

The Role of Nutrition in Mental Health Promotion and Prevention (1)

The Role of Nutrition Care for Mental Health Conditions (2)

Nutrition and Mental Health: Therapeutic Approaches (3)

DECEMBER 2012

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This paper, **The Role of Nutrition in Mental Health Promotion and Prevention (1)**, is the first of three papers derived from the Dietitians of Canada comprehensive role paper on nutrition and mental health, ***Promoting Mental Health through Healthy Eating and Nutritional Care***.

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Forward

In 2006, Dietitians of Canada partnered with the Canadian Collaborative Mental Health Initiative, creating a toolkit, *The Role of Dietitians in Collaborative Primary Health Care Mental Health Programs*, to help dietitians and other health professionals in their care of clients with mental health conditions. One of the principles enshrined in the Canadian Collaborative Mental Health Charter, endorsed by Dietitians of Canada, was “All Canadians have the right to health services that promote a healthy, mind, body and spirit.” In the same year, the Standing Senate Committee on Social Affairs, Science and Technology recognized the urgent need to transform mental health systems across Canada, releasing the report, *Out of the Shadows at Last: Transforming mental health, mental illness and addiction services in Canada*¹, which led to the creation of the Mental Health Commission of Canada.

In the six years since publication of the initial toolkit, Dietitians of Canada has continued to speak to issues in mental health care. A brief to the newly formed Mental Health Commission of Canada was submitted in 2007, highlighting dietitian roles in mental health promotion and mental health conditions and citing evidence for association between mental health and diet quality. In 2009, the Mental Health Commission of Canada released its first report, *Toward recovery & well-being: A framework for a mental health strategy for Canada*². This year, in 2012, the Commission has outlined its strategy in their second report, *Changing directions, changing lives: The mental health strategy for Canada*³, calling on all Canadians to play a role in improving the mental health system.

Dietitians of Canada is proud to release this new role paper, *Promoting Mental Health through Healthy Eating and Nutritional Care*⁴, a comprehensive document discussing intersections of nutrition with mental health, from promotion to nutrition care and therapeutic approaches. We believe dietitians will continue to play an important role in mental health promotion and care, supporting Canada’s mental health strategy in its strategic directions as outlined by the Mental Health Commission of Canada, helping people to find the right combination of services, treatments and supports.

The World Health Organization has acknowledged “there is no health without mental health”⁵. Health professionals, indeed any people with an interest in nutrition and mental health, will appreciate this extensively referenced, evidence-based resource, complete with many practical tips and links. We hope you will use this comprehensive document, or any one of the three section papers developed, to inform your knowledge and promote nutrition and mental health.

¹ Canada, Parliament, Senate. (2006). Standing Senate Committee on Social Affairs, Science and Technology. M.J.L. Kirby (Chair) & W.J. Keon (Deputy Chair). *Out of the shadows at last: Transforming mental health, mental illness and addiction services in Canada*. 38th Parl., 1st sess., p. 42. Retrieved from <http://www.parl.gc.ca/Content/SEN/Committee/391/soci/rep/rep02may06-e.htm>

² Mental Health Commission of Canada. (2009). *Toward recovery & well-being: A framework for a mental health strategy for Canada*. <http://www.mentalhealthcommission.ca>

³ Mental Health Commission of Canada. (2012). *Changing directions, changing lives: The mental health strategy for Canada*. Calgary, AB: Author. <http://strategy.mentalhealthcommission.ca/download/>

⁴ Davison KM, Ng E, Chandrasekera U, Seely C, Cairns J, Mailhot-Hall L, Sengmueller E, Jaques M, Palmer J, Grant-Moore J for Dietitians of Canada. *Promoting Mental Health through Healthy Eating and Nutritional Care*. Toronto: Dietitians of Canada, 2012. Access at: www.dietitians.ca/mentalhealth

⁵ World Health Organization (2010). *Mental health: strengthening our response*. Fact sheet N° 220. <http://www.who.int/mediacentre/factsheets/fs220/en/>

Summary

Mental health is “a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community”¹. Dietitians of Canada (DC), the national professional association for dietitians, recognizes that there are many intersections between nutrition and mental health and for this reason they commissioned the development of a comprehensive document titled “Promoting Mental Health Through Healthy Eating and Nutritional Care”. This paper derived from the larger document provides policy makers, practitioners, and other interested groups and individuals, with an evidence-based summary of the current literature about nutrition and the promotion of mental health.

This document is the first in the series which includes:

1. The Role of Nutrition in Mental Health Promotion and Prevention
2. The Role of Nutrition Care for Mental Health Conditions
3. Nutrition and Mental Health: Therapeutic Approaches

All documents are accessible at:

www.dietitians.ca/mentalhealth

Process

A structured literature search was conducted followed by extensive review of more than 100 resources to identify key themes. An integrative literature synthesis was then employed to outline the various intersections between nutrition, mental health promotion, and mental health condition prevention. The literature was organized into three key themes that included

proposed theories that link nutrition and mental health, evidence linking the prevention of mental health conditions and nutrition, and examples of nutrition-related strategies that can enhance mental health. Based on the analyses in these three areas, suggestions are presented, to guide the promotion of mental health as it relates to nutrition..

Key Findings

Mental health conditions are associated with long-lasting disability and significant mortality through suicide, medical illness, and accidental death. It is estimated that mental health conditions cost the Canadian economy \$51 billion dollars annually. By 2030, mental health issues are expected to be the leading cause of disability in Canada. Nutritional interventions as part of collaborative and integrative programs aimed at mental health promotion as well as prevention contributes to positive health outcomes and are cost-effective. Comprehensive mental health promotion interventions that include nutrition education and food skills training components, with a focus on pregnant moms, infants, children, and adolescents, can lead to reductions in neural tube defects, low birth weight, and premature delivery, and can positively affect cognitive development, behaviour, and academic performance. Positive parenting programs that include healthy lifestyle interventions have led to a return on investment in excess of 6% based on reduced use of special education, social, mental health, and criminal justice services. Simulations of healthy worksite programs aimed at mental health promotion have shown returns on investment of 9 to 1. Many nutrition initiatives that Registered Dietitians help facilitate support mental health by enhancing social inclusion, self-reliance, self-determination, food security, healthy body image, and reducing health and social inequities.

Recommendations

The recommendations relevant to nutrition, mental health promotion, and disease prevention are summarized here. To review all recommendations of the full role paper on nutrition and mental health, readers should refer to the executive summary of the complete role paper. The promotion of optimal nutrition that supports mental health through public health, policy, and programming can lead to reductions in health and social costs. Public health messaging and social marketing that highlight the importance of healthy eating and mental health, initiatives targeted at building healthy food environments (e.g., sodium reduction, banning trans fats, food guidelines for schools and recreation facilities), food policy aimed at supporting the general population's mental health, and continued investigative work that strengthens the evidence base about diet and the prevention of mental health conditions are important mechanisms to support mental health promotion and disease prevention.

