# 2009
# Nashville Area Aggregate Diabetes Audit Report

(revised)

Produced by
Nashville Area Diabetes Program/Tribal Epidemiology Center
Tribal Health Program Support Section
United South and Eastern Tribes, Inc. (USET)

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This year's United South and Eastern Tribes, Inc. (USET), Nashville Area Diabetes Audit Report and its sister Indian Health Service (IHS)/Tribal/Urban (I/T/U) specific Diabetes Audit Reports would not be possible without the dedicated and professional work of Nashville Area I/T/U health program personnel. We want to extend special thanks to all the Nashville Area I/T/U Diabetes Coordinators and other I/T/U personnel that participate in the annual IHS Diabetes Care and Outcome Audit (Diabetes Audit).

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The contributing USET staff members for the 2009 Diabetes Audit Reports include: Byron Jasper, Christina Compher, Weston Cornelius, Megan Turner, Ty Elders, Dianna Richter, Christy Duke, Nichole Blackfox, Cathy Hollister, Trudie Raymond, and John Mosely Hayes.

EXECUTIVE SUMMARY

A diabetes epidemic exists within Indian country. American Indian/Alaska Native (AI/AN) adults are 1.6 times more likely to have diabetes (16.1%) than non-Hispanic white adults (9.8%), and among the 12 Indian Health Service (IHS) Areas the Nashville Area has the second highest prevalence of diabetes among AI/AN adults. The 2008 all ages IHS Nashville Area AI/AN age-adjusted diabetes prevalence rate was 22.4%. An analysis of 2003-2008 data shows a continued large and disproportionate burden of diabetes in the Nashville Area AI/AN population, with an age-adjusted diabetes prevalence rate that is approximately two times greater than the IHS wide rate and four times greater than the US All Races rate. The Nashville Area Diabetes Audit Report (aggregate and site specific) presents an analysis of 2003-2008 data concerning AI/AN people with diabetes who receive care through the Indian health care delivery system. The Report provides trends and comparisons that help describe the health status of AI/ANs with diabetes. The IHS Nashville Area includes 28 federally recognized Tribes and three Urban Indian Health Care programs located in 14 states and encompasses approximately 112 counties totaling over 800,000 square miles. United South and Eastern Tribes, Inc. (USET) operates an IHS contracted Area Diabetes Program which provides consultative support to IHS/Tribal/Urban (I/T/U) health facilities in the Nashville Area. Twenty-five Nashville Area I/T/U programs receive funding under the IHS Special Diabetes Program for Indians, and 20 of these programs participate in the IHS Diabetes Care and Outcome Audit (Diabetes Audit).

Two primary data sources were used to create this Diabetes Audit Report: 1) 2003-2008 Nashville Area Diabetes Audit dataset, and 2) I/T/U health facility electronic patient management systems or I/T/U provided health data. With the exception of the diabetes prevalence graphs (Figures 1a-1b), the findings section charts are based on an analysis of data from the 2003-2008 Diabetes Audits. Sites have the option of auditing all or just a sample of their diabetes registry patients, and to manually or electronically Audit their patients medical records. In 2008, most Nashville Area I/T/Us chose to Audit all their diabetes registry patient records and to conduct the Audit electronically.

Findings

- Diabetes Prevalence: Age-adjusted diabetes prevalence rates calculated for the 23 Tribes included in the Nashville Area aggregate rate showed a wide range; in 2008, I/T/U specific age-adjusted AI/AN diabetes prevalence ranged from 9.7% to 34.2%. The 2006 all ages Nashville Area AI/AN age-adjusted diabetes prevalence rate (21.5%) was 1.9 times greater than the 2006 all ages IHS wide AI/AN rate (11.6%). For the four years (2003-2006) that adult US All Race age-adjusted rates were available for comparison, on average the all ages Nashville Area AI/AN age-adjusted diabetes prevalence rate (20.5%) was approximately 3.9 times greater than the adult US All Races rate (5.3%). Having an age-adjusted diabetes prevalence rate that is approximately two times greater than the IHS wide rate and four times greater than the US All Races rate reflects the existing large and disproportionate burden of diabetes in the Nashville Area AI/AN population.
- Audit Sample Size: Sample size impacts how well Diabetes Audit analysis results represent the health status of persons on the diabetes registries of participating facilities and measurement of how well a diabetes program is following the IHS Standards of Care for persons with diabetes. For 2008, the Nashville Area Audit sample (78%; 4,835/6,186) was 1.6 times larger than the IHS wide sample (50%; 63,840/127,204). Of the 20 Nashville Area I/T/Us that submitted data in 2008, Audit sample sizes ranged from 19% to 100%, with a median of 99.5%. In 2008, nine I/T/Us submitted sample sizes of 100%, seven submitted sample sizes of 92-99%, and the remaining four ranged from 82%, 67%, 31%, to 19%.
- Missing Data: Knowing the amount of missing data is important because as the percentage of missing data increases, so too does the concern that an Audit analysis result may not be an adequate representation of the particular aspect of patient health status and/or measurement of how well a diabetes program is following the IHS Standards of Care for persons with diabetes. For the 2008 Nashville Area Audit data, an analysis of missing data shows that the Cholesterol Category, LDL Category, HDL Category, Triglyceride Category, Number of Ideal Values (HbA1c, BP, LDL, BMI), Number of Ideal Values (HbA1c, BP, LDL), and Tobacco Use variables were missing data for 25% to 50% of the records.
- Duration of Diabetes: For the Nashville Area, there was a statistically significant increase between 2003 and 2008 in the percentage of patients with diabetes for 10+ years.
- Glycemic Control and Drug Therapy: Overall, there was an increase in the percentage of patients with diabetes with HbA1c values <7%; however, the data also reflects a small increase in the percentage of diabetic patients with HbA1c >9.5%. Drug treatment therapy distribution among patient with diabetes has changed significantly between 2003 and 2008. The percentage of patients being prescribed more than one drug (Insulin+Drug(s) and 2+ Drugs) or using diet and exercise alone has increased while the use of single drug therapies has declined.
- Blood Pressure Control and use of Hypertensive Medication: Blood pressure control peaked in 2005 with ~39% of patients having a blood pressure of <130/80. While there has been an overall increase in blood pressure control since

2003, there have been some decreases in control since the peak in 2005. Audit data reflect a statistically significant change between 2003 and 2008 in the percentage of patient with diabetes and hypertension receiving an ACE/ARB inhibitor for treatment of their hypertension. This statistically significant change is reflective of years 2005 through 2008 when there was a steady increase in ACE/ARB use; however, when evaluating the change between 2003 and 2008, there is only a very small increase in ACE/ARB use.

- Dyslipidemia and Lipid Management: Audit data reflect a statistically significant increase over time in the percentage of patients with good total cholesterol, good LDL cholesterol (<100 mg/dL), and good triglyceride results (<150 mg/dL). Overall, good HDL (>=HDL mg/dL) improved between 2003 and 2008; however, the HDL results fluctuated between those years and the steady increases noted in the other cholesterol results are not seen when evaluating HDL. Diabetes Audit data reflect fluctuations, with a slight overall decrease, between 2003 and 2008 in the use of lipid-lowering agent among patients with high LDL (>=160mg/dL).
- Weight Status: The Diabetes Audit data reflect very few patients with diabetes with normal weight (7.2% in 2008). Being overweight or obese are also risk factors for hypertension and cardiovascular disease. In 2008, 72.3% of patients with diabetes were obese (BMI 30+).
- Combination of Ideal Values (HbA1c, BP, LDL, BMI): Diabetes Audit data reflect overall increases in the percentage of patients with two, three, or four out of four (HbA1c, Blood Pressure, LDL, BMI) ideal values with simultaneous decreases in the percentage of patients with zero or one ideal value out of four. Still, few patients have a combination of three or four ideal values in 2008.
- Nephropathy Assessment and Medication for Treatment: Audit data reflect that while there was fluctuation in the percentage of patients with proteinuria and microalbuminuria, overall there was an increase between 2003 and 2007. For this Area's diabetic population, GFR <60 increased between 2003 and 2008. In 2008, approximately 23% of the patients with diabetes have a calculated GFR <60 and therefore need follow-up. Data reflect a statistically significant increase over time in the percentage of ACE/ARB inhibitor use among patients with proteinuria/microalbuminuria.
- Depression Assessment: There was a statistically significant increase over time in the percentage of patients with an active diagnosis of depression and in the percentage of patients being screened for depression.
- Tobacco Use/Counseling: Audit data reflect a statistically significant increase over time in the percentage of patients using tobacco. Audit data reflect a statistically significant decrease in the percentage of patients being provided tobacco cessation counseling between 2003 and 2008.
- Dental, Eye, and Foot Exams: Audit data reflect decreases in the percentage of patients with eye and foot exams between 2003 and 2008. While there was a substantial decrease in foot exams, there was a very small increase in dental exams during the same time period.
- Diet Education: There were substantial decreases in the percentage of patients with diabetes who had received any diet education or specifically education from an RD between 2003 and 2008.
- Vaccines (Flu, Pneumovax, Tetanus-Diphtheria): There has been little increase over time (2003-2008) in the percentage of patients that received a pneumovax vaccine; however, flu and tetanus-diphtheria vaccination has increased gradually over time.
- PPD Status (Tuberculosis Skin Test), Screening Rates and Treatment Completed: PPD Status changed little between 2003 and 2008; however, PPD Status unknown did increase gradually over time. The percentage of patients with diabetes receiving a PPD screening has remained static. In 2008, the percentage of patients with a positive PPD screening that had completed treatment was 9.2%. This is substantially lower than the percentage that had completed treatment in 2003 (37.9%).

General Recommendations

- Continue to support the Diabetes Audit process.
- Continue to standardize the Diabetes Audit process within the Nashville Area.
- Develop or maintain local quality check processes for the Diabetes Audit.
- Continue to support training of local staff on how to use the Resource Patient Management System Diabetes Management System package, documentation, coding, data entry and the electronic Diabetes Audit process.
- Continue efforts to improve the WebAudit process and its use by local programs.
- Utilize the technical support of the Area Diabetes Consultant and USET Tribal Epidemiology Center staff, as well as IHS resources in the ongoing development of local diabetes programs.
- Advocate for continued IHS Special Diabetes Program for Indians funding by using the Diabetes Audit Reports.

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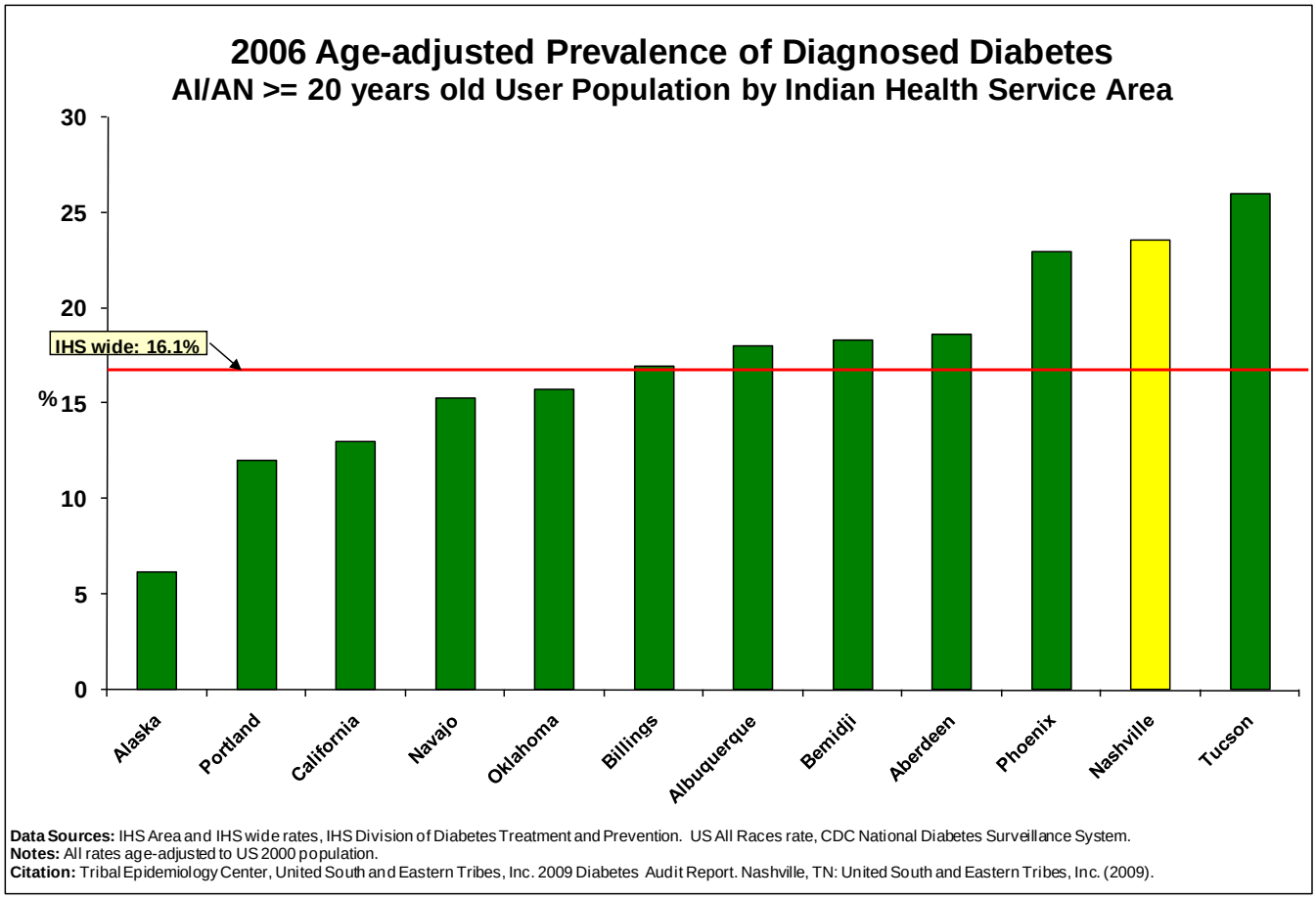
INTRODUCTION

A diabetes epidemic exists within Indian country. The American Indian/Alaskan Native (AI/AN) population suffers a disproportionate amount of disease compared to other US sub-populations.[1] In 2007, AI/AN adults were 1.6 times more likely to have diabetes (16.1%) than non-Hispanic white adults (9.8%).[2,1] As shown in the figure below, in 2006 among the 12 Indian Health Service (IHS) Areas the Nashville Area was identified as having the second highest age-adjusted prevalence of diabetes among AI/AN adults (23.6%).[2] An analysis of Tribal electronic patient management system data found the 2006 all ages Nashville Area AI/AN age-adjusted diabetes prevalence rate (21.5%) was 1.9 times greater than the 2006 all ages IHS wide AI/AN rate (11.6%).[3] For the four years (2003-2006) that adult US All Race age-adjusted rates were available for comparison, on average the all ages Nashville Area AI/AN age-adjusted diabetes prevalence rate (20.5%) was approximately 3.9 times greater than the adult US All Races rate (5.3%).[4] And the 2008 all ages IHS Nashville Area AI/AN age-adjusted diabetes prevalence rate was 22.4%. Having an age-adjusted diabetes prevalence rate that is approximately two times greater than the IHS wide rate and four times greater than the US All Races rate reflects the existing large and disproportionate burden of diabetes in the Nashville Area AI/AN population.

