

# ANTES

## Acanthosis Nigricans: The Education & Screening Program



## A Report to the Governor and the 78th Legislature of the State of Texas

IN FULFILLMENT OF HOUSE BILL 2989  
OF THE 77TH LEGISLATURE

Prepared By:  
The University of Texas-Pan American  
Border Health Office



ANTES  
Acanthosis Nigricans: The Education and Screening Program

LEGISLATIVE REPORT  
2001-2002 SCHOOL YEAR Screening

DECEMBER 2002

The Border Health Office at the University of Texas-Pan American expresses its appreciation to the 77th Legislature for supporting the ANTES program. In particular, the Border Health Office offers thanks to Representative Roberto Gutierrez (D-McAllen) for sponsoring House Bill 2989 and to Senator Leticia Van de Putte (D-San Antonio) and Representative Norma Chavez (D-El Paso) for their co-sponsor support.

# Table of Contents

	Page No.
1. Executive Summary	1
A. Mandate	
B. Results	
C. Recommendations	
2. Introduction and Background	2
A. Summary of House Bill 2989	3
B. Catchment area	4
C. Preparation for the screenings	4
D. Building Partnerships	5
3. Results	5
4. Companion Legislation	8
A. Senate Bill 19	8
B. Acanthosis Nigricans and School Health Advisory Councils	8
5. ANTES Future Activities	9
A. Randomized Screenings	9
B. Evaluating Intervention Progress	9
C. Certification of Acanthosis Nigricans Screeners	9
D. Developing Educational Materials	10
E. Center for Acanthosis Nigricans Studies	10
6. Conclusions and Recommendations	11
8. References	13
9. Addendum -	
Related Research	15
Distribution of ANTES Materials	16

# **1. Executive Summary**

## **A. Mandate**

A new strategy against childhood high insulin levels, obesity, diabetes and other resulting health consequences is being mounted in Texas. This was made possible with resources provided by the 77th Texas Legislature through House Bill 2989 that requires school children from eight Regional Education Service Centers to be screened for acanthosis nigricans. By focusing on acanthosis nigricans, a skin condition that is directly linked with hyperinsulinemia, much can be done to prevent chronic health conditions that begin in childhood.

Concentrating on prevention of disease saves the state money and insures a better future for its children. With commitment and leadership provided by the Border Health Office at The University of Texas-Pan American, together with partners from throughout the state, children from the third, fifth and seventh grades were screened for the acanthosis nigricans marker, elevated blood pressure and obesity/overweight. This initiative was identified as the acanthosis nigricans: The Education and Screening (ANTES) program. Antes in Spanish means "before." The ANTES program seeks to address latent health problems before they become debilitating, expensive health conditions.

## **B. Results**

School nurses from eight Regional Education Service Centers were trained to screen for acanthosis nigricans in conjunction with state mandated vision/hearing and scoliosis screenings. Children who had acanthosis nigricans were also measured for height and weight and blood pressure readings. Nurses reported that 12% of children screened had the acanthosis nigricans marker. A related study revealed that severity of acanthosis nigricans, incremental obesity and blood pressure readings are directly related. The more severe the acanthosis nigricans, the more negative the health condition.

An anticipated consequence of conducting many training sessions for school districts in numerous sites was a variation of acanthosis nigricans definition standards. The ANTES program encountered deviation in determining positive acanthosis nigricans as well as in how to measure the severity, or grade, of the marker. New training standards that lead to screening certification are in progress.

## **C. Recommendations**

It is recommended that acanthosis nigricans screenings be conducted statewide in randomized stratified clusters similar to how other population data is collected. Individual school districts should still screen with a goal to prevent, reduce and eliminate high insulin induced obesity and abnormal blood pressures through appropriate nutrition, weight loss and vigorous physical activity.

Organizations that cater to children should be discouraged from selling soft drinks, candy and other foods on campus whose nutritional value is questionable. Elimination of sugar-sweetened snacks that do not conform to the standards of the school meal program is encouraged. School districts should add more school nurses to their personnel roles.

## **2. Introduction and Background**

Acanthosis nigricans can easily be evaluated by means of a visual/tactile examination. In most cases, the acanthosis nigricans manifestations may look like a dirty neck. Acanthosis nigricans appears as a light brown-black, velvety, furrowed, rough or thickened marker on the skin around the neck, knuckles, elbows, knees, groin or stomach area. It indicates that the pancreas has been exhausting itself for quite some time pumping excess insulin into the bloodstream. Higher levels of insulin are secreted to control spikes in sugar concentrations in the blood as food is eaten. By the time acanthosis nigricans is noticed, insidious invisible health consequences, such as hyperinsulinemia, insulin resistance, bad cholesterol, high triglycerides, high blood pressure, sleep apnea and type 2 diabetes, may be occurring. Acanthosis nigricans is most frequently seen in preadolescence, accompanied by obesity in most cases.