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This paper is the first in a series of three papers derived from the Dietitians of Canada comprehensive role paper on nutrition and mental health, Promoting Mental Health through Healthy Eating and Nutritional Care. The three papers in the series are titled:

- 1. The Role of Nutrition in Mental Health Promotion and Prevention**
2. The Role of Nutrition Care for Mental Health Conditions
3. Nutrition and Mental Health: Therapeutic Approaches

The Role of Nutrition in Mental Health Promotion and Prevention

“International evidence is strong with respect to the factors that lead to positive mental health, as well as what governments and communities can do to promote mental health... Mental health promotion policies and programs must address individuals, their connections within the community and the broader environment in which they live.”

Canadian Mental Health Association, Ontario.
Mental Health Promotion in Ontario: A Call to Action¹

1. Introduction

Mental health is “a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community”². Positive mental health enhances social cohesion and social capital, improves peace and stability in the living environment, contributes to economic development in societies, and is a principle of democratic society^{3,4}. Mental health problems occur across all ages, cultures, and populations. The annual economic cost of mental health conditions in Canada has been estimated to be \$51 billion⁵. Evidence demonstrates that mental health promotion and disease prevention interventions can lead to health,

social and economic gains⁶. Mental health promotion focuses on promoting the value for mental health and improving the coping capacities of individuals². Prevention activities, concerned with avoiding disease, complement mental health promotion.

Dietitians of Canada (DC), the national professional association for dietitians, recognizes that there are many intersections between nutrition and mental health and for this reason the development of a comprehensive document titled “Promoting Mental Health Through Healthy Eating and Nutritional Care” was commissioned. This paper is derived from the larger document provides policy makers, practitioners, and other interested groups and individuals, with an evidence-based summary of the current literature about nutrition, the promotion of mental health, and prevention of mental health conditions.

2. Process

A structured literature search (see Appendix A for search strategy) was conducted with 313 resources related to nutrition, mental health promotion, and mental health condition prevention being found. Of these 313 resources, 205 provided duplicate or non-relevant information. The remaining 108 resources, underwent extensive review by the advisory committee to identify key themes. An integrative literature synthesis was then employed to outline the various intersections between nutrition, mental health promotion, and mental health condition prevention. The literature was organized into three key themes that included proposed theories that link nutrition and mental health, evidence linking the prevention of mental health conditions and nutrition, and examples of nutrition-related strategies that can enhance mental health. Based on the analyses in these three areas, suggestions to guide the promotion of mental health as it relates to nutrition are presented.

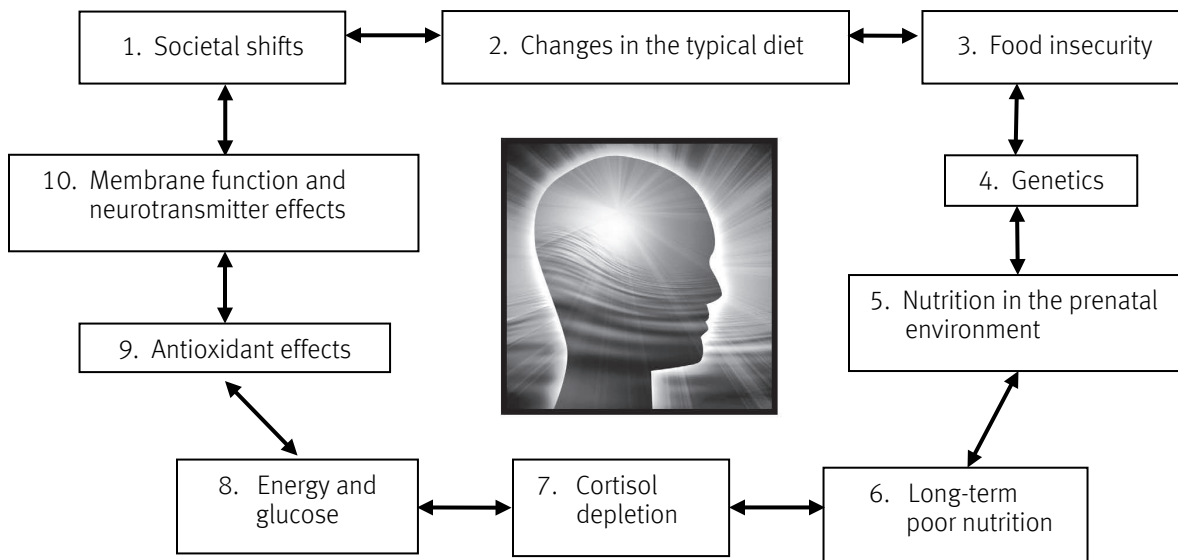
3. Nutrition and Mental Health: Proposed Links

The food we eat is associated with our mood, behaviour, and cognition. Current knowledge about nutrition and mental health is based on a variety of evidence from animal behavioural research, neurochemical experiments in vitro, epidemiological studies, and some clinical trials, and it continues to evolve. Based on the current literature, there are at least 10 common interrelated frameworks that explain the interactions between the food we eat and the functions of the mind (Figure 1). Each of these theories are discussed in the following pages.

1. Societal Shifts

Some observers have speculated that appetite for high-calorie foods has been accelerated by broad cultural and policy developments¹⁶, including policies related to punishment (i.e., mass incarceration), access to housing, and food production, which in turn contributed to issues such as obesity and mental health conditions. Obesity may be linked to living in neighbourhoods where fear and crime make walking dangerous and impractical⁸. The dislocation theory of addiction speculates that the globalization of free-market society has produced a general breakdown in psychosocial integration and responses including disordered eating, addictions, and distorted body image (i.e., emaciated body as the norm)⁹.

Figure 1: The Intersections of Nutrition and the Mind



2. Changes in the Typical Diet

The increased incidence in mental health conditions such as depression over recent years might be linked to the change in our diet over the same time frame, with shifts away from a diet based on a wide variety of whole foods to one that emphasizes more processed foods¹⁰. The changing nutrient content of our food supply could also be considered in support for these hypotheses. Data indicate that the mineral and trace elements of fruits and vegetables have been decreasing over the last 50 years¹¹, possibly due to poor remineralization of the soil. Conversely, some food products now contain substantial amounts of various added nutrients and nutrient supplements are widely used. Some individuals may be sensitive to these changes in nutrient levels as biochemical needs differ. The increasing incidence of mental health conditions is a complex issue associated with a range of biological, social, and economic factors; changes in food consumption may be a contributing factor.

3. Food Insecurity

Because mental health conditions account for a substantial portion of the global disease burden¹², related factors such as food insecurity have received increased attention. There are currently two main hypotheses to explain why the experience of food insecurity may influence mental health. First, individuals with conditions such as anxiety or depression may have diets that lack critical micronutrients¹³ known to be associated with mental health symptoms¹⁴; this relationship may be mediated by food insecurity. Second, the experience of food insecurity generates uncertainty, which in turn leads to stress and symptoms of anxiety and depression^{15;16}. For example, some individuals may be especially sensitive to differences in the relative well-being of households in a community and when they experience food insecurity, inequities among individuals are amplified (i.e., the “haves” and “have nots”) and this can create stress¹⁷.