The IHS Nashville Area Diabetes Audit Report presents an analysis of 2003-2008 data concerning AI/AN people with diabetes who receive care through the Indian health care delivery system. The IHS Nashville Area Diabetes Audit Report, which consists of an aggregate IHS Nashville Area report with accompanying Indian Health Service/Tribal/Urban (I/T/U) health facility specific sister reports, provides trends and comparisons that help describe the health status of IHS Nashville Area AI/ANs that have a diagnosis of diabetes. This information can assist Tribal leaders, health administrators and clinicians improve their diabetes programs, support those in the community with diabetes, and target the use of health care dollars to combat the diabetes epidemic.




**Data Sources:** IHS Area and IHS wide rates, IHS Division of Diabetes Treatment and Prevention. US All Races rate, CDC National Diabetes Surveillance System.
**Notes:** All rates age-adjusted to US 2000 population.
**Citation:** Tribal Epidemiology Center, United South and Eastern Tribes, Inc. 2009 Diabetes Audit Report. Nashville, TN: United South and Eastern Tribes, Inc. (2009).

The Nashville Area I/T/U health care program network, the IHS Nashville Area Office (NAO), and the United South and Eastern Tribes, Inc. (USET), work together to address AI/AN health needs. Together, they serve approximately 60,000 rural and 75,000 urban AI/ANs in the southern and eastern United States who are members of federally recognized Tribes and

eligible for Indian health care delivery system services. The Nashville Area includes 28 federally recognized Tribes and three Urban Indian Health Care Organizations, and encompasses approximately 112 counties totaling over 800,000 square miles dispersed across parts of Texas, Louisiana, Mississippi, Alabama, Florida, South Carolina, North Carolina, Maryland, Pennsylvania, New York, Connecticut, Massachusetts, Rhode Island, and Maine. In 2008, the Nashville Area Indian health care delivery system's network of I/T/Us included 2 hospitals, 25 clinics, 17 health stations, 10 alcohol/substance abuse programs, and 4 wellness centers or Contract Health Service only programs.

USET represents 25 of the 28 Nashville Area Tribes. Although USET primarily focuses on providing services to its member Tribes, it also hosts several programs that benefit the entire Nashville Area I/T/U network. One such service is the technical assistance provided through the Nashville Area Diabetes Program that is funded by IHS, hosted by USET, and managed by the Nashville Area Diabetes Consultant. Under the Nashville Area Diabetes Program, 25 of the Nashville Area I/T/Us receive funding through the IHS Special Diabetes Program for Indians (SDPI) and 20 of these are Tribal programs that manage their diabetic population's clinical data and participate in the IHS Diabetes Care and Outcome Audit (Diabetes Audit).[5] The Diabetes Audit is a standardized method for assessing the diabetes care and the health status of diabetes patients seen at an I/T/U. Except for the diabetes prevalence charts, the charts in the Nashville Area Diabetes Audit Report are based on an analysis of data collected from the population of persons with diabetes who receive care through the I/T/Us of the 20 Nashville Area Tribes that participate in the Diabetes Audit. These 20 Tribes are indicated with asterisks in the list below that includes all of the current Nashville Area Tribes and Urban Indian Health Organizations (non USET affiliated Tribes and urban organizations are indicated with pound signs):

*Alabama-Coushatta Tribe of Texas
*Chitimacha Tribe of Louisiana
*Coushatta Tribe of Louisiana
*Mississippi Band of Choctaw Indians
*Poarch Band of Creek Indians
*Miccosukee Tribe of Indians of Florida
*Seminole Tribe of Florida
*Catawba Indian Nation
*Eastern Band of Cherokee Indians
*Seneca Nation of Indians
*Oneida Indian Nation
*St. Regis Mohawk Tribe
*Mashantucket Pequot Tribal Nation
*Narragansett Indian Tribe
*Wampanoag Tribe of Gay Head (Aquinnah)
*Aroostook Band of Micmac
*Houlton Band of Maliseet Indians
*Passamaquoddy Tribe- Indian Township
*Passamaquoddy Indian Tribe- Pleasant Point
*Penobscot Indian Nation
Cayuga Nation of New York
Jena Band of Choctaw Indians
Tunica-Biloxi Indians of Louisiana
Mohegan Tribe of Connecticut
Mashpee Wampanoag Tribe
#Onondaga Nation
#Towanda Band of Seneca
#Tuscarora Nation
#AI Community House of New York (urban)
#North American Indian Center of Boston (urban)
#Baltimore American Indian Center (urban)

The IHS Nashville Area Diabetes Audit Report includes the following components:

- An executive summary and an introductory section presenting a description of the purpose and components of the Nashville Area Diabetes Audit Report and a description of the Nashville Area.
- A methodology section describing calculation logic and data limitations.
- A findings section with diabetes related charts and narratives covering the period 2003-2008. Diabetes prevalence findings are provided first followed by a series of analyses and charts based on the Diabetes Audit data. For the aggregate report, comparisons are made between the aggregate of the Audit data from the participating I/T/Us across years. For the I/T/U specific reports Audit comparisons include both comparisons of a particular I/T/U to itself and to the aggregate of the other Nashville Area I/T/Us across years. A summary of findings is provided at the end.
- A general recommendations section.
- Appendices that include a compendium of resources (Appendix A), a listing of participating I/T/Us by year (Appendix B), and the raw data used to create the Diabetes Audit charts presented in the findings section (Appendix C).

I/T/U specific reports are bound separately from the aggregate Nashville Area Diabetes Audit Report. The I/T/U specific reports are limited to an executive summary, findings, recommendations, and an appendix with the data from a particular I/T/U's Diabetes Audit program. This is to avoid duplicating information already provided in the aggregate report and for each I/T/U to receive only its own data.

## METHODOLOGY

### Data Sources

Two data sources were used to create this Diabetes Audit Report:1) 2003-2008 Nashville Area IHS Diabetes Care and Outcome Audit (Diabetes Audit) dataset provided by the IHS Division of Diabetes Treatment and Prevention (DDTP), and, 2) I/T/U health facility electronic patient management systems or I/T/U provided health data. Appendix B identifies the I/T/Us included in the Nashville Area Aggregate Diabetes Audit Report by year. Comparison statistics are from the IHS and Centers for Disease Control and Prevention (CDC).

### Methodology for Diabetes Prevalence Charts

To calculate Nashville Area and I/T/U specific age-adjusted diabetes prevalence rates (Figure 1a), the US Census 2000 All Race population was used as the standard. These rates represent what the prevalence would have been if the population had the same age distribution as the standard, in this case the entire US population as defined by the Census 2000. The crude rates are provided in the narrative and a distribution of the persons with diabetes by age group is shown in Figure1b. USET analysts either extracted data stored in electronic patient management systems or utilized I/T/U provided diabetes case data.

Nashville Area I/T/Us can opt to use the Resource and Patient Management System (RPMS) or a commercial product as their electronic patient management system.[6] RPMS is the IHS provided electronic patient management system and it can be used to evaluate clinical quality as well as public health.[6] For I/T/Us that use RPMS, USET analysts extract age group specific population and diabetes case data using the Clinical Reporting System (CRS) application.[7] For I/T/Us that do not use RPMS (for this year's report this represented 2 out of the 23 Tribes that were included in the prevalence calculation), Tribal health facility personnel extract similar data from their electronic patient management systems and provide these data to USET analysts.

CRS generated User Populations were used as denominators for prevalence rate calculations. The CRS application's User Population extraction logic criteria were as follows:

- An individual had to be alive at the end of the report year.
- An individual had to be classified as American Indian/Alaskan Native (AI/AN).
- An individual had to live within the Contract Health Service Delivery Area (CHSDA). An I/T/U's CHSDA is defined as those communities assigned to a particular Tribe by the IHS.
- An individual had to have had a health visit within three calendar years prior to the last day of the report year.
- All demo or "dummy" patients are excluded.

Note: The non-RPMS I/T/Us followed the same criteria when mining their electronic patient management systems.

CRS generated cohorts of persons with diabetes were used as numerators for prevalence rate calculations. The CRS application's persons with diabetes extraction logic criteria were as follows:

- An individual had to be a member of the User Population denominator.
- An individual had to have at least one diagnosis of diabetes (ICD-9 codes 250.00-250.93) before or during the calendar year report period.

Note: The non-RPMS I/T/Us followed the same criteria when mining their electronic patient management systems.

For an IHS wide comparison, an unpublished 2006 all age age-adjusted diabetes prevalence rate from the IHS Division of Diabetes Treatment and Prevention that was based on IHS National Data Warehouse data was used.[3,8] For non-AI/AN population comparisons, CDC calculated US and state All Races population age-adjusted diabetes prevalence rates based on self reported diabetes among persons 18 years or older data were used.[4,9]

Limitations for the diabetes prevalence rates include:

- An I/T/U's CHSDA is defined as those communities assigned to a particular Tribe by the IHS. Some of these CHSDA definitions have varied across years which can impact the denominator. In addition, the patient management systems record and store new residence information over previous residence information. Thus, patients that move into or out of the CHSDA between the report year end and the time of data extraction may be erroneously included or excluded from the denominators.
- The electronic patient management system data are always changing because new information is constantly added, edited, and deleted.

- The diabetes prevalence rates represent those AI/ANs residing in the CHSDA who receive I/T/U services, not the entire AI/AN community residing in the CHSDA.
- In calculating the IHS wide, Nashville Area and I/T/U specific diabetes prevalence rates, only electronic patient management system data are analyzed. Data from health care provided to patients outside of an I/T/U which have not been entered into an I/T/U's electronic patient management system were not included in the analyses.
- Variability in medical provider documentation and data entry impacts the quantity and quality of the data in an I/T/U's electronic patient management system.
- The comparison IHS wide diabetes prevalence rate was calculated based on IHS National Data Warehouse System data. Caution is warranted when comparing the Nashville Area and I/T/U specific rates to the IHS wide rates which were based on data mined directly from Tribal electronic patient management systems.
- Comparison US and State All Races diabetes prevalence rates are based on self reports among persons 18 years or older. Therefore, caution is warranted when comparing these rates to IHS wide, Nashville Area and I/T/U specific rates which are based on clinical documentation and the all age population.

### Methodology for Diabetes Audit Charts

With the exception of the diabetes prevalence graphs (Figures 1a-1b), the findings are based on an analysis of the 2003-2008 IHS Diabetes Audit data provided by participating I/T/Us. The IHS Diabetes Audit establishes a standardized method for assessing the IHS Standards of Care and the health status of patients that have diabetes.[10] This allows for valid comparisons between participating I/T/Us. Sites have the option of a manual or electronic Audit, and a recent study that compared these different data collection methods found that for the same patient record the manual Audit and the electronic Audit did not produce the same results suggesting a significant Audit data limitation.[11] In 2008, most Nashville Area I/T/Us chose to Audit all their diabetes registry patient records and to conduct the Audit electronically. Data are collected by the Nashville Area Diabetes Consultant from participating I/T/Us, and sent to IHS Division of Diabetes Treatment and Prevention (DDTP). The IHS DDTP staff clean and organize the data so it can be aggregated at the Area and national levels. It is returned to the Area Diabetes Consultant and the I/T/Us Diabetes Coordinators for program planning and additional analyses. I/T/Us have the option of using a random sample of patients with diabetes or using the entire diabetes registry for the Audit process. The random sample is drawn from the I/T/U's list of active patients with diabetes in sufficient number to provide an estimate within 10% or less of the true rate (at a 90% or more level of certainty).

It is important to note that the time frame for each Nashville Area Diabetes Audit period varied across years which impacts comparability. The period covered by the 2008 and 2007 Diabetes Audit was from January 1 to December 31; the period covered by the 2006 Audit was from June 1, 2005 to May 31, 2006; the period covered by the 2005 Audit was from July 1, 2004 to June 30, 2005. The 2003 and 2004 Audit periods were unknown at the time this report was created. The Nashville Area Diabetes Consultant now coordinates calendar year based Audit cycles to improve comparability.

It is also important to note that the number of participating I/T/Us varied from year to year. This impacts comparability across years. Between 2005 and 2008, 20 Nashville Area I/T/Us submitted Audit data. In 2004, 18 Nashville Area I/T/Us submitted data and in 2003, 16 Nashville Area I/T/Us submitted data. See Appendix B for a list of participating I/T/Us by year.

In 2007, for the first time, DDTP provided the Nashville Area Diabetes Consultant a Statistical Analysis Software (SAS) patient level dataset, allowing co-morbidity analyses, determinations of statistically significant differences, and yearly comparisons between an I/T/U and the aggregate of other participating I/T/Us. In the aggregate report, trends across time are analyzed. For the I/T/U specific reports trends across time are evaluated, and comparisons are made between an I/T/U and the aggregate. For the I/T/U specific reports the aggregate Audit data is represented as a series of dashes that coincide with the bars on each of the bar graphs.

For each chart, any missing data for the variable was excluded from the analysis (see Findings Section Table 1). This method of excluding records with missing values from the denominator differs from the DDTP's current method of including missing data in the denominator. These methodological differences may impact the comparability of this report to DDTP provided Audit analyses figures.

SAS computer programs were written to create the Diabetes Audit charts. Nashville Area aggregate level data were weighted according to the I/T/U ratio of sample size to registry size. This weighting procedure must be applied to calculate accurate Area level statistics so each I/T/U diabetic population is accounted for proportionate to the Nashville Area. This procedure increases how well the aggregate level results represent the population (the pool of patients from the combined diabetes

registries of participating Nashville Area I/T/Us from which the sample was selected). Accordingly, the results that are presented in the Diabetes Audit charts for the aggregate are adjusted. I/T/U specific Diabetes Audit results are not adjusted. Aggregate level percentages shown in a chart may not match the percentages presented in the non-weight chart's raw data table that is provided in the report appendix because the raw data are calculated from non-weighted data. The chart's secondary data table provided in the report appendix provide correctly weighted percentages but inaccurate counts based on the weighting.

Three different statistical tests are applied to Diabetes Audit chart data. For each test, a p-value threshold of less than 5% is used to determine if an observed difference is believed true or due to chance. A summary of data used to create each chart and the results of the statistical significance tests are provided in Appendix C. Please note that statistical significance may not indicate clinical significance of diabetes care. The three statistical significance tests are as follows:

- Differences among years: This test examines whether the distribution of data for a particular chart variable change from year to year. If the test shows statistical significance (p-value < 0.05), one can conclude that at least two of the years have different distributions. Directionality cannot be determined from this test.
- Trend across years: This test examines whether there is a directional change across years in the distribution of data. If the test shows statistical significance (p-value < 0.05), then one can conclude that there has been a directional shift in the population. When the variable has only 2 or 3 categories, it is often easy to see how the trend manifests itself over the years. If the variable has many categories, it is usually more difficult to see. The results of this test are provided as a footnote in most of the charts. This test is only valid when the variable values are numeric. If the variable includes either "Refused", or "Unknown" then this test cannot be used.
- Difference between I/T/U and aggregate of other I/T/Us: This test examines whether for the most recent year the I/T/U's data is distributed differently than the aggregate of the other I/T/Us. If the test shows statistical significance (p-value < 0.05) then one can conclude that a difference exists. The results of this test are provided as a footnote in most of the charts.

