



ALZHEIMER'S DISEASE AND RELATED DEMENTIAS IN INDIGENOUS POPULATIONS IN CANADA: *Prevalence and Risk Factors*

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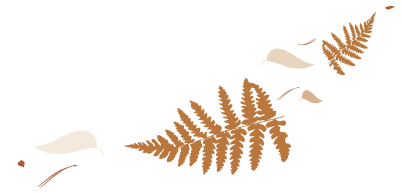
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Indigenous older adults are considered to be among Canada's most vulnerable citizens. They often face complex health issues stemming from socio-economic marginalization and a legacy of colonialism, and their ability to access healthcare is impacted by a host of barriers related to poverty, cultural and linguistic differences, racism and geography

(Beatty & Berdahl, 2011; Health Council of Canada, 2013).

1.0 INTRODUCTION



Canada's population is aging. In 2016, an estimated 16.9% of the population was over the age of 65 (Statistics Canada, 2017a), increasing by 1.6% since 2013, and this proportion is expected to increase to between 23.8% and 27.8% by 2063 (National Population Projection Team, 2015). While the Indigenous population profile is currently younger than the general population, it is expected to age more rapidly. Indigenous older adults¹ comprised 7.3% of the total Indigenous population in 2016, an increase of 3.5% since 2006, and this population is expected to more than double by 2036 (Statistics Canada, 2017b). While age does not necessarily mean ill health or disability, the risk of both of these does increase as people age (Canadian Institute for Health Information, 2011). In 2014, an estimated 51.5% of women and 41.0% of men in Canada aged 65 years and over had dementia (Chambers, Bancej, & McDowell, 2016). The number of people living with dementia is expected to double by 2030 and more than triple by 2050, which will place an increasing burden on health care systems (World Health Organization, 2012).

While little is known about Alzheimer's disease and related dementias (ADRDs) among Indigenous² populations in Canada, dementias are recognized as an emerging health issue in Indigenous communities (Jacklin, Walker, & Shawande, 2013; Jacklin & Warry, 2012). Indigenous older adults are considered to be among Canada's most vulnerable citizens. They often face complex health issues stemming from socio-economic marginalization and a legacy of colonialism, and their ability to access healthcare is impacted by a host of barriers related to poverty, cultural and linguistic differences, racism and geography (Beatty & Berdahl, 2011; Health Council of Canada, 2013). The rates of ADRDs among Indigenous people in Canada are expected to grow more rapidly than among non-Indigenous people due to higher rates of many of the risk factors for ADRDs in this population. The topic of ADRDs is therefore of great importance to Indigenous people.

This paper provides an overview of ADRDs, what is known about the prevalence of ADRDs among Indigenous peoples, the challenges associated with diagnosing dementias in this population, and the risk factors contributing to ADRDs. The paper draws on literature identified through a search of Pubmed, Web of Science, Access Science, Medline, and Google Scholar, using the search terms 'First Nations', 'Aboriginal', 'Native', 'Indigenous', 'Inuit', 'Métis', 'Indian', AND 'Alzheimer', 'Dementia', and 'Memory Loss'. Searches were narrowed, wherever possible, to include literature primarily from Canada, published up to January 2017. However, because there is limited research in this area, information from Australia and the United States was also included. While this literature review was not systematic, and therefore some relevant literature may not have been identified, it was comprehensive and is likely representative of current knowledge in this field.

¹ Older adults are typically defined as anyone 65 years of age and older (Centers for Disease Control and Prevention, 2015 Public Health Agency of Canada, n.d.). This definition will be used throughout this paper.

² The terms 'Indigenous' and 'Aboriginal' are used interchangeably throughout this paper to refer inclusively to the original inhabitants of Canada and their descendants, including First Nations, Inuit and Métis peoples as defined in Section 35 of the Canadian Constitution of 1982. When not referring to all Indigenous peoples collectively, the specific terms 'First Nations', 'Inuit', and 'Métis' will be used.

2.0 TYPES OF DEMENTIA



As we age, it is normal to experience some memory loss. Memory loss does not mean we have dementia. However, when memory loss and difficulties with thinking, judgement, problem solving or language are so severe they interfere with an individual's daily functioning, this is considered to be dementia and not a natural part of aging (American Psychiatric Association, 2013). Early diagnosis is critical for the safety of elders and for maintaining quality of life. The Alzheimer's Association (2011) has created a list of 10 warning signs to facilitate early detection of the disease:

- 1) memory loss that disrupts daily life;
- 2) challenges in planning or solving problems;
- 3) difficulty completing familiar tasks at home, at work or at leisure;
- 4) confusion with time or place;
- 5) trouble understanding visual images and spatial relationships;
- 6) new problems with words in speaking or writing;
- 7) misplacing things and losing the ability to retrace steps;
- 8) decreased or poor judgment;

- 9) withdrawal from work or social activities; and
- 10) changes in mood and personality.

Sometimes other conditions or diseases such as vitamin deficiencies, sleep disorders, mental illness, thyroid disease, brain tumors, drug interactions or alcohol abuse can produce symptoms similar to dementia (Alzheimer Society of Canada [ASC], 2017a). It is very important to see a health care provider as early as possible if you or someone you love is experiencing these symptoms.

While there are other types (causes) of dementia, five are typically recognized, including Alzheimer's Disease, vascular dementia, frontotemporal dementia, Lewy body dementia, and Familial Alzheimer's Disease³ (ASC, 2017b). These dementias are progressive and irreversible. This section will provide a brief overview of these types of dementia.

