

**Quality of Life, Exercise Behaviour and Baseline Dietary Intake of Women Undergoing  
Neoadjuvant Chemotherapy in the DHA WIN Randomized Controlled Trial**

by

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## ABSTRACT

Breast cancer is the second most common cancer in Canada. It is estimated that one in eight Canadian women will be diagnosed with the disease in their lifetime. Neoadjuvant chemotherapy is often prescribed to improve surgical resection outcomes and reduce micrometastases. Achieving a pathological complete response (pCR) after neoadjuvant chemotherapy is associated with an improved prognosis. However, chemotherapy has been associated with side effects that undermine quality of life (QoL) and inhibit physical activity. Both exercise and supplementation of omega-3 polyunsaturated fatty acids during chemotherapy have been associated with reduced side effects and improved QoL in breast cancer patients. There are mixed findings regarding the relationship between exercise and pCR in patients with breast cancer.

The current study analyzes secondary outcomes from the DHA WIN phase II randomized controlled trial which was designed to evaluate docosahexaenoic acid (DHA) supplementation (4.4 g/day) on tumour growth and metabolism in women with breast cancer undergoing six cycles of neoadjuvant chemotherapy (3 weeks/cycle) (n = 49). QoL questionnaires were completed at baseline and at the end of chemotherapy treatment (n = 47). Exercise questionnaires were completed at baseline, the start of cycles 2 to 6 and the end of cycle 6 (n = 42). A food frequency questionnaire was completed at baseline (n = 46) and pCR was assessed after surgery (n = 49).

Estimated daily dietary intake of macronutrients, cholesterol, sodium, sugar and dietary fiber were not statistically significantly different between the DHA and placebo groups. Compared to Albertan women that completed the 2015 Canadian Community Health Survey (CCHS), the estimated daily intake of the DHA WIN cohort was greater for protein, total fat, total monounsaturated fatty acids, sodium and dietary fiber (all  $p \leq 0.05$ ). Compared to the CCHS cohort, a greater percentage of the DHA WIN cohort was above the acceptable macronutrient

distribution range for fat (52.2% versus 32.9%,  $p = 0.008$ ) and carbohydrate (8.7% versus  $< 3\%$ ,  $p = 0.008$ ).

All subscales of the Functional Assessment of Cancer Therapy (FACT) questionnaire (except emotional well-being), the fatigue subscale and the State-Trait Anxiety Inventory (STAI) score decreased over time in both the DHA and control groups ( $p\text{-time} \leq 0.03$ ). Emotional well-being and the Fordyce Emotions Combination score increased over time in both groups ( $p\text{-time} \leq 0.03$ ). DHA supplementation did not significantly mitigate the change in any QoL indicator over time.

A change over time was observed for mean weekly aerobic exercise ( $p\text{-time} < 0.001$ ) and resistance training frequency ( $p\text{-time} = 0.01$ ). However, the DHA treatment did not significantly affect mean weekly aerobic exercise ( $p\text{-interaction} = 0.56$ ) or resistance training frequency ( $p\text{-interaction} = 0.28$ ) over time.

Participants that met WHO's aerobic exercise recommendation at baseline experienced a smaller decline in their FACT-General (FACT-G) total score, a greater decline in their Perceived Stress Scale and STAI scores, as well as a greater increase in their emotional well-being score over time ( $p\text{-interactions} \leq 0.05$ ). Similarly, participants that met WHO's aerobic exercise recommendation at the end of cycle 6 experienced a smaller decline over time in their FACT-G total score and functional well-being ( $p\text{-interactions} = 0.01$ ).

Participants that met WHO's resistance training recommendation at baseline experienced a smaller decline in their FACT-G total score and FACT-Breast (FACT-B) total score over time ( $p\text{-interactions} \leq 0.06$ ). Similarly, participants that met WHO's resistance training exercise recommendation at the end of cycle 6 experienced a smaller decline in their functional well-being and FACT-B trial outcome indices ( $p\text{-interactions} \leq 0.07$ ). Meeting WHO's aerobic or resistance

training exercise recommendation at baseline or the end of cycle 6 was not associated with achieving a pCR.

These findings suggest that aerobic and resistance training exercise before and during treatment have the potential to mitigate the negative effect of chemotherapy on various QoL indicators in patients with breast cancer. DHA did not appear to mitigate the change in participants' QoL over time. Further research is needed to determine the role of exercise in achieving a pCR in this population.

## **PREFACE**

This thesis is an original work by Claire Douglas. The clinical trial titled “Docosahexaenoic Acid (DHA) for Women with Breast Cancer in the Neoadjuvant Setting (DHA-WIN)” that produced the data that was analyzed in the thesis research received Health Canada approval (#HC6-24-c220167) and full ethical approval by the Health Research Ethics Board of Alberta-Cancer Committee (HREBA.CC-18-0381). The trial is registered at ClinicalTrials.gov (NCT03831178).

## **DEDICATION**

To my mom, dad, brother and partner. Thank you for your continuous support and encouragement. I owe my participation in this program to all of you.

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## **LIST OF ABBREVIATIONS**

ACSM, American College of Sports Medicine

AI, adequate intake

ALA, alpha-linolenic acid

AMDR, acceptable macronutrient distribution range

ASCO, American Society of Clinical Oncology

BC, breast cancer

BMI, body mass index

BPI, brief pain inventory

CCHS, Canadian Community Health Survey

CDRR, chronic disease risk reduction intake

CCI, Cross Cancer Institute

C-DHQ II, Canadian-Diet History Questionnaire II

CES-D, Center for Epidemiologic Studies-Depression

CRF, cancer-related fatigue

DHA, docosahexaenoic acid

DHA WIN, Docosahexaenoic acid for Women with Breast Cancer in the Neoadjuvant Setting

DRI, dietary reference intake

EAR, estimated average requirement

ECOG, Eastern Cooperative Oncology Group

EPA, eicosapentaenoic acid

ER, estrogen receptor

ES, endocrine symptoms

FACIT, Functional Assessment of Chronic Illness Therapy

FACT, Functional Assessment of Cancer Therapy

FACT-B, FACT – Breast

FACT-ES, FACT – Endocrine Symptoms

FACT-G, FACT – General

FFQ, food frequency questionnaire

GEE, generalized estimating equations  
HER2, human epidermal growth factor receptor 2  
HRQoL, health-related quality of life  
MCID, minimal clinically important difference  
n-3, omega-3  
pCR, pathological complete response  
PR, progesterone receptor  
PSS, Perceived Stress Scale  
PUFA, polyunsaturated fatty acid  
QoL, quality of life  
RCT, randomized controlled trial  
RDA, recommended dietary allowance  
RDI, relative dose intensity  
STAI, State-Trait Anxiety Inventory  
TNBC, triple-negative breast cancer  
TOI, trial outcome index  
UL, tolerable upper intake level  
WB, well-being  
WHO, World Health Organization

## **CHAPTER 1: INTRODUCTION**

Chemotherapy has been associated with several side effects that undermine the quality of life (QoL) and inhibit physical activity in patients with breast cancer [1, 2]. Both exercise [2-5] and supplementation of omega-3 polyunsaturated fatty acids (n-3 PUFAs) [6, 7] during chemotherapy have been associated with reduced side effects and improved QoL in breast cancer patients. This paper will describe QoL, exercise behaviour and dietary habits in women with breast cancer undergoing neoadjuvant chemotherapy and investigate relationships between the aforementioned variables. This chapter will provide a background on the relevant topics and review the current literature.

### **1.1 Breast Cancer**

Breast cancer is the second most common cancer in Canada, and the most common cancer among Canadian women [8]. It is estimated that one in eight Canadian women will be diagnosed with the disease sometime in their lifetime. It was estimated in 2023 that 29,400 Canadian women would be diagnosed with breast cancer that year [9], of which approximately 82% would have been diagnosed at stage I or II [8]. Early detection and advances in treatment have made the likelihood of surviving the disease for at least five years following a diagnosis approximately 89% in Canada [8]. Several factors contribute to one's risk of developing the disease. These include non-modifiable risk factors such as age, genetic predisposition, early menarche and late menopause, as well as a number of modifiable risk factors including diet, being overweight or obese, and physical activity [10, 11].

Treatment choices for breast cancer depend on the molecular subtype, grade and stage of the tumour [12]. Invasive breast cancer can be categorized by molecular subtype, which is



determined by the expression of the estrogen receptor (ER), progesterone receptor (PR) and human epidermal growth factor receptor 2 (HER2) [12]. Luminal A breast cancer (ER+ and/or PR+, and HER2-) comprises approximately 60% of cases and is associated with a good prognosis [12]. Luminal B breast cancer (ER+ and/or PR+, and HER2+) and HER2+ breast cancer (ER-, PR- and HER2+) make up about 30% and 10% of cases, respectively [12]. Both subtypes are associated with a poor prognosis. Triple-negative breast cancer (TNBC) represents 15-20% of cases [12]. It is more aggressive than other subtypes and is associated with the worst prognosis.

The tumour grade is based on the appearance of tumour cells compared to nontumour cells, and is one index used to determine the aggressiveness of the tumour [12, 13]. Breast cancer is graded from one to three, with higher grades indicating more abnormal cells which tend to proliferate faster and are more likely to metastasize [14]. The tumour stage describes the extent of cancer in the body, and is based on tumour size, lymph node invasion and the presence of metastases [12]. There are five stages for breast cancer ranging from zero to four, with higher numbers indicating larger tumours and cancer that has spread more [15]. Some stages are subdivided using the letters A, B and C, with earlier letters indicating a lower stage [15, 16]. Both tumour stage and grade provide prognostic information for breast cancer tumours, with higher stages and grades typically having a poorer prognosis [13, 17].

Treatment for non-metastatic breast cancer often involves surgically removing the tumour with preoperative (neoadjuvant) or postoperative (adjuvant) radiotherapy or systemic therapy, including chemotherapy [12]. Neoadjuvant chemotherapy was originally used in patients with inoperable tumours in an attempt to make them operable [18]. However, it is now commonly used for earlier, operable breast cancer and locally advanced breast cancer to allow for breast conservation therapy, reduce micrometastases, and improve surgical resection outcomes and

prognoses [1, 19-22]. Approximately 20% of newly diagnosed patients with breast cancer receive neoadjuvant chemotherapy, which is more frequently prescribed to patients with TNBC or HER2+ subtypes [19, 23, 24]. Its efficacy is determined, in part, by achieving a pathological complete response (pCR), which has been defined as the absence of any residual invasive tumours in the breast and axillary lymph nodes [25]. For example, a recent meta-analysis concluded that achieving a pCR after neoadjuvant chemotherapy was associated with overall survival and event-free survival in breast cancer patients, particularly for TNBC and HER2+ breast cancer [26]. Approximately 20% of breast cancer patients that receive neoadjuvant chemotherapy achieve a pCR [27]. Ki-67, a marker of tumour proliferation, has been shown to be an independent predictor of pCR in breast cancer patients, and is another common endpoint to measure efficacy of neoadjuvant chemotherapy in clinical trials [19, 28, 29].

Chemotherapy has consistently been proven to improve survival among breast cancer patients [30]. Relative dose intensity (RDI) is defined as the ratio of delivered dose intensity to planned dose intensity for a chemotherapy regimen [31]. It is recommended that an  $RDI \geq 85\%$  be achieved in ER+/PR+ and HER2- patients, and an  $RDI \geq 75\%$  in TNBC in order to optimize survival benefits [30]. However, there are numerous toxic side effects associated with chemotherapy that may contribute to poorer treatment outcomes including fewer courses of chemotherapy delivered, dose reductions, treatment delays and decreases in overall treatment time [32]. For example, a retrospective review that included 20,799 patients with early-stage breast cancer treated with adjuvant chemotherapy reported that 55.5% of patients received an RDI of  $<85\%$  [33]. Side effects of chemotherapy include fatigue, dizziness, constipation, loss of appetite, nausea, vomiting, reduced exercise capacity and weight gain which ultimately affects individuals' QoL [6, 21, 34, 35]. Co-adjuvant therapies have the potential to reduce side effects and maintain

patients' QoL, which may contribute to improved chemotherapy tolerability and increased RDIs of chemotherapy [6, 32].

## **1.2 Docosahexaenoic acid for Women with Breast Cancer in the Neoadjuvant Setting (DHA WIN) Randomized Controlled Trial**

Not all patients that receive neoadjuvant chemotherapy achieve a pCR, and it is therefore important to identify agents that increase the efficacy of this treatment without causing additional side effects [19]. Previous preclinical studies have demonstrated the ability of DHA to reduce tumour growth when combined with chemotherapy [19, 36-39]. DHA supplementation has also been shown to increase chemotherapy efficacy in animal models of breast cancer [40]. Increased dietary intake of n-3 long-chain PUFAs, including DHA, increases incorporation of DHA into breast adipose tissue [19, 41], which has been correlated with the tumour response to chemotherapy in patients with breast cancer [42]. For example, in a single-arm phase II study, Bougnoux *et al.* (2009) found that DHA supplementation (1.8 g/day) during chemotherapy in women with advanced metastatic breast cancer was associated with improved outcomes [43]. The objective of the DHA WIN phase II clinical trial was to investigate the effect of DHA supplementation (4.4 g/day) during neoadjuvant chemotherapy on treatment efficacy in women with non-metastatic breast cancer. In addition to the primary outcome (Ki67 index), several secondary outcomes were measured during the trial, including QoL, exercise, food frequency questionnaires and rate of pCR.

## **1.3 Quality of Life**

Although the ultimate goal of cancer treatment is curing patients of their disease, QoL during and after treatment is also a priority to many patients [44]. The World Health Organization

(WHO) describes QoL as one's perception of their reality in the context of their culture and values [45]. Health-related QoL (HRQoL) considers how disease and treatment affect an individual's sense of overall function and well-being [44]. QoL has become an important outcome measure and factor in treatment decisions [1]. Therefore, it is critical to better understand how neoadjuvant chemotherapy affects patients' QoL.

### **1.3.1 Quality of Life During Cancer Treatment**

Neoadjuvant chemotherapy is associated with a number of physical and psychosocial side effects including cancer-related fatigue (CRF) and impaired HRQoL [21]. Zhao *et al.* (2022) found that among ten studies that investigated physical aspects of QoL, 80% of breast cancer patients receiving neoadjuvant chemotherapy experienced some physical symptoms, including nausea, vomiting, fatigue, impaired cognitive function and pain [1]. One observational study with 134 breast cancer patients found that 48.5% of participants experienced chemotherapy-induced nausea and vomiting [46]. A number of studies have reported increased fatigue among patients with breast cancer subject to neoadjuvant chemotherapy [47, 48]. One study found that QoL significantly decreased after preoperative chemotherapy [49]. This finding stayed consistent for the physical symptoms and pain subscale, as well as the side-effects of treatment subscale, but the authors found that the subscale titled "Dress, sexual aspect, other" significantly increased after preoperative therapy. Specifically, the latter subscale asked respondents, among other things, if they found it difficult to wear the clothes they wanted to wear, if they were satisfied with their sex life and whether they worried about their family getting the same disease. Hermelink *et al.* (2007) conducted a prospective longitudinal study and found that cognitive function remained stable in

most patients undergoing neoadjuvant chemotherapy, but that 27% of patients experienced cognitive decline [50].

Zhao *et al.* (2022) reported that among eight studies that examined neoadjuvant chemotherapy's psychological effects, 52% of breast cancer patients experienced negative psychological effects related to emotional well-being, anxiety/depression and role function. Lee *et al.* (2022) found that patients with breast cancer experienced the most severe depression during neoadjuvant chemotherapy, compared to before and after chemotherapy [51]. In contrast, patients experienced the highest level of anxiety before chemotherapy, which gradually improved during treatment. Another study found that chemotherapy-induced nausea and vomiting was significantly associated with anxiety, highlighting the interrelatedness of the discussed symptoms [46].

Zhao *et al.* (2022) found that among five studies, 55% of breast cancer patients receiving neoadjuvant chemotherapy did not receive adequate family or societal support [1]. The authors found that family social support was positively correlated with patient self-esteem, which further emphasizes the importance of social support for these individuals. It is imperative to identify ways to reduce the side effects of neoadjuvant chemotherapy in order to prevent a reduction in patients' QoL.

## **1.3.2 DHA and QoL**

### *1.3.2.1 Omega-3 Fatty Acids*

Omega-3 PUFAs are involved in many physiological and metabolic processes, and contribute to cell membrane structure, fluidity and cell signaling [52, 53]. The most abundant n-3 PUFA in the diet is the short-chain alpha-linolenic acid (ALA, 18:3n-3), which is a dietary essential fatty acid that serves as a precursor for a number of n-3 long-chain PUFAs, including

eicosapentaenoic acid (EPA, 20:5n-3) and docosahexaenoic acid (DHA, 22:6n-3). However, it is estimated that less than 1% of ALA is converted to DHA [52]. Therefore, one must directly consume DHA in order to significantly increase tissue levels [19].

Supplementation of EPA and DHA during chemotherapy has been shown to reduce toxicity and improve disease outcomes in cancer patients [6, 32]. This was reported to be due to modulation of inflammatory profiles, maintenance of nutritional status by reducing gastrointestinal side effects, maintenance of skeletal muscle and improved neuronal recovery following chemotherapy-related toxicities [32].

#### *1.3.2.2 The Role of DHA in QoL of Breast Cancer Patients*

A recent systematic review examined randomized controlled trials (RCTs), quasi and semi-experimental studies that investigated the effects of supplementation or consumption of foods enriched in n-3 fatty acids (300 – 6000 mg/day) in breast cancer patients that were receiving treatment or were in the follow-up period [6]. The authors found that n-3 fatty acid supplementation led to a significant decrease in perceived stress, sleep disturbance, depression, pain, joint stiffness and fatigue. Among the studies reviewed, only one considered QoL among breast cancer patients that were supplemented with n-3 fatty acids *during* neoadjuvant chemotherapy [54]. It consisted of an RCT in which the treatment group received 2.4 g/day of n-3 PUFA (1.6 g EPA and 0.8 g DHA) during the six months of chemotherapy. Both groups experienced an increase at three and six months in fatigue, nausea, drowsiness, appetite and dyspnea and there were no significant differences between groups [54].

A review done by Newell *et al.* (2021) concluded that supplementation of EPA and DHA in clinical cancer therapy improved overall QoL among patients with various types of cancer [7].

Focusing on breast cancer patients, Martinez *et al.* (2019) carried out a single-arm clinical trial in which patients were supplemented with n-3 fatty acids, hydroxytyrosol and curcumin for one month during hormonal therapy [55]. The authors observed a 21.5% decrease in patients' worst pain score obtained from the brief pain inventory (BPI) after 30 days of treatment. However, Shen *et al.* (2018) found that in an RCT with women also undergoing hormonal therapy for breast cancer, supplementation of 3.3 g/day of EPA + DHA for 24 weeks significantly decreased the BPI worst pain scores among obese patients, but there were no differences in treatment arms among non-obese patients [56]. Another RCT supplemented breast cancer patients with 0.2 g EPA and 1.0 g DHA per day for 16 weeks during treatment and one month following treatment, and the authors observed a significant reduction in peripheral neuropathy in the treatment group compared to the control group [57]. Taken together, these findings suggest that n-3 supplementation during chemotherapy may improve the QoL of breast cancer patients, but further investigation is needed to understand its effect on patients receiving neoadjuvant chemotherapy.

#### **1.4 Exercise**

Physical activity has been shown to reduce risk, recurrence and mortality from breast cancer [11]. One study demonstrated that meeting WHO's recommendation for aerobic exercise was associated with a 12% risk reduction for breast cancer [58]. Similarly, a meta-analysis investigating 38 cohort studies reported that the most physically active women had a 12-21% reduced risk of breast cancer than the least physically active women [59].

Several biological mechanisms underlying the role of physical activity in breast cancer outcomes have been proposed. These include changes in body composition, improvements in metabolic function, a reduction in estrogen availability, changes in inflammatory and immune

mediators and alterations in tumour gene expression [11, 60]. Physical activity has also been shown to alter the phenotype of tumour vasculature, which may improve chemotherapy efficacy and enhance tumour regression [25, 61, 62]. Specifically, preclinical studies have demonstrated that moderate aerobic exercise is able to remodel breast tumour vasculature and improve blood flow and drug delivery to tumours [63, 64]. It is also important to highlight that a combination of aerobic and resistance training has been shown to improve chemotherapy completion rates in women with breast cancer undergoing adjuvant chemotherapy [65]. Chemotherapy completion rates have been strongly associated with an improved prognosis [25], and therefore the association between exercise and treatment completion may help explain the beneficial role of exercise on patient outcomes.

