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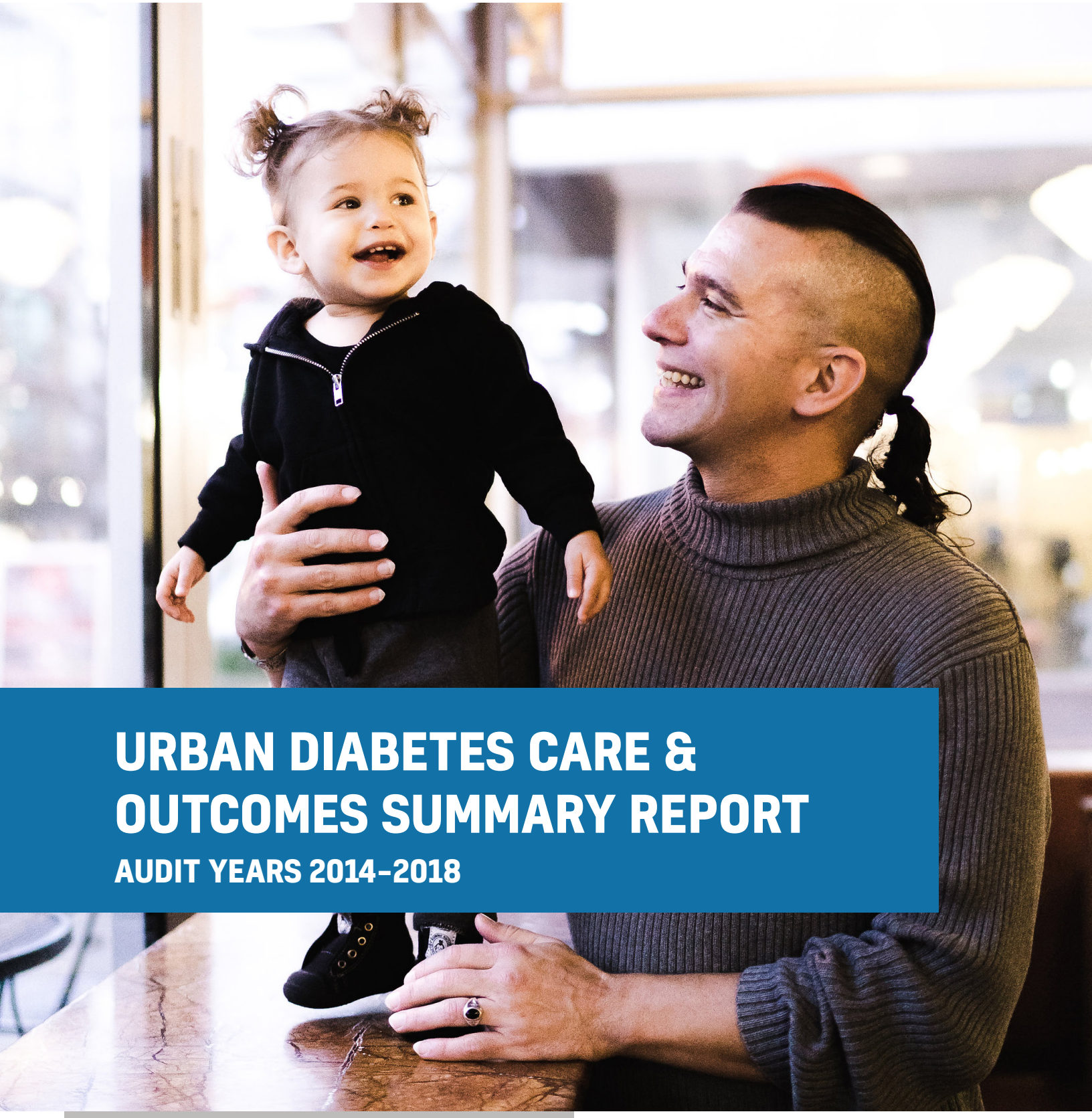

URBAN DIABETES CARE & OUTCOMES SUMMARY REPORT

AUDIT YEARS 2014–2018

Urban Indian Health Institute
A Division of the Seattle Indian Health Board

Acknowledgments

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This report was prepared by Kalyn Yasutake, MPH, designed by J. Gunnar Colleen, BA, under the direction of the Director of Informatics and Epidemiology, Adrian Dominguez, MS, with the support of Urban Indian Health Institute staff.

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The mission of Urban Indian Health Institute (UIHI) is to decolonize data, for Indigenous people, by Indigenous people.

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EXECUTIVE SUMMARY

Type 2 diabetes is more prevalent in the American Indian and Alaska Native (AI/AN) population than in any other race or ethnicity. This epidemic among AI/AN people can be drawn to a legacy of historical trauma, including colonization that forced Native people off their lands. This has resulted in diminished natural resources, persistent malnutrition and nutritional deficiencies, and eliminated access to traditional foods for AI/AN people. The U.S. Congress created the Special Diabetes Program for Indians (SDPI) to address diabetes-related AI/AN health disparities through evidence-based and community-directed initiatives in Indian country. In its two decades of existence, it has provided resources to improve diabetes surveillance, prevention, treatment, and education which has helped to reduce federal spending on AI/AN patients with diabetes.

This report, *Urban Diabetes Care & Outcomes Summary Report, Audit Years 2014-2018* (2018 Urban Diabetes Audit), is primarily funded by SDPI and uses data from Urban Indian Health Programs (UIHPs) to highlight strengths and disparities of diabetes health in urban AI/AN patients. The data for the 2018 Urban Diabetes Audit was obtained from the annual IHS Diabetes Care and Outcomes Audit (Diabetes Audit). It includes AI/AN patients with diabetes at 31 participating UIHPs from 2014 to 2018.

This report aims to motivate collaboration and communication...

A total of 39 indicators were analyzed over a five-year period. Information is presented for each year and reflects the year the annual Diabetes Audit took place, representing care administered in the previous year. Therefore, all references to years in this report, including in graphs and tables, reflect the audit year, not the year that services were received by the patients. Percentages shown are calculated as a proportion of all audited records for each audit year. Percentages and means are weighted to account for differing sampling approaches used at UIHPs.

This report aims to motivate collaboration and communication in the field of diabetes care for urban AI/AN patients. It can inform data collection, research, prevention funding, and programmatic efforts to ensure success in diabetes care, prevention, and outcomes for urban AI/AN patients.

KEY FINDINGS

1. The percentage of patients aged 55 years or older increased significantly over the five-year period.
2. The proportion of patients with an A1c less than 7.0% decreased significantly over the five-year period.
3. The proportion of patients with an A1c of 8.0% or higher increased significantly over the five-year period.
4. **In 2018, 7 in 10 patients with diabetes had an eGFR of 60 ml/min/1.7m2 or higher, indicative of no chronic kidney disease.**
5. In 2018, 20.5% of patients were not tested for eGFR, a significant increase in the proportion not tested over the five-year period.
6. **In 2018, the mean systolic and diastolic blood pressures in the patients were 130.8 and 78.5 mmHg, respectively, indicating good blood pressure control on average.**
7. **In 2018, 79.8% of patients with a diagnosis of hypertension were prescribed ACE inhibitors or ARBs.**
8. **In 2018, only 25.5% of patients were currently using tobacco, which has significantly decreased over the five-year period.**
9. **In 2018, 78.0% of patients currently using tobacco were referred to or received cessation counseling, a significant increase over the five-year period.**
10. Although there was a **significant increase in the percentage of patients receiving a dental exam over the five-year period**, only 30.5% of patients received a dental exam in 2018.
11. Over the five-year period, there was a **significant increase in the proportion of patients who ever received a hepatitis B vaccine**, however only 33.8% of patients had ever received one in 2018.
12. In 2018, 74.2% of patients had an unknown tuberculosis status and an additional 4.0% had an outdated or date unknown TB status.

RECOMMENDATIONS

PROGRAMMATIC EFFORT:
Programs may need to prepare for an aging patient population that will have unique health needs due to an increase in those aged 55 and older.

RESEARCH:
Further research to address the increasing A1c levels among patients may be warranted to better understand this upward trend and provide better care for patients.

DATA COLLECTION:
Continue to gather health information to ensure patients are regularly screened for tuberculosis and chronic kidney disease which can assist in minimizing gaps in patient screening.

PREVENTION FUNDING:
Continue to expand on the successful support of current programmatic efforts encouraging patients to receive the hepatitis B vaccine.

PROGRAMMATIC EFFORT:
Continue successful program efforts in maintaining healthy eGFR levels in patients, maintaining good blood pressure control in patients, prescribing of ACE inhibitors or ARBs to those with hypertension, and referring tobacco users to cessation counseling.

PREVENTION FUNDING:
Continue to expand on the successful support of current programmatic efforts encouraging patients to receive an annual dental exam.

INTRODUCTION

BACKGROUND

Diabetes Mellitus is a chronic disease that inhibits the body's capacity to produce and/or utilize insulin, a hormone necessary to break down and absorb glucose. There are three main types of diabetes—1, 2, and gestational—of which type 2 is the most common.[1] Type 2 diabetes accounts for almost 95% of all diabetes cases and results when the body develops a resistance to insulin.[1] Type 1 diabetes is an autoimmune condition that usually develops during childhood and only accounts for about 5% of all diabetes cases.[2] Gestational diabetes is a condition that develops in 2% to 10% of pregnancies in the United States and usually resolves itself after delivery.[3] Over time, diabetes results in excessive blood sugar levels that may cause many health issues, such as cardiovascular and kidney disease, which can lead to death.

Type 2 diabetes is more prevalent in the AI/AN population than in any other race or ethnicity...[10]

THE DIABETES EPIDEMIC

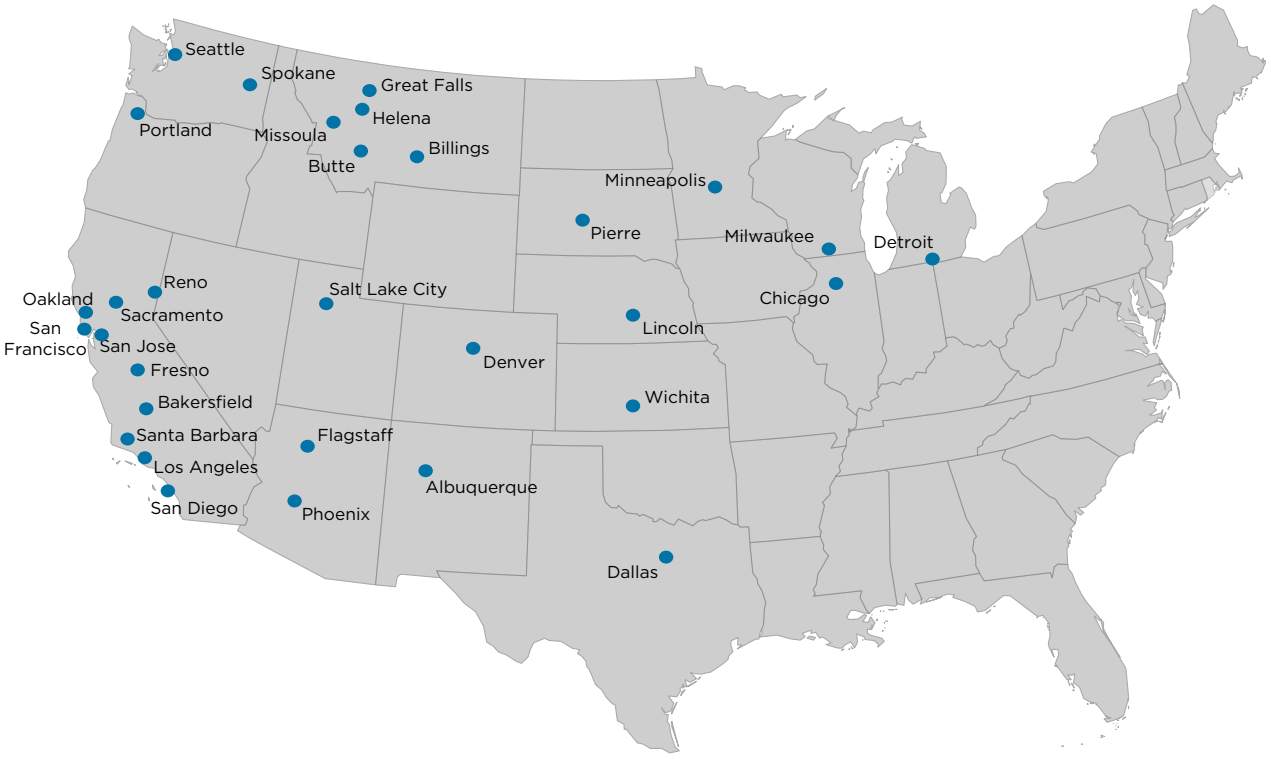
"Diabetes" was not even a word in the vocabulary of American Indian and Alaska Native (AI/AN) people until the last century. It was essentially unknown until World War II when cases of the disease were first reported to Indian Health Service (IHS) providers.[4] Then, in 1963, the first longitudinal study of the Pima Tribe identified a high prevalence of type 2 diabetes among AI/AN people and an increase in this prevalence over time.[5] In response to the growing epidemic, the U.S. Congress created the Special Diabetes Program for Indians (SDPI) in 1997.[6] Since then, research has shed light on the health and psychological vulnerabilities resulting from a legacy of historical trauma, including colonization that forced Native people off their lands. This has resulted in diminished natural resources, persistent malnutrition and nutritional deficiencies, and eliminated access to traditional foods.[7-9]