Alzheimer's disease (AD) is the most common cause of dementia (CSHA Working Group, 1994; Morris, 1996; National Institute on Aging, 2015). It

is estimated to account for between 60 and 80% of all cases of dementia (Alzheimer's Association, 2015). AD comes in two forms. The first, Familial Alzheimer's disease (FAD), is inherited genetically; a child has a 50% chance of inheriting the genetic mutation and developing FAD from a parent who has the disease (ASC, 2015b). This form of AD is often diagnosed before the age of 65. The most common form is called sporadic Alzheimer's disease, which is due to a "complex combination of our genes, our environment, and our lifestyle" (ASC, 2015a, p. 3). Factors that increase the risk of developing AD are often modifiable or partially modifiable. Modifiable risk factors include high cholesterol levels in the blood, high blood pressure, diabetes, smoking and obesity. Partially modifiable risk factors include alcohol, low levels of formal education, depression, and head injuries. Other risk factors are non-modifiable, including age, family history and genetics, FAD, sporadic Alzheimer's disease, gender,⁴ and other medical conditions, such as Parkinson's disease, multiple sclerosis, chronic kidney disease and HIV (ASC, 2015a).

³ Formerly known as 'Early Onset Alzheimer's Disease.'

⁴ Some evidence shows women are more likely to develop AD than men, though the evidence has not consistently been shown to be true.



Credit: iStockPhoto.com. ID 821315432

The hallmark signs of AD are plaques and tangles that are present on a brain scan. Plaques are numerous tiny dense deposits that are scattered throughout the entire brain. These plaques become toxic to brain cells if they are present in high levels (National Institute on Aging, 2015). Tangles interfere with vital processes and eventually choke off the living cells. As these brain cells die, the brain will shrink in certain regions, resulting in a deterioration of cognitive ability and memory.

Vascular dementia (VD) is the second most common cause of dementia after AD (CSHA Working Group, 1994; Morris, 1996; National Institute on Aging, 2015). It is estimated to account for approximately 10% of all dementia cases (Alzheimer's Association, 2015). It occurs when the brain cells are deprived of oxygen, similar to when a stroke occurs (ASC, 2015b). As a result, it usually comes on suddenly. This form of dementia


affects not only an individual's cognitive abilities, but may also result in urinary difficulties (ASC, 2015b). Risk factors for VD include being older than 65, having high blood pressure (hypertension), heart disease, and/or diabetes (ASC, 2015b).

Frontotemporal dementia is similar to AD in that it is progressive and irreversible; however, it differs from AD in that it tends to occur at a younger age and generally affects only the frontal and temporal lobes of the brain, areas associated with personality and behavior (ASC, 2015c). Because of this, early symptoms typically affect behavior or speech, rather than memory. An estimated 2-5% of all dementia cases are of this type (ASC, 2015c). Little is known about the risk factors for this form of dementia.

Lewy body dementia results from abnormal deposits of a protein, alpha-synuclein, inside the brain's

nerve cells, which interrupt the brain's messages (ASC, 2015d). This type of dementia is estimated to account for 5-15% of all dementias. Symptoms are generally similar to AD; however, memory problems may not be an early symptom, visual hallucinations may be common, and some symptoms (muscle stiffness, tremors, shuffling movements) may resemble Parkinson's disease (ASC, 2015d). This form of dementia usually progresses quickly. Like frontotemporal dementia, the risk factors are generally unknown, though genetics may be a factor.





The limited available evidence suggests that rates of dementia have been increasing more rapidly among Indigenous people compared to the general population, and that dementia onset may be earlier in Indigenous people

(Jacklin & Walker, 2012).

3.0 PREVALENCE OF ADRDs AMONG INDIGENOUS PEOPLES IN CANADA



There is a paucity of epidemiological research on ADRDs related to Indigenous people in Canada. Of the few studies identified in this literature review, none provided data specifically for Inuit or Métis peoples, while several focused on First Nations. Data on the prevalence of specific types of dementia is also lacking. One study reported on a large North American Aboriginal kindred with early onset familial AD, identifying over 100 at-risk family members⁵ (Butler, et al. 2011); however, the focus of this study was primarily on culturally appropriate treatment and communication rather than prevalence. The remainder of the studies focused on dementias for all Indigenous groups collectively or did not distinguish among the groups. Additionally, none of the studies were national in scale. As a result, the true prevalence of ADRDs among First Nations, Inuit and Métis is unknown.

The limited available evidence suggests that rates of dementia have been increasing more rapidly among Indigenous people compared to the general population, and that dementia onset may be earlier in Indigenous people (Jacklin & Walker, 2012). A study in Manitoba compared rates of ADRDs among the Cree from two northern reserves to a general population sample from Winnipeg and found that the Cree were significantly less likely to have AD (0.5% compared to 3.5% from the Winnipeg sample), but had similar rates of other types of dementias (4.2%) (Hendrie et al., 1993). In British Columbia, the prevalence of dementia among Status Indians was lower in 2002 compared to other residents but, within five years had reached parity at 0.6 per 100 (British Columbia Provincial Health Officer, 2009). In Alberta, data revealed that dementias were less prevalent among First Nations compared to other

Alberta residents in 1998, but had become higher for First Nations than the general population by 2009 (Jacklin et al., 2013). Warren and colleagues' (2015) systematic review of the prevalence and incidence of dementia among Indigenous populations internationally confirms higher rates among Indigenous peoples compared to non-Indigenous populations. The rates of ADRDs are expected to increase by 4.2 times for First Nations and 3.3 times for Inuit between 2006 and 2031 (Jacklin & Walker, 2012). The onset of dementia appears to be at a younger age in Indigenous people compared to the general population (Hendrie, et al., 1993; Jacklin et al., 2013).

⁵ See also Butler, Beattie, Puang Thong, & Dwosh (2010); Cabera, Beattie, Dwosh, & Illes (2015); Mackie et al. (2012); Stevenson et al. (2013); Stevenson et al. (2015) for further information on this study.

4.0 CHALLENGES WITH RECOGNIZING AND DIAGNOSING DEMENTIAS IN INDIGENOUS COMMUNITIES



In order to understand the true prevalence of ADRDs among Indigenous people, dementias must be recognized and diagnosed. However, dementias often go undiagnosed due to a number of challenges in Indigenous communities, including lack of awareness and knowledge about dementias, lack of geriatric care specialists, and use of inappropriate diagnostic tools, as well as the need to travel to urban centres to access specialized health care services. These challenges can have an impact on the timeliness of a dementia diagnosis, which can delay access to dementia services and impact the quality of life for individuals with dementias (Jacklin, Warry, & Blind, 2014a/b; Pace, Jacklin, & Warry, 2013). Additionally, because Indigenous individuals may have multiple chronic conditions and other health issues that are higher priority, dementias may not be diagnosed until they are in the late stages (Beatty & Weber-Beeds, 2012; Health Council of Canada, 2013).

