



# Quality of Care in Early Stage Chronic Kidney Disease 2012 – 2013

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*Supplementary Report to the 2015  
Alberta Annual Kidney Care Report  
Kidney Health Strategic Clinical Network*

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For more information on this report, contact [Braden.Manns@albertahealthservices.ca](mailto:Braden.Manns@albertahealthservices.ca)

## EXECUTIVE SUMMARY

### Background

Chronic kidney disease (CKD) is a common and significant public health burden. Adverse outcomes of CKD can be prevented through high quality care including early detection and treatment. Treatment goals in CKD include reducing cardiovascular risk through appropriate lifestyle management, blood pressure control, and use of statins, and use of medications to slow progression to advanced kidney failure. This report is a supplement to the 2015 Alberta Annual Kidney Care Report and examines quality indicators in three areas relevant to detection and care of earlier stages of CKD.

### Methods

Routine laboratory data was obtained from the Alberta Kidney Disease Network database then linked to Alberta Health administrative data and detailed clinical information from the Southern and Northern Alberta Renal Programs. This report was prepared for the Kidney Health Strategic Clinical Network by the Interdisciplinary Chronic Disease Collaboration.

### Key Findings

Urinary albumin excretion (albuminuria) is a sensitive marker of kidney disease in early and advanced stages of CKD. Early detection of CKD with albuminuria will enable earlier initiation of therapy and thereby slow the course of the disease. Among patients with CKD and a measure of urinary albumin, the most common form of measurement was urine dipstick (77%), whereas guidelines recommend albumin-to-creatinine ratio (ACR) to identify people at risk and institute appropriate treatment. People with CKD and diabetes were more likely to have any measure of albuminuria (usually urine dipstick) measured compared to those without diabetes (90% vs. 79%).

Angiotensin-converting enzyme inhibitors (ACEi) and angiotensin receptor blockers (ARB) have been shown to delay disease progression in people with proteinuric CKD, and reduce mortality in people with CKD and diabetes. Use of ACEi and ARB appears suboptimal in patients with CKD and albuminuria – only 55-60% of patients who are at very high risk of progression to end-stage renal disease are using them.

The use of statins is also low (~35%) in non-diabetic individuals over the age of 50, despite evidence that they are effective at lowering cardiovascular and kidney risk, and the fact that these individuals are at higher cardiovascular risk than individuals with CKD and diabetes – in whom the use of statins approached 65%.

Appropriate glycemic control, as measured by A1c, in people with diabetes can lower the risk of CKD. Screening for complications of diabetes, including ACR annually, is also recommended. In Alberta, the measurement of A1c was common, whereas measurement of ACR was less common, varying <30% to >50% across Alberta's former health regions.

### Conclusions

This report identifies potential areas for improvement in the quality of care in early CKD. There are opportunities to: improve the appropriate assessment of albuminuria using ACR in people with CKD; increase the proportion of patients with CKD and albuminuria on an ACEi/ARB, especially those without diabetes; and increase the proportion of appropriate patients with CKD on a statin. The information in this report is intended to inform future quality improvement efforts in the evaluation and management of CKD.

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## CHAPTER 1: BACKGROUND AND METHODS

### PURPOSE OF SUPPLEMENTARY REPORT

The initial Alberta Annual Kidney Care Report (April 2015) focused on the prevalence of chronic kidney disease (CKD) and current care for patients with advanced kidney disease across Alberta. To support the launch of the Kidney Health Strategic Clinical Network (KH-SCN) and the identification of KH SCN priorities, additional analyses were requested examining quality indicators relevant to care for earlier stages of CKD across three broad areas. Based on guidelines recommending specific care relevant to patients with or at risk of CKD, the following indicators were agreed upon:

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<b>Quality Indicator 1</b>	Angiotensin receptor enzyme inhibitor (ACEi) and angiotensin receptor blocker (ARB) use in patients with CKD and albuminuria and in those with CKD and diabetes
<b>Quality Indicator 2</b>	Proportion of patients with diabetes, or without diabetes but over the age of 50, who filled a prescription for a statin in a one year period
<b>Quality Indicator 3</b>	Proportion of patients with diabetes who had an albumin-to-creatinine ratio (ACR) or a hemoglobin A1c measurement in a one year period

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### BACKGROUND

#### Chronic Kidney Disease

Kidney disease is a common, complex and chronic condition, which may lead to kidney failure. It increases the risk of cardiovascular complications, and when severe, is associated with debilitating symptoms, which impact a patient's quality of life. Kidney disease encompasses a variety of disorders and represents a major public health burden, affecting nearly four million Canadians, with particular relevance to vulnerable populations such as Aboriginal people and the elderly.

CKD is defined by estimated glomerular filtration rate (eGFR - an estimate of kidney function) of  $< 60 \text{ mL/min/1.73m}^2$  that is persistent for at least three months. Other simple laboratory tests, such as measurement of urinary albumin using a urinalysis or other measure of albuminuria, can provide important prognostic information and indicate that a patient is at high risk for cardiovascular events and progression to kidney failure.

#### Quality indicators relevant to earlier stages of chronic kidney disease

High quality care of patients with or at risk of CKD can delay the onset of kidney disease, or delay its progression to more advanced stages of kidney failure. High quality care can consist of appropriate testing to detect the presence of abnormalities of kidney function and structure in people at high risk of kidney disease, for instance those with diabetes. Treatment goals in CKD usually include reducing cardiovascular risk through appropriate lifestyle management, blood pressure control, and use of statins, as recommended by

guidelines.<sup>1</sup> In addition, angiotensin-converting enzyme inhibitors and angiotensin receptor blockers have been shown to delay progression to end-stage renal disease in people with proteinuric CKD,<sup>2</sup> and reduce mortality in people with CKD and diabetes.<sup>3</sup> Finally, appropriate glycemic control in people with diabetes, before the onset of CKD, can lower the risk of albuminuria and CKD.<sup>4</sup>

We are not able to create quality indicators for some of these clinical outcomes, such as achievement of blood pressure goals. However given the laboratory and medication data available within the Alberta Kidney Disease Network, the following quality indicators (each representative of high quality care recommended by guidelines) were feasible to measure:

Quality Indicator	Guideline
ACEi/ARB use in patients with CKD (eGFR 15 - 60 ml/min/1.73m <sup>2</sup> ) and heavy albuminuria (ACR >60 mg/mmol); and in those with CKD (eGFR 15 - 60 ml/min/1.73m <sup>2</sup> ) and diabetes	KDIGO guidelines for the care of people with chronic kidney disease recommend the use of ACEi/ARB in all patients with CKD (GFR<60 ml/min/1.73m <sup>2</sup> ) who have albuminuria (ACR >30 mg/mmol) (with the goal of delaying progression to advanced kidney failure). <sup>5</sup> The Canadian Diabetes Association recommends the use of ACE/ARB in people with CKD and diabetes, irrespective of the presence of albuminuria (with the goal of improving survival). <sup>6</sup>
Proportion of patients with CKD (eGFR 15 - 60 ml/min/1.73m <sup>2</sup> ) and diabetes, or CKD (eGFR 15 - 60 ml/min/1.73m <sup>2</sup> ) without diabetes but over the age of 50, who filled a prescription for a statin in a one-year period.	KDIGO lipid guidelines recommend use of statins in all adults with CKD and diabetes, and those with CKD without diabetes who are over the age of 50 <sup>7</sup> - with the goal of reducing cardiovascular risk.
Proportion of patients with diabetes who had an ACR or an A1c measurement in a one year period	The CDA recommends screening for complications of diabetes, including screening for kidney disease by measuring albumin to creatinine (ACR) annually, and measuring average blood glucose levels using A1C levels every 3-6 months in people with diabetes <sup>8 9</sup>

<sup>1</sup> Kidney Disease Improving Global Outcomes. KDIGO 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Accessed at: <http://kdigo.org/home/guidelines/ckd-evaluation-management/>

<sup>2</sup> Jafar TH, Schmid CH, Landa M, Giatras I, Toto R, Remuzzi G, et al. Angiotensin-converting enzyme inhibitors and progression of nondiabetic renal disease. A meta-analysis of patient-level data. *Ann Intern Med* 2001;135(2):73-87.