The pressure for AI/AN people to adjust their ways of life caused stress and additional historical trauma that impacted the health of Native people for generations to follow. Today, type 2 diabetes is more prevalent in the AI/AN population than in any other race or ethnicity; the prevalence is two times higher than that of non-Hispanic Whites.[10] AI/AN populations have higher proportions of diabetes precursors such as poor nutrition, high blood pressure, insufficient physical activity, heart disease, and obesity.[11] Additionally, AI/AN people with diabetes are also more likely than the general population to experience related complications such as kidney failure, heart disease, and death.[10, 12]

SPECIAL DIABETES PROGRAM FOR INDIANS

In its two decades of existence, SDPI has addressed AI/AN health disparities by providing critically needed resources to improve diabetes surveillance, prevention, treatment, and education. Evidence-based and community-directed initiatives in Indian country have yielded major improvements in diabetes-related health indicators which have assisted in reducing federal

Map 1. Urban Indian Health Programs in Diabetes Audit, 2018



spending on AI/AN patients with diabetes and diabetes-related complications.[13] This report is primarily funded by SDPI and uses data from 31 Urban Indian Health Programs (UIHPs) to highlight strengths and disparities of diabetes health in urban AI/AN patients. It aims to motivate collaboration and communication in the field of diabetes care for urban AI/AN patients. It can inform data collection, research, prevention funding, and programmatic efforts to ensure success in achieving diabetes care, prevention, and outcomes for urban AI/AN people with diabetes.

URBAN INDIAN HEALTH PROGRAMS

UIHPs are a network of independent health agencies that provide primary health care services — including traditional health care and cultural activities—and also provide a culturally appropriate place for urban Natives to receive health care. UIHPs are non-profit 501 (c)(3) programs that are funded through grants and contracts from IHS, under Title V of the Indian Health Care Improvement Act, PL 94-437, as amended. The 31 programs in this report are in 17 states and serve individuals in over 85 U.S. counties where over 1.1 million Native people reside (Map 1).

ABOUT URBAN INDIAN HEALTH INSTITUTE

Urban Indian Health Institute (UIHI) is one of 12 Tribal Epidemiology Centers (TECs) in the United States and the only one that serves all UIHPs across the nation. A TEC is an IHS-funded organization that serves AI/AN tribal and urban communities. UIHI recognizes research, data, and evaluation as indigenous values. We utilize the strengths of western science and are grounded in traditional and indigenous methods as we conduct research and evaluation, collect and analyze data, and provide disease surveillance.

Our mission is to decolonize data, for indigenous people, by indigenous people.

METHODS

The data for the *Urban Diabetes Care & Outcomes Summary Report, Audit Years 2014-2018*, referred to as the 2018 Urban Diabetes Audit, was obtained from the annual Indian Health Service (IHS) Diabetes Care and Outcomes Audit (Diabetes Audit) of 31 participating Urban Indian Health Programs (UIHPs) from 2014 to 2018. Every year, IHS, Tribal, and Urban (I/T/U) facilities submit audit data for American Indian and Alaska Native (AI/AN) patients with diabetes that meet certain inclusion and exclusion criteria.

INCLUSION CRITERIA

- Have a diagnosis of diabetes
- AI/AN people eligible for services at I/T/U facilities
- Have at least one visit to an eligible clinic at a UIHP during the audit period

EXCLUSION CRITERIA

- Receive the majority of their primary care outside the UIHP
- Currently on dialysis and receive the majority of their primary care at the dialysis unit during the audit period
- Die before the end of the audit period
- Women pregnant during any part of the audit period
- Are pre-diabetic
- Move away from the service area

The data from each participating facility were gathered electronically from an electronic health record system or manually via review of charts. Some UIHPs use Resource and Patient Management System (RPMS), the electronic health record system developed by IHS to gather

epidemiological and personal health information, while others use different systems. The extracted data were submitted to IHS via the WebAudit, a set of internet-based tools for data submission, processing, and reporting. The WebAudit provides each participating UIHP with summary reports of their audit data. Data from all participating UIHPs were aggregated for this report.

A total of 39 indicators were analyzed over a five-year period. Information is presented for each year and reflects the year the annual Diabetes Audit took place, which represents care administered in the previous year. Therefore, all references to years in this report, including in graphs and tables, reflect the audit year, not the year that services were received by the patients.

Percentages shown are calculated as a proportion of all audited records for each audit year. Percentages and means are weighted to account for differing sampling. Electronic audits generally include all eligible patients, while most manual audits use a systematic random sampling scheme. Rounding was used in presenting percentages. Suppression of data occurred as needed to maintain the privacy of patients. For these reasons, the sum of the percentages for each indicator may not equal exactly 100.

Trends over the five years were analyzed using Joinpoint Regression Program version 4.6.0.0. This statistical software was developed by National Institutes of Health to analyze trends in data, such as percentages or rates, using Joinpoint models. These models use several straight lines connected at Joinpoints to fit a trend. A maximum number of zero Joinpoint was used and the average annual percent change (AAPC) was analyzed. Due to the shorter timeframe analyzed, no Joinpoints could be used. Results were considered statistically significant for p-values less than 0.05. More information about this software and Joinpoint models can be found at: https://surveillance.cancer.gov/joinpoint/.

R version 3.4.3 (R, Vienna, Austria) was used to perform all other analyses.

For more information about the Diabetes Audit process, visit the website: https://www.ihs.gov/diabetes/audit/ .

GOVERNMENT PERFORMANCE AND RESULTS ACT

Passed by Congress in 1993, this act was designed to address government accountability and performance in the management of government-funded programs. IHS reports on a range of health topics for Government Performance and Results Act (GPRA), including diabetes. This report compares audit results to four IHS GPRA targets related to diabetes. However, official GPRA results are prepared and distributed by the IHS Planning and Evaluation office and are different from the estimates presented in this report. Official GPRA results are among AI/AN participants in the IHS National Data Warehouse (NDW), whereas this report focuses on urban AI/AN people. The Diabetes Audit and GPRA use different criteria to determine which patients with diabetes to include in the results, and official GPRA results are from data over the fiscal year whereas the data in this report is over the calendar year. GPRA results include all UIHPs' patients with diabetes, but some of the UIHPs that participate in the Diabetes Audit submit a sample of their patients with diabetes. Therefore, these comparisons should be interpreted with caution. They are incorporated here to provide additional important benchmarks for comparing improvements or needs over time. They are summarized in Table 1. All four GPRA diabetes targets overlap with SDPI best practices. For more information about IHS GPRA targets and measurements, visit:
https://www.ihs.gov/quality/government-performance-and-results-act-gpra/
https://www.ihs.gov/CRS/

SPECIAL DIABETES PROGRAM FOR INDIAN BEST PRACTICES

Special Diabetes Program for Indians (SDPI) best practices are focus areas for improvement of diabetes prevention and treatment outcomes. Each best practice has a required key measure (RKM) that is used to report progress on a related outcome. These 19 RKMs are all assessed by the 2018 Urban Diabetes Audit and are summarized in Table 2. For more information on SDPI best practices, visit:
https://www.ihs.gov/sdpi/sdpi-community-directed/diabetes-best-practices/#BPTOPICS

Table 1. Government Performance and Results Act (GPRA) Diabetes-Related Targets, 2018

FY 2018 GPRA Indicators for Diabetes	Target
Good Glycemic Control Percentage of patients with diagnosed diabetes with good glycemic control (A!c less than < 8.0%).	**36.2%**
Nephopathy Assessment Proportion of patients with diagnosed diabetes assessed for nephorpathy (eGFR and UACR).	**34.0%**
Blood Pressure Control Percentage of patients with diagnosed diabetes that have achieved blood pressure control (less than < 140/90 mmHg).	**52.3%**
Retinopathy Assessment Proportion of patients with diagnosed diabetes who received an annual retinal examination.	**49.7%**

Table 2. Special Diabetes Program for Indians (SDPI) Best Practice Required Key Measures (RKMs)

Glycemic Control: Percent of individuals with most recent A1c < 8.0%

Chronic Kidney Disease Screening & Monitoring: Percent of individuals who have both urine albumin-creatinine ratio (UACR) and estimated glomerular filtration rate (eGFR) completed

Blood Pressure Control: Percent of individuals who have a mean blood pressure <140/90 mmHg

Aspirin or Other Antiplatelet Therapy in Cardiovascular Disease: Percent of individuals with cardiovascular disease who are prescribed aspirin or other antiplatelet therapy

Lipid Management in Cardiovascular Disease: Percent of individuals who are prescribed a statin

Tobacco Use & Screening: Percent of individuals who do not use tobacco screened for tobacco use

Eye Exam: Percent of individuals who receive a dilated eye examination or digital retinal imaging performed by an optometrist or ophthalmologist

Foot Exam: Percent of individuals who receive a comprehensive foot exam that includes assessment of sensation and vascular status

Dental Exam: Percent of individuals who receive a dental exam performed by a dental professional

Physical Activity Education: Percent of individuals who receive physical activity education

Nutrition Education: Percent of individuals who receive nutrition education performed by a registered dietician or other health or wellness program staff

Diabetes-related Education: Percent of individuals who receive education on any diabetes topic, including nutrition education, physical activity education, and any other diabetes education, either in a group or individual setting

Depression Screening: Percent of individuals without depression screened for depression

Immunizations: Percent of individuals who receive each of the following vaccines: annual influenza, pneumococcal vaccine ever, hepatitis B three dose series ever, and tetanus/diphtheria and pertussis (Tdap) in the past 10 years

Tuberculosis Screening: Percent of individuals who have ever had a TB test result documented

Hepatitis C Screening: Percent of individuals born between 1945 and 1965 ever screened for Hepatitis C virus (HCV)

RESULTS

PATIENTS AUDITED

Figure 1 shows the number of patients audited, the number of patients eligible for inclusion in the 2018 Urban Diabetes Audit, the percentage of patients audited, and the number of Urban Indian Health Programs (UIHPs) included over the five-year period of the 2018 Urban Diabetes Audit. A total of 2,130 urban American Indian and Alaska Native (AI/AN) patients with diabetes across 25 facilities were included in 2018. This represents 70.0% of patients in diabetes registries across the UIHPs. Although the percent of patients audited has gone down each year, it has remained statistically stable over the five-year period ($p=0.100$; Appendix A, Table A1). Additionally, each year fewer UIHPs take part in annual Indian Health Service (IHS) Diabetes Care and Outcomes Audit (Diabetes Audit) and therefore results in less UIHPs included in the Urban Diabetes Audit.

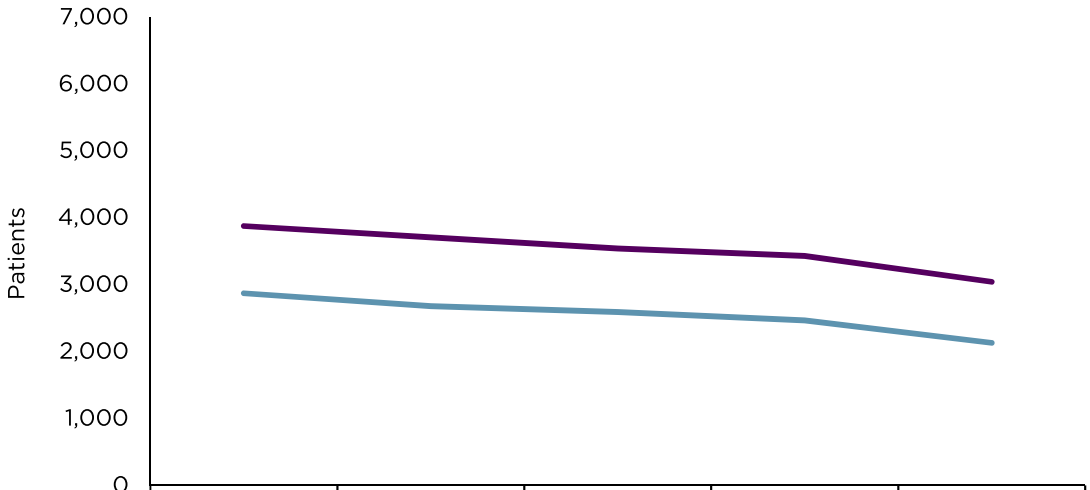
DEMOGRAPHICS AND VITAL STATISTICS

In 2018, 61.0% of patients were female and the mean age of all patients was 54.0 years (Appendix A, Table A2). Half of patients in 2018 were 55 years or older (Figure 2). The proportion of patients that are 55 years or older significantly increased from 44.5% in 2014 to 50.0% in 2018 ($p<0.005$; Appendix A, Table A2). This trend suggests an aging population of patients with diabetes at UIHPs.

