Urban Diabetes Care & Outcomes Audit Summary Report

Audit Years 2015–2019



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

Acknowledgments

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The report contents are solely the responsibility of the authors and do not necessarily represent the official views of Indian Health Service. Urban Indian Health Institute would like to thank the staff at the Urban Indian Health Programs for the excellent work they do on behalf of their communities. Additional thanks to the Division of Diabetes Treatment and Prevention, Indian Health Service, for their assistance.

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CONTENTS

EXECUTIVE SUMMARY

American Indian and Alaska Native (AI/AN) communities have a rich history of healthy food systems and communities.[1] However, colonization attempted to bring an end to this, forcing AI/AN people from their lands and into confined reservations with diminished natural resources. This forced relocation resulted in a loss of access not only to traditional lands, but also to traditional, healthy foods, ultimately creating a reliance on unhealthy food sources.[1-3] Today, type 2 diabetes is more prevalent in the AI/AN population than in any other race or ethnicity in the United States and is two times more prevalent among AI/AN than among non-Hispanic Whites.[4]

In 1997, the U.S. Congress created the Special Diabetes Program for Indians (SDPI) to address the diabetes epidemic in AI/AN communities.[5] SDPI provides much-needed funds and resources to culturally adapted and community-directed diabetes programs. Since SDPI's inception there has been a steady decrease in the rate of diabetes among AI/AN, however despite these promising results, there has been a reduction in federal spending on AI/AN patients with diabetes.[5-7]

This report, *Urban Diabetes Care & Outcomes Summary Report, Audit Years 2015–2019* (2019 Urban Diabetes Audit), is primarily funded by SDPI and uses data from Urban Indian Health Programs (UIHPs) to highlight strengths and disparities in the health of urban AI/AN patients with diabetes. The data for the 2019 Urban Diabetes Audit was obtained from the annual IHS Diabetes Care and Outcomes Audit (Diabetes Audit). It includes AI/AN patients with diabetes at 30 participating UIHPs from 2015 to 2019.

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. With these goals in mind, the key findings and recommendations of this report are summarized on the following two pages.

2019 Key Findings

Findings in **bold** represent strengths identified by the 2019 Urban Diabetes Audit, while findings in regular print represent opportunities for improvement.

70.6% of urban AI/AN patients with diabetes had systolic and diastolic blood pressures below 140 mmHg and 90 mmHg, respectively, indicating good blood pressure control.

The proportion of urban AI/AN patients with diabetes that had healthy LDL levels below 100 mg/dL increased significantly from 42.4% in 2015 to 46.6% in 2019 ($p<0.05$).

The proportion of urban AI/AN patients with diabetes diagnosed with cardiovascular disease or who were between 40 – 75 years of age that were on statin therapy increased significantly from 48.8% in 2015 to 62.7% in 2019 ($p<0.05$).

88.9% of urban AI/AN patients with diabetes were screened for tobacco use.

25.8% of patients with diabetes reported currently using tobacco, which was a significant decrease over the five-year period ($p<0.05$). Of those reported using tobacco in 2019, 72.7% were referred to or received cessation counseling.

The proportion of patients that received all doses of the hepatitis B vaccine increased significantly from 18.4% in 2015 to 38.2% in 2019 ($p<0.05$).

Approximately half of urban AI/AN patients with diabetes were 55 years or older, which was a significant increase from 46.4% in 2015 ($p<0.05$).

The proportion of urban AI/AN patients with diabetes with an A1c level of 8.0% or greater increased significantly from 39.4% in 2015 to 42.2% in 2019 ($p<0.05$).

The proportion of urban AI/AN patients with diabetes that had both eGFR and UACR assessed decreased significantly from 63.1% in 2015 to 51.8% to 2019 ($p<0.05$).

The proportion of urban AI/AN patients with diabetes that received exercise education decreased significantly from 78.4% in 2015 to 64.1% to 2019 ($p<0.05$).

Only 36.8% of urban AI/AN patients with diabetes received an eye exam.

73.5% of urban AI/AN patients with diabetes had an unknown tuberculosis status, and an additional 5.5% had an outdated or date unknown negative tuberculosis status.

Only 23.3% of urban AI/AN patients with diabetes were screened for hepatitis C.

Recommendations

The following table gives an overview of UIHIs recommendations for improving the health of urban AI/ANs around diabetes. More details can be found in the Recommendations section on page 33.

1. PROGRAMMATIC EFFORT

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

2. PROGRAMMATIC EFFORT

Continue successful program efforts in maintaining healthy eGFR levels, maintaining good blood pressure control, maintaining healthy LDL levels, prescribing statins, decreasing tobacco use, and referring tobacco users to cessation counseling.

3. PROGRAMMATIC EFFORT

Expand program efforts to ensure patients receive exercise instruction and are receiving important diabetes management practices.

4. PROGRAMMATIC EFFORT

Expand program efforts to ensure patients receive their annual eye exam so that the risk for diabetic retinopathy is decreased.

5. PROGRAMMATIC EFFORT

Continue to expand on the current programmatic efforts encouraging patients to receive all doses of the hepatitis B vaccine to maintain the increasing trend in vaccination seen at UIHPs.

6. RESEARCH

Further research to address the increasing A1c levels among patients may be warranted to better understand if this upward trend is of clinical concern or is an outcome of changes in the patient population.

7. DATA COLLECTION

Continue to gather health information to ensure patients are regularly screened for chronic kidney disease, tuberculosis, and hepatitis C, which can assist in minimizing gaps in patient screening and decrease additional health risks.

INTRODUCTION

What is Diabetes?

Diabetes mellitus is a chronic disease that interferes with the body's ability to turn food into energy by disrupting how insulin—a hormone necessary to break down and absorb glucose—functions in the body.[8] This disruption happens through inhibiting the body's capacity to produce insulin, utilize insulin, or both.[8]

There are three main types of diabetes: 1, 2, and gestational.[8] Type 2 diabetes, when the body is resistant to insulin, accounts for 90% to 95% of all diabetes cases.[9] Type 2 can be prevented or delayed with healthy lifestyle changes, such as losing weight or eating healthy foods.[9] Type 1 diabetes is an autoimmune condition that results in the pancreas making very little to no insulin and accounts for 5% to 10% of all diabetes cases.[10] Gestational diabetes is diabetes in people who are pregnant and develops in 2% to 10% of pregnancies in the United States. It usually resolves itself after delivery.[11] Over time, all types of diabetes result in excessive blood sugar levels that can lead to further health complications like cardiovascular and kidney disease, which can eventually lead to death.

The Diabetes Epidemic

Type 2 diabetes is more prevalent in American Indian and Alaska Native (AI/AN) people than in people of any other race or ethnicity in the United States.[4] The primary risk factors for type 2 diabetes are weight and inactivity. The diabetes epidemic among AI/AN people stems from colonization that forced Native people off their lands, with accompanying loss of access to traditional, healthy food and restricted movement. AI/AN communities were forced to be reliant on outside sources of food where the driving forces behind the provision of this food was not nutrition, but low cost. Furthermore, AI/AN could not work, hunt, play, or worship without restrictions placed on their free movement.[1-3]

Colonization led to the development of diseases that had never affected Native communities before. Diabetes was unknown in AI/AN communities until the first cases of the disease were reported to Indian Health Service (IHS) during World War II.[12]

These traumas impacted the health of AI/AN people for generations to follow contributing to today's diabetes epidemic in AI/AN communities. AI/AN populations have higher proportions of risk factors for diabetes such as poor nutrition, high blood pressure, insufficient physical activity, heart disease, and obesity.[4] 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.[4, 13]

Special Diabetes Program for Indians

In 1997, the U.S. Congress created the Special Diabetes Program for Indians (SDPI) in response to the growing epidemic.[5, 13] SDPI funds culturally adapted and community-directed diabetes programs. In its two decades of existence, SDPI has addressed AI/AN health disparities by providing critically needed resources and increased access to treatment and prevention services throughout Indian Country—both on tribal lands and in urban areas.[6]

Evidence-based and community-directed initiatives in Indian Country have yielded major health improvements and resulted in reduced federal spending on AI/AN patients with diabetes and diabetes-related complications.[6] One of the largest successes seen is a 5.2% decrease in diabetes prevalence in AI/AN adults, from 15.4% in 2013 to 14.6% in 2017.[7] Although this decrease in prevalence does vary by geographic region, diabetes prevalence either decreased or leveled off in all regions.[7]

Another success is the 54% drop in kidney failure due to diabetes in AI/AN adults with diabetes between 1996 to 2013. This was the largest decrease of any racial or ethnic group during that time period, and resulted in an incidence equal to that of non-Hispanic White adult patients with diabetes.[14] The cost savings associated with this decrease is estimated at $174 million to $520 million.[15] Finally, eye diseases due to diabetes, which can result in vision loss and blindness, saw rates decrease by 50% since the inception of SDPI.[6] All of these successes and many more show the ongoing positive impact SDPI funding has in addressing diabetes health issues in AI/AN communities.

Urban Indian Health Programs

Urban Indian Health Programs (UIHPs) are a network of 41 independent health agencies that provide culturally appropriate primary health care services—including traditional health care and cultural activities—for urban Natives. 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.

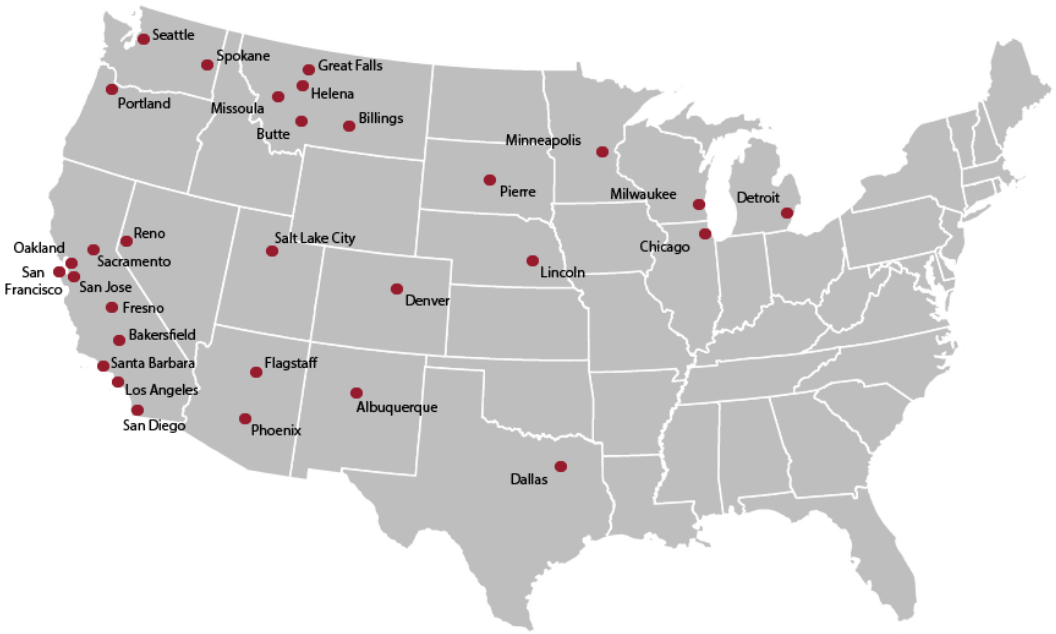
About Urban Indian Health Institute

Urban Indian Health Institute (UIHI) is one of 12 Tribal Epidemiology Centers (TECs) in the United States and serves to strengthen the health and well-being of AI/AN in tribal people urban communities across the nation. A TEC is an IHS-funded organization that serves AI/AN tribal and urban communities through research, data collection and analysis, program evaluation, and health education activities. UIHI grounds these public health activities in indigenous values while utilizing the strengths of western science. UIHI's mission is to decolonize data, for Indigenous people, by Indigenous people.

METHODS

The data for the *Urban Diabetes Care & Outcomes Summary Report, Audit Years 2015–2019,* also known as 2019 Urban Diabetes Audit, was obtained from the annual Indian Health Service (IHS) Diabetes Care and Outcomes Audit (Diabetes Audit). Every year, IHS, Tribal, and Urban (I/T/U) facilities submit data on American Indian and Alaska Native (AI/AN) patients with diabetes to IHS for the Diabetes Audit. Patients whose data is submitted must meet certain inclusion and exclusion criteria. The Diabetes Audit included data from 30 participating Urban Indian Health Programs (UIHPs) from 2015 to 2019 (Map 1).