<sup>3</sup> Strippoli GF, Craig M, Deeks JJ, Schena FP, Craig JC. Effects of angiotensin converting enzyme inhibitors and angiotensin II receptor antagonists on mortality and renal outcomes in diabetic nephropathy: systematic review. *BMJ* 2004;329(7470):828.

<sup>4</sup> Canadian Diabetes Association Clinical Practice Guidelines Expert Committee. Canadian Diabetes Association 2013 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada. *Can J Diabetes* 2013;37(suppl 1):S1-S212.

<sup>5</sup> <http://kdigo.org/home/guidelines/ckd-evaluation-management>

<sup>6</sup> <http://guidelines.diabetes.ca/browse/chapter29>

<sup>7</sup> <http://kdigo.org/home/guidelines/lipids/>

<sup>8</sup> CDA <http://guidelines.diabetes.ca/browse/chapter9>

## METHODS

This work was done by the Interdisciplinary Chronic Disease Collaboration and the Alberta Kidney Disease Network (AKDN). Routine laboratory data for all outpatients and inpatients in Alberta was obtained through the unique AKDN database. This data was linked to Alberta Health administrative data and detailed clinical information from the Southern and Northern Alberta Renal Programs to define CKD.

### **Definitions:**

Throughout this report:

- **CKD** is defined as eGFR 15 - 60 ml/min/1.73m<sup>2</sup> not on renal replacement therapy (i.e. excluding dialysis and prior transplants). Specifically:
  - We included patients who had a series of consecutive eGFR measurements <60 ml/min/1.73m<sup>2</sup> spanning at least 90 days, with at least 1 of the measurements falling in the fiscal year April 1, 2011 to March 31, 2012; or,
  - We also included patients who had <90 days of eGFR measurements <60 ml/min/1.73m<sup>2</sup> in the fiscal year, but no further measurements until censoring or end of study on March 31, 2013.

The first qualifying eGFR in the fiscal year became the index eGFR. We excluded patients who were on dialysis at the time of their index eGFR, or in the following 90 days, or who had had a prior kidney transplant at any time. We also excluded patients whose index eGFR was <15 ml/min/1.73m<sup>2</sup>. This definition was used because we wished to be certain of a diagnosis of CKD by excluding people who may have had a brief reversible period with eGFR <60 ml/min/1.73m<sup>2</sup>.<sup>10</sup>

- **Albuminuria** is defined as protein to creatinine ratio (PCR) >100mg/mmol or albuminuria (albumin to creatinine ratio (ACR) >60 mg/mmol or dipstick albuminuria=heavy) in the prior 2 years. We used outpatient measurements only, and used any ACR in preference to any PCR, which was used in preference to any urinary dipstick measurement.<sup>11</sup>
- **Diabetes** is defined using a validated algorithm based on the ICD-9 and ICD-10 diagnostic codes in the physician claims and inpatient data; specifically, it required two physician claims for diabetes in a 2-year period, or a single hospitalization.<sup>12</sup> Diabetes status was determined on the index date.

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<sup>9</sup> CDA <http://guidelines.diabetes.ca/browse/chapter29>

<sup>10</sup> In comparison, the definition of CKD used in the April 2015 Kidney Care report required only a single eGFR <60 ml/min/1.73m<sup>2</sup>.

<sup>11</sup> This definition was slightly different from that used in the April 2015 Kidney Care report. In that report, the eGFR < 60 ml/min/1.73m<sup>2</sup> with albuminuria group included people if any eGFR <60 ml/min/1.73m<sup>2</sup> in the 2-year period was associated with a heavy albuminuria measurement in the prior 2 years, whereas in this report albuminuria was assessed only for the first eGFR in the 1-year period.

<sup>12</sup> Hux JE, Ivis F, Flintoft V, Bica A. Diabetes in Ontario: determination of prevalence and incidence using a validated administrative data algorithm. *Diabetes Care* 2002; 25: 512-516.

## Data Sources

Data from the following sources was used for this report: the AKDN repository of laboratory data; the Northern and Southern Alberta Renal Programs (NARP and SARP); and Alberta Health (AH) – as described in the Alberta Annual Kidney Care Report (April 2015). The data sources were linked via each patient's unique provincial health number (PHN). In addition to these data sources, we also used the Alberta Pharmaceutical Information Network (PIN) data, which captures prescription drug information on all drugs dispensed in Alberta, and which was also linked using the patient's PHN. All data sources were updated to March 31, 2013.

## Identification of Study Population

### CKD cohort (Quality Indicators 1 and 2)

To define this cohort, we used laboratory data from the AKDN database, as described above, to identify Albertans who met one of the two criteria for CKD (sustained eGFR between 15 and 60 ml/min/1.73m<sup>2</sup>) in the year April 1, 2011 to March 31, 2012. The first qualifying eGFR measurement in the fiscal year defined the index eGFR and the index date. Individuals were excluded if they were younger than 18 years old at their index date. Follow-up was to March 31, 2013.

### Diabetes cohort (Quality Indicator 3)

This cohort included all Alberta residents who had an administrative diagnosis of diabetes up to and including March 31, 2012 and who had an entry in the Alberta Health registry for both the 2011/12 and 2012/13 fiscal years, and who were at least 18 years old as of April 1, 2012. The index date for the cohort was March 31, 2012, which allowed for up to 1 year of follow-up to March 31, 2013.

## Covariates and Other Variable Definitions

Demographic data including age, sex, and First Nations status were determined from the AH registry file. We determined zone and former health region of residence using the postal code of residence from the AH registry file, which we linked with the Postal Code Translator File. We used validated algorithms to define diabetes, hypertension and the 17 comorbidities in the Charlson index using the AH physician claims and hospitalization databases.<sup>13,14</sup> We calculated eGFR from the index serum creatinine measurement, using the CKD-EPI equation. We defined filling a prescription for an ACEi/ARB or a statin by using the Drug identification numbers for drugs dispensed in the PIN database.

## Ethics and Privacy

We are secondary users of the data, as defined by the Alberta Health Information Act. Ethics approval was obtained from the Universities of Calgary and Alberta for ongoing ICDC / AKDN data collection (Ethics ID: E-22590), and for the purposes of this report (Ethics ID: REB 14-0884). Data is housed within the Citrix Research Data Haven within the IT department of the University of Calgary (UC), which has been approved for storage of patient level data.

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<sup>13</sup> Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis* 1987; 40: 373-383.

<sup>14</sup> Quan H, Sundararajan V, Halfon P, Fong A, Burnand B, Luthi JC et al. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. *Med Care* 2005; 43: 1130-1139.



### Quality indicator 1: ACEi and ARB use in patients with CKD and diabetes, or with CKD and albuminuria

There were 96,480 patients who met the two criteria for sustained eGFR 15 - 60 ml/min/1.73m<sup>2</sup> between April 1, 2011 to March 31, 2012. A total of 91,737 (95.1%) qualified via the first criterion of eGFR <60 ml/min/1.73m<sup>2</sup> for at least 90 days, and an additional 4,743 (4.9%) qualified by the second criterion of less than 90 days of eGFR <60 ml/min/1.73m<sup>2</sup> but no further measurement until censoring or end of study. Characteristics of these people are shown in Table 1, stratified by AHS zone of residence.