WHO recommends that adults aged 18 to 64 perform at least 150-300 minutes of moderate-intensity aerobic physical activity, 75-150 minutes of vigorous-intensity aerobic physical activity, or an equivalent combination of both, per week [66]. WHO also recommends that this population do muscle-strengthening activities at moderate or greater intensity on two or more days per week. It is worth noting that WHO has also released guidelines for people living with chronic conditions, including cancer survivors [66]. These guidelines are consistent with those previously described for healthy individuals, but also include the recommendation for older adults to do multicomponent physical activity that emphasizes functional balance and strength training at least three days per week. The American College of Sports Medicine (ACSM) has also developed exercise guidelines for cancer survivors, including both patients actively receiving treatment and those that have finished treatment [67]. The ACSM produced a roundtable report in 2018 that detailed the type and duration of exercise shown to improve specific cancer-related side effects [67]. Generally, they reported that moderate-intensity aerobic training for a minimum of 30 minutes at least three times



per week, for a minimum of 8-12 weeks positively effects health-related outcomes including anxiety, depression, fatigue, QoL and physical function. They also found that resistance training at least twice weekly in addition to the aerobic exercise recommendation demonstrated similar benefits to aerobic exercise alone. Lastly, the American Society of Clinical Oncology (ASCO) recommends regular aerobic and resistance exercise during active treatment with curative intent [68]. Previously established guidelines can serve as cutoff points to help assess whether meeting the recommendations leads to better clinical outcomes. Physical activity is recommended for individuals with any cancer type, but the kind, intensity and duration may need to be tailored to the specific individuals' condition [2]. This highlights the need to understand the role of different types of exercise in different clinical scenarios.

#### **1.4.1 Exercise During Cancer Treatment**

Physical activity of patients with cancer is often inhibited by side effects of chemotherapy, including severe fatigue, lack of energy and negative effects on individuals' mental health [2]. However, physical activity has been shown to reduce the severity of side effects, decrease fatigue and positively impact patients' QoL [2]. Therefore, it is critical to provide appropriate and evidence-based recommendations to patients with cancer because this may help encourage individuals to take part in physical activity despite treatment side effects.

Physical activity has been shown to alleviate fatigue and improve HRQoL in patients with breast cancer [3]. A recent meta-analysis of RCTs examined the effects of exercise interventions on CRF and QoL in cancer patients [4]. The authors concluded that exercise interventions reduced CRF and improved QoL, with greater effects observed for aerobic exercise. Consistent with these findings, Carayol *et al.* (2019) found that a combined diet and exercise intervention in patients

with early breast cancer undergoing chemotherapy and radiotherapy significantly improved fatigue and QoL at the end of treatment and 12 months post-intervention [5]. Another study investigated the effect of a 12-week self-managed home-based moderate intensity walking intervention on psychosocial health of patients with breast cancer undergoing chemotherapy [69]. The walking intervention significantly reduced fatigue, and increased self-esteem and mood compared to the control group. Several studies have demonstrated that the beneficial effects of exercise on fatigue and QoL persist for months after treatment [70-72].

#### **1.4.2 Association Between Exercise and Achieving a Pathological Complete Response**

As previously mentioned, exercise may act through several physiological mechanisms to exert beneficial effects on breast cancer outcomes, including chemotherapy efficacy and treatment completion rates. As a result, it has been hypothesized that physical exercise could improve pCR rates after neoadjuvant chemotherapy [25]. However, there are few studies investigating this association in breast cancer patients. One prospective study found that there was no relationship between pre-treatment levels of physical activity classification and pCR [73]. However, this study did not consider exercise levels *during* treatment. In contrast, results from a recent RCT that randomized breast cancer patients to usual care or a home-based exercise and nutrition counselling intervention found that among women receiving neoadjuvant chemotherapy, those assigned to the exercise and nutrition intervention were more likely to achieve a pCR than the control group [74].

Two clinical trials are currently underway that aim to investigate the effect of exercise on achieving a pCR in patients with breast cancer. One study is a prospective clinical trial in which patients are randomized to a home-based physical exercise intervention or routine care during neoadjuvant chemotherapy [25]. The primary endpoint of the trial is pCR. A similar RCT is

investigating the effects of supervised exercise training compared to usual care on tumour size, with pCR serving as a secondary outcome [21].

## **1.5 Dietary Intake**

### **1.5.1 Dietary Intake and Breast Cancer Risk**

Nutritional status and different dietary patterns have been associated with breast cancer risk, treatment outcomes and QoL in survivors [75]. Previous studies have investigated the role of nutrition, dietary patterns and individual foods in the risk of breast cancer. For example, increased consumption of alcohol, processed meats and animal fats as well as lower consumption of dietary fiber, fruits and vegetables may increase one's risk of breast cancer [76]. Previous studies have also demonstrated that healthy eating patterns reduce the risk of breast cancer, whereas unhealthy eating patterns increase the risk [75].

There are mixed findings regarding macronutrient intake and risk of breast cancer. A recent systemic review reported a significant association between dietary fat intake and breast cancer risk, which may be due to increased oxidative stress and obesity [76]. However, other studies have shown a negative association with breast cancer risk and dietary fat [77, 78]. Different types of fat may help explain these inconsistencies. For example, one study found that intake of saturated fatty acids was not associated with breast cancer risk, but polyunsaturated and total unsaturated fatty acid intake were associated with a decreased risk of breast cancer [77]. Similarly, multiple studies have demonstrated a positive association between dietary carbohydrate consumption and breast cancer risk, which may in part be due to insulin resistance [77-79]. Other studies, including a recent meta-analysis, found no significant association between dietary carbohydrate intake and breast cancer risk [79]. It is important to note that different types of dietary carbohydrates, including

sugars, starches and fiber may affect one's health in different ways. For example, dietary fiber has been associated with reduced breast cancer incidence, whereas sugar intake has been positively associated with breast cancer risk [80]. Lastly, several studies have found no significant association between total protein intake and breast cancer risk [81, 82]. However, when separated into vegetable protein and animal protein, they were associated with lower and higher breast cancer incidence, respectively [82]. Overall, inconsistent findings between breast cancer risk and macronutrient intake highlight the need for further investigation regarding nutrient intake and breast cancer risk.

## **1.5.2 Dietary Recommendations**

### *1.5.2.1 Dietary Reference Intakes*

Health Canada has provided healthy eating guidelines for the general population. It is recommended that individuals regularly consume fruits and vegetables, whole grain foods and protein, particularly plant protein, while limiting their intake of highly processed foods, added sodium, sugars and saturated fat [83]. Dietary reference intakes (DRIs) have been established to serve as nutrient recommendations for healthy Canadians [84]. DRIs include four types of nutrient reference values, including the estimated average requirement (EAR), recommended dietary allowance (RDA), adequate intake (AI) and the tolerable upper intake level (UL) [84]. The EAR of a nutrient is developed based on scientific evidence and is the estimated amount to meet the requirement of half of all healthy individuals in a population of a given age and gender. The RDA serves as the goal for individuals as it ensures a low risk of insufficiency. It is calculated from the EAR plus twice the standard deviation and is the daily dietary intake of a nutrient that is sufficient to meet the requirement of 97-98% of healthy persons. When data is not sufficient to develop an

EAR and RDA, an AI value is established based on population data or by estimating how much of a given nutrient is consumed by a group of healthy people which is assumed to be adequate to promote health. The UL is the highest average daily intake level of a nutrient that is unlikely to induce any adverse health effects. In addition, the acceptable macronutrient distribution ranges (AMDRs) for carbohydrate, fat and protein are calculated based on population intake and considerable research studies. Expressed as a percentage of total energy, these ranges are updated on a regular basis with new information to reflect ranges associated with reduced risk of chronic disease [84]. Lastly, the chronic disease risk reduction intake (CDRR) is the level of a nutrient expected to reduce the risk of chronic disease development [85, 86].

These DRIs serve as a benchmark to determine how well Canadians are eating and can be used to assess nutritional intake of different groups or individuals [87]. It is important to note that it is not appropriate to simply compare the mean intake of a group to the EAR or RDA [87]. Instead, the EAR for a nutrient is used to estimate the prevalence of inadequacy within a group. In contrast, the prevalence of inadequacy cannot be determined for nutrients with an AI [87]. Instead, the average intake of the group can be compared to the AI, and if the group's average intake is greater than the AI, the prevalence of inadequacy is likely to be low. However, if the average intake is less than the AI, it cannot be concluded that the prevalence of inadequacy is high because it is possible that the AI exceeds the true RDA, and therefore the prevalence cannot be estimated [87]. Lastly, the UL is used to estimate the prevalence of intakes that are at risk of being excessive. Available DRIs will be used to assess the intake of the DHA WIN cohort.

#### *1.5.2.2 Recommendations for Women with Breast Cancer*

Consistent with dietary recommendations for the general population, a healthy dietary pattern, characterized by a high intake of fruits, vegetables, whole grains, poultry and fish, and a

low intake of red meat, refined foods, sweets and high-fat dairy products may positively impact the prognosis and survival of women with breast cancer [10]. The World Cancer Research Fund/American Institute for Cancer Research has provided evidence-based lifestyle recommendations for patients with breast cancer with the goal to increase overall survival. Along with being physically active and maintaining a healthy body weight, it is recommended that individuals follow a fiber- and soy-rich diet and limit the intake of fats (in particular, saturated fatty acids). In addition, nutritional interventions during chemotherapy may help ensure adequate energy and nutrient intake, which may in turn improve treatment efficacy and reduce toxicity during cancer treatment [10]. For example, Souza *et al.* (2021) conducted an RCT in breast cancer patients undergoing neoadjuvant chemotherapy. The intervention group received an individualized diet plan created by a dietician that was consistent with guidelines set by the European Society for Clinical Nutrition and Metabolism for patients with cancer [22, 88]. The authors found that nausea and vomiting increased in the control group, but decreased in the intervention group. The nutritional intervention also contributed to improved role function, grip strength and reduction in leucopenia and abdominal pain [22].

### **1.5.3 Canadian Community Health Survey**

The Canadian Community Health Survey (CCHS) is a cross-sectional survey that gathers information on health status, health care utilization and health determinants of Canadians [89]. The CCHS-Nutrition collects information about individuals' dietary intake through a 24-hour recall [90, 91]. To date, the most recent nutritional intake data released by Health Canada is from the 2015 CCHS-Nutrition survey. This publicly available data serves as a useful reference tool to

compare how the dietary intake of women in the DHA WIN sample compares to that of Albertan women above the age of 19.

#### **1.5.4 Food Frequency Questionnaires**

Food frequency questionnaires (FFQs) are dietary assessment tools used to assess habitual intake by asking about the frequency of consumption and portion sizes of specific foods or food groups [92, 93]. FFQs reflect intake over a longer period of time, usually ranging from the previous month(s) to one year. This avoids the issue of day-to-day variability seen in other dietary assessment tools, such as a 24-hour dietary recall [93]. The Canadian-Diet History Questionnaire II (C-DHQ II) is an FFQ comprised of 165 questions that queries about intake in the past year or month and includes questions about portion sizes [94]. It is available in paper and electronic formats. The C-DHQ II food list was created based on analyses of 24-hour dietary recall data from the CCHS. Each question on the C-DHQ II is linked to a nutrient profile generated from the CCHS nutrient database that consists of 33 nutrients and can be used to estimate participants' daily nutrient intake [95]. The questionnaire can be self-administered and the respondents' burden is small, with an estimated completion time of about 30 minutes [92, 93]. FFQs are a simple, cost-effective method that permits the assessment of long-term dietary intake [92].

## **CHAPTER 2: RATIONALE, OBJECTIVES AND HYPOTHESES**

### **2.1 Rationale for Thesis Research**

Chemotherapy has been associated with a number of side effects that undermine QoL and inhibit physical activity in patients with breast cancer, and these effects may differ between different chemotherapy regimens [1, 2]. This may ultimately contribute to reduced treatment tolerability and poorer clinical outcomes [32]. Current literature suggests that n-3 PUFA supplementation [6, 7] as well as exercise [2-5, 69] during chemotherapy may mitigate side effects and help maintain patients' QoL, but research on these associations is limited in patients with breast cancer receiving neoadjuvant chemotherapy. In order for n-3 PUFA supplementation and exercise to be utilized in clinical oncology, it is imperative to demonstrate their benefits in specific clinical settings (i.e. with a specific cancer type and treatment protocol) [96]. Therefore, further research is warranted to investigate the role of n-3 PUFA supplementation and exercise on QoL in women with stage I-III non-metastatic breast cancer undergoing neoadjuvant chemotherapy.

The current study is an analysis of secondary outcomes from the DHA WIN study, a phase II RCT evaluating DHA supplementation (4.4 g/day) on tumour growth and metabolism in women with breast cancer undergoing six cycles of neoadjuvant chemotherapy (3 weeks/cycle) [19]. QoL questionnaires were completed at baseline and at the end of chemotherapy treatment. Exercise questionnaires were completed at the start of each 3-week cycle, and the end of cycle 6. Classification of pCR was assessed at surgery by a pathologist. The current thesis will utilize the aforementioned outcomes to help determine the relationships between chemotherapy, QoL, exercise levels and pCR in patients with breast cancer.



## **2.2 Research Objectives and Hypotheses**

The overall aim, objectives and hypotheses of the current thesis research are outlined below.

### *Overall aim:*

The overall aim is to describe QoL, exercise behaviour and dietary habits in women with breast cancer undergoing neoadjuvant chemotherapy, and identify potential relationships between DHA, exercise, QoL and achieving a pCR.

### *Research objectives and hypotheses:*

1. Determine how QoL changes from baseline to the end of neoadjuvant chemotherapy among breast cancer patients in the DHA WIN cohort and determine the role of DHA and exercise in mitigating potential changes.
  - a. It is hypothesized that QoL will decrease from baseline to end of chemotherapy and that this decrease will be less in the DHA group and among participants that meet WHO's aerobic or resistance training exercise recommendations at baseline or the end of cycle 6. Timepoints for exercise categorization (i.e. baseline and the end of cycle 6) were chosen to allow for analysis of both pre-treatment exercise levels and levels at the end of chemotherapy treatment (when patients may be experiencing side effects from chemotherapy).
2. Describe participants' aerobic and resistance training exercise levels throughout the trial and compare them between treatment groups, and determine whether meeting exercise recommendations predicted achieving a pCR.

- a. It is hypothesized that a greater proportion of the DHA group will meet exercise guidelines compared to the placebo group at the end of chemotherapy.
  - b. It is hypothesized that meeting WHO's aerobic or resistance training exercise recommendations will increase the likelihood of achieving a pCR.
3. Describe the estimated daily dietary intake of DHA WIN participants at study entry with the CCHS and Canadian DRIs and compare daily intake between the DHA and placebo groups.

### **2.3 Thesis Outline**

Chapter 1 introduced topics relevant to the thesis and provided a review of the current literature. Chapter 2 provides the rationale, objectives and outline of the current paper. Chapter 3 will provide an overview of the DHA WIN RCT and highlight components of the trial that are relevant to the current thesis research. It will also provide baseline characteristics of participants, and briefly describe the methods employed to analyze the QoL, exercise levels and dietary intake of the trial's participants.

Chapter 4 will describe the baseline estimated daily dietary intake of participants and compare it to current DRIs and the CCHS. It will also compare participants' aerobic and resistant training exercise levels to the WHO's exercise recommendations. Chapter 5 will discuss how QoL and exercise changed during chemotherapy, as well as their relationships with each other and the DHA intervention. It will also investigate whether meeting WHO's exercise guidelines predicted achieving a pCR. Chapter 6 will discuss the results as they relate to the project's objectives and summarize the key findings. It will also describe limitations of the current research and provide recommendations for future directions.

## **CHAPTER 3: METHODS**

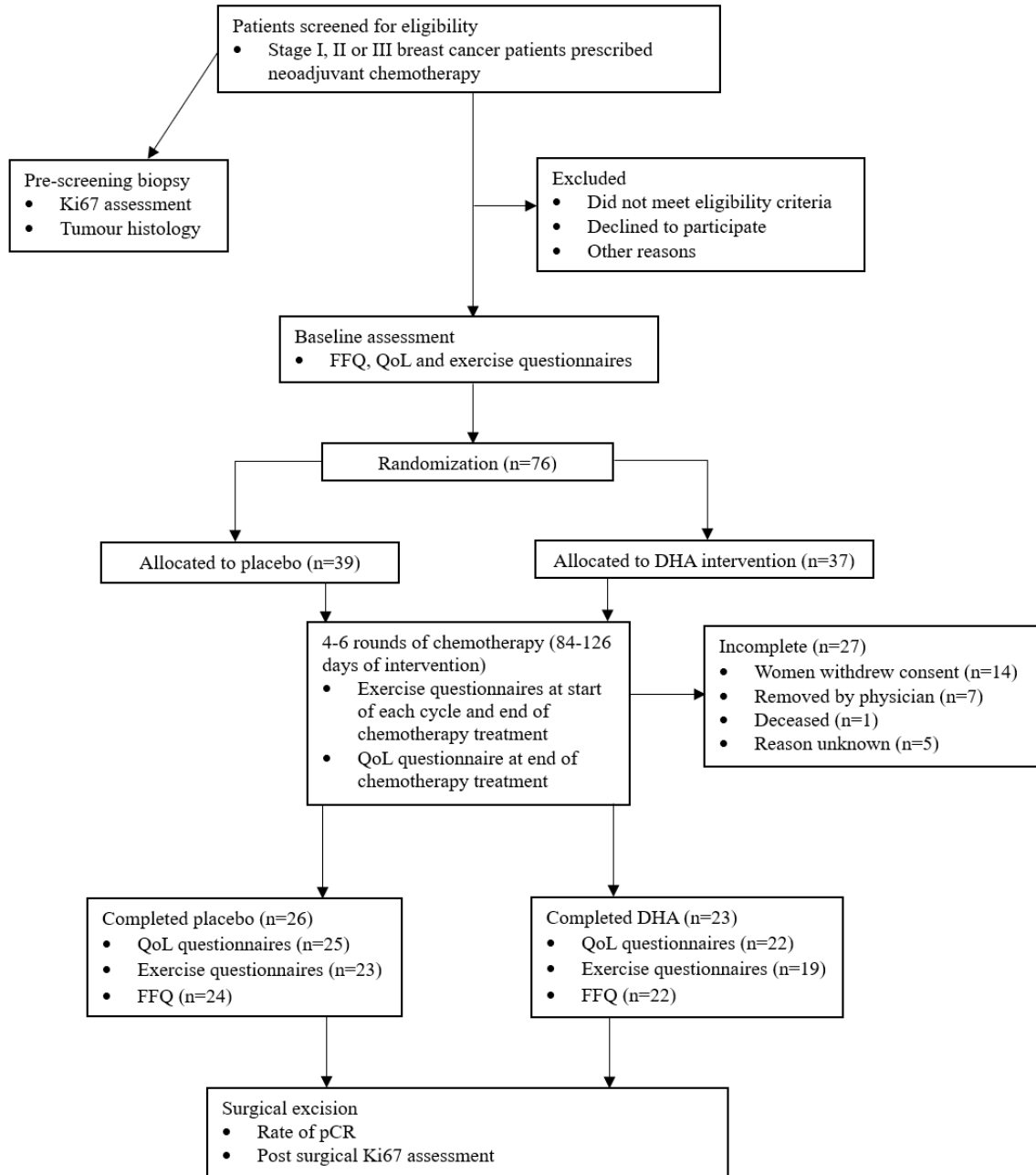
### **3.1 Docosahexaenoic Acid for Women with Breast Cancer in the Neoadjuvant Setting (DHA WIN) Randomized Controlled Trial**

The DHA WIN trial is the first two-arm, double-blind, phase II RCT to investigate the effects of DHA supplementation concomitant with neoadjuvant chemotherapy in women with non-metastatic breast cancer [19]. The primary outcome of the trial is the Ki67 index, which is a common endpoint to measure efficacy of neoadjuvant chemotherapy in clinical trials [19].

