

# Aboriginal Participation in the DOVE study

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## ABSTRACT

**Objective/Background:** Aboriginals constitute a substantial portion of the population of Northern Alberta. Determinants such as poverty and education can compound health-care accessibility barriers experienced by Aboriginals compared to non-Aboriginals. A diabetes care enhancement study involved the collection of baseline and follow-up data on Aboriginal and non-Aboriginal patients with known type 2 diabetes in two rural communities in Northern Alberta. Analyses were conducted to determine any demographic or clinical differences existing between Aboriginals and non-Aboriginals.

**Methods:** 394 diabetes patients were recruited from the Peace and Keeweenok Lakes health regions. 354 self-reported whether or not they were Aboriginal; a total of 94 self-reported being Aboriginal. Baseline and follow-up data were collected through interviews, standardized physical assessments, laboratory testing and self-reporting questionnaires (RAND-12 and HUI3).

**Results:** Aboriginals were younger, with longer duration of diabetes, more likely to be female, and less likely to have completed high school. At baseline, self-reported health status was uniformly worse, but the differences disappeared with adjustments for socio-demographic confounders, except for perceived mental health status. Aboriginals considered their mental health status to be worse than non-Aboriginals at baseline. Some aspects of health utilization were also different.

**Discussion:** While demographics were different and some utilization differences existed, overall this analysis demonstrates that "Aboriginality" does not contribute to diabetes outcomes when adjusted for appropriate variables.

**MeSH terms:** Aboriginal, North America; type 2 diabetes mellitus; practice guidelines; health status indicators; rural communities

*La traduction du résumé se trouve à la fin de l'article.*

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Treatment gaps in diabetes care exist in both urban and rural settings.<sup>1-7</sup> Northern Alberta, which consists of largely remote and rural communities, bears a greater burden of diabetes,<sup>8,9</sup> and residents with type 2 diabetes often have little access to specialist care.<sup>5,7</sup> Commonly, primary care providers are responsible for assisting patients with diabetes management; evidence shows patients often receive suboptimal care due to physicians' lack of success applying clinical practice guidelines for diabetes management.<sup>5,7</sup>

Aboriginal people constitute a substantial portion of the population of Northern Alberta. Determinants such as poverty and education compound health-care accessibility barriers experienced by Aboriginals compared to non-Aboriginals. The effects may be reflected by higher rates of type two diabetes among Aboriginals: age-standardized prevalence was estimated at 3.7% among non-Aboriginal Albertans in 2000, compared to 8.5% estimated for the province's First Nations population.<sup>10</sup>

Health research data are frequently presented without adjustments for socio-economic variables that may influence comparisons across ethnicity.<sup>11</sup> Evidence shows that when socio-economic confounders are controlled for, "Aboriginality" loses its association with risk.<sup>12,13</sup> However, positive health outcomes for Aboriginals are not achieved through equal access to health care alone,<sup>13</sup> and differences in cause-specific mortality still correlate with ethnicity.<sup>11,12</sup> In a study examining death and renal transplantation, Tonelli et al. found the correlation with socio-economic status and mortality was similar for Aboriginals and non-Aboriginals treated with dialysis, though Aboriginals were less than half as likely to receive a renal transplant.<sup>4</sup>

The DOVE (Diabetes Outreach Van Enhancement) study conducted in two rural health regions in Northern Alberta undertook a provider-level intervention to improve diabetes care for type 2 diabetes patients. The study's rationale and design,<sup>8</sup> and the results of the intervention are reported elsewhere.<sup>5,14,15</sup> Briefly, the intervention involved a multidisciplinary team of diabetes specialists travelling to the larger communities in the region once a month for six months, providing support to local primary care physicians and allied

health-care professionals. The Canadian Diabetes Association’s Clinical Practice Guidelines (CPG’s) “best practices” were promoted. The intervention was evaluated by analyzing baseline and follow-up data collected from recruited patients.

