

# ANTES

Acanthosis Nigricans: The Education and Screening Program

## A REPORT TO THE GOVERNOR AND 79TH LEGISLATURE OF THE STATE OF TEXAS



IN FULFILLMENT OF HOUSE BILL 2721  
OF THE 78TH LEGISLATURE



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

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## ACKNOWLEDGEMENTS

The University of Texas-Pan American Border Health Office appreciates the efforts and contributions of everyone involved with the ANTES program, but a special thanks is extended to those who truly make this initiative work - the School Nurse. We do consider ourselves fortunate to have partnered with school nurses in this effort to reduce the health problems that they witness first-hand on a day-to-day basis. Through our partnership, we have come to understand the numerous responsibilities that they carry...and they consistently perform above and beyond. Despite their burdened work day, they always cooperate with what is being asked from them. To the school nurses in ESC's 1, 2, 3, 4, 10, 11, 13, 15, 18, 19, and 20...the State of Texas and the UTPA Border Health Office is indebted to you...THANK YOU!

We would also like to take this opportunity to recognize three individuals who were instrumental in the making of this program...



Former District 41 State Representative Roberto Gutierrez D-McAllen is a true champion of children's health as he authored legislation (HB 1860 - 76th Texas Legislature; HB 2989 - 77th Texas Legislature; HB2721 - 78th Texas Legislature) to conduct AN screenings throughout the State of Texas. Through his vision, the ANTES program now screens over 700,000 school children in 11 Educational Center Service Regions.



Dr. Paul Villas, who served as the Executive Director of the UTPA Border Health Office from 1994 to 2004, provided leadership and guidance to the program from its infancy to the end of his tenure with the Office. Dr. Villas was the catalyst for coalescing the movement towards Type 2 diabetes risk assessment in Texas schools.



Dr. Stephen Ponder is a board certified pediatrician and pediatric endocrinologist with 37 years of personal experience with Type 1 diabetes. Dr. Stephen W. Ponder is also a Professor of Pediatrics, Texas A&M University College of Medicine, and Director of Diabetes & Endocrine Center at Driscoll Children's Hospital in Corpus Christi, Texas. Dr. Ponder has served as the Medical Director of the ANTES program since its inception in 1999. His professional experience in treating children with Type 2 diabetes and metabolic syndrome in South Texas is unparalleled. He has provided the ANTES program with guidance and has served as the program liaison between the professional medical community.

We would also like to thank The University of Texas-Pan American, President Dr. Blandina Cárdenas, and Provost Dr. Rodolfo Arévalo for their continuing support of the program.

Finally, we would like to thank the UTPA Border Health Office staff for embracing the program with strength, endurance, humility, and perseverance.

## EXECUTIVE SUMMARY

In 1999, the 76th Texas Legislature took a bold first step in preventing the problems of Type 2 diabetes and other obesity-related conditions can create in children by charging The University of Texas-Pan American Border Health Office to develop a program where children, during school vision/hearing and scoliosis screening, would be screened for Acanthosis Nigricans, a marker that is considered the hallmark of insulin resistance. Now, five years and two mandates later, the Acanthosis Nigricans: The Education and Screening (ANTES) program screens over 700,000 children and is active in over three-fourths of the state.

As the issue of obesity in school children gathers national attention, the call for risk factor assessment programs to identify at-risk children, like the ANTES program, are gaining support. The ANTES Program, however, is not just a data collection program that provides snapshots of the severity of the problem, whether it is high Body Mass Index (BMI), elevated blood pressures, or percentages of children with Acanthosis Nigricans. The ultimate purpose of the ANTES program is to identify those children who are at highest risk to develop Type 2 diabetes or other conditions and to make these risk factors known to parents, educate them on what the risk factors mean, and provide them with the opportunity to seek additional health evaluation.

Information on the health status of children is found in the following pages, including the number of children screened for AN, those who were AN positive, and the additional measures BMI, degree of overweight and blood pressure for those children. Although the information is not organized to show degrees of statistical power, the frequencies provided should be nonetheless extremely compelling.

The ANTES Program makes the following recommendations:

- 1) Restructure the ANTES program to have Body Mass Index (BMI) as the primary screening tool to identify children who may be at-risk of developing Type 2 diabetes and determine the degree of overweight.
- 2) Assess children who have a body mass index in the 85%-ile and higher for the additional risk factors of Acanthosis Nigricans and blood pressure.
- 3) Expand the use of the ANTES Risk Factor Electronic System (RFES) to assist with the interpretation of the assessments and provide school health referrals.
- 4) Refer children who are identified with these risk factors to seek additional health evaluation.
- 5) Collect the outcomes of the referrals.
- 6) Make accessible ANTES aggregate data for researchers and government agencies.
- 7) Continue training, certifying, and providing technical assistance to school nurses in the current Education Service Center (ESCs) Regions where the ANTES program is mandated (Regions 1, 2, 3, 4, 10, 11, 13, 15, 18, 19, and 20)



## INTRODUCTION

### Personal Profile: Kimberly Chavez



Maria Chavez with daughter Kimberly, age 9.

In 1999, a new approach against childhood high insulin levels, Type 2 diabetes and other resulting health consequences was mounted in Texas by The University of Texas-Pan American Border Health Office (UTPA BHO). This was made possible with resources provided by the 76th Texas Legislature through House Bill 1860 that required school children from two Regional Education Service Centers to be screened for Acanthosis Nigricans. By focusing on Acanthosis Nigricans, or AN, a skin condition that is directly linked with hyperinsulinemia, much can be done to prevent chronic health conditions that begin in childhood.

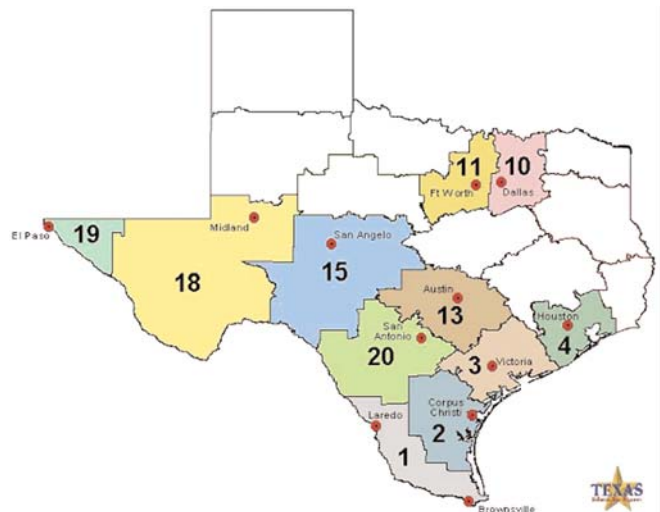
*"I noticed dark skin markers in Kimberly's body but I did not pay too much attention because I thought she had some type of allergies. One day she brought home a referral letter from the school nurse letting me know that Kimberly had **Acanthosis Nigricans** that meant high insulin levels and could lead to develop Type 2 Diabetes. Since Kimberly's grandmother has battled with diabetes for 15 years, I did not hesitate to take Kimberly to a physician for a check up. A medical examination was done and the results scared me even more-- Kimberly was **borderline diabetic**. She had the acanthosis marker and was overweight; the medical recommendations were that Kimberly has to be more physically active in order to lose weight and start eating healthier meals and snacks. I couldn't believe that was it-- Eat healthy and exercise! I felt guilty because I'm the one who buys the groceries and because I'm always working and don't do anything fun and active with Kimberly. Thanks to programs like the **ANTES**, Kimberly and I were able to educate ourselves on this condition and also learn about proper nutrition and the importance of exercise. With the assistance of nutritional counseling, Kimberly was able to lose 5 pounds in three weeks (from 121 lbs. to 116 lbs.). When we followed up with her physician, she congratulated us for bringing down Kimberly's weight. I appreciate the great efforts the government is doing to help our children to live a healthy and longer life."*

**Maria Chavez**  
Pharr, Texas



Acanthosis Nigricans (AN) is a skin condition that causes light brown-black, velvety, rough or thickened areas on the surface of the skin. It signals high insulin levels in the body of one who is at risk for Type 2 diabetes. During vision/hearing and scoliosis screenings, school nurses identify children with AN and refer these children to health professionals for further evaluation.