#### **3.1.1 DHA WIN RCT Protocol**

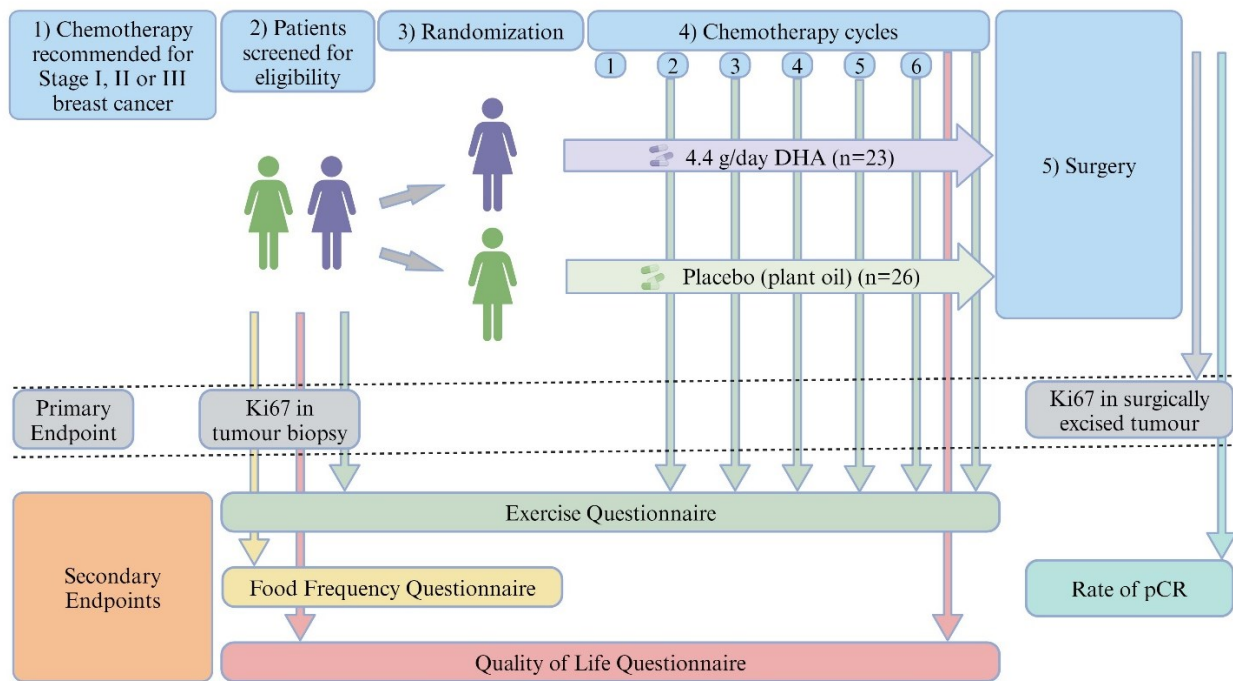
The protocol for the DHA WIN RCT has previously been published [19]. Briefly, the RCT involved women with stage I-III non-metastatic breast cancer that were prescribed neoadjuvant chemotherapy. Participants were randomized to receive 4.4 g/day of DHA or a placebo supplement (Figure 1). All women received standard-of-care chemotherapy, which was one of two docetaxel-based neoadjuvant chemotherapy regimens that were used in this population. Each regimen consisted of six cycles of chemotherapy that were administered in 3-week intervals. The DHA group received 11-1 g DHA-enriched, algae-sourced triglyceride oil capsules (life'sDHA S40-O400), while the placebo group received 11 g of a corn/soy oil blend per day (DSM Nutritional Products, Columbia, Maryland). It is worth noting that the placebo supplements contained equal amounts of polyunsaturated fatty acids as the DHA supplement, in the form of linoleic acid. Participants were instructed to orally consume the capsules at any time throughout the day, with or without food. The intervention began at the start of the first cycle of chemotherapy and continued throughout chemotherapy treatment. It is important to note that for patients unable to complete the full six cycles of chemotherapy, local guidelines mandated surgery between three to five weeks after the last cycle of chemotherapy was administered, and therefore supplementation

of the intervention was continued until surgery [19]. Compliance was determined by a review of the patient dosing diary and the recorded number of any remaining capsules returned at the end of the study.



**Figure 1.** Flowchart of the DHA WIN RCT. The figure was adapted from Newell *et al.* (2019). Abbreviations: Docosahexaenoic acid (DHA), Docosahexaenoic acid for Women with Breast Cancer in the Neoadjuvant Setting (DHA WIN), randomized controlled trial (RCT), food frequency questionnaire (FFQ), quality of life (QoL), pathological complete response (pCR).

In addition to the primary outcome of the Ki67 index, several secondary outcomes were measured, including the rate of pCR, baseline dietary intake, QoL and exercise levels (Figure 2) [19]. Classification of pCR was completed after surgical resection as part of the standard-of-care assessment [19]. Resected breast tissue and all sampled axillary nodes were assessed for absence of invasive cancer by Hematoxylin and Eosin evaluation. The C-DHQ-II was completed by participants at baseline. QoL questionnaires were completed at baseline and at the end of chemotherapy treatment. Exercise questionnaires were completed at the start of each 3-week cycle, and the end of cycle 6. Participants were given paper copies of the questionnaires to complete during clinic visits.



**Figure 2.** Flowchart of DHA WIN trial design with the primary endpoint and outcomes relevant to the thesis research. The figure was adapted from Newell *et al.* (2019) and created using BioRender.com. Abbreviations: Docosahexaenoic acid (DHA), pathological complete response (pCR).

### **3.1.2 Ethical Approval, Inclusion Criteria and Recruitment**

The DHA WIN RCT received full approval from the Health Research Ethics Board of Alberta – Cancer Committee (Protocol #: HREBA.CC-18-0381) [19]. The study is registered at ClinicalTrials.gov (NCT03831178). The study took place at the Cross Cancer Institute (CCI) in Edmonton, Alberta with central laboratory and clinical analyses being completed at the University of Alberta. Participants were recruited by oncologists and clinical trial nurses at the CCI and screened for eligibility. Eligible patients that were interested in participating received a detailed explanation of the study and written informed consent was obtained prior to their involvement in the study. The target sample size of 26 participants was determined based on the primary objective. All data for the trial is managed through the REDCap trial database.

Inclusion criteria for participants included stage I, II or III invasive breast cancer and prescription of neoadjuvant chemotherapy [19]. Participants needed an Eastern Cooperative Oncology Group (ECOG) performance status of 0 or 1, the ability to take oral medications, adequate tissue specimen for diagnosis and analysis, and normal haematology and biochemistry assessments. Patients were excluded if they received chemotherapy prior to surgery, were currently consuming or had consumed in the previous two months n-3, fish oil or other supplements or foods containing DHA (>200 mg/day) for more than one day per week, or had continued intake of supplements containing vitamin C, vitamin E or  $\beta$ -carotene that was greater than the DRIs or other antioxidant supplements. Individuals that were allergic to soy or corn or were hypersensitive to any component of the container were also excluded. Several medical conditions were also cause for exclusion, including symptomatic but untreated cholelithiasis, a history of deep vein thrombosis, active thrombophlebitis, pulmonary embolism, stroke, acute myocardial infarction, congestive cardiac failure, untreated hypertension and known inherited hypercoagulable disorder

and diagnosis of any other malignancy within the past year except for adequately treated basal cell or squamous cell skin cancer. Lastly, a history of a psychiatric disorder that would preclude consent or a partial or complete loss of vision or diplopia from ophthalmic vascular disease was means for exclusion.

### 3.1.3 Baseline Characteristics

Baseline demographic and clinical characteristics of participants are shown in Table 1.

**Table 1.** DHA WIN participant demographic and clinical characteristics.

<b>Variables</b>	<b>Total (n = 49)</b>	<b>Placebo (n = 26)</b>	<b>DHA (n = 23)</b>
<b>Age (years)<sup>1</sup></b>	50.8 (31-73)	51.2 (31-69)	50.4 (32-73)
<b>BMI [kg/m<sup>2</sup>]<sup>2</sup></b>	28.8 ± 6.7	27.5 ± 6.0	30.3 ± 7.3
Underweight (<18.5) <sup>3</sup>	1 (2.0%)	1 (3.8%)	0 (0.0%)
Healthy weight (18.5-25) <sup>3</sup>	13 (26.5%)	8 (30.8%)	5 (21.7%)
Overweight (25-30) <sup>3</sup>	18 (36.7%)	10 (38.5%)	8 (34.8%)
Obese (≥30) <sup>3</sup>	17 (34.7%)	7 (26.9%)	10 (43.5%)
<b>Ethnicity<sup>3</sup></b>			
Caucasian	31 (63.3%)	17 (65.4%)	14 (60.9%)
Asian	10 (20.4%)	5 (19.2%)	5 (21.7%)
Black	4 (8.2%)	2 (7.7%)	2 (8.9%)
Indigenous	4 (8.2%)	2 (7.7%)	2 (8.9%)
<b>Menopausal status<sup>3</sup></b>			
No	27 (55.1%)	13 (50.0%)	14 (60.9%)
Yes	22 (44.9%)	13 (50.0%)	9 (39.1%)
<b>Age at menarche (years)<sup>2</sup></b>	12.8 ± 1.5	12.7 ± 1.7	12.8 ± 1.3
Missing values	4 (8.2%)	2 (7.7%)	2 (8.7%)
<b>Diabetes<sup>3</sup></b>			
No	47 (95.9%)	26 (100.0%)	21 (91.3%)
Yes	2 (4.1%)	0 (0%)	2 (8.7%)
<b>Ethanol abuse<sup>3</sup></b>			
No	48 (98.0%)	26 (100.0%)	22 (95.7%)
Yes	1 (2.0%)	0 (0%)	1 (4.3%)

<b>Smokers<sup>3</sup></b>			
No	41 (83.7%)	21 (80.8%)	20 (87.0%)
Yes	8 (16.3%)	5 (19.2%)	3 (13.0%)
<b>Histology<sup>3,4</sup></b>			
HER2+	25 (51.0%)	14 (53.8%)	11 (47.8%)
TNBC	12 (24.5%)	5 (19.2%)	7 (30.4%)
Luminal A	10 (20.4%)	6 (23.1%)	4 (17.4%)
Luminal B	2 (4.1%)	1 (3.8%)	1 (4.3%)
<b>Disease Stage<sup>3</sup></b>			
IIA	13 (26.5%)	6 (23.1%)	7 (30.4%)
IIB	9 (18.4%)	3 (11.5%)	6 (26.1%)
IIIA	14 (28.6%)	9 (34.6%)	5 (21.7%)
IIIB	4 (8.2%)	2 (7.7%)	2 (8.7%)
IIIC	1 (2.0%)	0 (0.0%)	1 (4.3%)
Unknown	8 (16.3%)	6 (23.1%)	2 (8.7%)
<b>Tumour Grade<sup>3</sup></b>			
T1	1 (2.0%)	1 (3.8%)	0 (0.0%)
T2	26 (53.1%)	14 (53.8%)	12 (52.2%)
T3	11 (22.4%)	5 (19.2%)	6 (26.1%)
T4	5 (10.2%)	3 (11.5%)	2 (8.7%)
Unknown	6 (12.2%)	3 (11.5%)	3 (13.0%)
<b>Axillary Node Status<sup>3</sup></b>			
N0	12 (24.5%)	6 (23.1%)	6 (26.1%)
N1	20 (40.8%)	10 (38.5%)	10 (43.5%)
N2	5 (10.2%)	3 (11.5%)	2 (8.7%)
N3	2 (4.1%)	1 (3.9%)	1 (4.4%)
Unknown	10 (20.4%)	6 (23.1%)	4 (17.4%)
<b>ECOG<sup>3,5</sup></b>			
Baseline			
0	44 (89.8%)	24 (92.3%)	20 (87.0%)
1	2 (4.1%)	2 (7.7%)	0 (0.0%)
Unknown	3 (6.1%)	0 (0.0%)	3 (13.0%)
End of treatment			
0	35 (71.4%)	22 (84.6%)	13 (56.5%)
1	10 (20.4%)	2 (7.7%)	8 (34.8%)
2	2 (4.1%)	1 (3.8%)	1 (4.3%)
Unknown	2 (4.1%)	1 (3.8%)	1 (4.3%)
<b>Total recruited (n)</b>	<b>76</b>	<b>39</b>	<b>37</b>
<b>Overall compliance<sup>2</sup></b>	<b>83.9 ± 20.0</b>	<b>81.3 ± 22.5</b>	<b>86.3 ± 17.7</b>
Missing values <sup>3</sup>	13 (26.5%)	9 (34.6%)	4 (17.4%)



### Pathological complete response<sup>3</sup>

No	32 (65.3%)	19 (73.1%)	13 (56.5%)
Yes	17 (34.7%)	7 (26.9%)	10 (43.5%)

<sup>1</sup>Mean (range); <sup>2</sup>Mean  $\pm$  SD; <sup>3</sup>Count (percentage of total or given treatment group); <sup>4</sup>HER2+ (ER-, PR-, HER2+), TNBC (ER-, PR-, HER2-), Luminal A (ER+ and/or PR+, HER2-), Luminal B (ER+ and/or PR+, HER2+); <sup>5</sup>0 = Fully active, able to carry on all pre-disease performance without restriction [97]; 1 = Restricted in physically strenuous activity but ambulatory and able to carry out work of a light or sedentary nature, i.e., light housework, office work; 2 = Ambulatory and capable of all selfcare but unable to carry out any work activities, up and about more than 50% of waking hours. Abbreviations: Body mass index (BMI), human epidermal growth factor receptor 2 (HER2), triple negative breast cancer (TNBC), Eastern Cooperative Oncology Group (ECOG).

## **3.2 Questionnaires**

### **3.2.1 Quality of Life Questionnaire**

Several assessments were included in the QoL questionnaire completed by participants. These included the Functional Assessment of Cancer Therapy (FACT)-General (FACT-G), FACT-Breast (FACT-B), FACT-Taxane, FACT-Endocrine Symptoms (FACT-ES), Functional Assessment of Chronic Illness Therapy (FACIT)-Fatigue Scale (FACIT-Fatigue), the Perceived Stress Scale (PSS), the Fordyce Emotions Questionnaire, the Center for Epidemiologic Studies-Depression Scale (CES-D) and the State-Trait Anxiety Inventory (STAI). A copy of the QoL questionnaire is included in Appendix 1. As mentioned previously, QoL questionnaires were completed at baseline (prior to the start of chemotherapy), and at the end of chemotherapy treatment (prior to surgery).

#### *3.2.1.1 FACT and FACIT Questionnaires*

The FACT and FACIT questionnaires are validated questionnaires that are commonly used to assess HRQoL in cancer patients [98-102]. The FACT-G is comprised of 27 items that measures four domains of HRQoL in patients with cancer, including physical well-being, social well-being, emotional well-being and functional well-being [103]. A number of other subscales, including the

breast cancer subscale (10 questions), taxane subscale (16 questions) and endocrine symptom subscale (19 questions) have been developed to assess QoL in patients with breast cancer and specific symptoms related to taxane and endocrine therapies [104-106]. They are commonly added to the FACT-G questionnaire, and make up the FACT-B, FACT-Taxane and FACT-ES questionnaires, respectively. It is worth noting that each of these questionnaires produce several subscores. For example, each one produces a subscale score for physical well-being, social well-being, emotional well-being, and functional well-being and a FACT-G total score which is the sum of the four previous subscales. Additionally, the FACT-B produces a breast cancer (BC) subscale score, a FACT-B total score (which is the sum of the FACT-G and BC subscale scores) and a FACT-B trial outcome index (TOI) (which is the sum of the physical well-being, functional well-being and BC subscales). The FACT-Taxane produces a taxane subscale score, a FACT-taxane total score (which is the sum of the FACT-G and the taxane subscale scores) and a FACT-taxane TOI (that is the sum of the physical well-being, functional well-being and taxane subscales). Lastly, the FACT-ES generates an endocrine symptoms (ES) subscale score and a FACT-ES total score (which is the sum of the FACT-G and ES subscale scores). The FACIT-Fatigue scale consists of 13 items that assess patients' fatigue and its impact on daily function [107].

Each of these questionnaires had a recall period of seven days, and responses were given on a five-point Likert-type scale, ranging from 0 (not at all) to 4 (very much). Scores for each subscale were determined by summing the score for positive items with the reverse coded score of negative items. Higher scores indicate a better QoL.

### *3.2.1.2 Perceived Stress Scale (PSS)*

The PSS is one of the most widely used stress perception assessments worldwide [108]. The PSS-14 consists of seven negative questions (i.e. felt nervous and stressed) and seven positive questions (i.e. felt that you were on top of things) that relate to how often participants have experienced stressful situations in the past month. Similar to the FACT questionnaires, the responses to the PSS questions were given on a five-point Likert-type scale, from 0 (never) to 4 (very often). The scores for positive items were reverse coded and summed with negative item scores. Higher total scores indicate more perceived stress.

### *3.2.1.3 Fordyce Emotions Questionnaire*

The Fordyce Emotions Questionnaire, also known as the happiness measure, is a measure of an individual's emotional well-being [109]. It consists of an 11-point happiness/unhappiness scale and a question asking for the percentage of time spent in "happy", "unhappy" and "neutral" moods. A combination score can be calculated which combines the scale and happy % scores with equal weights. It is obtained using the following equation:  $\text{Combination score} = [\text{scale score} \times 10 + \text{happy}\%]/2$ . The combination score is generally used as the primary criterion for happiness in research [109].

### *3.2.1.4 Center for Epidemiologic Studies-Depression Scale (CES-D)*

A modified version of the CES-D was included in the QoL questionnaire to assess depressive symptoms. It consisted of 10 statements and asked participants how often they experienced specific feelings or behaviours over the past seven days. Each item was rated from 0 (rarely or none of the time) to 3 (most or all of the time). Positively worded items were reverse

coded, and summed with negatively worded items to obtain a final score, with higher scores indicating greater depressive symptomology [110].

#### *3.2.1.5 State-Trait Anxiety Inventory (STAI)*

A modified version of the STAI was utilized to assess participants' levels of anxiety [111]. Respondents were asked to rate 10 statements from 1 (not at all) to 4 (very much so). Items that reflect the absence of anxiety were reverse coded and summed with items that indicated higher anxiety. Therefore, higher scores indicate more severe anxiety.

#### **3.2.2 Godin Leisure-Time Exercise Questionnaire**

An adapted version of the Godin Leisure-Time Exercise Questionnaire was used to collect information on the frequency and average duration of light, moderate and vigorous aerobic exercise as well as strength/resistance training per week [112, 113]. Participants were asked to only include exercise that was done during free time (i.e. was not housework or occupation) and lasted at least 10 minutes. Brief descriptions of each exercise category and examples were given for each item on the questionnaire. Light intensity aerobic exercise consisted of activities that took minimal effort and did not lead to perspiration (i.e. easy walking, yoga). Moderate intensity aerobic exercises included those that were not exhausting, and led to light perspiration (i.e. fast walking, easy bicycling). Vigorous intensity exercises included those that caused sweating and a rapid heartbeat (i.e. running, vigorous bicycling). Strength/resistance exercise consisted of activities such as weight lifting, resistance bands, sit-ups and push-ups. A copy of the exercise questionnaire is available in Appendix 2.

Average weekly aerobic exercise was determined by adding the average minutes of moderate aerobic exercise to two times the average minutes of vigorous aerobic exercise. Participants were categorized into those that met WHO's aerobic exercise guidelines ( $\geq 150$  minutes/week), and those that did not meet the guidelines ( $< 150$  minutes/week). A separate categorization also separated participants into those that met WHO's resistance training recommendation ( $\geq 2$  times/week), and those that did not ( $< 2$  times/week). As described in Section 3.1.2, exercise questionnaires were completed at 7 timepoints throughout the trial, including at baseline and the end of chemotherapy.

### **3.2.3 Food Frequency Questionnaire**

As previously mentioned, the FFQ employed in the DHA WIN RCT was the C-DHQ II, and was previously described in Section 1.4.3. A copy of the C-DHQ II is included in Appendix 3. Paper copies of the C-DHQ II were completed by participants at baseline, prior to starting chemotherapy [19]. Paper copies were manually inputted into the C-DHQ II website, and data was analyzed using Diet\*Calc software [114, 115].

### **3.3 Statistical Analyses**

Descriptive statistics including means and proportions were used to describe continuous and categorical variables, respectively. Baseline dietary intake data was compared between treatment groups using independent t-tests. Depending on the availability of DRIs, the EAR of a nutrient was used to determine the prevalence of inadequacy within the DHA WIN cohort. When an AI was available, it was compared to the average intake of the cohort. Average nutrient intakes were compared to the UL to determine the prevalence of intakes at risk of being excessive. Lastly,

the AMDRs were used to determine the proportion of participants below, within and above these ranges. The proportion of participants in the DHA WIN trial that were below the DRI for a given nutrient was compared to the proportion of the Albertan women not meeting the DRI (based on data obtained from the 2015 CCHS) using chi-squared or Fisher's exact test.

Scoring of the QoL and exercise questionnaires were completed as previously described (Sections 3.2.1 and 3.2.2). Generalized estimating equations (GEE) were used to assess the effects of time and treatment on the average duration of aerobic exercise and average frequency of strength/resistance training. Unadjusted multiple comparisons were used to measure statistical significance compared to baseline levels of exercise. GEE was also used to examine the effects of time and treatment on QoL scores. Lastly, GEE was used to assess the effect of time and exercise classification on QoL scores. GEE was performed with unadjusted models, as well as models adjusted for age, BMI, histology, menopausal status, disease stage and tumour grade. Fisher's exact test was used to assess associations between categorical variables (i.e. meeting WHO's exercise guidelines and treatment group or achieving a pCR). Only participants that completed the trial (i.e. were not withdrawn due to clinical or personal reasons) were included in analyses. Continuous and categorical baseline characteristics of those that completed the trial were compared to those that did not complete the trial using the independent t-test and chi-squared or Fisher's exact test, respectively. Statistical analyses were conducted using SPSS (V27.0, IBM Corporation, Armonk, NY, USA). Statistical significance was defined as a two-sided p-value  $\leq 0.05$ . Figures were created using BioRender.com or SPSS.