In a previous report, the Border Health Office at The University of Texas-Pan American indicated that 15% of children living along the Texas-Mexico border had acanthosis nigricans associated with extremely high rates of obesity, insulin resistance and high blood pressure. These children were at risk of developing type 2 diabetes as well as a number of related chronic health conditions. Thirty-eight percent of Texas children aged 10-13 living on the Texas-Mexico border are overweight. That is 24 percentage points higher than national figures for the same age group. Elevated blood pressure in children with the acanthosis nigricans marker is also alarming. Fifty-seven percent of the children examined had normal blood pressures, 35% had elevated blood pressures and 9% had high-normal readings which carry an increased risk of developing high blood pressure.

Until recently, it was believed that children could not develop type 2 diabetes. Today we know this notion is incorrect. The increasing number of youth-onset type 2 diabetes cases has heightened interest in children's health, particularly in cases where acanthosis nigricans has been present at the time of diagnosis. It is known that screening for acanthosis nigricans is an important prevention function since the marker alerts clinicians, parents, educators and individuals that a health problem is on the horizon. It is important to note that acanthosis nigricans is NOT a diagnosis for Type 2 diabetes. However, the health conditions associated with acanthosis nigricans could lead to Type 2 diabetes.

## **A. Summary of House Bill 2989**

The Border Health Office at The University of Texas-Pan American will conduct acanthosis nigricans screening training and shall monitor the quality of screening activities. Each school shall submit to the office an annual report on the screening status of the students screened during the reporting year and shall include in the report any other information required by the Border Health Office.

The chief administrator of each school district shall ensure that students enrolled in the school are screened for acanthosis nigricans. However, in lieu of the school screening, parents may elect to have the acanthosis nigricans examination performed by a clinician not responsible to the school district.

Students who attend public or private schools located in Texas Education Agency Regional Education Service Centers 1, 2, 3, 13, 15, 18, 19, and 20 will be screened.

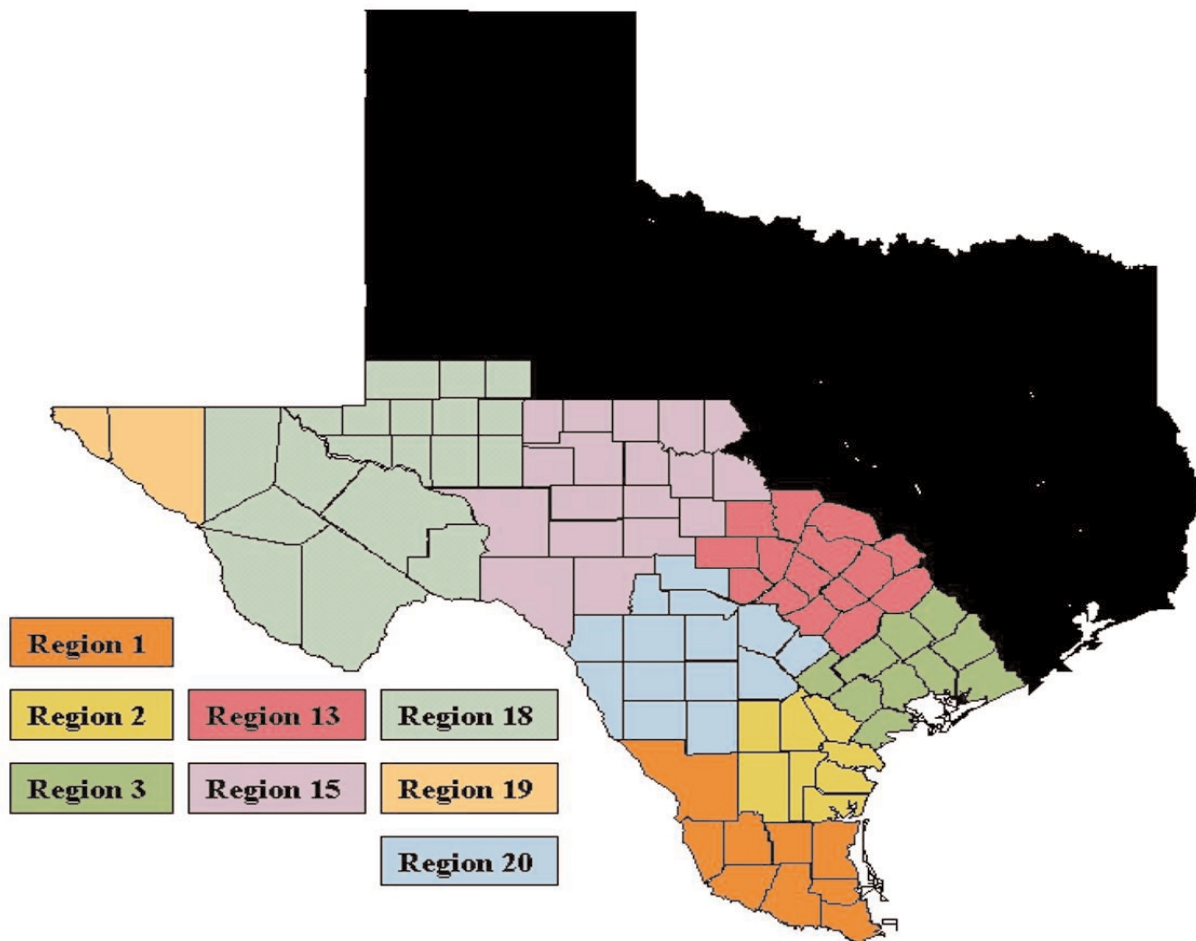
The acanthosis nigricans screening should be performed at the same time hearing and vision screenings are conducted. However, an individual is exempt from the acanthosis nigricans screening if the screening conflicts with the tenets and practices of a recognized church or religious denomination of which the individual is an adherent or a member.