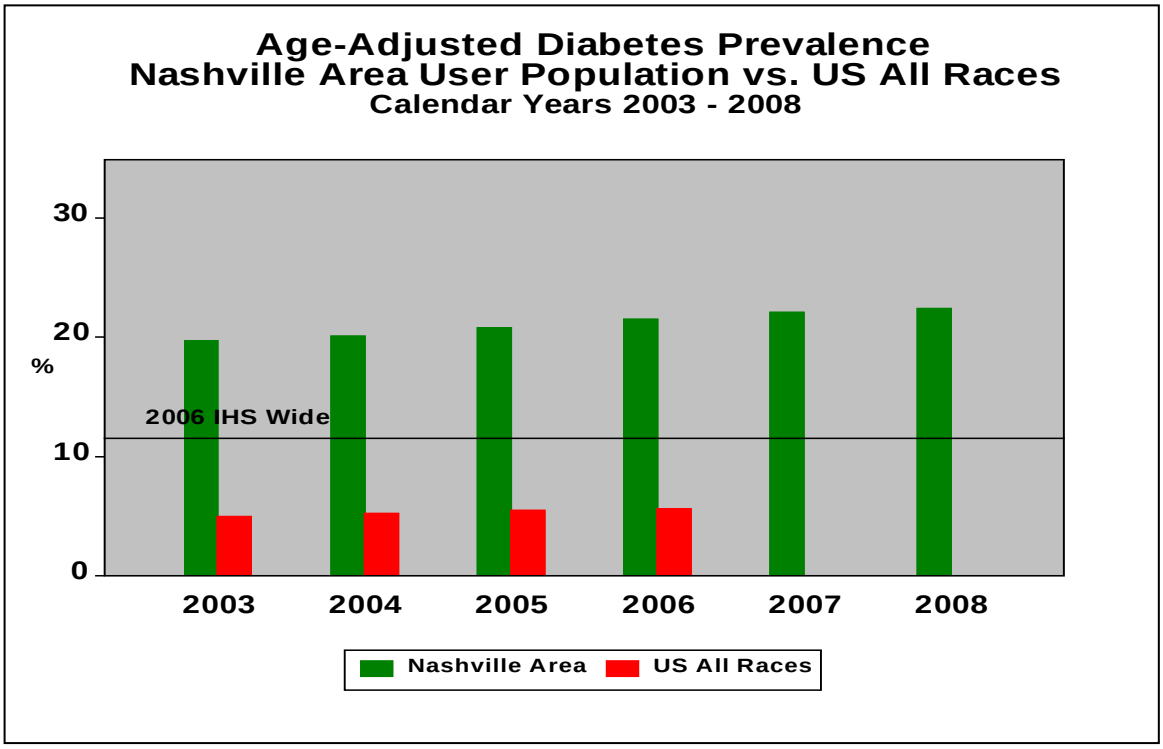
Limitations of the Nashville Area Diabetes Audit analysis include:

- The Audit process reviews only individuals on the active diabetes registry. Thus individuals who are not actively seeking care are not included in the analysis.
- The type of Audit data collection method (i.e. Manual vs. Electronic) impacts the values of the Audit variables that are collected and these in turn can impact comparability across years.
- The lack of Diabetes Audit report period consistency and I/T/U participation variations across years impacts comparability.
- Skills and degree of accuracy of the person performing the Diabetes Audit process and/or entering the data can impact data quality.
- Sample size impacts how well Diabetes Audit analysis results represent the health status of persons on the diabetes registries of participating facilities and measurement of how well a diabetes program is following the IHS Standards of Care.
- Missing data impacts the results of analysis and ultimately the representation of patient health and program status.

FINDINGS

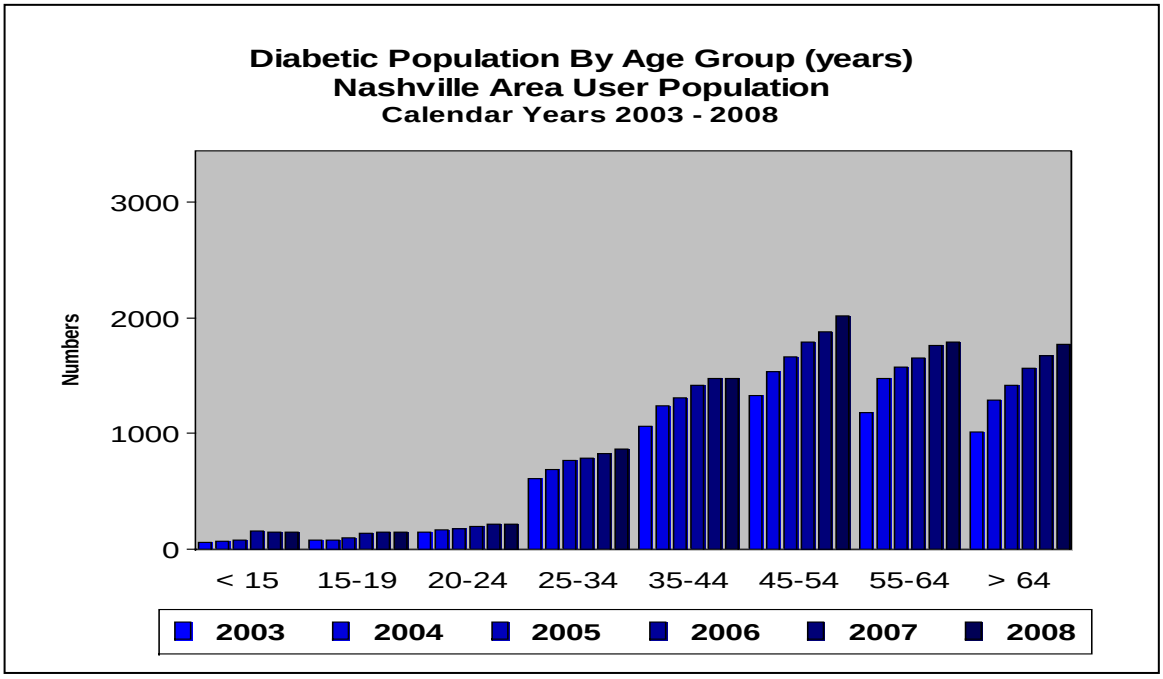
Diabetes Prevalence Analysis Results

Figure 1a.




**Data Sources:** For Nashville Area, Tribal health data systems (e.g. RPMS). For 2006 IHS wide, IHS Division of Diabetes Treatment and Prevention. For US, CDC National Diabetes Surveillance System. **Notes:** All rates age-adjusted to US 2000 population. Age categories for Area aggregate calculations differed from categories used to calculate 2006 IHS wide and US rates. Nashville Area and IHS wide rates based on clinical documentation and all ages data. US rates based on self-reports from persons >= 18 years. Caution is warranted because data quality varies overtime and in previous years fewer Tribes included in the aggregate. IHS wide and US data for some years was unavailable. **Citation:** Tribal Epidemiology Center, United South and Eastern Tribes, Inc. 2009 Diabetes Audit Report. Nashville, TN: United South and Eastern Tribes, Inc. (2009).

Figure 1b.




**Data Source:** Tribal health data systems (e.g. RPMS). **Notes:** Caution is warranted because data quality varies overtime and in previous years fewer Tribes included in the aggregate. IHS wide and US data for some years was unavailable. **Citation:** Tribal Epidemiology Center, United South and Eastern Tribes, Inc. 2009 Diabetes Audit Report. Nashville, TN: United South and Eastern Tribes, Inc. (2009).

Diabetes prevalence was calculated from data collected from 23 Nashville Area Tribes (see Appendix B) following the RPMS Clinical Reporting System User Population definition (see Methodology Section).[7] To calculate age-adjusted diabetes prevalence rates (Figure 1a), the US Census 2000 All Race population was used as the standard. These rates represent what the prevalence would have been if the population had the same age distribution as the entire US population as defined by the Census 2000. Figure 1a shows that the Nashville Area AI/AN age-adjusted diabetes prevalence increased slightly from 19.7% in 2003 to 22.4% in 2008. Age-adjusted diabetes prevalence rates calculated for the 23 Tribes included in the Nashville Area aggregate rate showed a wide range; in 2008, I/T/U specific age-adjusted AI/AN diabetes prevalence ranged from 9.7% to 34.2%. The 2006 all ages Nashville Area AI/AN age-adjusted diabetes prevalence rate (21.5%) was 1.9 times greater than the 2006 all ages IHS wide AI/AN rate (11.6%).[3] For the four years (2003-2006) that adult US All Race age-adjusted rates were available for comparison, on average the all ages Nashville Area AI/AN age-adjusted diabetes prevalence rate (20.5%) was approximately 3.9 times greater than the adult US All Races rate (5.3%).[4] ***Having an age-adjusted diabetes prevalence rate that is approximately two times greater than the IHS wide rate and four times greater than the US All Races rate reflects the existing large and disproportionate burden of diabetes in the Nashville Area AI/AN population.***

The crude diabetes prevalence rates for the Nashville Area aggregate were as follows: for 2003, 13.7% (5,471/39,810); for 2004, 14.4% (6,525/45,232); for 2005, 15.0% (7,070/47,067); for 2006, 15.8% (7,685/48,602); for 2007, 16.4% (8,111/49,349); and for 2008, 16.9% (8,422/49,743). Figure 1b shows the distribution of the population of persons with diabetes by age group and overtime.

## IHS Diabetes Care and Outcome Audit Data Analysis Results

The information presented in the series of tables and graphs that follow reflects an analysis of the IHS Diabetes Care and Outcome Audit (here after referred to as Diabetes Audit) data.[5] Data are generated from audits performed on the records of selected patients on the diabetes registries of participating Nashville Area I/T/Us from 2003 to 2008. The Diabetes Audit (electronic or manual) captures data on numerous health variables consistent with IHS Standards of Care for adults with Type 2 diabetes for each patient record audited.[10] A summary of data used to create each graph, perform the statistical significance tests, and the results of the tests are provided in the Appendix (available as an electronic file).

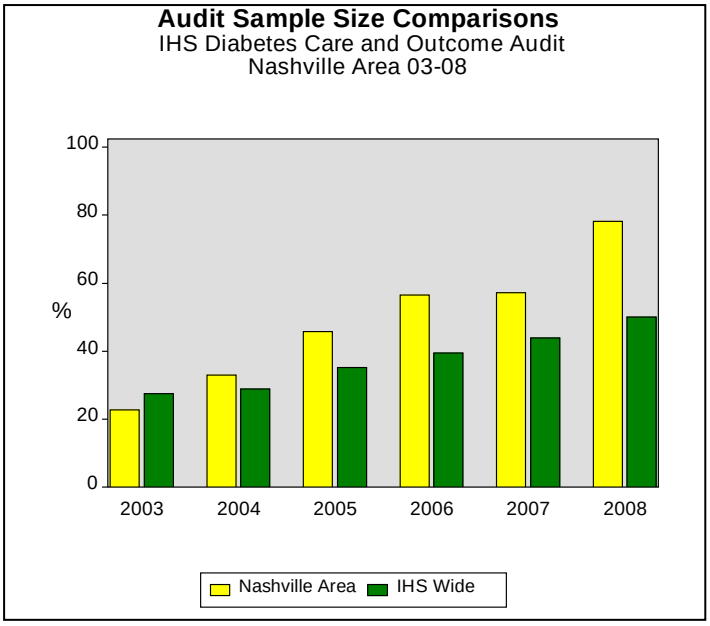
For some of the graphs statistical significance tests are applied to determine if an observed difference is believed true or due to chance (see Methodology Section). For the I/T/U specific reports, statistical tests were used to evaluate whether there had been a change in an I/T/U's data between the earliest year and the most recent year (years vary for some I/T/Us, 2003 and 2008 are the standard) and whether in the most recent year an I/T/U's data was different than the Nashville Area aggregate.

In the footnote of each graph, the "Statistical Significance (<=.05)" refers to the level at which the statistical test was applied. The "Trend over Time" refers to whether the data changed in one direction over time; if a "Yes" is indicated this means that with 95% confidence, a real trend is being seen over time. For the I/T/U specific reports, the "Difference between I/T/U & Other Nashville Area I/T/Us" refers to whether data for an I/T/U was different than data for the aggregate of the other Nashville Area I/T/Us included in the most recent year; if a "Yes" is indicated this means that with 95% confidence a real difference exists between an I/T/U's data and the Nashville Area aggregate data for the most recent year. However, statistical significance may not indicate clinical significance of diabetes care. Clinical judgment is needed to determine what statistically significant changes or differences are clinically significant.

### Audit Sample Size

Sample size impacts how well Diabetes Audit analysis results represent the health status of persons on the diabetes registries of participating facilities and measurement of how well a diabetes program is following the IHS Standards of Care for persons with diabetes. Figure 2 below provides a comparison of the Nashville Area Diabetes Audit sample size to the IHS wide Diabetes Audit sample size. For 2008, the Nashville Area Audit sample (78%; 4,835/6,186) was 1.6 times larger than the IHS wide sample (50%; 63,840/127,204). Of the 20 Nashville Area I/T/Us that submitted data in 2008, Audit sample sizes ranged from 19% to 100%, with a median of 99.5%. In 2008, ten I/T/Us submitted sample sizes of 100%, six submitted sample sizes of 92-99%, and the remaining four ranged from 82%, 67%, 31%, to 19% respectively. In 2008, most Nashville Area I/T/Us chose to Audit all their diabetes registry patient records and to conduct the Audit electronically.

Figure 2. Comparison of Diabetes Audit Sample Sizes




For 2008, the Nashville Area Audit sample was 1.6 times larger than the IHS wide sample.

Missing Data

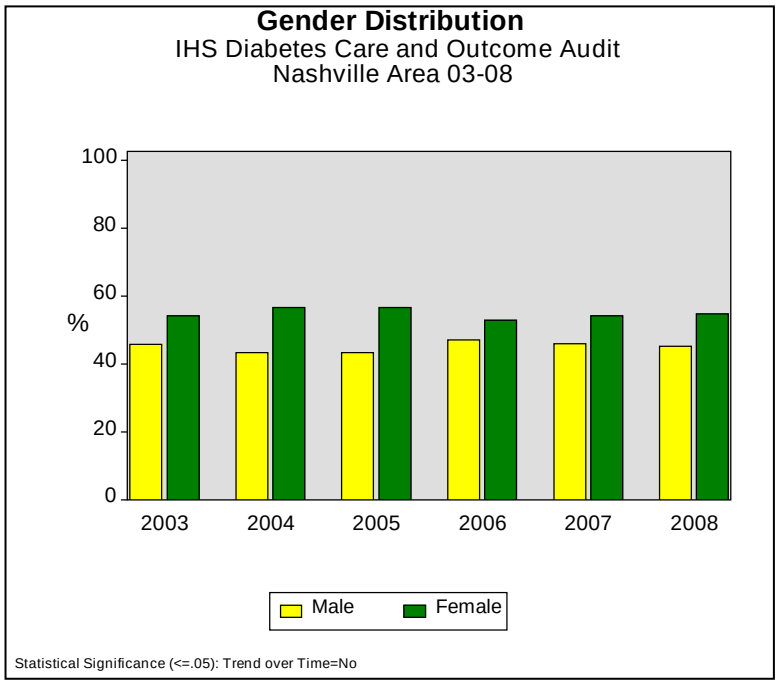
Prior to beginning a review of Diabetes Audit data analysis interpretations it is important to examine the amount of missing data associated with each of the variables under study. Knowing the amount of missing data is important because as the percentage of missing data increases, so too does the concern that an Audit analysis result may not be an adequate representation of the particular aspect of patient health status and/or measurement of how well a diabetes program is following the IHS Standards of Care for persons with diabetes. Table 1 below shows the amount of missing data for each variable by year. For the 2008 Nashville Area Audit data, an analysis of missing data shows that the Cholesterol Category, LDL Category, HDL Category, Triglyceride Category, Number of Ideal Values (HbA1c, BP, LDL, BMI), Number of Ideal Values (HbA1c, BP, LDL), and Tobacco Use variables were missing data for 25% to 50% of the records.