Currently, the Acanthosis Nigricans: The Education and Screening Program (ANTES) under authority of HB 2989 (77th Texas Legislature) and HB 2721 (78th Texas Legislature), is active in 11 Regional Educational Service Centers and screens over 700,000 students.



## THE SCHOOL NURSE

School nurses are truly the backbone of the ANTES project. Despite the screenings being a legislative mandate, the State of Texas is indebted to the school nurses who are most often too eager to conduct the screenings, as they are witnesses of the increase in the prevalence of overweight in school children.

School nurses conduct the AN screenings during vision/hearing and scoliosis screenings. Once a child is positively identified with the AN marker, the nurse conducts additional assessments. The school nurse takes the child's height and weight to determine body mass index (BMI), determines the degree of overweight in the child as prescribed by the Centers for Disease Control and Prevention guidelines, and performs two blood pressure measures, which are averaged and interpreted as elevated, high-normal, or normal as recommended by the National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents.

School nurses issue medical referrals to AN positive students, which includes the results from the other assessments performed. The referral contains an explanation of AN and recommends that parents seek further evaluation from their health care provider. The health care provider evaluates the children and makes recommendations. The health care provider may also refer children to a dietician for nutritional counseling.

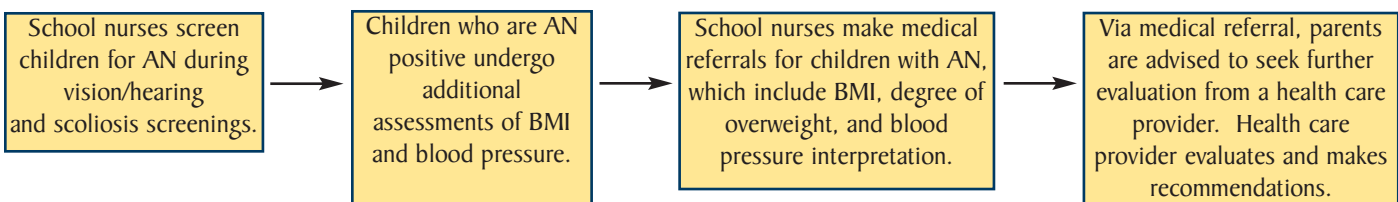
*"As a school nurse who has done all the different types of state-mandated screenings on 10 years' worth of elementary students, I feel that the AN screening program is very valuable. First, the screening is quick to perform. An entire classroom can be checked in 15-20 minutes with only a ruler and good lighting. No expensive equipment or special location is required. The students do not have to learn to perform any procedures to be tested and do not have to undress (Of course, if blood pressures, heights, and weights are being checked, that is additional time, but the actual check for AN is very fast. Second, the screening is easy for screeners to learn. I am an instructor for training AN screeners as well as spinal screeners, and the training to teach people how to screen for AN only takes half as long as that for spinal. Third, screening for AN finds a large number of people at risk for a condition that could cause them significant health problems later in life. Compared to future diagnoses of spinal deformity, a diagnosis of diabetes has much broader negative implications for an individual in terms of body systems affected, quality of life, and cost of health care. And at least among our Hispanic population, diabetes is MUCH more common than significant diagnoses of spinal deformity. It could be argued that not many parents follow through with medical referrals and then with following recommendations, but is that a reason for us not to do the screening? The same happens when referrals are made for vision, hearing, and spinal, but we continue to do what we can. I feel that screening for AN as a risk factor is perhaps a small but important part of the solution for the epidemic problems in our society of obesity and lack of exercise."*

**Julia Soper, RN, MSN**  
Director of Health Services  
Pharr-San Juan-Alamo ISD  
San Juan, Texas

### Personal Profile: Julia Soper, RN, MSN



## The ANTES Screening Process





## THE SCHOOL NURSE

The University of Texas-Pan American Border Health Office has provided training and certification to over 5,000 school nurses throughout the 11 mandated Regional Education Service Centers . Requests for trainings, materials, or technical support are provided by the Border Health Office's health education coordinators at a school nurse's request. Also, through collaboration with The University of Texas Health Science Center-Houston School of Nursing, school nurses are awarded 3.1 Type I Continuing Education Credits with every certification training. Establishing a perennial presence and providing customer service is pertinent to the success of the program and the UTPA BHO recognizes that garnering school nurse trust and support is a priority. These are few comments about what some school nurses have to say about the ANTES program:

*"I am amazed at the number of students that have this [Acanthosis Nigricans marker]. I think this is a wonderful service that we are providing our students with. Thank you for the education that we as nurses got from you."*

**Billye Pawlik**  
Clear Creek ISD  
Houston, TX

*"A JR. High student came in [nurse's office] feeling dizzy and fainted. The nurse found a level 3 AN marker. She referred her to a doctor with symptoms and for AN findings. Doctor did appropriate testing and diagnosed the girl with type 2 diabetes. Mom was very grateful....we have had several positive stories and responses from parents and physicians."*

**Sandra (Sandy) Rivers**  
Supervisor of Health Services  
Arlington ISD  
Arlington, TX

*"I already have one student who was referred [for Acanthosis Nigricans] and is under the care of a physician and being treated for Type 2 diabetes. This student's marker is lighter and the student has lost weight... I have identified two more students and referred them too....both sets of parents were appreciative and responsive...I fully expect to find more students and refer them."*

**C. Chisholm**  
Mathis High School Nurse  
Mathis, TX

*"I'd like to request [AN] brochures....I have identified 20 students (3rd. and 5th graders) already. I am surprised at their elevated blood pressures!"*

**S. Hughes, RN**  
DeZavala Elementary  
Baytown, TX

*"Yesterday, I screened 8 mothers for Acanthosis Nigricans, out of the 8, 7 were positives...also students passing by the ANTES poster in the hall on their way to the cafeteria ask me to screen them...the parents and students are getting involved...I'm hoping they will take action and seek medical treatment..."*

**Martha C. Blocker, RN**  
J. Castro Elementary  
Mission, TX

*"Hi! I'm the nurse from Missouri City that called you Monday requesting more ANTES brochures. If you could send me even just a dozen, it would be really helpful. The color pictures have a much greater impact than our verbal description! I want to thank you for all your efforts getting this massive program together. I find that the program has been really helpful to us in having a stronger voice when we talk with parents who know fully well that their child has a weight control issue. We are all taking a closer look at our students, **and no longer can we let our concerns fall on deaf ears**. Unfortunately, I too have picked up students in kindergarten and 1st grade who fit the model, but at least we have some time over the years to partner with the parents and physicians and have a greater impact on the child's growth and development. I have one parent whose 2 children (both positive for AN) went home to check HER neck, and sure enough, she, too, has a grade 2 mark. With a family history of diabetes, the doctor has them all under observation and weight control counseling! Thanks!"*

**Joanne Meyer, R.N.,B.S.N.,M.Ed.,N.C.S.N.**  
School Nurse  
Lantern Lane Elementary School

*"The ANTES program has increased awareness of what the AN marker means in our school and community population. Screening all school children for AN is important and I believe that the earlier it is detected and medically evaluated, the sooner affected children can be treated. I hope through earlier detection, treatment, and lifestyle changes that the devastating diseases related to AN can be prevented. This will only occur through a standardized ANTES program for comprehensive assessment, evaluation, and treatment. In my School Nurse Office, I have a large, eye-catching ANTES poster(with colorful pictures). This really grabs my visitors attention when they walk in and I have found this to be a real conversation starter about AN and I have been able to raise many parents/school visitors awareness of just what 'that dark mark' means. Thank you for the ANTES program and all the good work you do."*

**Denise A. Zbozny,RN, CCRN**  
School Nurse  
Point Isabel ISD  
Port Isabel, TX

## ASSESSMENTS - ACANTHOSIS NIGRICANS (AN)

The increasing number of youth-onset Type 2 diabetes cases has heightened new interest in children's health, particularly in cases where acanthosis nigricans has been present at the time of diagnosis. Acanthosis nigricans is considered the hallmark for insulin resistance. Acanthosis nigricans, a hyperkeratinization of the skin, is a cutaneous marker associated with hyperinsulinemia and insulin resistance and serves as 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 screenings are important and can help identify children with high insulin levels who may be at-risk for developing Type 2 diabetes or other problems of the metabolic syndrome. The American Diabetes Association recognizes AN as a risk factor in the development of Type 2 diabetes.