Map 1. Urban Indian Health Programs in Diabetes Audit, 2015–2019



INCLUSION CRITERIA

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

EXCLUSION CRITERIA

- Receive most of their primary care outside of the UIHP
- Currently on dialysis and receive most 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. Data from all participating UIHPs were aggregated for this report.

A total of 40 indicators were analyzed over a five-year period. Information is presented for each year and reflects the year the annual IHS Diabetes Audit took place, which represents care administered in the previous year. 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 weighted proportion of all audited records for each year. Percentages and means are weighted to account for differing sampling by different UIHPs. Electronic audits generally include all eligible patients, while most manual audits use a systematic random sampling scheme. Percentages were rounded to one decimal place, so the sum of the percentages for each indicator may not exactly equal 100. Data were suppressed if the numerator was less than 10.

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 using joinpoint models. These models use several straight lines connected at “joinpoints” to fit a trend. For this analysis, a maximum number of zero joinpoints was used and the average annual percent change (AAPC) was analyzed. 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, the Government Performance and Results Act (GPRA) was designed to improve government performance management by requiring agencies to set goals, measure results, and report results. IHS measures and reports results on a range of health goals for GPRA, including goals around diabetes care and treatment. This report compares audit results to three 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 derived from AI/AN patient data in the IHS National Data Warehouse (NDW), whereas this report focuses on urban AI/AN patients served at UIHPs. The Diabetes Audit and GPRA use different criteria to determine which patients with diabetes to include, 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 UIHP patients with diabetes, but some of the UIHPs that participate in the Diabetes Audit submit data for only a sample of their patients with diabetes. Therefore, comparisons between the two sets of GPRA results should be interpreted with caution. They are incorporated here to provide additional important benchmarks for comparing improvements or needs over time and are summarized in Table 1. All three GPRA diabetes targets overlap with Special Diabetes Program for Indians 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/

Table 1. Government Performance and Results Act (GPRA) Diabetes-related Targets, 2019

	**Nephropathy Assessment** Proportion of patients with diagnosed diabetes assessed for nephropathy (eGFR and UACR).	**Target** 34.0%
	**Blood Pressure Control** Percentage of patients with diagnosed diabetes that have achieved blood pressure control (less than (<) 140/90 mmHg).	**Target** 52.3%
	**Retinopathy Assessment** Proportion of patients with diagnosed diabetes who received an annual retinal examination.	**Target** 49.7%

Special Diabetes Program for Indians Best Practices

Special Diabetes Program for Indians (SDPI) best practices are focus areas for improvement of diabetes prevention and treatment outcomes. Each SDPI grantee selects one of 19 best practices to focus on each year. Each best practice has a required key measure (RKM) that is used to report progress on a related outcome. All of the RKMs were assessed in the 2019 Urban Diabetes Audit (Table 2). For more information on SDPI best practices, visit: https://www.ihs.gov/sdpi/sdpi-community-directed/diabetes-best-practices/#BPTOPICS

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.
The treatment goal of <140/90 mmHg is appropriate for most people with diabetes, but some patients may require individualized goals.

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 with cardiovascular disease or who are 40-75 years of age who are prescribed a statin.

Tobacco Use Screening
Percent of individuals who are not known current tobacco users who are screened for tobacco use.

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

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 previously diagnosed depression who are screened for depression.

Hepatitis B Immunization
Percent of individuals who ever completed the hepatitis B vaccine series using either a two or three dose series, depending on vaccine type.

Influenza Immunization
Percent of individuals who receive the annual influenza vaccine.

Pneumococcal Immunization
Percent of individuals who have ever received a pneumococcal vaccine.

Tetanus/Diphtheria Immunization
Percent of individuals who have received a tetanus/diphtheria (Td or Tdap) vaccine in the past 10 years.

Tuberculosis Screening
Percent of individuals who have ever had a tuberculosis screening test result documented.

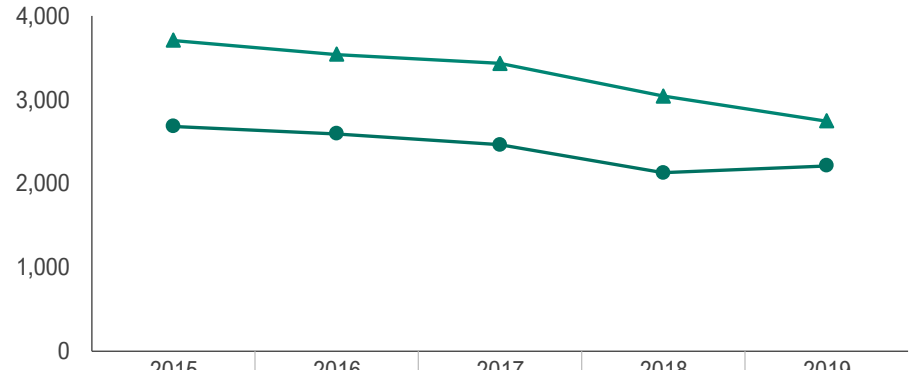
Hepatitis C Screening
Percent of individuals who have ever been screened for hepatitis C virus (HCV) using the hepatitis C antibody (anti-HCV) test.

RESULTS

Patients Audited

Figure 1 shows the number of patients audited, the number of patients eligible for inclusion in the 2019 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 2019 Urban Diabetes Audit. A total of 2,211 urban American Indian and Alaska Native (AI/AN) patients with diabetes across 26 facilities were included in 2019. This represents 80.6% of patients in diabetes registries at the UIHPs. Although the number of patients audited has gone down each year, it has remained statistically stable over the five-year period (p=0.30; Appendix A, Table A1).

Figure 1. Patients in Diabetes Registries at Urban Indian Health Programs, 2015–2019



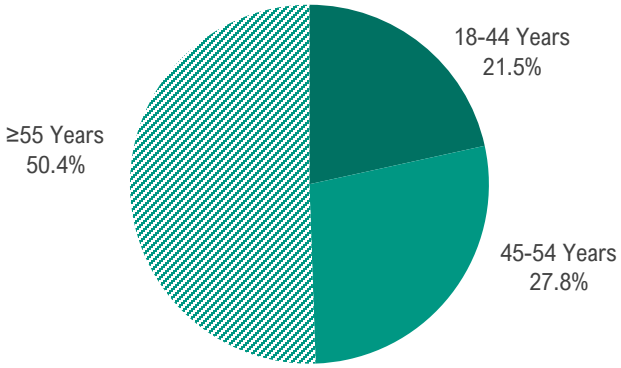
	2015	2016	2017	2018	2019
Total Number Audited	2,681	2,592	2,464	2,130	2,211
Total Number in Registry	3,706	3,539	3,432	3,042	2,744
Percent of Patients Audited	72.3	73.2	71.8	70.0	80.6
Number of Programs	30	30	29	25	26

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Demographics

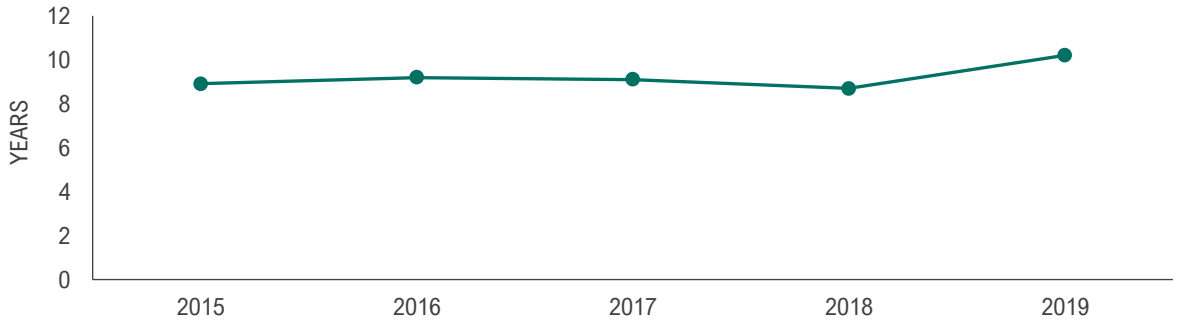
In 2019, 58.7% of AI/AN patients with diabetes were female and the mean age of all patients was 54.1 years (Appendix A, Table A2). Approximately half of patients in 2019 were 55 years or older (Figure 2). Furthermore, the proportion of patients that were 55 years or older significantly increased from 2015 to 2019 ($p<0.05$; Appendix A, Table A2). Additionally, the proportion of patients aged 45–54 years old decreased from 2015 to 2019 ($p<0.05$; Appendix A, Table A2). As in previous years, most patients in 2019 had type 2 diabetes, with only 1.4% having type 1 (Appendix A, Table A2). On average, urban AI/AN patients with diabetes had been living with diabetes for 10.2 years in 2019 (Figure 3). This measure was based on length of time since first known diagnosis of diabetes.

Figure 2. Age Categories among Urban AI/AN Patients with Diabetes, 2019



Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Figure 3. Average Duration of Diabetes among Urban AI/AN Patients with Diabetes, 2015–2019



Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Glycemic Control

Hemoglobin A1c, also known as A1c, measures a person's average blood glucose in the past two to three months.[16] An A1c level of 6.5% or higher indicates a person has diabetes.[16] While glycemic control is important in diabetes management, there is strong evidence that tight control (A1c 6.5%-7.0% or lower) early in the course of diabetes is beneficial, while tight control has not demonstrated the same benefits in the general diabetes population.[17] It is important to tailor glucose targets to the circumstances of the individual with diabetes with the goal of avoiding poor glycemic control.[17]

In 2019, 42.2% of urban AI/AN patients with diabetes had an A1c level of 8.0% or greater (Figure 4). The proportion of patients with an A1c level of 8.0% or greater significantly increased from 2015 to 2019 ($p<0.05$; Appendix A, Table A3).

Being overweight or obese increases insulin resistance and raises blood glucose levels, making diabetes management difficult.[18] Healthy weight is determined using body mass index (BMI).[18] BMI is a person's weight in kilograms divided by the square of height in meters.[19] In 2019, 48.1% of urban AI/AN patients with diabetes had a BMI of 30.0–39.9 and were obese (Figure 5). An additional 21.8% were morbidly obese with a BMI of 40.0 or greater (Figure 5). The proportion of patients that were obese and the proportion that were morbidly obese both remained stable across the five-year period (Appendix A, Table A3).