Table 1. Missing Diabetes Audit Variable Value

| Variable | Percent Missing | | | | | |
|---|---|---|---|---|---|---|
| | 2008 | 2007 | 2006 | 2005 | 2004 | 2003 |
| **Patients with a Combination of Ideal Values (A1c,BP,LDL,BMI)** | **45.7%** | 41.6% | 39.9% | 50.9% | 37.9% | 35.9% |
| **Patients with a Combination of Ideal Values (A1c,BP,LDL)** | **45.2%** | 40.8% | 38.7% | 49.9% | 36.2% | 33.1% |
| **Low Density Lipid Results (mg/dL)** | **36.2%** | 31.9% | 28.8% | 40.5% | 27.5% | 29.2% |
| **Triglyceride Results (mg/dL)** | **35.9%** | 33.5% | 30.2% | 39.1% | 26.6% | 26.4% |
| **High Density Lipid Results (mg/dL)** | **35.4%** | 32.8% | 30.0% | 39.0% | 26.6% | 27.2% |
| **Cholesterol Results (mg/dL)** | **35.1%** | 32.0% | 29.3% | 38.5% | 25.7% | 25.6% |
| **Tobacco Use** | **26.5%** | 38.1% | 40.9% | 12.3% | 19.0% | 14.9% |
| **Glycemic Control - HbA1c** | 19.3% | 21.0% | 15.1% | 18.0% | 14.8% | 9.3% |
| **Blood Pressure Control (mmHg)** | 18.5% | 17.8% | 16.4% | 20.5% | 16.3% | 9.8% |
| **Creatinine Results (mg/dL)** | 14.9% | 21.1% | 20.3% | 23.5% | 28.5% | 18.1% |
| **GFR (mL/min/1.73 m2)** | 14.9% | 21.1% | 20.3% | 23.5% | 28.5% | 18.2% |
| **Duration of Diabetes (10 Year)** | 13.9% | 17.0% | 15.7% | 15.3% | 7.0% | 3.5% |
| **Weight Status by BMI Value** | 2.1% | 2.6% | 3.8% | 2.3% | 3.1% | 6.7% |
| **PPD Status** | 0.3% | 0.6% | 1.0% | 0.1% | 0.3% | 2.7% |
| **Dental, Eye, Foot Exams (Dental)** | 0.2% | 0.3% | 0.5% | 0.2% | 0.4% | 4.1% |
| **Tobacco Cessation Counseling** | 0.2% | 0.7% | 0.3% | 2.6% | 2.7% | 8.5% |
| **Dental, Eye, Foot Exams (Eye)** | 0.1% | 0.4% | 0.3% | 1.0% | 0.1% | 1.5% |
| **Depression Active Diagnosis** | 0.1% | 0.1% | 0.5% | 0.2% | 0.0% | 0.0% |
| **Flu and Pneumovax (Pneumovax)** | 0.1% | 0.2% | 0.5% | 0.4% | 0.5% | 2.0% |
| **Diet Education Provided (Any Education)** | 0.1% | 0.1% | 0.3% | 0.1% | 0.2% | 2.7% |
| **Diet Education Provided (RD Education)** | 0.1% | 0.1% | 0.3% | 0.1% | 0.2% | 2.7% |
| **Tetanus-Diphtheria within Past 10 Years** | 0.1% | 0.2% | 0.5% | 0.7% | 0.5% | 1.7% |
| **Flu and Pneumovax (Flu)** | 0.1% | 0.1% | 0.4% | 0.2% | 0.3% | 0.8% |
| **Dental, Eye, Foot Exams (Foot)** | 0.0% | 0.2% | 0.4% | 0.1% | 0.2% | 1.3% |
| **Gender Distribution** | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **Age Distribution** | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% |
| **Hyperglycemia Treatment** | 0.0% | 0.5% | 1.1% | 3.6% | 1.3% | 3.2% |
| **ACE or ARB Inhibitor Use Among Patients with Hypertension** | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **Lipid Agent Use Among Patients w/ High LDL (>=160mg/dL)** | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **EKG Done within Last 5 Years** | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **Urinalysis Past Year** | 0.0% | 0.4% | 0.7% | 0.7% | 0.9% | 1.4% |
| **No Active Depression Dx - Depression Screen** | 0.0% | 0.0% | 0.0% | 0.0% | . | . |
| **PPD Negative and Last PPD After Diabetes Diagnosis** | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **PPD Positive and Treatment Complete** | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **Proteinuria** | . | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **Microalbuminuria** | . | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **ACE/ARB Inhibitor Use for Proteinuria/Microalbuminuria** | . | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |

Gender Distribution

Figure 3.

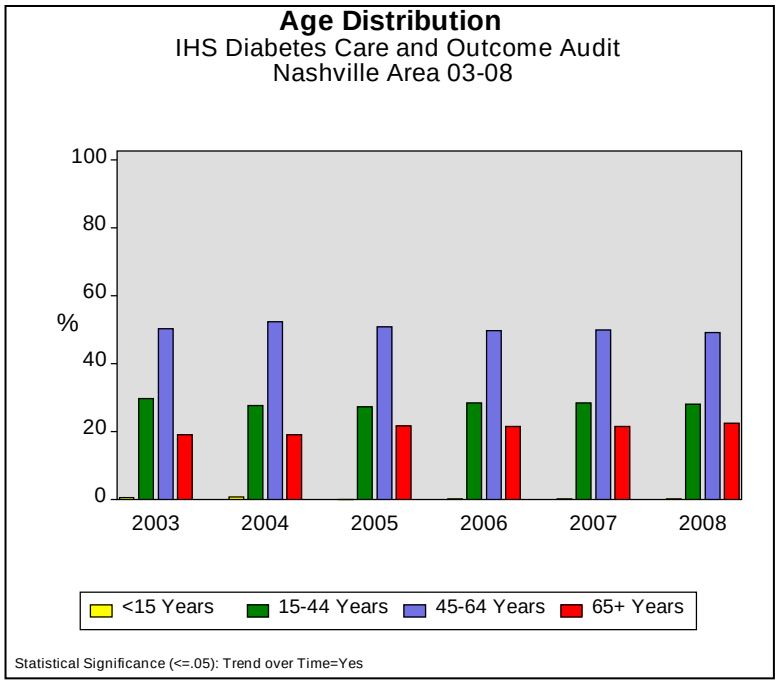



Diabetes Audit data reflect a greater percentage of females with diabetes, which mirrors national AI/AN statistics.

Age Distribution

Age is a risk factor for Type 2 diabetes. In the past Type 2 diabetes was diagnosed predominately in patients age 40 and older. Now Type 2 diabetes is increasingly common among AI/AN youth.

Figure 4.

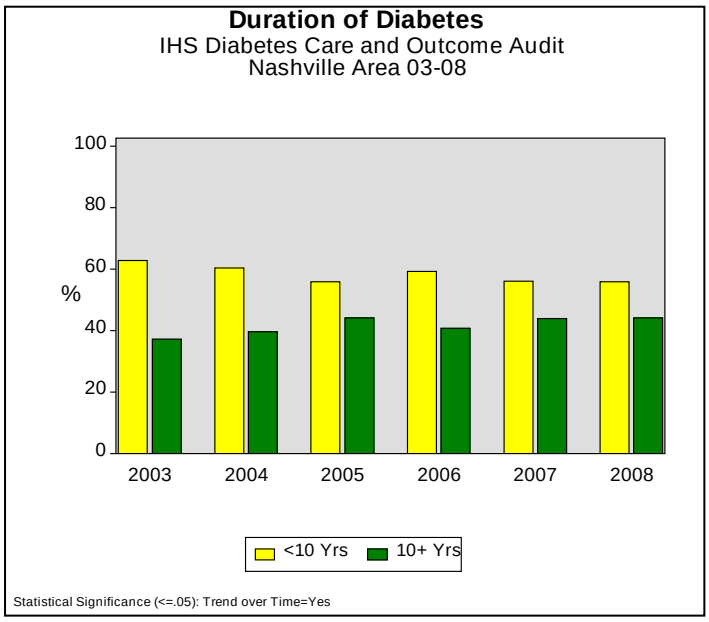



For the Nashville Area, the age group distribution of persons with diabetes included in the Audit has changed slightly over time. However this change was statistically significant.

Duration of Diabetes

The duration of diabetes is related to complications such as kidney disease, cardiovascular disease and amputation. Intensive treatment and patient compliance with a regimen of recommended care can reduce the risk of diabetes complications.

Figure 5.

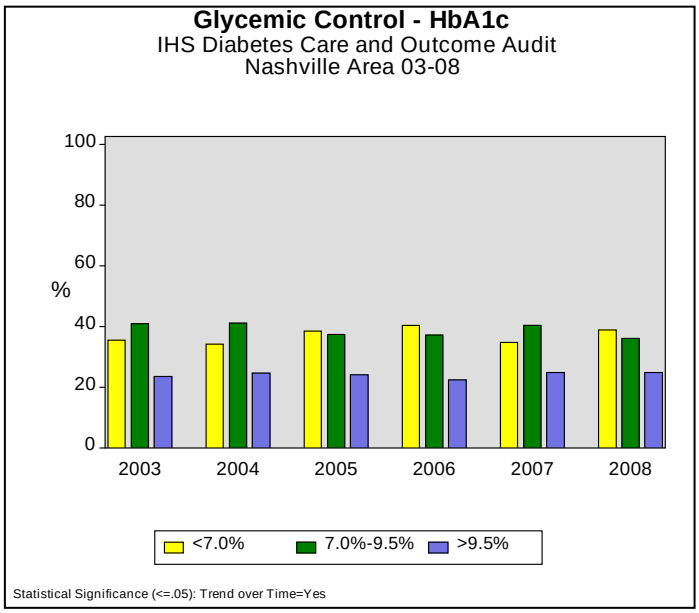



For the Nashville Area, there was a statistically significant increase between 2003 and 2008 in the percentage of patients with diabetes for 10+ years.

Glycemic Control

Hemoglobin A1c (HbA1c) is a weighted measure, which is used to estimate glycemic control for the previous 3 months. The HbA1c value goal is less than 7%; however, some clinical groups advocate for a goal of less than 6.5%. This lab test is recommended in all patients with diabetes to monitor progress toward clinical glucose targets and facilitate decision making. As a goal, a HbA1c lab test is recommended every 3-4 months.

Figure 6.

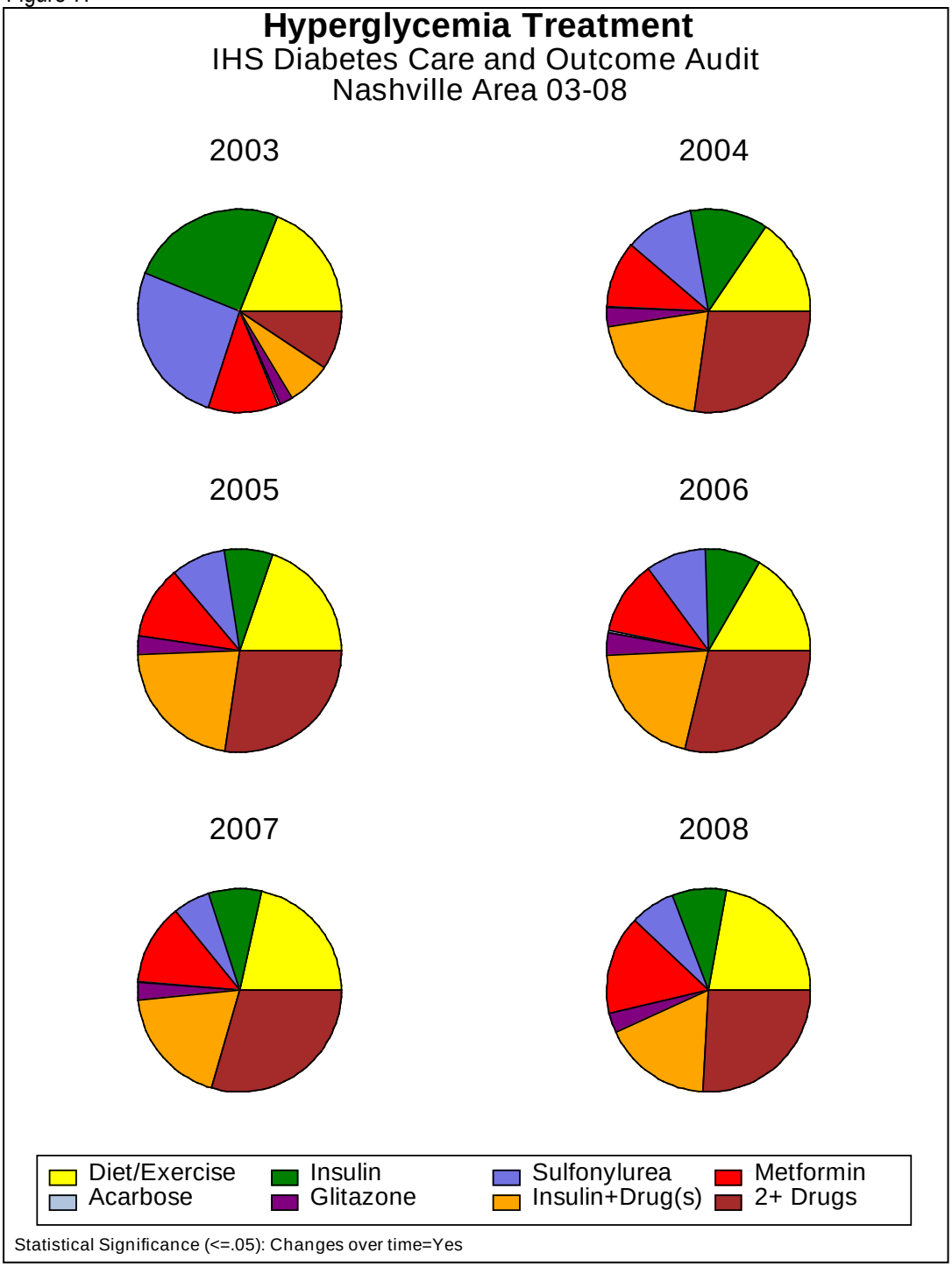



Overall, there was an increase in the percentage of patients with diabetes with HbA1c values <7%; however, the data also reflects a small increase in the percentage of diabetic patients with HbA1c >9.5%.