Table 1 shows that the median age of the cohort was 75.9 years, with slightly over half (57%) of the cohort being female. The majority of people (63.5%) were in Stage 3A (eGFR 45-60 ml/min/1.73m<sup>2</sup>), while 5.6% had albuminuria (6.8% among those with a measurement). Almost 85% had hypertension, while 33% had diabetes, and about 10% had a history of MI or stroke.

Only 1.2% of the cohort was First Nations, compared to 3% of the Alberta adult population; however, this apparent under-representation is mainly because the First Nations population in Alberta is much younger than the non-First Nations population. Stratified by age, First Nations people were still over-represented in the cohort relative to the Alberta population. For example, 2.6% of the cohort aged 50-59 were First Nations, compared to 2.2% of the population aged 50-59; 2.1% of the cohort aged 60-69 was First Nations, compared to 1.8% of the population aged 60-69.

Table 2 shows albuminuria measurement by former health region of residence, broken down by the three methods for testing albuminuria: albumin-to-creatinine ratio (ACR), protein-to-creatinine ratio (PCR), and urine dipstick (UDIP). The table shows some significant variations in the overall measurement of albuminuria, and also the measurement method, across regions.

Figures 1 and 2 show the percentage of people with CKD who had albuminuria measured by any of the three methods, by region of residence, for people with CKD and diabetes (Figure 1) and for people with CKD and no diabetes (Figure 2). There are substantial differences in albuminuria measurement, depending on diabetes status, and also substantial differences between regions.

Figures 3 and 4 show the percentage of people who had heavy albuminuria, among those who had a measure of albuminuria, by region of residence and First Nations status. Figure 3 shows this for people with CKD and diabetes, while Figure 4 shows this for people with CKD and no diabetes. Data for the former Chinook Health Region are not included as the ACR data (as reported) from Chinook Labs underestimates albuminuria, and a large portion of the albuminuria assessments in the Chinook Region are based on an ACR test.

Overall, 21.1% of people without diabetes had no albuminuria measurement in the prior 2 years, compared to 10.1% of people with diabetes. Of note, 9.8% of people with diabetes had heavy albuminuria, compared to only 3.5% of people without diabetes.

Figure 5 shows the percentage of people with CKD who filled a prescription for an ACEi or an ARB within one year, by former health region, for people with or without diabetes and with or without albuminuria. Practices across health regions and between patients with or

without albuminuria show little variation. Those with diabetes were more likely to be on an ACEi/ARB than those without diabetes.

**Quality indicator 2: Proportion of patients with CKD and diabetes, or CKD and no diabetes but over the age of 50, who filled a prescription for a statin over one year**

Figure 6 shows the percentage of patients with CKD and diabetes, or CKD and no diabetes but over the age of 50, who filled a prescription for a statin within one year, by former health region. Again, practices across health regions show little variation; however, patients with diabetes were more likely to have filled a prescription for a statin (59.0 – 66.7%, overall rate of 64.6%) compared to those without diabetes (35.7 – 42.3%, overall rate of 39.2%).

**Quality indicator 3: Proportion of patients who had an ACR or an A1c measurement in a one year period.**

The cohort consisted of 235,649 people who were diagnosed with diabetes before April 1, 2012, who were included in the Alberta Health Registry file in both 2011/12 and 2012/13, and who were at least 18 years old as of April 1, 2012. All but 7,125 people (3.0%) had a full year of follow-up. Some characteristics of these people are shown in Table 3, stratified by AHS zone of residence.

The mean age of the cohort was 61.7 years, substantially younger than the CKD cohort, and there were slightly more men than women. A total of 4.4% of the cohort was First Nations, with this proportion increasing to 6.8% in the South Zone and 13.5% in the North Zone. Almost a third of the people in the cohort (31.8%) had a most recent A1c measurement that was <6.5%.

Figures 7 and 8 show the percentage of people in the cohort who had an A1c measurement in the year April 1, 2012 to March 31, 2013, by former health region of residence, among all those with a full year of follow-up (Figure 7). This analysis was repeated in a cohort of people in whom ongoing screening would be more relevant and in whom the diagnosis of diabetes was confirmed based on their A1C measure (by excluding people aged 80 or older, and those whose most recent A1c was < 6.5%, since they may not have diabetes) (Figure 8). Both figures show some slight variations in the measurement of A1c, with the rates being highest in the 3 southern health regions (>70% in Figure 7), and lowest in the Peace Country and East Central regions (<65% in Figure 7). Overall, 70.1% of all people with a full year of follow-up had an A1c measurement, compared to 73.7% also excluding people aged 80 or older, or whose most recent A1c was < 6.5%.

Figures 9 and 10 show the percentage of people in the cohort who had an ACR measurement in the year April 1, 2012 to March 31, 2013, by former health region of residence, again among those with a full year of follow-up (Figure 9), and (similar to above) after excluding people aged 80 or older, or whose most recent A1c was < 6.5% (Figure 10). Both figures show substantial variations in the measurement of ACR, with rates being lowest in the East Central region (<30% in both cohorts), and highest in the Capital Health Region (>50% in both cohorts). Overall, 41.8% of all people with a full year of follow-up had an ACR measurement, compared to 47.4% also excluding people aged 80 or older, or whose most recent A1c was < 6.5%.

## CHAPTER 3: DISCUSSION

The measurement of urinary albumin excretion (albuminuria) provides a sensitive marker of kidney disease in early and advanced kidney disease. Albuminuria is a key finding in the differential diagnosis of CKD and a key prognostic finding in CKD. Moreover, albuminuria guides therapy with angiotensin blockade, and early detection of kidney disease with albuminuria will enable earlier initiation of this therapy, thereby slowing the course of the disease. The most common form of measurement of albuminuria in Alberta for people with CKD is urine dipstick, whereas guidelines recommend use of albumin-to-creatinine ratio (ACR) to identify people at risk and institute appropriate treatment. People with diabetes were more likely to have albuminuria measured (by any method) compared to those without diabetes (90% vs. 79%). There is an opportunity to improve the appropriate assessment of albuminuria using ACR in people with CKD.

Medication use, as measured by filled prescriptions, is an indicator of the degree to which patients are receiving recommended drug therapies. Guidelines recommend the use of Angiotensin converting enzyme inhibitors (ACEi) and angiotensin receptor blockers (ARB) in all patients with CKD and albuminuria (ACR > 30 mg/mmol), and in all patients with CKD and diabetes (irrespective of their level of albuminuria), based on evidence that this improves survival and lowers the risk of kidney failure. While it is uncertain what the optimal values are for the three quality indicators reported herein, most patients (>85%) will tolerate ACEi/ARB and / or statins.

Use of ACEi and ARB appears suboptimal in patients with CKD and heavy albuminuria – only 55-60% of patients who are at very high risk of progression to end-stage renal disease are using them. The use of statins is also particularly low (~35%) in non-diabetic individuals over the age of 50, despite evidence that they are effective at lowering cardiovascular and kidney risk, and the fact that these individuals are at higher cardiovascular risk than individuals with CKD and diabetes<sup>15</sup> – where the use of statins approached 65%. While we noted some variation in quality indicators across zones in these indicators, it was not large.

Screening for kidney disease using albuminuria testing has been shown to be cost-effective in high risk groups<sup>16 17</sup> – since it delays progression to advanced kidney failure. Guidelines recommend annual screening with ACR, though ACR measurement was undertaken only in 35-50% of people with diabetes (even in a younger cohort of individuals with confirmed diabetes). A1C measurement was undertaken in 63-75% of individuals with diabetes annually, suggesting reasonable adherence with guidelines. There was variation across zones in these two measures, which deserves further consideration.