4. Genetics

Inborn errors of metabolism can have many effects, including influencing enzyme and coenzyme reactions in the brain. In a review of 50 human diseases attributed to an enzyme having decreased binding affinity for a coenzyme¹⁸, it was shown that in the majority of conditions the inborn errors of metabolism could be corrected by feeding the affected person additional cofactors or coenzymes (e.g., vitamins), thereby raising the coenzyme levels and enhancing enzymatic activity. Methylation reactions (i.e., adding a methyl group (CH₃) to a molecule) represent one interface between nutrients and genetic expression. There are hundreds of methylation reactions in our bodies, including those needed for DNA transcription and neurotransmitter synthesis. There is evidence of deficient methylation processes in relation to mental health symptoms, leading researchers to examine compounds called “methyl donors” that transfer CH₃ in the synthesis of important compounds¹⁹. For instance, the biochemical interrelationship between folate and cobalamin (Vitamin B₁₂) lies in the maintenance of nucleic acid synthesis and methylation reactions, such as the methylation of homocysteine to methionine and the synthesis of S-adenosyl-L-methionine (S-AdoMet)²⁰. Norwegian research²¹ has shown increased risk for depression in people with a particular genotype that is associated with increased homocysteine and decreased folate.

5. Nutrition in the Prenatal Environment

Human neurodevelopment is the result of genetic and environmental interactions. Epidemiological studies that examined the role of prenatal nutrition relative to mental health conditions have found that prenatal caloric malnutrition, low birth weight, and prematurity increase the risk for neurodevelopmental disorders, schizophrenia, and schizoid and antisocial personality disorders²².

6. Long-Term Effects of Poor Nutrition

Many individuals are not diagnosed with some types of mental health conditions (e.g., depression) until after decades of life, which suggests that long-latency effects of poor nutrition on the central nervous system affect mental health²³. In one small study of people with familial bipolar I disorder (n=15)²⁴, proton magnetic resonance spectroscopic evidence of progressive changes in the right hippocampus was found. The correlation between years of having a mental health condition and reduced N-acetyl-aspartate concentrations was quite high, suggesting that the brain is gradually less able to produce this amino acid. However, the direction of causality is unknown; and it may be possible that long-term psychological stress alters nutrient absorption or even directly influences brain development²⁵. Research on cognitive decline suggests that intakes of fat, sugar, and excess calories contribute to body-wide oxidative stress associated with weight gain, atherosclerosis²⁶, circulatory deficits in the brain, cognitive decline³⁴, and mental health conditions²⁷.

7. Nutrition and Stress

Cortisol, an important steroid hormone secreted in response to stress, may affect mental health, mood stability in particular. Cortisol secretion levels may be affected by negative mood states²⁸, fatigue²⁹, and “burnout,” as a result of acute and chronic stress³⁰. Psychological factors associated with food intake (e.g., intentional diet restraint) may alter cortisol secretion³¹ and therefore mental function.

8. Energy Metabolism and Glucose

Glucose is the preferred fuel source for the brain. The roles of glucose include forming acetylcholine and many other neurotransmitters. Glucose utilization enhances cognition and may be affected by fatty acids which can alter both how glucose is used and also insulin sensitivity³². Some mental health symptoms may represent a condition associated with decreased mitochondrial energy metabolism^{33;34}. Other research suggests that lower brain glucose metabolism is present before the onset of cognitive decline in certain people with Alzheimer’s disease³⁵.

9. Antioxidant Effects

Several substances containing antioxidants, such as minerals and vitamins (beta carotene, alpha-tocopherol), polyphenols, and herbal extracts may prevent oxidative stress leading to DNA damage³⁷. Research suggests that oxidative stress mechanisms appear to be a common thread in various neurological and emotional conditions such as Alzheimer’s disease, anxiety disorders, attention deficit hyperactivity disorder, autism, dementia, depression, fibromyalgia, Huntington’s disease, multiple sclerosis, and schizophrenia³⁶⁻³⁸.

The link between nutrition and immunity also support the role of antioxidants in mental health. Recognition of immune system dysfunction in people with mental health conditions, particularly those with depression or schizophrenia, has led to different hypotheses for their pathogeneses, including infectious and autoimmune factors³⁹. Alternatively, dysfunction of the immune system may be secondary to the mental health condition process (i.e., altered neurotransmitter activity) or to long-term pharmacological treatment, or it may be a result of an unrecognized concurrent medical disorder⁴⁰. Repairing the central nervous system is facilitated by both cellular and humoral components of the immune system and adequate nutrition (i.e., vitamins, minerals, and antioxidants) supports these processes. Some investigators have reported immunological involvement in conditions such as schizophrenia, somatization disorder, mania, depression, anxiety, and conversion disorder⁴¹⁻⁴⁴.

10. Membrane Function and Neurotransmitter Effects

Several substances, especially lipids and fatty acids, act on the integrity of the membranes of neurons. Imbalances of these nutrients may alter membrane fluidity, receptor formation and function, signalling and surface activity, blood-brain barrier integrity, and the release of neurotransmitters, hormones, and cytokines. These effects may be especially true for elderly people in whom membrane function declines with age⁴⁵.

In addition to these theories linking nutrition and mental health, we also know a lot about diet and brain function. One of nutrition's most important contributions to mental health is the maintenance of the structure and function of the neurons and brain centres. The support and maintenance of the brain's functions rely on the interplay between the major and minor nutrients. (Their known brain functions are outlined in Table 1.) In addition to these nutrients, many bioactive substances — including cocoa flavanols, isoflavones, and resveratrol²⁶ — found in food are linked to brain function.

Table 1: Known Brain Functions of Selected Major Nutrients, Vitamins, and Minerals