Hyperglycemia Treatment Distribution – Multi-Drug Therapy

Providers are increasingly prescribing multi-drug therapy as treatment for individuals with diabetes. Many individuals are experiencing improved glycemic control with the use of multiple diabetes drug therapy.

Figure 7.

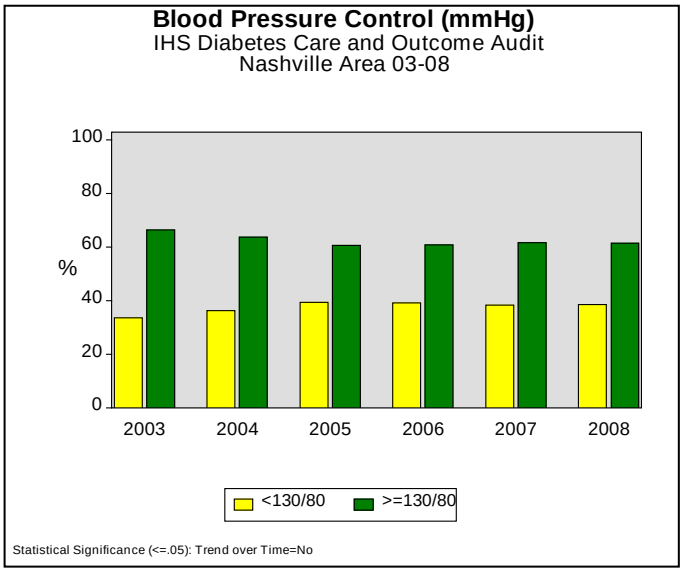



Drug treatment therapy distribution among patient with diabetes has changed significantly during these years. The percentage of patients being prescribed more than one drug (Insulin+Drug(s) and 2+ Drugs) has increased while the use of single drug therapies has declined.

Blood Pressure Management

The target blood pressure (BP) for patients with diabetes is <130/80 mmHg and there is additional protection against renal disease by lowering BP to 120/70 mmHg. High blood pressure increases the risk of heart disease and renal failure in Type 2 diabetes.

Figure 8.

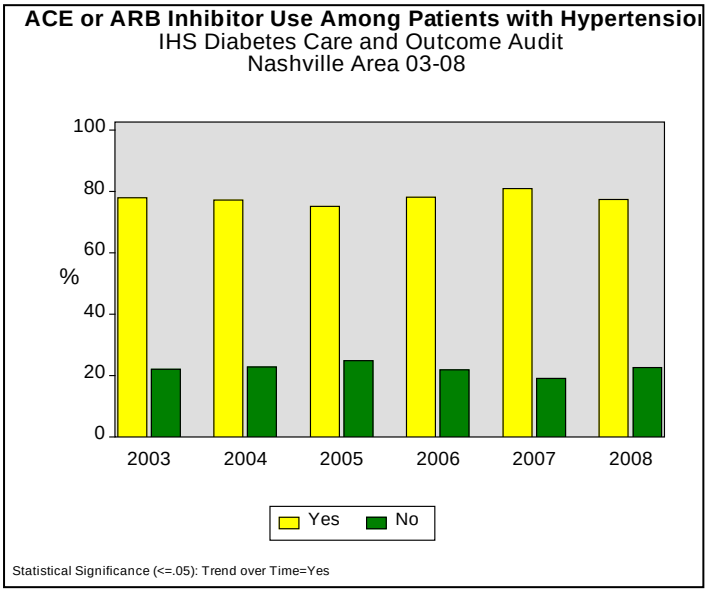



Blood pressure control peaked in 2005 with ~39% of patients having a blood pressure of <130/80. While there has been an overall increase in blood pressure control since 2003, there have been some decreases in control since the peak in 2005.

Treatments for Co-occurring Disorders - ACE Inhibitor/ARB Use in Hypertension

Angiotensin Converting Enzyme (ACE) Inhibitors and Angiotensin II Receptor Blockers (ARB) are used for controlling blood pressure, treating heart failure and preventing kidney damage in people with hypertension or diabetes.

Figure 9.




Audit data reflect a statistically significant change between 2003 and 2008 in the percentage of patient with diabetes and hypertension receiving an ACE/ARB inhibitor for treatment of their hypertension. This statistically significant change is reflective of years 2005 through 2008 when there was a steady increase in ACE/ARB use; however, when evaluating the change between 2003 and 2008, there is only the smallest increase in ACE/ARB use.

Lipid Results and Treatment

A lipid panel should be performed annually for all individuals with diabetes. A lipid panel includes total cholesterol, low-density lipoprotein (LDL), high-density lipoprotein (HDL) and triglycerides. The risk factors for atherosclerosis include: total cholesterol >200 mg/dL, LDL>100 mg/dL, HDL<40 mg/dL, and triglyceride >150 mg/dL.

Figure 10.

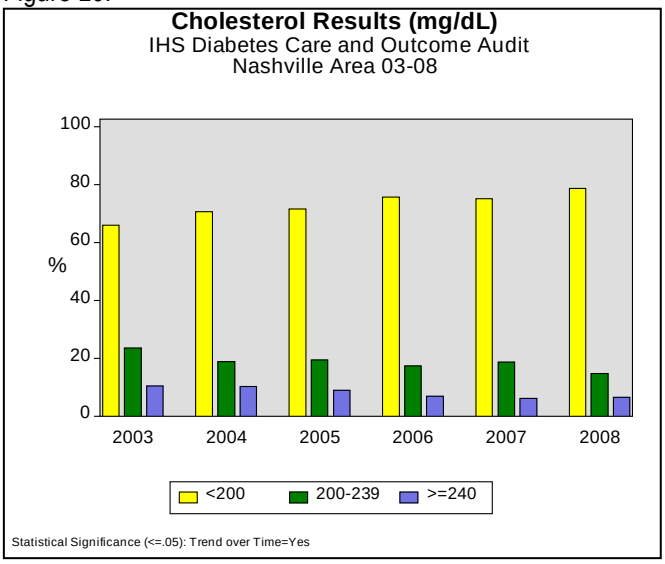



Figure 11.

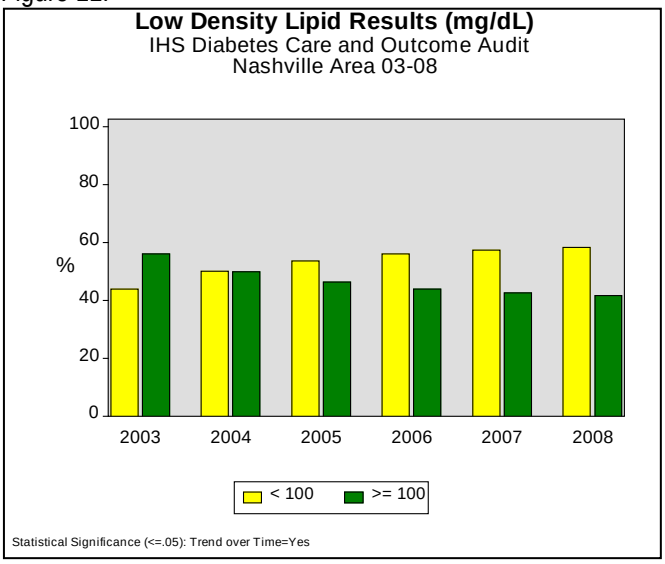



Figure 12.

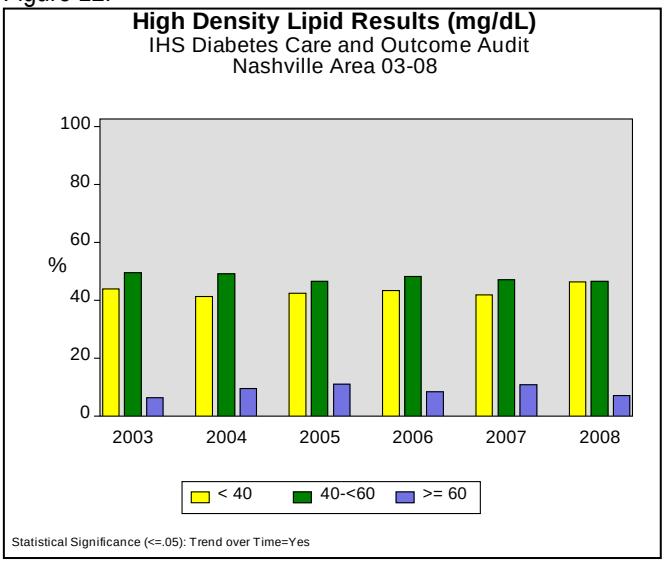
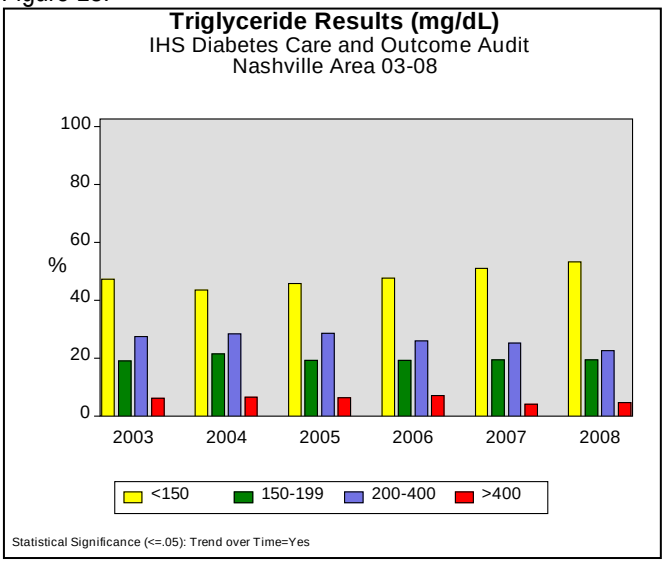


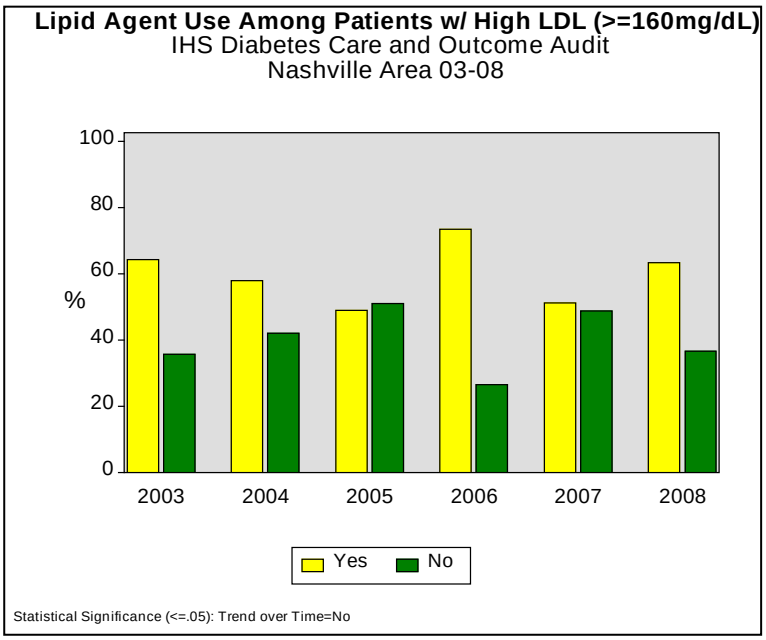

Figure 13.




Audit data reflect a statistically significant increase over time in the percentage of patients with good total cholesterol, good LDL cholesterol (<100 mg/dL), and good triglyceride results (<150 mg/dL). Overall, good HDL (>=HDL mg/dL) improved between 2003 and 2008; however, the HDL results fluctuated between those years and the steady increases noted in the other cholesterol results are not seen when evaluating HDL.

Lipid Agent Use

Figure 14.

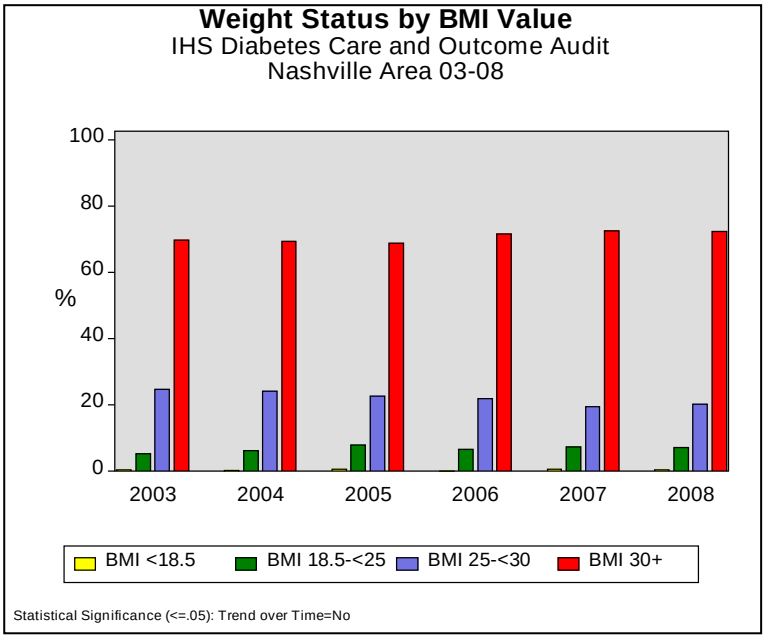



Diabetes Audit data reflect fluctuations, with a slight overall decrease, between 2003 and 2008 in the use of lipid-lowering agent among patients with high LDL (>=160mg/dL).

Overweight and Obesity

Obesity and physical inactivity are risk factors associated with the development of Type 2 diabetes. The Diabetes Prevention Project (DPP) demonstrated that weight loss, low fat eating, and regular physical activity can decrease the risk of developing diabetes by 58%.

Figure 15.

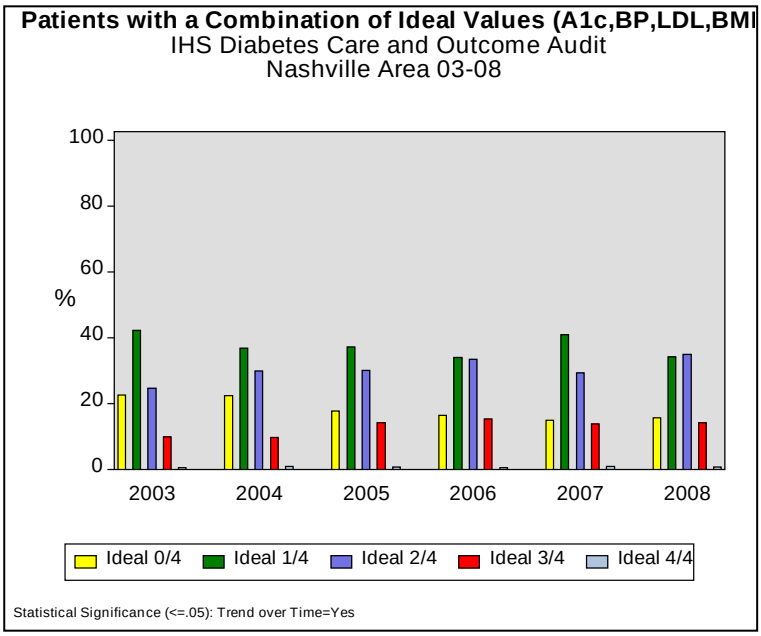



The Diabetes Audit data reflect very few patients with diabetes with normal weight (7.2% in 2008). Being overweight or obese are also risk factors for hypertension and cardiovascular disease. In 2008, 72.3% of patients with diabetes were obese (BMI 30+).