As in previous years, the majority of patients in 2018 had type 2 diabetes, with only 2.1% having type 1 (Appendix A, Table A2).

On average, urban AI/AN patients with diabetes had been living with diabetes for 8.7 years in 2018, as seen in Figure 3. This measure was based on length of time since first known diagnosis of diabetes.

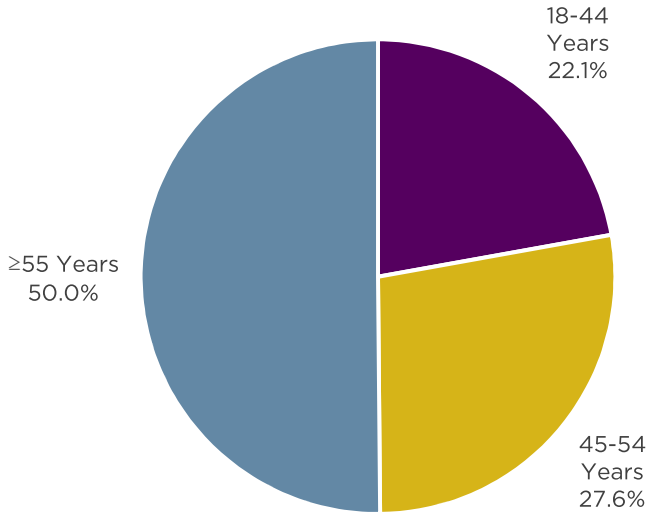
Figure 1. Patients in Diabetes Registries, Urban Indian Health Programs, 2014-2018



	2014	2015	2016	2017	2018
Total Number Audited	2,871	2,681	2,592	2,464	2,130
Total Number in Registry	3,877	3,706	3,539	3,432	3,042
Percent of Patients Audited	74.1	72.3	73.2	71.8	70.0
Number of Programs	31	30	30	29	25

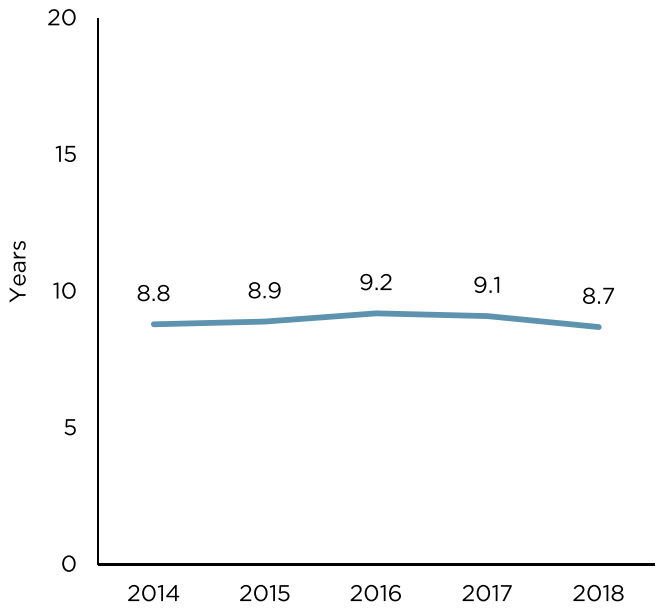
Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Figure 2. Age Categories among Urban AI/AN Diabetes Patients, 2018



Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2018

Figure 3. Average Duration of Diabetes among Urban AI/AN Diabetes Patients, 2014-2018



Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

GLYCEMIC CONTROL

Hemoglobin A1c, also known as A1c, measures a person's average blood glucose in the past two to three months.[14] Those with A1c levels of 6.5% or higher are considered to have diabetes.[14] Since all patients included in the 2018 Urban Diabetes Audit have diabetes, Indian Health Service (IHS) considers those with an A1c level below 8.0% as demonstrating good glycemic control, as per the relevant GPRA measurement. While glycemic control is important in diabetes management, tight control, such as achieving A1c below 8.0%, is most beneficial in newly diagnosed patients.[15] Therefore, it is important to develop individualized glucose targets for patients to avoid poor glycemic control.

Although only half of urban AI/AN patients with diabetes had an A1c < 8.0% in 2018, it still exceeded the GPRA target of 36.2% in 2018 (Figure 4). Furthermore, 32.5% had A1c levels below 7.0% (Figure 5). The proportion of patients with A1c levels below 7.0% significantly decreased from 2014 to 2018 ($p<0.005$; Appendix A, Table A3). Additionally, the proportion that had an A1c of 8.0% or higher significantly increased from 2014 to 2018 ($p<0.005$; Appendix A, Table A3).

Being overweight or obese increases insulin resistance and raises blood glucose levels, making it difficult to achieve glycemic control.[16] It is determined using body mass index (BMI).[17] BMI is a person's weight in kilograms divided by the square of height in meters and is used as an indicator of healthy weight.[18] In 2018, 48.4% of urban AI/AN patients with diabetes were obese with a BMI of 30.0-39.9 (Figure 6). An additional 20.8% were morbidly obese with a BMI of 40.0 or greater. The proportions of patients with BMIs that were obese or that were morbidly obese remained stable across the five-year period (Appendix A, Table A3). From 2014 to 2018, the proportion of patients with missing BMI information significantly increased but still made up less than 2% of patients audited each of the five years ($p<0.005$; Appendix A, Table A3).

Figure 4. Good Glycemic Control, 2018

2018 IHS GPRA Target: 36.2% of patients with diabetes achieve good glycemic control (A1c less than < 8.0%)

2018 Audit Results: Half (50.0%) of audited urban diabetes patients achieved good glycemic control (A1c less than < 8.0%)

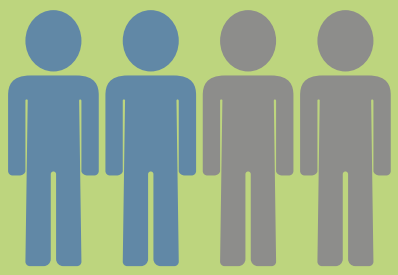
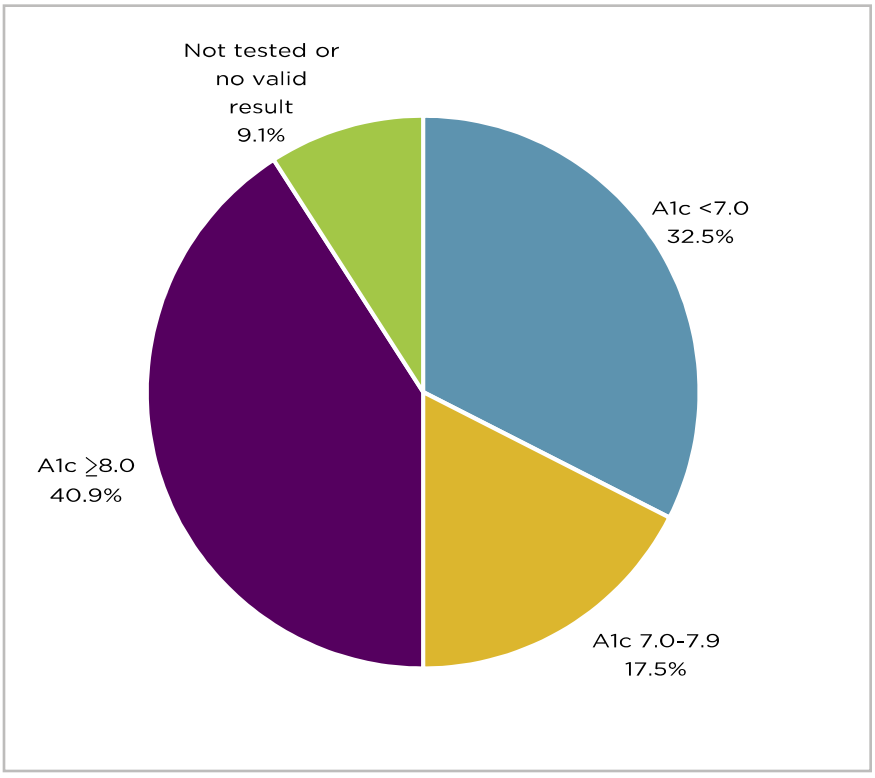
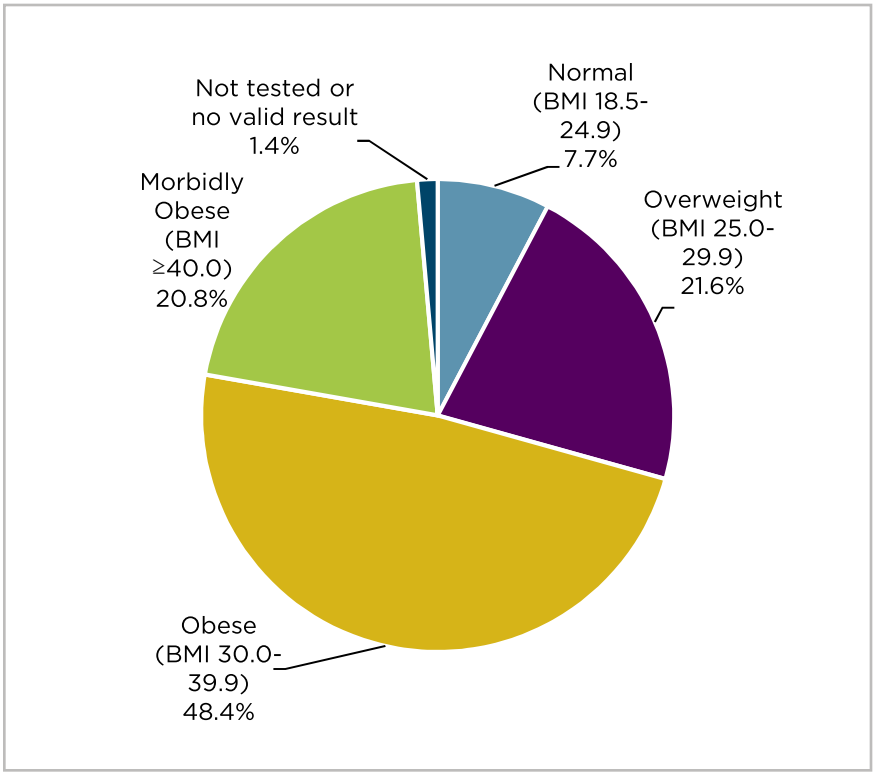


Figure 5. Hemoglobin A1c Levels among Urban AI/AN Diabetes Patients, 2018



Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2018

Figure 6. Body Mass Index Categories among Urban AI/AN Diabetes Patients, 2018



Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2018

Success Story: Native Health Diabetes Program

Native Health, Phoenix, AZ

Native Health (NH) Diabetes Program includes overseeing many community programs including classes teaching adult and family cooking basics, youth wellness camp, diabetes care counseling demonstrations, and availability of traditional ingredients which resulted in higher attendance and engagement. The Diabetes Program Coordinator, Amanda Chee, witnessed much more enthusiasm and sharing of experiences when the benefits of traditional foods are discussed versus the USDA My Plate information or other healthy living tools that are not designed for urban Indian populations. She noted that NH participants are eager to connect with traditional foods and lifeways even though they are removed from some of these teachings on the reservation. Amanda remarked that program participants yearn for more culturally centered health care, particularly integration and access to traditional foods. Therefore, it is the duty of NH to provide this access to urban Indian populations.

Denella is Dine mother of 5 and one of her favorite programs is the Native Health gardens. For Denella, time in the garden with her kids is invaluable for the sharing and learning opportunities. She is grateful that this service is provided and encourages other families to be involved. Denella is also a graduate of Le Cordon Bleu Culinary Arts in Scottsdale, Arizona. Her culinary career has focused on classic French cooking and she didn't integrate her Navajo traditions. It was through cooking for her family that she was inspired to blend traditional cooking with her formal training. She also credits the NH gardens and the availability of traditional produce outside of the reservation.

NATIVE HEALTH
A Tradition of Wellness

To learn more about Native Health, visit nativehealthphoenix.org

CHRONIC KIDNEY DISEASE

Chronic kidney disease (CKD) is the kidney's inability to adequately filter waste from the blood and indicates an overall decrease in kidney function.[19] This decrease in function can lead to end-stage renal disease, which requires dialysis or a kidney transplant.[20] Diabetes is a leading cause of CKD in the United States, with one in three diabetic adults having CKD.[21] Due to this, it is important for diabetic patients to be regularly screened for CKD and diabetic nephropathy. This is assessed through estimated glomerular filtration rate (eGFR) and urine albumin-creatinine ratio (UACR).[22, 23] In 2018, 54.2% of urban AI/AN patients with diabetes had both eGFR and UACR assessed, exceeding the GPRA target of 34.0% (Figure 7).