Nutrient	Brain Function
Major Nutrients	
Carbohydrates	Provides glucose, the preferred energy source for erythrocytes and nerve cells, including those of the brain. Eating carbohydrates triggers the release of insulin that helps blood glucose enter the cells. As insulin levels rise, more of the amino acid tryptophan crosses the blood brain barrier that affects levels of neurotransmitters such as serotonin.
Fat	The lipid concentration of the brain partly reflects the dietary intake. About 35% of the brain/nervous system tissue comprises polyunsaturated fatty acids that include the essential fatty acids, eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA). EPA and DHA form phospholipids in brain cell membranes and have important roles in signal transduction.
Protein	Provide amino acids; the precursors of neurotransmitters, and therefore facilitates neurotransmission and neuromodulation. The dietary precursors of serotonin (precursor is tryptophan), dopamine (precursor is phenylalanine), norepinephrine (precursor is tyrosine), and histamine (precursor is histidine) have been the main protein derivatives investigated.
Vitamins	
Thiamine (Vitamin B ₁)	<ul style="list-style-type: none"> • Functions as a coenzyme in the synthesis of acetylcholine, γ-aminobutyric acid (GABA), and glutamate⁵⁴ • Can mimic action of acetylcholine⁵⁵
Niacin (Vitamin B ₃)	<ul style="list-style-type: none"> • Nicotinamide adenine dinucleotide (NADH) increases tyrosine hydroxylase activity and dopamine production in pheochromocytoma cells⁵⁶ • Involved in synthesis of serotonin (5-HT)⁵⁷
Pyridoxine (Vitamin B ₆)	<ul style="list-style-type: none"> • Role in the synthesis of many neurotransmitters (e.g., dopamine, serotonin, norepinephrine, epinephrine, histamine, GABA)⁵⁸ • Deficiency tends to reduce production of serotonin and GABA⁵⁹
Folate, folic acid (Vitamin B ₉)	<ul style="list-style-type: none"> • Functions as a cofactor for enzymes that convert tryptophan into serotonin and tyrosine into norepinephrine/noradrenaline • Can heighten serotonin function by slowing destruction of brain tryptophan⁶⁰ • Helps form compounds involved in brain energy metabolism⁶¹ • Involved in the synthesis of dopamine^{62,63}
Cobalamin (Vitamin B ₁₂)	<ul style="list-style-type: none"> • Involved in the synthesis of monoamine neurotransmitters⁶² • Involved in maintaining myelin sheaths for nerve conductance⁶⁴ • Functions in folate metabolism
Pantothenic Acid	<ul style="list-style-type: none"> • Changes to coenzyme A that helps convert macronutrients into energy • Production of red blood cells, hormones, and nerve regulators⁶⁵ • Needed for the uptake of amino acids and acetylcholine • Is necessary to make vitamin D and works closely with B vitamins such as biotin, niacin, vitamins B₁, B₂, and B₆
Vitamin C	<ul style="list-style-type: none"> • Acts as part of the intracellular antioxidant network, and is an important neuroprotective constituent⁶⁶ • Acts as a neuromodulator⁶⁷ and enzyme cofactor in noradrenaline and dopamine synthesis⁵⁷
Vitamin A	<ul style="list-style-type: none"> • Retinoids influence hormone pathways (steroid and thyroid hormones) known to cause mood elevation and depression⁶⁸
Vitamin D	<ul style="list-style-type: none"> • 1,25-Dihydroxyvitamin D₃ affects cholinergic activity in several brain regions and may have a role in the neuroendocrine regulation of certain aspects of anterior pituitary function⁶⁹
Vitamin E	<ul style="list-style-type: none"> • Alpha-tocopherol protects cells from damage by free radicals⁷⁰ • May reduce brain amyloid beta peptide accumulation, known to be relevant in Alzheimer's disease⁷⁰

continued...

Table 1: Known Brain Functions of Selected Major Nutrients, Vitamins, and Minerals - continued

Nutrient	Brain Function
Vitamins - continued	
Vitamin K	<ul style="list-style-type: none"> Involved in the development of the nervous system⁷¹ and affects calcium regulation in the brain through osteocalcin⁷²
Choline	<ul style="list-style-type: none"> Essential roles in structural integrity of cell membranes, cell signalling (precursor to acetylcholine), and nerve impulse transmission Major source of methyl groups for methylation reactions⁷³
Minerals	
Calcium	<ul style="list-style-type: none"> Important intracellular messenger, cofactor for enzymes⁷⁴ and release of neurotransmitters
Copper	<ul style="list-style-type: none"> Modulator of NMDA-receptor activity
Chloride	<ul style="list-style-type: none"> Negatively charged chloride ions cause influx of sodium ions and reverts the brain cell to its resting state
Chromium	<ul style="list-style-type: none"> Involved in glucose and lipid homeostasis⁷⁵
Iron	<ul style="list-style-type: none"> Essential cofactor for the production of ATP⁶⁴ Plays an essential role in hemoglobin for ensuring there is sufficient oxygen in the brain for oxidative metabolism⁶⁴ Functions in the enzyme system involved in the production of serotonin, norepinephrine, epinephrine, and dopamine⁶⁰
Magnesium	<ul style="list-style-type: none"> Functions as a coenzyme; roles in the metabolism of carbohydrates and fats to produce ATP, and in the synthesis of nucleic acids (DNA and RNA) and proteins⁶⁴ Important for the active transport of ions (such as potassium and calcium) across cell membranes, and for cell signalling⁶⁴
Manganese	<ul style="list-style-type: none"> Manganese deficiency results in lowering the catecholaminergic content of the brain⁷⁶
Phosphate	<ul style="list-style-type: none"> Helps maintain membrane potential and role in energy metabolism⁵⁷
Potassium	<ul style="list-style-type: none"> In the brain, potassium channels regulate neuronal signalling. Potassium channels may also regulate cell volume and protect neurons under metabolic stress. Role in energy metabolism⁵⁷.
Selenium	<ul style="list-style-type: none"> Glutathione peroxidase maintains the integrity of the cellular and subcellular membranes. This antioxidative protective system of glutathione peroxidase depends heavily on selenium⁶⁴.
Sodium	<ul style="list-style-type: none"> Voltage-gated sodium channels allow sodium ions to enter the brain cells⁷⁷
Vanadium	<ul style="list-style-type: none"> Inhibits Na⁺-K⁺-ATPase pump activity
Zinc	<ul style="list-style-type: none"> Roles in protein synthesis, as well as structure and regulation of gene expression⁷⁶ Serves in neurons and glial cells. Certain zinc-enriched regions (e.g., hippocampus) are especially responsive to dietary zinc deprivation, which can cause learning impairment and olfactory dysfunction^{78,79}

Note: ATP = adenosine triphosphate; DNA = deoxyribonucleic acid; RNA = ribonucleic acid.

*Table adapted from Kaplan BJ, Crawford SG, Field CJ, Simpson JSA (2007). Vitamins, Minerals and Mood. *Psychological Bulletin*, 133(5), 747-760.

4. Nutrition in the Prevention of Mental Health Conditions

Disease prevention initiatives are sustainable methods to reduce the effects of mental health conditions. Social and biological sciences have provided insight into the role of risk and protective factors in the development of poor mental health. Many of these factors, like nutrition, are modifiable and provide targets for prevention and promotion.

Table 2 highlights examples of mental health promotion and mental health condition prevention initiatives targeted throughout the lifespan, at policy, and to research. In addition, important mental health outcomes are highlighted including increasing psychological well-being, competence and resilience, and creating supportive living conditions and environments.

Nutrients commonly associated with mental health include polyunsaturated fatty acids (particularly omega-3 types); minerals such as zinc, magnesium, selenium, copper, and iron; B vitamins such as folate, vitamin B₆, and vitamin B₁₂; antioxidant vitamins such as C and E¹³; and bioactive substances found in foods²⁶. Most of these are available in healthy diets that include dark green leafy and orange-coloured vegetables and whole grains. Some of the research related to nutrition and prevention of mental health conditions is outlined as follows.

There is considerable epidemiological literature in the area of nutrition and the development of neurocognitive disorders⁷³. The nutrients associated with dementia-related conditions include omega-3 fatty acids, antioxidants (vitamins C and E, and selenium), B-vitamins, iron, copper, and zinc⁷⁴. Because neurocognitive disorders tend to occur more frequently in older adults, it is thought that the link between nutrition and these mental health conditions

may be related to consuming less food, during a time in the life cycle where there are heightened nutrition needs. Many epidemiological studies have shown that older adults have higher rates of nutritional deficiencies than younger age groups. Particular deficiencies have been shown for B-vitamins, vitamin C, vitamin E, selenium, omega-3 fatty acids, and choline. Cognitive decline may be accelerated if nutritional deficiencies are not addressed. Results of nutritional intervention studies in Alzheimer's Disease (AD) have been conflicting^{73;75-77} which may be due to different biochemical markers being used to measure deficiency⁷³.