### CONCLUSION

This report identifies potential areas for improvement in the quality of care in early CKD. There are opportunities to: improve the appropriate assessment of albuminuria using ACR

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<sup>15</sup> Tonelli M, et al. Risk of coronary events in people with chronic kidney disease compared with those with diabetes; A population level cohort study. *The Lancet* 2012; 380 (9844): 807 - 814

<sup>16</sup> Boulware LE, Jaar BG, Tarver-Carr ME, Brancati FL, Powe NR. Screening for proteinuria in US adults: a cost-effectiveness analysis. *JAMA*. 2003;290(23):3101-14

<sup>17</sup> Manns B, Hemmelgarn B, Tonelli M, et al. Population based screening for chronic kidney disease: cost effectiveness study. *BMJ* 2010;341:c5869

in people with CKD; increase the proportion of patients with CKD and albuminuria on an ACEi/ARB, especially those without diabetes; and increase the proportion of appropriate patients with CKD on a statin. The information in this report is intended to inform future quality improvement efforts in the evaluation and management of CKD.

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This study is based in part on data provided by Alberta Health and Alberta Health Services. The interpretation and conclusions contained herein are those of the researchers and do not necessarily represent the views of the Government of Alberta or Alberta Health Services. Neither the Government of Alberta nor, Alberta Health or Alberta Health Services express any opinion in relation to this study.

Further information about this report is available from Braden Manns, Interim Scientific Director, Kidney – Strategic Clinical Network and Svare Professor in Health Economics, University of Calgary, [Braden.Manns@albertahealthservices.ca](mailto:Braden.Manns@albertahealthservices.ca). 1403 – 29th St N.W., Calgary, AB, T2N 2T9.

## CHAPTER 4: TABLES AND FIGURES

Table 1: Characteristics of Albertans with CKD (sustained eGFR 15-60 ml/min/1.73m<sup>2</sup>) by AHS Zone of residence

Characteristic	Zone of residence*					Alberta (n=96,480) <sup>†</sup>
	South (n = 11,978)	Calgary (n = 29,076)	Central (n = 12,784)	Edmonton (n = 32,077)	North (n = 10,559)	
Age						
18-29	0.2	0.2	0.2	0.2	0.3	0.2
30-39	0.5	0.7	0.5	0.5	0.7	0.6
40-49	1.3	1.9	1.4	1.7	2.7	1.8
50-59	6.2	6.6	5.5	6.1	9.3	6.6
60-69	18.4	17.2	17.1	17.3	31.7	17.9
70-79	32.7	31.7	33.8	31.7	33.5	32.3
80-89	32.6	32.9	33.0	33.5	26.4	32.4
90+	8.1	8.7	8.6	8.9	5.3	8.3
Mean, s.d.	76.1, 11.1	76.0, 11.7	76.5, 11.0	76.4, 11.5	73.5, 11.9	75.9, 11.5
Female	58.3	56.1	59.0	57.8	55.9	55,282 (57.3)
CKD Stage of index eGFR:						
3A: 45-60	60.9	64.6	60.7	64.1	65.2	61,300 (63.5)
3B: 30-45	30.2	27.0	29.8	27.4	26.4	26,843 (27.8)
4: 15-30	8.9	8.4	9.5	8.5	8.4	8,337 (8.6)
Albuminuria						
No	‡	76.9	72.9	82.8	75.8	74,269 (77.0)
Yes	‡	5.9	6.5	5.6	6.3	5,375 (5.6)
Unmeasured	30.4	17.2	20.5	11.5	17.9	16,836 (17.5)
First Nations	1.4	0.7	0.8	0.8	4.4	1,183 (1.2)
Hypertension	85.4	83.5	85.6	85.8	82.6	81,679 (84.7)
Diabetes	34.6	29.9	32.8	35.2	34.1	31,923 (33.1)
MI	8.3	8.2	11.2	10.7	9.8	9,278 (9.6)
Stroke	10.4	11.7	10.3	10.2	9.4	10,256 (10.6)
PVD	7.2	9.6	7.0	7.1	6.9	7,564 (7.8)
Cancer	16.7	17.1	15.6	14.1	14.7	15,036 (15.6)
Dementia	10.0	11.8	8.9	12.1	7.9	10,491 (10.9)

\* % unless otherwise indicated

† n (%) unless otherwise indicated

‡ Albuminuria is not reported for South Zone as the ACR data for the former Chinook Health Region is unreliable, and 55% of the albuminuria assessments from Chinook were based on an ACR.

Table 2: Albuminuria measurement in the prior 2 years among Albertans with CKD (sustained eGFR 15 – 60 ml/min/1.73m<sup>2</sup>), by type of measurement and former health region of residence (N = 96,474)

Former health region	n	ACR measured (%)	PCR measured (%)	UDIP measured (%)	Unmeasured by any means (%)
Region 1 Chinook	8,042	36.3	10.9	48.3	33.4
Region 2 Palliser	3,936	34.9	0.6	69.9	24.3
Region 3 Calgary	29,076	29.6	6.9	78.9	17.1
Region 4 David Thompson	8,508	31.4	7.1	74.4	19.4
Region 5 East Central	4,276	17.6	9.3	73.2	22.7
Region 6 Capital	32,178	37.6	15.1	85.1	11.5
Region 7 Aspen	5,238	26.6	10.5	78.4	17.0
Region 8 Peace	4,502	31.1	6.3	74.2	19.7
Region 9 Northern Lights	718	39.7	21.0	77.4	14.2
Alberta	96,474	32.6	10.1	77.2	17.4

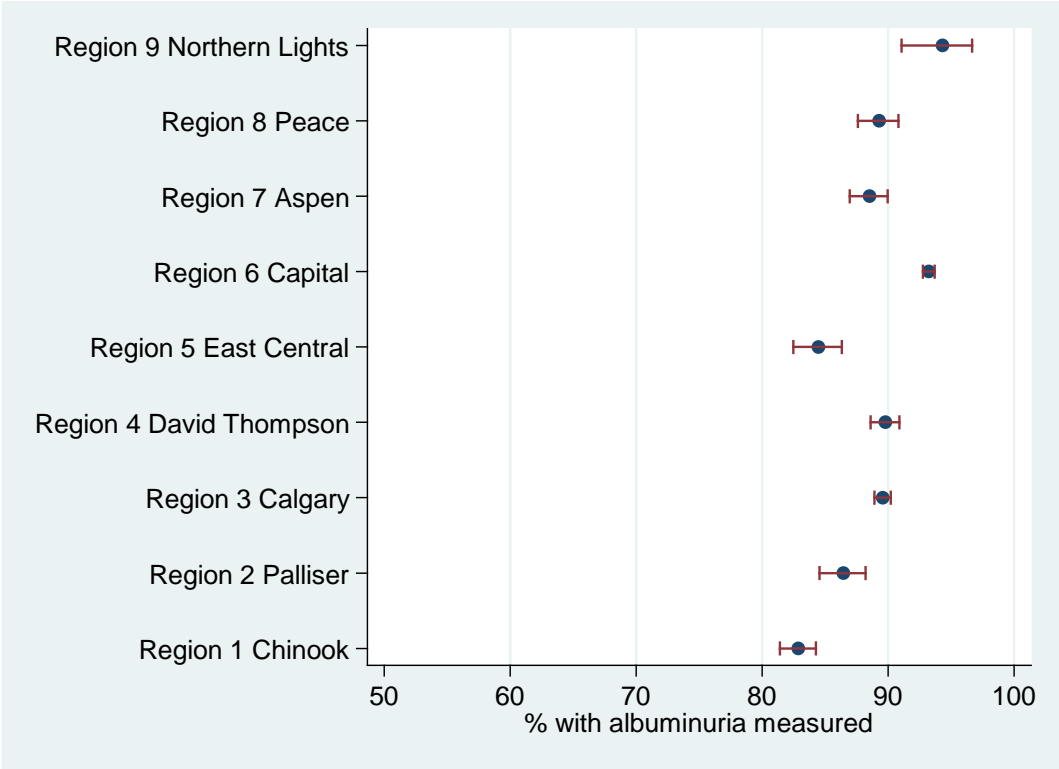
Table 3: Characteristics of diabetes cohort (adults age 18 and older with an administrative diagnosis of diabetes prior to April 1, 2012, who had an entry in the AH registry for 2011-12 and 2012-13), by AHS zone of residence. Index date = April 1, 2012.