## CHAPTER 4: COMPARING EXERCISE LEVELS AND ESTIMATED BASELINE DIETARY INTAKE TO CURRENT GUIDELINES

### 4.1 Exercise

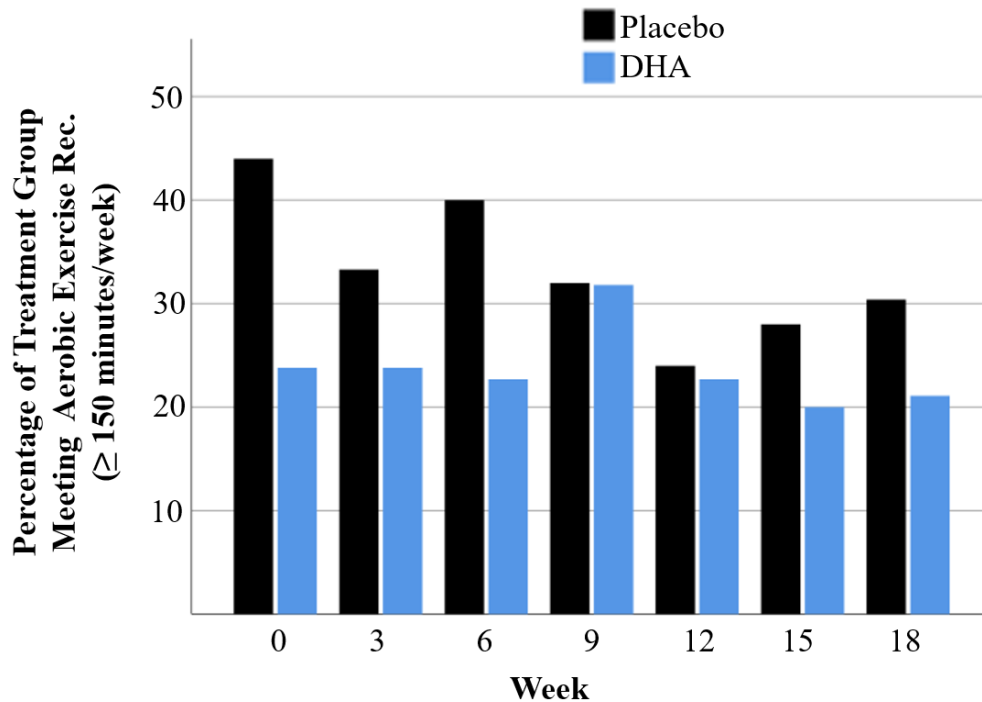
Participants were categorized into those that met WHO’s aerobic exercise recommendation ( $\geq 150$  minutes/week) and those that did not ( $< 150$  minutes/week) (Table 2; Figure 3). At baseline, 23.8% of the DHA group met this recommendation, compared to 44.0% of the placebo group ( $p = 0.22$ ). At the end of the sixth cycle of chemotherapy, the percentages meeting the recommendation dropped to 21.1% and 30.4%, respectively ( $p = 0.73$ ). Treatment group was not associated with meeting WHO’s aerobic exercise recommendation at any timepoint throughout the trial (Table 2).

**Table 2.** Categorization of participants based on treatment group and meeting WHO’s aerobic exercise recommendation ( $\geq 150$  minutes/week) over time.

	<b><math>\geq 150</math> minutes/week of aerobic exercise</b>		<b>p-value</b>
	<b>Yes</b>	<b>No</b>	
<b>Week 0</b> (n = 46)			
DHA	5 (23.8%)	16 (76.2%)	0.22
Placebo	11 (44.0%)	14 (56.0%)	
Total	16 (34.8%)	30 (65.2%)	
<b>Week 3</b> (n = 45)			
DHA	5 (23.8%)	16 (76.2%)	0.53
Placebo	8 (33.3%)	16 (66.7%)	
Total	13 (28.9%)	32 (71.1%)	
<b>Week 6</b> (n = 47)			
DHA	5 (22.7%)	17 (77.3%)	0.23
Placebo	10 (40.0%)	15 (60.0%)	
Total	15 (31.9%)	32 (68.1%)	
<b>Week 9</b> (n = 47)			
DHA	7 (31.8%)	15 (68.2%)	1.00
Placebo	8 (32.0%)	17 (68.0%)	
Total	15 (31.9%)	32 (68.1%)	
<b>Week 12</b> (n = 47)			
DHA	5 (22.7%)	17 (77.3%)	1.00
Placebo	6 (24.0%)	19 (76.0%)	
Total	11 (23.4%)	36 (76.6%)	

<b>Week 15 (n = 45)</b>			
DHA	4 (20.0%)	16 (80.0%)	0.73
Placebo	7 (28.0%)	18 (72.0%)	
Total	11 (24.4%)	34 (75.6%)	
<b>Week 18 (n = 42)</b>			
DHA	4 (21.1%)	15 (78.9%)	0.73
Placebo	7 (30.4%)	16 (69.6%)	
Total	11 (26.2%)	31 (73.8%)	

Percentage of the treatment group or total are shown in parentheses. Fisher's exact test was used to test the association between treatment groups and meeting WHO's aerobic exercise recommendation. No statistically significant associations were observed. Week 0 indicates baseline. Week 18 indicates the end of cycle 6. Abbreviations: World Health Organization (WHO), docosahexaenoic acid (DHA).



**Figure 3.** Percentage of the DHA (n = 19) or placebo (n = 23) groups that met WHO's aerobic exercise recommendation ( $\geq 150$  minutes/week) over time. Fisher's exact test was used to test the association between treatment groups and meeting WHO's aerobic exercise recommendation. There were no statistically significant differences between treatment groups at any week. Week 0 indicates baseline. Week 18 indicates the end of cycle 6. Abbreviations: World Health Organization (WHO), docosahexaenoic acid (DHA), recommendation (rec).



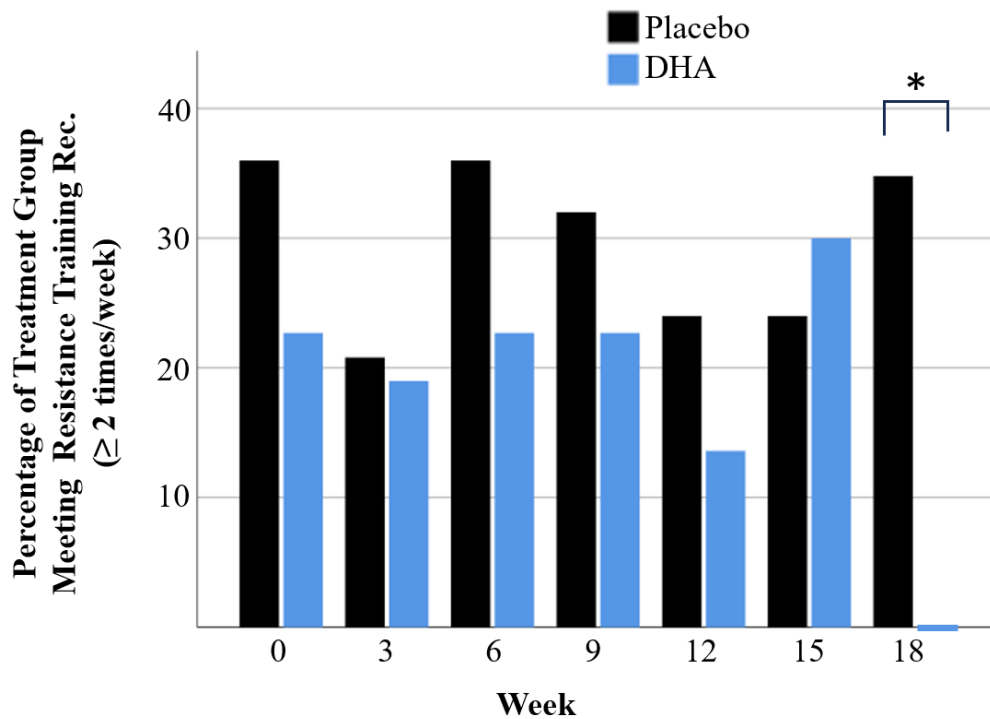
Similarly, participants were categorized based on meeting WHO’s resistance training exercise recommendation ( $\geq 2$  times/week) (Table 3; Figure 4). At baseline, 22.7% of the DHA group met the recommendation, compared to 36.0% of the placebo group ( $p = 0.36$ ). These dropped to 0% and 34.8% at the end of the sixth cycle of chemotherapy, respectively ( $p = 0.01$ ). Treatment group was not associated with meeting WHO’s resistance training exercise recommendation at any timepoint throughout the trial except at the end of cycle 6 ( $p = 0.01$ ) (Table 3; Figure 4).

**Table 3.** Categorization of participants based on treatment group and meeting WHO’s resistance training exercise recommendation ( $\geq 2$  times/week) over time.

	$\geq 2$ times/week of resistance training exercise		p-value
	Yes	No	
<b>Week 0</b> (n = 47)			
DHA	5 (22.7%)	17 (77.3%)	0.36
Placebo	9 (36.0%)	16 (64.0%)	
Total	14 (29.8%)	33 (70.2%)	
<b>Week 3</b> (n = 45)			
DHA	4 (19.0%)	17 (81.0%)	1.00
Placebo	5 (20.8%)	19 (79.2%)	
Total	9 (20.0%)	36 (80.0%)	
<b>Week 6</b> (n = 47)			
DHA	5 (22.7%)	17 (77.3%)	0.36
Placebo	9 (36.0%)	16 (64.0%)	
Total	14 (29.8%)	33 (70.2%)	
<b>Week 9</b> (n = 47)			
DHA	5 (22.7%)	17 (77.3%)	0.53
Placebo	8 (32.0%)	17 (68.0%)	
Total	13 (27.7%)	34 (72.3%)	
<b>Week 12</b> (n = 47)			
DHA	3 (13.6%)	19 (86.4%)	0.47
Placebo	6 (24.0%)	19 (76.0%)	
Total	9 (19.1%)	38 (80.9%)	

<b>Week 15 (n = 45)</b>			
DHA	6 (30.0%)	14 (70.0%)	0.74
Placebo	6 (24.0%)	19 (76.0%)	
Total	12 (26.7%)	33 (73.3%)	
<b>Week 18 (n = 42)</b>			
DHA	0 (0.0%)	19 (100.0%)	<b>0.01</b>
Placebo	8 (34.8%)	15 (65.2%)	
Total	8 (19.0%)	34 (81.0%)	

Percentage of the treatment group or total are shown in parentheses. Fisher's exact test was used to test the association between treatment groups and meeting WHO's resistance training exercise recommendation. Bolded p-values indicate a significant difference at  $p = 0.01$ . Week 0 indicates baseline. Week 18 indicates the end of cycle 6. Abbreviations: World Health Organization (WHO), docosahexaenoic acid (DHA).



**Figure 4.** Percentage of the DHA (n = 19) or placebo (n = 23) groups that met WHO's resistance training exercise recommendation ( $\geq 2$  times/week) over time. Fisher's exact test was used to test the association between treatment groups and meeting WHO's resistance training exercise recommendation. \*Indicates a statistically significant difference at  $p = 0.01$ . Week 0 indicates baseline. Week 18 indicates the end of cycle 6. Abbreviations: World Health Organization (WHO), docosahexaenoic acid (DHA), recommendation (rec).

## **4.2 Dietary Intake**

### **4.2.1 Estimated Baseline Dietary Intake**

There were no statistically significant differences between the DHA and placebo groups for estimated baseline daily intake of energy, macronutrients, total monounsaturated fatty acids, total polyunsaturated fatty acids, total saturated fatty acids, cholesterol, sodium, sugar or dietary fiber (Table 4).

**Table 4.** Estimated baseline daily dietary intake obtained from the C-DHQ II.

	<b>DHA</b> (n = 22)	<b>Placebo</b> (n = 24)	<b>p-value</b>
<b>Energy (kcal)</b>	1684 ± 568	1821 ± 1255	0.64
% from carbohydrate	48.7 ± 10.0	48.0 ± 9.5	0.82
% from fat	34.3 ± 6.9	36.4 ± 7.3	0.32
% from protein	17.1 ± 3.6	16.8 ± 3.6	0.79
% from alcohol	2.0 ± 3.1	1.5 ± 2.2	0.57
<b>Carbohydrate (g)</b>	212 ± 109	218 ± 156	0.90
<b>Protein (g)</b>	69.8 ± 21.7	78.2 ± 58.6	0.53
<b>Total fat (g)</b>	62.2 ± 19.5	74.1 ± 54.6	0.34
<b>Total monounsaturated fatty acids (g)</b>	25.1 ± 8.1	29.6 ± 22.1	0.37
<b>Total polyunsaturated fatty acids (g)</b>	10.5 ± 3.4	14.8 ± 14.7	0.19
PUFA 18:2 (Octadecadienoic acid) (g)	8.3 ± 2.9	12.1 ± 12.5	0.17
PUFA 18:3 (Octadecatrienoic acid) (g)	1.8 ± 0.7	2.2 ± 1.8	0.32
<b>Total saturated fatty acids (g)</b>	20.8 ± 8.3	23.1 ± 17.0	0.56
<b>Cholesterol (mg)</b>	233 ± 79	249 ± 156	0.67
<b>Sodium (mg)</b>	2492 ± 934	2880 ± 2237	0.45
<b>Sugar (g)</b>	103 ± 80	93 ± 77	0.65
<b>Dietary fiber (g)</b>	18.3 ± 8.9	22.7 ± 19.4	0.33

Data are presented as mean ± SD. Independent t-tests were conducted to determine if there was a statistically significant difference in mean daily intake between the DHA and placebo groups. No statistically significant differences were observed between groups. Abbreviations: Canadian-Diet History Questionnaire II (C-DHQ II), docosahexaenoic acid (DHA), polyunsaturated fatty acid (PUFA).

#### **4.2.2 Estimated Daily Dietary Intake Compared to Current Recommendations and the Canadian Community Health Survey**

Of the nutrients presented in Table 4, EARs exist for carbohydrates (100 g/day) and protein (0.66 g/kg/day) [116]. Carbohydrate intake below the EAR was reported by 8.7% of the DHA WIN cohort, compared to 3.1% of Albertan women that completed the 2015 CCHS ( $p = 0.07$ ) [117]. Within the DHA WIN cohort, 23.9% of participants reported a protein intake level below the EAR. This percentage was not compared to the CCHS because the national survey did not report the percentage of participants below the EAR. An AI exists for sodium (1500 mg/day) and dietary fiber (25 g/day for women aged 31-50 and 21 g/day for women aged 51-70). Within the DHA WIN cohort, 82.6% of participants reported sodium intake above the AI, compared to 91.1% of the CCHS women ( $p = 0.06$ ). It is also worth highlighting that the mean intake of sodium was  $2695 \pm 1733$  mg/day in the DHA WIN cohort (Table 6). Since the average intake exceeds the AI, the prevalence of inadequacy is likely low [87]. The CDRR for sodium is 2300 mg/day, which is the amount of sodium above which intake reduction in an apparently healthy population is expected to reduce the risk of chronic disease development [118]. The percentage of the DHA WIN cohort that reported sodium intake above the CDRR was 45.7%, compared to 40.2% in the CCHS cohort ( $p = 0.47$ ) [117]. Average reported daily intake was above the AI for dietary fiber for 61.5% of the DHA WIN cohort, but this percentage was not reported on the 2015 CCHS. Average intake of dietary fiber was  $20.6 \pm 15.3$  g/day for the DHA WIN cohort (Table 6), which is less than the AIs provided for this population. Risk of inadequacy increases at some intake level below the AI, but conclusions regarding the prevalence of inadequacy cannot be made without clinical or biochemical assessment [119].

The percentage of participants that reported macronutrient intake below, within or above the AMDRs were determined (Table 5). Carbohydrate intake that exceeded the AMDR was

reported among 8.7% of the DHA WIN cohort, compared to < 3% of Albertan women that completed the CCHS (p = 0.008). Similarly, 52.2% of the DHA WIN women reported intake above the AMDR for fat, compared to 32.9% that completed the 2015 CCHS (p = 0.008). A greater percentage of women from the CCHS reported an intake within the AMDR for fat (66.9%) compared to DHA WIN participants (45.7%) (p = 0.003). The two groups did not statistically significantly differ in other AMDR categories (Table 5).

**Table 5.** Percentages of the DHA WIN or CCHS cohorts that were below, within or above the AMDRs.

	<b>Carbohydrate</b> (45-65% of energy) <sup>1</sup>	<b>Fat</b> (20-35% of energy) <sup>1</sup>	<b>Protein</b> (10-35% of energy) <sup>1</sup>
<b>% below AMDR</b>			
DHA WIN	32.6%	2.2%	2.2%
CCHS [117]	33.5%	< 3%	< 3%
<b>% within AMDR</b>			
DHA WIN	58.7%	45.7%*	97.8%
CCHS	66.3%	66.9%	99.7%
<b>% above AMDR</b>			
DHA WIN	8.7%*	52.2%*	0.0%
CCHS	< 3%	32.9%	0.0%

<sup>1</sup>AMDR for listed macronutrient. Data are presented as the percentage of the given cohort that are within each category. Chi-squared and Fisher's exact test were used to determine if there was a statistically significant difference between the percentage in the DHA WIN cohort (n = 46) compared to the percentage obtained from the CCHS (n = 696) [117]. \*Indicates a statistically significant difference between the DHA WIN and CCHS cohorts at p < 0.01. Abbreviations: Acceptable macronutrient distribution range (AMDR), Docosahexaenoic acid for Women with Breast Cancer in the Neoadjuvant Setting (DHA WIN), Canadian Community Health Survey (CCHS).

#### 4.2.3 Estimated Daily Dietary Intake Compared to Canadian Community Health Survey

Mean intake of energy and several nutrients were compared between the DHA WIN cohort and Albertan women that completed the 2015 CCHS (Table 6). On average, the estimated daily intake of protein, total fat, monounsaturated fat, sodium and dietary fiber were greater in the DHA WIN cohort compared to the CCHS group (all p ≤ 0.05).

**Table 6.** Mean estimated daily intake of energy and nutrients in the DHA WIN cohort compared to Albertan women that completed the 2015 CCHS.

	<b>DHA WIN</b> (n = 46)	<b>CCHS</b> (n = 696)	<b>p-value</b>
<b>Energy (kcal/day)</b>	1755 ± 980	1575 ± 923	0.20
% from carbohydrate	48.3 ± 9.7	47.6 ± 13.2	0.71
% from fat	35.4 ± 7.1	33.0 ± 10.6	0.14
% from protein	16.9 ± 3.6	16.7 ± 5.3	0.76
<b>Carbohydrate (g/day)</b>	215 ± 135	188 ± 132	0.18
<b>Protein (g/day)</b>	74.2 ± 44.6	65.0 ± 26.4	<b>0.03</b>
<b>Total fat (g/day)</b>	68.4 ± 41.7	60.0 ± 26.4	<b>0.05</b>
<b>Total monounsaturated fatty acids (g/day)</b>	27.4 ± 16.9	21.9 ± 13.2	<b>0.01</b>
<b>Total polyunsaturated fatty acids (g/day)</b>	12.8 ± 11.0	12.3 ± 7.9	0.71
<b>Total saturated fatty acids (g/day)</b>	22.0 ± 13.5	19.8 ± 13.2	0.27
<b>Cholesterol (mg/day)</b>	241 ± 124	218 ± 185	0.40
<b>Sodium (mg/day)</b>	2695 ± 1733	2206 ± 1398	<b>0.02</b>
<b>Total sugar (g/day)</b>	97.8 ± 77.8	77.0 ± 79.1	0.08
<b>Dietary fiber (g/day)</b>	20.6 ± 15.3	14.9 ± 10.6	<b>&lt;0.001</b>

Data are presented as mean ± SD. Independent t-tests were used to assess statistical significance between the DHA and CCHS [117] groups. Bolded p-values indicate statistically significant differences at  $p \leq 0.05$ . Abbreviations: Docosahexaenoic acid for Women with Breast Cancer in the Neoadjuvant Setting (DHA WIN), Canadian Community Health Survey (CCHS).

## **CHAPTER 5: RESULTS**

Seventy-six participants were recruited to participate in the DHA WIN RCT, of which 49 (65%) completed the trial. Participants that completed the trial ( $n = 49$ ) were compared with those that did not ( $n = 27$ ) and there were no statistically significant differences in age, BMI, tumour stage, tumour grade, histology or menopausal status. Adherence to the intervention was 81% for the placebo group and 86% for the DHA group.

### **5.1 Quality of Life**

#### **5.1.1 Comparing Quality of Life Within and Between Treatment Groups**

All subscales of the FACT questionnaires significantly decreased from baseline to the end of the sixth cycle of chemotherapy in both the DHA and control groups ( $p\text{-time} \leq 0.03$ ), with the exception of the emotional well-being scores, which significantly increased over time in both groups ( $p\text{-time} = 0.01$ ). The FACIT-Fatigue scale and STAI also decreased over time in both groups ( $p\text{-time} \leq 0.01$ ), while the happiness measure (Fordyce Emotions Combination score) increased ( $p\text{-time} = 0.03$ ). Perceived stress decreased in both groups, while the depression scores increased, but these changes did not reach statistical significance. These changes are shown in Table 7. DHA did not statistically significantly mitigate the change in QoL indicators over time (all  $p\text{-interactions} > 0.05$ ).