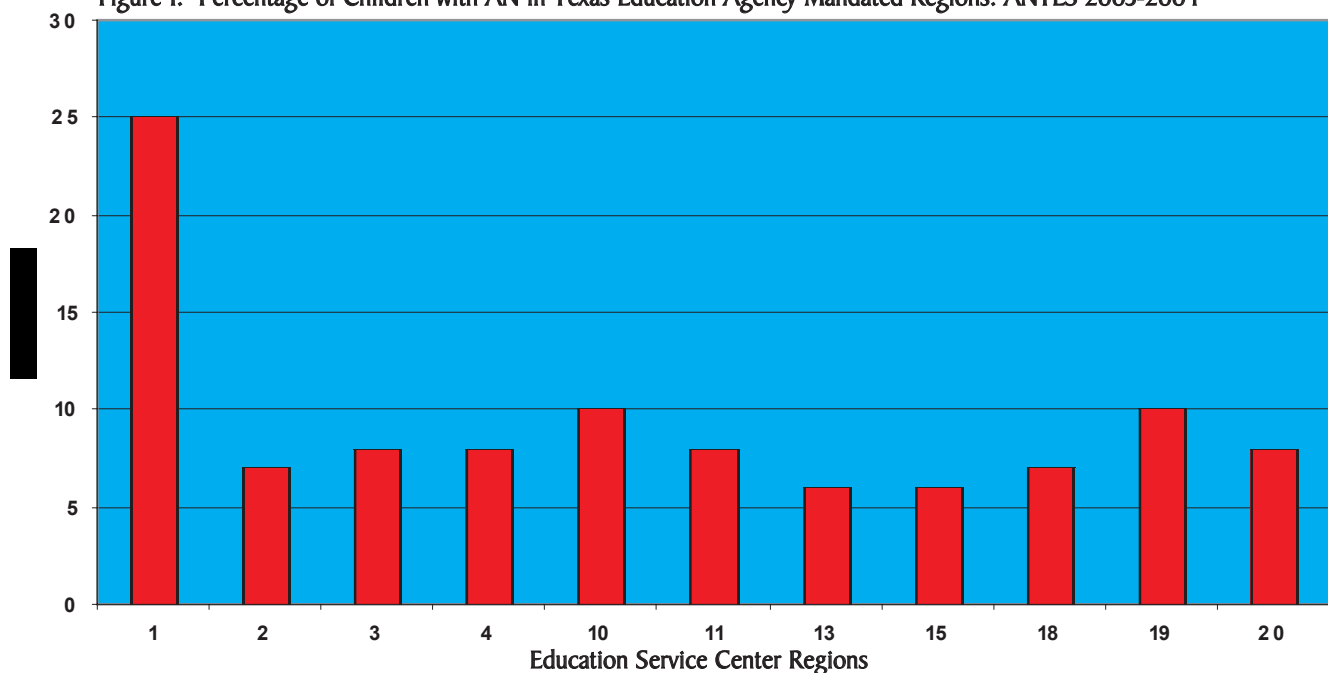
During vision/hearing and scoliosis screenings, school nurses identify children with AN. The following table provides the number of children screened and the number of children with acanthosis nigricans by Texas Education Agency Educational Service Center Regions during the 2003-2004 school year:

**Table 1. Total number of children screened and total number with AN positive by TEA Region - ANTES 2003/2004**

Regions	Total Number of Children Screened	Total Number of Children with AN
Region 1 (Rio Grande Valley/Laredo Area)	49,717	12,663
Region 2 (Corpus Christi Area)	13,541	942
Region 3 (Victoria Area)	10,382	828
Region 4 (Houston Area) (*)	87,218	6,806
Region 10 (Dallas Area) (*)	21,965	2,260
Region 11 (Fort Worth Area) (*)	64,721	5,288
Region 13 (Austin Area)	38,859	2,249
Region 15 (San Angelo Area)	5,801	362
Region 18 (Midland Area)	10,241	690
Region 19 (El Paso Area)	26,005	2,708
Region 20 (San Antonio Area)	56,490	4,451
<b>Total</b>	<b>384,940</b>	<b>39,247</b>

\* Due to scheduling conflicts, some school districts did not conduct AN screenings

**Figure 1. Percentage of Children with AN in Texas Education Agency Mandated Regions. ANTES 2003-2004**



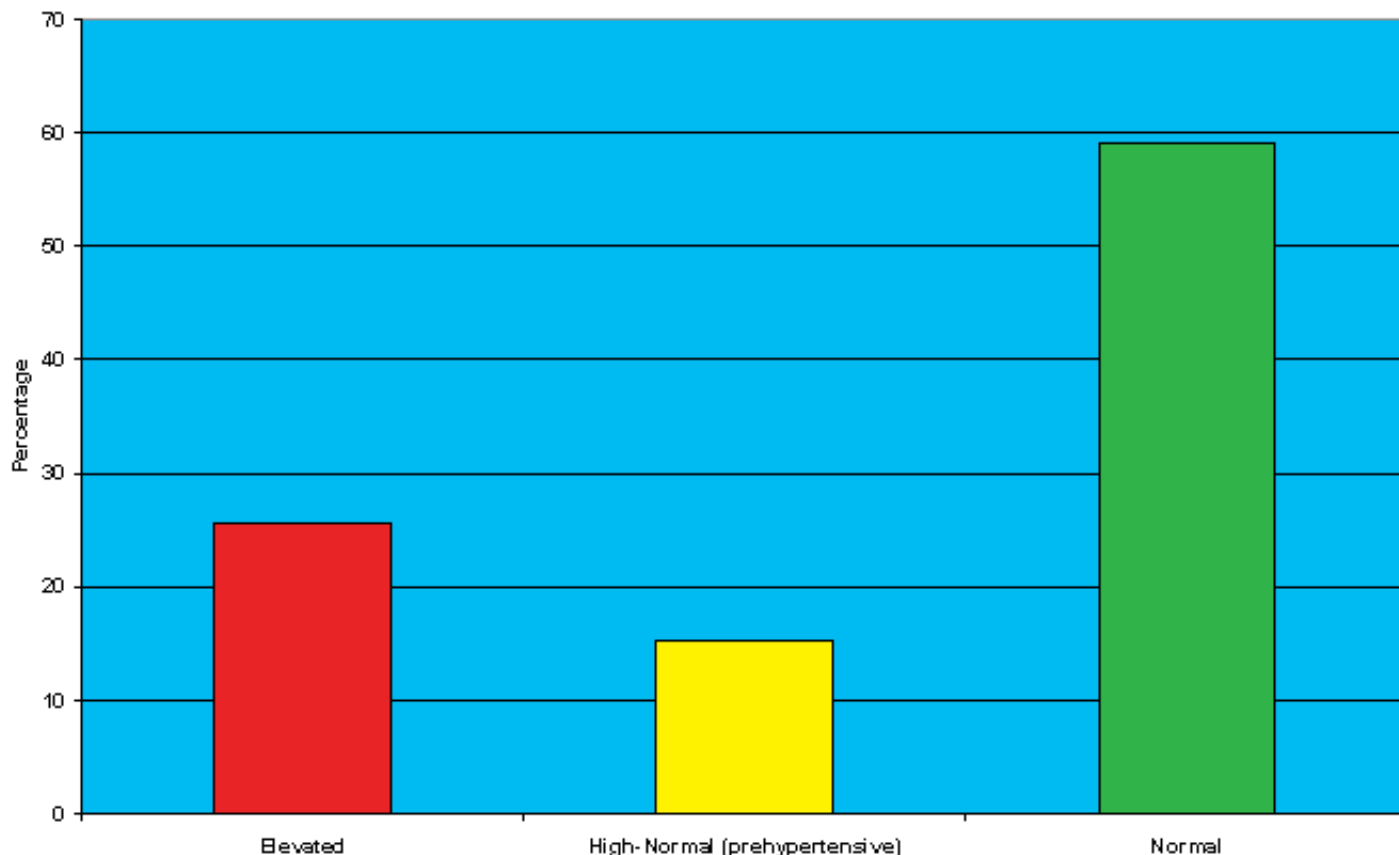
## ASSESSMENTS - BLOOD PRESSURE

Hypertension increases the risk for cardiovascular disease and is a complication of obesity. Hypertension has also been associated with insulin resistance and hyperinsulinemia, which results in acanthosis nigricans. Elevated blood pressure in childhood correlates with hypertension in early adulthood, supporting the need to track blood pressure in children.