A significant number of patients who participated in the DOVE study were Aboriginal. The objective of our current analyses was to assess whether differences existed between Aboriginals and non-Aboriginals in terms of clinical characteristics, utilization of health care resources, health status, and adherence to screening guidelines when baseline and six-month follow-up data were adjusted for covariates. In other words, our current analyses explored whether “Aboriginality” contributes to diabetes outcomes when adjusted for appropriate variables.

**METHODS**

The DOVE study received approval from the Human Research Ethics Board at the University of Alberta.

The Peace Region and Keewetink Lakes Region in Northern Alberta were selected. Both Regional Health Authorities (RHAs) were an approximate six-hour drive from the nearest secondary or tertiary referral centre.<sup>14</sup> Total population for the Peace RHA at the time was approximately 20,000, of which about 11% was Aboriginal. For Keewetink Lakes RHA, total population was approximately 26,000, of which about 46% was Aboriginal. Comparatively, Alberta’s total population was approximately 3 million, of which about 5% was Aboriginal.<sup>16,17</sup>

Three hundred ninety-four (394) patients were recruited via referral from local primary health-care givers, pharmacists, and through self-referral. Patients were enrolled in the study if they had type 2 diabetes, gave informed consent, and had sufficient ability in English to answer questionnaires (interpreters were allowed). Of the 394 recruited, 354 self-reported their ethnicity. Although no specific efforts were made to recruit or not recruit Aboriginals, 94 of the 354 (27%) self-identified as being Aboriginal (First Nations, Métis or Aboriginal).

Baseline data were collected through interviews (for demographic characteristics, histories and detailed medication profiles),

**TABLE I**

**Baseline Demographics**

		Non-Aboriginal (n=260)	Aboriginal (n=94)
Age (years)		63.70 ± 12.4	58.9 ± 12.6*
Sex	Male	132 (51%)	21 (24%)*
	Female	128 (49%)	73 (76%)
High School Education	Yes	99 (39%)	14 (16%)*
	No	161 (61%)	80 (84%)
Income	<\$19,999	89 (38%)	56 (64.4%)*
	≥\$19,999	171 (62%)	38 (35.6%)
Duration of Diabetes (years)		7.1 ± 7.6	9.8 ± 9.3*
Visited Diabetes Education Clinic (DEC)	Yes	148 (60%)	49 (56%)
	No	112 (40%)	45 (44%)
Years since last DEC visit (n=188)		3.7 ± 4.6	3.0 ± 3.6

\*p<0.05

**TABLE II**

**Adjusted Clinical Parameters at Baseline and Six Months**

	Ethnicity	Adjusted† Baseline Mean (95% CI)	Adjusted†‡ 6-month Mean (95% CI)
Systolic BP (mm Hg)	Aboriginal	130.3 (125.7-134.9)	132.2 (128.4-135.9)
	Non-Aboriginal	132.4 (129.9-135.0)	130.1 (128.0-132.2)
Diastolic BP (mm Hg)	Aboriginal	75.8 (74.7-80.6)	75.5 (73.0-78.0)
	Non-Aboriginal	77.6 (74.1-77.4)	76.4 (75.0-77.8)
A1c (%) (mmol/L)	Aboriginal	7.4 (7.0-7.8)	7.7 (7.4-7.9)
	Non-Aboriginal	7.3 (7.1-7.5)	7.4 (7.3-7.6)
BMI (kg/m <sup>2</sup> )	Aboriginal	31.1 (29.3-32.8)	32.6 (32.1-33.1)
	Non-Aboriginal	32.8 (31.9-33.8)	32.5 (32.2-32.8)
Total Cholesterol (mmol/L)	Aboriginal	4.83 (4.57-5.08)	5.00 (4.82-5.18)
	Non-Aboriginal	4.92 (4.78-5.06)	4.95 (4.85-5.05)