Abram and colleagues (2012) note that dementias are a new phenomena in Indigenous communities and, as such, there may be a lack of knowledge about the signs, symptoms and treatment. In rural and remote Indigenous communities, it is primarily a physician or nurse practitioner's role to diagnose ADRDs due to

the lack of access to specialists. Andrews, Morgan and Stewart (2010), in their study exploring dementia awareness in northern Saskatchewan health regions, found that dementia diagnosis may be hampered by the lack of knowledge about dementias among physicians and nurses, highlighting the need for professional, caregiver and community education on dementia. They also identified additional challenges to dementia awareness among nurses in the north, including high staff turnover, lack of comfort and familiarity with living in a northern community, no prior nursing experience, and communication challenges, which can result in reduced familiarity with older members of northern communities. Additionally, they noted the dearth of provincial resources for geriatric referrals.

Jacklin and colleagues' study assessing attitudes, beliefs and behaviours related to ADRDs in diverse Indigenous communities in Ontario found that in remote and rural Indigenous communities, few individuals had undergone formal assessment for dementia and there was no consistent way of diagnosing dementia in these communities (Jacklin et al., 2014a/b; Jacklin, Pace & Warry, 2015; Pace et al., 2013). Lack of access to geriatric care specialists and culturally appropriate assessment processes

in these communities resulted in a reliance on mental, emotional and physical symptoms for diagnosis. This contrasted with southern and less remote Indigenous communities where the majority of caregivers stated their loved ones had been tested and diagnosed (Jacklin et al., 2014b).

An additional challenge in diagnosing dementias in Indigenous populations relates to the appropriateness of western diagnostic tools within this population. This topic has been a focus for researchers for several decades, with the consensus that the tools used in Indigenous contexts are often culturally inappropriate (see for example, Kaufert & Shapiro, 1996; Jacklin, et al., 2014a/b; Pace et al., 2013). Lanting and colleagues (2011) argue that the vast majority of neuropsychological measures for assessing mental cognition have been developed for White, educated and urban-dwelling individuals. For example, Cattarinich, Gibson, and Cave (2001) reviewed mental capacity assessment instruments being used in Indigenous contexts and found that "both the process by which capacity assessments are conducted and the content of the assessment instruments are problematic" (p. 1469). These tools had linguistic and cultural biases, including:

- a failure to account for differing degrees of acculturation across Indigenous cultures in assessment content;
- incompatibility of the assessment tools with characteristics of Indigenous cultures (such as the ethic of non-competitiveness and Indigenous attitudes towards gratitude and approval), Indigenous protocols around rules and social behaviors, and Indigenous peoples' preferences around communication styles;
- failure to account for the prevalence of particular health problems which may inhibit performance during an assessment;
- incongruences in the meanings of English words and biomedical concepts when translated into Indigenous languages; and
- the role of education levels on assessment performance.

The lack of a validated cognitive screening tool which takes into account the broader social determinants of health and cultural differences places the reliability of mainstream screening tools into question when used with Indigenous peoples (Cattarinich et al., 2001; Jacklin & Walker, 2012).

Researchers have been working to develop more culturally appropriate screening tools. Hall, Hendrie, and Brittain (1993) developed a screening tool for the Cree of Manitoba, consisting of a cognitive test adapted to incorporate cultural content (using a translation/back-translation process), and an interview with an informant about the subject's daily living. They found that scores were comparable to a screening tool used for non-Indigenous residents of Winnipeg, with a specificity of 89% for clinically diagnosing dementia in this Indigenous population. Lanting et al. (2011) undertook cultural and geographical modifications of the Pyramids and Palm Trees cognitive screening tool for use with Indigenous populations. In consultation with Indigenous grandmothers in Saskatchewan, they developed the Grasshoppers and Geese test to prompt conversation and relaxation in Indigenous patients. Adaptations included translating the test from English to Cree, and modifying or removing items so they did not assume a specific level of formal education or exposure to urban culture on the part of patients. Likewise, an adaptation of the Kimberley Indigenous cognitive assessment tool for use with Anishinaabe older adults was found to be culturally relevant and psychometrically sound and ready for pilot testing (Pitawanakwat et al., 2016). These

diagnostic tools must also be utilized in culturally appropriate ways. This includes observing cultural etiquette, respecting informal rules of communication, hiring native-speaking interviewers or translators, including back translation to ensure accuracy of English content translated into Indigenous languages, and considering including family in cognitive assessments to help alleviate stress (Cattarinich et al., 2001).

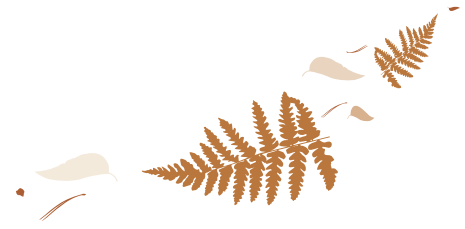
Other factors related to Indigenous perceptions of mainstream health care providers and of dementia and caregiving were also a challenge to dementia diagnosis. Jacklin and colleagues (2014b) found that family obligations around caregiving, perceptions of dementia as part of normal aging, denial of behavioural changes, and patients not liking or being able to connect with physicians delayed seeking a diagnosis or care for First Nations individuals with dementia in Ontario. Others noted that fear or mistrust of western systems or health care personnel, fear of diagnosis or fear of its repercussions also resulted in delays in diagnosis repercussions (Cammer, 2006; Finkelstein, Forbes, & Richmond, 2012). Resolving these types of challenges to diagnosis are critical to understanding the true prevalence of dementias in Indigenous populations.



