

Module 9

Diet and Mental Health of Circumpolar Peoples

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Key Terms and Concepts

- Arctic and Subarctic regions
- brain function
- circumpolar peoples
- depression
- diet
- mental health

- omega-3 fatty acids
- suicide
- traditional

Learning Objectives/Outcomes

Upon completion of this module, you should be able to

1. describe the benefits of the traditional lifestyles of circumpolar peoples.
2. list and describe key components of a traditional circumpolar diet.
3. outline the changes in the traditional diets of circumpolar peoples.
4. list and describe the negative health effects of a Western-style, store-bought diet.
5. describe the mental illnesses related to living in the Arctic and Subarctic regions.
6. explain the connection between diet and its effects on brain development, health, and function.
7. describe and explain why diet may be an important risk factor for mental health in circumpolar peoples.

Reading Assignments

Lucy J. Boothroyd, Laurence J. Kirmayer, Sheila Spreng, Michael Malus, and Stephen Hodgins, “Completed Suicides among the Inuit of Northern Quebec, 1982–1996: A Case-Control Study,” *Canadian Medical Association Journal* 165(6):749–755. [Online]

http://www.cmaj.ca/cgi/content/full/165/6/749?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=%22Completed+suicides+among+the+Inuit+of+northern+Quebec%2C+1982%961996%3A+a+case-control+study%22&andorexactfulltext=and&searchid=1086144359431_533&stored_search=&FIRSTINDEX=0&sortspec=relevance&resourcetype=1&journalcode=cmaj.

This study reports that suicide rates are several-fold higher in the Inuit of northern Quebec compared to the general Canadian population. This study is, therefore, a good illustration of the extent of the mental health crisis in circumpolar peoples. This paper also addresses some of the factors that may

have contributed to the suicide, such as prior mental health problems and drug abuse. It is also a good example of the fact that diet has not been linked in the past to mental health in circumpolar peoples. Deterioration of mental health has most often been attributed to factors such as social and cultural change, poverty, and social and economic marginalization.

Overview

The aim of this module is to promote an understanding of a possible link between changing traditional diets and mental health that may have substantial consequences for circumpolar peoples. The people living in Arctic and Subarctic environments have adapted to cold temperatures, short growing seasons, and low precipitation, but their traditional ways are now changing because of increased contact with Western society. The rapid alteration of circumpolar cultures has led to generational changes in diet from traditional foods to the processed groceries common in modern stores. That idea that diet is an important risk factor for mental health in circumpolar peoples, as a hypothesis, is developed through the review of current knowledge of Arctic environments and circumpolar peoples, traditional circumpolar diets and changes in these diets, mental health in circumpolar regions of circumpolar and non-circumpolar peoples, and the connection between diet and mental health as revealed by studies of non-circumpolar peoples. The conclusions presented in this module include that the change in traditional diets has already led to increased health problems, such as obesity, cardiovascular disease, and diabetes, while the mental health of circumpolar peoples has also declined substantially during the same time period. The decline in mental health is characterized by increased rates of depression, seasonal affective disorder, anxiety, and suicide, which now often occur at higher rates than in lower-latitude populations. Studies in non-circumpolar peoples have shown that diet can have profound effects on neuronal and brain development, function, and health. Therefore, diet may be an important risk factor for mental health in circumpolar peoples.

Lecture

Arctic Environments and Circumpolar Peoples

The northern circumpolar environments of the world consist of the Arctic and Subarctic areas. These ecosystems are dominated by tundra and taiga¹ and are characterized by cold average yearly temperatures, short growing seasons, below average precipitation and low net primary productivity.² The tundra is characterized by its dwarf plants and lack of trees caused by permafrost,^{3,4} with temperature averages of at most 10°C and precipitation of less than 25 mm per year.⁵ The taiga, or boreal coniferous forest, has a cool, or cold average

temperature, with more precipitation than the tundra.⁵ The circumpolar areas also experience large yearly fluctuations in daylight, with long days in the summer and short days in the winter. High Arctic areas can experience the midnight sun of summer and days with no sunlight in the winter.⁴ The lower temperatures require increased energy expenditure and other physiological and behavioural adaptations by euthermic inhabitants to stay warm and survive.⁶ These harsh living conditions and the low primary productivity of the circumpolar regions have limited human population growth^{1,4} and have led to low species diversity among all animal taxa.^{2,4}