The person performing the screening shall send a report home indicating that a student may have acanthosis nigricans. The report must include:

- \* an explanation of acanthosis nigricans and related conditions;
- \* a statement concerning a student's need for further evaluation of conditions related to acanthosis nigricans; and
- \* instructions to help the student or family receive evaluation and intervention by the school district.

## B. The catchment area

The map below depicts the eight Regional Education Service Centers area of responsibility mentioned in HB 2989 where the acanthosis nigricans screening was conducted. The ANTES program screened nearly 180,000 children in grades 3, 5 and 7 from the eight educational service center areas that cover 95 counties and over half of the landmass of the state of Texas



## C. Preparation for the Screenings

The Border Health Office at The University of Texas-Pan American prepared for acanthosis nigricans screening by informing each school superintendent whose district fell within the catchment area of his or her responsibility with respect to HB 2989 and indicated that the Border Health Office would be conducting training sessions for school nurses. Most of these training sessions occurred in August and September 2001. Subsequent sessions were held during the school year as requested. Health specialists from the Regional Education Service Centers assisted the Border Health Office by scheduling these trainings and inviting school nurses.

## D. Building Partnerships

An encouraging result of the ANTES-related work has been the valuable partnerships that have been formed. A number of health professionals, agencies and organizations with state, national and international affiliations have expressed interest in acanthosis nigricans and the ANTES program. The Border Health Office has fielded countless e-mails, faxes and telephone calls from interested parties. The program has also distributed educational literature about the acanthosis nigricans screenings.

## 3. Results

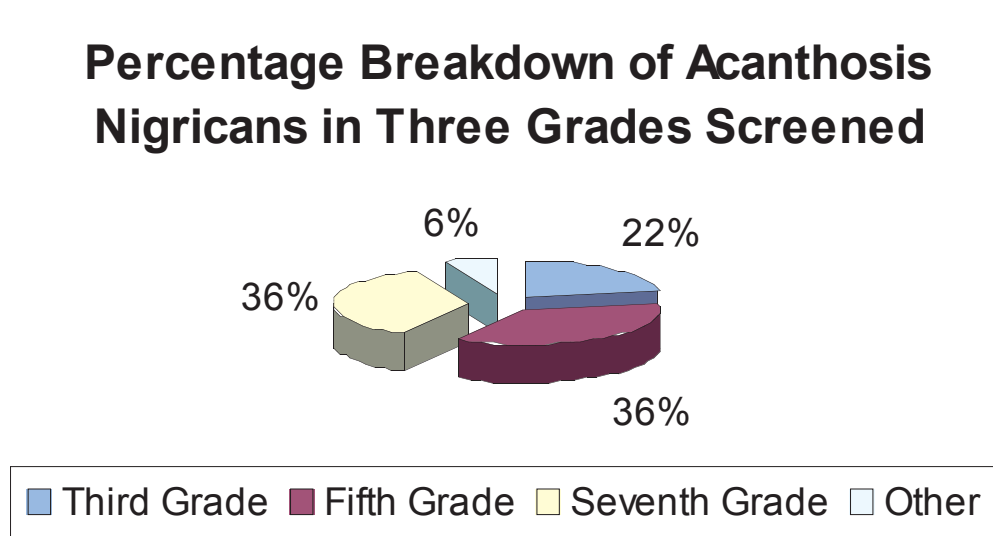
*Table 1 presents general demographic information on acanthosis nigricans screenings conducted during the 2001-2002 school year in Regional Education Service Centers 1, 2, 3, 13, 15, 18, 19 and 20. Over eight percent of the 3rd, 5th and 7th grade students who were screened had the acanthosis nigricans marker.*

**TABLE 1.**  
**Acanthosis Nigricans Screening Information 2001-02**

Total Screened	179,995	Percent with Acanthosis Nigricans	8.6%
Males Screened	51.5%	Females Screened	48.5%

*Figure 1 presents the breakdown in percentages of the total acanthosis nigricans reported in the three grades screened. Six percent of students in grades other than 3rd, 5th and 7th were screened.*

**FIGURE 1.**





Acanthosis nigricans is graded numerically and progressively from one through four. Generally, the higher grades indicate higher levels of insulin circulating within the body.