Indigenous people have an increased risk of ADRDs due to the impacts of colonization, including marginalization, intergenerational trauma, and substance abuse, on their physical and mental health and well-being

(Alcock, 2014; Bourassa, Blind, Dietrich, & Oleson, 2015).

5.0 RISK FACTORS FOR ADRDs



The Alzheimer’s Society of Canada (n.d.) defines risk factors for ADRDs as “characteristics of the person, lifestyle, environment, and genetic background that contribute to the likelihood of getting a disease” (para. 3). While risk factors alone do not cause a disease, they do increase the likelihood of developing a disease. Risk factors for ADRDs can be grouped under three categories: modifiable, non-modifiable, and potentially modifiable. Modifiable risk factors are those factors that can be changed or modified; non-modifiable risk factors are those that cannot be changed; and potentially modifiable risk factors are modifiable but dependent on additional environmental factors and individual conditions which may create insurmountable challenges to modification. Table 1 summarizes the risk factors related to ADRDs, characterized as modifiable, non-modifiable, or potentially modifiable (see Baumgart et al., 2015; Barnes & Yaffe, 2011).

Although there remains a dearth of literature on prevalence and rates of ADRDs in the Indigenous population in Canada. Scholarship has focused on risk factors associated with ADRDs in this population. Indigenous people have an increased risk of ADRDs due to the impacts of colonization, including

TABLE 1: RISK FACTORS FOR ADRDs

Modifiable risk factors	Potentially modifiable risk factors	Non-modifiable risk factors
<ul style="list-style-type: none"> • Physical inactivity • Diabetes • Hypertension • Obesity • Smoking • Diet 	<ul style="list-style-type: none"> • Alcohol • Depression • Low education • Head injuries • Stress/PTSD 	<ul style="list-style-type: none"> • Age • Family history/genetics • Gender

marginalization, intergenerational trauma, and substance abuse, on their physical and mental health and well-being (Alcock, 2014; Bourassa, Blind, Dietrich, & Oleson, 2015). Many of the factors that increase the risk of ADRDs among Indigenous people are modifiable. For example, in a recent article investigating implications of modifiable risk factors (including diabetes, midlife hypertension and obesity, physical inactivity, low education, and smoking) for AD in the Indigenous population in Canada, Petrusek MacDonald, Barnes and Middleton (2014) estimated that modifiable risk factors could account for approximately 75% of AD cases in the Indigenous population. Out of the six modifiable risk factors, physical inactivity and

low educational attainment were deemed to have the highest risk of developing AD in the Indigenous population. Given the importance of modifiable risk factors in the development of ADRDs among Indigenous peoples, the authors called for strategies focused on reducing the rates of these risk factors in Indigenous communities.

This section will discuss the prevalence of modifiable risk factors for ADRDs within Indigenous populations in Canada, including physical inactivity, diabetes, hypertension, obesity, smoking, depression, alcohol, PTSD, low educational attainment, and diet.



5.1 Physical Inactivity

Physical inactivity has consistently been linked to increased risk of ADRDs. Not only does exercising decrease your risk of these diseases, it can improve one's cognitive performance (Middleton & Rockwood, 2007; Rolland, van Kan, & Vellas, 2008). In a literature review by Rolland and colleagues (2008), the authors found that "physical activity could result in better brain health, prevent cognitive decline, and reduce the incidence of AD" (p. 395).

Physical inactivity is projected to be one of the main contributors to cases of ADRDs in the Indigenous population (Petrasek MacDonald et al., 2015). There is a paucity of research on Indigenous peoples' physical activity, especially research that compares physical activity levels of Indigenous people to the general population in Canada. The research that exists often devalues participation in traditional practices (such as berry picking, hunting, or fishing) as physical activity (Young

& Katzmarzyk, 2007). Nevertheless, the existing evidence does suggest that many Indigenous people are not getting enough physical activity, which is increasing the risk of poorer health outcomes. For example, the 2008-10 Regional Health Survey found that approximately 46.4% of First Nations adults living on reserve or in northern communities are inactive, 28.3% are moderately active and only 25.2% are active, with the proportion of adults who are physically active decreasing with age (First Nations Information Governance Centre [FNIGC], 2012). Data from the 2005 Canadian Community Health Survey indicated that First Nations people living off-reserve and Métis have slightly higher rates of physical activity compared to their non-Indigenous counterparts (37% and 39% respectively versus 30%), while Inuit people had similar rates of physical activity (Findlay, 2011).

Research has shown that loss of traditional lifestyles is significantly connected to decreased rates of physical activity in Indigenous

communities on and off reserve (Akande, Hendriks, Ruiter, & Kremers, 2015; Gates, et al., 2016). Specifically, rapid social, cultural, and environmental changes associated with colonialism have been noted as impacting the reduced participation in traditional activities. Other barriers to physical activity identified for Indigenous peoples include:

- structural constraints (e.g. low socioeconomic status, lack of access to transportation or sports equipment);
- institutional constraints (e.g. lack of or poorly maintained sport and activity facilities, lack of sport and physical activity programs);
- intrapersonal constraints (e.g. transient lifestyle, substance abuse and related social problems; prevalence of chronic conditions or health issues, lack of motivation, low self-esteem);
- cultural constraints (e.g. racism and gender role expectations. lack of cultural relevancy in active aging policies, lack of traditional activities in programs and fitness classes); and
- environmental constraints (such as neighbourhood safety, fear of crime, poor walkability; geographic isolation; climates not conducive to physical activity) (Belza et al., 2004; Brooks-Cleator, 2014; Findlay, 2011; Findlay, & Kohen, 2007; Forsyth, & Heine, 2008; Frisby, Alexander, & Taylor, 2010; Mason, & Koehli, 2012; McLintock, 1999; Ranzijn, 2010).

Strategies to improve physical health and well-being for Indigenous peoples must be holistic and multi-sectoral to address these wide-ranging socio-economic, institutional, environmental, intrapersonal, and cultural barriers.