The nutrients most widely studied in neurocognitive disorders include many of the B vitamins, vitamin E, the omega-3 fatty acids, vitamin D, and iron. Vitamin B₁₂ and folate affect neurocognitive development and deficiencies of these may contribute to higher levels of homocysteine and cognitive decline^{74;75}. Evidence supporting the efficacy of vitamin B₁₂, vitamin B₆, vitamin E, folate, thiamin, or niacin supplements in delaying the progression of Alzheimer's disease (AD) is inconclusive^{74;76;77}. Vitamin E supplements higher than 1000 mg/day are not recommended for prevention of AD due to the possible adverse effects⁶².

Evidence suggests that intake of omega-3 fatty acids by consumption of fatty fish a minimum of once weekly may reduce the risk of developing cognitive impairment and dementia^{73;78-80}. However, since fish is also a high dietary source of vitamin D, the relationships with mental symptoms may be due to vitamin D deficiency. Data suggest a possible association between vitamin D insufficiency and cognitive function⁸¹ and possibly depression, bipolar disorder, and schizophrenia, though results are mixed⁸².

Both excess and deficient iron intakes are linked to dementia. Elevated iron levels have been found in the brains of people with AD, while observational studies have indicated a link between both excess and deficient iron intakes and dementia⁷³. Iron deficiency increases the absorption of aluminum in the blood, which can have harmful effects on the brain⁸³.

The relationship between diet and cognition may be due to changes that occur in vascular function²⁶. Cardiovascular risk factors are linked to conditions such as hypertension, dyslipidemia, obesity, diabetes^{75;76;88-90}, and cognitive decline⁹¹⁻⁹⁴. High intakes of fat and processed sugar, and excess calories are thought to contribute to body-wide oxidative stress associated with weight gain, atherosclerosis²⁵, and cognitive decline²⁶. Observational studies (including prospective investigations) suggest that not only diets comprising excess fat (particularly saturated and trans fats) and calories, but also early, midlife, and long-term obesity are associated with an increased risk of mental health conditions^{95;96}. Advanced glycated endproducts (AGEs), a group of endogenous sugar-protein compounds that have proinflammatory properties⁹⁷, have been linked with AD⁹⁸. External sources of AGE, found in high sugar and fried foods as well as foods exposed to high and dry heat may contribute to the body's pool and promote "cross-linking" of proteins and AD development⁹⁹.

Studies have reported consistent associations between diet patterns and the symptoms of anxiety and depression¹⁰⁰⁻¹⁰². Cross-sectional and longitudinal studies that compared "healthy" and "unhealthy" diets classified by food frequency questionnaires have shown that increased adherence to unhealthy diets (e.g., non-Mediterranean) is associated with new diagnoses of depression¹⁰⁰, dysthymia, or anxiety disorders¹⁰², or high depression scores¹⁰¹. Mediterranean-style diets are characterized by an

abundance of plant foods and include vegetables, fresh and dried fruits, whole-grain cereals, nuts and legumes, and a moderate amount of red wine¹⁰³.

It is well known that prevention is a logical and cost-effective intervention for eating disorders. Efforts that emphasize health at every size and intuitive eating are promising practices¹⁰⁴. Targeted prevention such as dissonance programs address thin-ideal internalization and challenge body distortions¹⁰⁵.

*Table 2: Examples of Nutrition-Related Strategies that Promote Mental Health and Prevent Mental Health Conditions**

Target	Examples	Rationale	Mental Health Outcomes
Reproductive and mental health	<ul style="list-style-type: none"> • Support health-promoting choices for all women of childbearing age, pregnant women, and new mothers, using educational interventions to enhance nutrition, healthy weights, breastfeeding, psychosocial health, positive parent-infant attachment, and parenting skills. • Screen iron status in pregnant women • Targeted prenatal in-home counselling and support for at-risk pregnant women and new mothers (including food supplementation, promotion of life skills, screening for depression, brief interventions to decrease substance use) • Folate fortification programs and supplementation guidelines for women during childbearing years 	<ul style="list-style-type: none"> • Reduce social and environmental risk factors for mental health conditions • Pregnancy outcomes associated with cognitive development 	<ul style="list-style-type: none"> • Improvement of mental health both in the mothers and the newborns • Reduced prevalence of neural tube defects (from increased folate in the food supply) • Reductions in low birth weight and preterm delivery, and long-term reductions in problem behaviours.
Early childhood mental health	<ul style="list-style-type: none"> • Interventions that combine nutrition (e.g., food supplementation) with counselling and psychosocial care (e.g., attentive listening) • Breastfeeding support • Growth charts to monitor anthropometrics with referral to specialized services as needed • Preschool interventions to promote healthy eating 	<ul style="list-style-type: none"> • Reduce social and environmental risk factors for mental health conditions • Enhance social competence and other protective factors • Prevent weight issues that can impact mental health 	<ul style="list-style-type: none"> • Improved parenting literacy which includes knowledge of development and role of nutrition • Enhanced cognitive functioning • Healthy weight management, improved emotional and behavioural functioning • Positive parenting programs (Triple P) have a return on investment in excess of 6% based on special education, social services, mental health services, and criminal justice services⁹⁶

continued...

Table 2: Examples of Nutrition-Related Strategies that Promote Mental Health and Prevent Mental Health Conditions - continued

Target	Examples	Rationale	Mental Health Outcomes
Middle to late childhood mental health	<ul style="list-style-type: none"> • Parent nutrition and food training programs • Food programs and other feeding programs to target disadvantaged children (e.g., school breakfast clubs, weekend food hampers) • School-based ecological interventions and health education (e.g., healthy body image, media literacy prevention programs to prevent eating disorders and obesity, food skills training), and early detection of mental health problems (e.g., eating disorders) • Interventions for non-school contexts (e.g., promote eating together as families, offer only healthy foods and beverages) such as recreation facilities • Positive parenting programs with healthy lifestyle component 	<ul style="list-style-type: none"> • Children spend much of their time at school, which is an efficient setting to influence behaviour • Depression and anxiety are common emotional problems in childhood; and has been related to breakdown of families • Media literacy can help prevent weight-related problems 	<ul style="list-style-type: none"> • Improved parenting literacy which includes knowledge of development and role of nutrition • Enhanced cognitive functioning • Academic improvement, and increased problem-solving skills and social competence • Breakfast clubs are associated with improved behaviour in classrooms⁹⁷ • Healthy weight management, improved emotional and behavioural functioning • Positive parenting programs (Triple P) have a return on investment in excess of 6% based on special education, social services, mental health services, and criminal justice services⁹⁶ • Media literacy
Young adult mental health	<ul style="list-style-type: none"> • Ecological approaches that promote connectedness through food • Food programs (e.g., weekend food hampers) for disadvantaged individuals • School-based ecological interventions and health education (e.g., healthy body image, food skills training), and early detection of mental health problems (e.g., eating disorders) • Interventions for non-school contexts (e.g., promote eating together as families, offer only healthy foods and beverages) such as recreation facilities • Multi-component programs that include nutrition interventions targeted to at-risk youth and their parents • Perinatal education, skill development and supports for teen mothers • Strategies that prevent, delay and reduce use of substances • Opportunities in volunteering and mentorship related to nutrition and food (e.g., peer support food skills building) 	<ul style="list-style-type: none"> • Children spend much of their time at school, which is an efficient setting to influence behaviour • Depression, anxiety, substance use, and suicide can occur during adolescence; and has been related to breakdown of families • Media literacy can help prevent weight-related problems 	<ul style="list-style-type: none"> • Improved food and nutrition literacy • Media literacy • Enhanced cognitive functioning • Academic improvement, and increased problem-solving skills and social competence • Breakfast clubs are associated with improved behaviour in classrooms⁹⁷ • Healthy weight management, improved emotional and behavioural functioning • Positive parenting programs (Triple P) have a return on investment in excess of 6% based on special education, social services, mental health services, and criminal justice services⁹⁶