School nurses perform blood pressure measurements on children who test positive with AN. When school nurses are trained to conduct AN screenings, they are also informed of the proper procedure for assessing blood pressure measures in children as recommended by the National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. School nurses are instructed to perform two blood pressure measures on the child's right arm in a controlled environment, giving three to five minutes of rest in between each reading.

The blood pressure categories are identified as **elevated**, **high-normal**, or **normal**. Recently, these categories have been changed by the National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents to read as **possible hypertension**, **prehypertension**, and **normal**. Interpreting blood pressure in children, as opposed to adult blood pressures, is a complex process as a child's age, sex, and height-percentile are needed to read the the averaged systolic and diastolic measure taken by the school nurses. This process is simplified by the ANTES Risk Factor Electronic System (RFES) which takes the raw blood pressures and interprets them instantly. Figure 2 represents the percentage of children with AN who had elevated, high-normal, or normal blood pressures.

Figure 2. Percentage of Elevated, High-Normal, and Normal Blood Pressure Readings in Children with AN, ANTES 2003-2004



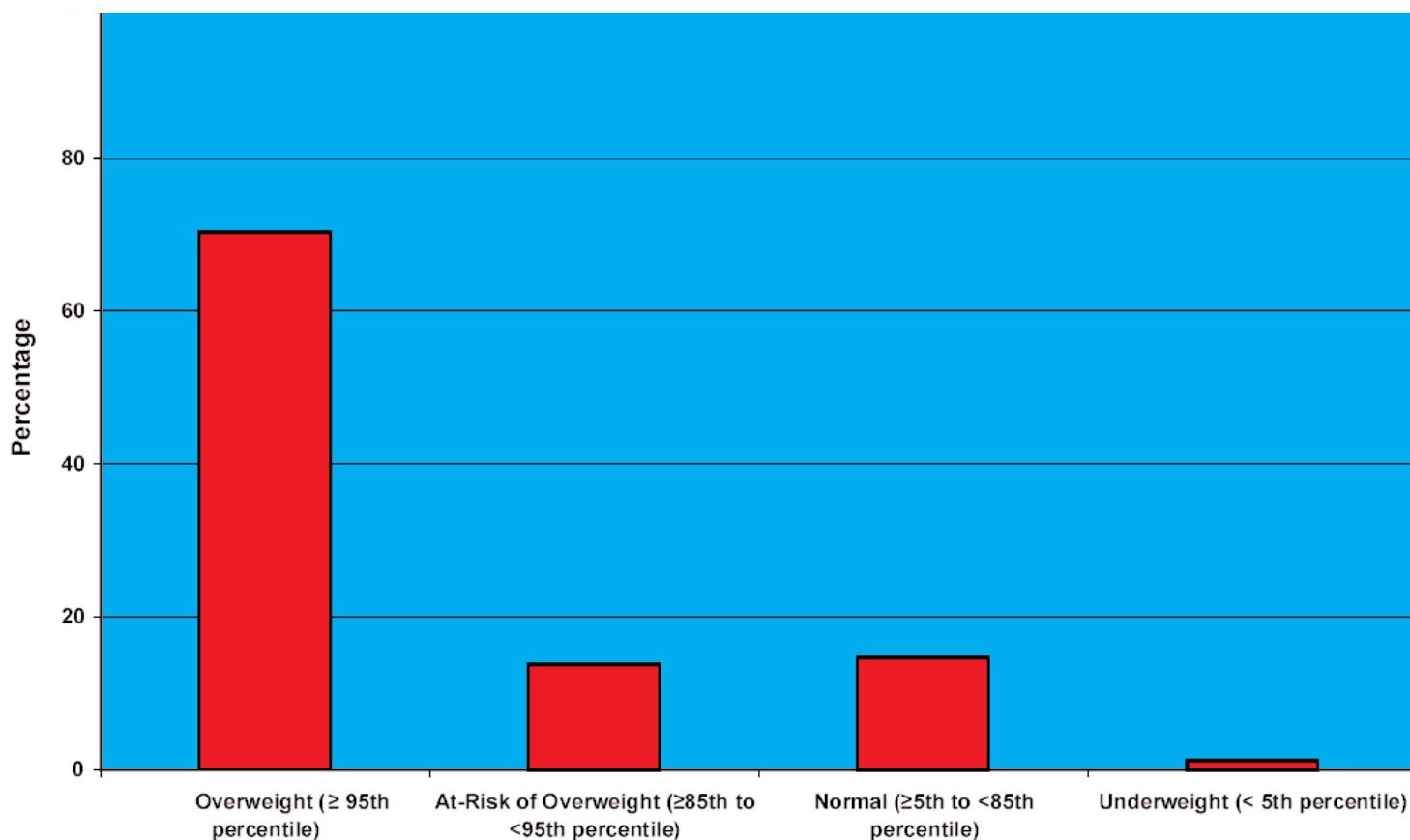
## ASSESSMENTS - BODY MASS INDEX (BMI)

Since the ANTES project focused on acanthosis nigricans and children who are at high risk of developing Type 2 diabetes, understanding complications associated with obesity is also important. Obesity has rapidly become a major health concern since its prevalence has increased dramatically worldwide and it has been linked with an increase in the incidence of Type 2 diabetes, cardiovascular disease, hypertension, stroke and other physical, physiological and even psychological complications. Obesity is also a major cause of mortality in the United States, with substantial increases in morbidity and impairing quality of life.

Childhood obesity is now occurring in epidemic proportions as suggested by the recent increase in the incidence of Type 2 diabetes cases. It is estimated that 60% of obese children aged 5-10 have at least one risk factor for cardiovascular disease, while 25% of these children have two or more. In addition, childhood obesity has also been associated with decreased levels of self-esteem, higher rates of sadness, loneliness, and nervousness and an inclination to engage in high-risk behaviors.

With the assistance of the ANTES RFES, BMI was interpreted on children with AN. Overweight in children was determined using the revised National Center for Health Statistics growth charts to determine the degree of the child's overweight. 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. Figure 3 shows the percent degree of overweight in children with AN.

Figure 3. Percent Degree of Overweight in Children with AN - ANTES 2003-2004



## ANTES PROGRAM - OUTCOMES



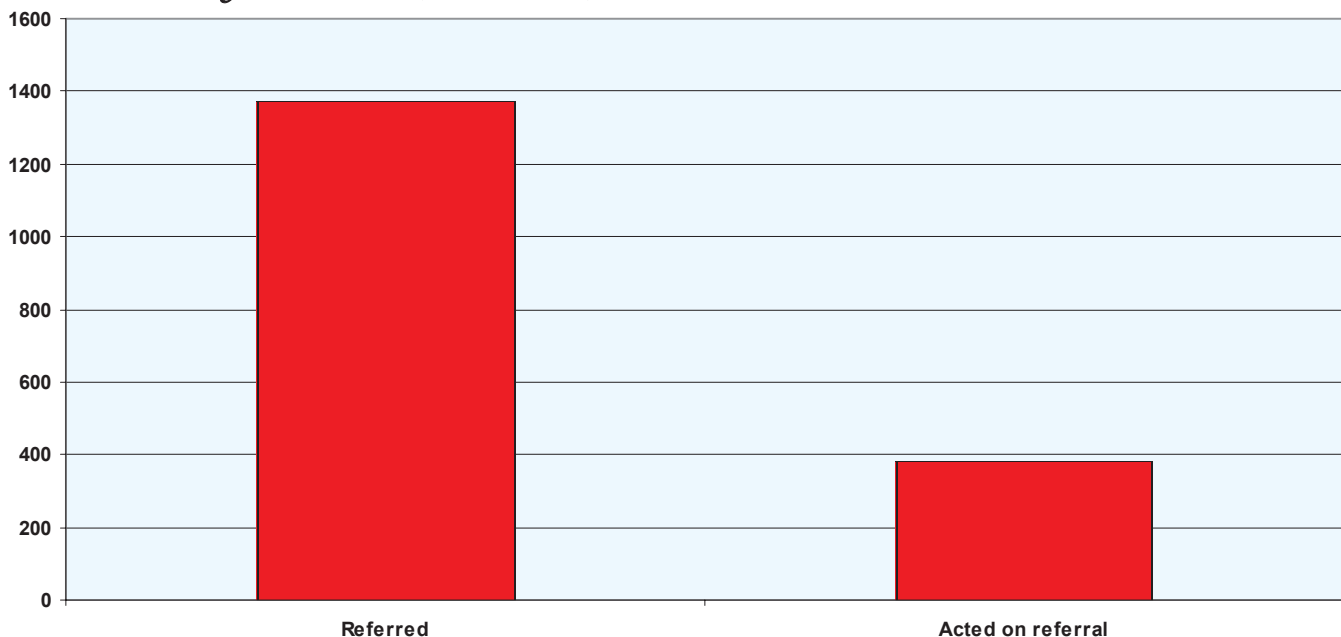
Sandra Cervantes with daughter Sandy, age 13.