5.2 Diabetes, Obesity and Hypertension

Chronic conditions such as diabetes, obesity and hypertension are cardiovascular risk factors, meaning they also present the risk of developing heart disease. Cardiovascular risk factors have been associated with cognitive decline, dementia and even AD (Grodstein, 2007). For example, people with diabetes have two times the risk of developing dementia than those without diabetes (Barnes, & Yaffe, 2010). Furthermore, hypertension and obesity have been associated

with the development of dementia and cognitive decline (Fergenbaum et al., 2009a/b; Middleton & Yaffe, 2009).

High rates of chronic conditions like obesity, hypertension and diabetes have been well documented in Indigenous communities across Canada. However, rates vary widely across Indigenous groups with First Nations having the highest rates of chronic conditions while Inuit have the lowest (Bruce, Riediger, & Lix, 2014; Lix, Bruce, Sarkar, & Young, 2009; Sarkar, Lix, Bruce, & Young, 2010; Wallace, 2014). The 2012 Aboriginal Peoples Survey indicated that 56% of off-reserve First Nations people aged 15 and older and 55% of Métis reported having at least one chronic condition, compared to 48% of the general population and 43% of the Inuit population (Gionet & Roshanafshar, 2015). The majority (62.6%) of First Nations adults

living on reserve have reported having at least one chronic health condition (First Nations Information Governance Centre [FNIGC, 2012].

Research has shown that First Nations and Métis people are considerably more likely to have diabetes compared to the general population, while rates among Inuit (once rare) are increasing rapidly and have now caught up to the general population. First Nations people are three to five times more likely to have diabetes than non-First Nations people (Dyck, Osgood, Lin, Gao, & Stang, 2010; Harris, Bhattacharyya, Dyck, Naqshbandi Hayward, & Toth, 2013). In 2008/09, the age-standardized rates of diabetes were 17.2% among First Nations individuals living on reserve, 10.3% among First Nations individuals living off reserve, and 7.3% among Métis compared to 5% of the general population (Public Health Agency

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of Canada [PHAC], 2011a) and 5% of the Inuit population⁶ (Wallace, 2014). First Nations people are also diagnosed with type 2 diabetes at a younger age than non-First Nations people (Dyck et al., 2010).

There is less research available on the prevalence of hypertension (high blood pressure) among Indigenous peoples. The 2011 National Household Survey reports that among off-reserve First Nations, Métis, and Inuit peoples, prevalence of high blood pressure was 15%, 17% and 11% respectively (Kelly-Scott & Smith, 2015). The prevalence of high blood pressure is especially alarming for on-reserve First Nations. In 2012, 21.8% of First Nations reported having high blood pressure (FNIGC, 2012). To provide some measure of comparison, Statistics Canada (2015) reports that 17.1% of males and 17.6% of females aged 12 and older in the general Canadian population had been diagnosed with high blood pressure in Canada in 2012.

Indigenous peoples also have higher rates of obesity compared to the general population. While there are no directly comparable indicators across all Indigenous groups, Gionet and Roshanafshar (2015) report rates of obesity among First Nations people living off reserve, Métis and Inuit peoples in 2007-2010 at 26%, 26% and 22% respectively, compared to only 16% of the non-Indigenous population, while the 2012 RHS reports that 34.8% of on-reserve First Nations are obese and 5.4% are morbidly obese (FNIGC,

2012). Given the pervasiveness of obesity, diabetes and hypertension among Indigenous people, the potential for increased development of ADRDs in this population is a major cause for concern. The consistent trend of higher rates of chronic conditions for Indigenous peoples can be attributed to lifestyle changes, including poor diets and physical inactivity.

5.3 Diet

Over the years, there has been conflicting evidence on how diet influences the risk of ADRDs, but there is strong evidence that specific nutrients confer protective benefits, such as vitamin E, B vitamins and the n-3 fatty acids (Morris, 2016; Scarmeas, Stern, Tang, Mayeux, & Luchsinger, 2006; Xu et al., 2015). The Alzheimer's Association (2017) has acknowledged the limited published literature on the effects of diet on cognitive functioning; however, two diets have been noted to have positive benefits and lower the risk of developing AD (see also Gardener et al., 2012; Scarmeas et al., 2006). These diets include the Dietary Approaches to Stop Hypertension (DASH) and the Mediterranean diet (MeDi). Both of these diets are low in saturated fats, salt, red meats, and sugar; place emphasis on consumption of fruits and vegetables, whole grains, fish and poultry; and use 'healthy fats' such as olive oil instead of butter. The DASH and MeDi diets have also been linked to a decrease in cardiovascular risk factors such as hypertension, diabetes, and heart

disease – all of which have been documented to increase the risk of ADRDs (Gardener et al., 2012).

Traditionally, Indigenous peoples in Canada maintained diets comprised of local plant and animal sources through hunting and gathering processes. However, over time, these food sources have been replaced largely with foods that are high in fats and sugars, resulting in an increase in chronic diseases such as cardiovascular disease, obesity and diabetes, all of which are risk factors for ADRDs (Petrasek-Macdonald et al., 2015). Many Indigenous people face significant barriers in accessing healthy market and traditional foods. Due largely to the impacts of colonization, Indigenous people are among the poorest in Canada (Wilson & MacDonald, 2010). As a result, they have increased vulnerability to food insecurity. Tarasuk and colleagues (2016) reported that in 2014, 25.7% of Indigenous households off reserve (as measured through the Canadian Community Health Survey) were food insecure, with prevalence of food insecurity highest in Nunavut and the Northwest Territories, at 46.8% and 24.1% respectively. Likewise, a high prevalence of food insecurity was reported among First Nations on reserve in the 2008/10 First Nations Regional Health Survey, with more than half (54.2%) of households categorized as being 'moderate' to 'severely' food insecure (FNIGC, 2012).

⁶ These rates must be interpreted cautiously due to small sample sizes.



Traditionally, Indigenous peoples in Canada maintained diets comprised of local plant and animal sources through hunting and gathering processes. However, over time, these food sources have been replaced largely with foods that are high in fats and sugars, resulting in an increase in chronic diseases such as cardiovascular disease, obesity and diabetes, all of which are risk factors for ADRDs

(Petrasek-Macdonald et al., 2015).