**TABLE 2**  
**Percent Grade Of Acanthosis Nigricans In Each Of Classes Screened**

	AN Grade 1	AN Grade 2	AN Grade 3	AN Grade 4
3rd Graders	8%	8%	4%	1%
5th Graders	12%	13%	8%	3%
7th Graders	10%	13%	9%	4%

Figure 2 presents the breakdown in the average total Body Mass Index reported for the three grades screened. Seventh graders had the highest index (30) followed by 5th graders (29) and then 3rd graders (27).

**FIGURE 2.**

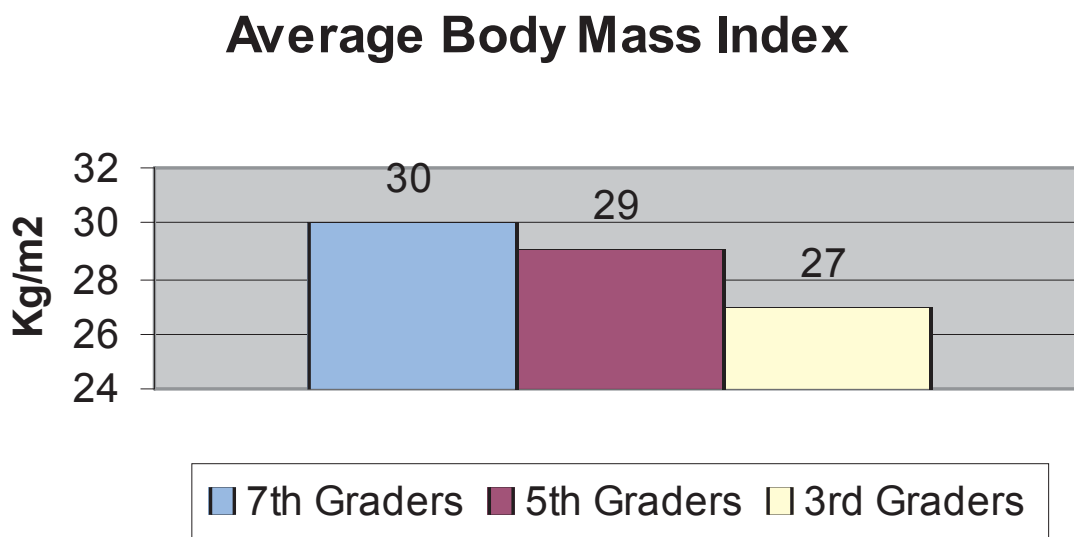


Table 4 represents Body Mass Index averages in the 12 Regional Education Service Centers.

**TABLE 4**  
**Average Body Mass Index In 12 ESC Screened**

BMI	Region 1 30	Region 2 31	Region 3 30	Region 13 30
BMI	Region 15 30	Region 18 30	Region 19 29	Region 20 30

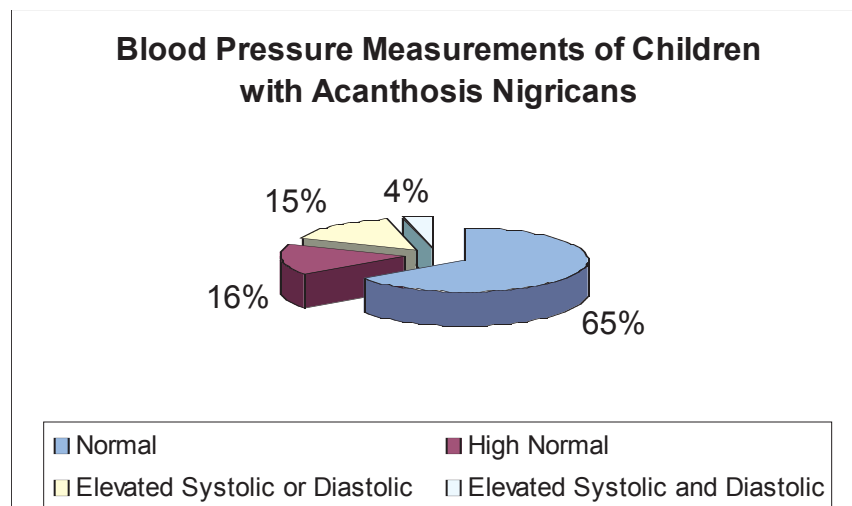
Table 5 represents the percentages of acanthosis nigricans in the 12 Regional Education Service Centers.

**TABLE 5**  
**Percentages Of Acanthosis Nigricans (AN) In 12 ESC Screened**

Percent AN	Region 1 16	Region 2 14	Region 3 11	Region 13 9
Percent AN	Region 15 10	Region 18 10	Region 19 13	Region 20 10

Figure 3 presents information on blood pressure measurements of children with acanthosis nigricans. Elevated blood pressure in children correlates with hypertension in early adulthood, supporting the need to track blood pressure in children. Sixty-five percent fell into the normal range, 16% had high normal readings, 15% had an elevated systolic or diastolic reading, and 4% were classified in the elevated systolic and diastolic category.