In 2018, 7 in 10 urban AI/AN patients with diabetes had an eGFR of 60 ml/min/1.7m^2 or higher (Figure 8), indicative of no CKD.[24] The proportion of patients that did not have eGFR tested increased from 17.2% in 2014 to 20.5% in 2018 ($p<0.005$; Appendix A, Table A4). In 2018, 37.9% urban AI/AN patients with diabetes had a UACR < 30 mg/g, a normal to mildly increased amount of protein in the urine (Appendix A, Table A4).[25] The proportion of patients with a UACR between 30 to 300 mg/g—a moderate increase in protein in urine that could indicate CKD but would need further testing before a diagnosis is given—significantly decreased over the five-year period ($p<0.005$; Appendix A, Table A4).[25]

Figure 7. Nephropathy Assessment, 2018

2018 IHS GPRA Target: 34.0% of patients with diabetes are assessed for nephropathy.

2018 Audit Results: More than half (54.2%) of audited urban diabetes patients were assessed for nephropathy (both eGFR and UACR assessed).

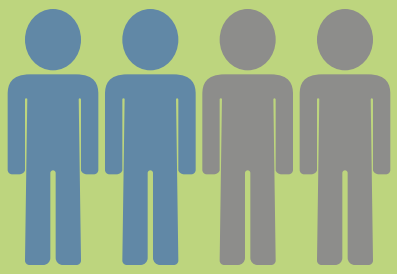
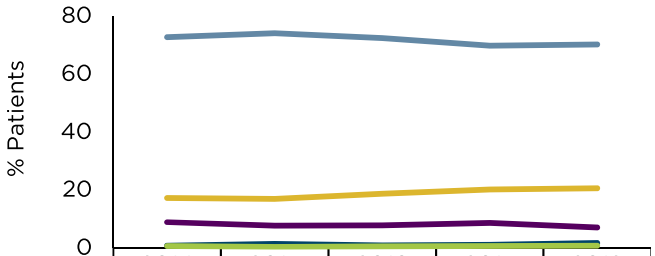


Figure 8. eGFR Categories among Urban AI/AN Diabetes Patients, 2014-2018



	2014	2015	2016	2017	2018
eGFR ≥ 60	72.7	74.0	72.3	69.7	70.1
eGFR 30-59: Moderate Reduction	8.8	7.6	7.7	8.6	7.0
eGFR 15-29: Severe Reduction	0.7	1.3	0.8	1.0	1.6
eGFR < 15: End Stage Renal Disease	0.6	0.3	0.5	0.6	0.7
Not tested or no valid result	17.2	16.8	18.6	20.1	20.5

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

CARDIOVASCULAR HEALTH

In the general population, cardiovascular disease (CVD) is the leading cause of death in both men and women and the second leading cause of death in AI/AN people.[26] Adults with diabetes are two times more likely to die from CVD than those without diabetes.[27] IHS tracks the progression of lipid levels and blood pressure in AI/AN patients with diabetes to help understand this large risk area. Proportions of urban AI/AN patients with diabetes and CVD or hypertension have remained relatively over the audit period, with 14.1% having diagnosed CVD and 69.7% having diagnosed hypertension in 2018 (Figure 9). Furthermore, in 2018, 65.7% urban AI/AN patients with diabetes diagnosed with CVD were prescribed aspirin or antiplatelet therapy to help decrease the risk of diabetes-related cardiovascular health problems (Figure 10).

Lipid Management

Lipids are a cardiovascular health measurement that is tracked through levels of low-density lipids (LDL), high-density lipids (HDL), and the use of lipid-lowering medications. In 2018, 45.8% of urban AI/AN patients with diabetes had healthy LDL levels below 100 mg/dL (Appendix A, Table A5). Similarly, 30.9% had healthy HDL levels above 50 mg/dL for females (16.8%) and 40 mg/dL for males (14.1%).

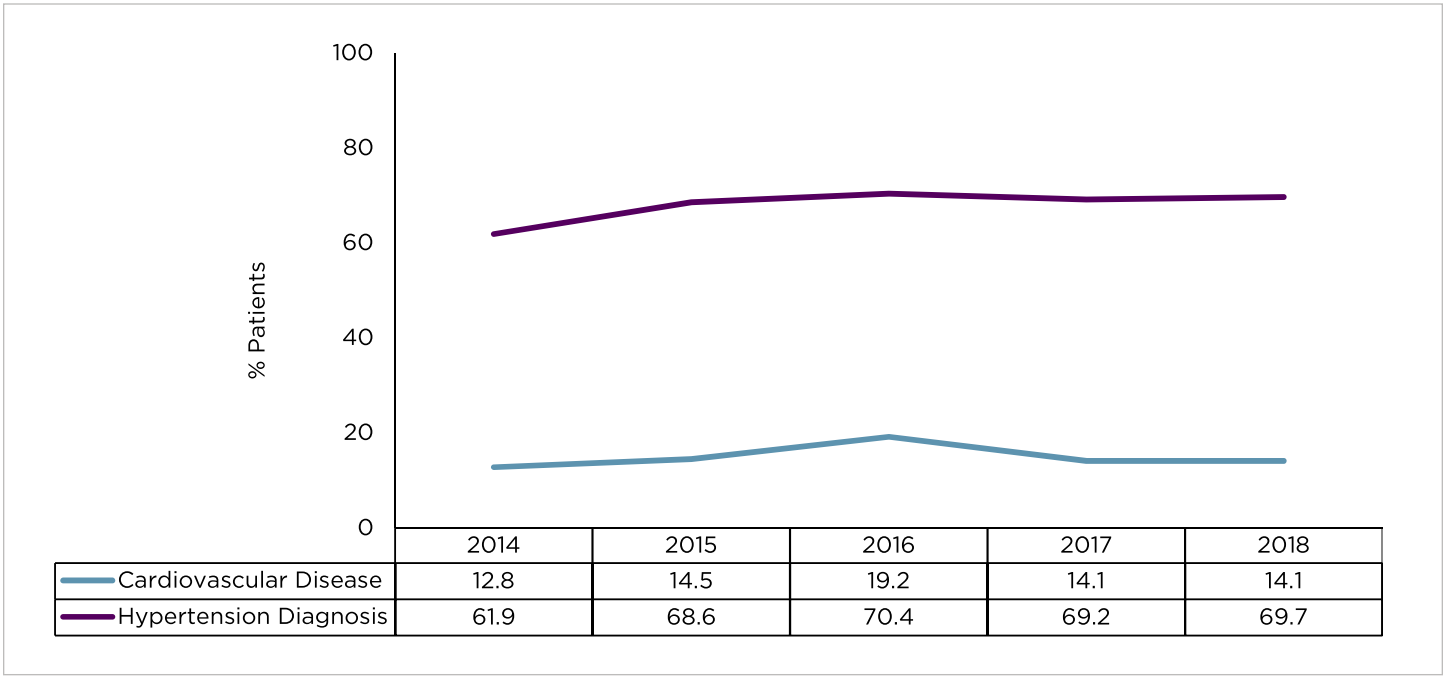
Statins are a class of medication that lower lipid levels and reduce the overall risk of CVD. In 2018, 54.3% of urban AI/AN patients with diabetes were on statin therapy (Figure 10).

Blood Pressure Control

Blood pressure is another measure of cardiovascular health. Those with systolic blood pressure (SBP) and diastolic blood pressure (DBP) below 140 and 90, respectively, are considered to have achieved good blood pressure control, as per the relevant GPRA measurement.

Overall, urban AI/AN patients with diabetes in 2018 had a mean SBP of 130.8 mmHg and DBP of 78.5 mmHg (Appendix A, Table A6). In 2018, 71.4% of urban AI/AN patients with diabetes had blood pressures below 140 and 90, exceeding the GPRA target of 52.3% (Figure 11). Finally, 79.8% of urban AI/AN patients with diabetes diagnosed with hypertension were prescribed ACE inhibitors or ARBs in 2018 (Figure 10).

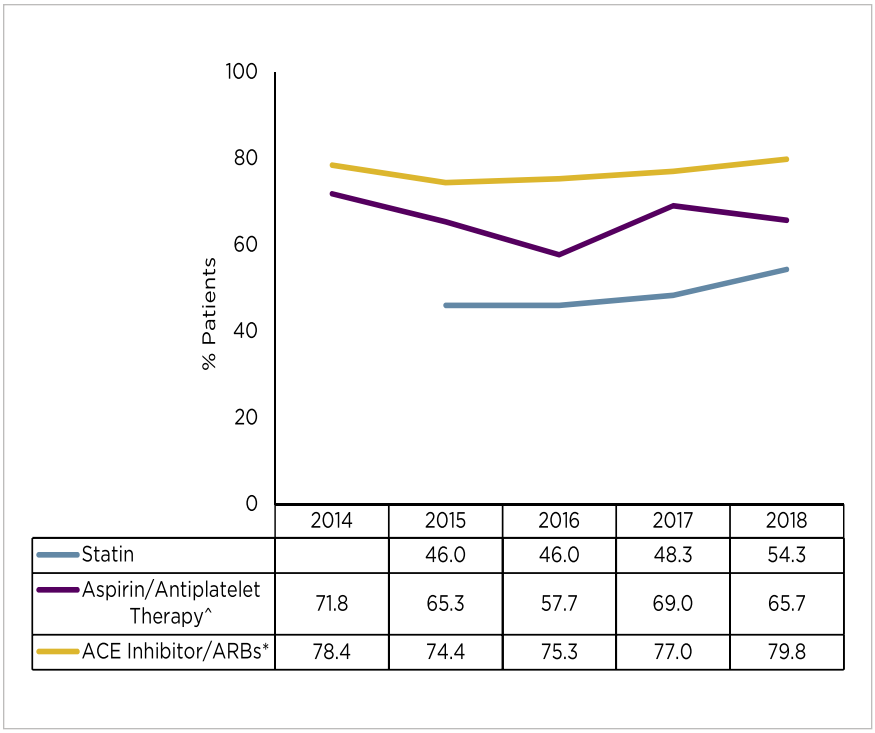
Figure 9. Cardiovascular Disease and Hypertension Diagnoses among Urban AI/AN Diabetes Patients, 2014-2018



	2014	2015	2016	2017	2018
Cardiovascular Disease	12.8	14.5	19.2	14.1	14.1
Hypertension Diagnosis	61.9	68.6	70.4	69.2	69.7

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Figure 10. Medications among Urban AI/AN Diabetes Patients, 2014-2018



	2014	2015	2016	2017	2018
Statin		46.0	46.0	48.3	54.3
Aspirin/Antiplatelet Therapy^	71.8	65.3	57.7	69.0	65.7
ACE Inhibitor/ARBs*	78.4	74.4	75.3	77.0	79.8

^ Among patients with diagnosed cardiovascular disease

* Among patients with known hypertension

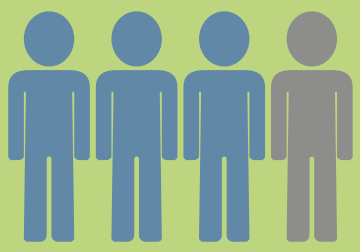
Data not collected in that audit year

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Figure 11. Blood Pressure Control, 2018

2018 IHS GPRA Target: 52.3% of patients with diabetes have achieved blood pressure control (less than < 140/90)

2018 Audit Results: Nearly 3 in 4 (71.4%) of audited urban diabetes patients achieved blood pressure control (less than < 140/90)