Lack of access to high quality and affordable healthy foods is another significant barrier to eating a nutritious diet. Studies⁷ have shown that Indigenous people generally meet the recommendations of the Canadian Food Guide for meat and alternatives, but fall well short of the recommended levels for milk products, fruits and vegetables, and grain products (see for example Blanchet & Rochette, 2008; Halseth, 2015). These foods are generally less readily available in northern and remote Indigenous communities, and are more expensive than unhealthier processed market foods that are high in salt, sugar, and carbohydrates (FNIGC, 2012; Kuhnlein, McDonald, Spiegelski, Vittrekwa, & Erasmus, 2013; Rosol,

Powell-Hellyer, & Chan, 2016). For example, First Nations women in a northern Saskatchewan reserve community described having to leave the community to shop for groceries since food sold in the local stores was considered as ‘junk food’ (Bruner & Chad, 2014). Additionally, older people are more likely to eat a nutritious, balanced diet compared to younger ones (Drewnowski & Shultz, 2001). Nearly half of First Nations adults aged 60 years or older participating in the 2008/10 RHS reported they “always or almost always” consumed a healthy diet, compared to only 21.9% of those aged 18 to 29 (FNIGC, 2012).

Lack of access to traditional foods is another barrier to healthy eating

for Indigenous people. Traditional foods have numerous nutritional benefits, including lower content of unhealthy fats and high nutrient densities for iron, B vitamins, vitamin D, dietary fibre, zinc, copper and magnesium, yet consumption of these foods by Indigenous people has been decreasing over time. For example, the FNIGC (2012) reports a decrease in the proportion of First Nations adults participating in traditional food gathering activities in the past 12 months since the 2002/03 Regional Health Survey (RHS), including fishing (10.6%), berry picking (9.8%), and hunting or trapping (9.8%). A wide range of social, economic and environmental barriers have contributed to this decline in the consumption of

⁷ Most of these studies are focused on rural, remote or isolated Indigenous (First Nations or Inuit) communities, with few studies examining the dietary patterns of urban Indigenous people or Métis.



traditional foods, including the high price of hunting equipment, the safety of traditional foods through the bioaccumulation of chemical contaminants, time constraints associated with the replacement of a traditional economy with a wage-based one, and the loss of cultural knowledge related to hunting, fishing and food gathering practices (Kuhnlein & Chan, 2000; Rosol, et al., 2016). Additionally, climate change appears to be having an impact on the availability of country foods. For example, in a Woodland Cree community, women reported a decrease in the availability of wild meats in the area as a barrier to accessing traditional foods (Bruner & Chad, 2014). Likewise, Inuit adults from across Arctic Canada who participated in the 2007-08 Inuit Health Survey reported that fish, whale, seal, caribou, and birds/fowl were less abundant over the past 12 months (Rosol et al., 2016). As access to traditional foods decreases, Indigenous people are more likely to purchase less nutrient dense store-bought foods.

5.4 Smoking

There is considerable evidence that smoking is a risk factor for ADRDs (Cataldo, Prochaska, & Glantz, 2010; Durazzo, Mattson, & Weiner, 2014; Rusanen, Kivipelto, Quesenberry, Zhou, & Whitmer, 2011). Smoking is estimated to account for nearly 5 million cases of AD worldwide (Durazzo et al., 2014). A systematic review undertaken by Durazzo and colleagues (2014) aimed to identify the mechanisms by which smoking increases the risk of AD. They found that a history of smoking is strongly related to multiple neurobiological and neurocognitive abnormalities, which are components of preclinical stages of AD. Smoking is associated with early onset AD symptomology as a result of cerebral oxidative stress; that is, damage to the brain and other organ system tissue resulting from increased concentrations of reactive oxygen and nitrogen species and other oxidizing agents. Smoking is also associated with increased risk of cardiovascular diseases, diabetes and

hypertension, which are potentially modifiable risk factors for AD (Anand et al., 2001).

There is higher commercial tobacco⁸ use in Indigenous communities, especially among individuals living on reserve. More than half (57%) of First Nations adults living on reserve reported they smoked daily or occasionally in the 2008/10 RHS (FNIGC, 2012). Rates of smoking are also higher for off-reserve First Nations, Inuit and Métis. A reported 37.9% of off-reserve First Nations and 40.7% of Métis adults were current smokers, compared to only 16.6% of adults in the general Canadian population (Ryan, Leatherdale, & Cooke, 2016). Inuit had the highest rates of smoking, with 52% of Inuit aged 15 and older reporting smoking daily, and 9% smoking occasionally (Wallace, 2014). Factors which have been found to be associated with increased likelihood of smoking among Indigenous peoples have included low income and unemployment

⁸ For the purposes of this Fact Sheet, when the word 'tobacco' is used, it is referring to the uses of commercial tobacco.

(FNIGC, 2012; Richmond & Ross, 2009), as well as Indigenous status (Lemstra, Mackenbach, Neudorf, Nannapaneni, & Kunst, 2009).

5.5 Alcohol

More research is needed to further understand how alcohol is a risk factor for ADRDs; however, mild to moderate consumption of alcohol has been shown to be protective against developing ADRDs, whereas excessive alcohol consumption has been shown to increase your chance of developing cognitive decline (ASC, n.d.; Imtiaz, Tolppanen, Kivipelto, & Soininen, 2014). In a large cohort study, Paul and colleagues (2008) found that individuals with higher alcohol consumption showed decreased brain volume. This was especially the case for females who absorb alcohol faster than males, and are thus more susceptible to the negative effects of alcohol on the brain.