Characteristic	Zone of residence*					Alberta† (N = 235,649)
	South N = 20,644	Calgary N = 76,012	Central N = 29,008	Edmonton N = 82,709	North N = 27,247	
Age						
18-29	2.4	2.2	2.4	2.4	2.9	5,709 (2.4)
30-39	5.1	5.5	4.9	6.8	6.9	14,223 (6.0)
40-49	10.2	13.3	11.3	13.3	14.6	30,410 (12.9)
50-59	20.2	23.9	21.3	22.6	24.9	53,950 (22.9)
60-69	25.9	26.0	26.4	24.8	25.0	60,152 (25.5)
70-79	21.3	18.0	20.7	18.3	16.7	43,767 (18.6)
80-89	12.6	9.7	10.9	10.1	7.8	23,621 (10.0)
90+	2.2	1.4	2.0	1.7	1.2	3,817 (1.6)
Mean, s.d.	63.8 (15.2)	61.6 (14.6)	63.0 (14.9)	61.4 (15.2)	59.9 (14.8)	61.7 (14.9)
Male	52.1	55.0	53.5	51.3	54.7	125,432 (53.2)
Duration of diabetes						
0 to 1 yr	7.4	8.5	8.0	8.5	8.7	19,734 (8.4)
>1 to 5 yrs	29.2	32.3	27.5	30.0	31.0	71,818 (30.5)
>5 to 10 yrs	28.0	27.6	28.9	28.2	28.2	66,119 (28.1)
>10 to 15 yrs	20.2	17.5	20.9	19.1	19.2	44,586 (18.9)
>15 yrs	15.2	14.2	14.7	14.2	12.8	33,392 (14.2)
First Nations	6.8	2.3	4.4	2.8	13.5	10,482 (4.4)
Category of last A1c before April 1, 2012						
<6.5%	39.2	32.9	30.6	30.6	27.9	74,881 (31.8)
6.5-8%	35.8	41.8	38.5	41.6	38.0	95,060 (40.3)
>8%	19.4	20.7	22.9	20.1	25.8	50,031 (21.2)
No previous A1c	5.7	4.7	8.0	7.7	8.3	15,677 (6.6)

\* % unless otherwise indicated

† n (%) unless otherwise indicated

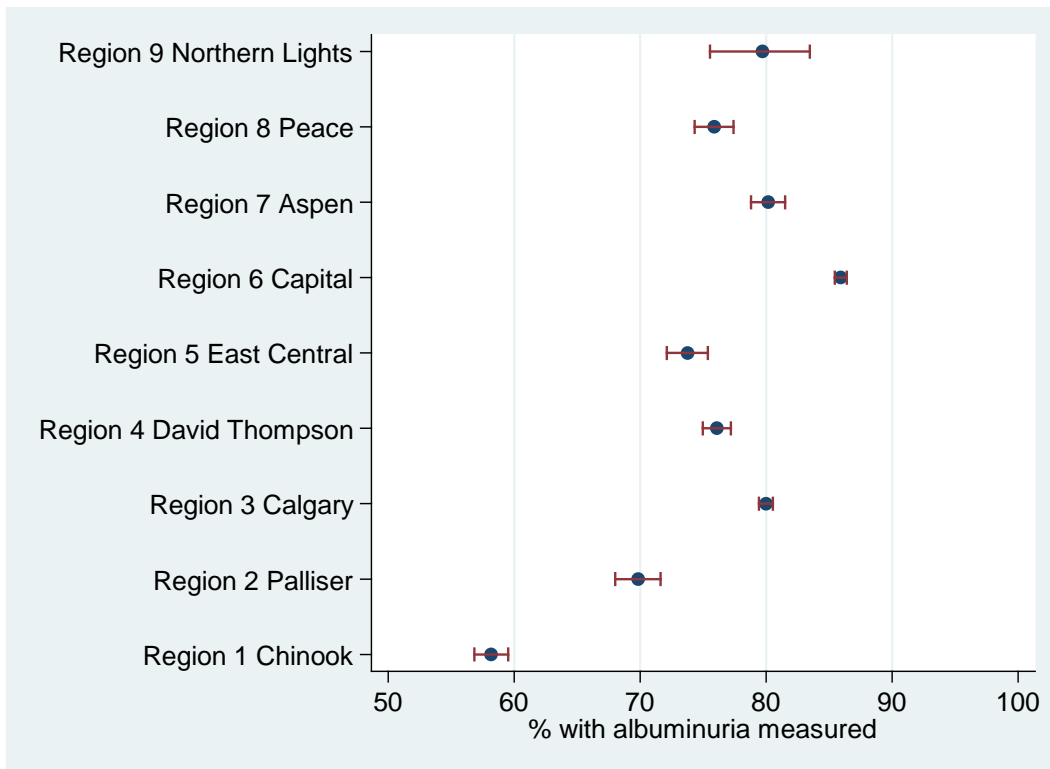
Figure 1: Proportion of people with CKD and diabetes who have albuminuria measurement (by any method) in the 2 years prior to index date (N = 31,920)



Error bars show 95% confidence intervals.  
Reported by former Alberta Health Region

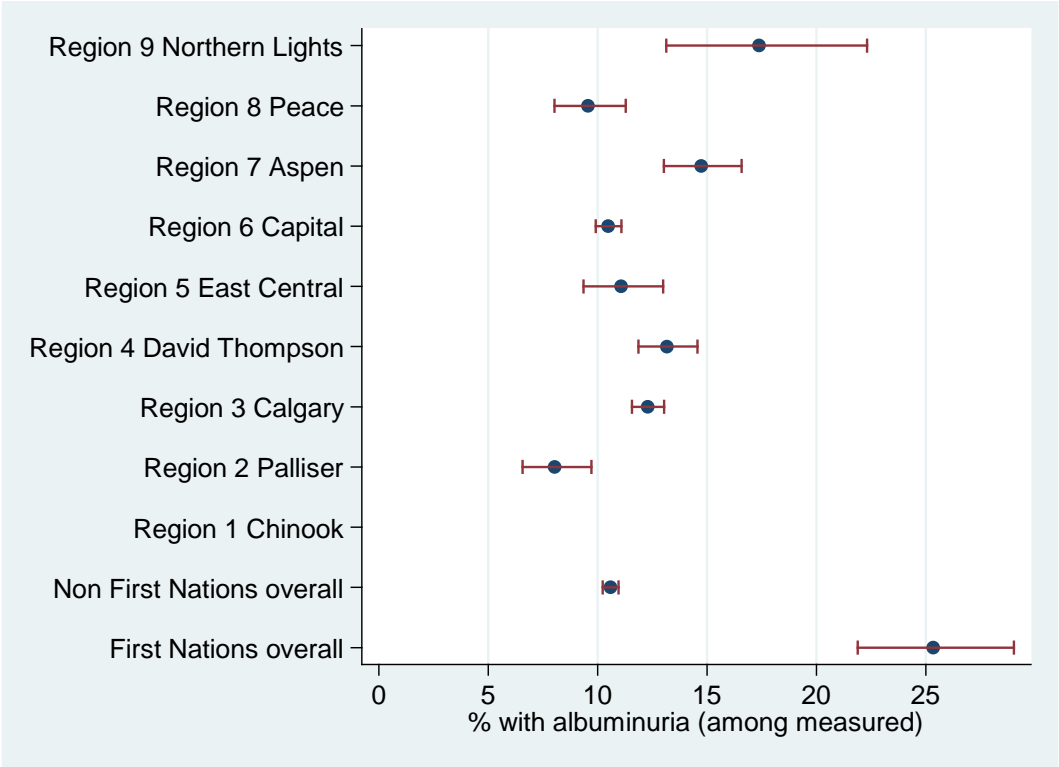


Figure 2: Proportion of people with CKD without diabetes who have albuminuria measurement (by any method) in the 2 years prior to index date (N = 64,554)