Circumpolar populations have developed similar cultural practices that have allowed them to use the scant and seasonal resources of the Arctic and Subarctic to survive.¹ The major modes of subsistence include land hunting, sea mammal hunting, fishing, reindeer herding, and gathering.⁷ Traditionally, two or three of these were combined over the year to maximize chances of survival. Traps were also extensively used for both fish and game. Skin clothing, semi-subterranean housing, and skin-covered tents were universally used in the North.^{4,6,8,9} Transportation was by canoe, skin boat, skis, snowshoes, sleds, and toboggans. Dogs and domesticated reindeer were used as pack animals. The circumpolar peoples traded very early in their history and had extensive trading networks by the time they were contacted by Western society. These trading networks ensured that vital materials, such as meteoritic iron and lithic resources, were shared among groups.¹

The ephemeral and seasonal nature of circumpolar resources led to highly mobile societies that followed their seasonal food resources.^{4,7} As a result, no permanent large settlements were established. The circumpolar peoples stayed mostly in kin-based bands that would join others at certain times of the year to exploit seasonal resources, such as migrating caribou, or spawning salmon.⁴ Traditionally, most circumpolar peoples believed in a form of animism, which holds that all parts of the natural world are inhabited by spirits and are sacred. Clan elders, or shamans, that could placate these spirits would ensure that enough resources were secured to survive. Through this system, the resources were not overharvested and every part of the animal was used, helping to ensure that animals would be available for future generations.^{1,10}

Traditional Diets

Traditional diets of the circumpolar peoples vary from region to region but have several commonalities. These diets are generally rich in marine mammals, fish, ungulates, fur-bearing animals, birds and their eggs, plants, and berries.¹¹⁻¹⁷ These foods are nutrient dense, with high levels of protein, fat (especially omega-3 fatty acids), and antioxidants (e.g., selenium), while they are low in carbohydrates.^{11,18-22} Despite the traditional diets' high protein and fat content, problems such as obesity, diabetes, and cardiovascular disease were historically

rare in circumpolar people.^{23–30} An increasing number of studies suggest that this may in part be due to the high content of omega-3 fatty acids and antioxidants in the traditional diet. These nutrients correlate with a reduced prevalence of cardiovascular disease^{31–42} and normal glucose metabolism.⁴³ The physical, social, and cultural activities associated with hunting, fishing, harvesting, and storing wild game and plants also contribute positively to the physical and mental health of circumpolar peoples.^{44–46} With traditional lifestyles, however, the incidence of cerebrovascular disease and injury, or death due to accidents, are increased.^{47, 48}

Student Activity

Make a list of things you typically eat and drink during a day. Also make a list of items that you may not eat or drink every day, but eat or drink at least once a week. Categorize these dietary items according to whether you consider them part of a traditional diet or part of a Western diet. How would you characterize your diet? Is your diet typical for people in your community?

Changes in Traditional Diets

Western societies brought new diseases and new diets to the circumpolar regions. Diseases such as measles, smallpox, tuberculosis, and influenza took a toll on the populations of many villages.^{49, 50} With the loss of so many lives, traditional knowledge that was transferred from one generation to another was lost.⁵¹ Other factors, such as loss of traditional language, regulated hunting, restricted access to land, protection of endangered species, and a decrease in wildlife density, have made the traditional lifestyle difficult to maintain.^{51–54} Contaminants—for example, mercury and organochlorines—found in fish eaten in circumpolar regions may currently not pose an important health risk^{45, 55–57} (but see Kuhnlein 1995 and Kuhnlein and Chan 2000). Nevertheless, possible harmful contamination of traditional food sources is of great concern to circumpolar peoples and has led to a decrease in the use of these food resources.^{51, 60} These factors have contributed to the replacement of most of the traditional diet with a Western-style diet, which is high in carbohydrates and saturated fats, and low in essential nutrients such as omega-3 fatty acids.^{11, 16, 46, 61–65} These changes in diet, in combination with other changes in lifestyle,^{44, 52, 66, 67} have led to significant increases in diseases in circumpolar people, including obesity,^{26, 28, 63, 66–71} diabetes,^{26, 28, 63, 72, 73} cardiovascular diseases,^{28, 47, 74, 75} and dental disease.^{70, 76} These chronic diseases may also affect mental health.^{77, 78}

Student Activity

Ask the elders in your community what they consider to be a traditional diet. How has this diet changed over time in your community? What are their views on a possible connection between the diet and physical and mental health? What things do your elders recommend to eat for a healthy lifestyle?