Research has shown that Indigenous peoples are less likely to consume

alcohol than their non-Indigenous counterparts; however, when they do drink, they are more likely to report drinking heavily (FNIGC, 2012). The 2008/10 RHS reports that more than a third of First Nations adults abstained from alcohol use in the 12 months prior to the survey (with rates of abstinence higher among females than males). In comparison, only 23% of the general Canadian population abstained from alcohol use in the preceding year (FNIGC, 2012). However, among alcohol users, nearly 64% met the criteria for heavy drinking,⁹ and while heavy drinking drops off dramatically after young-adulthood in the general Canadian population, significant reductions in heavy drinking do not occur among First Nations adults until age 60 or older (FNIGC, 2012). Data from the 2012 Canadian Aboriginal Peoples Survey and the 2011 National Household survey showed that 30.9% of First Nations off reserve, 24.9% of Métis, and 23.5% of Inuit had abstained from alcohol consumption, compared to 23.5% of the general population

(Kelly-Scott, & Smith, 2015). In contrast, 35.0% of First Nations off reserve, 29.6% of Métis, and 38.5% of Inuit were heavy drinkers, compared to 22.5% of the general population.

5.6 Depression

Research has shown that depression can increase the risk of cognitive impairment and dementia (Gorwood, Corruble, Falissard, & Goodwin, 2008; Simons et al., 2009). Depression can damage the hippocampal region in the brain, the part of the brain responsible for long-term memory (Butters et al., 2008; Peavy et al., 2007). Research also suggests that people with depression have increased accumulation of β -amyloid plaques, which are markers of AD (Butters et al., 2008).

There is a lack of comparable (and recent) data on depression among Indigenous populations in Canada, and the existing evidence is inconsistent. The 2002/03 First

⁹ Heavy drinking is defined by the FNIGC (2012) as 5 or more drinks in one sitting at least once a month for the past 12 months.

Nations Regional Health Survey indicated that 25.7% of on-reserve First Nations men and 34.5% of on-reserve First Nations women reported feeling depressed for more than two weeks that year (National Aboriginal Health Organization, 2006). Tjepkema (2002) reported increased levels of depression among Indigenous people living off reserve compared to the general population (13.2% vs. 7.3%). In Manitoba, a study showed Métis generally had similar rates of depression compared to the general population; however, rates of depression were higher for Métis in some communities (Martens et al., 2010). Compared to the general population, only a slightly higher proportion of Inuit in Nunavut reported feeling so depressed nothing could cheer them up (Galloway & Saudny, 2012).

5.7 Chronic psychological stress and Post Traumatic Stress Disorder (PTSD)

Chronic psychological stress, including PTSD, has been identified as a risk factor for ADRDs (Greenberg, Tanev, Marin, & Pitman, 2014; Yaffe et al., 2010). It has been associated with a decrease in brain volume, specifically in the hippocampus (Greenberg et al., 2014), as well as with cognitive decline, especially with respect to episodic memory

(Wilson et al., 2003; Wilson et al., 2007). Individuals with chronic psychological stress or PTSD have been found to be twice as likely to develop AD (Qureshi, et al., 2010; Wilson et al., 2003; Wilson et al., 2007; Yaffe et al., 2010). Yaffe and colleagues (2010) found that while PTSD was associated with all types of dementia, the association was strongest for frontotemporal dementia and weakest for vascular dementia. However, it has been noted that, “[PTSD and chronic stress] appear to play an ancillary role among numerous factors that are involved in the pathogenesis of dementia, including AD” (Greenberg et al., 2014, p. S163). As such, there is still much to be learned about the relationship between PTSD, chronic stress and the risk of ADRDs.

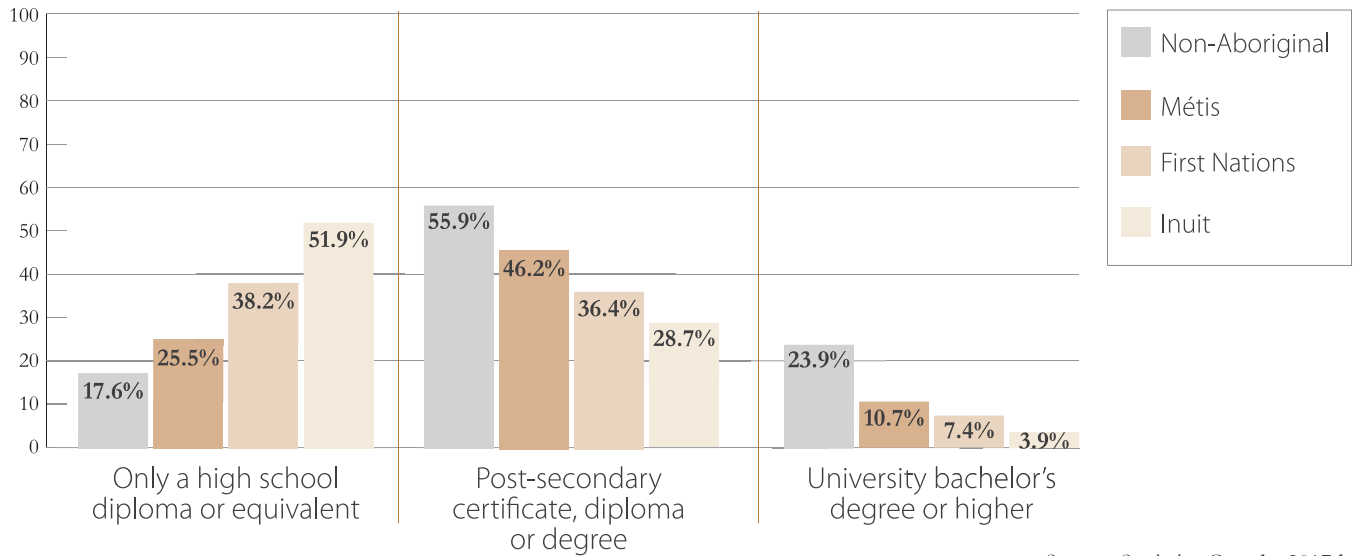
Little research has explored the prevalence of PTSD and chronic psychological stress among Indigenous peoples in Canada. Of the few studies that have been done, the research indicates that PTSD and chronic psychological stress may be higher in Indigenous communities compared to non-Indigenous communities due to historical effects attributed to colonialism and ongoing intergenerational effects (Bellamy & Hardy, 2015; Kirmayer, Simpson, & Cargo, 2009). The high rates of suicide and suicide ideation among Indigenous peoples are certainly a testament to the high levels of psychological stress in this