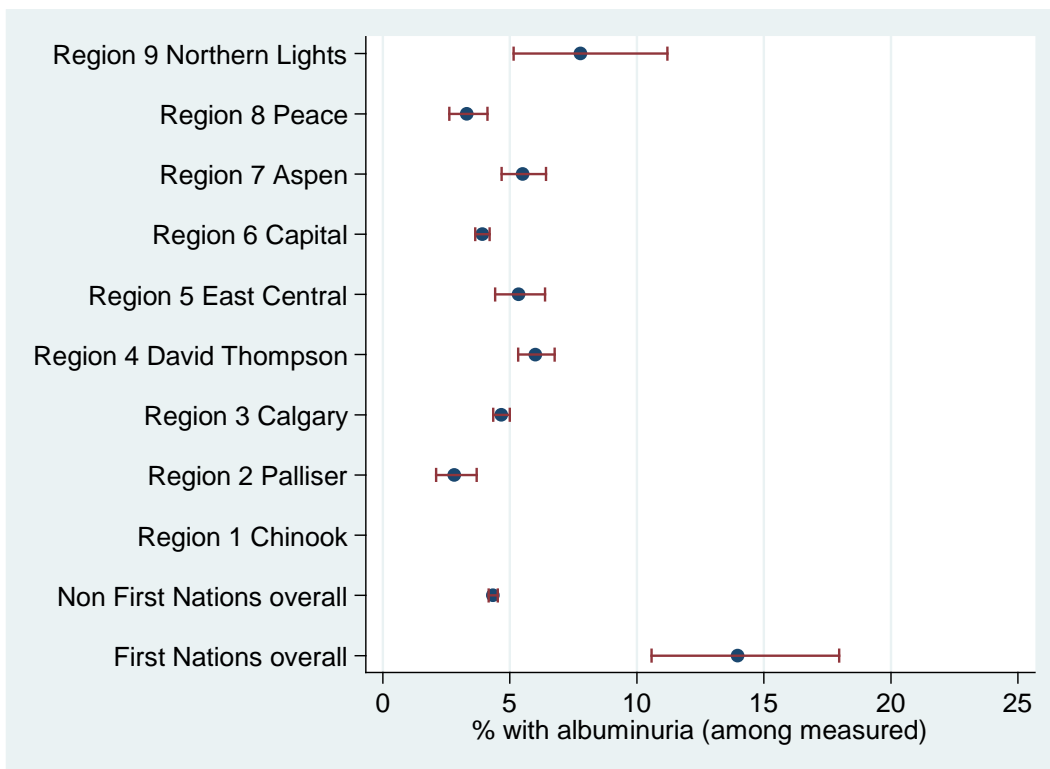
Error bars show 95% confidence intervals.  
Reported by former Alberta Health Region

Figure 3: Percentage of patients with albuminuria among people with CKD and diabetes who had a measure of albuminuria, by First Nations status (N = 28,704)



Error bars indicate 95% confidence intervals.  
 Reported by former Alberta Health Region  
 Data for Chinook is not shown because the ACR data from Chinook is unreliable, and 80% of the albuminuria assessments in Chinook Region among people with CKD and diabetes were based on an ACR.

Figure 4: Percentage of patients with albuminuria among people with CKD but no diabetes who had a measure of albuminuria, by First Nations status (N = 50,937)

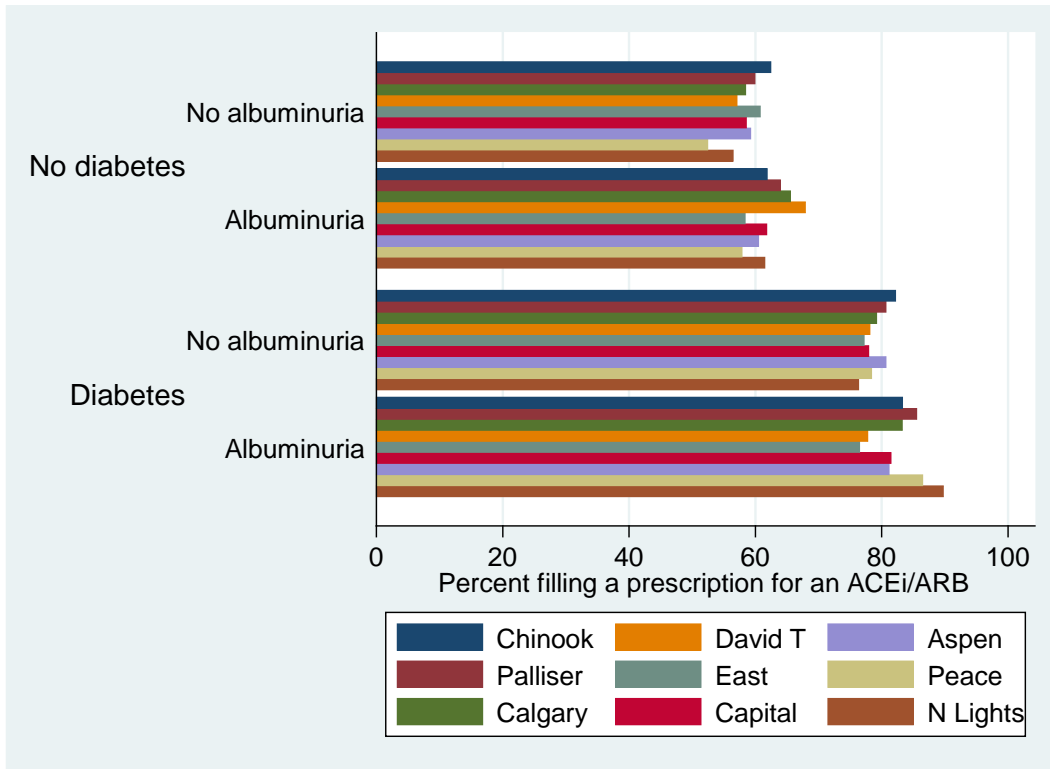


Error bars show 95% confidence intervals.