*"I attend Mary Hoge Middle School and I discovered I had the (AN) marker when I went for a physical for sports. Dr. Juan Aguilera saw the marker and told me what it meant. He said I needed to live a healthier life. He sent me to Pat Lopez (dietitian) and I have been seeing her for a month. When I first saw her, I weighed 153 pounds. So far, I have **lost 10 pounds**. I went from a **size 9** to a **size 7**. Since I am in sports, it has helped me lose weight and also helps me drink lots of water. I also exercise with my Mom. We walk at the park and do alot of dancing. At first, I did not enjoy doing it, but I think it is fun now. I am more energetic and feel healthier than I've ever been. For this Thanksgiving, I will be sure to eat smaller portions to maintain my weight."*

**Sandy Cervantes**  
Weslaco, Texas

The ultimate purpose of the ANTES program is not only to identify those children who are at highest risk to develop Type 2 diabetes or other conditions, but more importantly to make these risk factors known to parents, educate them on what the risk factors mean, and provide them with the opportunity to seek action. Although the ANTES program does not require school nurses to report the outcome of the referrals, the question of whether the children are seeking medical attention is important. The UTPA Border Health Office recently requested for certain school districts to provide a report of those children who were referred and asked whether the children had sought the help of a health care provider and what recommendations were made. School nurses tracked the outcomes of 1370 students who were referred for AN. A total of 28 percent of the students referred for AN sought the assistance of a health care professional. The recommendations made by the health care professionals mainly involved performing labwork and instructing the child to engage in a healthy lifestyle through proper nutrition and exercise.

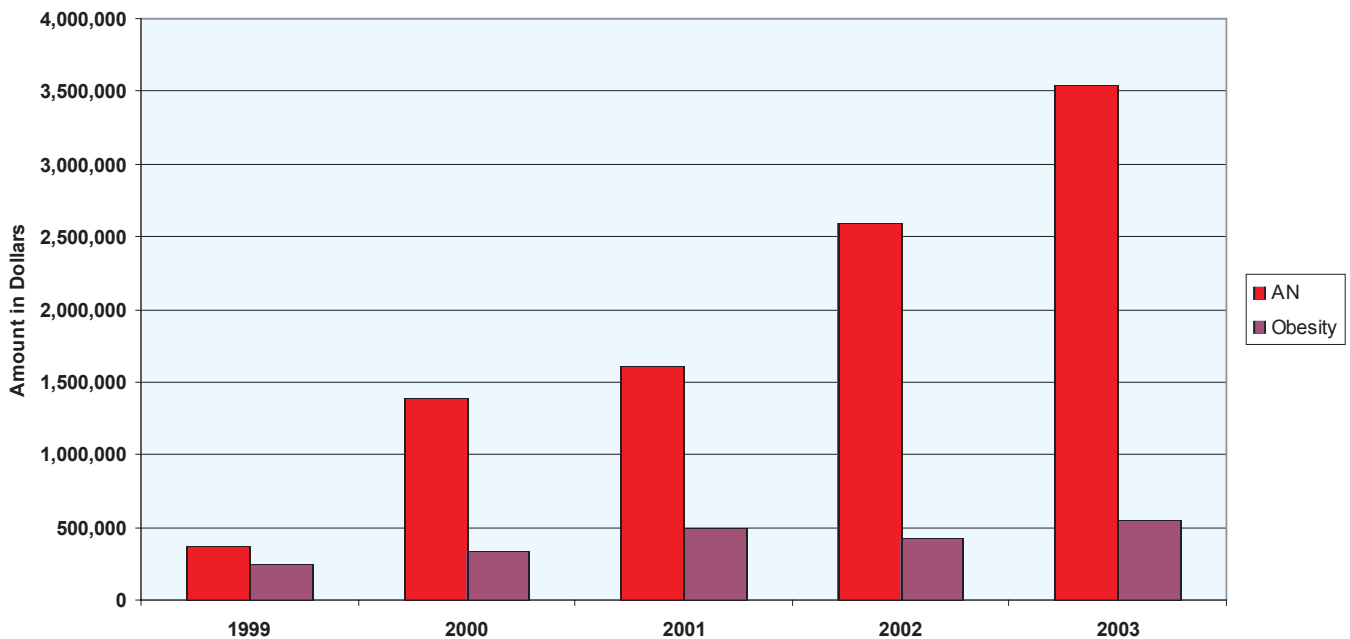
**Figure 4. Number of AN referrals and number of those who sought the assistance of a Health Care Professional - ANTES Program 2003-2004 - (selected schools)**



## ANTES PROGRAM - OUTCOMES

Physicians are vital in the referral of an AN positive child by understanding the risk assessments to ensure that the child receives the proper recommendations. Physician education has been important to the ANTES program. Much effort has been placed in making sure that physicians receive the proper reimbursement for services rendered. Therefore, since the inception of the program, it was imperative to inform physicians that visits with AN positive children may be reimbursed with CPT Code 701.2 Acquired Acanthosis Nigricans. The following graph depicts the number of referrals made using this code from the program's inception in 1999 to 2004.

Figure 5. Acanthosis Nigricans/Obesity - 1999-2003 Paid Amount



Source: AHQP Claims Universe, TMHP

Prepared by: Research, Planning and Evaluation (Monica Smoot), Texas Health and Human Services Commission



## THE ANTES RISK-FACTOR ELECTRONIC SYSTEM (RFES)

In 2003, The University of Texas-Pan American Border Health Office and The University of Texas-Pan American Computer Information Technology Center (CITeC) collaborated to create a secure web-based electronic information system that would assist school nurses to fulfill the requirements of the ANTES program. The system was developed to provide school nurses with a faster, easier, and organized way to input information and obtain results and to strengthen the assessment of the AN positive children.

The capabilities of the system allows users to enter information such as age, gender, height, weight, and blood pressure and allows for the interpretation of the variables. Although the ANTES program is charged for screening children during vision/hearing and scoliosis screenings in II Educational Service Center Regions, the Risk Factor Electronic System has the capacity to enter information on every student, Pre-K to 12th grade, in all of Texas' 20 Educational Service Center Regions for the next 10 years. The following screenshots are accompanied with descriptions of the RFES capabilities.

The ANTES RFES was created to provide school nurses with a faster, easier, and organized way to input information and to strengthen the assessments of children with Acanthosis Nigricans by providing interpretations of a child's Body Mass Index and blood pressures. The importance of these interpretations are great as they differ from adult standards and manual calculation and interpretation is difficult and time consuming. The RFES is capable of plotting and printing individual growth charts and referral forms with assessments for every child entered in the system.

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**Introduction**

The rising incidence of childhood obesity, type 2 diabetes and cardiovascular related diseases has been reported in recent years around the world. In the United States, public health officials agree that childhood obesity has become an epidemic and are equally concerned about the unprecedented rise in youth-onset type 2 diabetes cases. The fact that Texas has a large proportion of persons who are at risk for cardiovascular disease and type 2 diabetes makes screening of children and youth for the underlying causes of said conditions an important prevention and intervention tool.