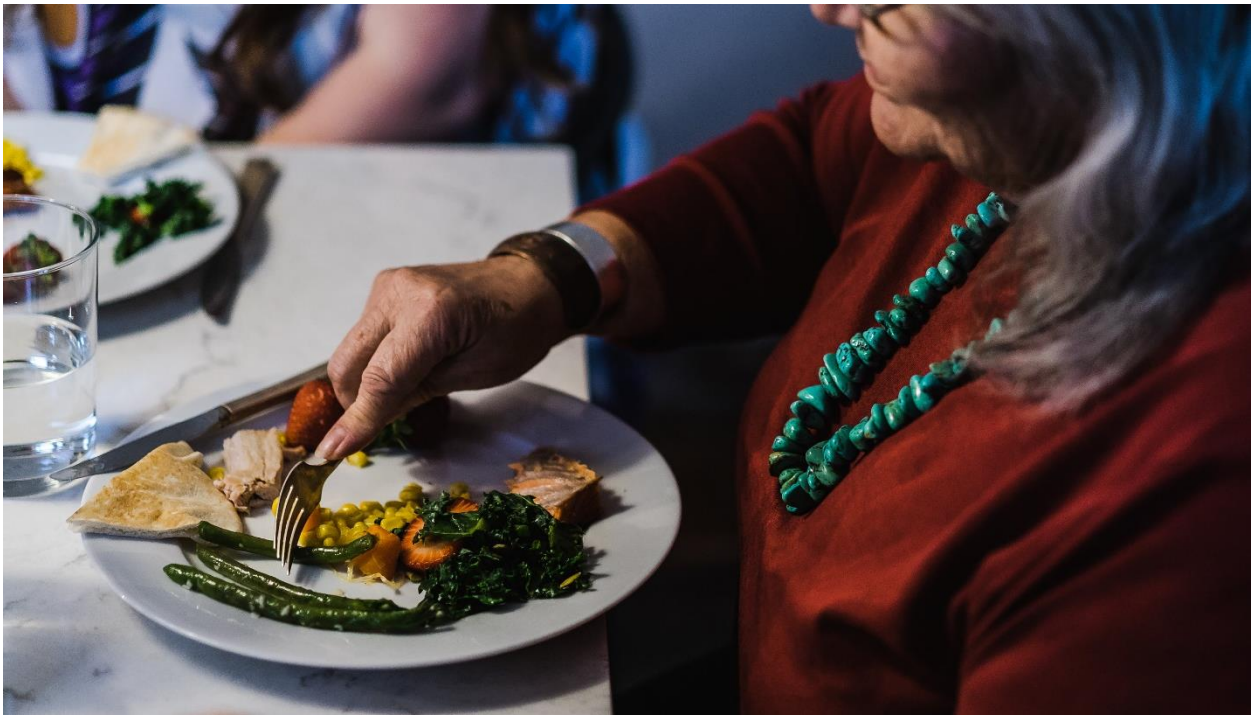
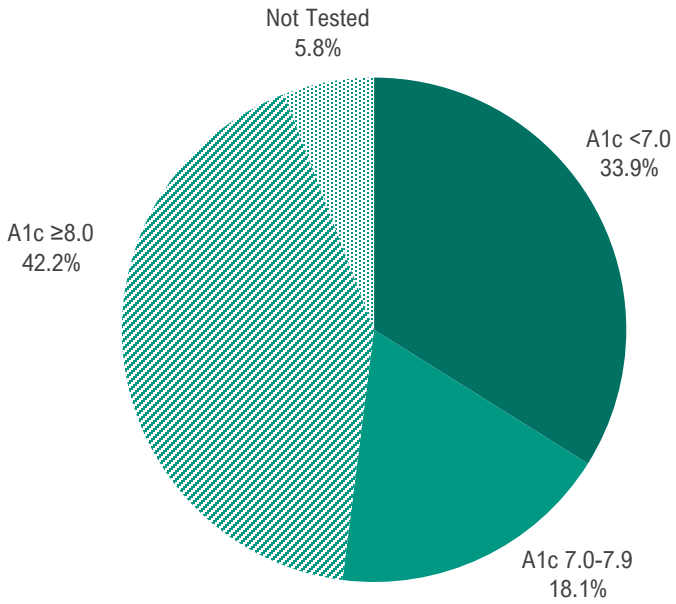
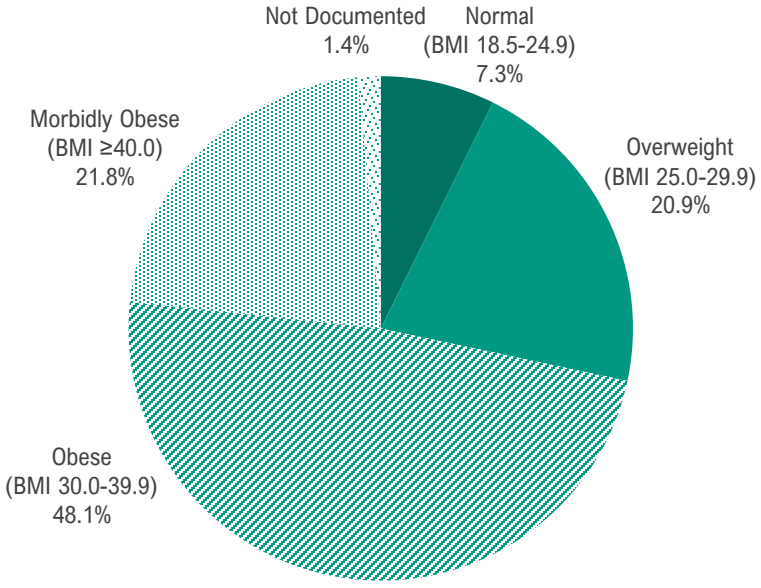


Figure 4. Hemoglobin A1c Levels among Urban AI/AN Patients with Diabetes, 2019



Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Figure 5. Body Mass Index Catergories among Urban AI/AN Patients with Diabetes, 2019



Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Kidney Health

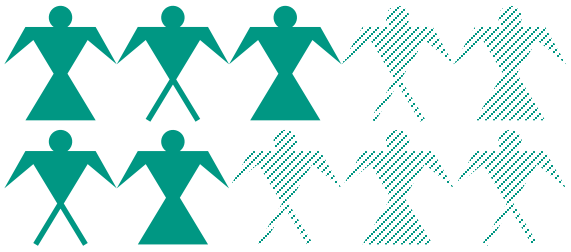
Chronic kidney disease (CKD) is related to the gradual loss of kidney function. When the kidney does not adequately filter waste from the blood, it causes an increase in waste in blood that can lead to high blood pressure, poor nutritional health, and other health issues.[20] CKD can result in end-stage renal disease (ESRD), which requires dialysis or a kidney transplant.[21] Diabetes is a leading cause of CKD in the United States, with one in three adults with diabetes also having CKD.[22] It is important that patients with diabetes are regularly screened for CKD and diabetic nephropathy. This is done through the assessment of both estimated glomerular filtration rate (eGFR) and urine albumin-creatinine ratio (UACR).[23, 24] In 2019, 51.8% of urban AI/AN patients with diabetes had both eGFR and UACR assessed, exceeding the Government Performance and Results Act (GPRA) target of 34.0% (Figure 6). While this value, exceeded the GPRA target, the 5-year trend indicated a significant decrease from 2015 ($p<0.05$; Appendix A, Table A4).

In 2019, 70.6% of urban AI/AN patients with diabetes had an eGFR of 60 ml/min/1.7m^2 or higher (Figure 6), indicative of no CKD,[25] while 20.2% of patients did not have eGFR tested (Figure 7). The proportion of patients that did not have eGFR tested significantly increased from 16.8% in 2015 ($p<0.05$; Appendix A, Table A4). In 2019, the proportion of urban AI/AN patients with diabetes with a UACR <30 mg/g—a normal to mildly increased amount of protein in the urine—was 32.9% (Figure 8).[26] The proportion with a UACR <30 mg/g significantly decreased from 2015 to 2019 ($p<0.05$; Appendix A, Table A4). Additionally, in 2019, 45.8% of patients were not tested for UACR. This proportion significantly increased from 2015 to 2019 ($p<0.05$; Appendix A, Table A4).

Figure 6. Nephropathy Assessment, 2019

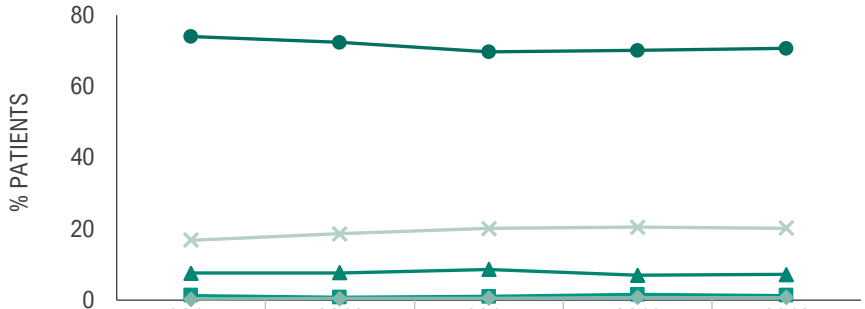
2019 Audit Results: More than half (51.8%) of audited urban patients with diabetes were assessed for nephropathy (both eGFR and UACR assessed).

Target Exceeded: The 2019 IHS GPRA Target is 34.0% of patients with diabetes assessed for nephropathy.



Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

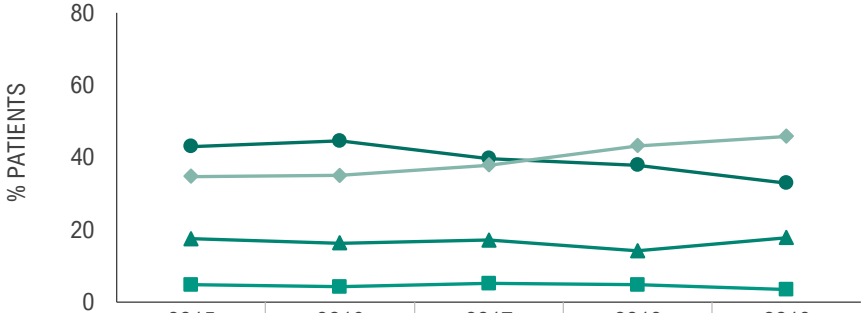
Figure 7. eGFR Categories among Urban AI/AN Patients with Diabetes, 2015-2019



	2015	2016	2017	2018	2019
eGFR ≥ 60	74.0	72.3	69.7	70.1	70.6
eGFR 30-59: Moderate Reduction	7.6	7.7	8.6	7.0	7.2
eGFR 15-29: Severe Reduction	1.3	0.8	1.0	1.6	1.3
eGFR < 15: End Stage Renal Disease	0.3	0.5	0.6	0.7	0.7
Not Tested	16.8	18.6	20.1	20.5	20.2

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Figure 8. UACR Categories among Urban AI/AN Patients with Diabetes, 2015–2019



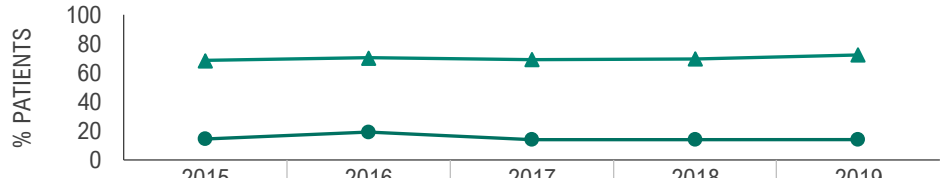
	2015	2016	2017	2018	2019
UACR <30	43.0	44.6	39.7	37.9	32.9
UACR 30-300	17.5	16.3	17.1	14.2	17.8
UACR > 300	4.8	4.2	5.2	4.8	3.5
Not Tested or Invalid Result	34.7	35.0	37.9	43.2	45.8

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Cardiovascular Health (Including Aspirin or Other Antiplatelet Therapy)

In both AI/AN and general populations, cardiovascular disease (CVD) is the leading cause of death.[27, 28] Adults with diabetes are two times more likely to die from CVD than those without diabetes.[29] In people with type 2 diabetes, hypertension plays a major role in developing CVD. Proportions of urban AI/AN patients with diabetes and CVD or hypertension have remained stable over the five years, with 14.0% diagnosed with CVD and 72.3% diagnosed with hypertension in 2019 (Figure 9; Appendix A Table A5). In 2019, 70.4% of urban AI/AN patients diagnosed with diabetes and CVD were prescribed aspirin or antiplatelet therapy to decrease the risk of diabetes-related CVD (Figure 10). 78.5% of urban AI/AN diagnosed with diabetes and hypertension were prescribed ACE inhibitors or ARBs in 2019 (Figure 10).

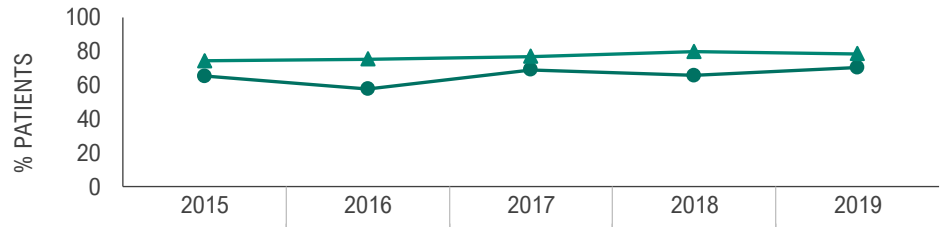
Figure 9. Cardiovascular Disease and Hypertension Diagnoses among Urban AI/AN Patients with Diabetes, 2015–2019



	2015	2016	2017	2018	2019
Cardiovascular Disease	14.5	19.2	14.1	14.1	14.0
Hypertension Diagnosis	68.6	70.4	69.2	69.7	72.3

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Figure 10. Medications among Urban AI/AN Patients with Diabetes, 2015–2019



	2015	2016	2017	2018	2019
Aspirin/Antiplatelet Therapy^	65.3	57.7	69.0	65.7	70.4
ACE Inhibitor/ARBs*	74.4	75.3	77.0	79.8	78.5

*Among patients with known hypertension.