† Adjusted for age, sex, marital status, income, education, duration of diabetes

‡ Adjusted for baseline value and intervention

**TABLE IIIa**

**Baseline Screening Activities**

	Aboriginal	Non-Aboriginal	Baseline Odds Ratio†‡
Baseline Feet Checked in Past Year (n=351)	48 (52%)	145 (56%)	1.0 (0.6-1.9)
Baseline Eyes Checked in Past Year (n=354)	51 (54%)	167 (64%)	1.1 (0.6-2.0)
Baseline Eyes Dilated in Past Year (n=207)	42 (76%)	110 (72%)	0.8 (0.3-2.0)
Baseline Kidneys Checked in Past Year for Diabetes (n=294)	34 (42%)	109 (51%)	2.0 (1.1-3.9)*
Baseline Urine Checked in Past Year for Diabetes (n=316)	56 (62%)	143 (63%)	0.9 (0.5-1.8)

† An odds ratio greater than 1.0 indicates that Aboriginals were less likely to have screening

‡ Adjusted for age, sex, marital status, income, education, duration of diabetes

\* p<0.05 for comparison between Aboriginals and non-Aboriginals

**TABLE IIIb**

**Screening Activities at Six-month Follow-up**

	Aboriginal	Non-Aboriginal	Adjusted†‡ Odds Ratio (95% CI)
6 Month Feet Checked in Past Year	51 (54%)	165 (65%)	0.6 (0.3-1.3)
6 Month Eyes Checked in Past Year	55 (59%)	173 (67%)	1.7 (0.9-3.3)
6 Month Eyes Dilated in Past Year	41 (76%)	137 (79%)	7.1 (1.1-45.6)*
6 Month Kidneys Checked in Past Year for Diabetes	37 (44%)	146 (64%)	1.5 (0.6-3.7)
6 Month Urine Checked in Past Year for Diabetes	54 (60%)	177 (75%)	1.5 (0.7-3.3)

† An odds ratio greater than 1.0 indicates that Aboriginals were less likely to have screening

‡ Adjusted for intervention, baseline value, age, sex, marital status, income, education, duration of diabetes

\* p<0.05 for comparison between Aboriginals and non-Aboriginals

TABLE IV

## Unadjusted and Adjusted Patient-reported Health

	Ethnicity	Adjusted† Baseline Mean (95% CI)	Adjusted†‡ 6-month Mean (95% CI)
RAND-12 PHC	Aboriginal	43.3 (40.3-46.3)	44.5 (42.7-46.3)
	Non-Aboriginal	44.4 (42.8-46.0)	44.1 (43.1-45.1)
RAND-12 MHC	Aboriginal	42.9* (40.1-45.7)	47.4* (45.2-49.5)
	Non-Aboriginal	46.0 (44.5-47.5)	44.3 (43.1-45.4)
HUI3	Aboriginal	0.65 (0.57-0.73)	0.72** (0.67-0.78)
	Non-Aboriginal	0.67 (0.63-0.72)	0.64 (0.61-0.67)
Self-rated Health§	Aboriginal	3.3 (3.1-3.5)	2.5 (2.3-2.7)
	Non-Aboriginal	3.2 (3.0-3.3)	2.5 (2.3-2.6)

† Adjusted for age, sex, marital status, income, education, duration of diabetes

‡ Adjusted for baseline value and intervention

§ Self-rated health was scored on a 5-point Likert Scale (1=poor, 5=excellent)

\*  $p < 0.05$  for comparison between Aboriginals and non-Aboriginals

\*\*  $p < 0.01$  for comparison between Aboriginals and non-Aboriginals

standardized physical assessments and laboratory testing (for clinical indicators), and self-report questionnaires for health-related quality of life (HRQL) and utilization of health care resources. Follow-up physical exams, lab test and questionnaires were completed at six months.

Self-report questionnaires included the RAND-12 physical and mental health composites (PHC and MHC) and the Health Utilities Index Mark 3 (HUI3); a standard four-week recall was used. Study participants rated their general health on a five-point scale, with response options of excellent, very good, good, fair and poor. Higher scores indicated better self-rated health.

