AN**



**Body Mass Index**

A high Body Mass Index (BMI) for age percentile is also considered a risk factor for the development of Type 2 Diabetes. BMI is calculated using the student's height and weight. The BMI percentiles are determined by the Center for Disease Control BMI for age percentile growth charts. The percentiles are separated into four categories: **Underweight**, **Normal**, **Overweight**, and **Obese**. In the development of Type 2 Diabetes, special emphasis is placed on the At-Risk of Overweight and Overweight categories.



	1 <sup>st</sup>	3 <sup>rd</sup>	5 <sup>th</sup>	7 <sup>th</sup>	Other Grades
<b>Normal</b>	26	39	67	72	14
<b>Obese</b>	642	1,428	1,751	1,445	267
<b>Overweight</b>	38	139	231	230	36
<b>Underweight</b>	3	2	1	4	1

\* Includes high schools, charter schools, and private schools and excludes incomplete data sources. **Source:** Texas Education Agency