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Table 2: Examples of Nutrition-Related Strategies that Promote Mental Health and Prevent Mental Health Conditions - continued

Target	Examples	Rationale	Mental Health Outcomes
Mental health in adulthood	<ul style="list-style-type: none"> • Work with primary care physicians to provide mental health promotion and screening of nutrition-related issues • Healthy worksite programs, including how to cope with periods of unemployment or underemployment (e.g., low-cost healthy eating) • Healthy eating and body image education in a university or college setting • Nutrition labelling and education programs • Phone helpline and online services for dietary information • Eating disorder prevention programs • Body image education, screening and detection of mental health conditions 	<ul style="list-style-type: none"> • Workplace stress and unemployment are major stressors • Promote food literacy skills (e.g., label reading) • Weight gain in menopause; can cause distress, and can alter eating habits and body image • Disordered eating reported in adult women 	<ul style="list-style-type: none"> • Healthier, motivated workforce and reduced sickness absences • Simulations of workplace programs (e.g., Web portal, wellness literature, seminars) found returns on investment of 9 to 1⁹⁸ • Worksite prevention strategies can produce annual savings of \$392,055⁹⁹ • Enhanced self-esteem, self-reliance, and self-determination over healthy food choices
Mental health of older adults	<ul style="list-style-type: none"> • Promote brief primary care interventions during routine primary care for older adults to promote nutrition screening and early intervention, treat vascular disease to prevent/delay dementia, and brief interventions to reduce substance use • Healthy living interventions, including nutrition, in primary care and programs using life review techniques • Work with food retailers to develop “senior-friendly” shopping facilities to maintain the independence of older citizens and allow them to do their own food purchasing 	<ul style="list-style-type: none"> • Older adults are at increased risk for food insecurity, dementia, depression, poor nutrition, and substance use 	<ul style="list-style-type: none"> • Prevent high blood pressure, stroke, and high blood cholesterol levels; reduces the risk of dementia • Promote optimal nutrition • Enhance food security • Prevent substance use which can impact nutritional status

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Table 2: Examples of Nutrition-Related Strategies that Promote Mental Health and Prevent Mental Health Conditions - continued

Target	Examples	Rationale	Mental Health Outcomes
Foster mental health by creating supportive environments and reducing inequities	<ul style="list-style-type: none"> Food security policies and programs (e.g., buying clubs, community kitchens, community gardens) Healthy food options in congregate meal programs (e.g., in seniors centres, transitional houses, emergency shelters, adults day care programs) Food and nutrition service standards in facilities and programs Work with governments around the planning of locations of food establishments, transit, and zoning provisions that enable access to healthy foods Sufficient food assistance funds that give those on social assistance adequate resources to purchase foods for a healthy diet 	<ul style="list-style-type: none"> Poverty is a risk factor for mental health conditions Studies of congregate meal programs indicate nutritional content of menus don't always meet standards Research shows that convenience stores with limited food selection are more typical in low-income neighbourhoods 	<ul style="list-style-type: none"> Social inclusion, food security, self-reliance, and self-determination over food choices
Community action for mental health	<ul style="list-style-type: none"> Work with family-based centres and programs to build capacity to address food security and support nutritional health of children Train peer support workers about nutrition in programs targeting vulnerable populations such as high-risk pregnant moms, Aboriginals, and seniors Promote healthy eating by providing healthy menu options in restaurants 	<ul style="list-style-type: none"> Childhood obesity rates are increasing; carrying excess weight can impact on physical and mental health Weight bias associated with overweight leads to stigmatization; can reduce quality of life and increase risk for low self-esteem and depression 	<ul style="list-style-type: none"> Social inclusion, food security, healthy weights
Healthy public policy for mental health	<ul style="list-style-type: none"> Healthy community policies affecting various sectors to enable access to healthy food choices (e.g., recreation centres, workplaces, day cares, restaurants) Nutrition labelling to help consumers make healthy food choices Mental health and nutrition policy Policies and regulatory frameworks to test foods for a range of contaminants regularly and appropriate actions are taken 	<ul style="list-style-type: none"> Many food environments are obesogenic; weight issues can impact mental health Contaminants can affect brain health 	<ul style="list-style-type: none"> Food security, self-determination

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Table 2: Examples of Nutrition-Related Strategies that Promote Mental Health and Prevent Mental Health Conditions - continued

Target	Examples	Rationale	Mental Health Outcomes
Cultural competence and mental health	<ul style="list-style-type: none"> Develop culturally appropriate nutrition education materials based on engagement by potential users 	<ul style="list-style-type: none"> Cultural assimilation can affect mental health Some populations experience more discrimination and distress Address specific needs of Aboriginal people and people from diverse cultural and ethnic backgrounds 	<ul style="list-style-type: none"> Health (nutrition) literacy, self-determination Reduce health and social inequities
Reorient mental health services	<ul style="list-style-type: none"> Facilitate networks and referrals among dietitians and other health providers so that community members have access to a range of nutrition services Train other providers and professionals (e.g., nurses, social workers, teachers) to extend dietitian expertise Encourage automatic referral of mental health consumers to dietitians once prescribed psychiatric medications known to cause weight gain and nutrition-related side effects Develop nutrition risk screening tools for mental health consumers Provide undergraduate education in nutrition and mental health promotion and prevention Use Internet-based mechanisms (e.g., email-based campaigns) to promote self-help strategies 	<ul style="list-style-type: none"> Current nutrition services in mental health are limited Specific training in mental health promotion and prevention is minimal Studies suggest that nutrition risk screening is often not performed in mental health populations, and when consumers are high-risk this is usually not detected Other providers learn practical strategies for promotion of mental health and well-being which are often needed in daily practice 	<ul style="list-style-type: none"> Reduce health and social inequities Prevention of mental health conditions
Preventing physical health conditions	<ul style="list-style-type: none"> Establish standards for prevention and treatment of individuals with, or at risk for, diabetes and other common conditions seen in mental health consumers 	<ul style="list-style-type: none"> Comorbid conditions are common in mental health consumers 	<ul style="list-style-type: none"> Reduce inequities

continued...