**What is Acanthosis Nigricans?**

Acanthosis nigricans is associated with systemic disorders such as hyperinsulinemia and insulin-resistance and can be easily evaluated by means of a visual examination. Acanthosis nigricans is a light brown-black, velvety, furrowed, rough or thickened manifestation on the surface areas of the skin. The pigmentation is most frequently seen on the back of the neck, but can also be seen in armpits, over the knuckles, elbows, knees, inner thighs, and skin folds in the abdomen and back. In most cases, the acanthosis nigricans manifestations may appear like dirty skin.

**What other health conditions are related to hyperinsulinemia and insulin-resistance?**

Acanthosis nigricans is a powerful tool for identifying persons with insulin -resistance. Cardiovascular problems, obesity, high blood pressure, increased cholesterol and triglycerides, and obstructive sleep apnea are also related to hyperinsulinemia.

**Why is screening for acanthosis nigricans important?**

Acanthosis nigricans screenings offer important and immediate information by identifying persons who have high insulin levels and are at risk for developing type 2 diabetes. Once identified, the necessary measures can be taken to lower insulin levels and reduce the risk of developing diabetes. Exercise and proper nutrition will help sensitize the body to insulin and lower insulin levels. Similarly, the acanthosis nigricans markers should begin to fade.

**What does the acronym ANTES mean?**

The acronym ANTES means "before" in Spanish which also defines purpose. It stands for Acanthosis Nigricans: The

## THE ANTES RISK-FACTOR ELECTRONIC SYSTEM (RFES)

The ANTES Risk Factor Electronic System (RFES) has three user levels and is built on a secure system where each user can only enter the system if they have been issued a username and password.

Each level has its restrictions. For example, only school nurses can enter and edit information.

The system also includes a statistical package that has the capacity to produce reports and queries in aggregate, specific to school districts, and even particular schools.

Acanthosis Nigricans:  
The Education and Screening Program

Change Password || Ethnicity Groups || Coordinators || Reports || Queries || Feedback || Help || Logout

Welcome to the ANTES System

**Regions**

Add New Region			
	Region ID	Region Name	# Districts
Delete Edit/view	1	REGION 1	52
Delete Edit/view	2	REGION 2	50
Delete Edit/view	3	REGION 3	43
Delete Edit/view	4	REGION 4	104
Delete Edit/view	5	REGION 5	38
Delete Edit/view	6	REGION 6	64
Delete Edit/view	7	REGION 7	104
Delete Edit/view	8	REGION 8	50
Delete Edit/view	9	REGION 9	43
Delete Edit/view	10	REGION 10	116
Delete Edit/view	11	REGION 11	94
Delete Edit/view	12	REGION 12	90
Delete Edit/view	13	REGION 13	77
Delete Edit/view	14	REGION 14	45
Delete Edit/view	15	REGION 15	48
Delete Edit/view	16	REGION 16	66
Delete Edit/view	17	REGION 17	64
Delete Edit/view	18	REGION 18	39
Delete Edit/view	19	REGION 19	17
Delete Edit/view	20	REGION 20	76
Delete Edit/view	2000	R2000	3

Add New Region

This is a screenshot of the RFES that shows how all regions and ISD's in the State of Texas are connected to one database. Information is directly entered by school nurses as they perform the AN screenings and other risk assessments.

Antes: Update Student Record - Microsoft Internet Explorer

**Update Student Data**

Birth Date: 11 / 22 / 1995 (mm/dd/yyyy)

Sex: Male

Race/Ethnicity: HISPANIC

Weight: 86 lbs.

Height: 49 in.

BMI: 25.18 [view chart](#)

Blood Pressure 1: Systolic 116 Diastolic 79 (mm-Hg)

Blood Pressure 2: Systolic 123 Diastolic 82 (mm-Hg)

[Referral Letter](#)

Save Cancel

This is a screenshot of the **Student Data Box** in the RFES. School nurses enter student information and are provided with instant interpretation of the child's body mass index and blood pressures. It also provides school nurses with a printable plotted growth chart of the child's BMI and a referral form that includes all of the school nurse's risk assessments.

## THE ANTES RISK-FACTOR ELECTRONIC SYSTEM (RFES)

This is a screenshot of the Consolidated Data Form (CDF). School nurses enter student information that is specific to the nurse's assigned school. A school nurse is assigned to a school by their district nurse coordinator. Once assigned, the nurse enters the system via username/password and is taken directly to the nurse's assigned campus.

School nurses are required to enter all variables as the system will not allow them to proceed if incomplete information is entered. **The system DOES NOT ALLOW for student identifiers such as names or social security numbers to be entered.** As school nurses enter risk assessment information from the Student Data Box, the variables are consolidated into a CDF. The variables contained in the CDF are described below.

ANTES

Acanthosis Nigricans:  
The Education and Screening Program

sponsored by  
CITEC

Change Password || Reports || Queries || Feedback || ? Help || Logout

Home || Login || Select School || List CDF's || Edit CDF: 292

### Edit Consolidated Data Form

Form ID: 292

Region: R2000 School: TEST DATA SCHOOL

ISD: D2000 Grade: 4

Students Screened: 13 count

Save Changes

Students Screened: Add Student...

	Ethnicity	Sex	DOB	Weight (lbs.)	Height (in.)	BMI	BP(1 <sup>st</sup> Measure)	BP(2 <sup>nd</sup> Measure)	BP Cat.	AN Degree
	ASIAN	Male	11/13/2002	100	48	30.52	0/0	0/0		3
	HISPANIC	Male	11/22/1995	86	49	25.18	116/79	123/82	E	2
	HISPANIC	Female	11/23/1994	89	48	27.16	113/75	112/75	HN	3

Add Student

School nurses may delete or edit entries. Only school nurses may use these functions.

**Referral Letter Icon.** School nurses may click on this icon to obtain a referral form with all risk assessment information for that particular entry.

**Variables.** Variables include the student's race/ethnicity as recorded by the school, the child's sex, date of birth, weight, height, two blood pressure measures, and degree of AN.

**Growth Chart/BMI Icon.** School nurses may click on this icon to obtain a printable growth chart for that particular entry. The student's BMI found to the right of the icon is automatically plotted.

**Blood Pressure Category.** The RFES takes the average of the two blood pressure measures and automatically provides the blood pressure category based on the standards from the National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. The blood pressure categories are identified as **elevated**, **high-normal**, or **normal**. Recently, these categories have been changed by the Working Group to read **possible hypertension**, **prehypertension**, and **normal**.



## THE ANTES RISK-FACTOR ELECTRONIC SYSTEM (RFES)

### Growth Chart.

The RFES provides users with a printable CDC growth chart. The RFES plots the child's BMI and determines the degree of overweight in children. The RFES makes the plotting of BMI convenient, error-free, and easy. The RFES provides the date of the measurement and determines the degree of overweight in the upper right hand corner of the growth chart. The left hand corner contains an area that school nurses may use to record the child's name for their records. **Only school nurses have access to this function.** School nurses may print out growth charts for the student's file or may attach the chart to the student referral form to assist physicians with the child's assessment. The American Academy of Pediatrics (AAP) has recommended that pediatricians plot a child's BMI and monitor the child's progress. The pre-plotted growth chart helps alert the physician to the child's degree of overweight and may assist with the AAP's recommendations.