**Table 7.** Quality of life scores at baseline (week 0) and end of cycle 6 (week 18) in the DHA and placebo groups.

	Week 0 [mean ± SD]	Week 18 [mean ± SD]	Mean Change (95% CI)	Unadjusted			Adjusted		
				p-int	p-treatment	p-time	p-int	p-treatment	p-time
<b>FACT-G total score</b>									
DHA	88.9 ± 14.0	82.2 ± 17.0	-6.7 (-16.0 to 2.7)	0.82	0.44	<0.001	0.65	0.36	<0.001
Placebo	85.2 ± 14.1	79.4 ± 16.0	-5.9 (-14.9 to 3.1)						
<b>Physical WB</b>									
DHA	24.6 ± 4.4	21.8 ± 5.0	-2.8 (-5.6 to 0.0)	0.69	0.79	<0.001	0.85	0.46	<0.001
Placebo	24.5 ± 4.4	21.1 ± 6.8	-3.4 (-6.7 to 0.1)						
<b>Social WB</b>									
DHA	24.8 ± 4.3	23.2 ± 4.8	-1.6 (-4.3 to 1.1)	0.87	0.26	<0.001	0.72	0.14	<0.001
Placebo	23.3 ± 5.1	21.6 ± 5.4	-1.7 (-4.7 to 1.3)						
<b>Emotional WB</b>									
DHA	17.6 ± 4.8	18.8 ± 4.2	+1.2 (-1.5 to 3.9)	0.57	0.83	0.01	0.65	0.87	0.01
Placebo	17.1 ± 5.1	19.1 ± 3.9	+2.0 (-0.5 to 4.6)						
<b>Functional WB</b>									
DHA	21.9 ± 5.9	18.4 ± 5.8	-3.5 (-7.0 to 0.0)	0.33	0.43	<0.001	0.35	0.52	<0.001
Placebo	20.1 ± 5.1	18.0 ± 5.2	-2.1 (-5.0 to 0.8)						
<b>FACT-B total score</b>									
DHA	118.6 ± 17.0	108.5 ± 21.8	-10.2 (-21.9 to 1.6)	0.86	0.73	<0.001	0.75	0.64	<0.001
Placebo	115.7 ± 18.0	106.9 ± 19.9	-8.8 (-19.8 to 2.2)						
<b>FACT-B TOI</b>									
DHA	76.2 ± 12.5	66.5 ± 15.0	-9.8 (-18.0 to -1.5)	0.91	1.00	<0.001	0.83	0.95	<0.001
Placebo	75.8 ± 11.2	66.3 ± 13.7	-9.5 (-16.6 to -2.3)						



<b>BC subscale score</b>									
DHA	29.7 ± 5.9	26.2 ± 6.7	-3.5 (-7.3 to 0.3)	0.88	0.24	<0.001	0.93	0.11	<0.001
Placebo	31.2 ± 4.4	27.8 ± 5.5	-3.3 (-6.1 to -0.5)						
<b>FACT-Taxane total score</b>									
DHA	150.2 ± 18.4	136.9 ± 21.4	-13.3 (-25.3 to -1.3)	0.95	0.72	<0.001	0.84	0.73	<0.001
Placebo	147.8 ± 15.1	135.1 ± 21.4	-12.7 (-23.6 to -1.8)						
<b>FACT-Taxane TOI</b>									
DHA	107.8 ± 14.8	94.8 ± 14.8	-12.9 (-21.8 to -4.1)	0.75	0.87	<0.001	0.74	0.97	<0.001
Placebo	105.9 ± 12.2	94.5 ± 17.3	-11.3 (-20.0 to -2.6)						
<b>Taxane subscale score</b>									
DHA	61.3 ± 6.0	54.6 ± 7.1	-6.6 (-10.6 to -2.7)	0.47	0.73	<0.001	0.46	0.12	<0.001
Placebo	60.9 ± 6.5	56.0 ± 9.3	-4.9 (-9.5 to -0.3)						
<b>FACT-ES total score</b>									
DHA	154.9 ± 21.5	145.7 ± 22.9	-9.2 (-22.5 to 4.2)	0.62	0.95	<0.001	0.68	0.96	<0.001
Placebo	155.3 ± 17.0	144.6 ± 21.1	-10.7 (-22.0 to 0.6)						
<b>ES subscale score</b>									
DHA	66.0 ± 9.4	63.5 ± 8.1	-2.5 (-7.7 to 2.8)	0.51	0.11	0.01	0.44	0.05	0.03
Placebo	69.6 ± 4.9	65.4 ± 7.7	-4.2 (-7.8 to -0.5)						
<b>Fatigue subscale score</b>									
DHA	44.3 ± 11.1	38.0 ± 10.7	-6.3 (-12.9 to 0.3)	0.66	0.82	<0.001	0.70	0.66	<0.001
Placebo	43.1 ± 8.2	38.0 ± 10.9	-5.2 (-10.6 to 0.2)						
<b>PSS score</b>									
DHA	19.7 ± 7.2	18.0 ± 9.2	-1.7 (-6.6 to 3.2)	0.84	0.72	0.22	0.92	0.80	0.29
Placebo	20.2 ± 8.5	19.2 ± 8.7	-1.0 (-5.9 to 3.8)						

<b>CES-D score</b>									
DHA	7.0 ± 3.2	7.3 ± 4.0	+0.3 (-1.9 to 2.4)	0.78	0.69	0.38	0.84	0.96	0.37
Placebo	7.3 ± 4.3	7.8 ± 3.9	+0.5 (-1.8 to 2.8)						
<b>STAI score</b>									
DHA	20.4 ± 7.0	18.7 ± 6.6	-1.7 (-5.8 to 2.4)	0.89	0.86	<b>0.04</b>	0.79	0.88	<b>0.01</b>
Placebo	20.8 ± 6.1	18.9 ± 6.0	-1.9 (-5.3 to 1.5)						
<b>Fordyce Emotions Combination score</b>									
DHA	59.4 ± 24.3	63.5 ± 21.8	+4.1 (-10.2 to 18.5)	0.16	0.60	<b>0.01</b>	0.14	0.36	<b>0.03</b>
Placebo	57.6 ± 22.4	68.1 ± 17.4	+10.5 (-1.2 to 22.2)						

The sample sizes were 22 for the DHA group and 25 for the placebo group. Generalized estimating equations were used to test statistical significance of differences within and between treatment groups. Statistical significance is indicated by bolded p-values. Adjusted models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Week 0 indicates baseline. Week 18 indicates end of cycle 6. Abbreviations: p-interaction (p-int; time\*treatment), docosahexaenoic acid (DHA), Functional Assessment of Cancer Therapy-General (FACT-G), well-being (WB), FACT-Breast (FACT-B), Trial Outcome Index (TOI), breast cancer (BC), endocrine symptoms (ES), Perceived Stress Scale (PSS), Center for Epidemiologic Studies-Depression (CES-D), State-Trait Anxiety Inventory (STAI), body mass index (BMI).

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### 5.1.2 Exercise Classification and QoL

Participants were previously categorized based on meeting WHO's aerobic or resistance training exercise recommendation at baseline and after the sixth cycle of chemotherapy (Section 4.1). Consistent with the results reported in Section 5.1.1, all subscales of the FACT questionnaires decreased or remained the same from baseline to end of cycle 6 in all exercise groups (i.e. the groups that met or did not meet the aerobic or resistance training exercise recommendation at baseline or the end of cycle 6) ( $p\text{-time} \leq 0.06$ ), except emotional well-being, which increased in all groups ( $p\text{-time} \leq 0.06$ ) (Tables 8-11). Anxiety decreased over time in all groups ( $p\text{-time} \leq 0.03$ ) while the happiness measure increased over time ( $p\text{-time} \leq 0.07$ ).

#### 5.1.2.1 Aerobic Exercise Classification at Baseline and QoL

On average, participants that reported  $\geq 150$  minutes of aerobic exercise per week at baseline experienced a smaller decline in their FACT-G total score (-5.4; 95% CI, -17.1 to 6.4 versus -7.4; 95% CI, -15.6 to 0.7;  $p\text{-interaction} = 0.05$ ) (Figure 5), a greater decrease in their anxiety (-4.7; 95% CI, -9.5 to 0.1 versus -0.2; 95% CI, -3.4 to 3.0;  $p\text{-interaction} = 0.01$ ) (Figure 6), as well as a greater increase in their emotional well-being (+3.3; 95% CI, 0.1 to 6.6 versus +0.9; 95% CI, -1.3 to 3.1;  $p\text{-interaction} = 0.05$ ) (Figure 7) over time. Participants that met the aerobic exercise recommendation at baseline experienced a decrease in their perceived stress (-4.0; 95% CI, -10.4 to 2.3), whereas those that did not meet the exercise recommendation at baseline experienced an increase in stress from baseline to end of treatment (+0.3; 95% CI, -3.8 to 4.4) ( $p\text{-interaction} = 0.01$ ) (Figure 8). Additionally, those that met the recommendation at baseline reported a higher taxane subscale score at baseline ( $62.5 \pm 3.9$  versus  $60.1 \pm 7.2$ ) and end of treatment ( $56.3 \pm 10.7$  versus  $55.0 \pm 7.2$ ) ( $p\text{-recommendation} < 0.002$ ) and a greater happiness

score at baseline ( $60.5 \pm 21.0$  versus  $57.2 \pm 24.7$ ) and end of treatment ( $72.4 \pm 13.3$  versus  $60.5 \pm 20.9$ ) (p-recommendation = 0.03). These changes are shown in Table 8.

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**Table 8.** Quality of life scores at baseline (week 0) and end of cycle 6 (week 18) in participants that met ( $\geq 150$  minutes/week) or did not meet ( $< 150$  minutes/week) WHO's aerobic exercise recommendation at baseline.

	Week 0 [mean $\pm$ SD]	Week 18 [mean $\pm$ SD]	Mean Change (95% CI)	Unadjusted			Adjusted		
				p-int	p-rec	p-time	p-int	p-rec	p-time
<b>FACT-G total score</b>									
$\geq 150$ min/week	85.4 $\pm$ 15.6	80.1 $\pm$ 15.2	-5.4 (-17.1 to 6.4)	0.12	0.64	<b>&lt;0.001</b>	<b>0.05</b>	0.61	<b>&lt;0.001</b>
$< 150$ min/week	87.2 $\pm$ 13.5	79.7 $\pm$ 16.7	-7.4 (-15.6 to 0.7)						
<b>Physical WB</b>									
$\geq 150$ min/week	24.4 $\pm$ 5.4	21.2 $\pm$ 7.3	-3.2 (-7.9 to 1.6)	0.86	0.96	<b>&lt;0.001</b>	0.78	0.56	<b>&lt;0.001</b>
$< 150$ min/week	24.6 $\pm$ 3.9	21.3 $\pm$ 5.5	-3.3 (-5.8 to -0.9)						
<b>Social WB</b>									
$\geq 150$ min/week	24.4 $\pm$ 6.0	22.4 $\pm$ 6.4	-2.0 (-6.6 to 2.6)	0.76	0.83	<b>&lt;0.001</b>	0.82	0.82	<b>&lt;0.001</b>
$< 150$ min/week	23.9 $\pm$ 4.2	22.2 $\pm$ 4.6	-1.6 (-3.9 to 0.6)						
<b>Emotional WB</b>									
$\geq 150$ min/week	14.9 $\pm$ 5.5	18.2 $\pm$ 3.0	+3.3 (0.1 to 6.6)	<b>0.05</b>	0.07	<b>&lt;0.001</b>	<b>0.05</b>	0.18	<b>&lt;0.001</b>
$< 150$ min/week	18.1 $\pm$ 4.2	19.0 $\pm$ 4.3	+0.9 (-1.3 to 3.1)						
<b>Functional WB</b>									
$\geq 150$ min/week	20.1 $\pm$ 4.7	18.9 $\pm$ 4.9	-1.2 (-4.7 to 2.3)	0.10	0.76	<b>&lt;0.002</b>	0.09	0.82	<b>&lt;0.001</b>
$< 150$ min/week	21.0 $\pm$ 5.9	17.2 $\pm$ 5.3	-3.8 (-6.7 to -0.8)						
<b>FACT-B total score</b>									
$\geq 150$ min/week	114.6 $\pm$ 21.2	106.2 $\pm$ 19.8	-8.4 (-23.8 to 7.0)	0.44	0.70	<b>&lt;0.001</b>	0.41	0.65	<b>&lt;0.001</b>
$< 150$ min/week	117.6 $\pm$ 15.5	106.8 $\pm$ 20.8	-10.9 (-20.6 to -1.2)						
<b>FACT-B TOI</b>									
$\geq 150$ min/week	75.4 $\pm$ 13.6	65.8 $\pm$ 13.9	-9.5 (-19.8 to 0.7)	0.68	0.99	<b>&lt;0.001</b>	0.68	0.93	<b>&lt;0.001</b>
$< 150$ min/week	75.9 $\pm$ 11.1	65.5 $\pm$ 14.1	-10.3 (-17.0 to -3.7)						
<b>BC subscale score</b>									
$\geq 150$ min/week	30.9 $\pm$ 6.2	26.8 $\pm$ 6.5	-4.1 (-8.8 to 0.6)	0.73	0.88	<b>&lt;0.001</b>	0.75	0.71	<b>&lt;0.001</b>
$< 150$ min/week	30.3 $\pm$ 4.9	27.0 $\pm$ 5.9	-3.2 (-6.1 to -0.4)						

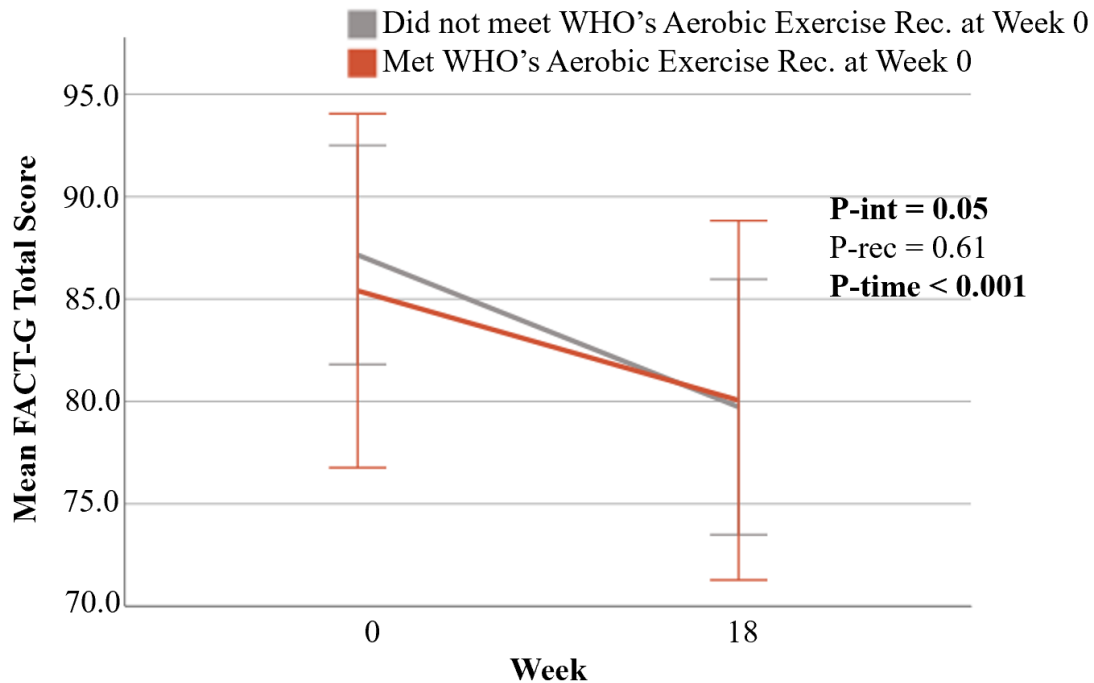
<b>FACT-Taxane total score</b>										
≥ 150 min/week	148.0 ± 17.5	135.9 ± 24.1	-12.1 (-28.0 to 3.9)	0.59	0.99	<0.001	0.52	0.77	<0.001	
< 150 min/week	148.5 ± 16.9	134.7 ± 19.9	-13.8 (-23.5 to -4.0)							
<b>FACT-Taxane TOI</b>										
≥ 150 min/week	107.8 ± 12.7	95.5 ± 20.2	-12.2 (-25.0 to 0.5)	0.94	0.61	<0.001	0.95	0.07	<0.001	
< 150 min/week	105.6 ± 14.3	93.4 ± 14.0	-12.1 (-19.5 to -4.7)							
<b>Taxane subscale score</b>										
≥ 150 min/week	62.5 ± 3.9	56.3 ± 10.7	-6.2 (-12.2 to -0.2)	0.65	0.32	<0.001	0.73	<0.002	<0.001	
< 150 min/week	60.1 ± 7.2	55.0 ± 7.2	-5.2 (-8.9 to -1.4)							
<b>FACT-ES total score</b>										
≥ 150 min/week	154.6 ± 19.0	143.4 ± 20.8	-11.1 (-26.3 to 4.0)	0.97	0.88	<0.001	0.98	0.71	<0.001	
< 150 min/week	154.3 ± 19.7	144.5 ± 22.3	-9.9 (-21.0 to 1.3)							
<b>ES subscale score</b>										
≥ 150 min/week	69.1 ± 4.9	63.8 ± 8.6	-5.4 (-10.6 to -0.1)	0.26	0.72	0.01	0.31	0.78	0.01	
< 150 min/week	67.1 ± 8.7	64.7 ± 7.8	-2.3 (-6.6 to 2.0)							
<b>Fatigue subscale score</b>										
≥ 150 min/week	44.3 ± 9.6	40.1 ± 13.1	-4.2 (-12.6 to 4.2)	0.30	0.38	<0.001	0.33	0.09	<0.001	
< 150 min/week	43.0 ± 10.1	36.4 ± 9.5	-6.6 (-11.7 to -1.5)							
<b>PSS score</b>										
≥ 150 min/week	21.6 ± 8.8	17.5 ± 8.4	-4.0 (-10.4 to 2.3)	0.01	0.98	0.02	0.01	0.13	0.02	
< 150 min/week	19.4 ± 7.1	19.7 ± 8.7	+0.3 (-3.8 to 4.4)							
<b>CES-D score</b>										
≥ 150 min/week	8.1 ± 5.1	7.5 ± 4.2	-0.6 (-4.0 to 2.9)	0.10	0.73	0.66	0.09	0.94	0.64	
< 150 min/week	6.9 ± 3.0	7.9 ± 3.7	+1.0 (-0.7 to 2.8)							
<b>STAI score</b>										
≥ 150 min/week	22.3 ± 6.9	17.5 ± 6.1	-4.7 (-9.5 to 0.1)	0.01	0.98	<0.003	0.01	0.46	<0.001	
< 150 min/week	20.0 ± 6.3	19.8 ± 6.2	-0.2 (-3.4 to 3.0)							

**Fordyce Emotions  
Combination score**

≥ 150 min/week	60.5 ± 21.0	72.4 ± 13.3	+12.0 (-1.1 to 25.0)	0.19	0.16	<b>0.01</b>	0.21	<b>0.03</b>	<b>0.01</b>
< 150 min/week	57.2 ± 24.7	60.5 ± 20.9	+3.3 (-9.1 to 15.7)						

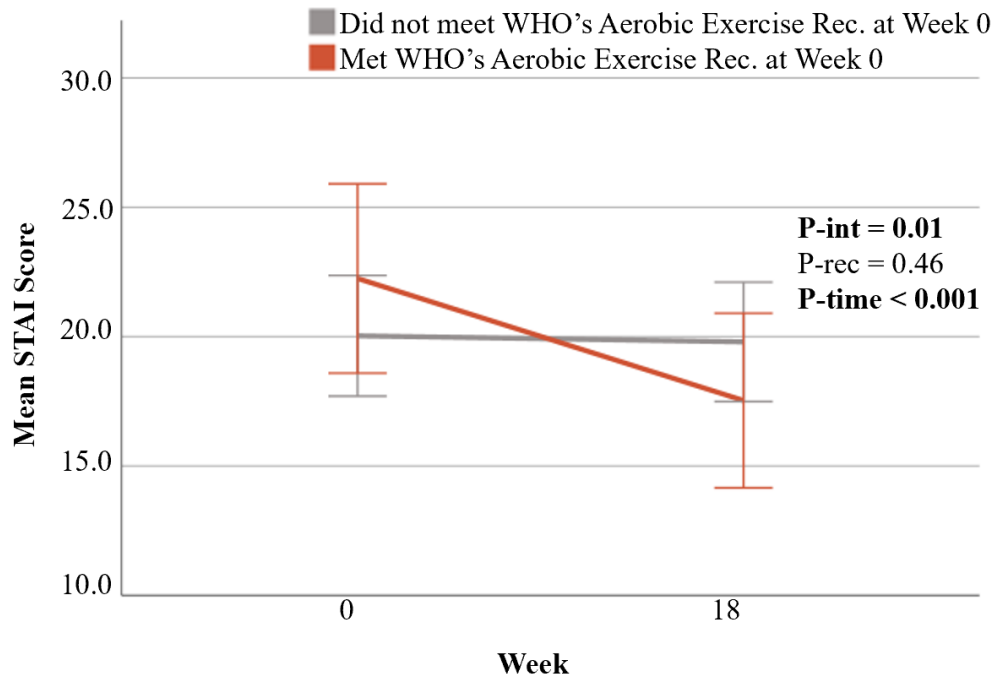
16 participants reported ≥ 150 minutes/week of aerobic exercise and 30 participants reported < 150 minutes/week. Generalized estimating equations were used to test statistical significance of differences within and between exercise categories. Statistical significance is indicated by bolded p-values. Adjusted models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Week 0 indicates baseline. Week 18 indicates end of cycle 6. Abbreviations: p-interaction (p-int; time\*recommendation), p-recommendation (p-rec), World Health Organization (WHO), Functional Assessment of Cancer Therapy-General (FACT-G), well-being (WB), FACT-Breast (FACT-B), Trial Outcome Index (TOI), breast cancer (BC), endocrine symptoms (ES), Perceived Stress Scale (PSS), Center for Epidemiologic Studies-Depression (CES-D), State-Trait Anxiety Inventory (STAI), body mass index (BMI).