TOBACCO USE AND SCREENING

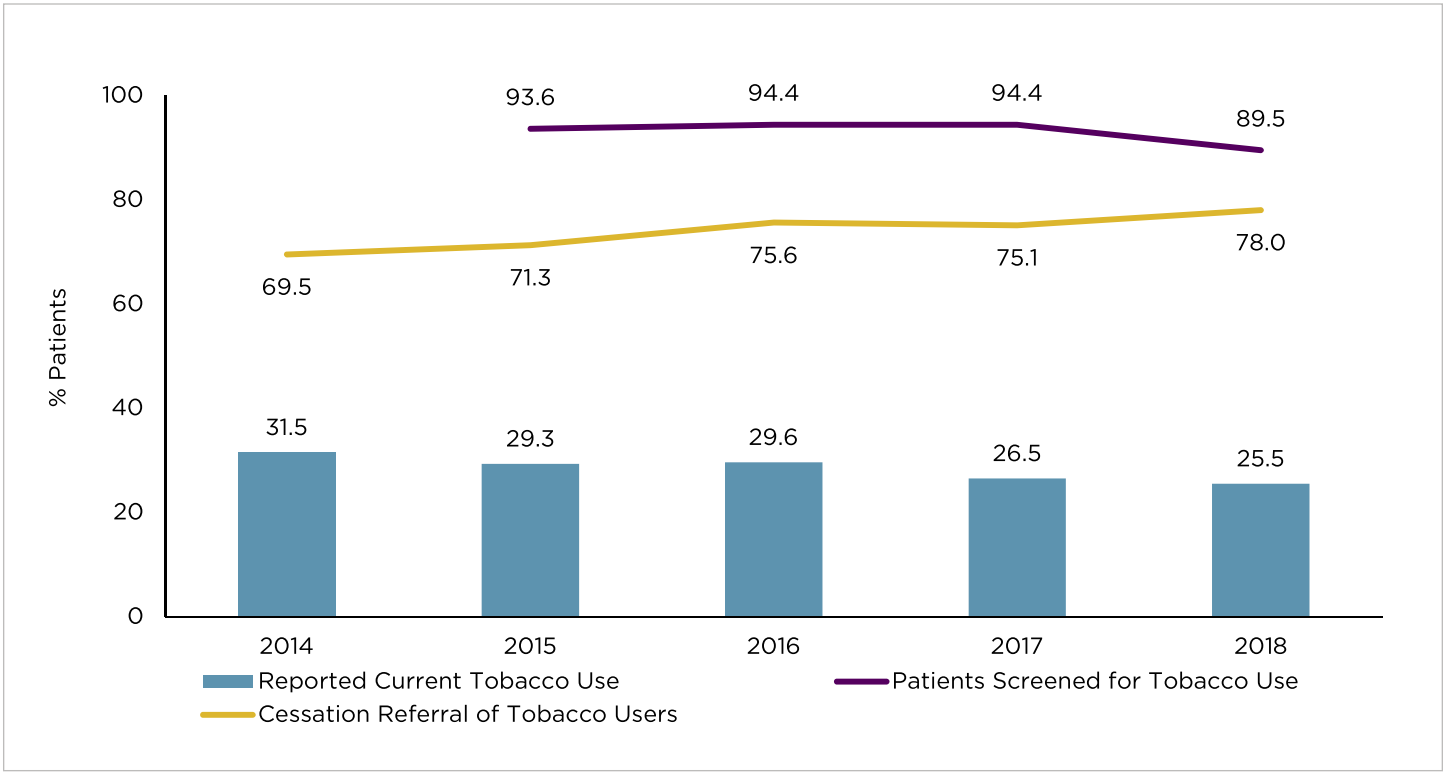
Tobacco use is one of the largest risk factors of CVD.[28] Therefore it is important not only to screen diabetic patients for tobacco use but also refer patients to cessation counseling. In 2018, 89.5% of urban AI/AN patients with diabetes were screened for tobacco use (Figure 12). Only 25.5% of patients were tobacco users, a statistically significant decrease over the five-year period ($p<0.005$; Appendix A, Table A7). Of those tobacco users, 78.0% were referred to or received cessation counseling in 2018 and a significant increase was seen over the five-year period ($p<0.005$; Appendix A, Table A7).

DIABETES THERAPY

Therapies to manage diabetes range from lifestyle changes to oral or injectable therapies and vary between those with type 1 and type 2 diabetes. Those with type 2 diabetes, most of the patients included in the 2018 Urban Diabetes Audit, usually start by managing their health through diet and exercise alone.29 If unsuccessful, other therapies can be utilized. Those with type 1 must use insulin since they cannot produce it naturally.30 Insulin is an injectable therapy that can be used alone or in tandem with other medications.29 The annual Indian Health Service (IHS) Diabetes Care and Outcomes Audit (Diabetes Audit) collects information on 11 different diabetic therapies, no medication, and insulin. Types of medications and therapies are listed in Appendix B, Table B1.

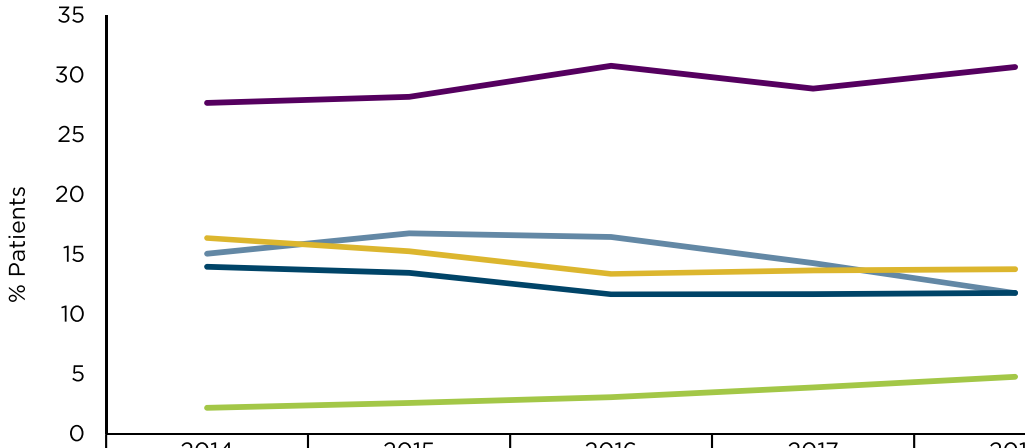
Figure 13 shows the proportion of urban AI/AN patients with diabetes in 2018 that use no medication, one medication only, two medications only, three or more medications, insulin only, or insulin and other medication. The proportion using three medications or more increased significantly over the five-year period but was less than 5% of the patients audited all five years ($p<0.005$; Appendix A, Table A8). Conversely, the proportion of those on insulin only decreased significantly over the audit period ($p<0.005$; Appendix A, Table A8). Therapy regimens may change over time depending on the change in condition as well as the effectiveness of therapies for individuals. Patient-centered approaches to care and individualized treatment plans are important to consider when looking at diabetes therapy.

Figure 12. Tobacco Use, Screening, and Referrals, among Urban AI/AN Diabetes Patients, 2014-2018



Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Figure 13. Standard Therapies among Urban AI/AN Diabetes Patients, 2014-2018



	2014	2015	2016	2017	2018
None	15.1	16.8	16.5	14.3	11.8
1 Medication	27.7	28.2	30.8	28.9	30.7
2 Medications	16.4	15.3	13.4	13.7	13.8
3 Medications or More	2.2	2.6	3.1	3.9	4.8
Insulin Only	14.0	13.5	11.7	11.7	11.8

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

SCREENING EXAMS

Poor glycemic control caused by diabetes can lead to significant microvascular damage in the blood vessels, most notably in the eyes, feet, and mouth.[31-34] This damage can be prevented and managed with regular exams.

Diabetic retinopathy is caused by damage to blood vessels in the retina due to high blood sugar levels and can lead to a loss of vision.[31] It is the leading cause of blindness in adults with diabetes and often lacks early symptoms.[32] It can, however, be detected through regular eye exams and is why annual eye exams are important for diabetes patients.[32] Diabetic neuropathy is nerve damage—most commonly in the legs and feet—and is experienced by 60% to 70% of diabetic patients in the United States.[33] This may result in foot sores or wounds that will not heal (foot ulcers) and can lead to amputation of the toe, foot, or part of the leg.[33] Annual foot exams are recommended to help prevent these complications. The risk of oral health problems—infections, sore and swollen gums that bleed, and gums that pull or shrink away from teeth—are also increased in diabetic patients.[34] Regular dental exams with cleanings can help to prevent these issues.[34]

Despite the importance of annual eye exams, only 36.9% of urban AI/AN patients with diabetes received one in 2018, falling short of the GPRA target of 49.7% (Figure 14; Figure 15). Additionally, only 57.5% of patients received a foot exam in 2018 (Figure 15). Despite only 30.5% of patients receiving a dental exam in 2018, there was a statistically significant increase over the five-year period ($p<0.005$; Appendix A, Table A9). In 2018, 8.4% of urban AI/AN patients with diabetes had a retinopathy diagnosis (Appendix A, Table A10). This was the first time retinopathy diagnosis information was collected in the Diabetes Audit and why information in years prior to 2018 is not available.

DIABETES MANAGEMENT EDUCATION

Education on nutrition, physical activity, or other diabetes topics can help patients manage diabetes. Physical activity and learning to shop, cook, and eat nutritionally, can help to lower blood glucose levels, lower the risk for heart disease and nerve damage, and potentially lead to weight loss.[35]

Figure 16 shows that in 2018, 67.9% of urban AI/AN patients with diabetes received exercise education, 68.5% received nutrition education, and 72.7% received other diabetes education. There was a statistically significant decrease in other diabetes education during the years reported ($p<0.005$; Appendix A, Table A11).

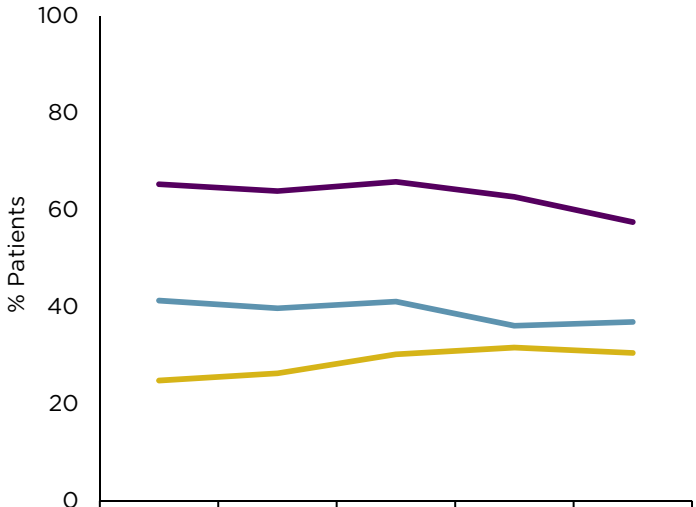
Nutrition education could come from a registered dietitian, other staff member, or both a registered dietitian and staff member (Figure 17). In 2018, only a quarter of patients received nutrition education from registered dietitians with or without other staff, while 43.5% received nutrition education from other staff.

Figure 14. Retinopathy Assessment, 2018

2018 IHS GPRA Target: 49.7% of patients with diabetes receive an annual retinal exam.

2018 Audit Results: One third (36.9%) of audited urban diabetes patients received an annual retinal exam.

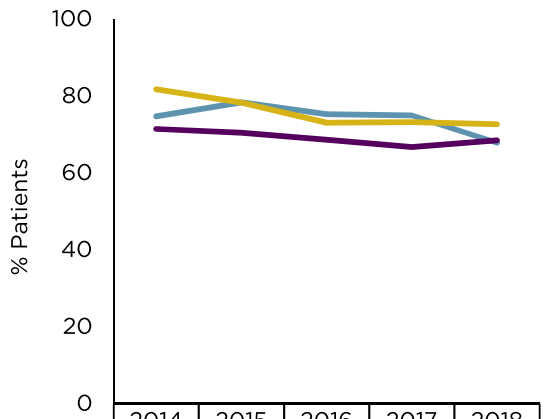
Figure 15. Documented Exams among Urban AI/AN Diabetes Patients, 2014-2018



	2014	2015	2016	2017	2018
Eye Exam	41.3	39.7	41.1	36.1	36.9
Foot Exam	65.3	63.9	65.8	62.7	57.5
Dental Exam	24.8	26.3	30.2	31.6	30.5

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

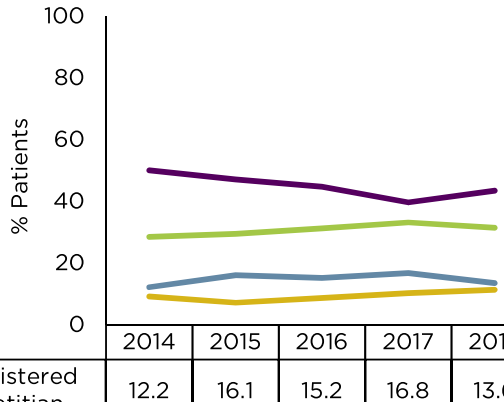
Figure 16. Diabetes Management Education among Urban AI/AN Diabetes Patients, 2014-2018



	2014	2015	2016	2017	2018
Exercise Instruction	74.8	78.4	75.3	75.0	67.9
Nutrition Education	71.5	70.5	68.7	66.8	68.5
Diabetes Education (Other)	81.8	78.3	73.1	73.3	72.7

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Figure 17. Nutrition Education by Provider among Urban AI/AN Diabetes Patients, 2014-2018



	2014	2015	2016	2017	2018
Registered Dietitian	12.2	16.1	15.2	16.8	13.6
Other Staff Only	50.1	47.2	44.8	39.7	43.5
Both Registered Dietitian and Staff	9.2	7.2	8.7	10.3	11.4
Neither	28.5	29.5	31.3	33.2	31.5

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Success Story: DIHSF Diabetes Program

Denver Indian Health and Family Services, Denver, Colorado

Our care team takes an integrated care approach to diabetes management and treatment. For many of our patients with multiple health conditions, social barriers, and trauma-related stressors, a simple medical visit with a single health care provider is inadequate to meet their complex health needs. Many patients also report challenges with transportation, childcare, absences from work, and insurance coverage that makes scheduling multiple visits nearly impossible. Our one-stop-shop approach ensures that our patients get the care they need and deserve.