**FIGURE 3.**



## **4. Companion Legislation**

### **A. Senate Bill 19**

The Texas Legislature approved Senate Bill 19 which directs school districts to address comprehensive school health education. The bill has three key components. First, it authorizes the State Board of Education to adopt rules mandating 35 minutes a day or 135 minutes per week of physical activity for students in grades K-6. Second, it requires every school system to organize a School Health Advisory Council (SHAC) with clearly defined membership and a broad scope of responsibilities affecting school health. Third, it directs the Texas Education Agency to produce a coordinated school health curriculum and requires every school system to have trained personnel to implement the curriculum by 2007.

### **B. Acanthosis Nigricans and School Health Advisory Councils**

It would be ideal for all parents whose children were identified with the acanthosis nigricans markers to modify the home environment to include healthy snack choices and incorporate evening family walks. We realize we cannot enforce these recommendations. Nevertheless, it is under the school's purveyance to provide and promote a healthy environment where children can learn. This can be accomplished if school districts utilize the mandated development of School Health Advisory Councils (SHAC).

A SHAC is composed of key personnel from within a school district. This may (and probably should) include the superintendent, assistant superintendent for curriculum instruction, school principals, school nurse, school counselors, teachers, food service personnel, physical education instructors, parental involvement coordinators, parents and students. Using the Centers for Disease Control and Prevention self-assessment and planning guide (School Health Index For Physical Activity and Healthy Eating), schools can make nutrition, health instruction and exercise modifications within the school environment.

SHACs are the ideal instrument for assisting those students with acanthosis nigricans and the associated health risk factors. Since no pharmacological intervention is currently approved for acanthosis nigricans, the recommended intervention under the purview of the schools. Nutritional changes and physical activity can and will make a positive change by lowering insulin levels, thus causing the acanthosis nigricans markers to fade. The SHACs can insure that these positive measures are implemented for students.

## **5. ANTES Future Activities**

### **A. Randomized Screenings**

It is anticipated that acanthosis nigricans screenings would be conducted statewide in randomized stratified clusters similar to other population data collected. Mathematical models would be developed to determine statistical significance in representing the school population in the state that has acanthosis nigricans. The ANTES program would provide screeners for each randomly selected school using validated instruments with consistent applications applied in each setting. This would enable the ANTES program to give the state a yearly snapshot of an important aspect of children's health. Individual school districts should still screen for acanthosis nigricans with a goal to prevent, reduce and eliminate high-insulin-induced obesity and abnormal blood pressures through appropriate nutrition, weight loss and vigorous physical activity.

### **B. Evaluating Intervention Progress**

It is anticipated that screenings for reporting purposes be conducted in the third grade for meaningful intervention to take place. Since we already know the degree of acanthosis nigricans that can be expected in higher grades and older children, the larger intervention impact would be with children identified earlier. School districts should compare acanthosis nigricans severity, body mass index and blood pressures from one year to the next to evaluate what positive progress may be occurring.

The potential for intervention in the lives of children identified with acanthosis nigricans presents an exciting opportunity. Models designed to help these students and their families to address the underlying health conditions indicated by the AN marker might then be replicated in other areas of the state.

### **C. Certification of Acanthosis Nigricans Screeners**

A consequence of conducting numerous training sessions in various sites for over 400 school nurses throughout the state of Texas was the realization that a variety of standards for determining if a student has acanthosis nigricans are being used. The ANTES program encountered variance in determining positive acanthosis nigricans as well as how measure the severity or grade of the marker.

Two factors may explain some of the inconsistency. The ninety-minute presentation was insufficient and an exit evaluation to determine the level of learning that took place was necessary. Both of these things have been rectified along with further strengthening of the screening training presentation. This prompted the Border Health Office to form a committee of experts to advise the ANTES program on how to standardize the screening process. This has led to development of training materials and standards that lead to screening certification. A new volunteer training course for certification should be in place by Spring 2003.

## **D. Developing Educational Materials**

The ANTES program has developed new materials in what has been packaged as the ANTES Toolkit. The ANTES Toolkit contains a "how to screen for acanthosis nigricans" video, a video on general acanthosis nigricans information, a question and answer booklet, a new screening manual, posters, acanthosis nigricans grade severity indicators, resource materials, a nutrition booklet and training materials about acanthosis nigricans. Preliminary reviews have been very favorable. These toolkits will be made available to a cadre of acanthosis nigricans screening trainers and to school districts.