Table 2: Examples of Nutrition-Related Strategies that Promote Mental Health and Prevent Mental Health Conditions - continued

Target	Examples	Rationale	Mental Health Outcomes
Treatment strategies to enhance mental health	<ul style="list-style-type: none"> • Include nutrition interventions as part of clinical guidelines for treatment of mental health conditions • Targeted initiatives to address depression experienced by people with chronic conditions and disabilities 	<ul style="list-style-type: none"> • Nutrition is not part of most standards or clinical guidelines for mental health 	<ul style="list-style-type: none"> • Reduce inequities
Research for mental health	<ul style="list-style-type: none"> • Collect surveillance data that can enable tracking of foods, beverages, and added substances in food products (e.g., caffeine) and relationship to mental health • Encourage and fund research in specialized areas of nutrition and mental health, particularly for vulnerable populations 	<ul style="list-style-type: none"> • There is limited knowledge about the impact of intake of substances (e.g., caffeine), particularly for children • Lack of evidence about certain segments of the population (e.g., some have genetic polymorphisms that are associated with altered rates of metabolism of caffeine) — consumption of these substances within current acceptable levels can present health risk 	<ul style="list-style-type: none"> • Reduce inequities

*Table adapted from:

Dietitians of Canada (2006). *The Role of Dietitians in Collaborative Primary Health Care Mental Health Programs*. Mississauga: Canadian Collaborative Mental Health Initiative

Jané-Llopis, E., and Anderson, P. (Eds.) (2006). *Mental health promotion and mental disorder prevention across European Member States: A collection of country stories*. Luxembourg: European Communities

BC Health Authorities and BC Ministry of Healthy Living and Sport (2009). *Model Core Program Paper: Mental Health Promotion and Mental Disorders Prevention*. Victoria: BC Ministry of Healthy Living and Sport.

5. Nutrition, Mental Health Promotion, and Disease Prevention:

A Case Example and Resources

In Table 2, examples of nutrition and mental health promotion strategies, their rationale, and reported outcomes were outlined. In Canada, there are many nutrition and mental health promotion programs and services at work. Here, we outline a recent initiative.

Healthy Buddies Program

The Healthy Buddies program was developed around the prescribed learning outcomes from the British Columbia Ministry of Education. The program's content is based on 3 main components of healthy living: being physically active, eating healthy foods, and having a healthy body image. The program's slogan ("Go Move!", "Go Fuel!", and "Go Feel Good!") emphasizes these 3 themes. Twenty-one healthy-living lessons have been designed and taught over the course of the school year.

The program involves pairing older students with younger students. At the beginning of the school year, students in 4th through 7th grade are paired with kindergarten through 3rd-grade buddies. Each week, students in 4th through 7th grade receive a 45-minute healthy-living lesson through direct instruction from the teacher. Students in 4th through 7th grade act as peer educators, teaching a 30-minute lesson to their kindergarten through 3rd grade buddy. Buddy lessons are delivered using a variety of techniques (e.g., presentations, games, art activities, etc). In the first half of the year, the buddy pairs learn how to be positive buddies and learned about the 3 components of a healthy life. In the second half of the year, they learn about the challenges to living a healthy life (e.g., the media) and how to overcome these obstacles. Each buddy pair also spend two 30-minute structured physical activity sessions per week in the gymnasium, which allows

both classes (paired buddies) to participate simultaneously. Several steps are taken to decrease the potential variability in the performance between buddy pairs and to ensure that all younger buddies receive a similar experience. For instance, buddy pairs are changed once during the year, buddies away because of illness would be replaced by other buddies, and older buddies still developing in their leadership abilities would be paired with a more capable older buddy.

A brief description of the 3 themes of the Healthy Buddies program is provided below:

Regular Physical Activity: "Go Move!"

The buddy pairs spend two sessions per week doing 30-minute structured aerobic fitness sessions, called fitness loops. Each fitness loop incorporates a circuit, with a series of stations, designed around a theme (e.g., transportation fitness loop). Students are encouraged during the fitness loops to exercise vigorously, using self measured parameters of physical exertion (e.g., sweating, red in the face, etc). The school also participate in a school-wide healthy-living theme day, midway through the year. Each classroom prepares an activity and buddy pairs rotate through the different activities.

Healthy Eating: "Go Fuel!"

Students learn about nutritious and nonnutritious foods and beverages and were exposed to numerous examples of healthy foods throughout the program. Students' learning are reinforced through exercises such as memory card games and visual art projects. Students learn about why we eat, about how the body uses fuel and about energy balance.

Healthy Body Image, Self-esteem, and Social Responsibility: “Go Feel Good!”

Students first learn about valuing themselves and others based on who they and others are on the inside. The Healthy Buddies program also addresses body-image and disordered eating issues by teaching kids about healthy growth and development and media literacy. Fitness loops are designed for every level of fitness so that the physical activity component aids in healthy body-image development. The peer-led structure are designed to facilitate social skills development as well as self-esteem and social responsibility through role modeling.

A more comprehensive description of the Healthy Buddies program can be obtained from their website: www.healthybuddies.ca. Other resources for mental health promotion that the reader can access for further information are located in Appendix B.

6. Registered Dietitians in Mental Health Promotion: Qualified and Cost-Effective

Registered Dietitians are licensed health professionals who have special training and practice in many areas of human nutrition. Their skills can be applied to all aspects of mental health, including health promotion, and disease prevention. From their education in the science and management of nutrition, and practices based on evidence-based decision making and national standards, the Registered Dietitian can assess clinical, biochemical, and anthropometric measures, dietary concerns, and feeding skills, as well as understand the varied determinants of health that affect nutrition. In particular, Registered Dietitians are uniquely qualified to work within the multidisciplinary framework of mental health as their training provides the requisite:

- knowledge about the intersections between nutrition and mental health
- skills to develop, implement, and evaluate mental health promotion and disease prevention strategies
- skills needed to adapt psychotherapeutic approaches to achieve individualized nutritional goals
- cultural competence to work with diverse populations
- ability to advocate for and develop relevant policy and practice-based research initiatives

Complex interactions between genes, lifestyle, diet and environment are increasingly demanding that Registered Dietitians become members of multidisciplinary teams that provide services across the continuum of mental health care. Despite evidence that demonstrates that Registered Dietitian services improve health outcomes and are cost-effective^{591,592}, the services of this allied health professional in mental health promotion are currently lacking.

7. Concluding Remarks

This paper is derived from the comprehensive role paper on nutrition and mental health titled *Promoting Mental Health through Healthy Eating and Nutritional Care* which outlines a complete set of recommendations related to nutrition and the continuum of mental health care.

In this first paper (of three papers in the series), titled **The Role of Nutrition in Mental Health Promotion and Prevention (1)**, some of the intersections between diet, mental health promotion, and disease prevention are highlighted. Many possibilities exist to integrate healthy eating, nutrition, and mental health strategies into public health and health promotion policies and programs across various sectors and levels (e.g., local strategies, broad national interventions), which can generate a range of health, social, and economic benefits¹¹³. Public health messaging and social marketing that highlight the importance of healthy eating and mental health, initiatives targeted at building healthy food environments (e.g., sodium reduction, banning trans fats, food guidelines for schools and recreation facilities), food policy aimed at supporting the general population's mental health, and continued investigative work that strengthens the evidence base about diet and the prevention of mental health conditions are important mechanisms to support mental health promotion and disease prevention.