The RAND-12 contains 12 items from the RAND-36 Health Status Inventory (RAND-36).<sup>18</sup> Six of the 12 items create the Physical Health Composite (PHC); the remaining six create the Mental Health Composite (MHC). The PHC and MHC are norm-based standardized scores, with a mean of 50 and standard deviation of 10 (i.e., T-scores) in the general United States population.<sup>18</sup> For interpreting clinically important differences on the PHC and MHC of the RAND-12, Cohen's guidelines for effect sizes were used, as no established guidelines were available. Differences of 5.0 between groups represented a moderate effect size (mean difference = 5.0 / S.D. = 10.0 = 0.50), and were considered clinically important. Effect sizes greater than 0.80 were considered large, while effect sizes between 0.20 and 0.49 were considered small.<sup>19</sup>

The HUI3 used a multi-attribute utility function to assign valuations to different health states.<sup>20</sup> Eight attributes defined health status: vision, hearing, speech, ambulation, dexterity, emotion, cognition, and pain and discomfort. Overall HUI3 utility scores were obtained based on level of functioning (i.e., highly impaired to normal) on the eight attributes. HUI3 scores generally range from -0.36 to 1.0, with -0.36 representing the utility of the worst possible HUI3 health state, 0.0 representing dead and 1.0 representing perfect health.<sup>20</sup> Differences greater than 0.03 on the overall HUI3 score were considered clinically important.<sup>21,22</sup>

Self-reported emergency room utilization, hospitalizations, physician visits and absenteeism from work (for both general health reasons and reasons specifically related to diabetes) in the previous six months were collected to assess utilization of health care resources. Participation in screening activities (i.e., eye, dilated eye, and foot exams and screening for renal complications) over the previous six months was also assessed.

Statistical analyses were performed using SPSS Version 13.0. Clinical and HRQL data were analyzed as continuous data. For utilization of health care resources and absenteeism, individuals were dichotomized as users or non-users (e.g., having no emergency room visits or one or more). The exception to this was physician visits, which was treated as both continuous and dichotomous variable (i.e., the average number of physician visits and

whether or not a physician was seen was determined).

Aboriginals and non-Aboriginals were compared at baseline and six-month follow-up using multivariate analyses to control for potential confounding. Analysis of covariance was used to assess differences according to Aboriginal status for continuous outcomes, while logistic regression analysis was used to assess dichotomous outcomes. Age, sex, marital status, annual household income, level of education, and duration of diabetes were included in all analyses. Follow-up (six-month) results were adjusted for baseline values and group (intervention or control), in addition to the other covariates. Intention-to-treat analyses were performed with clinical and HRQL data (i.e., individuals missing six-month follow-up data were assumed not to have changed from baseline). For all comparisons, a  $p$ -value of less than 0.05 (two-tailed) was considered statistically significant.

## RESULTS

Aboriginal participants were younger than non-Aboriginal participants (mean age 58.9 vs. 63.7), had a longer duration of diabetes (mean 9.8 vs. 7.1 years) and were more likely to be female (76% vs. 49%) (Table I). After adjustments, the Aboriginal and non-Aboriginal groups were not significantly different in basic clinical parameters at baseline or at six-month follow-up (Table II).

Consistent with treatment gaps reported elsewhere,<sup>5</sup> screening activities (Table IIIa) in the six months prior to the study were approximately 42-72% of that recommended by the Canadian Diabetes Association's (CDA) Clinical Practice Guidelines.<sup>23</sup> At baseline, non-Aboriginals were twice as likely to have had their kidneys checked for diabetes in the previous six months (OR=2.0, 95% CI: 1.1-3.9). At six-month follow-up, screening activities were 44-79% of that recommended in the CDA Clinical Practice Guidelines. There were no differences between Aboriginals and non-Aboriginals at six months after adjusting for baseline screening activities, intervention status and the other covariates (Table IIIb).