#### Name.

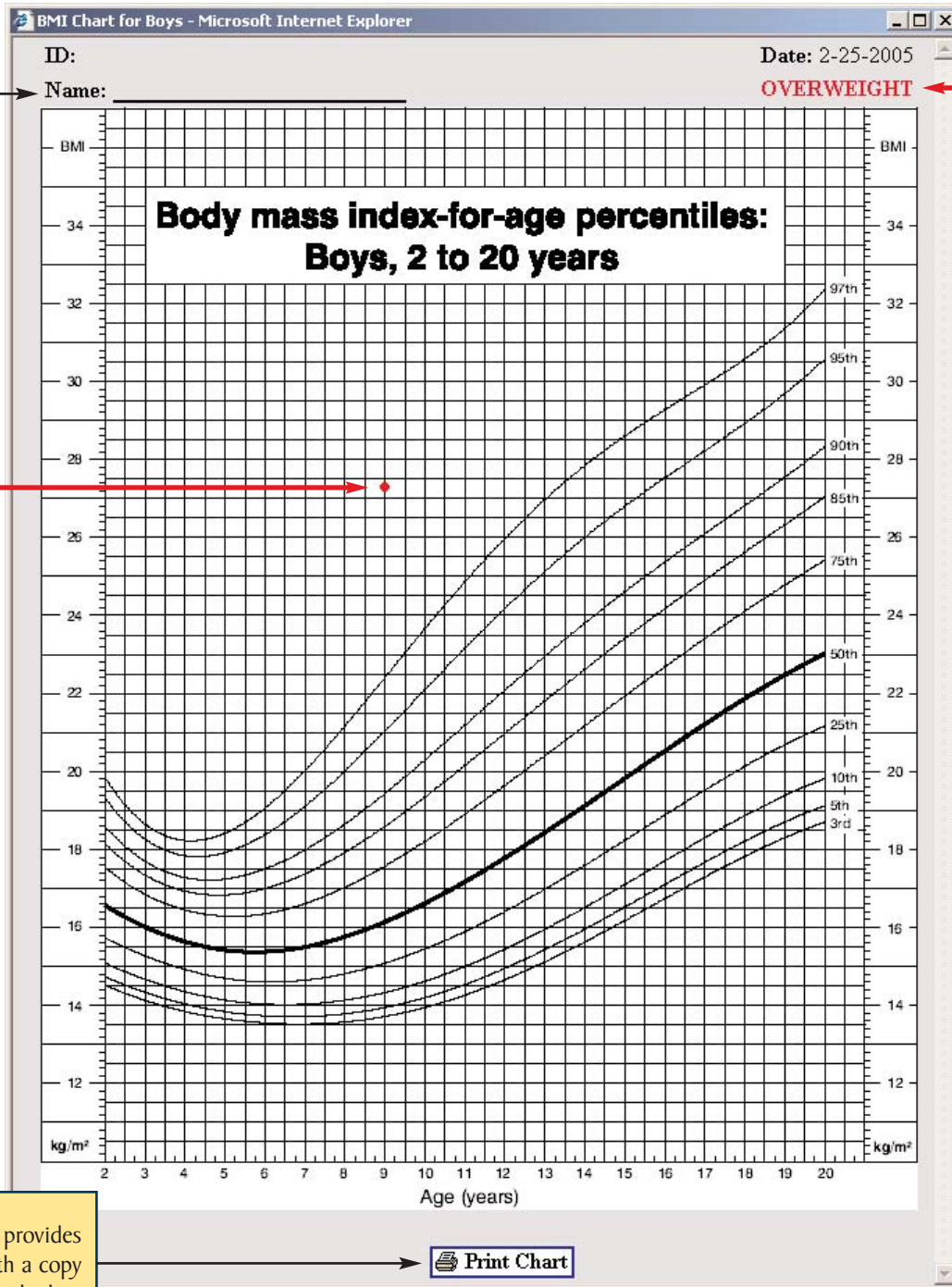
School nurses are provided the function to type in the child's name. The child's name is **NOT** stored by the system.

#### BMI.

The child's BMI is plotted by the RFES based on age, sex, and BMI.

#### Degree of Overweight.

The RFES provides the school nurse with an interpretation of the child's BMI. The RFES system identifies the child based on CDC's categories of **Overweight**, **At-Risk of Overweight**, **Normal**, or **Underweight**.



#### Print Chart Icon.

Clicking this icon provides a school nurse with a copy of the plotted growth chart.

## THE ANTES RISK-FACTOR ELECTRONIC SYSTEM (RFES)

### Referral Form

School nurses issue medical referrals to AN positive students, which includes the results from the other assessments performed. The ANTES RFES provides the school nurse with a printable referral letter which contains the child's height, weight, BMI, degree of overweight, average blood pressure, blood pressure category, and degree of AN. The referral contains an explanation of AN and recommends that parents seek further evaluation from their health care provider. The referral form includes the additional assessments to strengthen the school nurse's observation and alert the physician for further health evaluation. The box highlighted below indicates the information from the assessments included in the referral form.

Our observations are as follows:

Height: <u>49</u>	Weight: <u>86</u>	BMI: <u>25.18</u>	OVERWEIGHT
Average Blood Pressure: <u>119/80</u>		Blood Pressure Level: <u>Elevated</u>	
Acanthosis Nigricans Degree: <u>2</u>			

Referral Letter Sample - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Print Mail News RSS Feeds Links M-W SLC

Address <https://antes.cs.panam.edu/RFES/ReferralLetter.asp>

School TEST DATA SCHOOL Date 12/15/2004

Student's Name \_\_\_\_\_ Grade 4

Dear Parents:

While observing the health of your child, the teacher and/or the nurse have noted the following symptoms/signs which we feel should be brought to your attention:

*(Al observar la salud de su hijo(a) la maestra(o) y la enfermera notamos los siguientes síntomas/señales que pensamos se debe traer a su atención)*

ACANTHOSIS NIGRICANS - OTHER

*(Acanthosis nigricans is a light-brown-black, velvety, rough or thickened lesion on the surface of the skin. It is usually found around the neck, armpits, and over the knuckles. The purpose of this screening is to detect these markings in children. Acanthosis Nigricans can be a primary marker that may signal high insulin levels, which can lead to insulin resistance and then Type 2 diabetes.)*

*(La Acanthosis Nigricans es un síntoma/señal de pigmentación anormal caracterizada de color oscuro en la piel especialmente en la nuca, axilas, y nudillo de las manos. El propósito de esta evaluación es para poder detectar estas señales en los niños a una temprana edad. Acanthosis Nigricans puede ser una de las primeras indicaciones de que hay niveles altos de insulina, y que puede llegar a una resistencia y desarrollarse en diabetes.)*

Our observations are as follows:

Height: <u>49</u>	Weight: <u>86</u>	BMI: <u>25.18</u>	OVERWEIGHT
Average Blood Pressure: <u>119/80</u>		Blood Pressure Level: <u>Elevated</u>	
Acanthosis Nigricans Degree: <u>2</u>			

Please take this form with you when you take your child to your

EYE DOCTOR - FAMILY DOCTOR - DENTIST - HEALTH CLINIC

This school system would appreciate comments from you or your doctor regarding these symptoms/signs. The information you provide will be helpful for the nurse and teacher to better serve your child.

*(La escuela apreciará sus comentarios o los de su médico tocante la salud de su hijo(a). La información que usted nos proporcione será útil para la enfermera y el maestro(a) para cuidar mejor de su hijo(a).)*

\_\_\_\_\_  
School Nurse

Parent's comments OR Doctor's diagnosis, treatment and recommendations:  
*(Comentarios de los Padres O diagnóstico, tratamiento y recomendaciones del Médico)*

Done Internet

## OUT-OF-MANDATE IMPACT

Although HB 2721 charges the UTPA Border Health Office to coordinate AN screenings in the II Regional Educational Service Centers, the impact of the program transcends the scope limits and has made the State of Texas as one of the frontrunners to become actively involved in the fight against the burden of childhood obesity and Type 2 diabetes.

### Personal Profile:



**Dr. Phyllis Preciado & Dr. Ruth Avila**

One of the most notable impacts has been the enactment of legislation by the State of California, **Assembly Bill 766**, which is modeled after the ANTES program bills HB 1860, 2989, and 2721. The project is headed by the University of California San Francisco-Fresno Latino Center for Medical Education and Research and looks to develop school nurse screening recommendations and eventually recommend to mandate statewide screening for children who may be at risk for developing Type 2 diabetes or other obesity-related illnesses.

March 2, 2004

The University of Texas System  
Texas-Mexico Border Health Coordination Office  
University of Texas-Pan American  
1201 West University Drive  
Edinburg, Texas 78539-2999  
Attn: Doreen Garza, Assistant Director

The UTPA Border Health Office has provided training materials, posters, brochures, and technical assistance to the Center and the school nurses involved in the program.

To Whom It May Concern:

We would like to make a formal request to obtain the Texas-Mexico Border Health Coordination Office (UTPA BHO) resource handbook that was developed for the Acanthosis Nigricans: The Education and Screening program. Your website and your staff informed us that the resource handbook, includes information regarding screenings for Acanthosis Nigricans, obesity and blood pressure. We realize that all of you have worked very hard to create and develop this handbook. For this reason we would be honored to have your organization send a copy of this resource book.