^Among patients with diagnosed cardiovascular disease.

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Blood Pressure Control

High blood pressure is a risk factor for CVD. Those with systolic blood pressure (SBP) and diastolic blood pressure (DBP) below 140 mmHg and 90 mmHg, respectively, are considered to have achieved good blood pressure control, as per the relevant GPRA measurement.

In 2019, urban AI/AN patients with diabetes had a mean SBP of 131.0 mmHg and DBP of 78.8 mmHg (Appendix A, Table A5). Additionally, 70.6% of urban AI/AN patients with diabetes had an SBP and DBP below 140 mmHg and 90 mmHg, respectively, exceeding the GPRA target of 52.3% (Figure 11). The proportion of patients who had SBP and DBP above 140 mmHg or 90 mmHg, respectively, significantly increased from 2015 to 2019 ($p<0.05$; Appendix A Table A5).

Figure 11. Blood Pressure Control, 2019

2019 Audit Results: 7 in 10 (70.6%) audited urban patients with diabetes achieved blood pressure control (less than < 140/90 mmHg).

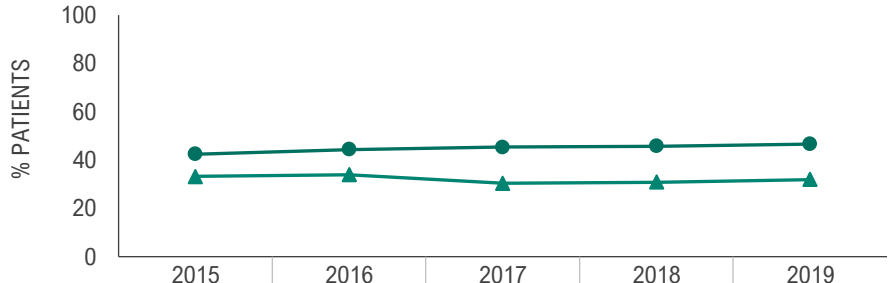
Target Exceeded: The 2019 IHS GPRA Target is 52.3% of patients with diabetes achieve blood pressure control (less than < 140/90 mmHg).

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Lipid Management

Along with hypertension, dyslipidemia is a major risk factor for CVD among people with diabetes. Lipids are analyzed by measuring low-density lipoprotein (LDL) and high-density lipoprotein (HDL) cholesterol levels and managed using lipid-lowering medications. In 2019, 46.6% of urban AI/AN patients with diabetes had healthy LDL cholesterol levels below 100 mg/dL (Figure 12). The proportion of people with healthy LDL cholesterol levels significantly increased from 42.4% in 2015 ($p<0.05$; Appendix A, Table A6). In 2019, 32.0% of patients had HDL levels above 50 mg/dL for females (27.2%) and 40 mg/dL for males (39.0%) (Figure 12), which are healthy levels for each sex. Statins are a class of medication that lower lipid levels and reduce the overall risk of CVD. In 2019, 62.7% of urban AI/AN patients with diabetes and CVD or with diabetes and aged 40-75 were on statin therapy (Appendix A, Table A6). This proportion increased significantly from 48.8% in 2015 ($p<0.05$; Appendix A, Table A6).

Figure 12. Healthy Lipid Levels among Urban AI/AN Patients with Diabetes, 2015–2019



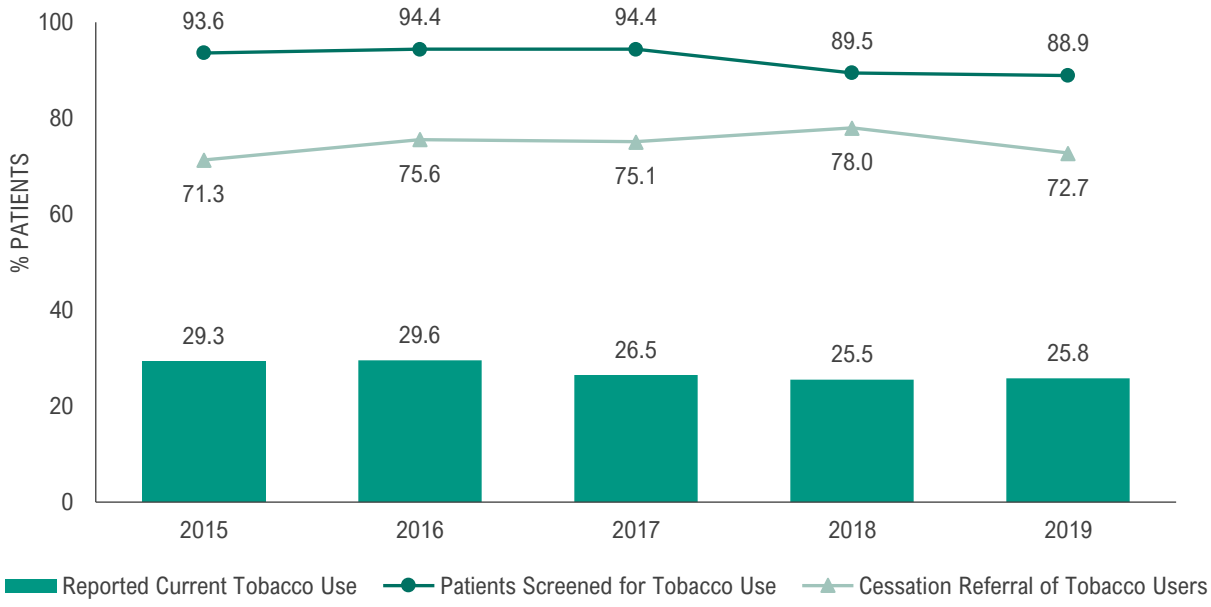
	2015	2016	2017	2018	2019
Healthy LDL Levels (<100 mg/dL)	42.4	44.4	45.3	45.8	46.6
Healthy HDL Levels (Female >50 mg/dL and Male >40 mg/dL)	33.2	33.9	30.4	30.9	32.0

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Tobacco Use Screening

Tobacco use is one of the largest risk factors for developing CVD,[30] therefore it is important not only to screen patients with diabetes for tobacco use but also refer tobacco users to cessation counseling. In 2019, 88.9% of urban AI/AN patients with diabetes were screened for tobacco use (Figure 13). There was a statistically significant decrease in the percentage of patients who reported current tobacco use between the years of 2015 – 2019 ($p<0.05$; Figure 13; Appendix A, Table A7). Of tobacco users in 2019, 72.7**%** were referred to or received cessation counseling (Figure 13).

Figure 13. Tobacco Use, Screening, and Referrals, among Urban AI/AN Patients with Diabetes, 2015–2019



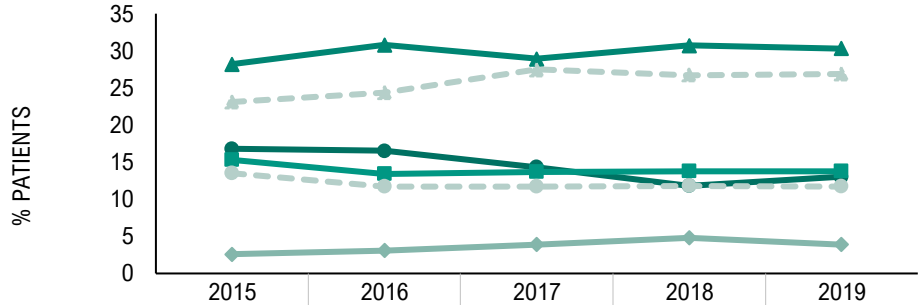
Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

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, the majority of patients in the 2019 Urban Diabetes Audit, usually start by managing their health through diet and exercise alone.[31] If unsuccessful, other therapies, including insulin, can be utilized. Those with type 1 must use insulin since they cannot produce it naturally.[31] Insulin is an injectable therapy that can be used alone or in tandem with other medications.[31] The annual Indian Health Service (IHS) Diabetes Care and Outcomes Audit (Diabetes Audit) collects information on 13 different diabetic therapies, which include diet and exercise alone with no medication, taking insulin alone, taking insulin with medication, or various combinations of medications. The 13 different types of therapies are listed in Appendix B, Table B1.

Figure 14 shows the proportion of urban AI/AN patients with diabetes that use different standard therapies. In 2019, the largest proportion of urban AI/AN patients with diabetes were on one medication, at 30.3%. The proportion of patients on no medication decreased over the five-year period from 2015 to 2019 ($p<0.05$; 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.

Figure 14. Different Standard Therapies among Urban AI/AN Patients with Diabetes, 2015-2019



	2015	2016	2017	2018	2019
Diet and Exercise Alone	16.8	16.5	14.3	11.8	13.0
1 Medication	28.2	30.8	28.9	30.7	30.3
2 Medications	15.3	13.4	13.7	13.8	13.8
3 Medications or More	2.6	3.1	3.9	4.8	3.9
Insulin Only	13.5	11.7	11.7	11.8	11.7
Insulin and Other Medication	23.1	24.4	27.5	26.7	26.9

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

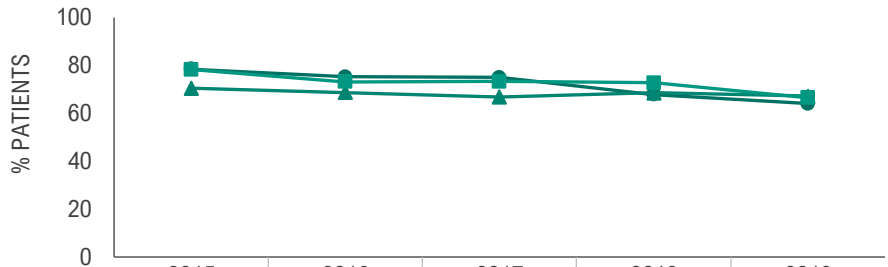
Health Education (Physical Activity, Nutrition, and Other diabetes-related topics)

Education on nutrition, physical activity, or other diabetes topics can help patients manage diabetes. Physical activity and healthy eating can help to lower blood glucose levels, lower the risk for heart disease and nerve damage, and potentially lead to weight loss.[32] Other diabetes education includes education regarding: blood glucose monitoring, medication taking, risk reduction, healthy coping, or problem solving.[33]

Figure 15 shows that in 2019, 64.1% of urban AI/AN patients with diabetes received exercise education. This proportion of patients decreased significantly from 78.4% in 2015 ($p<0.05$; Appendix A, Table A9). In 2019, 67.1% of patients received nutrition education, and 66.5% of patients received other diabetes education (Figure 15). There was a significant decrease in the percentage of patients who received diabetes education other than nutrition or exercise during the years reported ($p<0.05$; Appendix A, Table A9).

Nutrition education could come from a registered dietitian, other staff member, or both. In 2019, 24.7% of patients received nutrition education from registered dietitians with or without other staff, while 42.4% received nutrition education from other staff (Figure 16).

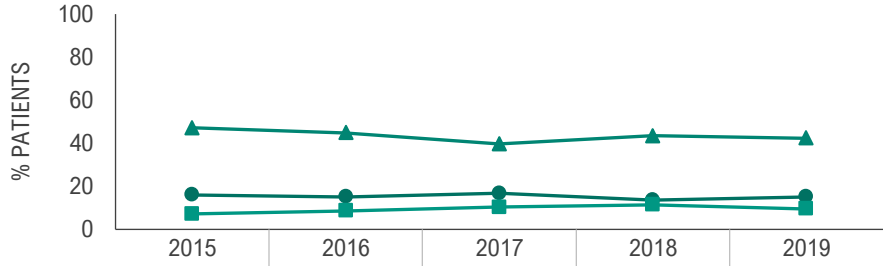
Figure 15. Diabetes Management Education among Urban AI/AN Patients with Diabetes, 2015–2019



	2015	2016	2017	2018	2019
Exercise Instruction	78.4	75.3	75.0	67.9	64.1
Nutrition Education	70.5	68.7	66.8	68.5	67.1
Diabetes Education (Other)	78.3	73.1	73.3	72.7	66.5

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Figure 16. Nutrition Education by Provider among Urban AI/AN Patients with Diabetes, 2015–2019



	2015	2016	2017	2018	2019
Registered Dietitian	16.1	15.2	16.8	13.6	15.2
Other Staff Only	47.2	44.8	39.7	43.5	42.4
Both Registered Dietitian and Staff	7.2	8.7	10.3	11.4	9.5

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Screening Exams (Eye, Foot, and Dental)

Poor glycemic control caused by diabetes can lead to significant microvascular damage in the blood vessels, most notably in the eyes, feet, and mouth.[34-37] Regular exams can help with the prevention and management of diabetes complications.