Of the health status measured at baseline, only the MHC of the RAND-12 was

lower in Aboriginals compared to non-Aboriginals after adjustment for baseline characteristics (Table IV), the difference being 3.1 units ( $p < 0.05$ ) representing a small effect size (0.31). At follow-up, after controlling for baseline values, intervention status and the other covariates, MHC scores were 3.1 units (effect size = 0.31,  $p < 0.05$ ) higher in Aboriginals compared to non-Aboriginals, also representing a small-to-moderate effect size. Adjusted HUI3 scores for Aboriginals were also significantly higher than those for non-Aboriginals at the six-month follow-up (difference of 0.08,  $p < 0.05$ ).

At baseline, Aboriginals were 7.6 times (95% CI: 1.7-31.4,  $p < 0.05$ ) more likely to take days off work for general health reasons, but the odds ratio was 1.0 (95% CI: 0.2-4.5) at follow-up, after adjusting for baseline, intervention status and the other covariates (Table V). The baseline and six-month probabilities of having a physician visit were not significantly different for Aboriginals and non-Aboriginals (Table V). However, average number of physician visits overall (i.e., not specifically related to diabetes) was significantly higher for Aboriginals at baseline (adjusted difference of 1.5, 95% CI: 0.14-2.8,  $p < 0.05$ ) after adjusting for covariates. The average number of physician visits for diabetes did not differ at baseline between Aboriginals and non-Aboriginals, nor did the average number of physician visits overall at six months (data not shown).

**DISCUSSION**

After controlling for “Aboriginality”, there were relatively few differences between Aboriginals and non-Aboriginals in our study; those that did exist were not significant. Overall, our analysis demonstrated that “Aboriginality” does not contribute to diabetes outcomes when adjusted for appropriate variables. Our sample was relatively small, however.

Aboriginal participants in the DOVE study were younger and had a longer duration of diabetes, probably representative of the fact that Northern Alberta Aboriginals are suffering a similar fate as their counterparts throughout North America; that is, wherever studied, Aboriginal populations have more diabetes<sup>24-27</sup> and are developing it at younger ages.<sup>28,29</sup> Whereas Northern

**TABLE V**

**Health Care Resource Utilization (in Previous Six Months): Aboriginals vs. Non-Aboriginals**

	Baseline Odds Ratio†	6 Months Odds Ratio‡
Day Off Work	7.6 (1.7-31.4)*	1.0 (0.2-4.5)
Day Off Work for Diabetes	0.5 (0.04-5.9)	11.1 (0.8-151.7)
Physician Visits	4.5 (0.4-49.6)	1.2 (0.2-6.7)
Physician Visits for Diabetes	1.0 (0.6-1.9)	1.0 (0.2-6.0)
Emergency Room Visit	1.4 (0.7-2.5)	1.3 (0.6-2.7)
Emergency Room Visit for Diabetes	2.9 (0.9-9.5)	0.4 (0.09-1.5)
Hospitalizations	1.3 (0.7-2.5)	1.3 (0.6-2.7)
Hospitalizations for Diabetes	1.3 (0.5-3.6)	0.8 (0.2-2.8)

† Adjusted for age, sex, marital status, income, education, duration of diabetes  
 ‡ Adjusted for age, sex, marital status, income, education, duration of diabetes, baseline and intervention  
 \*  $p < 0.05$  for comparison between Aboriginals and non-Aboriginals

Canadian Aboriginals were once thought to have less diabetes than those in Southern Canada,<sup>30</sup> the relentless “progress” of acculturation is likely diminishing those differences, although definitive data are lacking.