Mental Health in Circumpolar Regions

Circumpolar Mental Illnesses

The extreme environment of the Arctic has been hypothesized to contribute to an increased rate of mental distress when compared to more temperate climates.^{79, 80} The most common circumpolar mental illnesses are depression, seasonal affective disorder (SAD), subsyndromal seasonal affective disorder (SSAD), and increased anxiety. SAD is characterized by symptoms of depression, such as sadness, increased anxiety, and irritability, which occur only during one part of the year, and reoccur year after year.⁸¹ SSAD is a condition in which an individual experiences mild difficulties with seasonal changes.⁸² Other mental disturbances, such as seasonality (mood changes that correspond to the seasons of the year), sleep disturbances, and anxiety, have also been commonly reported.⁷⁹⁻⁸⁶ Increased depression and sleep disturbances have also been observed in Antarctic workers.⁸⁷⁻⁸⁹

Circumpolar Peoples

More isolated circumpolar populations do not have an increase in seasonal mood changes as compared to non-Arctic populations, have less SAD, and have unexpectedly low rates of depression in winter.^{80, 90-92} A unique characteristic of these populations is that many have been virtually isolated during the past 1,000 years and retain their traditional lifestyles and diets. These isolated circumpolar populations more closely resemble circumpolar peoples prior to contact with Western society. These populations may, therefore, represent the best opportunity to assess the mental health of circumpolar peoples prior to the adoption of a more Western lifestyle, because careful scientific studies of mental health of past circumpolar populations is lacking.^{80, 91} Low rates of SAD in circumpolar peoples may also have a genetic component.⁹³

Studies conducted on the mental health of current circumpolar populations have found notably different results in less isolated areas. Rates of depression, SAD, seasonality, anxiety, and other mental disorders have increased in non-isolated circumpolar populations and often occur at higher rates than in lower-latitude

populations.^{47, 86, 94–97} In addition, suicide rates have increased for many non-isolated circumpolar populations.^{74, 98–102} Suicides are discussed in more detail in the Diet and Mental Health section of this module.

Student Activity

Ask the elders in your community what they usually did in terms of daily schedule, physical activity, helping their community members, and other activities while living a traditional lifestyle. How has their lifestyle changed over time in your community? What are their views on these changes? Which changes do your elders believe were good and which ones were bad?

Non-Circumpolar Peoples Living in Arctic and Subarctic Regions

As populations have increased and more people are moving to the Arctic, more studies are investigating the effects of the environment on unacclimated populations. In Fairbanks, Alaska, non-circumpolar residents were found to have increased fatigue, sleep duration, and melatonin levels in the blood in winter.^{103, 104} Increased melatonin levels may have been due to seasonal variations in caloric and macronutritional intake, which also may influence L-tryptophan, a precursor to melatonin and serotonin.¹⁰³ Changes in the serotonin system have been shown to play a role in the development of depression.^{105, 106} Increased melatonin in the blood has been suggested as a possible marker for winter SAD^{104, 107, 108} and has been linked to disruptive sleep–wake patterns.¹⁰⁹ In Alaska, army soldiers from non-circumpolar communities had a high prevalence of SAD.¹¹⁰ Increased seasonal depression and sleep disturbances were also found to be prevalent in non-circumpolar Alaskan and Siberian populations.^{111, 112} The difference in the response of circumpolar and non-circumpolar populations to the Arctic environment was also evident in the Svalbard studies by Nilssen et al.,^{113, 114} in which two populations—Norwegians originally from an Arctic climate and Russians who had migrated from lower latitudes—were compared. Although both populations were living in the same village, the Russians had rates of depression 2–3 times higher and more sleeping problems than the Norwegians.

Recent studies have investigated a link between latitude and mental distress, such as SAD. Several studies were compiled, reviewed, and analyzed in a recent article by Mersch et al.¹¹⁵ They found that latitude was positively correlated with the prevalence of SAD, but North American populations had a stronger correlation than European populations. Latitude may have an influence on mental disorders; but other factors, such as drug abuse, hospital admission,

social and cultural change, climate, and genetic predisposition, may also contribute to the development of mental disorders.^{97, 98, 100, 113–117} However, a genetic basis alone cannot explain the rapid increase of mental distress (depression, SAS, SSAD, and suicide) in circumpolar peoples and gives rise to the question of etiology.

Student Activity

1. Ask your police service what percentage of crime they attribute to mental illness. What single thing would they change to prevent this type of crime?
 2. Ask a health-care professional in your community how prevalent mental illness is in your community. What single thing does the health-care professional believe could be done to reduce mental illness in your community?
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Diet and Mental Health

It is increasingly apparent that diet has major effects on mental health. Nutrients and dietary supplements—for example, folate and vitamin B₁₂—appear to be beneficial for mental health,^{118–120} although this benefit has not been confirmed by all studies.¹²¹ Several lines of evidence reveal an important role for omega-3 fatty acids in mental health.^{122–24} Omega-3 fatty acids are important for neuronal and brain development, function, and health^{125–138} (but see Simmer 2001¹³⁹) and are only available from dietary intake such as fish. Lower levels of fish consumption and omega-3 fatty acids have been linked to increased rates of depression and possibly suicide.^{140–143} Decreased omega-3 fatty acid content in breast milk and an increased risk of postpartum depression in mothers have also been linked to lower levels of fish consumption.¹⁴⁴ In addition, depressed patients show a depletion of systemic omega-3 fatty acids compared to healthy controls.^{105, 106, 145–148} Increased levels of omega-3 fatty acids also have a beneficial effect on patients' bipolar symptoms.^{149, 150}