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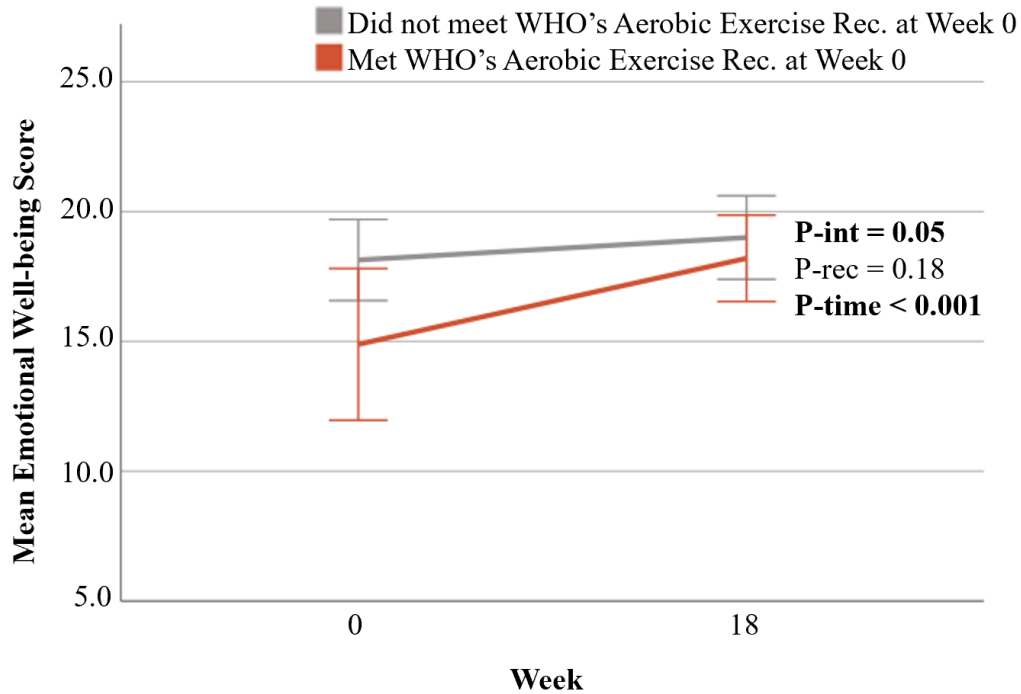


**Figure 5.** Change in mean FACT-G total scores from baseline (week 0) to end of cycle 6 (week 18) in participants that met ( $n = 16$ ) or did not meet ( $n = 30$ ) WHO's aerobic exercise recommendation at baseline. Error bars represent 95% confidence intervals. Generalized estimating equations were used to test statistical significance of differences within and between exercise categories. Models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Statistical significance is indicated by bolded p-values at  $p \leq 0.05$ . Abbreviations: p-interaction (p-int; time\*recommendation), p-recommendation (p-rec), World Health Organization (WHO), Functional Assessment of Cancer Therapy-General (FACT-G), recommendation (rec), body mass index (BMI).

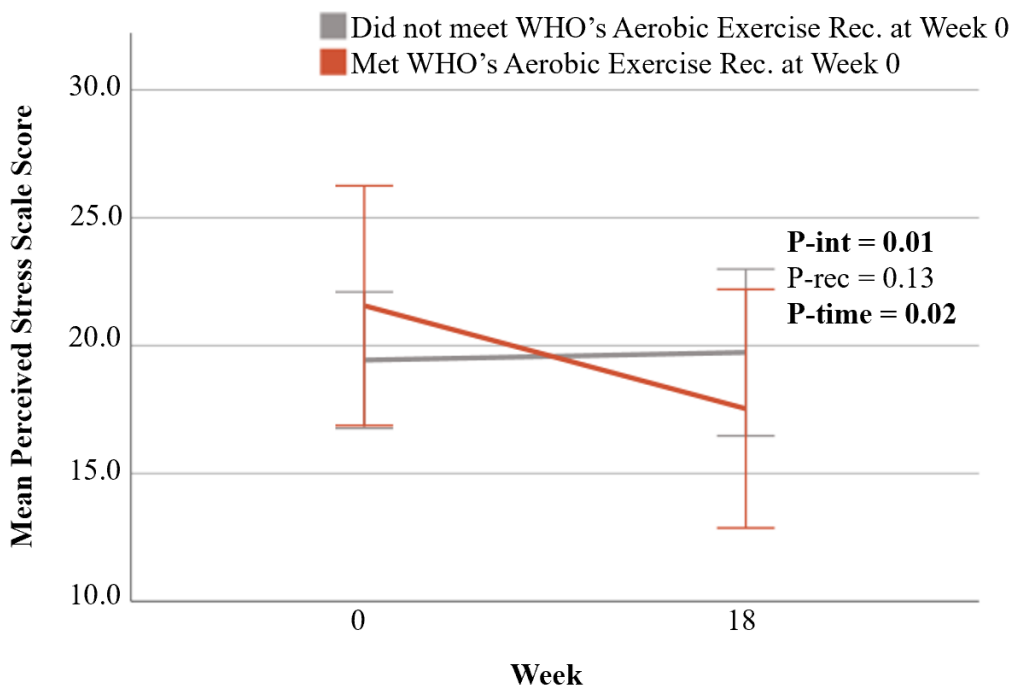




**Figure 6.** Change in mean STAI scores from baseline (week 0) to end of cycle 6 (week 18) in participants that met (n = 16) or did not meet (n = 30) WHO's aerobic exercise recommendation at baseline. Error bars represent 95% confidence intervals. Generalized estimating equations were used to test statistical significance of differences within and between exercise categories. Models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Statistical significance is indicated by bolded p-values at  $p \leq 0.05$ . Abbreviations: p-interaction (p-int; time\*recommendation), p-recommendation (p-rec), World Health Organization (WHO), State-Trait Anxiety Inventory (STAI), recommendation (rec), body mass index (BMI).



**Figure 7.** Change in mean emotional well-being scores from baseline (week 0) to end of cycle 6 (week 18) in participants that met ( $n = 16$ ) or did not meet ( $n = 30$ ) WHO's aerobic exercise recommendation at baseline. Error bars represent 95% confidence intervals. Generalized estimating equations were used to test statistical significance of differences within and between exercise categories. Models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Statistical significance is indicated by bolded p-values at  $p \leq 0.05$ . Abbreviations: p-interaction (p-int; time\*recommendation), p-recommendation (p-rec), World Health Organization (WHO), recommendation (rec), body mass index (BMI).



**Figure 8.** Change in mean perceived stress scale scores from baseline (week 0) to end of cycle 6 (week 18) in participants that met (n = 16) or did not meet (n = 30) WHO’s aerobic exercise recommendation at baseline. Error bars represent 95% confidence intervals. Generalized estimating equations were used to test statistical significance of differences within and between exercise categories. Models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Statistical significance is indicated by bolded p-values at  $p \leq 0.05$ . Abbreviations: p-interaction (p-int; time\*recommendation), p-recommendation (p-rec), World Health Organization (WHO), recommendation (rec), body mass index (BMI).

### 5.1.2.2 Aerobic Exercise Classification at the End of Cycle 6 and QoL

Participants were also categorized based on meeting the aerobic exercise recommendation at the *end* of the sixth cycle of chemotherapy (Table 2). Participants that met the recommendation experienced a smaller decline over time in their FACT-G total score (-2.1; 95% CI, -16.0 to 11.9 versus -8.9; 95% CI, -17.5 to -0.3; p-interaction = 0.01) (Figure 9). They also did not experience a change in their functional well-being over time, whereas the group that did not meet the recommendation experienced a decrease in their functional well-being from baseline to end of

cycle 6 (-4.1; 95% CI, 7.1 to -1.1) (p-interaction = 0.01) (Figure 10). Additionally, those that met the aerobic exercise recommendation after the sixth cycle reported a higher happiness score at baseline ( $70.0 \pm 15.5$  versus  $58.0 \pm 25.3$ ) and at end of cycle 6 ( $78.4 \pm 12.0$  versus  $61.4 \pm 20.8$ ) compared to those that did not meet the exercise recommendation (p-recommendation < 0.002). These changes are shown in Table 9.

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**Table 9.** Quality of life scores at baseline (week 0) and end of cycle 6 (week 18) in participants that met ( $\geq 150$  minutes/week) or did not meet ( $< 150$  minutes/week) WHO's aerobic exercise recommendation at the end of cycle 6.

	Week 0 [mean $\pm$ SD]	Week 18 [mean $\pm$ SD]	Mean Change (95% CI)	Unadjusted			Adjusted		
				p-int	p-rec	p-time	p-int	p-rec	p-time
<b>FACT-G total score</b>									
$\geq 150$ min/week	87.7 $\pm$ 16.7	85.7 $\pm$ 13.9	-2.1 (-16.0 to 11.9)	<b>0.01</b>	0.59	<b>&lt;0.001</b>	<b>0.01</b>	0.65	<b>&lt;0.001</b>
$< 150$ min/week	88.3 $\pm$ 14.6	79.4 $\pm$ 18.0	-8.9 (-17.5 to -0.3)						
<b>Physical WB</b>									
$\geq 150$ min/week	25.3 $\pm$ 2.5	22.9 $\pm$ 5.7	-2.4 (-6.3 to 1.5)	0.46	0.34	<b>&lt;0.001</b>	0.35	0.87	<b>&lt;0.001</b>
$< 150$ min/week	24.5 $\pm$ 5.1	21.0 $\pm$ 6.5	-3.5 (-6.5 to -0.5)						
<b>Social WB</b>									
$\geq 150$ min/week	22.4 $\pm$ 6.7	21.6 $\pm$ 6.9	-1.1 (-7.2 to 4.9)	0.57	0.36	<b>&lt;0.005</b>	0.53	0.11	<b>&lt;0.005</b>
$< 150$ min/week	24.5 $\pm$ 4.2	22.9 $\pm$ 4.3	-1.6 (-3.8 to 0.6)						
<b>Emotional WB</b>									
$\geq 150$ min/week	17.9 $\pm$ 3.7	19.7 $\pm$ 2.5	+1.8 (-1.0 to 4.6)	0.53	0.73	<b>0.01</b>	0.56	0.36	<b>0.01</b>
$< 150$ min/week	17.9 $\pm$ 5.0	19.0 $\pm$ 4.5	+1.1 (-1.3 to 3.6)						
<b>Functional WB</b>									
$\geq 150$ min/week	21.8 $\pm$ 5.3	21.8 $\pm$ 2.7	0.0 (-3.8 to 3.8)	<b>0.01</b>	<b>0.05</b>	<b>0.01</b>	<b>0.01</b>	0.98	<b>0.01</b>
$< 150$ min/week	21.0 $\pm$ 6.1	16.9 $\pm$ 5.7	-4.1 (-7.1 to -1.1)						
<b>FACT-B total score</b>									
$\geq 150$ min/week	119.7 $\pm$ 20.9	112.4 $\pm$ 19.9	-7.3 (-25.9 to 11.4)	0.14	0.56	<b>&lt;0.001</b>	0.10	0.76	<b>&lt;0.001</b>
$< 150$ min/week	117.8 $\pm$ 17.7	106.1 $\pm$ 22.3	-11.6 (-22.0 to -1.2)						
<b>FACT-B TOI</b>									
$\geq 150$ min/week	79.2 $\pm$ 12.1	71.4 $\pm$ 13.1	-7.8 (-19.3 to 3.8)	0.25	0.19	<b>&lt;0.001</b>	0.20	0.81	<b>&lt;0.001</b>
$< 150$ min/week	75.8 $\pm$ 12.5	64.4 $\pm$ 15.2	-11.4 (-18.5 to -4.3)						
<b>BC subscale score</b>									
$\geq 150$ min/week	31.9 $\pm$ 5.3	26.7 $\pm$ 7.0	-5.2 (-10.9 to 0.5)	0.22	0.70	<b>&lt;0.001</b>	0.19	0.98	<b>&lt;0.001</b>
$< 150$ min/week	30.2 $\pm$ 5.1	27.0 $\pm$ 6.3	-3.2 (-6.1 to -0.3)						

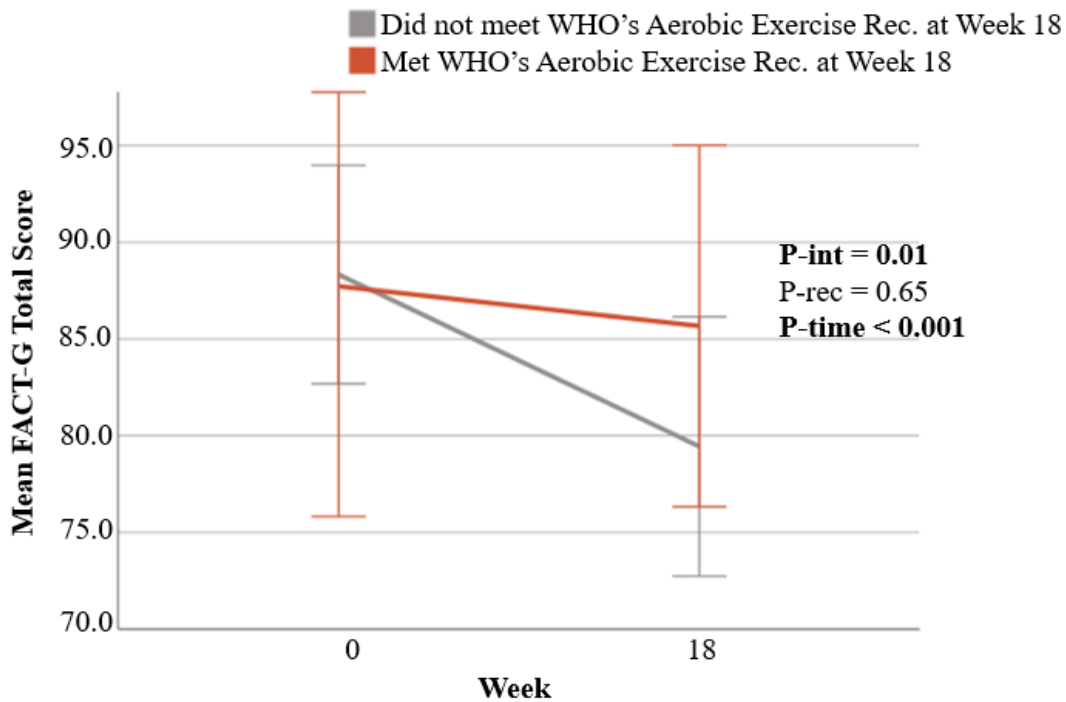
<b>FACT-Taxane total score</b>										
≥ 150 min/week	151.6 ± 16.7	140.8 ± 16.6	-10.9 (-26.1 to 4.3)	0.34	0.42	<0.001	0.31	0.51	<0.001	
< 150 min/week	149.5 ± 18.3	134.3 ± 23.9	-15.2 (-26.3 to -4.1)							
<b>FACT-Taxane TOI</b>										
≥ 150 min/week	111.1 ± 7.7	99.8 ± 11.8	-11.3 (-20.5 to -2.1)	0.73	0.08	<0.001	0.63	0.87	<0.001	
< 150 min/week	105.8 ± 15.7	92.5 ± 17.8	-13.3 (-22.0 to -4.7)							
<b>Taxane subscale score</b>										
≥ 150 min/week	63.9 ± 0.3	55.1 ± 8.5	-8.8 (-14.6 to -3.1)	0.17	0.26	<0.001	0.18	0.48	<0.001	
< 150 min/week	59.9 ± 7.3	55.1 ± 8.8	-4.8 (-8.9 to -0.7)							
<b>FACT-ES total score</b>										
≥ 150 min/week	157.1 ± 17.9	149.8 ± 22.0	-7.3 (-25.8 to 11.1)	0.30	0.62	<0.001	0.28	0.48	<0.001	
< 150 min/week	156.2 ± 21.3	144.2 ± 23.1	-12.1 (-23.7 to -0.4)							
<b>ES subscale score</b>										
≥ 150 min/week	70.0 ± 3.6	64.1 ± 10.1	-5.9 (-12.6 to 0.9)	0.33	0.67	<0.009	0.31	0.46	0.01	
< 150 min/week	67.5 ± 9.1	64.9 ± 7.4	-2.6 (-6.9 to 1.6)							
<b>Fatigue subscale score</b>										
≥ 150 min/week	45.6 ± 7.4	40.9 ± 12.1	-4.8 (-13.7 to 4.2)	0.46	0.30	<0.001	0.39	0.77	<0.001	
< 150 min/week	43.2 ± 10.9	36.6 ± 10.9	-6.5 (-12.1 to -1.0)							
<b>PSS score</b>										
≥ 150 min/week	20.5 ± 8.3	17.9 ± 8.8	-2.6 (-10.3 to 5.0)	0.30	0.93	0.12	0.25	0.65	0.16	
< 150 min/week	19.3 ± 8.3	18.7 ± 9.6	-0.5 (-5.1 to 4.0)							
<b>CES-D score</b>										
≥ 150 min/week	7.2 ± 5.3	6.8 ± 4.7	-0.4 (-4.8 to 4.0)	0.17	0.85	0.54	0.15	0.84	0.49	
< 150 min/week	6.7 ± 3.3	7.8 ± 3.9	+1.0 (-0.8 to 2.9)							
<b>STAI score</b>										
≥ 150 min/week	19.5 ± 5.8	16.6 ± 6.0	-2.9 (-8.1 to 2.3)	0.23	0.39	0.01	0.24	0.47	0.01	
< 150 min/week	20.2 ± 6.9	19.2 ± 6.4	-1.0 (-4.4 to 2.4)							

**Fordyce Emotions  
Combination score**

≥ 150 min/week	70.0 ± 15.5	78.4 ± 12.0	+8.4 (-4.4 to 21.2)	0.14	<b>&lt;0.003</b>	<b>0.01</b>	0.11	<b>&lt;0.002</b>	<b>0.01</b>
< 150 min/week	58.0 ± 25.3	61.4 ± 20.8	+3.4 (-8.8 to 15.6)						

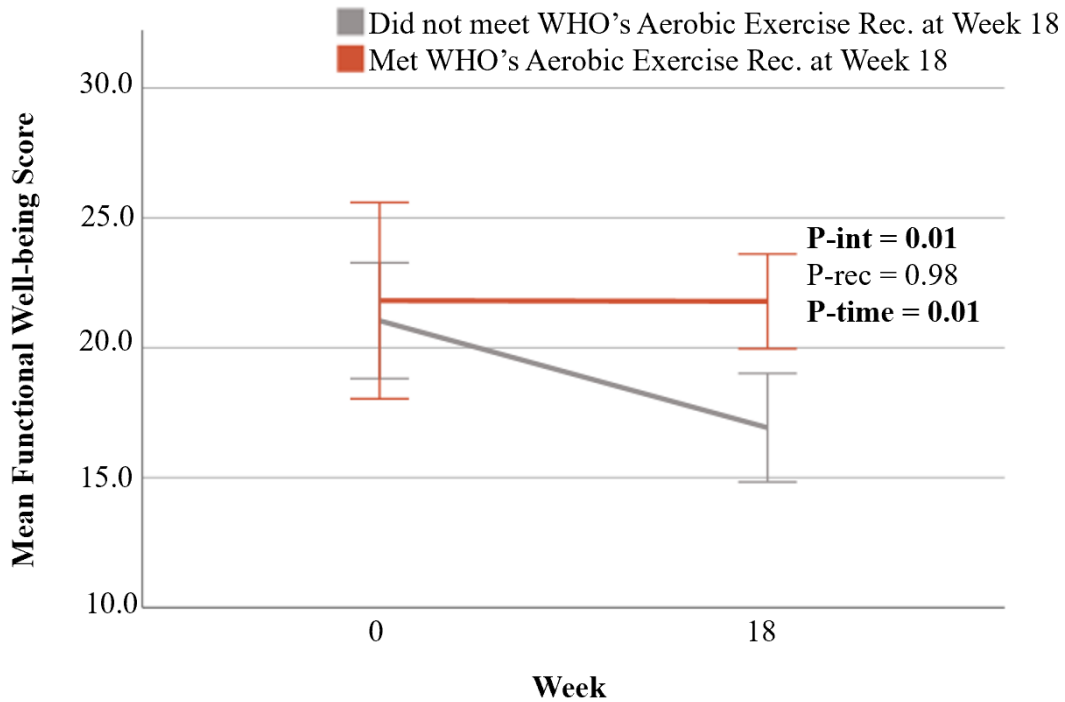
11 participants reported ≥ 150 minutes/week of aerobic exercise and 31 participants reported < 150 minutes/week. Generalized estimating equations were used to test statistical significance of differences within and between exercise categories. Statistical significance is indicated by bolded p-values. Adjusted models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Week 0 indicates baseline. Week 18 indicates end of cycle 6. Abbreviations: p-interaction (p-int; time\*recommendation), p-recommendation (p-rec), World Health Organization (WHO), Functional Assessment of Cancer Therapy-General (FACT-G), well-being (WB), FACT-Breast (FACT-B), Trial Outcome Index (TOI), breast cancer (BC), endocrine symptoms (ES), Perceived Stress Scale (PSS), Center for Epidemiologic Studies-Depression (CES-D), State-Trait Anxiety Inventory (STAI), body mass index (BMI).