## **E. Center for Acanthosis Nigricans Studies**

The ANTES program plans to develop into a Center for Acanthosis Nigricans Studies. It is becoming more evident that research into the impact acanthosis nigricans is having on our children should be conducted so that this information translates into positive changes with practical applications. The work should focus on preventing chronic health problems seen mostly in adults by intervening in the lives of youth and children in Texas. Collaboration between the Border Health Office at the University of Texas - Pan American, The Diabetes Center at Texas Tech University Health Science Center-El Paso, the Texas state government, the public school system, and other partners, will result in The Center performing the following functions:

- \* Train and certify school nurses and community health workers to screen children for acanthosis nigricans and related non-invasive procedures.
- \* Develop a cadre of Certified Trainers to assist in the training of school nurses.
- \* Maintain a registry of certified individuals, offer continuing education opportunities, and notify those individuals who are due for re-certification.
- \* Operate a data collection system with which to maintain and analyze information gathered from the screenings.
- \* Perform research and prepare reports on acanthosis nigricans and related health conditions.

- \* Provide school district with practical intervention applications to reduce the insulin levels in children and thus reduce the acanthosis nigricans.
- \* Act as a depository of information for the public on the hazards of acanthosis nigricans and related health conditions.
- \* Produce yearly statewide rates on the prevalence of acanthosis nigricans with recommendations.
- \* Assist the state in preparing acanthosis nigricans health related awareness campaigns.
- \* Develop intervention strategies/initiatives.

## **6. Conclusions and Recommendations**

The ANTES program offers the following conclusions:

- \* A consequence of conducting many training sessions for the school districts in numerous sites over a six-week period revealed a variation in acanthosis nigricans definition standards. This became apparent when school districts began reporting they had no children with the acanthosis nigricans marker. After several on-site visits by Border Health Office staff, it was mutually determined (school nurse and site visitor) that false negatives were reported. Those who were visited received clarification, however, it was impossible to evaluate every screening site. Extrapolating from the errors found in site visits, we conclude that between three and five percent of children with acanthosis nigricans were not reported.
- \* The high insulin levels found in elementary school children exhibited externally by the acanthosis nigricans marker and overweight and internally by elevated blood pressure, high cholesterol, insulin resistance and high triglycerides will "break the bank." In other words, the health conditions produced by high insulin levels in so many children has the potential to overrun the health care system. There are not enough facilities and resources to care for the enormous health problems loom on the horizon.
- \* The screening for acanthosis nigricans should be coupled with recommendations from the School Health Advisory Councils (SHAC) for schools to intervene with appropriate nutrition and vigorous physical activity.
- \* A greater emphasis should be placed on informing school administrators of the legislatively mandated SHACs and that these councils can play a positive role in children's health and learning.

- \* Acanthosis nigricans screenings are important for early intervention purposes.
- \* As the acanthosis nigricans screening begin to produce positive results, the state of Texas will be indebted to its school nurses for enhancement of student health and the medical expenditures they enable the state to avert.

The ANTES program offers the following recommendations:

- \* Require a ratio of one school nurse to every 500 students.
- \* Provide funding for districts to hire additional school nurses or mandate that if a school district is going to hire coaches, it must also fund a school nurse program.
- \* Have the Texas Education Agency develop a procedure by which acknowledges schools throughout the state of Texas are acknowledged for meeting student health needs and ensuring that children are equipped to learn. The process would resemble the Texas Essential Knowledge and Skills (TEKS). Schools would be recognized by various categories of acceptability in a scheme known, perhaps, as Healthy Plus Schools or Lone Star Leaders. The school nutrition program, sequential physical and health education and a healthy environment are areas that could be evaluated.
- \* Provide a Physical Fitness Report Card that includes blood pressure reading, height and weight accompanied by information explaining the health risks associated with overweight.
- \* Conduct statewide acanthosis nigricans screenings using randomized, stratified clusters similar to other population data collection. Mathematical models would be developed to determine statistical significance.
- \* School districts should NOT enter into "Pouring Rights" contracts in which the district grants a beverage company sole rights to all drink sales in its schools.
- \* School districts should insure that sanitary water fountains are available and operational in all its buildings and playgrounds.
- \* The nutritional content of school breakfast and lunch programs should be improved by reducing the amount of highly refined foods offered. Replacement foods should include high fiber fruits and vegetables and quality protein.

## 7. References

- Barlow, SE, Dietz, WH. Obesity Evaluation and Treatment: Expert Committee Recommendations. Pediatrics. 1998; 102 (3): e29.
- Berenson GS, Srinivasan SR. Emergence of obesity and cardiovascular risk for coronary artery disease: the Bogalusa heart Study. Prev Cardiol. 2001 Summer;4(3):116-121.
- Epstein, LH, Valoski, AM, Vara, LS, et al. Effects of decreasing sedentary behavior and increasing activity on weight change in obese children. Health Psychology. 1995; 14:109-115.
- Epstein, LH, Wing, RR, Koeske, R, Valoski, A. Effects of diet plus exercise on weight change in parents and children. Journal of Consulting and Clinical Psychology. 1984
- Gower BA. Syndrome X in children: Influence of ethnicity and visceral fat. Am J Human Biol 1999;11(2): 249-257.
- Kerem N, Guttman H, Hochberg Z. The autosomal dominant trait of obesity, Acanthosis Nigricans, hypertension, ischemic heart disease and diabetes type 2. Horm Res. 2001;55(6):298-304.
- Odeleye, OE, Courtem M, Pettitt, DJ, Ravvssin, E. Fasting hyperinsulinemia is a predictor of increased body weight gain and obesity in Pima Indian children. Diabetes. 1997; 46:1341-1345.
- 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.
- Ponder, S, Sullivan, S, McBarth, G. Type 2 Diabetes Mellitus in Teens. Diabetes Spectrum 2000 13 (2): 97-105
- 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.