Aggression has been linked to low concentrations of serotonin and dopamine metabolites and is negatively correlated with omega-3 fatty acids.^{131, 151, 152} Deficiencies in omega-3 fatty acids can change serotonergic and dopaminergic neurotransmission in the frontal cortex and hippocampus.^{153–155} Interestingly, these changes mirror those found in the prefrontal cortex of suicide victims^{156, 157} and in the cortex of patients with dysfunctional attitudes and depression.^{158, 159} In addition, aggressive and compulsive behaviours have been correlated with suicide,^{160, 161} and changes in the serotonergic systems in

the brain are linked to depression¹⁶² and aggressive and compulsive behaviours.^{163, 164} Suicide rates have increased several-fold for many non-isolated circumpolar populations over the past several decades.^{74, 98-102} The rates of completed suicides for the Canadian Inuit from 1987–1991 were 3.9 times higher than that of the general Canadian population and continued to increase over the study period (1982–1996).⁹⁸ These results are comparable to suicide rates found in other circumpolar peoples.^{74, 99, 102, 117, 165-169}

Summary

A Link between Mental Health and Diet of Circumpolar Peoples?

The decline of mental health in circumpolar peoples has been attributed to the large cultural and social changes they have undergone, as well as to increases in chronic diseases, such as obesity, cardiovascular disease, and diabetes. We agree that these factors play a role, but we would like to add another important factor, which has received little attention. We hypothesize that diet is an important risk factor for mental health in circumpolar peoples. As we reviewed here, the diet of circumpolar peoples has changed considerably from a traditional diet high in omega-3 fatty acids and antioxidants, to a Western-style diet high in carbohydrates and saturated fat. Several lines of evidence reveal that omega-3 fatty acids and other nutrients that are rich in traditional diets are beneficial for mental health and that depletion of omega-3 fatty acids are associated with increased levels of depression and possibly suicide. The combined decline in mental health and the disappearance of traditional diets in circumpolar peoples makes a direct connection between diet and mental health in these peoples a very real possibility. This possible link should receive considerable attention and epidemiological and clinical studies should be done with a focus on diet and mental health, in order to make this connection directly in circumpolar peoples. With suicide rates in circumpolar peoples among the highest in the world and other chronic diseases increasing rapidly, all avenues should be explored to improve this health crisis. Prevention and treatment of chronic diseases in circumpolar peoples can only be truly effective when all the major causes are understood.

Notes

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Supplementary Readings

Here are some suggested additional readings for the following topics:

Traditional Diet:

Håglin, L. 1999. The Nutrient Density of Present-Day and Traditional Diets and Their Health Aspects: The Sami and Lumberjack Families Living in Rural Areas of Northwestern Sweden. *International Journal of Circumpolar Health* 58:30–43.

Chronic Diseases in Circumpolar Peoples:

Thouez, J. P., J. M. Ekoe, P. M. Foggin, et al. 1990. Obesity, Hypertension, Hyperuricemia and Diabetes Mellitus among the Cree and Inuit of Northern Quebec. *Arctic Medical Research* 49:180–88.

Seasonal Affective Disorder:

Rosenthal, N. E., D. A. Sack, J. C. Gillin, et al. 1984. Seasonal Affective Disorder: A Description of the Syndrome and Preliminary Findings with Light Therapy. *Archives of General Psychiatry* 41:72–80.

Suicide:

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Omega-3 Fatty Acids and Brain Function:

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Omega-3 Fatty Acids and Depression:

Edwards, R., M. Peet, J. Shay, D. Horrobin. 1998. Omega-3 Polyunsaturated Fatty Acid Levels in the Diet and in Red Blood Cell Membranes of Depressed Patients. *Journal of Affective Disorders* 48:149–55.

Study Questions

1. Describe some of the benefits of the traditional lifestyles of circumpolar peoples.
2. List and describe key components of a traditional circumpolar diet.
3. Describe some of the changes in traditional diets of circumpolar peoples.

4. List and describe some of the mental illnesses related to living in the Arctic and Subarctic regions.
5. List and describe the negative health effects of a Western-style, store-bought diet.
6. Describe the connection between diet and its effects on brain development, health, and function.
7. Describe how, and explain why, diet may be an important risk factor for mental health in circumpolar peoples.

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