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Appendix A: Search Strategy

Search Strategy for Peer-Reviewed Literature for Section Two: Mental Health Promotion and Prevention

<i>Mental Health Terms</i>		<i>Promotion/Prevention Terms</i>		<i>Nutrition Terms</i>		<i>Databases</i>		<i>Search Limits</i>
Mental health Mental disorder Mental illness Mental wellness Mental well-being Behaviour Emotional intelligence Stress Depression Coping Mental crisis Anxiety Resilience Cognition Mood Sleep	+	Mental health promotion Mental illness prevention Mental health intervention Healthy public policy Population health Social marketing Body image Self esteem Food environments Perinatal	+	Nutrition Food Vitamins Minerals Antioxidants Beverages Food security	in	Medline Embase PsychInfo CINAHL Pubmed Science Citation Index HealthSTAR EBM Reviews Biological Abstracts	with	English Human Time: 1980 to present

Manual Searches

American Journal of Health Promotion, Journal of Public Mental Health, Journal of Mental Health Promotion, International Journal of Mental Health Promotion

Search Strategy for Grey Literature

Psychological associations, Canadian Mental Health Association, Canadian Institutes of Health Research, Centre for the Study of Living Standards, Centre for Applied Research in Mental Health and Addiction (CARMHA), Centre for Addiction and Mental Health, World Health Organization, Brain and Mind Research Institute (University of Sydney), corporate wellness companies, Web of Science

Appendix B: Nutrition and Mental Health Resources

Aboriginal

Registered Dietitians in Aboriginal Communities: Feeding Mind, Body and Spirit. Role Paper of the Dietitians of Canada Aboriginal Nutrition Network, 2012. www.dietitians.ca/aboriginalnutrition

Healthy Food Guidelines For First Nations Communities. First Nations Health Council, 2009. www.fnhc.ca

Indigenous Food Sovereignty. www.indigenousfoodsystems.org/food-sovereignty

Northwest Territories Food Guide. Government of the Northwest Territories.
www.hltss.gov.nt.ca/pdf/brochures_and_fact_sheets/healthy_eating_and_active_living/2005/english/nwt_food_guide.pdf

Northwest Territories Healthy Foods in Facilities. Food and Beverage Guidelines for Health and Social Services.
<http://pubs.aina.ucalgary.ca/health/62202.pdf>

Food-based dietary guidelines in circumpolar regions, 2011. [http://ijch.fi/CHS/CHS_2011\(8\).pdf](http://ijch.fi/CHS/CHS_2011(8).pdf)

Behaviour and Food

Food and Behaviour Research. www.fabresearch.org

Provides updates on nutrition and its role in the prevention and management of many kinds of difficulties in behaviour, learning and mood.

Body Size Acceptance

Health At Every Size (HAES). www.haescommunity.org

Budgeting

Healthy eating CHEAP AND EASY. www.health.gov.bc.ca/cpa/publications/HealthyEatingdoc.pdf

A nutrition education tool by the BC Ministry of Health Planning.

Culturally Competent Care

Goody CM, Drago L. Cultural Food Practices. Includes a chapter on culturally competent nutrition counselling. Book can be ordered from the Academy of Nutrition and Dietetics. www.eatright.org

Ethnoracial Resources

Mian S, Brauer P and CDA Committee. South Asian Materials for Educators. Toronto: Canadian Diabetes Association, 2008. www.diabetes.ca/for-professionals/resources/nutrition/tools/

Food Security

BC Food Security Gateway. www.health.gov.bc.ca/healthyeating/foodsecurity.html

Food Secure Canada. <http://foodsecurecanada.org>

Healthy Eating and Living Resources

Gates LM. Making the Case for Integrating Healthy Eating into Mental Health Service. www.mindingourbodies.ca

Provincial Health Services Authority, BC Mental Health and Addiction Services, BC Children's Hospital. Healthy Living, Healthy Minds: A Toolkit for Health Professionals. Government of British Columbia. www.keltymentalhealth.ca

Mental Health Resources

Anxiety Disorder Association of Canada. www.anxietycanada.ca

Autism Canada Foundation. www.autismcanada.org

Autism Society Canada. www.autismsocietycanada.ca

Canadian Collaborative Mental Health Initiative. www.ccmhi.ca

Canadian Mental Health Association. www.cmha.ca (bilingual)

Centre for Addiction and Mental Health. www.camh.net

Offers numerous fact sheets on mental disorders and addiction – most have been translated into many languages. Has online catalogue of resources. Also have series of webinars, CAMH Mental Health and Addiction 101 Series

Mental Health Commission of Canada. www.mentalhealthcommission.ca

Provides quarterly newsletters; subscription free.

Mood Disorders Society of Canada. www.mooddisorderscanada.ca

Schizophrenia Society of Canada. www.schizophrenia.ca (bilingual)

Seniors' Psychosocial Interest Group. www.seniorsmentalhealth.ca

The Alzheimer's Society of Canada. www.alzheimer.ca

Mental Health Promotion

BC Health Authorities and BC Ministry of Healthy Living and Sport. Model Core Program Paper: Mental Health Promotion and Mental Disorders Prevention. 2009, Victoria: BC Ministry of Healthy Living and Sport.

www.vch.ca/media/MentalHealth_Model_Paper.pdf

Canadian Mental Health Association, Ontario. Making the Case for Integrating Healthy Eating into Mental Health Service Provision. 2010. www.mindingourbodies.ca/sites/mindingourbodies.ca/files/Making_the_Case_for_Healthy_Eating.pdf

Canadian Mental Health Association, Ontario. Eating Well for Mental Health - Final Evaluation Report. 2010. www.mindingourbodies.ca/about_the_project/evaluation/eating_well_for_mental_health_final_evaluation_report

Canadian Mental Health Association, Ontario. Mental Health Promotion in Ontario: A Call to Action. 2008. Toronto, Canadian Mental Health Association.

World Health Organization (WHO). Prevention and Promotion in Mental Health. 2002. Geneva, WHO.

World Health Organization (WHO). Strengthening mental health promotion (Fact sheet no. 220). 2001. Geneva, WHO.

Mindful Eating

Altman D. Meal-by-Meal: 365 Daily Meditations for Finding Balance Through Mindful Eating. Inner Ocean Publishing (April, 2004)

David M. The Slow Down Diet: Eating for Pleasure, Energy, and Weight Loss Healing. Arts Press (2005)

Koenig K. The Rules of "Normal" Eating: A Commonsense Approach for Dieters, Overeaters, Undereaters, Emotional Eaters, and Everyone in Between! Gürze Books (2005)

Motivational Interviewing

Dr. Bill Miller's Motivational Interviewing Homepage. www.motivationalinterview.org

MI Training for New Trainers (TNT) Workbook. www.motivationalinterview.org/training/tnt2004.pdf

Molly Kellogg Resources. www.mollykellogg.com

Manual for the Motivational Interviewing Skills Code (MISC). <http://casaa.unm.edu/download/misc.pdf>

Brief coding form to assess motivational interviewing practice. www1.od.nih.gov/behaviorchange/measures/mi.htm

Behaviour Change Counselling Index (BECCI) – A tool for assessing MI Practice in Clinicians (Scale and coding). www.cardiff.ac.uk/medicine/general_practice/csu

Physical Activity

The Physical Activity Resource Centre

A website managed by the Ontario Physical and Health Education Association. Provides educators and healthcare promoters with an online networking space. Available at: www.ophea.net/parc



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