Urbina, A. and Zevallos, R. ***Acanthosis Nigricans, Blood Pressure and Anthropometrics among 8-year-olds from East El Paso.*** Unpublished

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

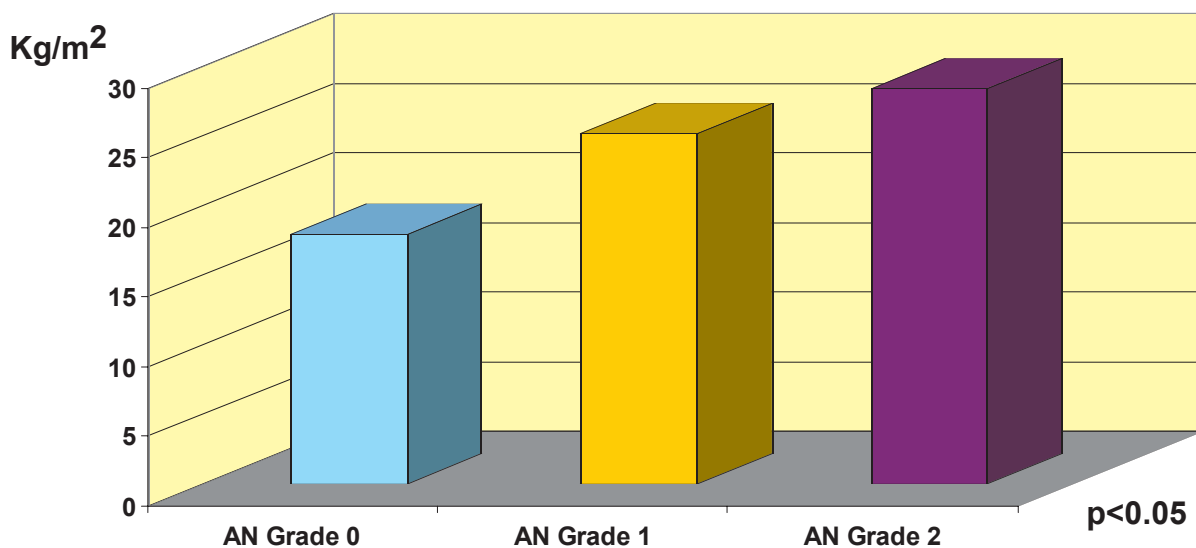
## 9. Addendum

### Related Research

A study of students from six third grade classes in an East El Paso elementary school was conducted to investigate the association between acanthosis nigricans (AN), body mass index (BMI), body fat distribution and blood pressure (BP). A total of 72 children participated. Acanthosis nigricans was present in six of these individuals (8.3% of the sample population).

*Figure 1 demonstrates the correlation this study discovered between increasing body mass and advancing stages of AN.*

**FIGURE 1. MEAN BODY MASS INDEX BY ACANTHOSIS GRADE**



**FIGURE 2. MEAN SYSTOLIC BLOOD PRESSURE BY ACANTHOSIS GRADE**

This study found that systolic and diastolic blood pressure increased by grade of Acanthosis Nigricans among boys and girls, however, the difference did not achieve statistical significance.