Combination of Ideal Values

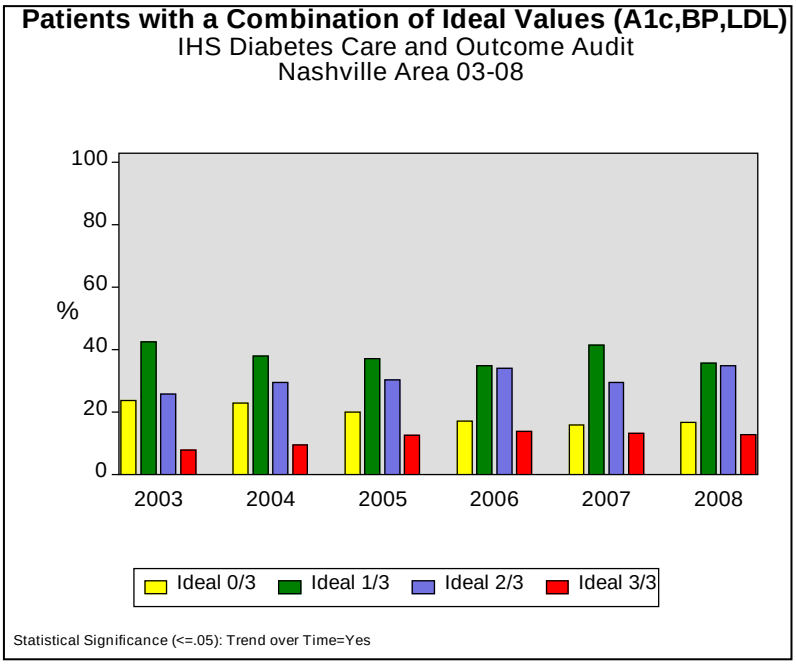
HbA1c, Blood Pressure, LDL, and BMI values are key measurements for determining if a person with diabetes is maintaining good control or poor control of their diabetes. These indicators are also important factors in assessing heart disease risk. Monitoring the percentage of patients with good values for one or more of these markers can help diabetes program managers understand the overall health status of their patient populations.

Figure 16.




Diabetes Audit data reflect overall increases in the percentage of patients with two, three, or four out of four (HbA1c, Blood Pressure, LDL, BMI) ideal values with simultaneous decreases in the percentage of patients with zero or one ideal value out of four. Still, few patients have a combination of three or four ideal values in 2008.

Figure 17.

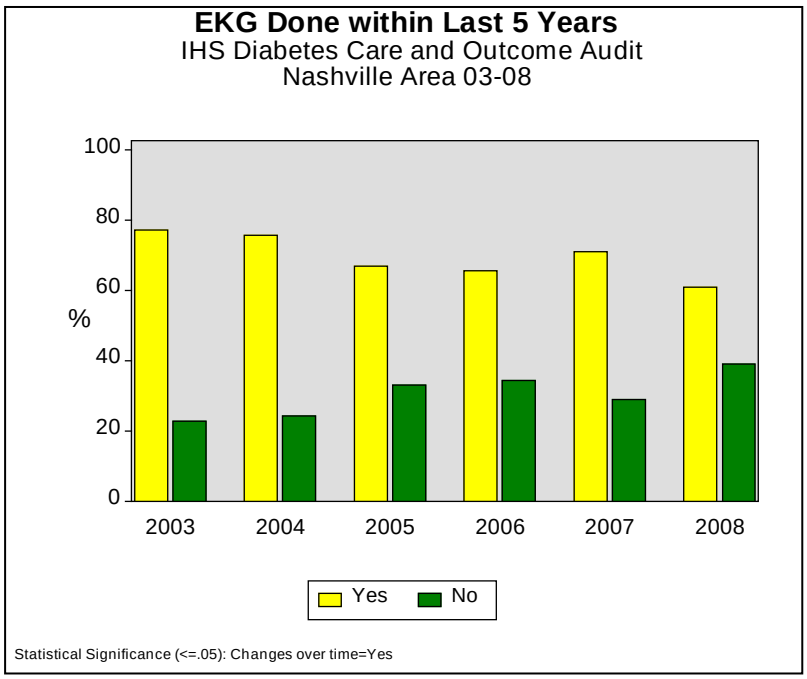



Diabetes Audit data reflect overall increases in the percentage of patients with two or three out of three (HbA1c, Blood Pressure, LDL) ideal values with simultaneous decreases in the percentage of patients with zero or one ideal value out of three.

EKG

A baseline electrocardiogram (EKG) should be obtained after diagnosis of diabetes and repeated every 1-5 years as clinically indicated.

Figure 18.

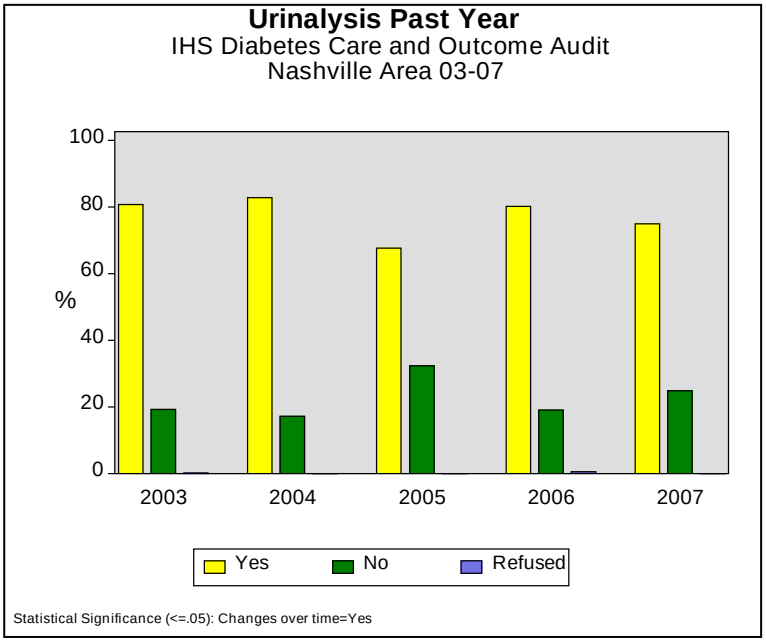



Audit data reflect a decrease over time (2003-2008) in the percentage of patients that had an EKG done.

Chronic Kidney Disease Assessment

Screening for chronic kidney disease includes an assessment of glomerular filtration rate (GFR) and a measurement of urinary protein excretion. Per IHS Standards of Care for persons with diabetes these tests should be done at diagnosis and repeated at least annually.

Figure 19.




There has been an overall decrease in the percentage of patients between 2003 and 2007 receiving this test. 2008 data was not available.

Kidney Disease Assessment and Treatment: Proteinuria, Microalbuminuria, Glomerular Filtration Rate, and Treatment

Figure 20.

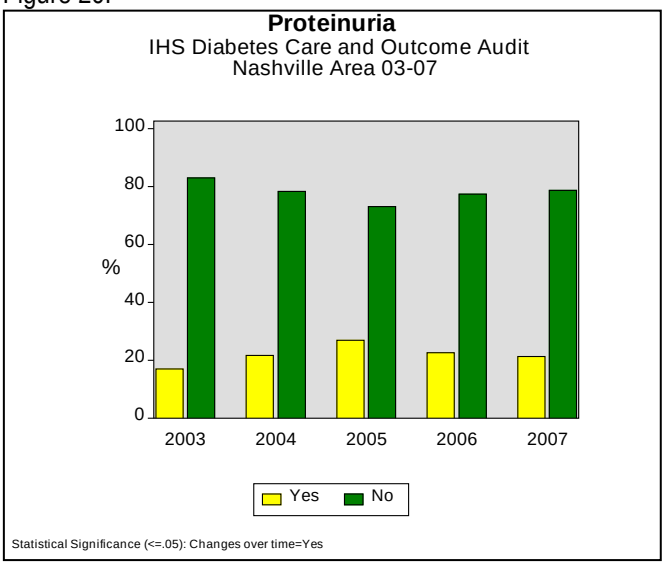



Figure 21.

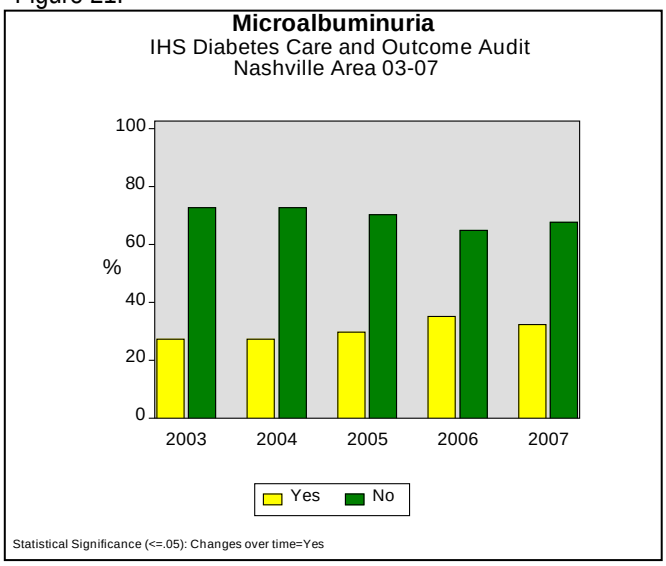



Figure 22.

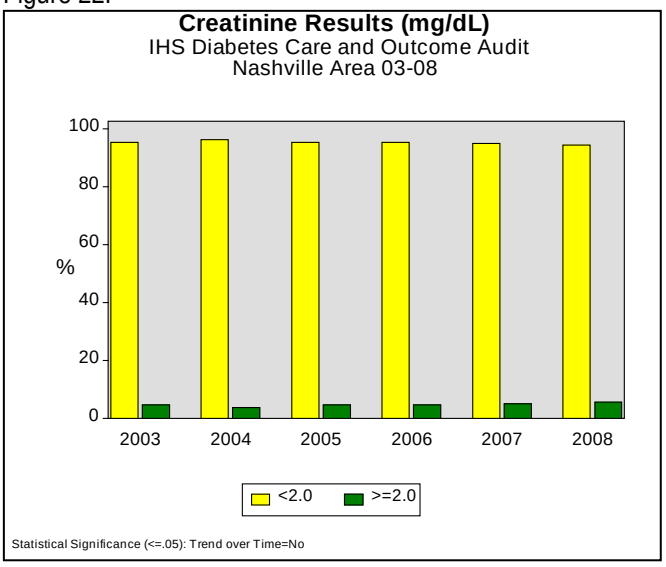
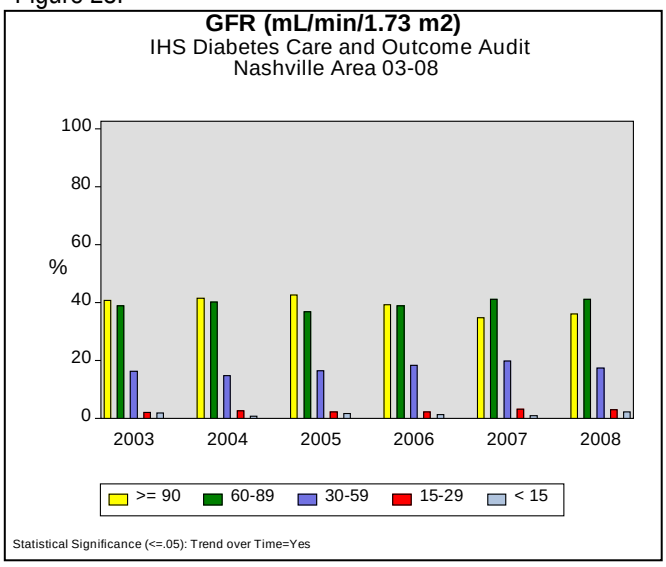
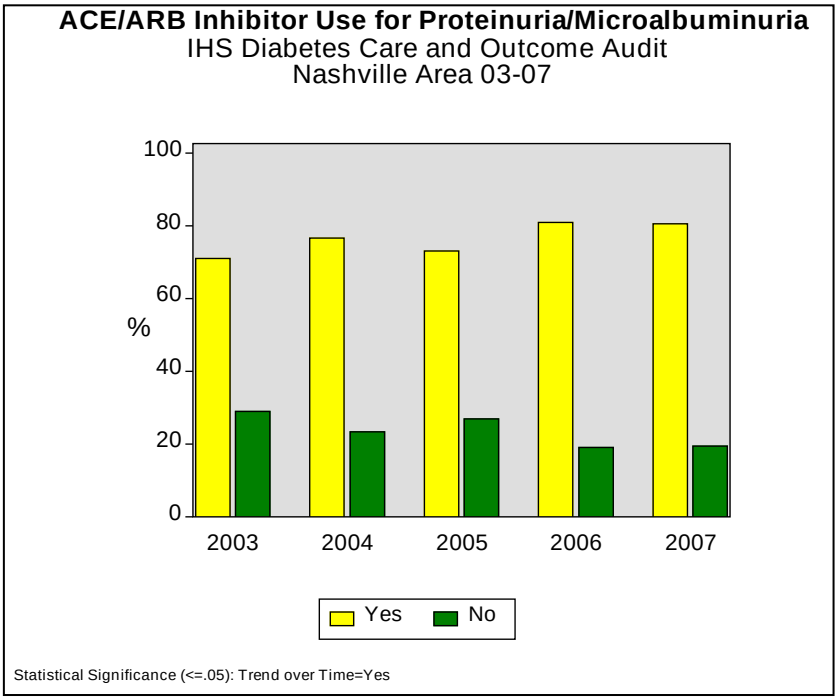



Figure 23.




Audit data reflect that while there was fluctuation in the percentage of patients with proteinuria and microalbuminuria, overall there was an increase between 2003 and 2007. For this Area's diabetic population, GFR <60 increased between 2003 and 2008. In 2008, approximately 23% of the patients with diabetes have a calculated GFR <60 and therefore need follow-up.

Figure 24.




Data reflect a statistically significant increase over time in the percentage of ACE/ARB inhibitor use among patients with proteinuria/microalbuminuria.

Depression Screen

Studies have shown that many people with diabetes also have depression, and that depression may affect the control of diabetes.[11,12] This indicator was added in 2005 and will continue to be trended in future years.

Figure 25.