We are proud to share an example of our integrated care model as it's best! Mrs. Y presented to our clinic with uncontrolled type 1 diabetes, chronic kidney disease, hypertension, active hepatitis C and anxiety from adverse childhood events. She also had severe distress from the burden and burnout of chronic disease management. It was clear a 40-minute medical visit would not be enough to manage her care. By using our integrated care approach, we expended her medical visit by just 20 minutes to include time with the diabetes educator, care coordinator, social worker, and pharmacy clinician, without the need to schedule separate appointments with each support provider. Over the course of a year, Mrs. Y obtained insurance with the help of our enrollment team, reduced her A1c from 12% to 8%, scheduled specialty care visits with nephrology, hematology, gastroenterology, obtained a colonoscopy and mammogram, and started on hepatitis C treatment. To accommodate Mrs. Y's busy schedule, she enrolled in behavioral health counseling by phone to continue her journey health and wellness. Use of the integrated care model in our diabetes program is respectful of our patients' time and honors the native approach to wellness in mind, body, emotion and spirit.

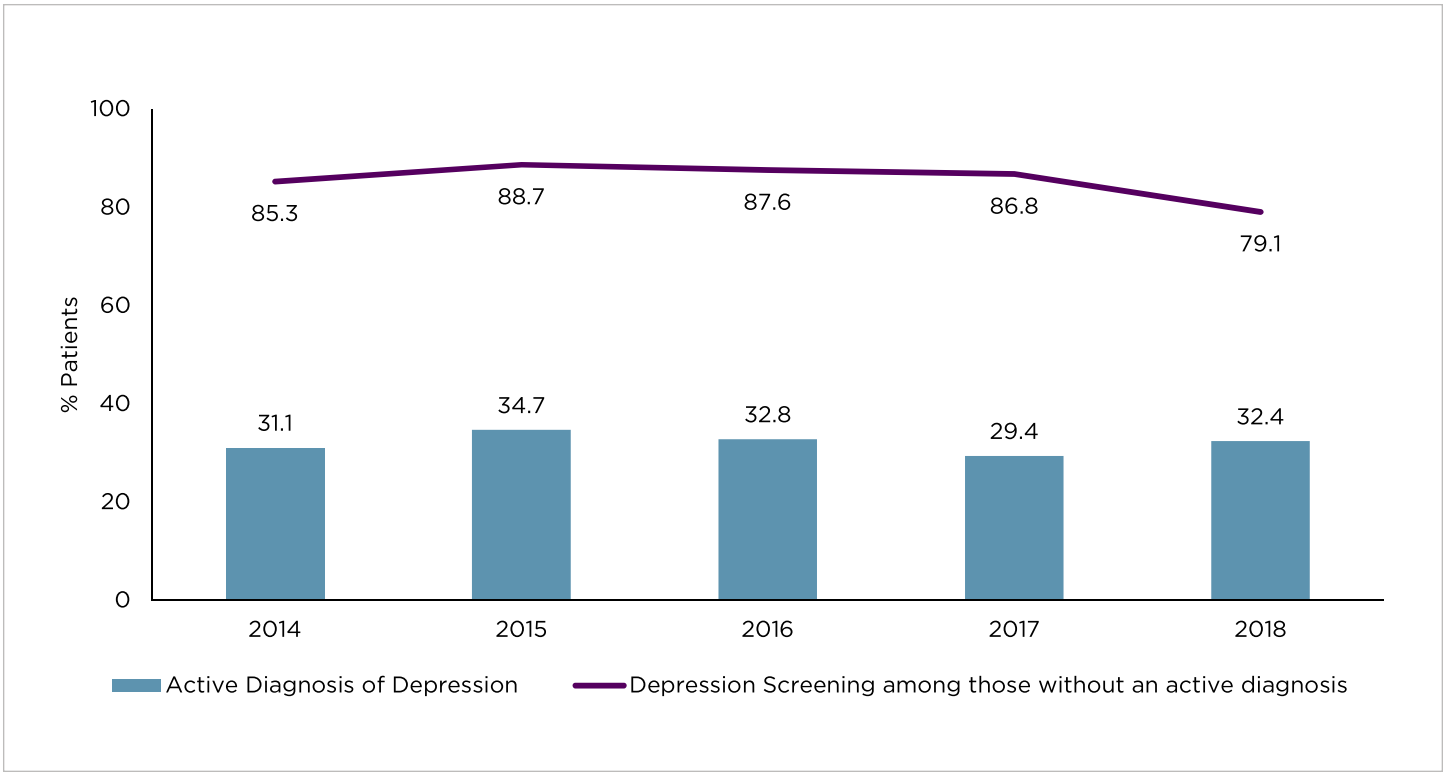
Learn more about the work of Denver Indian Health and Family Services at www.dihfs.org.

DEPRESSION SCREENING AND MANAGEMENT

Diabetes is associated with an increased risk of depression, and depression can contribute to worsened diabetes outcomes and care.[36] These include worsened glycemic control, worsened self-care, and an increase in risk for other complications. The odds of depression are 1.6 to 2 times higher in those with diabetes compared to those without the disease.[37, 38] Furthermore, a study of 18,814 people found the rates in AI/AN people are three times higher compared to non-Hispanic Whites.[39] Given the negative consequences and higher rates of depression in those who have diabetes—especially for AI/AN patients—it is important to screen for depression in urban AI/AN patients with diabetes.

In 2018, 32.4% of urban AI/AN patients with diabetes had an active diagnosis of depression (Figure 18). Of patients without a current diagnosis, 79.1% were screened for depression. For all five years, this proportion of patients screened among those without an active diagnosis of depression was above 75% and has remained stable (Appendix A, Table A12).

Figure 18. Depression Diagnosis and Screening among Urban AI/AN Diabetes Patients, 2014-2018



Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

IMMUNIZATIONS

Those with diabetes are at an increased risk for acquiring certain vaccine-preventable diseases and developing more complications when ill because of the strain diabetes has on the immune system.[40] The immunizations tracked in the Diabetes Audit are annual influenza vaccine, pneumococcal vaccine ever, tetanus/diphtheria/pertussis (Tdap) vaccine in the last ten years, and all three doses of the hepatitis B vaccine series.

The proportions of patients that received an annual influenza vaccine, pneumococcal vaccine, or Tdap vaccine remained relatively stable over the audit period and each vaccine had more than 50% of patients receive it in 2018 (Figure 19; Appendix A, Table A13). In particular, the proportion of patients that received the hepatitis B vaccine significantly increased, more than doubling from 2014 to 2018 ($p<0.005$; Appendix A, Table A13). Despite this significant increase, only 33.8% of patients had ever received the complete hepatitis B vaccine series in 2018.

TUBERCULOSIS SCREENING

Tuberculosis (TB) is an infectious disease caused by the bacterium Mycobacterium tuberculosis (MTB), but not everyone infected with MTB becomes sick.[41] There are, however, two related conditions: latent TB infection (LTBI) and active TB disease.[41] LTBI can easily progress to active TB in patients with weakened immune systems, as in diabetes.[42] The risk of TB among those with diabetes ranges from 2 to 7 times higher.[43] Therefore, it is recommended that those with diabetes receive TB screening at least once after a diabetes diagnosis.

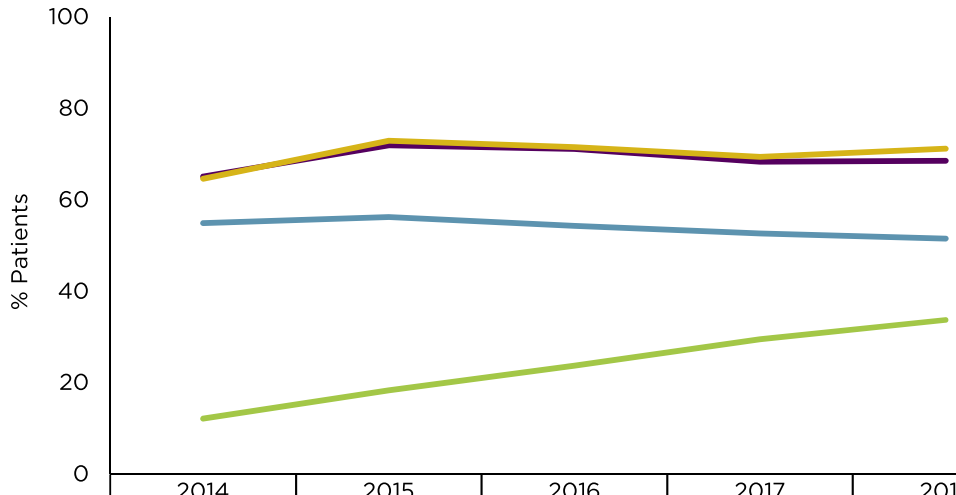
Figure 20 shows 74.2% of urban AI/AN patients with diabetes had an unknown TB status, and an additional 4.0% had an outdated or date unknown TB status in 2018. Furthermore, the percent of those who tested positive and received treatment had significantly decreased over the five years but still makes up less than 3% of all patients audited each of the five years ($p<0.005$; Appendix A, Table A14). Given the higher risk of TB among those with diabetes, it is important to determine the TB status of diabetic patients.

HEPATITIS C SCREENING

Hepatitis C is a liver infection caused by the hepatitis C virus (HCV), which is a blood borne virus.[44] This infection can result in a short-term illness, but, for 70%-85% of people, it becomes a chronic infection with long-term health problems and can even result in death.[44] The Centers for Disease Control and Prevention (CDC) recommends that all adults born between 1945 to 1965 receive a hepatitis C screening.[45] In 2018, the Diabetes Audit started tracking those who were infected and those who had been screened who were not infected and born between 1945 and 1965. Therefore, no information regarding these measurements is available before 2018 (Appendix A, Table A15).

Only 4.4% of urban AI/AN patients with diabetes had a hepatitis C infection diagnosis in 2018 (Appendix A, Table A15). Of those that did not have a hepatitis C infection diagnosis, 44.8% were not born between 1945 and 1965 and did not need to be screened based upon the CDC's recommendation (Appendix A, Table A15). Of those, only 38.3% were screened for hepatitis C in 2018 (Figure 21).

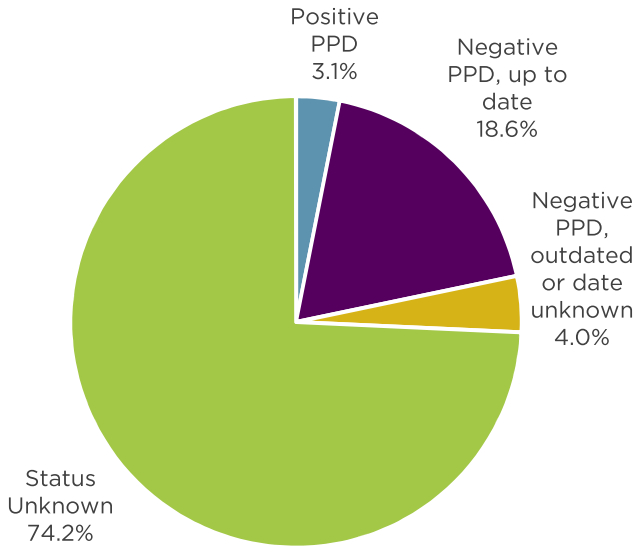
Figure 19. Documented Immunizations among Urban AI/AN Diabetes Patients, 2014-2018



	2014	2015	2016	2017	2018
Influenza Vaccine in Past Year	55.0	56.3	54.4	52.7	51.6
Pneumococcal Vaccine Ever	65.2	72.0	71.2	68.4	68.6
Tdap Vaccine in Past 10 Years	64.7	73.0	71.6	69.5	71.3
Hepatitis B Series	12.2	18.4	23.8	29.6	33.8

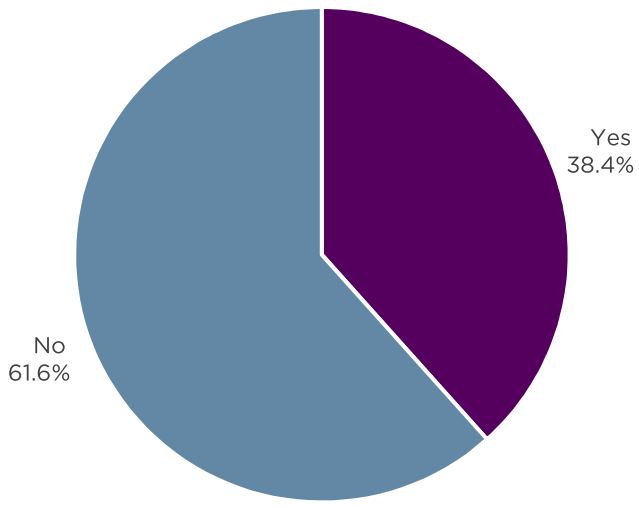
Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Figure 20. Tuberculosis PPD Status among Urban AI/AN Diabetes Patients, 2018



Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2018

Figure 21. Hepatitis C Screening among Urban AI/AN Diabetes Patients^, 2018



^ Among those who were born between 1945-1965 and not been diagnosed with hepatitis C

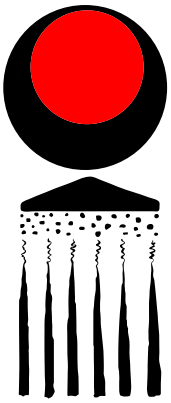
Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2018

Success Story: Seattle Indian Health Board

Seattle Indian Health Board, Seattle, WA

The Diabetes Support Group at Seattle Indian Health Board is a monthly event for our patients with diabetes. We always kick off the event with thirty minutes of fitness. Our fitness mainly consists of chair exercises to accommodate everyone safely and allows people at all levels to participate and have fun. We also have a presentation on a diabetes-related educational topic, such as nutritional cooking, which is led by a professional such as dentists, pharmacist, and nutritionists. The presentation is a great opportunity for the attendees to connect one-on-one with these professionals and answer specific questions they have regarding their health and provides more individualized care. Then, we always have a Sharing Circle that is opened with a prayer of gratitude. Sharing Circles are a confidential space where patients allow themselves to be vulnerable and share their experiences while receiving support and respect in return.