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**Figure 9.** Change in mean FACT-G total scores from baseline (week 0) to end of cycle 6 (week 18) in participants that met ( $n = 11$ ) or did not meet ( $n = 31$ ) WHO's aerobic exercise recommendation at the end of cycle 6. Error bars represent 95% confidence intervals. Generalized estimating equations were used to test statistical significance of differences within and between exercise categories. Models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Statistical significance is indicated by bolded p-values at  $p \leq 0.05$ . Abbreviations: p-interaction (p-int; time\*recommendation), p-recommendation (p-rec), World Health Organization (WHO), Functional Assessment of Cancer Therapy-General (FACT-G), recommendation (rec), body mass index (BMI).





**Figure 10.** Change in mean functional well-being scores from baseline (week 0) to end of cycle 6 (week 18) in participants that met ( $n = 11$ ) or did not meet ( $n = 31$ ) WHO's aerobic exercise recommendation at the end of cycle 6. Error bars represent 95% confidence intervals. Generalized estimating equations were used to test statistical significance of differences within and between exercise categories. Models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Statistical significance is indicated by bolded p-values at  $p \leq 0.05$ . Abbreviations: p-interaction (p-int; time\*recommendation), p-recommendation (p-rec), World Health Organization (WHO), recommendation (rec), body mass index (BMI).

### 5.1.2.3 Resistance Training Exercise Classification at Baseline and QoL

Compared to those that reported  $< 2$  times/week of resistance training exercise at baseline, participants that reported  $\geq 2$  times/week experienced a smaller decline in their FACT-G total score ( $-2.8$ ; 95% CI,  $-11.3$  to  $5.7$  versus  $-8.1$ ; 95% CI,  $-16.8$  to  $0.7$ ; p-interaction =  $0.04$ ) (Figure 11) and FACT-B total score ( $-5.8$ ; 95% CI,  $-18.2$  to  $6.7$  versus  $-11.3$ ; 95% CI,  $-21.7$  to  $-0.9$ ; p-interaction =  $0.06$ ) (Figure 12) from baseline to the end of cycle 6. Additionally, those that met the resistance training recommendation at baseline reported a lower anxiety score at baseline ( $19.8 \pm 7.0$  versus

20.9 ± 6.5) and at the end of chemotherapy (17.9 ± 6.6 versus 19.3 ± 6.1) (p-recommendation = 0.02) and a greater happiness score at baseline (68.5 ± 17.3 versus 55.0 ± 24.4) and at the end of chemotherapy (73.1 ± 13.8 versus 61.6 ± 20.8) (p-recommendation = 0.01). These changes are shown in Table 10.

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**Table 10.** Quality of life scores at baseline (week 0) and end of cycle 6 (week 18) in participants that met ( $\geq 2$  times/week) or did not meet ( $< 2$  times/week) WHO's resistance training exercise recommendation at baseline.

	Week 0 [mean $\pm$ SD]	Week 18 [mean $\pm$ SD]	Mean Change (95% CI)	Unadjusted			Adjusted		
				p-int	p-rec	p-time	p-int	p-rec	p-time
<b>FACT-G total score</b>									
$\geq 2$ times/week	88.8 $\pm$ 11.6	85.9 $\pm$ 10.2	-2.8 (-11.3 to 5.7)	0.06	0.17	<b>&lt;0.001</b>	<b>0.04</b>	0.44	<b>&lt;0.001</b>
$< 2$ times/week	86.1 $\pm$ 15.4	78.0 $\pm$ 18.2	-8.1 (-16.8 to 0.7)						
<b>Physical WB</b>									
$\geq 2$ times/week	25.9 $\pm$ 2.4	23.6 $\pm$ 4.6	-2.2 (-5.1 to 0.7)	0.39	<b>0.03</b>	<b>&lt;0.001</b>	0.24	0.67	<b>&lt;0.001</b>
$< 2$ times/week	23.9 $\pm$ 4.9	20.4 $\pm$ 6.4	-3.5 (-6.4 to -0.7)						
<b>Social WB</b>									
$\geq 2$ times/week	24.6 $\pm$ 3.3	23.8 $\pm$ 4.2	-0.8 (-3.7 to 2.2)	0.20	0.30	<b>0.01</b>	0.17	0.23	<b>0.01</b>
$< 2$ times/week	23.9 $\pm$ 5.3	21.8 $\pm$ 5.5	-2.2 (-4.9 to 0.5)						
<b>Emotional WB</b>									
$\geq 2$ times/week	16.3 $\pm$ 6.0	19.0 $\pm$ 3.4	+2.7 (-1.1 to 6.5)	0.21	0.73	<b>&lt;0.002</b>	0.28	0.79	<b>&lt;0.002</b>
$< 2$ times/week	17.5 $\pm$ 4.4	18.8 $\pm$ 4.2	+1.3 (-0.9 to 3.4)						
<b>Functional WB</b>									
$\geq 2$ times/week	22.0 $\pm$ 3.4	19.5 $\pm$ 4.0	-2.5 (-5.5 to 0.4)	0.78	0.11	<b>&lt;0.001</b>	0.70	0.42	<b>&lt;0.001</b>
$< 2$ times/week	20.3 $\pm$ 6.2	17.4 $\pm$ 5.7	-3.0 (-5.9 to 0.0)						
<b>FACT-B total score</b>									
$\geq 2$ times/week	119.9 $\pm$ 16.9	114.1 $\pm$ 15.2	-5.8 (-18.2 to 6.7)	0.10	0.20	<b>&lt;0.001</b>	0.06	0.67	<b>&lt;0.001</b>
$< 2$ times/week	115.7 $\pm$ 18.1	104.4 $\pm$ 22.4	-11.3 (-21.7 to -0.9)						
<b>FACT-B TOI</b>									
$\geq 2$ times/week	79.0 $\pm$ 10.7	71.3 $\pm$ 10.2	-7.7 (-15.9 to 0.4)	0.34	0.08	<b>&lt;0.001</b>	0.20	0.87	<b>&lt;0.001</b>
$< 2$ times/week	74.5 $\pm$ 12.2	63.9 $\pm$ 15.4	-10.6 (-17.6 to -3.6)						
<b>BC subscale score</b>									
$\geq 2$ times/week	31.1 $\pm$ 6.1	28.1 $\pm$ 6.1	-3.0 (-7.7 to 1.8)	0.74	0.51	<b>&lt;0.001</b>	0.64	0.48	<b>&lt;0.001</b>
$< 2$ times/week	30.3 $\pm$ 5.0	26.7 $\pm$ 6.2	-3.6 (-6.4 to -0.8)						

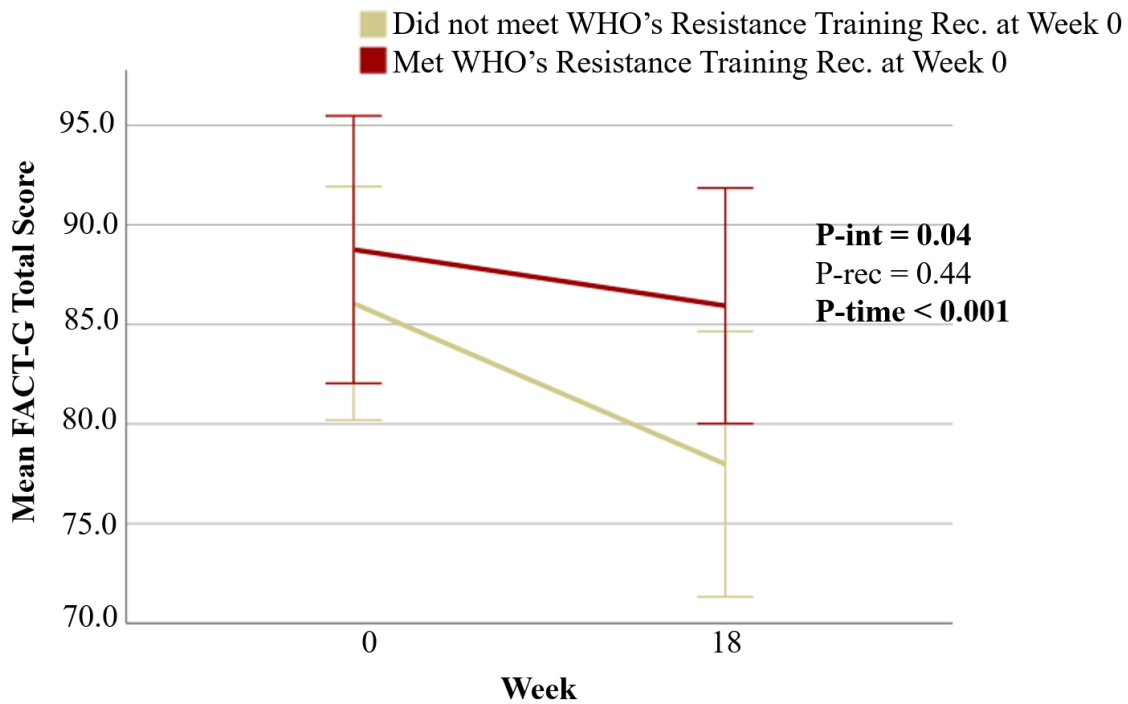
<b>FACT-Taxane total score</b>									
≥ 2 times/week	154.1 ± 8.0	141.9 ± 13.2	-12.3 (-21.0 to -3.5)	0.55	0.07	<0.001	0.37	0.58	<0.001
< 2 times/week	146.4 ± 19.2	133.0 ± 23.8	-13.4 (-24.4 to -2.5)						
<b>FACT-Taxane TOI</b>									
≥ 2 times/week	112.1 ± 4.2	99.1 ± 9.7	-13.0 (-19.0 to -7.0)	0.68	0.02	<0.001	0.97	0.55	<0.001
< 2 times/week	104.2 ± 15.4	92.5 ± 18.1	-11.7 (-20.2 to -3.3)						
<b>Taxane subscale score</b>									
≥ 2 times/week	63.1 ± 1.8	55.9 ± 7.4	-7.1 (-11.5 to -2.8)	0.32	0.21	<0.001	0.32	0.78	<0.001
< 2 times/week	60.1 ± 7.2	55.3 ± 8.8	-4.9 (-8.9 to -0.9)						
<b>FACT-ES total score</b>									
≥ 2 times/week	161.1 ± 10.1	151.1 ± 17.6	-10.0 (-21.5 to 1.5)	0.72	0.09	<0.001	0.56	0.76	<0.001
< 2 times/week	152.3 ± 21.7	142.1 ± 23.3	-10.3 (-21.7 to 1.2)						
<b>ES subscale score</b>									
≥ 2 times/week	70.1 ± 3.5	65.2 ± 8.8	-4.9 (-10.3 to 0.5)	0.41	0.24	0.01	0.47	0.64	0.01
< 2 times/week	67.0 ± 8.6	64.2 ± 7.6	-2.8 (-6.8 to 1.3)						
<b>Fatigue subscale score</b>									
≥ 2 times/week	46.5 ± 7.1	42.9 ± 9.9	-3.6 (-10.3 to 3.0)	0.29	0.03	<0.001	0.28	0.64	<0.001
< 2 times/week	42.3 ± 10.5	35.7 ± 10.7	-6.5 (-11.8 to -1.3)						
<b>PSS score</b>									
≥ 2 times/week	20.7 ± 7.6	18.1 ± 7.4	-2.6 (-8.5 to 3.2)	0.30	0.93	0.06	0.25	0.73	0.09
< 2 times/week	19.6 ± 8.0	18.8 ± 9.6	-0.8 (-5.2 to 3.6)						
<b>CES-D score</b>									
≥ 2 times/week	6.5 ± 3.5	7.1 ± 3.7	+0.6 (-2.2 to 3.4)	0.86	0.33	0.40	0.91	0.59	0.37
< 2 times/week	7.6 ± 4.0	8.0 ± 4.0	+0.4 (-1.6 to 2.4)						
<b>STAI score</b>									
≥ 2 times/week	19.8 ± 7.0	17.9 ± 6.6	-1.9 (-7.2 to 3.4)	0.84	0.47	0.05	0.96	0.02	0.03
< 2 times/week	20.9 ± 6.5	19.3 ± 6.1	-1.7 (-4.8 to 1.5)						

**Fordyce Emotions  
Combination score**

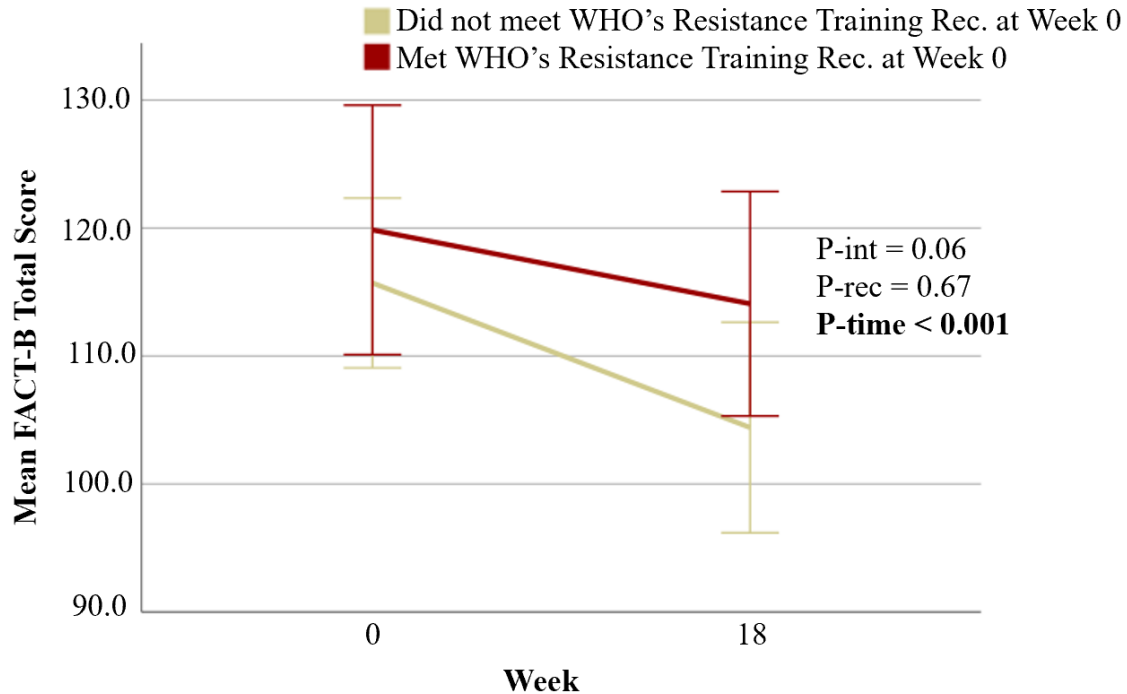
≥ 2 times/week	68.5 ± 17.3	73.1 ± 13.8	+4.7 (-7.7 to 17.0)	0.80	<b>0.01</b>	<b>0.04</b>	0.90	<b>0.01</b>	<b>0.04</b>
< 2 times/week	55.0 ± 24.4	61.6 ± 20.8	+6.6 (-5.1 to 18.3)						

14 participants reported resistance training exercise ≥ 2 times/week and 33 participants reported < 2 times/week at baseline. Generalized estimating equations were used to test statistical significance of differences within and between exercise categories. Statistical significance is indicated by bolded p-values. Adjusted models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Week 0 indicates baseline. Week 18 indicates end of cycle 6. Abbreviations: p-interaction (p-int; time\*recommendation), p-recommendation (p-rec), World Health Organization (WHO), Functional Assessment of Cancer Therapy-General (FACT-G), well-being (WB), FACT-Breast (FACT-B), Trial Outcome Index (TOI), breast cancer (BC), endocrine symptoms (ES), Perceived Stress Scale (PSS), Center for Epidemiologic Studies-Depression (CES-D), State-Trait Anxiety Inventory (STAI), body mass index (BMI).

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**Figure 11.** Change in mean FACT-G total scores from baseline (week 0) to end of cycle 6 (week 18) in participants that met (n = 14) or did not meet (n = 33) WHO's resistance training exercise recommendation at baseline. Error bars represent 95% confidence intervals. Generalized estimating equations were used to test statistical significance of differences within and between exercise categories. Models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Statistical significance is indicated by bolded p-values at  $p \leq 0.05$ . Abbreviations: p-interaction (p-int; time\*recommendation), p-recommendation (p-rec), World Health Organization (WHO), Functional Assessment of Cancer Therapy-General (FACT-G), recommendation (rec), body mass index (BMI).



**Figure 12.** Change in mean FACT-B total scores from baseline (week 0) to end of cycle 6 (week 18) in participants that met (n = 14) or did not meet (n = 33) WHO's resistance training exercise recommendation at baseline. Error bars represent 95% confidence intervals. Generalized estimating equations were used to test statistical significance of differences within and between exercise categories. Models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Statistical significance is indicated by bolded p-values at  $p \leq 0.05$ . Abbreviations: p-interaction (p-int; time\*recommendation), p-recommendation (p-rec), World Health Organization (WHO), Functional Assessment of Cancer Therapy-Breast (FACT-B), recommendation (rec), body mass index (BMI).

#### 5.1.2.4 Resistance Training Exercise Classification at the End of Cycle 6 and QoL

Compared to those that reported  $< 2$  times/week of resistance training exercise after the sixth cycle of chemotherapy, participants that reported  $\geq 2$  times/week experienced a smaller decline in their functional well-being (-0.5; 95% CI, -5.3 to 4.3 versus -3.6; 95% CI, -6.5 to -0.7; p-interaction = 0.07) (Figure 13) and FACT-B TOI (-6.2; 95% CI, -18.8 to 6.5 versus -11.3; 95% CI, -18.3 to -4.4; p-interaction = 0.06) (Figure 14). These changes are shown in Table 11.

**Table 11.** Quality of life scores at baseline (week 0) and end of cycle 6 (week 18) in participants that met ( $\geq 2$  times/week) or did not meet ( $< 2$  times/week) WHO's resistance training exercise recommendation at the end of cycle 6.