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.[34] It is the leading cause of blindness in adults with diabetes, and early damage is usually asymptomatic.[35] It can be detected through regular eye exams, so annual eye exams are important for patients with diabetes.[35] Diabetic neuropathy is nerve damage—most commonly in the legs and feet.[36] 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.[36] 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 patients with diabetes.[37] Regular dental exams can help to prevent these issues.[37]

Despite the importance of annual eye exams, only 36.8% of urban AI/AN patients with diabetes received one in 2019, falling short of the GPRA target of 49.7% (Figure 17; Figure 18). Additionally, in 2019, 59.5% of patients were documented as receiving a foot exam in 2019 while 29.8% of patients received a dental exam (Figure 18). All three proportions for screening exams have remained stable from 2015 to 2019 (Appendix A, Table A10). In 2019, 8.2% of urban AI/AN patients with diabetes had a retinopathy diagnosis (Appendix A, Table A11). This was only the second-time retinopathy diagnosis information was collected in the Diabetes Audit. Additionally, in 2019, 2.8% of urban AI/AN patients with diabetes had a lower extremity amputation (Appendix A, Table A11). This was the first-time lower extremity amputation information was collected in the Diabetes Audit.

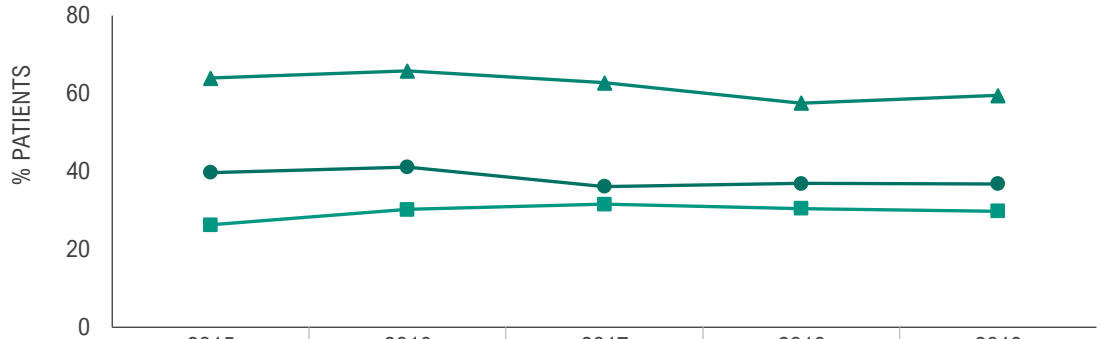
Figure 17. Retinopathy Assessment, 2019

2019 Audit Results: 36.8% of audited urban patients with diabetes received a retinal exam.

Target Not Met: The 2019 IHS GPRA Target is 49.7% of patients with diabetes receive an annual retinal exam.

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Figure 18. Documented Exams among Urban AI/AN Patients with Diabetes, 2015–2019



	2015	2016	2017	2018	2019
Eye Exam	39.7	41.1	36.1	36.9	36.8
Foot Exam	63.9	65.8	62.7	57.5	59.5
Dental Exam	26.3	30.2	31.6	30.5	29.8

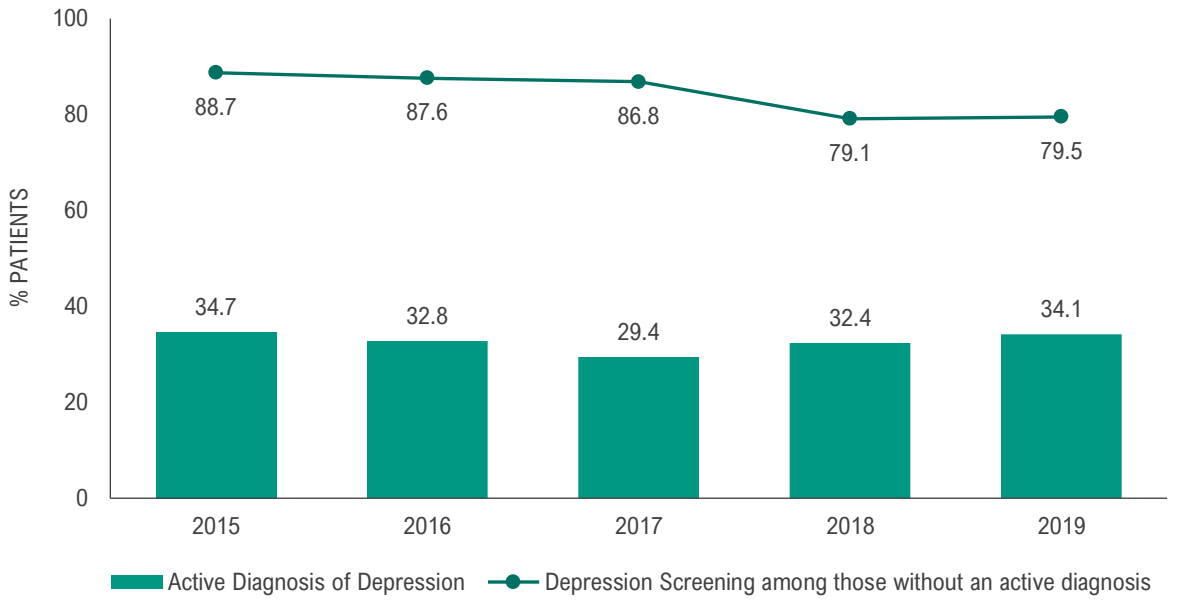
Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Depression Screening

Diabetes is associated with an increased risk of depression which can contribute to adverse diabetes outcomes and poor care, including problems with glycemic control, difficulties with self-care, and an increase in risk for other complications.[38, 39] The odds of depression are 1.6 to 2 times higher in those with diabetes compared to those without the disease.[40, 41] A study of 18,814 people found the rates of depression in AI/AN people with diabetes are three times higher compared to non-Hispanic White people with diabetes.[42] 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 2019, 34.1% of urban AI/AN patients with diabetes had an active diagnosis of depression (Figure 19). Of those patients without a current diagnosis, 79.5% were screened for depression (Figure 19). This proportion significantly decreased from 2015 to 2019 ($p<0.05$; Appendix A, Table A12).

Figure 19. Depression Diagnosis and Screening among Urban AI/AN Patients with Diabetes, 2015–2019



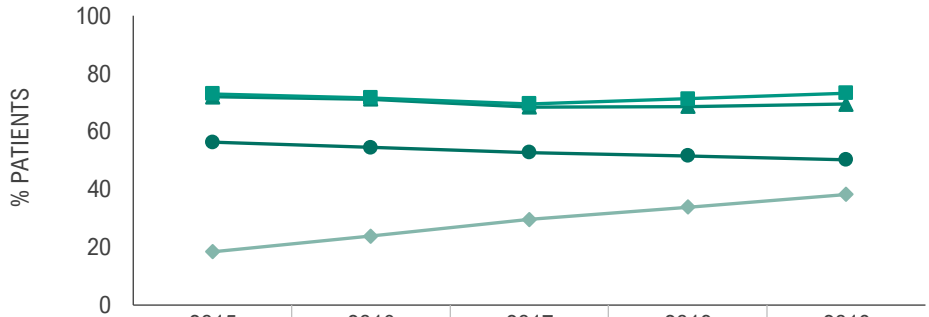
Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Immunizations

Those with diabetes are at an increased risk for acquiring certain vaccine-preventable diseases and developing more complications when ill.[43] The immunizations tracked in the Diabetes Audit are annual influenza vaccine, pneumococcal vaccine ever, tetanus/diphtheria (Td) or tetanus/diphtheria/pertussis (Tdap) vaccine in the last ten years, and all doses of the hepatitis B vaccine series.

In 2019, approximately half of urban AI/AN patients with diabetes received the influenza vaccine in the past year (Figure 20). This was a significant decrease from 56.3% in 2015 ($p<0.05$; Appendix A, Table A13). In 2019, 69.4% of patients were documented as having ever received the pneumococcal vaccine (Figure 20). Additionally, in 2019, 73.2% of patients received the Td or Tdap vaccine in the past ten years (Figure 20). Finally, in 2019, 38.2% of patients were documented as having ever received all doses of the hepatitis B vaccine series (Figure 20). In particular, the proportion of patients that ever received the complete hepatitis B vaccine series significantly increased, more than doubling from 2015 to 2019 ($p<0.05$; Appendix A, Table A13). Despite this significant increase, only a little over a third of patients had ever received the complete hepatitis B vaccine series.

Figure 20. Documented Immunizations among Urban AI/AN Patients with Diabetes, 2015–2019



	2015	2016	2017	2018	2019
Influenza Vaccine in Past Year	56.3	54.4	52.7	51.6	50.2
Pneumococcal Vaccine Ever	72.0	71.2	68.4	68.6	69.4
Td/Tdap Vaccine in Past 10 Years	73.0	71.6	69.5	71.3	73.2
Hepatitis B Series	18.4	23.8	29.6	33.8	38.2

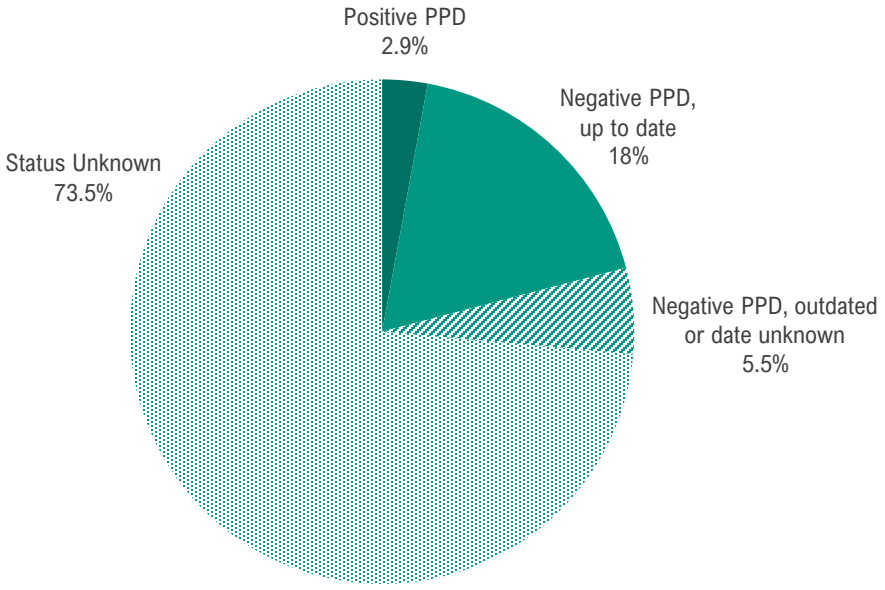
Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Tuberculosis Screening

Tuberculosis (TB) is an infectious disease caused by the bacterium *Mycobacterium tuberculosis*, but not everyone infected with TB becomes sick.[44] Two TB-related conditions exist: latent TB infection and TB disease.[44] People with latent TB infection have the bacteria in their bodies but it does not make them sick. Latent TB infection can progress to TB disease. Patients with weakened immune systems, including those with diabetes are at higher risk of TB disease .[45] The risk of TB disease among those with diabetes ranges from 2 to 7 times higher than in people without diabetes.[46] Therefore, it is recommended that those with diabetes receive a TB screening at least once after a diabetes diagnosis.