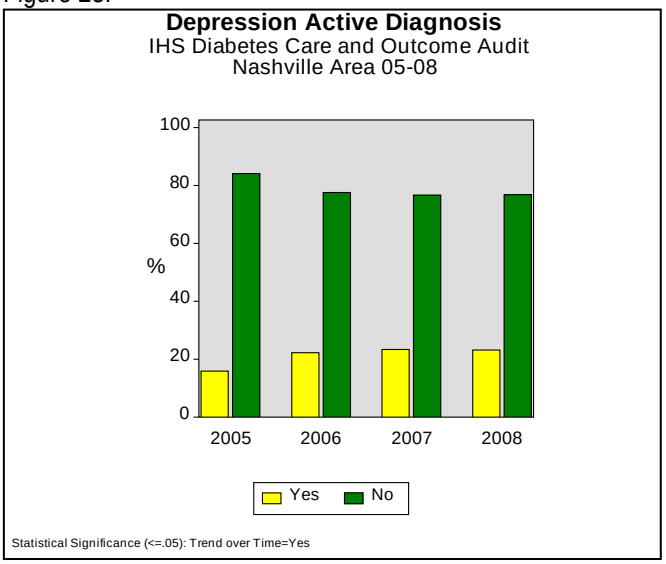
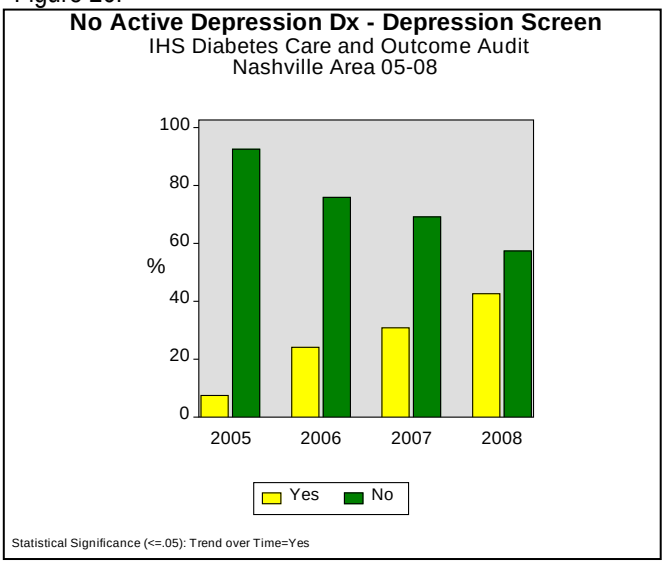



Figure 26.

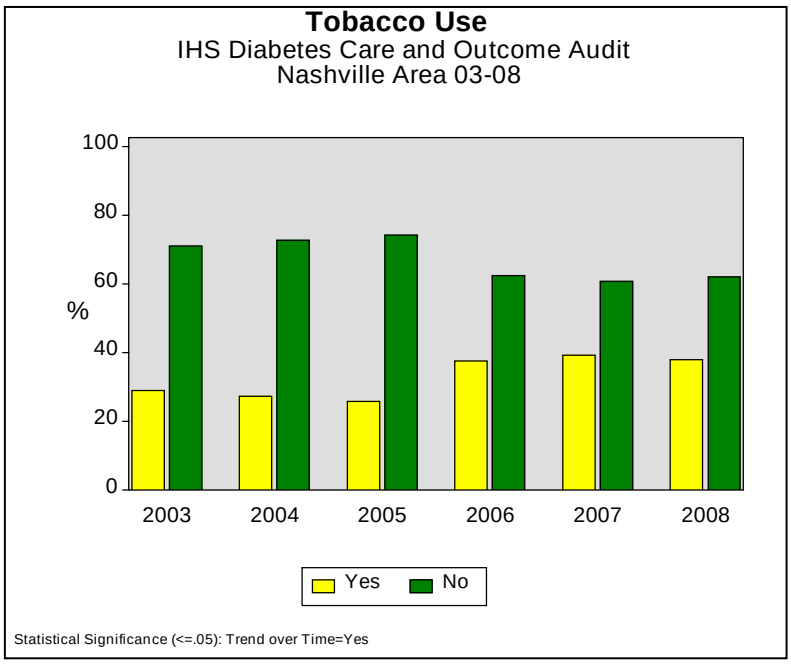



There was a statistically significant increase over time in the percentage of patients with an active diagnosis of depression and in the percentage of patients being screened for depression.

Tobacco Use/Counseling

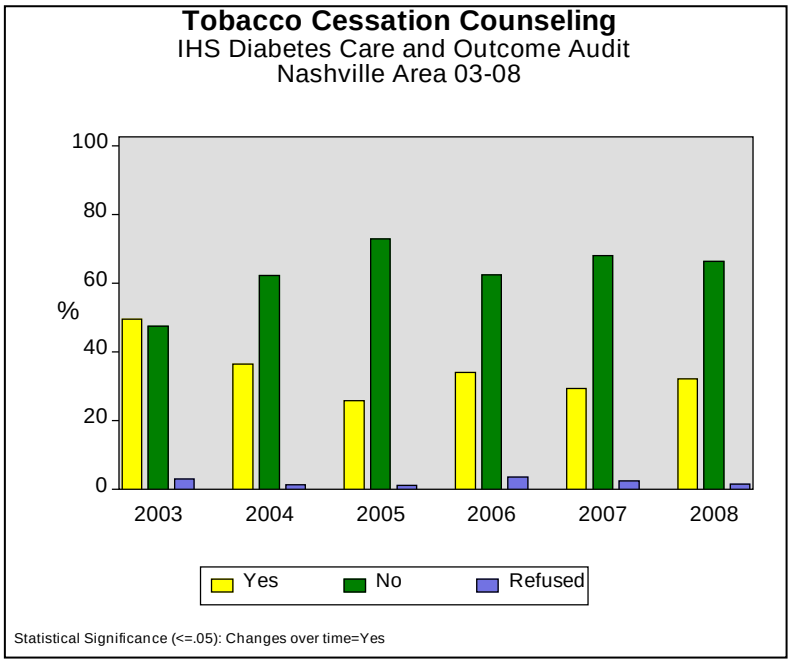
Tobacco use is a primary preventable risk factor for cardiovascular disease, which is the leading cause of death among patients with diabetes.

Figure 27.




Audit data reflect a statistically significant increase over time in the percentage of patients using tobacco.

Figure 28.

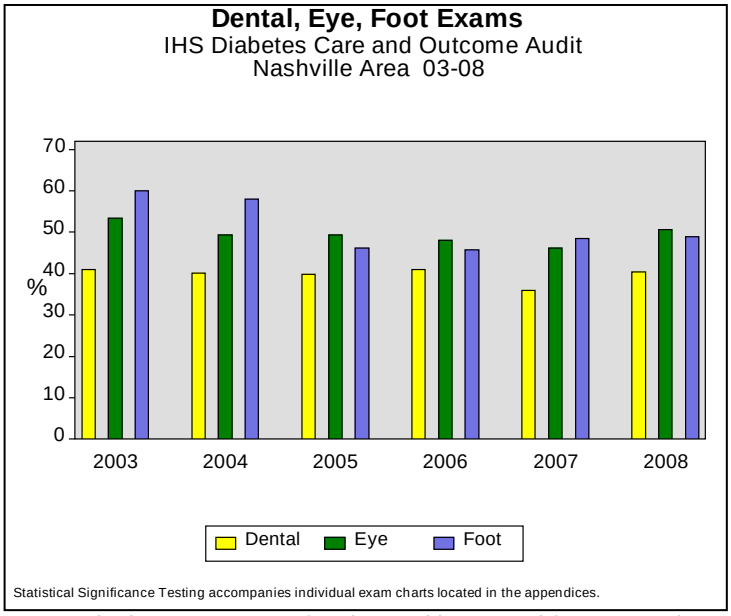



Audit data reflect a statistically significant decrease in the percentage of patients being provided tobacco cessation counseling between 2003 and 2008.

Preventive Care Measures – Dental, Eye and Foot Exams

Annual screening exams are important aspects of diabetes care. IHS standards recommend annual foot, dilated eye and dental exams.

Figure 29.




Audit data reflect decreases in the percentage of patients with eye and foot exams between 2003 and 2008. While there was a substantial decrease in foot exams, there was a very small increase in dental exams during the same time period.

Note: Caution should be warranted in that this graph represents patients that both received and refused dental, eye, or foot exams. For this I/T/U, in 2008, approximately 38% received a dental exam, 47% received an eye exam, and 44% received a foot exam.

Education – General and Provided by Registered Dietician

Nutrition and exercise education are integral aspects of diabetes treatment.

Figure 30

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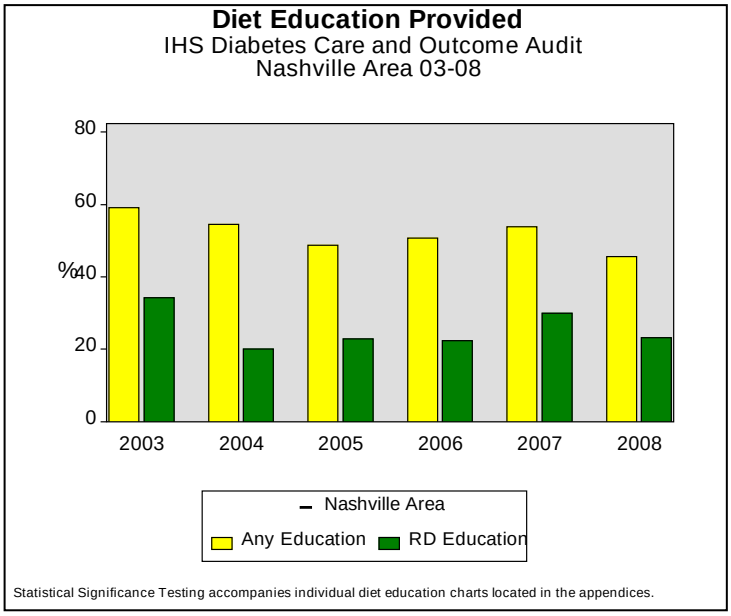



There were substantial decreases in the percentage of patients with diabetes who had received any diet education or specific education from an RD between 2003 and 2008.

Immunizations

Per IHS Standards of Care, persons with diabetes should have flu and pneumovax vaccines. Yearly re-vaccination for flu is recommended to provide up-to-date protection. The pneumovax vaccine is necessary at least once and a booster may be needed.

Figure 31.

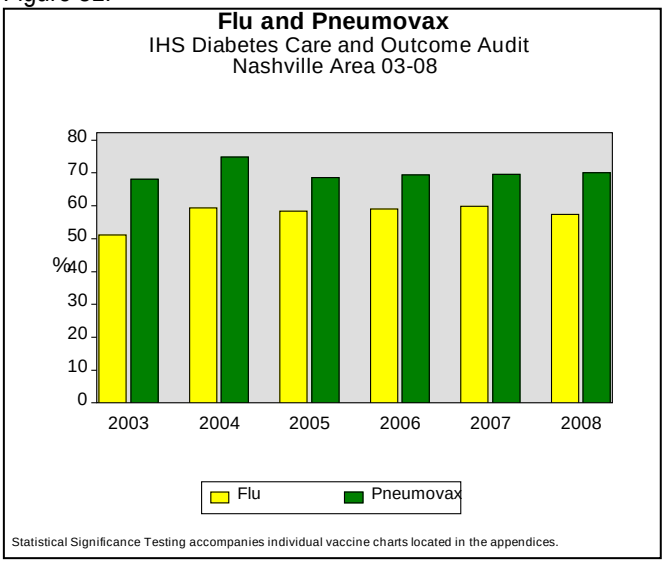
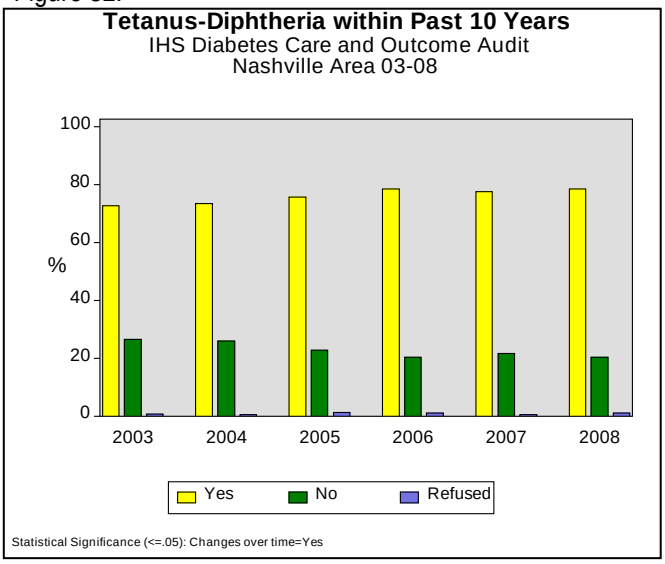



Figure 32.




There has been little increase over time (2003-2008) in the percentage of patients that received a pneumovax vaccine; however, flu and tetanus-diphtheria vaccination has increased gradually over time.
Note: Caution should be warranted in that Figure 31 represents patients that both received and refused flu and pneumovax vaccinations. In 2008, approximately 58% received a flu vaccination and 69% received a pneumovax vaccination.

Tuberculosis Skin Test (also known as PPD) Screening and Treatment

Adults with diabetes and latent tuberculosis infection (LTBI) are at high risk of progressing to active tuberculosis (TB) if they are not treated for LTBI.

Figure 33.

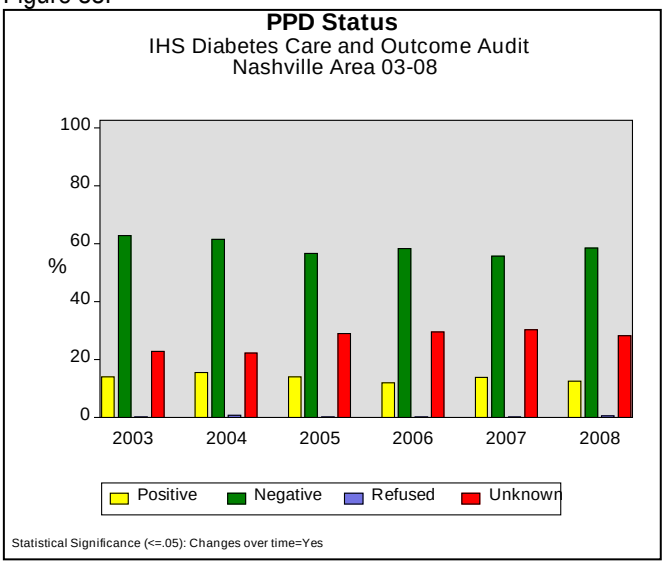
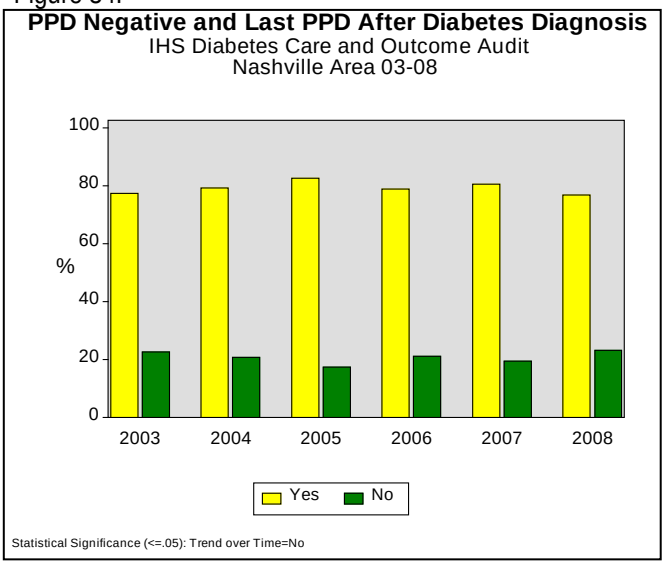
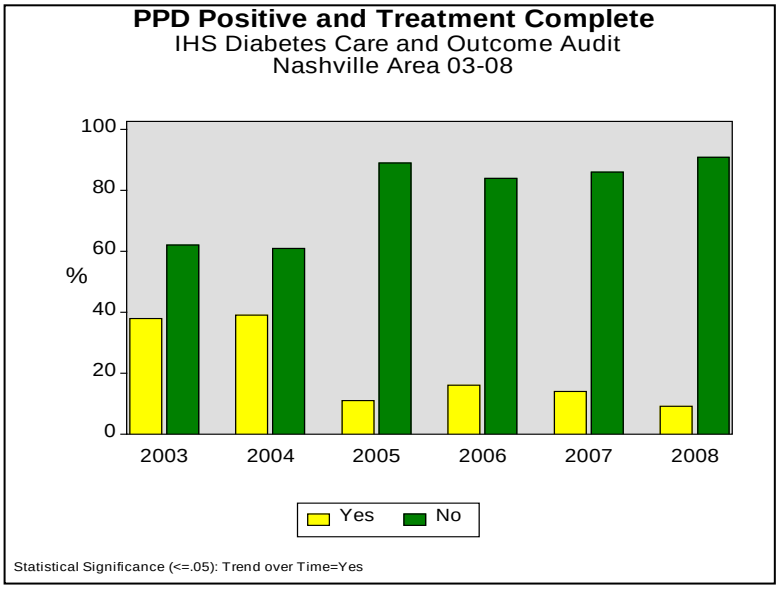



Figure 34.