The group simultaneously receives a demonstration of a healthy meal tailored to the needs of patients with diabetes. The meal provides opportunities to discuss ingredient selection, food preparation, and shopping strategies. The meals are affordable and easy-to-make and the recipe is shared with the group. Annually, we partner with our Traditional Medicine team to collaborate on healthy, native, dietary choices in a fun and lively holiday feast. Overall, our program allows our patients to forge friendships through their continued engagement with the group and find support and assistance in diabetes care.



To learn more about the Seattle Indian Health Board, visit sihb.org

CONCLUSION

Diabetes continues to be a significant public health burden for urban American Indian and Alaska Native (AI/AN) patients across the nation. The 2018 Urban Diabetes Audit provides critical surveillance information regarding diabetes patients' screening, outcomes, and health care. Over 2,000 patients from Urban Indian Health Programs (UIHPs) across the nation are included each year in the Urban Diabetes Audit and are able to highlight challenges that exists as well as improvements and successes that have been made in the health of urban AI/AN patients with diabetes. This allows programs to provide the best possible health care to these patients.

Although not official Government Performance and Results Act (GPRA) results, comparison to these targets provides important information on strengths in care as well as potential areas of need when serving urban AI/AN patients with diabetes. This report found that, in 2018, UIHPs overall exceeded in three of the four GPRA targets focused on diabetes outcomes. There were higher proportions of urban AI/AN patients with diabetes that exceeded the GPRA targets when demonstrating good glycemic control, demonstrating good blood pressure control, and being screened for nephropathy. The one that UIHPs did not exceed in was retinopathy screening, which only 36.9% of patients received. Programs can strive to improve work to screen more patients for retinopathy in the future.

This surveillance report was able to identify a few key areas of success and gaps in diabetes care for urban AI/AN patients. A total of six recommendations are posited here based on these findings.

1. Programmatic Effort Recommendation

Programs may need to prepare to serve an aging diabetes patient population. The percentage of patients aged 55 years or older increased significantly over the five-year period and could indicate patients that are getting older within diabetes programs at UIHPs. Older patients have unique health needs that need to be considered.

2.Programmatic Effort Recommendation

Continue successful program efforts in maintaining healthy eGFR levels in patients, maintaining good blood pressure control in patients, prescribing ACE inhibitors or ARBs to those with hypertension, and referring tobacco users to cessation counseling. In 2018, patients had a mean systolic and diastolic blood pressure lower than 140 and 90, demonstrating overall good blood pressure control. Additionally, 70.1% of patients had an eGFR of 60 ml/min/1.7m^2 or higher and 79.8% of patients with hypertension were prescribed ACE inhibitors or ARBs.

Furthermore, 25.5% of patients were currently using tobacco and 78.0% of tobacco users were referred to or received cessation counseling. This was coupled with a significant decrease in tobacco usage and a significant increase in patients referred to or receiving cessation counseling over the five-year period. Continuing the efforts in these areas will help to maintain the successes seen.

3. Research Recommendation

Further research to address the increasing A1c levels among patients may be warranted. The report found the proportion of patients with an A1c less than 7.0% significantly decreased while the proportion of patients with an A1c of 8.0% or higher significantly increased over the five-year period. Research into these changes will allow programs to better understand why these changes in A1c levels are occurring and provide better care to patients.

4. Prevention Funding Recommendation

Continuing to expand on the successful support of current programmatic efforts can help to encourage patients to receive an annual dental exam. While the proportion of patients that received dental exams significantly increased over the five-year period, less than a third of patients received a dental exam in 2018. To maintain this positive trend, continuing to support these efforts is necessary.

5. Prevention Funding Recommendation

Continuing to expand on the successful support of current programmatic efforts can help to encourage patients to receive the hepatitis B vaccine series. The proportion of patients that received the hepatitis B vaccine series significantly increased over the five-year period. Despite this encouraging trend, only approximately a third of patients received it by 2018. To maintain this positive trend, continuing to support these efforts is necessary.

6. Data Collection Recommendation

Continue to gather health information to ensure patients with diabetes are regularly screened for tuberculosis and chronic kidney disease. In 2018, 74.2% of patients had an unknown tuberculosis status and 20.5% of patients were not tested for eGFR. Although patients may receive this screening or test elsewhere, it is still important for clinics to continue to collect this information so that gaps in patient care can be identified.

These recommendations are suggested as ways to support the existing diabetes work done at UIHPs and to better serve urban AI/AN patients with diabetes. These programs work tirelessly to provide the best possible care to their patients with diabetes. This report aims to motivate collaboration and communication in the field of diabetes care for urban AI/AN patients. It can inform data collection, research, prevention funding, and programmatic efforts to ensure success in achieving diabetes care, prevention, and outcomes for urban AI/AN patients.

APPENDIX A

Results highlighted in **blue** represent statistically significant results where the p-value <0.05.

Table A1. Number of Audited Patients with Diabetes, 2014-2018

Year	2014	2015	2016	2017	2018	Trend P-Value
Total Number Audited	2,871	2,681	2,592	2,464	2,130	
Total Number in Registry	3,877	3,706	3,539	3,432	3,042	
Percent of Patients Audited	74.1	72.3	73.2	71.8	70.0	0.100
Number of Facilities	31	30	30	29	25	

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Table A2. Demographics among Audited Diabetes Patients, 2014-2018

Year	2014		2015		2016		2017		2018		
Number of charts audited	2,871		2,681		2,592		2,464		2,130		
	No.	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**Trend P-Value**
Sex											
Male	1,151	39.1	1,105	40.5	1,066	40.5	994	39.5	875	38.7	0.700
Female	1,720	60.9	1,576	59.5	1,525	59.4	1,470	60.5	1,253	61.0	0.800
Age (Years)											
<18	#	#	#	#	#	#	#	#	#	#	
18-44	690	25.4	605	23.0	576	23.2	531	23.3	435	22.1	0.100
45-54	881	29.9	803	30.5	749	29.4	702	29.2	591	27.6	0.100
≥55	1,295	44.5	1,271	46.4	1,261	47.1	1,224	47.1	1,099	50.0	<0.005
Mean age*	52.6		53.1		53.3		53.6		54.0		
Diabetes Duration (Years)											
<5	816	31.1	724	31.2	658	26.8	618	26.7	655	32.9	0.900
5-9	657	21.8	554	20.9	544	19.9	506	19.1	409	18.6	<0.005
≥10	957	31.2	904	32.4	920	33.5	827	30.6	773	32.7	0.800
Not Documented	441	15.9	499	15.5	470	19.8	513	23.6	293	15.8	0.300
Mean duration*	8.8		8.9		9.2		9.1		8.7		
Diabetes Type											
Type 1	56	2.0	66	2.7	47	1.8	39	1.5	51	2.1	0.500
Type 2	2,815	98.0	2,615	97.3	2,545	98.2	2,425	98.5	2,079	97.9	0.500

*Weighted Estimate
Suppressed

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Table A3. Glycemic Control among Audited Diabetes Patients, 2014-2018

Year Number of charts audited	2014 2,871		2015 2,681		2016 2,592		2017 2,464		2018 2,130		
	No.	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**Trend P-Value**
A1c (%)											
<7.0	1,069	36.6	978	35.8	960	36.1	852	33.4	737	32.5	<0.005
7.0-7.9	492	17.5	503	18.7	449	16.8	462	18.0	384	17.5	0.900
≥8.0	1,114	38.4	1,017	39.4	1,025	40.6	992	40.6	850	40.9	<0.005
Not tested or no valid result	196	7.6	183	6.1	158	6.5	158	8.0	159	9.1	0.300
Mean A1c*	8.0		8.1		8.2		8.2		8.2		
Body Mass Index (BMI) (kg/m*m)											
Normal (BMI 18.5-24.9)	225	8.1	197	6.8	192	7.5	194	8.2	171	7.7	0.800
Overweight (BMI 25.0-29.9)	624	21.2	584	21.3	585	22.8	507	20.9	449	21.6	0.900
Obese (BMI 30.0-39.9)	1,349	46.5	1,281	48.8	1,225	46.1	1,183	48.0	1,025	48.4	0.500
Morbidly Obese (BMI ≥40.0)	647	23.3	578	21.7	563	22.4	549	21.5	458	20.8	0.100
Not tested or no valid result	23	0.7	33	1.0	20	0.9	26	1.1	24	1.4	<0.005
Mean BMI*	35.0		34.8		34.6		34.6		34.4		

*Weighted Estimate

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Table A4. Chronic Kidney Disease among Audited Diabetes Patients, 2014-2018

Year	2014		2015		2016		2017		2018		
Number of charts audited	2,871		2,681		2,592		2,464		2,130		
	No.	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**Trend P-Value**
Estimated glom. filtration rate (eGRF) (ml/min/1.7m2)											
eGFR ≥ 60	2,098	72.7	1,903	74.0	1,849	72.3	1,704	69.7	1,483	70.1	0.100
eGFR 30-59: Moderate Reduction (CKD)	237	8.8	211	7.6	211	7.7	213	8.6	165	7.0	0.400
eGFR 15-29: Severe Reduction (CKD)	25	0.7	32	1.3	27	0.8	31	1.0	36	1.6	0.200
eGFR < 15: End Stage Renal Disease	19	0.6	11	0.3	15	0.5	19	0.6	18	0.7	0.500
Not tested or no valid result	492	17.2	524	16.8	490	18.6	497	20.1	428	20.5	<0.005
Mean eGFR	82.8		83.4		82.1		81.9		81.8		
Urine albumin to creatinine ratio (UACR) (mg/g)											
< 30	1,095	34.9	1,155	43.0	1,192	44.6	1,037	39.7	929	37.9	0.800
30-300	571	20.3	473	17.5	393	16.3	398	17.1	297	14.2	<0.005
> 300	107	3.5	130	4.8	118	4.2	129	5.2	112	4.8	0.200
Not tested or no valid result	1,098	41.3	923	34.7	889	35.0	900	37.9	792	43.2	0.800
Mean UACR	88.0		93.8		95.3		99.2		94.9		
Both eGFR and UACR Assessed*											
Yes	1,716	57.1	1,669	63.1	1,684	64.2	1,469	59.0	1,270	54.2	0.700
No	1,155	42.9	1,012	36.9	908	35.8	995	41.0	860	45.8	0.700

*Weighted Estimate

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Table A5. Lipid Management among Audited Diabetes Patients, 2014-2018

Year	2014		2015		2016		2017		2018		
Number of charts audited	2,871		2,681		2,592		2,464		2,130		
	No.	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**Trend P-Value**
LDL Cholesterol (mg/dL)											
<100	1,294	43.4	1,114	42.4	1,150	44.4	1,127	45.3	972	45.8	0.100
100-129	625	22.4	519	18.9	480	18.7	466	18.0	362	16.3	<0.005
130-160	238	8.4	227	7.9	227	8.5	166	6.9	138	5.4	0.100
>160	102	3.6	140	4.7	137	5.2	70	2.5	61	2.7	0.400
Not tested or no valid result	612	22.1	681	26.0	598	23.2	635	27.3	597	29.8	0.100
Mean LDL cholesterol*	96.7		97.7		97.7		91.6		90.4		
HDL Cholesterol (mg/dL)											
Females											
≤50	870	30.9	770	28.3	761	29.3	750	30.2	584	27.4	0.300
>50	501	17.0	430	17.1	437	17.4	380	15.2	344	16.8	0.500
Not tested or no valid result	349	12.9	376	14.1	327	12.7	340	15.2	325	16.7	0.100
Mean HDL cholesterol*	47.6		48.9		47.8		47.8		48.6		
Males											
≤40	472	16.5	429	14.8	462	16.8	416	15.9	352	14.7	0.500
>40	469	15.3	424	16.1	405	16.4	368	15.2	321	14.1	0.400
Not tested or no valid result	210	7.3	252	9.6	199	7.3	210	8.4	202	9.9	0.400
Mean HDL cholesterol*	42.8		43.6		42.6		42.8		42.6		
Triglyceride (mg/dL)											
<400	2,167	74.9	1,921	71.3	1,933	75.0	1,783	70.9	1,508	69.2	0.200
≥400	149	5.1	134	5.3	133	5.0	135	5.5	97	4.1	0.400
Not tested or no valid result	555	20.0	626	23.4	526	20.0	546	23.5	525	26.7	0.200
Mean triglyceride*	198.1		195.9		198.8		207.9		199.4		
Statin											
Yes	–	–	1,230	46.0	1,241	46.0	1,278	48.3	1,210	54.3	0.100
No	–	–	1,384	51.5	1,290	52.0	1,124	49.0	871	44.0	0.100
Allergy	–	–	66	2.5	61	2.0	59	2.5	49	1.7	0.400