Figure 21 shows 73.5% of urban AI/AN patients with diabetes had an unknown TB status, and an additional 5.5% had an outdated or testing date unknown negative TB status in 2019. The percent of those who tested positive significantly decreased over the five years and makes up less than 3% of all patients audited each of the five years ($p<0.05$; Appendix A, Table A14).

Figure 21.Tuberculosis PPD Status among Urban AI/AN Patients with Diabetes, 2015–2019



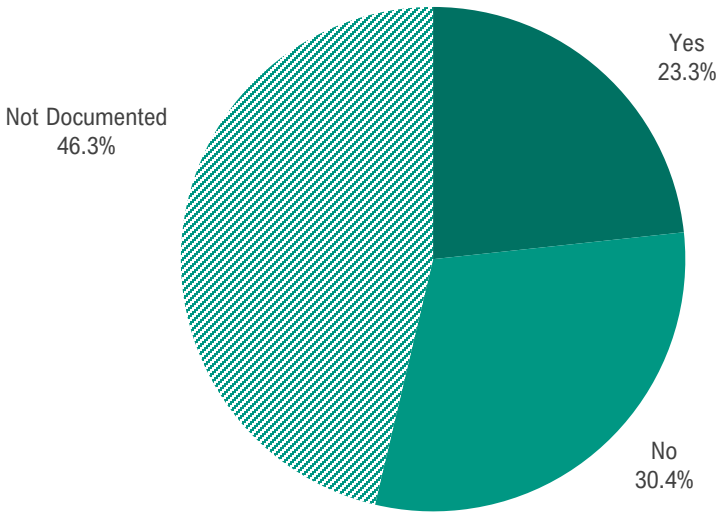
Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Hepatitis C Screening

Hepatitis C is a liver infection caused by the hepatitis C virus (HCV), a blood borne virus.[47] This infection can result in a short-term illness, but for 70%–85% of people, if untreated, it becomes a chronic infection with long-term health problems and can result in death.[47] People with chronic hepatitis C can be asymptomatic for many years but will eventually develop chronic liver disease. Patients with diabetes are at a greater risk for developing complications related to chronic hepatitis C. Screening for HCV is recommended for all adults in the United States. In 2018, the Diabetes Audit started tracking hepatitis C infection and screening of those with unknown hepatitis C infection status. No information regarding these measurements is available before 2018 (Appendix A, Table A15).

In 2019, 4.6% of urban AI/AN patients with diabetes had a hepatitis C infection diagnosis (Appendix A, Table A15). Of those that did not have a hepatitis C infection diagnosis, only 23.3% had a known screening for hepatitis C (Figure 22). The largest proportion of patients were missing hepatitis C screening information.

Figure 22. Hepatitis C Screening among Urban AI/AN Patients with Diabetes without a Hepatitis C Infection Diagnosis , 2019



^Among those who have not been diagnosed with hepatitis C

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

RECOMMENDATIONS

Diabetes continues to be a significant public health burden for urban American Indian and Alaska Native patients across the nation.

The 2019 Urban Diabetes Audit provides critical surveillance information regarding diabetes patient 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. The audit report highlights challenges that exist as well as improvements and successes that have been made in the health of urban AI/AN patients with diabetes. Information from this report supports UIHPs in providing the best possible health care to 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 2019, UIHPs overall exceeded two of the three GPRA diabetes outcome targets. There were higher proportions of urban AI/AN patients with diabetes that exceeded the GPRA targets for both blood pressure control and screening for nephropathy. The target that UIHPs did not exceed was retinopathy screening, which only 36.8% of patients received in 2019. Programs can strive 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 seven recommendations are made based on these findings.

1. PROGRAMMATIC EFFORT RECOMMENDATION

Programs may need to prepare to serve an aging diabetes patient population.

The proportion of patients aged 55 years or older increased significantly over the five-year period and indicates 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, maintaining healthy LDL levels in patients, prescribing statins to patients, decreasing tobacco use in patients, and referring tobacco users to cessation counseling.

In 2019, 70.6% of patients had an eGFR of 60 ml/min/1.7m^2 or higher and 70.6% of patients had a systolic and diastolic blood pressure below 140 mmHg and 90 mmHg, respectively. The proportion of patients with healthy LDL cholesterol levels and who were on statin therapy increased significantly over the five-year period. Additionally, 88.9% of patients were screened for tobacco use. Furthermore, only 25.8% of patients were currently using tobacco and 72.7% of tobacco users were referred to or received cessation counseling. This was coupled with a significant decrease in tobacco usage over the five-year period. Continuing the efforts in these areas will help to maintain program successes.

3. PROGRAMMATIC EFFORT RECOMMENDATION

Continue to expand on current programmatic efforts to ensure patients receive exercise education.

While 64.1% of patients received exercise instruction in 2019, it was a significant decrease from 78.4% in 2015. Expanding programmatic efforts can ensure this trend does not continue and give patients an important tool in diabetes management.

4. PROGRAMMATIC EFFORT RECOMMENDATION

Continue to expand on current programmatic efforts to ensure patients receive an annual eye exam and decrease their risk for diabetic retinopathy.

In 2019, only 36.8% of patients received an annual eye exam. By ensuring patients receive an annual eye exam, an additional health risk can be prevented.

5. PROGRAMMATIC EFFORT RECOMMENDATION

Continue to expand on the successful work of current programmatic efforts to help 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 38.2% of patients received it by 2019. To maintain this positive trend, continuing to support these efforts is necessary.

6. 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 of 8.0% or higher significantly increased over the five-year period. This increase may be related to an aging patient population who have had diabetes longer and for whom tight glycemic control may be less important. Research investigating this change will allow programs to better understand why these changes in A1c levels are occurring and adjust care accordingly.

7. DATA COLLECTION RECOMMENDATION

Continue to gather health information to ensure patients with diabetes are regularly screened for chronic kidney disease (CKD), tuberculosis (TB), and hepatitis C.

In 2019, only 51.8% of patients had both eGFR and UACR assessed and there was a significant downward trend from 63.1% in 2015. Furthermore, more than three out of four patients had an unknown TB status or outdated negative TB status. In 2019, less than 25% of patients had been screened for hepatitis C. Although patients may receive screenings or tests 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, and programmatic efforts to ensure success in achieving diabetes care, prevention, and outcomes for urban AI/AN patients.

APPENDIX A

Values in green indicate a statistically significant trend value.

Table A1. Number of Audited Patients with Diabetes, 2015–2019

Year	2015	2016	2017	2018	2019	Trend P-Value
Total Number Audited	2681	2592	2464	2130	2211	
Total Number in Registry	3706	3539	3432	3042	2744	
Percent of Patients Audited	72.3	73.2	71.8	70	80.6	0.30
Number of Facilities	30	30	29	25	26	

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Table A2. Demographics among Audited Patients with Diabetes, 2015–2019

Year	2015		2016		2017		2018		2019		Trend P-Value
Number of charts audited	**2,681**		**2,592**		**2,464**		**2,130**		**2,211**		
	No.	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	
Sex											
Male	1,105	40.5	1,066	40.5	994	39.5	875	38.7	927	41.1	0.90
Female	1,576	59.5	1,525	59.4	1,470	60.5	1,253	61.0	1,282	58.7	1.00
Age (Years)											
18–44	605	23.0	576	23.2	531	23.3	435	22.1	446	21.5	0.40
45–54	803	30.5	749	29.4	702	29.2	591	27.6	597	27.8	0.10
≥55	1,271	46.4	1,261	47.1	1,224	47.1	1,099	50.0	1,165	50.4	<0.05
Mean age*		53.1		53.3		53.6		54.0		54.1	–
Diabetes Duration (Years)											
<5	724	31.2	658	26.8	618	26.7	655	32.9	522	21.5	0.40
5–9	554	20.9	544	19.9	506	19.1	409	18.6	423	17.0	<0.05
≥10	904	32.4	920	33.5	827	30.6	773	32.7	803	32.6	0.90
Not Documented or Invalid Result	499	15.5	470	19.8	513	23.6	293	15.8	463	29.0	0.10
Mean duration*		8.9		9.2		9.1		8.7		10.2	–
Diabetes Type											
Type 1	66	2.7	47	1.8	39	1.5	51	2.1	39	1.4	0.20
Type 2	2,615	97.3	2,545	98.2	2,425	98.5	2,079	97.9	2,172	98.6	0.20

*Weighted Estimate.

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Table A3. Glycemic Control among Audited Patients with Diabetes, 2015–2019

Year	2015		2016		2017		2018		2019		Trend P-Value
Number of charts audited	2,681		2,592		2,464		2,130		2,211		
	No.	%*	No.	%*	No.	%*	No.	%*	No.	%*	
A1c (%)											
<7.0	978	35.8	960	36.1	852	33.4	737	32.5	753	33.9	0.10
7.0–7.9	503	18.7	449	16.8	462	18.0	384	17.5	404	18.1	0.80
≥8.0	1,017	39.4	1,025	40.6	992	40.6	850	40.9	904	42.2	<0.05
Not Tested	183	6.1	158	6.5	158	8.0	159	9.1	150	5.8	0.80
Mean A1c*		8.1		8.2		8.2		8.2		8.3	–
A1c (%) < 8											
Yes	1,481	54.5	1,409	52.9	1,314	51.4	1,121	50.0	1,157	52.0	0.10
No	1,017	39.4	1,025	40.6	992	40.6	850	40.9	904	42.2	<0.05
Not Tested	183	6.1	158	6.5	158	8.0	159	9.1	150	5.8	0.80
Body Mass Index (BMI) (kg/m*m)											
Normal (BMI 18.5–24.9)	197	6.8	192	7.5	194	8.2	171	7.7	177	7.3	0.50
Overweight (BMI 25.0–29.9)	584	21.3	585	22.8	507	20.9	449	21.6	472	20.9	0.50
Obese (BMI 30.0–39.9)	1,281	48.8	1,225	46.1	1,183	48.0	1,025	48.4	1,050	48.1	0.80
Morbidly Obese (BMI ≥40.0)	578	21.7	563	22.4	549	21.5	458	20.8	478	21.8	0.50
Mean BMI*		34.8		34.6		34.6		34.4		34.6	–

*Weighted Estimate.

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Table A4. Kidney Health among Audited Patients with Diabetes, 2015–2019

Year	2015		2016		2017		2018		2019		Trend P-Value
Number of charts audited	**2,681**		**2,592**		**2,464**		**2,130**		**2,211**		
	No.	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	
Estimated glom. filtration rate (eGRF)(ml/min/1.7m2)											
eGFR ≥ 60	1,903	74.0	1,849	72.3	1,704	69.7	1,483	70.1	1,507	70.6	0.10
eGFR 30–59: Moderate Reduction (CKD)	211	7.6	211	7.7	213	8.6	165	7.0	162	7.2	0.60
eGFR 15–29: Severe Reduction (CKD)	32	1.3	27	0.8	31	1.0	36	1.6	28	1.3	0.50
eGFR < 15: End Stage Renal Disease	11	0.3	15	0.5	19	0.6	18	0.7	18	0.7	<0.05
Not Tested	524	16.8	490	18.6	497	20.1	428	20.5	496	20.2	<0.05
Mean eGFR		83.4		82.1		81.9		81.8		86.2	–
Urine albumin to creatinine ratio (UACR) (mg/g)											
< 30	1,155	43.0	1,192	44.6	1,037	39.7	929	37.9	748	32.9	<0.05
30–300	473	17.5	393	16.3	398	17.1	297	14.2	369	17.8	0.80
> 300	131	5.0	118	4.2	131	5.4	113	4.8	81	3.5	0.40
Not Tested or Invalid Result	922	34.5	889	35.0	898	37.8	791	43.1	1,013	45.8	<0.05
Mean UACR		100.3		95.3		105.8		96.3		97.1	–
Both eGFR and UACR Assessed*											
Yes	1,669	63.1	1,684	64.2	1,469	59.0	1,270	54.2	1,147	51.8	<0.05
No	1,012	36.9	908	35.8	995	41.0	860	45.8	1,064	48.2	<0.05

*Weighted Estimate

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Table A5. Cardiovascular Health among Audited Patients with Diabetes, 2015–2019