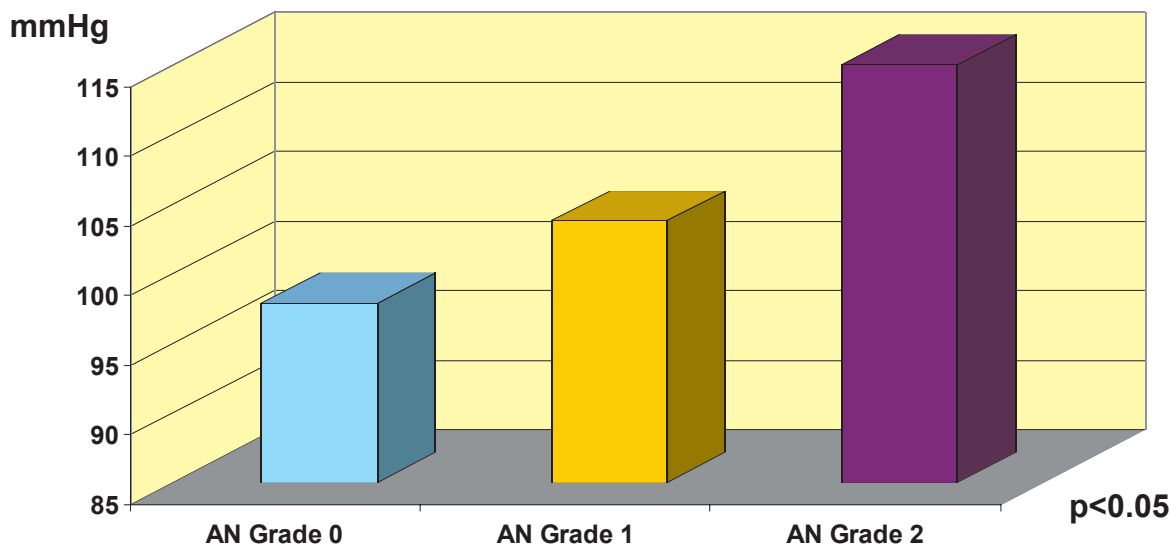
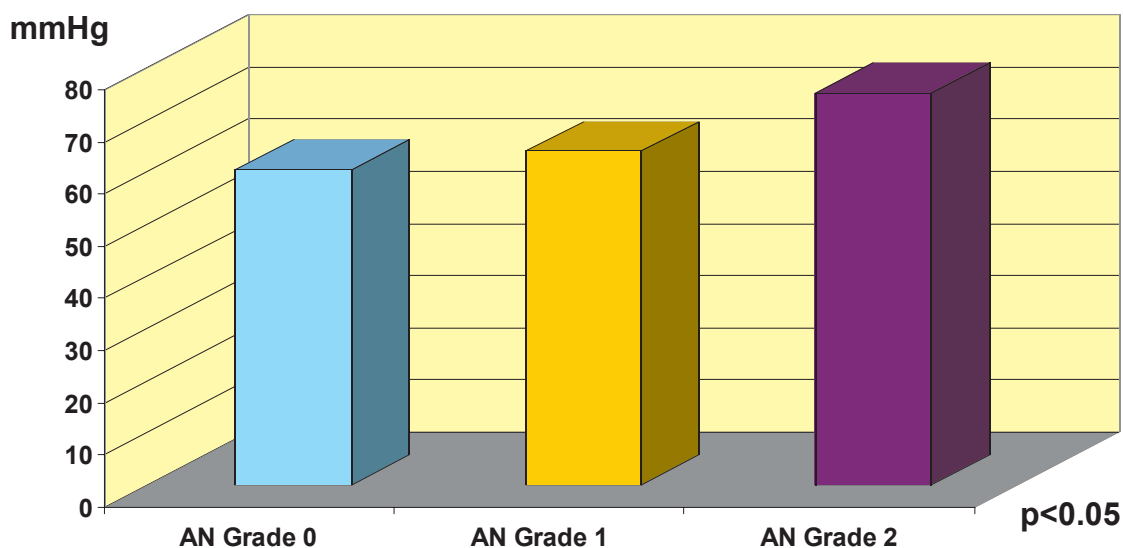


Figure 3 shows a similar relationship between AN grade and diastolic blood pressure.

**FIGURE 3. MEAN DIASTOLIC BLOOD PRESSURE BY ACANTHOSIS GRADE**



## Distribution of ANTES Materials

Table 1 presents a breakdown of how many and where ANTES materials have been distributed.

**TABLE 1.**

DESTINATION	HANDBOOKS	BROCHURES	TOTAL	DESTINATION			
Region 1 EDINBURG	768	10823	11591	Alabama	20	80	100
Region 2 CORPUS CHRISTI	265	8433	8698	Arkansas	250	1000	1250
Region 3 VICTORIA	310	4560	4870	California	434	1545	1979
Region 13 AUSTIN	387	7995	8382	Connecticut	16	25	41
Region 15 SAN ANGELO	275	6000	6275	Florida	25	25	50
Region 18 MIDLAND	316	5615	5931	Illinois	26	79	105
Region 19 EL PASO	425	9500	9925	Kentucky	13	47	60
Region 20 SAN ANTONIO	475	9556	10031	Louisiana	12	50	62
Region 4 HOUSTON	719	3201	3920	New Mexico	52	555	607
Region 6 COLLEGE STATION	50	50	100	New York	37	340	377
Region 7 TYLER	4	16	20	Ohio	5	10	15
Region 10 DALLAS	45	123	168	Oklahoma	78	500	578
Region 11 FORT WORTH	50	100	150	Tennessee	2	10	12
Region 12 WACO	45	755	800	West Virginia	15	100	115
Region 17 LUBBOCK	50	500	550				

# **That Which Can Be Foreseen Can Be Prevented**

**DR. CHARLES W. MAYO  
CIRCA 1928**

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

**1201 West University Drive  
Edinburg, Texas 78541  
Phone: (956) 381-3687  
Fax: (956) 381-3688  
E-mail: [TMBHCO@PANAM.EDU](mailto:TMBHCO@PANAM.EDU)  
[www.panam.edu/dept/tmbhco](http://www.panam.edu/dept/tmbhco)**