Reported by former Alberta Health Region

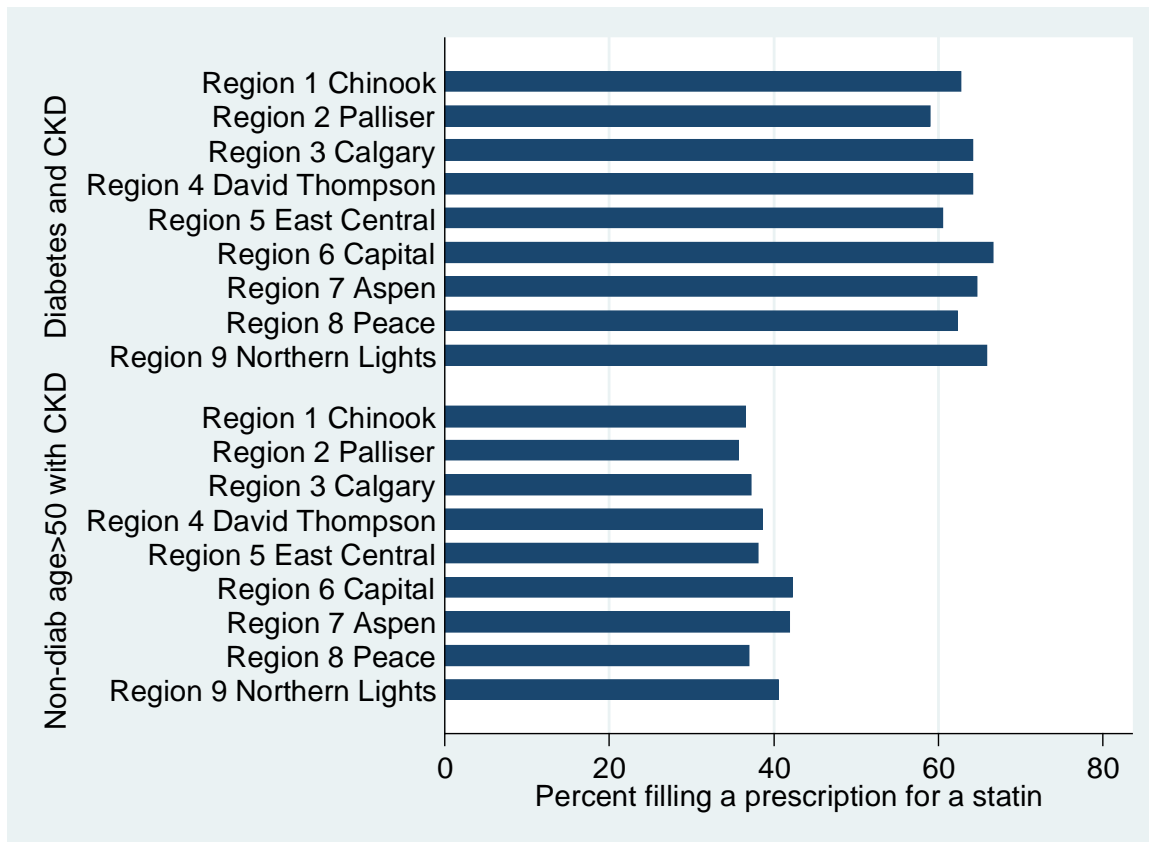
Data for Chinook is not shown because the ACR data from Chinook is unreliable, and 36% of assessments in Chinook Region among people with CKD but no diabetes were based on an ACR measurement.

Figure 5: Percentage of people with CKD (sustained eGFR 15-60mls/min/1.73m<sup>2</sup>) filling a prescription for an ACEi/ARB within one year, by diabetes status, and presence of albuminuria



Reported by former Alberta Health Region

Figure 6: Percentage of patients filling a prescription for a statin within one year among people with CKD and diabetes, and among people with CKD, no diabetes and age 50 or older



Reported by former Alberta Health Region

Figure 7: Proportion of adults with diabetes who had A1c measured during the 2012/13 fiscal year

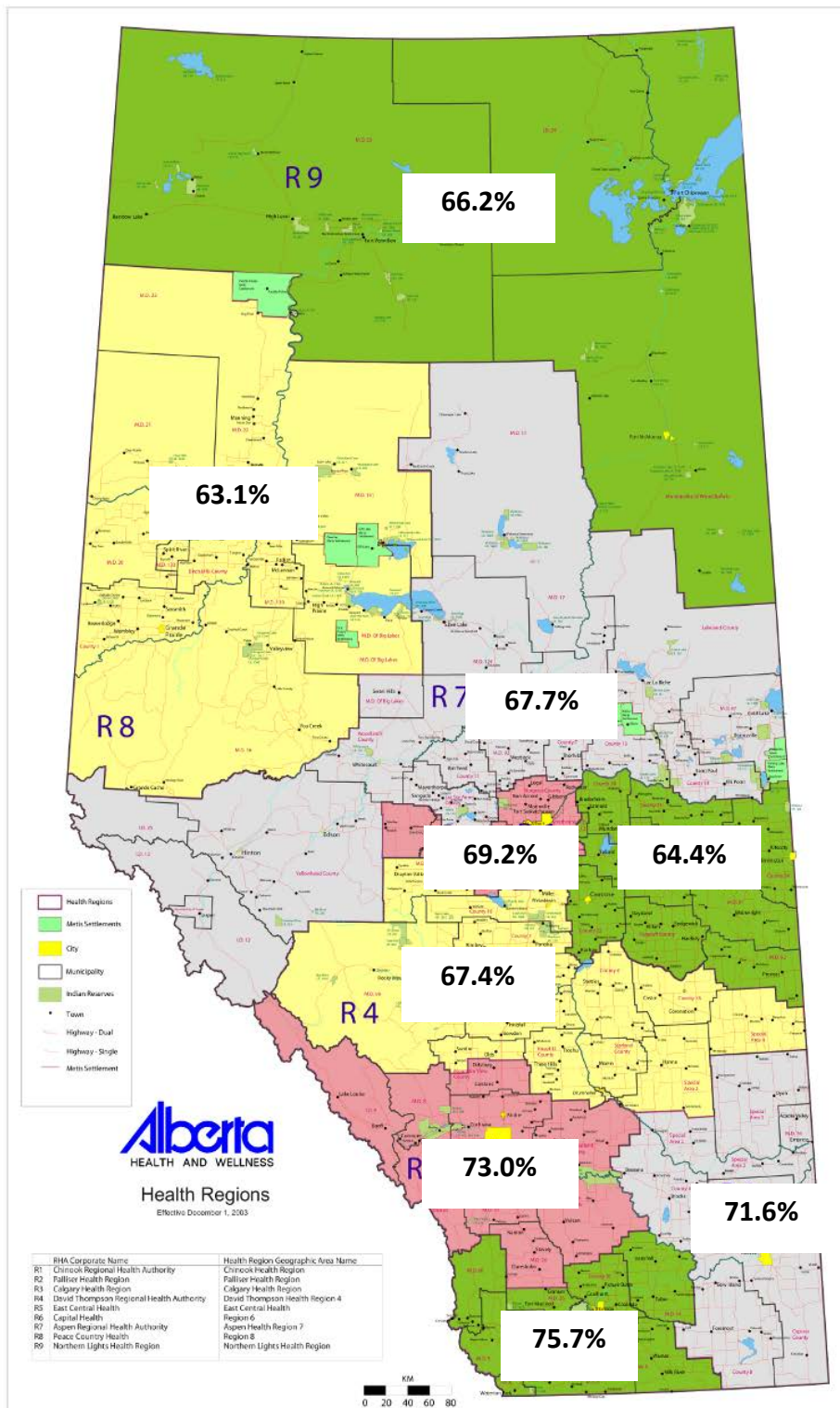


Figure 8: Proportion of adults with diabetes who had A1c measured during the 2012/13 fiscal year, excluding people aged 80 years or older or whose most recent A1c was <6.5%