Year	2015		2016		2017		2018		2019		Trend P-Value
Number of charts audited	**2,681**		**2,592**		**2,464**		**2,130**		**2,211**		
	No.	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	
Cardiovascular Disease											
Yes	378	14.5	409	19.2	367	14.1	342	14.1	351	14.0	0.40
No	2,303	85.5	2,183	80.8	2,097	85.9	1,788	85.9	1,850	85.6	0.60
Not Documented	#	#	#	#	#	#	#	#	10	0.4	–
Hypertension Diagnosis											
Yes	1,878	68.6	1,895	70.4	1,810	69.2	1,603	69.7	1,644	72.3	0.10
No	803	31.4	697	29.6	654	30.8	527	30.3	559	27.3	0.10
Aspirin/Antiplatelet Therapy^											
Yes	239	65.3	261	57.7	248	69.0	222	65.7	242	70.4	0.30
No	139	34.7	148	42.3	119	31.0	120	34.3	107	29.1	0.20
ACE Inhibitor/ARBs^^											
Yes	1,380	74.4	1,426	75.3	1,392	77.0	1,265	79.8	1,267	78.5	<0.05
No	498	25.6	469	24.7	418	23.0	338	20.2	376	21.4	<0.05
Blood Pressure (mmHg)											
<140 and <90	1,792	68.0	1,781	69.5	1,817	74.5	1,456	71.4	1,527	70.6	0.50
≥140 or ≥90	613	23.2	565	21.4	639	25.2	669	28.2	670	28.8	<0.05
Not Documented	276	8.8	246	9.1	#	#	#	#	#	#	0.10
Mean systolic*		130.1		129.5		129.8		130.8		131.0	–
Mean diastolic*		78.3		78.0		78.3		78.5		78.8	–

*Weighted Estimate
#Suppressed
^Among patients with diagnosed cardiovascular disease
^^Among patients with known hypertension
Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Table A6. Lipid Management among Audited Patients with Diabetes, 2015–2019

Year	2015		2016		2017		2018		2019		Trend P-Value
Number of charts audited	2,681		2,592		2,464		2,130		2,211		
	No.	%*	No.	%*	No.	%*	No.	%*	No.	%*	
LDL Cholesterol (mg/dL)											
<100	1,114	42.4	1,150	44.4	1,127	45.3	972	45.8	990	46.6	<0.05
100–129	519	18.9	480	18.7	466	18.0	362	16.3	365	16.7	<0.05
130–160	227	7.9	227	8.5	166	6.9	138	5.4	140	6.6	0.10
>160	140	4.7	137	5.2	70	2.5	61	2.7	58	2.5	0.10
Not tested or no valid result	681	26.0	598	23.2	635	27.3	597	29.8	658	27.6	0.30
Mean LDL cholesterol*		97.7		97.7		91.6		90.4		90.7	–
HDL Cholesterol (mg/dL)											
Both Male and Female											
Not Healthy (Female ≤50 and Male ≤40)	1199	43.2	1,223	46.1	1,166	46.0	936	42.1	941	44.4	0.90
Healthy (Female >50 and Male >40)	854	33.2	842	33.9	748	30.4	665	30.9	697	32.0	0.30
Not tested or no valid result	628	23.6	527	20.1	550	23.6	529	27.0	573	23.6	0.50
Females											
Not Healthy (≤50)	770	47.6	761	49.3	750	49.8	584	45.0	609	50.3	0.80
Healthy (>50)	430	28.8	437	29.3	380	25.2	344	27.6	344	27.2	0.40
Not Tested	376	23.6	327	21.4	340	25.0	325	27.4	329	22.5	0.70
Mean HDL cholesterol*		48.9		47.8		47.8		48.6		47.7	–
Males											
Not Healthy (≤40)	429	36.6	462	41.4	416	40.3	352	37.9	332	36.3	0.60
Healthy (>40)	424	39.8	405	40.5	368	38.5	321	36.4	353	39.0	0.30
Not Tested	252	23.6	199	18.0	210	21.3	202	25.7	242	24.7	0.40
Mean HDL cholesterol*		43.6		42.6		42.8		42.6		43.3	–
Triglyceride (mg/dL)											
≤400	1,922	71.3	1,933	75.0	1,785	71.0	1,509	69.2	1,541	71.2	0.50

Year	2015		2016		2017		2018		2019		Trend P-Value
Number of charts audited	**2,681**		**2,592**		**2,464**		**2,130**		**2,211**		
	No.	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	
>400	133	5.3	133	5.0	133	5.5	96	4.1	103	5.5	0.80
Not tested or no valid result	626	23.4	526	20.0	546	23.5	525	26.7	567	23.3	0.50
Mean triglyceride*		195.9		198.8		207.9		199.4		196.6	–
Statin^											
Yes	1,107	48.8	1,130	49.2	1,168	52.0	1,121	58.4	1,158	62.7	<0.05
No	1,098	48.7	1,033	48.8	890	45.4	683	39.9	672	34.7	<0.05
Allergy	57	2.4	54	2.1	51	2.5	41	1.6	44	2.0	0.30
Not Documented	#	#	#	#	#	#	#	#	13	0.7	–

*Weighted Estimate
#Suppressed
^Among patients with diagnosed cardiovascular disease or any patient 40-75
Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Table A7. Tobacco Use, Screening, and Cessation Referral among Audited Patients with Diabetes, 2015–2019

Year	2015		2016		2017		2018		2019		Trend P-Value
Number of charts audited	2,681		2,592		2,464		2,130		2,211		
	No.	%*	No.	%*	No.	%*	No.	%*	No.	%*	
Screened for Tobacco Use											
Yes	2,503	93.6	2,441	94.4	2,320	94.4	1,893	89.5	1,970	88.9	0.20
No	178	6.4	151	5.6	144	5.6	236	10.5	241	11.1	0.10
Current Tobacco Use											
User	873	29.3	813	29.6	706	26.5	604	25.5	615	25.8	<0.05
Non-user	1,777	69.3	1,755	69.5	1,731	71.5	1,465	70.1	1,556	71.5	0.10
Not Documented	31	1.3	24	0.8	27	2.0	61	4.4	40	2.7	0.10
Cessation Referral^											
Yes	631	71.3	628	75.6	545	75.1	471	78.0	443	72.7	0.60
No	242	28.7	185	24.4	161	24.9	133	22.0	171	27.2	0.60

*Weighted Estimate

^Among patients who are active tobacco users

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Table A8. Standard Diabetes Therapies among Audited Patients with Diabetes, 2015–2019

Year	2015		2016		2017		2018		2019		Trend P-Value
Number of charts audited	2,681		2,592		2,464		2,130		2,211		
	No.	%*	No.	%*	No.	%*	No.	%*	No.	%*	
Number of Medications											
None	516	16.8	447	16.5	359	14.3	279	11.8	309	13.0	<0.05
One Medication	736	28.2	732	30.8	714	28.9	631	30.7	653	30.3	0.40
Two Medications	408	15.3	381	13.4	356	13.7	316	13.8	316	13.8	0.40
Three Medications or More	72	2.6	96	3.1	120	3.9	119	4.8	100	3.9	0.10
Insulin Only	348	13.5	327	11.7	287	11.7	241	11.8	263	11.7	0.20
Insulin and Other Medication	592	23.1	609	24.4	628	27.5	539	26.7	563	26.9	0.10
Not Documented	#	#	#	#	#	#	#	#	#	#	–

*Weighted Estimate
#Suppressed
Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Table A9. Education by Type among Audited Patients with Diabetes, 2015–2019

Year	2015		2016		2017		2018		2019		Trend P-Value
Number of charts audited	2,681		2,592		2,464		2,130		2,211		
	No.	%*	No.	%*	No.	%*	No.	%*	No.	%*	
Exercise Instruction											
Yes	2,157	78.4	2,095	75.3	1,979	75.0	1,501	67.9	1,392	64.1	<0.05
No	524	21.6	497	24.7	485	25.0	628	32.1	811	35.6	<0.05
Nutrition Education											
Yes	1,866	70.5	1,775	68.7	1,599	66.8	1,413	68.5	1,411	67.1	0.10
No	815	29.5	817	31.3	865	33.2	717	31.5	793	32.7	0.20
Diabetes Education (Other)											
Yes	2,072	78.3	1,926	73.1	1,767	73.3	1,515	72.7	1,412	66.5	<0.05
No	609	21.7	666	26.9	697	26.7	615	27.3	792	33.3	<0.05
Nutrition Education											
Registered Dietitian	365	16.1	370	15.2	378	16.8	328	13.6	378	15.2	0.50
Other Staff Only	1,266	47.2	1,150	44.8	961	39.7	842	43.5	821	42.4	0.20
Both Registered Dietitian & Staff	235	7.2	255	8.7	260	10.3	243	11.4	212	9.5	0.10
Neither	815	29.5	817	31.3	865	33.2	717	31.5	793	32.7	0.20
Nutrition Education from Registered Dietitian											
Yes	600	23.3	625	23.9	638	27.0	571	25.0	590	24.7	0.50
No	2,081	76.7	1,967	76.1	1,826	73.0	1,559	75.0	1,614	75.1	0.40

*Weighted Estimate

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Table A10. Screening Examinations among Audited Patients with Diabetes, 2015–2019

Year	2015		2016		2017		2018		2019		Trend P-Value
Number of charts audited	2,681		2,592		2,464		2,130		2,211		
	No.	%*	No.	%*	No.	%*	No.	%*	No.	%*	
Eye Exam											
Yes	1,095	39.7	1,112	41.1	969	36.1	893	36.9	933	36.8	0.20
No	1,586	60.3	1,480	58.9	1,495	63.9	1,237	63.1	1,266	62.7	0.20
Foot Exam											
Yes	1,841	63.9	1,811	65.8	1,680	62.7	1,427	57.5	1,358	59.5	0.10
No	840	36.1	781	34.2	784	37.3	702	42.5	846	40.2	0.10
Dental Exam											
Yes	710	26.3	803	30.2	770	31.6	748	30.5	687	29.8	0.30
No	1,971	73.7	1,789	69.8	1,694	68.4	1,382	69.5	1,513	69.8	0.20

*Weighted Estimate

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Table A11. Retinopathy Diagnosis and Lower Extremity Amputation Status, 2015–2019

Year	2015		2016		2017		2018		2019		Trend P-Value
Number of charts audited	**2,681**		**2,592**		**2,464**		**2,130**		**2,211**		
	No.	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	
Retinopathy Diagnosis											
Yes							197	8.4	209	8.2	–
No							1,933	91.6	1,987	91.3	–
Not Documented									15	0.5	–
Lower Extremity Amputation											–
Yes									55	2.8	–
No									2,141	96.7	–
Not Documented									15	0.5	–

Striped areas represent data not collected in that audit year

*Weighted Estimate

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Table A12. Depression among Audited Patients with Diabetes, 2015–2019

Year	2015		2016		2017		2018		2019		Trend P-Value
Number of charts audited	2,681		2,592		2,464		2,130		2,211		
	No.	%*	No.	%*	No.	%*	No.	%*	No.	%*	
Active Diagnosis of Depression											
Yes	888	34.7	830	32.8	746	29.4	723	32.4	771	34.1	0.80
No	1,793	65.3	1,762	67.2	1,718	70.6	1,407	67.6	1,438	65.8	0.90
Depression Screening^											
Yes	1,587	88.7	1,569	87.6	1,503	86.8	1,169	79.1	1,175	79.5	<0.05
No	206	11.3	193	12.4	215	13.2	238	20.9	263	20.5	<0.05

*Weighted Estimate

^Among those without an active diagnosis of depression

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Table A13. Immunizations among Audited Patients with Diabetes, 2015–2019