The increased number of physician visits and emergency room visits for diabetes is consistent with provincial data for the same year (2000), which show that First Nations people with diabetes are 2-4 times more likely to utilize services in a physician’s office or an emergency department.<sup>31</sup>

The disparity in self-perceived mental health for Aboriginal participants reversed between baseline and six-month follow-up, after adjusting for covariates. This is an interesting observation, particularly given a recent provincial report that First Nations people sought health care services for mental health reasons at higher rates than non-First Nations people.<sup>31</sup> Additionally, the report observed First Nations people received less outpatient services at mental health clinics, while having more episodes in psychiatric treatment centres. The report speculated these treatment gaps were due to poor access to mental health clinics because of location; jurisdictional issues regarding federal vs. provincial government responsibility; and lack of culturally-sensitive treatment programs.<sup>31</sup>

**Limitations**

The DOVE study made no distinction between First Nations and Métis identity, therefore it is impossible to determine whether differences in the ways these two groups receive health care were potentially confounders.

Health status and utilization data relied on self-report rather than chart review; reliability of this information is therefore limited.

Our small sample size precluded us from conducting a meaningful analysis of possible differential effects of the DOVE intervention strategy on Aboriginal vs. non-Aboriginal participants. Relative to such an analysis, the DOVE intervention was not inherently designed to specifically address challenges unique to providing health care to Aboriginal peoples. Therefore any conclusions drawn from an analysis of differential outcomes among Aboriginals and non-Aboriginals in the intervention group may be inappropriate.

To properly evaluate the potential of a provider-level outreach intervention strategy such as DOVE’s, it would be useful for the strategy to specifically address certain traditional challenges experienced by Aboriginals in the health-care setting and with respect to health status (lower education levels, lower employment rates, poverty, etc.).<sup>32</sup> Broader consideration of determinants influenced by and incorporating Aboriginals’ experience of colonization is necessary for understanding the underlying factors differentiating health outcomes and experience of Aboriginals from non-Aboriginals.<sup>31</sup>

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**RÉSUMÉ**

**Objectif et contexte :** Les Autochtones représentent une part substantielle de la population du Nord de l'Alberta. Les déterminants comme la pauvreté et l'instruction peuvent aggraver les problèmes d'accès aux soins de santé que vivent les Autochtones par rapport au reste de la population. Dans le cadre d'une étude sur l'amélioration des soins du diabète, nous avons recueilli des données de référence et de suivi auprès de patients autochtones et non autochtones ayant reçu un diagnostic de diabète de type II dans deux communautés rurales du Nord de l'Alberta. Nous avons ensuite effectué des analyses pour déterminer l'existence de différences démographiques ou cliniques entre les Autochtones et les non-Autochtones.

**Méthode :** Nous avons recruté 394 patients diabétiques dans les régions sanitaires de Peace et de Keeweenaw Lakes. De ces patients, 354 ont indiqué s'ils étaient autochtones ou non; 94 ont dit l'être. Nous avons recueilli les données de référence et de suivi au moyen d'entretiens, d'examen médicaux standardisés, d'épreuves de laboratoire et de questionnaires d'auto-évaluation (le RAND-12 et le HUI3).

**Résultats :** Les Autochtones étaient plus jeunes, ils étaient diabétiques depuis plus longtemps, ils comptaient proportionnellement plus de femmes dans leurs rangs, et ils étaient moins susceptibles d'avoir terminé leurs études secondaires. Dans les données de référence, leur état de santé auto-perçu était uniformément pire que celui des non-Autochtones, mais ces écarts disparaissent après ajustement selon les facteurs confusionnels sociodémographiques, sauf pour l'état de santé mentale auto-perçu. Les Autochtones considéraient leur état de santé mentale pire que celui des non-Autochtones dans les données de référence. Nous avons aussi observé des écarts dans certains aspects de leur utilisation des services de santé.

**Discussion :** Malgré un profil démographique différent et quelques écarts au chapitre de l'utilisation des services de santé, dans l'ensemble, notre analyse démontre que le fait d'être autochtone ne contribue pas aux résultats du diabète lorsqu'on apporte des ajustements selon les variables pertinentes.