PPD Status changed little between 2003 and 2008; however, PPD Status unknown did increase gradually over time. The percentage of diabetes patients receiving a PPD screening after diagnosis has remained static.

Figure 35.




In 2008, the percentage of patients with a positive PPD screening that had completed treatment was 9.2%. This is substantially lower than the percentage that had completed treatment in 2003 (37.9%).

Summary

Diabetes data analysis findings are summarized as follows:

| Category | Summary of Findings |
|---|---|
| Diabetes Prevalence | Age-adjusted diabetes prevalence rates calculated for the 23 Tribes included in the Nashville Area aggregate rate showed a wide range; in 2008, I/T/U specific age-adjusted AI/AN diabetes prevalence ranged from 9.7% to 34.2%. The 2006 all ages Nashville Area AI/AN age-adjusted diabetes prevalence rate (21.5%) was 1.9 times greater than the 2006 all ages IHS wide AI/AN rate (11.6%).[3] For the four years (2003-2006) that adult US All Race age-adjusted rates were available for comparison, on average the all ages Nashville Area AI/AN age-adjusted diabetes prevalence rate (20.5%) was approximately 3.9 times greater than the adult US All Races rate (5.3%).[4] ***Having an age-adjusted diabetes prevalence rate that is approximately two times greater than the IHS wide rate and four times greater than the US All Races rate reflects the existing large and disproportionate burden of diabetes in the Nashville Area AI/AN population.*** |
| Audit Sample Size | Sample size impacts how well Diabetes Audit analysis results represent the health status of persons on the diabetes registries of participating facilities and measurement of how well a diabetes program is following the IHS Standards of Care for persons with diabetes. For 2008, the Nashville Area Audit sample (78%; 4,835/6,186) was 1.6 times larger than the IHS wide sample (50%; 63,840/127,204). Of the 20 Nashville Area I/T/Us that submitted data in 2008, Audit sample sizes ranged from 19% to 100%, with a median of 99.5%. In 2008, nine I/T/Us submitted sample sizes of 100%, seven submitted sample sizes of 92-99%, and the remaining four ranged from 82%, 67%, 31%, to 19% respectively. In 2008, most Nashville Area I/T/Us chose to Audit all their diabetes registry patient records and to conduct the Audit electronically. |
| Missing Data | Knowing the amount of missing data is important because as the percentage of missing data increases, so too does the concern that an Audit analysis result may not be an adequate representation of the particular aspect of patient health status and/or measurement of how well a diabetes program is following the IHS Standards of Care for persons with diabetes. For the 2008 Nashville Area Audit data, an analysis of missing data shows that the Cholesterol Category, LDL Category, HDL Category, Triglyceride Category, Number of Ideal Values (HbA1c, BP, LDL, BMI), Number of Ideal Values (HbA1c, BP, LDL), and Tobacco Use variables were missing data for 25% to 50% of the records. |
| Duration of Diabetes | For the Nashville Area, there was a statistically significant increase between 2003 and 2008 in the percentage of patients with diabetes for 10+ years. |
| Glycemic Control & Drug Therapy | Overall, there was an increase in the percentage of patients with diabetes with HbA1c values <7%; however, the data also reflects a small increase in the percentage of diabetic patients with HbA1c >9.5%. Drug treatment therapy distribution among patient with diabetes has changed significantly between 2003 and 2008. The percentage of patients being prescribed more than one drug (Insulin+Drug(s) and 2+ Drugs) or using diet and exercise alone has increased while the use of single drug therapies has declined. |
| Blood Pressure Control and use of Hypertensive Medication | Blood pressure control peaked in 2005 with ~39% of patients having a blood pressure of <130/80. While there has been an overall increase in blood pressure control since 2003, there have been some decreases in control since the peak in 2005. Audit data reflect a statistically significant change between 2003 and 2008 in the percentage of patient with diabetes and hypertension receiving an ACE/ARB inhibitor for treatment of their hypertension. This statistically significant change is reflective of years 2005 through 2008 when there was a steady increase in ACE/ARB use; however, when evaluating the change between 2003 and 2008, there is only a very small increase in ACE/ARB use. |

| Category | Summary of Findings (continued) |
|---|---|
| Dyslipidemia & Lipid Management | Audit data reflect a statistically significant increase over time in the percentage of patients with good total cholesterol, good LDL cholesterol (<100 mg/dL), and good triglyceride results (<150 mg/dL). Overall, good HDL (>=HDL mg/dL) improved between 2003 and 2008; however, the HDL results fluctuated between those years and the steady increases noted in the other cholesterol results are not seen when evaluating HDL. Diabetes Audit data reflect fluctuations, with a slight overall decrease, between 2003 and 2008 in the use of lipid-lowering agent among patients with high LDL (>=160mg/dL). |
| Weight Status | The Diabetes Audit data reflect very few patients with diabetes with normal weight (7.2% in 2008). Being overweight or obese are also risk factors for hypertension and cardiovascular disease. In 2008, 72.3% of patients with diabetes were obese (BMI 30+). |
| Combination of Ideal Values (HbA1c, BP, LDL, BMI ) | Diabetes Audit data reflect overall increases in the percentage of patients with two, three, or four out of four (HbA1c, Blood Pressure, LDL, BMI) ideal values with simultaneous decreases in the percentage of patients with zero or one ideal value out of four. Still, few patients have a combination of three or four ideal values in 2008. |
| Nephropathy Assessment and Medication for Treatment | Audit data reflect that while there was fluctuation in the percentage of patients with proteinuria and microalbuminuria, overall there was an increase between 2003 and 2007. For this Area's diabetic population, GFR <60 increased between 2003 and 2008. In 2008, approximately 23% of the patients with diabetes have a calculated GFR <60 and therefore need follow-up. Data reflect a statistically significant increase over time in the percentage of ACE/ARB inhibitor use among patients with proteinuria/microalbuminuria. |
| Depression Assessment | There was a statistically significant increase over time in the percentage of patients with an active diagnosis of depression and in the percentage of patients being screened for depression. |
| Tobacco Use/Counseling | Audit data reflect a statistically significant increase over time in the percentage of patients using tobacco. Audit data reflect a statistically significant decrease in the percentage of patients being provided tobacco cessation counseling between 2003 and 2008. |
| Dental, Eye, Foot Exams | Audit data reflect decreases in the percentage of patients with eye and foot exams between 2003 and 2008. While there was a substantial decrease in foot exams, there was a very small increase in dental exams during the same time period. |
| Diet Education | There were substantial decreases in the percentage of patients with diabetes who had received any diet education or specifically education from an RD between 2003 and 2008. |
| Vaccines (Flu, Pneumovax, Tetanus-Diphtheria) | There has been little increase over time (2003-2008) in the percentage of patients that received a pneumovax vaccine; however, flu and tetanus-diphtheria vaccination has increased gradually over time. |
| PPD Status (Tuberculosis Skin Test) & Screening Rates & Treatment Completed | PPD Status changed little between 2003 and 2008; however, PPD Status unknown did increase gradually over time. The percentage of patients with diabetes receiving a PPD screening has remained static. In 2008, the percentage of patients with a positive PPD screening that had completed treatment was 9.2%. This is substantially lower than the percentage that had completed treatment in 2003 (37.9%). |

GENERAL RECOMMENDATIONS

Based upon the findings from this report and the observations of the Nashville Area Consultant, the following thoughts are suggested for the ongoing process of the Diabetes Audit and local diabetes program system.

Use the data and recommendations in the Nashville Area Diabetes Audit Report and accompanying sister I/T/U specific diabetes reports to advocate for increased quality improvement efforts directed at diabetes treatment and prevention programs. This report helps provide a framework and baseline for local sites, USET and the NAO to measure their diabetes quality improvement efforts and to guide their decisions on where to target diabetes dollars.

Continue to support the IHS Diabetes Care and Outcome Audit (Diabetes Audit) process. Great strides have been made in the Nashville Area Diabetes Audit mechanisms in past years; however, this process requires a strong ongoing commitment from IHS, USET and I/T/Us to guarantee quality data is collected.

Continue to standardize the Diabetes Audit process in the Nashville Area. Steps already taken to standardize the process include: increasing the number of sites that choose to Audit all the patients on their diabetes registry instead of just a sample, and moving to a standardized calendar year based Audit cycle.

Develop or maintain local quality data check processes for the Diabetes Audit. Many factors can impact the data quality locally; hence each I/T/U is encouraged to review their overall diabetes process annually. The different issues of a manual versus an electronic Audit need to be addressed by each site.

Continue to support training of local staff. Documentation, coding, data entry, the electronic Audit and the RPMS/DMS package are critical to ensuring quality data collection. New staff should especially be targeted for training in these areas.

IHS initiated a WebAudit in 2008 for the Diabetes Audit. Local sites now have the ability to check for data errors in the WebAudit and make revisions to inaccurate data. This action is an excellent quality check for the Diabetes Audit process and I/T/Us are encouraged to incorporate this tool into their Audit process. Site specific reports for a specific year are also available from this web-site.

Utilize the technical support of the Area Diabetes Consultant and USET Tribal Epidemiology Center staff, as well as IHS resources in the ongoing development of local diabetes programs.

Use the Nashville Area Diabetes Audit Report and accompanying sister I/T/U specific diabetes reports to assist in efforts to advocate for continued IHS Special Diabetes Program for Indians funding which is scheduled to end in 2012.

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APPENDIX A

Resources

United South & Eastern Tribes, Inc.
Tribal Health Program Support
711 Stewarts Ferry Pike
Suite 100
Nashville, TN 37214
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Useful Links

IHS Standards of Care for Adults With Type 2 Diabetes
http://www.ihs.gov/MedicalPrograms/Diabetes/index.cfm?module=toolsClinicalGuidelines

Unofficial IHS Diabetes Audit Website
http://www.dmaudit.com

IHS
Integrated Diabetes Education Recognition Program
http://www.ihs.gov/MedicalPrograms/Diabetes/recognition/iderp_app1.asp

IHS
RPMS/DMS manual includes information on electronic audit
http://www.ihs.gov/Cio/RPMS/PackageDocs/bdm/bdm_020u.02.pdf

American Association of Indian Physicians
http://www.aaip.com

IHS, Division of Diabetes Treatment and Prevention
http://www.ihs.gov/MedicalPrograms/Diabetes/index.asp

National Diabetes Education Program
http://www.ndep.nih.gov
http://www.cdc.gov/diabetes/ndep/index.htm

American Diabetes Association, Awakening the Spirit
http://www.diabetes.org/communityprograms-and-localevents/nativeamericans.jsp

APPENDIX B

I/T/U Diabetes Audit Data Included in Audit Analyses by Year
The listed I/T/Us were included in each year's prevalence calculations.

| I/T/U | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|
| Alabama-Coushatta Tribe of Texas | X | | X | X | X | X |
| Chitimacha Tribe of Louisiana | | X | X | X | X | X |
| Coushatta Tribe of Louisiana | X | X | X | X | X | X |
| & Jena Band of Choctaw Indians | | | | | | |
| & Tunica-Biloxi Indians of Louisiana | | | | | | |
| Mississippi Band of Choctaw Indians | X | X | X | X | X | X |
| Poarch Band of Creek Indians | X | X | X | X | X | X |
| Miccosukee Tribe of Indians of Florida | X | X | X | X | X | X |
| Seminole Tribe of Florida | | X | X | X | X | X |
| Catawba Indian Nation | X | X | X | X | X | X |
| Eastern Band of Cherokee Indians | X | X | X | X | X | X |
| *, # Seneca Nation of Indians | X | X | X | X | X | X |
| Oneida Indian Nation | X | X | X | X | X | X |
| St. Regis Mohawk Tribe | | X | X | X | X | X |
| Mashantucket Pequot Tribal Nation | X | X | X | X | X | X |
| & Mohegan Tribe of Connecticut | | | | | | |
| Narragansett Indian Tribe | X | X | X | X | X | X |
| Wampanoag Tribe of Gay Head (Aquinnah) | | | X | X | X | X |
| Aroostook Band of Micmacs | X | X | X | X | X | X |
| Houlton Band of Maliseet Indians | X | X | X | X | X | X |
| Passamaquoddy Tribe- Indian Township | X | X | X | X | X | X |
| Passamaquoddy Indian Tribe- Pleasant Poin | X | X | X | X | X | X |
| * Penobscot Indian Nation | X | X | X | X | X | X |

**Notes: & = Jena Band, Tunica-Biloxi, and Mohegan did not participate in the 2003-2008 Diabetes Audit process.**

*** = Seneca/Penobscot diabetes prevalence data from local non-RPMS electronic patient management systems.**

**# = Due to local data concerns 2003 Seneca data not included in 2003 aggregate prevalence calculation.**

**Historically none of the following IHS Nashville Area I/T/Us have been included in Area Aggregate reports due to either their not having an electronic patient management system in place OR their choosing not to receive IHS health care delivery system services: Cayuga, Onondaga, Tuscarora, and Tonawanda (all of NY); Mashpee Wampanoag Tribe of MA; and three Urban Indian Health organizations (AI Community House, NYC, NY; North AI Community House, Boston, MA; Lifeline Foundation, Baltimore, MD).**

APPENDIX C

Raw Data with Associated
Diabetes Audit Charts and Statistical Tests
(provided as an electronic file)