*Weighted Estimate

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Table A6. Cardiovascular Health among Audited Diabetes Patients, 2014-2018

Year	2014		2015		2016		2017		2018		
Number of charts audited	2,871		2,681		2,592		2,464		2,130		
	No.	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**Trend P-Value**
Hypertension Diagnosis											
Yes	1,719	61.9	1,878	68.6	1,895	70.4	1,810	69.2	1,603	69.7	0.200
No	1,152	38.1	803	31.4	697	29.6	654	30.8	527	30.3	0.100
Blood Pressure (mmHg)											
<140 and <90	1,915	67.7	1,792	68.0	1,781	69.5	1,817	74.5	1,456	71.4	0.100
>140 or >90	681	23.0	613	23.2	565	21.4	639	25.2	669	28.2	0.100
Not tested or no valid result	275	9.3	276	8.8	246	9.1	#	#	#	#	0.400
Mean systolic*	129.8		130.1		129.5		129.8		130.8		
Mean diastolic*	78.3		78.3		78.0		78.3		78.5		
Cardiovascular Disease											
Yes	360	12.8	378	14.5	409	19.2	367	14.1	342	14.1	0.800
No	2,511	87.2	2,303	85.5	2,183	80.8	2,097	85.9	1,788	85.9	0.700
Aspirin/Antiplatelet Therapy^											
Yes	256	71.8	239	65.3	261	57.7	248	69.0	222	65.7	0.600
No	104	28.2	139	34.7	148	42.3	119	31.0	120	34.3	0.700
ACE Inhibitor/ARBs^^											
Yes	1,336	78.4	1,380	74.4	1,426	75.3	1,392	77.0	1,265	79.8	0.600
No	383	21.6	498	25.6	469	24.7	418	23.0	338	20.2	0.600

* Weighted Estimate
# Suppressed
^ Among patients with diagnosed cardiovascular disease
^^ Among patients with known hypertension
Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Table A7. Tobacco Use, Screening, and Cessation Referral among Audited Diabetes Patients, 2014-2018

Year	2014		2015		2016		2017		2018		
Number of charts audited	2,871		2,681		2,592		2,464		2,130		
	No.	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**Trend P-Value**
Screened for Tobacco Use											
Yes	–	–	2,503	93.6	2,441	94.4	2,320	94.4	1,893	89.5	0.500
No	–	–	178	6.4	151	5.6	144	5.6	236	10.5	0.300
Current Tobacco Use											
User	913	31.5	873	29.3	813	29.6	706	26.5	604	25.5	<0.005
Non-user	1,914	67.0	1,777	69.3	1,755	69.5	1,731	71.5	1,465	70.1	0.100
Not Documented	44	1.5	31	1.3	24	0.8	27	2.0	61	4.4	0.200
Cessation Referral^											
Yes	619	69.5	631	71.3	628	75.6	545	75.1	471	78.0	<0.005
No	288	28.2	242	28.7	185	24.4	161	24.9	133	22.0	<0.005

* Weighted Estimate

^ Among patients who are active tobacco users

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Table A8. Standard Diabetes Therapies among Audited Diabetes Patients, 2014-2018

Year	2014		2015		2016		2017		2018		
Number of charts audited	2,871		2,681		2,592		2,464		2,130		
	No.	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	Trend P-Value
Number of Medications											
None	509	15.1	516	16.8	447	16.5	359	14.3	279	11.8	0.300
1 Medication	740	27.7	736	28.2	732	30.8	714	28.9	631	30.7	0.200
2 Medications	500	16.4	408	15.3	381	13.4	356	13.7	316	13.8	0.100
3 Medications or More	75	2.2	72	2.6	96	3.1	120	3.9	119	4.8	<0.005
Insulin Only	353	14.0	348	13.5	327	11.7	287	11.7	241	11.8	<0.005
Insulin & Other Medication	687	24.1	592	23.1	609	24.4	628	27.5	539	26.7	0.100

* Weighted Estimate

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Table A9. Screening Examinations among Audited Diabetes Patients, 2014-2018

Year	2014		2015		2016		2017		2018		
Number of charts audited	2,871		2,681		2,592		2,464		2,130		
	No.	%*	No.	%*	No.	%*	No.	%*	No.	%*	Trend P-Value
Eye Exam											
Yes	1,221	41.3	1,095	39.7	1,112	41.1	969	36.1	893	36.9	0.100
No	1,649	58.5	1,586	60.3	1,480	58.9	1,495	63.9	1,237	63.1	0.100
Foot Exam											
Yes	2,001	65.3	1,841	63.9	1,811	65.8	1,680	62.7	1,427	57.5	0.100
No	869	34.5	840	36.1	781	34.2	784	37.3	702	42.5	0.100
Dental Exam											
Yes	733	24.8	710	26.3	803	30.2	770	31.6	748	30.5	<0.005
No	2,136	75.0	1,971	73.7	1,789	69.8	1,694	68.4	1,382	69.5	<0.005

* Weighted Estimate

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Table A10. Retinopathy Diagnosis among Audited Diabetes Patients, 2014-2018

Year	2014		2015		2016		2017		2018		
Number of charts audited	2,871		2,681		2,592		2,464		2,130		
	No.	%*	No.	%*	No.	%*	No.	%*	No.	%*	Trend P-Value
Retinopathy Diagnosis											
Yes	–	–	–	–	–	–	–	–	197	8.4	–
No	–	–	–	–	–	–	–	–	1,933	91.6	–

* Weighted Estimate

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Table A11. Types of Education among Audited Diabetes Patients, 2014-2018

Year	2014		2015		2016		2017		2018		
Number of charts audited	2,871		2,681		2,592		2,464		2,130		
	No.	%*	No.	%*	No.	%*	No.	%*	No.	%*	Trend P-Value
Exercise Instruction											
Yes	2,138	74.8	2,157	78.4	2,095	75.3	1,979	75.0	1,501	67.9	0.300
No	733	25.2	524	21.6	497	24.7	485	25.0	628	32.1	0.200
Nutrition Education											
Registered Dietitian	315	12.2	365	16.1	370	15.2	378	16.8	328	13.6	0.600
Other Staff Only	1,409	50.1	1,266	47.2	1,150	44.8	961	39.7	842	43.5	0.100
Both Registered Dietitian & Staff	280	9.2	235	7.2	255	8.7	260	10.3	243	11.4	0.200
Neither	867	28.5	815	29.5	817	31.3	865	33.2	717	31.5	0.100
Diabetes Education (Other)											
Yes	2,300	81.8	2,072	78.3	1,926	73.1	1,767	73.3	1,515	72.7	<0.005
No	570	18.1	609	21.7	666	26.9	697	26.7	615	27.3	<0.005

* Weighted Estimate

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Table A12. Depression among Audited Diabetes Patients, 2014-2018

Year	2014		2015		2016		2017		2018		
Number of charts audited	2,871		2,681		2,592		2,464		2,130		
	No.	%*	No.	%*	No.	%*	No.	%*	No.	%*	Trend P-Value
Active Diagnosis of Depression											
Yes	886	31.1	888	34.7	830	32.8	746	29.4	723	32.4	0.800
No	1,983	68.8	1,793	65.3	1,762	67.2	1,718	70.6	1,407	67.6	0.700
Depression Screening^											
Yes	1,711	85.3	1,587	88.7	1,569	87.6	1,503	86.8	1,169	79.1	0.500
No	272	14.7	206	11.3	193	12.4	215	13.2	238	20.9	0.300

* Weighted Estimate

^Among those without an active diagnosis of depression

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Table A13. Immunizations among Audited Patients with Diabetes, 2014-2018

Year	2014		2015		2016		2017		2018		
Number of charts audited	2,871		2,681		2,592		2,464		2,130		
	No.	%*	No.	%*	No.	%*	No.	%*	No.	%*	Trend P-Value
Influenza Vaccine in Past Year											
Yes	1,644	55.0	1,520	56.3	1,427	54.4	1,323	52.7	1,128	51.6	0.100
No	1,028	38.5	959	36.8	972	38.9	929	38.9	841	42.7	0.200
Refused	198	6.4	202	6.8	193	6.8	212	8.4	160	5.7	1.000
Pneumococcal Vaccine Ever											
Yes	1,998	65.2	2,014	72.0	1,942	71.2	1,750	68.4	1,535	68.6	0.700
No	789	31.8	555	24.5	538	24.3	600	27.0	492	27.3	0.400
Refused	82	2.8	112	3.5	112	4.5	114	4.6	103	4.1	0.100
Tdap Vaccine in Past 10 Years											
Yes	1,978	64.7	2,013	73.0	1,958	71.6	1,772	69.5	1,594	71.3	0.400
No	820	32.7	630	25.8	601	26.7	666	29.3	476	26.7	0.300
Refused	70	2.3	38	1.2	33	1.7	26	1.2	60	2.0	0.900
Hepatitis B Series											
Yes	369	12.2	578	18.4	724	23.8	754	29.6	757	33.8	<0.005
No	2,438	85.6	1,965	77.0	1,756	72.5	1,595	64.8	1,249	59.9	<0.005
Refused	59	1.7	74	2.6	44	1.5	48	2.2	47	2.0	0.800
Immune	–	–	64	2.0	68	2.2	67	3.4	77	4.2	<0.005

*Weighted Estimate

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Table A14. Tuberculosis among Audited Diabetes Patients, 2014-2018

Year	2014		2015		2016		2017		2018		
Number of charts audited	2,871		2,681		2,592		2,464		2,130		
	No.	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**Trend P-Value**
TB Test Done Ever											
Skin Test	865	26.9	802	27.4	785	26.4	712	24.4	658	25.8	0.200
Blood Test	27	0.9	76	2.2	57	1.8	91	2.9	74	2.5	0.200
Unknown/not offered	1,975	72.0	1,802	70.3	1,746	71.6	1,661	72.7	1,395	71.5	0.700
TB Status (PPD)											
Positive, INH complete	80	2.3	81	2.6	58	2.1	53	1.6	37	1.2	<0.005
Positive, not treated	79	2.6	60	2.4	55	1.8	55	2.0	54	1.9	0.100
Negative, up to date	577	17.4	542	17.5	558	18.0	518	16.4	481	18.6	0.700
Negative, outdated	89	2.6	89	3.2	75	2.4	81	3.0	65	2.6	0.900
Negative, date unknown	28	1.1	29	0.9	39	1.7	29	1.4	25	1.4	0.300
Status unknown	2,018	73.9	1,880	73.4	1,807	74.0	1,728	75.7	1,468	74.2	0.300

*Weighted Estimate

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

Table A15. Hepatitis C among Audited Diabetes Patients, 2014-2018

Year	2014		2015		2016		2017		2018		
Number of charts audited	2,871		2,681		2,592		2,464		2,130		
	No.	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**Trend P-Value**
Hepatitis C Diagnosis											
Yes	–	–	–	–	–	–	–	–	102	4.4	–
No	–	–	–	–	–	–	–	–	2,028	95.6	–
Ever Screened for Hepatits C^											
Not born between 1945-1965	–	–	–	–	–	–	–	–	907	44.8	–
Yes^^	–	–	–	–	–	–	–	–	441	38.3	–
No^^	–	–	–	–	–	–	–	–	678	61.5	–

*Weighted Estimate

^ Among those who have not been diagnosed with hepatitis C

^^ Among those who were born between 1945-1965

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2014-2018

APPENDIX B

Table B1. Standard Diabetes Therapies in the Diabetes Audit

Diabetes and Exercise alone
Insulin
Metformin (Glucophage©)
Acarbose (Precose©) or Miglitol (Glyset©)
Pioglitazone (Actose©) or Rosiglitazone (Avandia©)
GLP-1 medication (Byetta©, Bydureon©, Victoze©, Tanzeum©, Trulicity©)
DPP-4 Inhibitor (Januvia©, Onglyza©, Tradjenta©, Nesina©)
Amylin Analog (Smylin©)
Bromocriptine (Cycloset©)
Colesevelam (Welchol©)
SGLT-2 Inhibitor (Invokana©, Farxiga©, Jardiance©)
Sulfonylurea (Glucotrol©, DiaBeta©, Micronase©, Glynase©, PresTab©, Amaryl©)
Repaglinide (Prandin©)

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