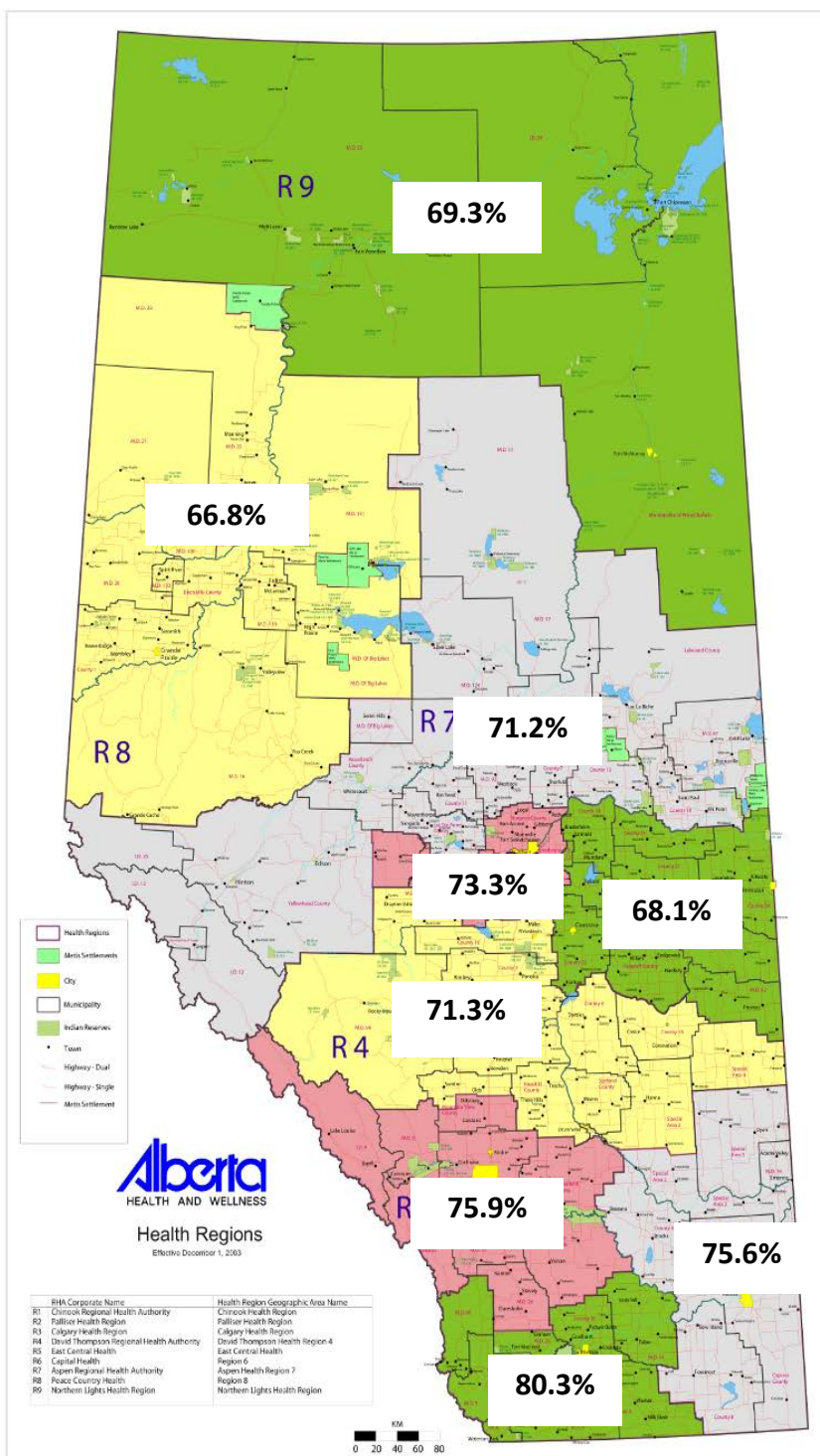




Figure 9: Proportion of adults with diabetes who had ACR measured during the 2012/13 fiscal year

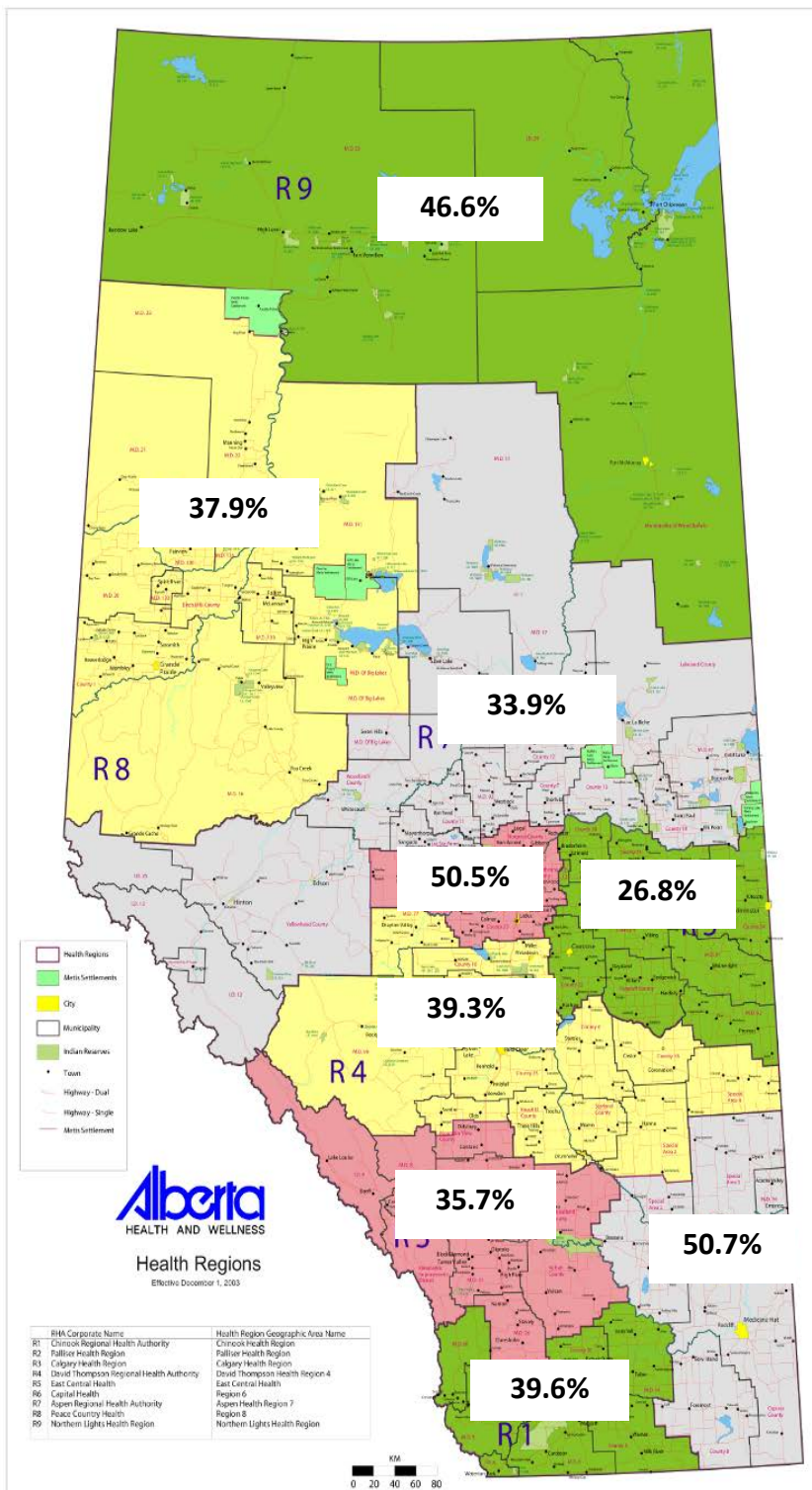




Figure 10: Proportion of adults with diabetes who had ACR measured during the 2012/13 fiscal year, excluding people aged 80 years or older or whose most recent A1c was <6.5%