Year	2015		2016		2017		2018		2019		Trend P-Value
Number of charts audited	2,681		2,592		2,464		2,130		2,211		
	No.	%*	No.	%*	No.	%*	No.	%*	No.	%*	
Influenza Vaccine in Past Year											
Yes	1,520	56.3	1,427	54.4	1,323	52.7	1,128	51.6	1,160	50.2	<0.05
No	959	36.8	972	38.9	929	38.9	841	42.7	861	42.1	<0.05
Refused	202	6.8	193	6.8	212	8.4	160	5.7	178	7.2	0.90
Pneumococcal Vaccine Ever											
Yes	2,014	72.0	1,942	71.2	1,750	68.4	1,535	68.6	1,558	69.4	0.10
No	555	24.5	538	24.3	600	27.0	492	27.3	547	26.7	0.10
Refused	112	3.5	112	4.5	114	4.6	103	4.1	98	3.7	0.90
Td or Tdap Vaccine in Past 10 Years											
Yes	2,013	73.0	1,958	71.6	1,772	69.5	1,594	71.3	1,586	73.2	0.90
No	630	25.8	601	26.7	666	29.3	476	26.7	554	24.0	0.60
Refused	38	1.2	33	1.7	26	1.2	60	2.0	67	2.6	<0.05
Hepatitis B Series											
Yes	578	18.4	724	23.8	754	29.6	757	33.8	855	38.2	<0.05
No	1,965	77.0	1,756	72.5	1,595	64.8	1,249	59.9	1,244	57.5	<0.05
Refused	74	2.6	44	1.5	48	2.2	47	2.0	45	1.9	0.60
Immune	64	2.0	68	2.2	67	3.4	77	4.2	59	2.2	0.60

*Weighted Estimate

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Table A14. Tuberculosis among Audited Patients with Diabetes, 2015–2019

Year	2015		2016		2017		2018		2019		
Number of charts audited	2,681		2,592		2,464		2,130		2,211		Trend P-Value
	No.	%*	No.	%*	No.	%*	No.	%*	No.	%*	
TB Test Done Ever											
Skin Test	802	27.4	785	26.4	712	24.4	658	25.8	599	24.7	0.10
Blood Test	76	2.2	57	1.8	91	2.9	74	2.5	125	4.7	0.10
Unknown/not offered	1,802	70.3	1,746	71.6	1,661	72.7	1,395	71.5	1,474	70.0	0.90
TB Status (PPD)											
Positive, INH complete	81	2.6	58	2.1	53	1.6	37	1.2	33	1.2	<0.05
Positive, not treated	60	2.4	55	1.8	55	2.0	54	1.9	44	1.7	0.20
Negative, up to date	542	17.5	558	18.0	518	16.4	481	18.6	471	18.0	0.60
Negative, outdated	89	3.2	75	2.4	81	3.0	65	2.6	66	2.7	0.60
Negative, date unknown	29	0.9	39	1.7	29	1.4	25	1.4	42	2.8	0.10
Status unknown	1,880	73.4	1,807	74.0	1,728	75.7	1,468	74.2	1,555	73.5	0.90

*Weighted Estimate

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

Table A15. Hepatitis C among Audited Patients with Diabetes, 2015–2019

Year	2015		2016		2017		2018		2019		Trend P-Value
Number of charts audited	**2,681**		**2,592**		**2,464**		**2,130**		**2,211**		
	No.	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	**No.**	**%***	
Hepatitis C Diagnosis											
Yes							102	4.4	115	4.6	–
No							2,028	95.6	2,081	94.9	–
Not Documented							0	0.0	15	0.5	–
Ever Screened for Hepatitis C											
Yes							441	21.2	604	23.3	–
No							678	34.0	784	30.4	–
Not Documented							909	44.9	693	46.3	–

Striped areas represent data not collected in that audit year

*Weighted Estimate

^Among those who have not been diagnosed with hepatitis C

Source: Indian Health Service, Diabetes Care and Outcomes Audit, 2015–2019

APPENDIX B

Table B1. Standard Diabetes Therapies Collected in the Diabetes Audit

Diabetes and Exercise alone with no medications
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©)

REFERENCES

1. Edwards K, Patchell B. State of the science: a cultural view of Native Americans and diabetes prevention. Journal of cultural diversity. Spring 2009;16(1):32-35.
2. Prucha FP. The Great Father: The United States Government and the American Indians. Lincoln, NE: University of Nebraska Press; 1986.
3. Bell-Sheeter A. Food Sovereignty Assessment Tool. Fredericksburg, VA: First Nations Development Institute; 2004.
4. Centers for Disease Control and Prevention. Native Americans with Diabetes. January 10, 2017. Available at: https://www.cdc.gov/vitalsigns/aian-diabetes/index.html. Accessed May 10, 2020.
5. Indian Health Service. Special Diabetes Program for Indians. Available at: https://www.ihs.gov/sdpi/about. Accessed May 10, 2020.
6. Indian Health Service. Changing the Course of Diabetes: Turning Hope into Reality; 2014:10.
7. Bullock A, Sheff K, Hora I, et al. Prevalence of diagnosed diabetes in American Indian and Alaska Native adults, 2006-2017. BMJ open diabetes research & care. 2020;8(1):e001218.
8. Centers for Disease Control and Prevention. What is Diabetes? Available at: https://www.cdc.gov/diabetes/basics/diabetes.html. Accessed May 10, 2020.
9. Centers for Disease Control and Prevention. Type 2 Diabetes. May 30, 2019. Available at: https://www.cdc.gov/diabetes/basics/type2.html. Accessed May 10, 2020.
10. Centers for Disease Control and Prevention. Type 1 Diabetes. March 11, 2020. Available at: https://www.cdc.gov/diabetes/basics/type1.html. Accessed May 10, 2020.
11. Centers for Disease Control and Prevention. Gestational Diabetes. May 30, 2019. Available at: https://www.cdc.gov/diabetes/basics/gestational.html. Accessed May 10, 2020, 2019.
12. McLaughlin S. Traditions and Diabetes Prevention: A Health Path for Native Americans. Diabetes Spectr. 2010;23(4):6.
13. Indian Health Service. Diabetes in American Indians and Alaska Natives Facts At-a-Glance; 2012.
14. Ann Bullock, Nika Rios Burrows, Andrew S Narva, et al. Vital Signs: Decrease in Incidence of Diabetes-Related End-Stage Renal Disease among American Indians/Alaska Natives — United States, 1996–2013. Morbidity and Mortality Weekly Report. 2017;66(1):7.
15. Department of Health and Human Services. The Special Diabetes Program for Indians: Estimates of Medicare Savings; 2019.
16. Centers for Disease Control and Prevention. Getting Tested. Available at: https://www.cdc.gov/diabetes/basics/getting-tested.html. Accessed May 12, 2018.
17. Indian Health Service. Diabetes Standards of Care & Clinical Practice Resources: Glycemic Control: Assessment, Monitoring and Goal Setting. Indian Health Service. Available at: https://www.ihs.gov/diabetes/clinician-resources/soc/glycemic-control-assessment-monitoring-and-goal-setting/. Accessed May 12, 2020.
18. Indian Health Service. Diabetes Standards of Care & Clinical Practice Resources: Weight Management, Overweight, and Obesity. Indian Health Service,. Available at: https://www.ihs.gov/diabetes/clinician-resources/soc/weight-mgmt1/. Accessed May 12, 2020.
19. Centers for Disease Control and Prevention. Body Mass Index (BMI). Available at: https://www.cdc.gov/healthyweight/assessing/bmi/index.html. Accessed May 12, 2020.
20. National Kidney Foundation. About Chronic Kidney Disease. Available at: https://www.kidney.org/atoz/content/about-chronic-kidney-disease. Accessed May 12, 2020.
21. Mayo Clinic. End-stage renal disease. August 17, 2019. Available at: https://www.mayoclinic.org/diseases-conditions/end-stage-renal-disease/diagnosis-treatment/drc-20354538. Accessed May 12, 2020.
22. United States Renal Data System. USRDS annual data report: Epidemiolgoy of kidney disease in the United States. In: National Institute of Health, National Institute of Diabetes and Digestive and Kidney Diseases, eds. Bethesda, MD; 2017.
23. Levey AS, Becker C, Inker LA. Glomerular filtration rate and albuminuria for detection and staging of acute and chronic kidney disease in adults: a systematic review. JAMA. Feb 24 2015;313(8):837-846.
24. Ku E, Xie D, Shlipak M, et al. Change in Measured GFR Versus eGFR and CKD Outcomes. J Am Soc Nephrol. Jul 2016;27(7):2196-2204.
25. National Kidney Foundation. Estimated Glomerular Filtration Rate (eGFR). Available at: https://www.kidney.org/atoz/content/gfr. Accessed March 7, 2019.

26. National Kidney Foundation. ACR. Available at: https://www.kidney.org/kidneydisease/siemens_hcp_acr. Accessed May 23, 2017.
27. Centers for Disease Control and Prevention. Heart Disease Facts. December 2, 2019. Available at: https://www.cdc.gov/heartdisease/facts.htm. Accessed May 12, 2020.
28. Kochanek KD, Murphy SL, Xu J, Arias E. National Vital Statistics Reports: National Center for Health Statistics; 2017.
29. Centers for Disease Control and Prevention. Putting the Brakes on Diabetes Complications. Available at: https://www.cdc.gov/features/preventing-diabetes-complications/index.html. Accessed May 12, 2020.
30. Centers for Disease Control and Prevention. Tobacco-Related Mortality. April 28, 2020. Available at: https://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/tobacco_related_mortality/index.htm. Accessed May 12, 2020.
31. American Diabetes Association. Medication Management. Available at: https://www.diabetes.org/diabetes/medication-management. Accessed May 12, 2020.
32. Centers for Disease Control and Prevention. Get Active! Available at: https://www.cdc.gov/diabetes/managing/active.html. Accessed May 12, 2020.
33. Beck J, Greenwood DA, Blanton L, et al. 2017 National Standards for Diabetes Self-Management Education and Support. Diabetes Care. Oct 2017;40(10):1409-1419.
34. Centers for Disease Control and Prevention. Common Eye Disorders. September 29, 2015. Available at: https://www.cdc.gov/visionhealth/basics/ced/index.html. Accessed May 12, 2020.
35. National Institute of Health. Facts About Diabetic Eye Disease. August 3, 2019. Available at: https://nei.nih.gov/health/diabetic/retinopathy. Accessed May 12, 2020.
36. Centers for Disease Control and Prevention. Diabetes and Your Feet. December 4, 2019. Available at: https://www.cdc.gov/features/diabetesfoothealth/index.html. Accessed May 12, 2020.
37. Centers for Disease Control and Prevention. Prevention Complications. August 1, 2019. Available at: https://www.cdc.gov/diabetes/managing/problems.html. Accessed May 12, 2020.
38. Katon WJ. The Comorbidity of Diabetes Mellitus and Depression. The American Journal of Medicine. 2008;121(11):S8-S15.
39. Mayo Clinic. Diabetes and depression: Coping with the two conditions. Available at: https://www.mayoclinic.org/diseases-conditions/diabetes/expert-answers/diabetes-and-depression/faq-20057904. Accessed May 12, 2020.
40. Anderson RJ, Freedland KE, Clouse RE, Lustman PJ. The Prevalence of Comorbid Depression in Adults With Diabetes. A meta-analysis. 2001;24(6):1069-1078.
41. S. A, A. SM, L. PJ, J. DM, K. K. The prevalence of co-morbid depression in adults with Type 2 diabetes: a systematic review and meta-analysis. Diabetic Medicine. 2006;23(11):1165-1173.
42. Li C, Ford ES, Strine TW, Mokdad AH. Prevalence of Depression Among U.S. Adults With Diabetes. Findings from the 2006 Behavioral Risk Factor Surveillance System. 2008;31(1):105-107.
43. Indian Health Service. Diabetes Standards of Care & Clinical Practice Resources: Immunizations. Available at: https://www.ihs.gov/diabetes/clinician-resources/soc/immunizations1/. Accessed May 12, 2020.
44. Centers for Disease Control and Prevention. Basic TB Facts. March 20, 2016. Available at: https://www.cdc.gov/tb/topic/basics/default.htm. Accessed May 13, 2020.
45. Centers for Disease Control and Prevention. Latent TB Infection and TB Disease. March 11, 2016. Available at: https://www.cdc.gov/tb/topic/basics/tbinfectiondisease.htm. Accessed May 13, 2020.
46. Retrepo BI. Diabetes and tuberculosis. Microbiology spectrum. December 2016 2016;4(6).
47. Centers for Disease Control and Prevention. Hepatitis C Information. Available at: https://www.cdc.gov/hepatitis/hcv/index.htm. Accessed May 12, 2020.

Urban Indian Health Institute

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

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