According, the last conversation with the Assistant Director, Doreen Garza, your organization can also send us the CD (s) that contains all your reports that have been submitted to the governor and legislature of your state of Texas. We are very grateful for all your time and effort in the development and implementation of your important program.

Currently, our research focuses on the prevalence of obesity associated with impaired glucose tolerance in children and adolescents in Fresno, California. A training protocol for screening of Acanthosis Nigricans, weight, height, and waist circumference by school nurses is currently being developed. Eventually we hope to not only recommend school nurse screening guidelines, but also implement a statewide health policy mandate that requires the screening, and evaluation of all adolescent patients at high risk for developing impaired glucose tolerance or type 2 diabetes mellitus. Any information provided by your establishment and used by us will be referenced appropriately.

I look forward to working closely with your office regarding this matter. If you have further questions, please do not hesitate to call me at (559) 241-6576. Thank you for your time and consideration.

Sincerely,

Phyllis Preciado, M.D.  
Faculty Research Fellow for Obesity  
Research in Diabetes Mellitus  
UCSF - Latino Center for Medical Education and Research

Ruth Avila, M.D.  
Latino Research Fellow for Obesity  
Research in Diabetes Mellitus  
UCSF - Latino Center for Medical Education and Research



## OUT-OF-MANDATE IMPACT

The UTPA Border Health Office has also provided ANTES program support to other state and out-of-state public and private organizations. Since its inception, the program has distributed well over 1,000 screening manuals, 3,000 posters, and 50,000 brochures to agencies outside the mandated ESC's who have requested information, either to start their own programs or for public consumption. The following are just a few comments from some of the requests the UTPA Border Health Office has received:

*"[Acanthosis Nigricans] is relatively unknown to the public and many health professionals still do not know about AN nor how to explain this condition...we would like to equip the parents of a child identified with this condition with a brochure so they can take it into their pediatrician or family practice...we hope that this will build an awareness of how this markers are predisposing a child towards the development of type 2 diabetes."*

**Gloria Fernandez-VanZante, MS, RD, LD**  
Nutrition Resource Project Coordinator  
Texas A & M Kingsville  
Kingsville, TX

*"I was able to see your video at a School Advisory Panel (Partnering with Children's Hospital of Central California) and was very impressed with the information presented, and would like to use this video to convince our School District of Trustees to allow us to institute the [AN] screening."*

**Irene Mendes, RN, PHN.**  
Health Services Coordinator  
Corcoran Unified School District  
Corcoran, CA

*"First of all, I'd like to commend you for the outstanding development of a program that addresses the concerns being voiced all over the country...we are implementing screening for diabetes...and we are anxious to be involved in your project. Please send packets with the necessary tools you have developed."*

**Carol Padilla, RN**  
CLOVIS Unified School District  
Clovis, CA

*"We (International Diabetes Center, Minneapolis) are partnering on several projects; one is IDC initiating screening for AN in MN. Are there any protocols that you might want to share with us?"*

**Pam Tompos, MS, RD**  
Consulting & Special Projects  
International Diabetes Center  
Minneapolis, MN

*"The CARDIAC program is about 3 years old...we are expanding and hope to screen all 5th graders in our state soon. We do height, weight, BMI, BP and AN screening on all the children whose parents give us permission...I have 25 positive screens for AN in our MS...the more teaching material on AN that we can find, the better."*

**Pat Mays**  
West Virginia University School of Medicine  
St. Mary, WV

*"A couple of years ago I found your website. It proved to be a lifesaver for me, which has lead me to better treatment and understanding. I had AN since I was four years old. My mother called it 'the dirty neck syndrome' and I suffered abuse for it. Little did I know it actually gave me the clue I needed, so now I am getting treated for insulin resistance."*

**DD**  
Rockmart, GA

*"I'm the manager of the Diabetes Center at Abington Memorial Hospital. We are very interested in initiating a screening program for Acanthosis Nigricans at Community Centers and/or local schools in the Philadelphia/Willow Grove Pennsylvania vicinity...we'd like to incorporate the use of your (ANTES) poster and brochures...is there a way for our staff to be officially trained to conduct the screening process?"*

**Eileen M. Sturner, MS, RD, CDE**  
Abington Memorial Hospital  
Philadelphia/Willow Grove Pennsylvania

*"We've started a 6-week 'Jump into Action' program for obese 4th, 5th, and 6th graders at risk for developing type 2 diabetes. We'd like (ANTES) posters that display the different grades of acanthosis nigricans to implement in our class... we are very aware of the increase incidence of type 2 diabetes and obesity in our youth and would like to promote awareness and prevention to our families."*

**Denise F. Hickman, RN, MSN, CPNP**  
Harlingen Pediatrics Associates  
Harlingen, TX

*"I am in the process of investigating the benefits of implementing an Acanthosis Nigricans screening program in the Albuquerque public schools...as New Mexico has population demographics similar to the southern countries in Texas and the impact of type 2 diabetes is great, I feel that implementing it would be beneficial...your screening manual would be helpful in proving screening that is consistent...I would utilize it in establishing protocols, school nurses trainings, and in-servicing for providers in the community."*

**Cheryl R. Brubaker, RN, BSN, MSN**  
Albuquerque Public Schools  
Health and Mental Services  
Albuquerque, NM

## SUGGESTED READINGS

1. Allison, DB, Fontaine, KR, Manson, JE, Stevens, J, VanItallie, TB. Annual Deaths Attributable to Obesity in the United States. *JAMA*. 2000; 282: 1530-1538.
2. Barlow, SE, Dietz, WH. Obesity Evaluation and Treatment: Expert Committee Recommendations. *Pediatrics*. 1998; 102 (3): e29.
3. Bent, KN, Shuster, GF, Hurley, JS, Frye, D, Loflin, 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.
4. 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.
5. Cook, VV, Hurley, and JS. Prevention of Type 2 Diabetes in Childhood. *Clinical Pediatrics*. 1998; 37: 123-130.
6. 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.
7. 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.
8. 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.
9. Kiernan, M, Winkley, 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.
10. 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.
11. Ludwig, DS, Majzoub, JA, Al-Zahrani, A, Dallal, GE, Blanco, I, Roberts, SB. High Glycemic Index Foods, Overeating, and Obesity. *Pediatrics*. 1999; 103: 3.
12. 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.
13. 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.
14. National Association of School Nurses. Position Statement: Caseload Assignments. June 1972.
15. National Association of State Boards of Education. Policy Update. Vol. 8, No. 10 June 2000.
16. National Task Force on the Prevention and Treatment of Obesity. Overweight, Obesity, and Health Risk. *Arch Intern Med*. 2000; 160: 898-904.
17. 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.
18. *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.
19. *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.
20. 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.
21. 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.
22. Pinhas-Hamiel, O, Dolan, LM, Daniels, SR, Standford, D, Khoury, PR, Zeitler, P. Increased incidence of non-insulin-dependent diabetes mellitus among adolescents. *Journal of Pediatrics*. 1996; 128: 608-615.
23. Reaven, GM. Role of insulin resistance in human diseases. *Diabetes*. 1988; 37: 1595-1607.
24. 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.
25. 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.
26. Rosenbloom, AL, Joe, JR, Young RS, Winter, WE. Emerging Epidemic of Type 2 Diabetes in Youth. *Diabetes Care*. 1999; 22: 345-354.
27. 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.
28. 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.
29. Shwartz, RA. Acanthosis Nigricans. *Journal of the American Academy Dermatology*. 1994; 31: 1-19.
30. Slyper, AH. Childhood obesity, adipose tissue distribution, and the pediatric practitioner. *Pediatrics*. 1998; 102(1): e4.
31. Strauss, RS. Childhood Obesity and Self-Esteem. *Pediatrics*. 2000; 105: 1.
32. 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.
33. 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.
34. Stuart, CA, Pate, CJ, Peters, EJ. Prevalence of acanthosis nigricans in an unselected population. *American Journal of Medicine*. 1989; 87: 269-272.

## ***SUGGESTED READINGS***

35. 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.
36. 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.
37. 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.
38. 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.
39. 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.
40. Zwillich, CW. Is Untreated Sleep Apnea a Contributing Factor for Chronic Hypertension? JAMA. 2000; 283: 1880-1881.

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