population. Over the 1991-2001 period, suicide rates were nearly twice as high among Registered Indian and Métis men compared to non-Indigenous men, while Inuit have had the highest suicide rates (Tjepkema, Wilkins, Senécal, Guimond, & Penney, 2009). Over the period 1999-2003, Inuit suicide rates were 10 times higher than the general population (Aboriginal Healing Foundation, 2007; PHAC, 2011b). Further, for Inuit from Nunavut, suicide rates have been on the increase, even among older Inuit, with rates increasing by more than 10% over the 1989-2013 period (Hicks, 2015). According to the 2012 Aboriginal Peoples Survey, more than 20% of First Nations, Inuit and Métis adults reported having had suicidal thoughts, with women being more likely to report suicidal thoughts compared to men (Kumar, 2016).

Many of the risk factors associated with PTSD for Indigenous peoples in Canada are directly associated with policies of assimilation, such as separation of Indigenous children from their families and culture through forced placement into residential schools or through child welfare apprehensions; the dispossession of communities from traditional lands and forced placement onto reserve lands; and the continued oppression and marginalization of this population (Kirmayer et al., 2009). In addition, trauma is influenced by different social factors (i.e. poverty and low educational attainment), which greatly affect Indigenous communities (Bellamy & Hardy, 2015).



FIGURE 1: EDUCATIONAL ATTAINMENT BY INDIGENOUS GROUP



Source: Statistics Canada, 2017d.

5.8 Low Educational Attainment

Low educational attainment has been identified as a risk factor for ADRDs (Shoenhofen Sharp, & Gatz, 2012; Stern, 2006; Valenzuela et al., 2008). Research has shown that people with higher levels of educational attainment have what is called an increased “cognitive reserve” (CR); that is, their brains have a higher capacity to resist damage as it ages because cognitively stimulating activities foster the growth of new neurons in the brain, slowing the “rate of hippocampal atrophy in normal aging, and perhaps even prevent[ing] accumulation of amyloid plaque” (Stern, 2012, p. 2). As a result, individuals with more education can tolerate more AD pathology,

delaying the onset of clinical AD. Furthermore, as noted by Middleton and Yaffe (2009), people – young and old – who engage in mentally stimulating activities such as learning, reading or playing games, are less likely to develop AD.

Indigenous peoples in Canada have lower levels of educational attainment compared to their non-Indigenous counterparts, and this has been noted as a potentially significant factor attributed to the development of ADRDs in this population (Jacklin et al., 2013; Petrasek MacDonald, et al., 2015). There are significant gaps in education between Indigenous and non-Indigenous people, especially among First Nations living on reserve, registered/status First Nations, and Inuit (Arriagata, &

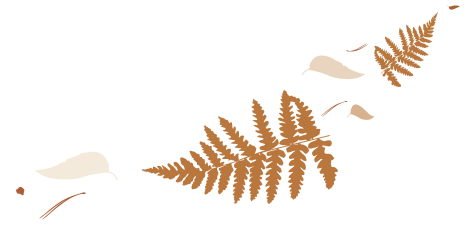
Hango, 2016; Bougie, Kelly-Scott, & Arriagata, 2013; Statistics Canada, 2013). Data from the 2016 Census (Figure 1) showed that while there have been increases in educational attainment for all Indigenous populations in both high school and postsecondary qualifications since the 2011 National Household Survey, some Indigenous people still face significant barriers in accessing educational opportunities, especially First Nations with Registered Indian status living on reserve and Inuit (Statistics Canada, 2017c, 2017d). To understand the present context of educational attainment in the Indigenous population today, it is important to consider the impacts of colonialism and the residential schooling system (Gordon & White, 2014).¹⁰

¹⁰ For more information about the impact of colonialism on education inequalities among Indigenous people, please refer to the National Collaborating Centre for Aboriginal Health’s (2017) fact sheet titled *Education as a social determinant of First Nations, Inuit and Métis health*.



The higher rates of chronic disease and modifiable risk factors, many of which can be attributed to the impacts of colonization such as poverty, changing lifestyles, and the impacts of intergenerational trauma, are placing Indigenous peoples at increased risk of dementias.

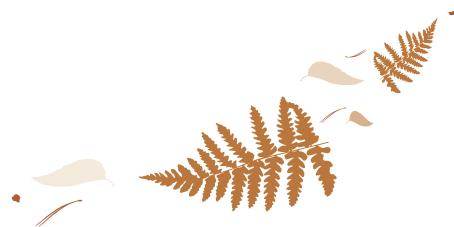
6.0 CONCLUSION



Rates of ADRDs in the Indigenous population in Canada are not well known, despite the increase in the prevalence of ADRDs worldwide. This represents a substantial gap in literature and scholarship to date. More work is needed to understand rates and prevalence of ADRDs in the Indigenous population across Canada, especially with respect to Inuit and Métis for whom little data exists. As the population in Canada continues to age, this information will be especially important to provide culturally safe and relevant support for Indigenous families experiencing ADRDs.

Although definitive rates are not documented in the literature, rates of ADRDs among Indigenous people have been said to be similar to non-Indigenous people (Jacklin et al., 2013). Despite this similarity, several differences present serious cause for concern. ADRDs present differently in Indigenous populations, with the onset of dementias occurring at a younger age than non-Indigenous people, and the rates are increasing faster among Indigenous people compared to the non-Indigenous people. The higher rates of chronic disease and modifiable risk factors, many of which can be attributed to the impacts of colonization such as poverty, changing lifestyles, and the impacts of intergenerational trauma, are placing Indigenous peoples at increased risk of dementias. This highlights the need for integrated multi-sectoral approaches to address the socio-economic inequities and health disparities Indigenous people are experiencing in order to stave off the potential for a dementia ‘epidemic’ among this population.

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