	Week 0 [mean $\pm$ SD]	Week 18 [mean $\pm$ SD]	Mean Change (95% CI)	Unadjusted			Adjusted		
				p-int	p-rec	p-time	p-int	p-rec	p-time
<b>FACT-G total score</b>									
$\geq 2$ times/week	88.0 $\pm$ 16.1	84.6 $\pm$ 12.7	-3.4 (-19.5 to 12.7)	0.44	0.58	<b>&lt;0.003</b>	0.44	0.93	<b>&lt;0.002</b>
$< 2$ times/week	88.2 $\pm$ 14.9	80.3 $\pm$ 18.0	-8.0 (-16.2 to 0.3)						
<b>Physical WB</b>									
$\geq 2$ times/week	25.5 $\pm$ 3.0	22.5 $\pm$ 5.6	-3.0 (-7.8 to 1.8)	0.91	0.43	<b>&lt;0.003</b>	0.81	0.61	<b>&lt;0.002</b>
$< 2$ times/week	24.5 $\pm$ 4.8	21.2 $\pm$ 6.5	-3.2 (-6.1 to -0.4)						
<b>Social WB</b>									
$\geq 2$ times/week	24.3 $\pm$ 3.3	22.1 $\pm$ 5.1	-2.2 (-6.8 to 2.4)	0.41	0.97	<b>&lt;0.001</b>	0.44	0.41	<b>&lt;0.001</b>
$< 2$ times/week	23.8 $\pm$ 5.3	22.5 $\pm$ 5.2	-1.3 (-3.9 to 1.3)						
<b>Emotional WB</b>									
$\geq 2$ times/week	17.6 $\pm$ 6.8	19.5 $\pm$ 4.0	+1.9 (-4.1 to 7.9)	0.67	0.98	0.06	0.69	0.70	0.06
$< 2$ times/week	17.9 $\pm$ 4.1	19.1 $\pm$ 4.1	+1.2 (-0.8 to 3.2)						
<b>Functional WB</b>									
$\geq 2$ times/week	21.0 $\pm$ 4.8	20.5 $\pm$ 4.1	-0.5 (-5.3 to 4.3)	0.08	0.41	<b>0.02</b>	0.07	0.68	<b>0.02</b>
$< 2$ times/week	21.3 $\pm$ 6.1	17.7 $\pm$ 5.7	-3.6 (-6.5 to -0.7)						
<b>FACT-B total score</b>									
$\geq 2$ times/week	117.5 $\pm$ 20.6	112.4 $\pm$ 18.9	-5.1 (-27.1 to 16.9)	0.30	0.63	<b>&lt;0.001</b>	0.25	0.60	<b>&lt;0.001</b>
$< 2$ times/week	118.4 $\pm$ 18.1	106.8 $\pm$ 22.4	-11.6 (-21.7 to -1.6)						
<b>FACT-B TOI</b>									
$\geq 2$ times/week	76.9 $\pm$ 11.5	70.8 $\pm$ 12.0	-6.2 (-18.8 to 6.5)	0.11	0.49	<b>&lt;0.001</b>	0.06	0.51	<b>&lt;0.001</b>
$< 2$ times/week	76.5 $\pm$ 12.7	65.2 $\pm$ 15.5	-11.3 (-18.3 to -4.4)						
<b>BC subscale score</b>									
$\geq 2$ times/week	30.4 $\pm$ 5.5	27.8 $\pm$ 7.4	-2.7 (-9.7 to 4.4)	0.39	0.88	<b>&lt;0.001</b>	0.27	0.08	<b>&lt;0.001</b>
$< 2$ times/week	30.7 $\pm$ 5.1	26.8 $\pm$ 6.2	-3.9 (-6.7 to -1.2)						



<b>FACT-Taxane total score</b>										
≥ 2 times/week	155.9 ± 10.5	139.0 ± 15.7	-16.9 (-33.1 to -0.6)	0.61	0.34	<0.001	0.79	0.78	<0.001	
< 2 times/week	149.0 ± 18.7	135.3 ± 23.6	-13.7 (-24.1 to -3.2)							
<b>FACT-Taxane TOI</b>										
≥ 2 times/week	107.3 ± 14.5	97.4 ± 11.1	-9.9 (-24.2 to 4.3)	0.54	0.66	<0.001	0.39	0.40	<0.001	
< 2 times/week	107.1 ± 14.4	93.7 ± 17.7	-13.4 (-21.3 to -5.4)							
<b>Taxane subscale score</b>										
≥ 2 times/week	59.0 ± 10.8	54.4 ± 8.2	-4.6 (-15.2 to 6.0)	0.78	0.62	<0.004	0.75	0.06	<0.003	
< 2 times/week	61.4 ± 5.3	55.3 ± 8.8	-6.1 (-9.6 to -2.6)							
<b>FACT-ES total score</b>										
≥ 2 times/week	164.7 ± 11.5	150.5 ± 22.9	-14.2 (-36.5 to 8.2)	0.48	0.18	<0.001	0.58	0.76	<0.001	
< 2 times/week	155.0 ± 21.3	144.5 ± 22.9	-10.4 (-21.3 to 0.4)							
<b>ES subscale score</b>										
≥ 2 times/week	71.1 ± 2.3	65.9 ± 11.7	-5.2 (-15.0 to 4.5)	0.59	0.25	0.04	0.72	0.84	0.06	
< 2 times/week	67.5 ± 8.7	64.4 ± 7.2	-3.1 (-7.0 to 0.7)							
<b>Fatigue subscale score</b>										
≥ 2 times/week	43.1 ± 9.8	39.4 ± 11.9	-3.8 (-15.4 to 7.9)	0.30	0.88	<0.001	0.26	0.22	<0.001	
< 2 times/week	44.0 ± 10.3	37.4 ± 11.2	-6.6 (-11.8 to -1.4)							
<b>PSS score</b>										
≥ 2 times/week	20.3 ± 9.3	18.3 ± 8.2	-2.0 (-11.4 to 7.4)	0.61	0.94	0.20	0.54	0.56	0.24	
< 2 times/week	19.4 ± 8.1	18.6 ± 9.6	-0.8 (-5.1 to 3.5)							
<b>CES-D score</b>										
≥ 2 times/week	6.6 ± 3.2	7.5 ± 4.8	+0.9 (-3.5 to 5.3)	0.85	0.91	0.32	0.88	0.76	0.30	
< 2 times/week	6.9 ± 4.0	7.5 ± 4.0	+0.6 (-1.4 to 2.6)							
<b>STAI score</b>										
≥ 2 times/week	20.8 ± 6.0	19.0 ± 8.1	-1.8 (-9.5 to 5.8)	0.80	0.75	0.03	0.81	0.62	0.03	
< 2 times/week	19.9 ± 6.8	18.4 ± 6.0	-1.4 (-4.5 to 1.7)							

**Fordyce Emotions  
Combination score**

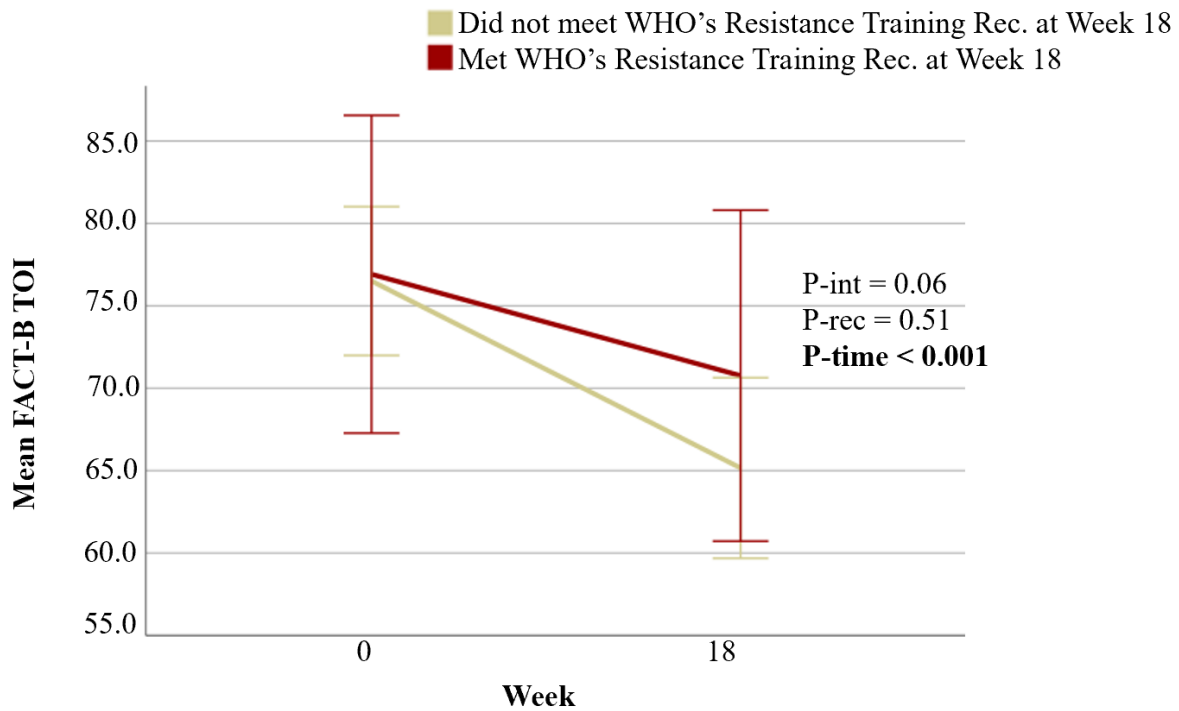
≥ 2 times/week	64.7 ± 20.1	74.3 ± 15.8	+9.6 (-9.8 to 28.9)	<b>0.39</b>	<b>0.20</b>	<b>0.07</b>	<b>0.39</b>	<b>0.49</b>	<b>0.07</b>
< 2 times/week	60.4 ± 24.5	63.5 ± 20.9	+3.1 (-8.4 to 14.6)						

8 participants reported resistance training exercise ≥ 2 times/week and 34 participants reported < 2 times/week at the end of cycle 6. Generalized estimating equations were used to test statistical significance of differences within and between exercise categories. Statistical significance is indicated by bolded p-values. Adjusted models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Week 0 indicates baseline. Week 18 indicates end of cycle 6. Abbreviations: p-interaction (p-int; time\*recommendation), p-recommendation (p-rec), World Health Organization (WHO), Functional Assessment of Cancer Therapy-General (FACT-G), well-being (WB), FACT-Breast (FACT-B), Trial Outcome Index (TOI), breast cancer (BC), endocrine symptoms (ES), Perceived Stress Scale (PSS), Center for Epidemiologic Studies-Depression (CES-D), State-Trait Anxiety Inventory (STAI), body mass index (BMI).

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**Figure 13.** Change in mean functional well-being scores from baseline (week 0) to end of cycle 6 (week 18) in participants that met ( $n = 8$ ) or did not meet ( $n = 34$ ) WHO's resistance training exercise recommendation at the end of cycle 6. Error bars represent 95% confidence intervals. Generalized estimating equations were used to test statistical significance of differences within and between exercise categories. Models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Statistical significance is indicated by bolded p-values at  $p \leq 0.05$ . Abbreviations: p-interaction (p-int; time\*recommendation), p-recommendation (p-rec), World Health Organization (WHO), recommendation (rec), body mass index (BMI).



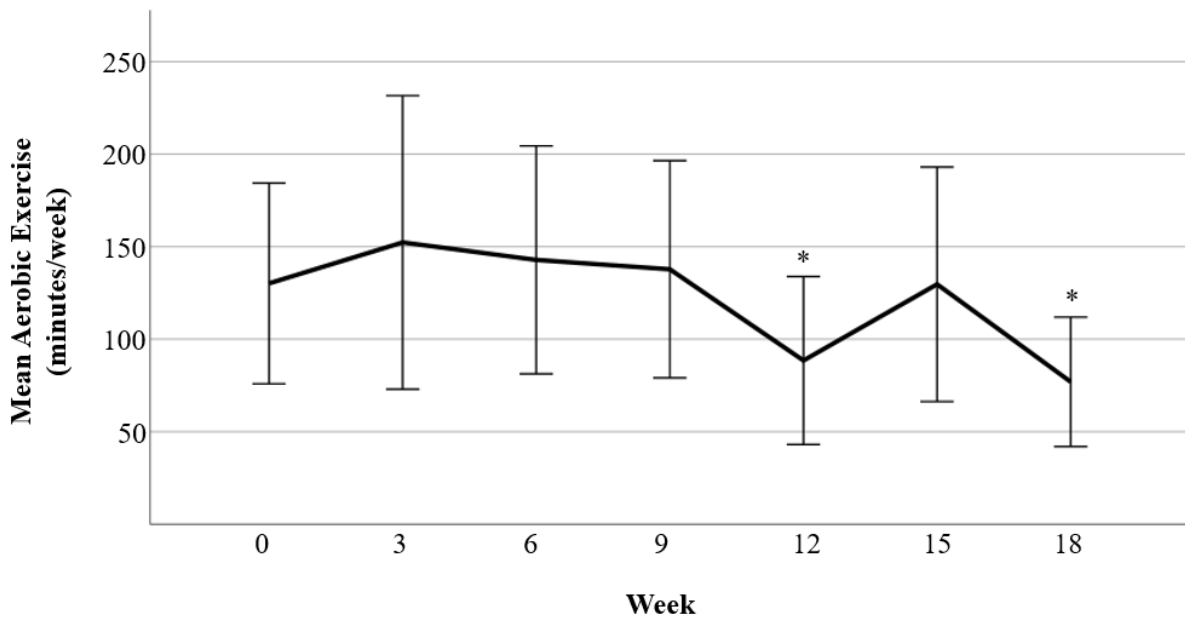
**Figure 14.** Change in mean FACT-B TOIs from baseline (week 0) to end of cycle 6 (week 18) in participants that met (n = 8) or did not meet (n = 34) WHO’s resistance training exercise recommendation at the end of cycle 6. Error bars represent 95% confidence intervals. Generalized estimating equations were used to test statistical significance of differences within and between exercise categories. Models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Statistical significance is indicated by bolded p-values at  $p \leq 0.05$ . Abbreviations: p-interaction (p-int; time\*recommendation), p-recommendation (p-rec), trial outcome index (TOI), World Health Organization (WHO), recommendation (rec), body mass index (BMI).

## 5.2 Exercise

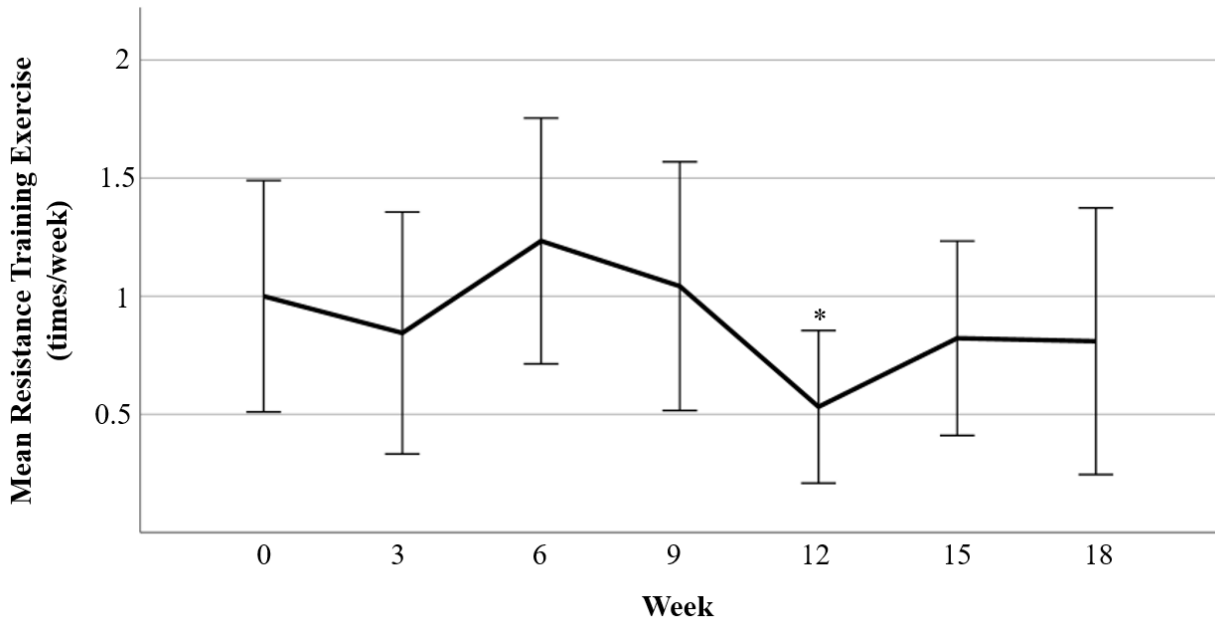
### 5.2.1 Comparing Exercise Behaviour Within and Between Treatment Groups

A change over time was observed for mean weekly aerobic exercise (p-time < 0.001) and resistance training frequency (p-time = 0.01). However, treatment group did not significantly affect the change in mean weekly aerobic exercise (p-interaction = 0.56) or resistance training frequency (p-interaction = 0.28) over time. Therefore, groups were combined to assess changes over time.

Overall, mean aerobic exercise was statistically significantly lower at week 12 (-53.5 minutes/week; 95% CI, -100.5 to -6.3;  $p = 0.03$ ) and week 18 (-70.8; 95% CI, -123.0 to -18.6;  $p = 0.008$ ) compared to baseline (Figure 15). Similarly, mean resistance training frequency was lower at week 12 (-0.57 times/week; 95% CI, -1.0 to -0.13;  $p = 0.01$ ) compared to baseline in the whole sample (Figure 16).



**Figure 15.** Daily aerobic exercise over time in the DHA and placebo groups combined ( $n = 42$ ). Error bars represent 95% confidence intervals. Generalized estimating equations were used to test statistical significance of differences within and between treatment groups. Models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Each week was compared to baseline using unadjusted multiple comparisons. \*Indicates statistically significantly different from baseline at  $p \leq 0.03$ . Not all statistically significant differences are shown on the graph. Week 0 indicates baseline. Week 18 indicates the end of cycle 6. Abbreviations: Docosahexaenoic acid (DHA), body mass index (BMI).



**Figure 16.** Daily resistance training exercise frequency over time in the DHA and placebo groups combined (n = 42). Error bars represent 95% confidence intervals. Generalized estimating equations were used to test statistical significance of differences within and between treatment groups. Models were adjusted for age, BMI, histology, menopausal status, tumour stage and grade. Each week was compared to baseline using unadjusted multiple comparisons. \*Indicates statistically significantly different from baseline at p = 0.01. Not all statistically significant differences are shown on the graph. Week 0 indicates baseline. Week 18 indicates the end of cycle 6. Abbreviations: Docosahexaenoic acid (DHA), body mass index (BMI).

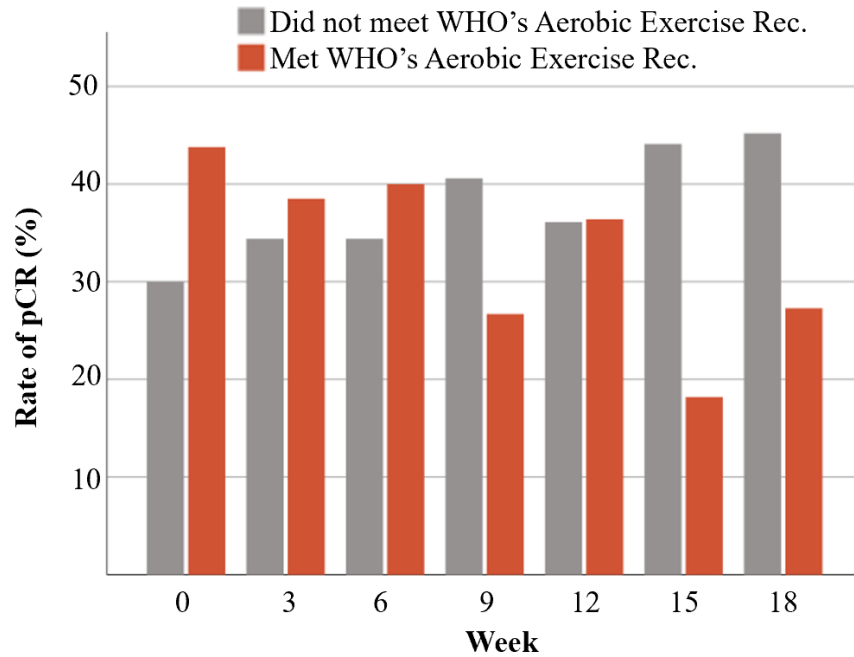
### 5.2.2 Associations Between Exercise Levels and pCR

Meeting WHO's aerobic exercise recommendation at any timepoint throughout the trial was not associated with achieving a pCR (Table 12). Similarly, meeting WHO's recommendation for resistance training at any timepoint was not associated with pCR (Table 13).

**Table 12.** Categorization of participants based on meeting WHO’s aerobic exercise recommendation ( $\geq 150$  minutes/week) and achieving a pathological complete response.

$\geq 150$ min/week	Achieved a pCR		p-value
	Yes	No	
<b>Week 0 (n = 46)</b>			
Yes	7 (43.8%)	9 (56.3%)	0.52
No	9 (30.0%)	21 (70.0%)	
Total	16 (34.8%)	30 (65.2%)	
<b>Week 3 (n = 45)</b>			
Yes	5 (38.5%)	8 (61.5%)	1.00
No	11 (34.4%)	21 (65.6%)	
Total	16 (35.6%)	29 (64.4%)	
<b>Week 6 (n = 47)</b>			
Yes	6 (40.0%)	9 (60.0%)	0.75
No	11 (34.4%)	21 (65.6%)	
Total	17 (36.2%)	30 (63.9%)	
<b>Week 9 (n = 47)</b>			
Yes	4 (26.7%)	11 (73.3%)	0.52
No	13 (40.6%)	19 (59.4%)	
Total	17 (36.2%)	30 (63.8%)	
<b>Week 12 (n = 47)</b>			
Yes	4 (36.4%)	7 (63.6%)	1.00
No	13 (36.1%)	23 (63.9%)	
Total	17 (36.2%)	30 (63.8%)	
<b>Week 15 (n = 45)</b>			
Yes	2 (18.2%)	9 (81.8%)	0.17
No	15 (44.1%)	19 (55.9%)	
Total	17 (37.8%)	28 (62.2%)	
<b>Week 18 (n = 42)</b>			
Yes	3 (27.3%)	8 (72.7%)	0.48
No	14 (45.2%)	17 (54.8%)	
Total	17 (40.5%)	25 (59.5%)	

Percentage of given exercise category or the total are shown in parentheses. Fisher’s exact test was used to test the association between meeting WHO’s aerobic exercise recommendation and achieving a pCR. No statistically significant associations were observed. Week 0 indicates baseline. Week 18 indicates end of cycle 6. Abbreviations: World Health Organization (WHO), pathological complete response (pCR).



**Figure 17.** Rate of pCR in each aerobic exercise category over time. Fisher's exact test was used to test the association between meeting (n = 11) or not meeting (n = 30) WHO's aerobic exercise recommendation and achieving a pCR. No statistically significant differences between aerobic exercise categories were observed. Week 0 indicates baseline. Week 18 indicates end of cycle 6. Abbreviations: World Health Organization (WHO), pathological complete response (pCR), recommendation (rec).



**Table 13.** Categorization of participants based on meeting WHO’s resistance training exercise recommendation ( $\geq 2$  times/week) and achieving a pathological complete response.

	Achieved a pCR		p-value
	Yes	No	
<b><math>\geq 2</math> times/week</b>			
<b>Week 0 (n = 46)</b>			
Yes	4 (28.6%)	10 (71.4%)	0.53
No	13 (39.4%)	20 (60.6%)	
Total	17 (36.2%)	30 (63.8%)	
<b>Week 3 (n = 45)</b>			
Yes	2 (22.2%)	7 (77.8%)	0.46
No	14 (38.9%)	22 (61.1%)	
Total	16 (35.6%)	29 (64.4%)	
<b>Week 6 (n = 47)</b>			
Yes	4 (28.6%)	10 (71.4%)	0.53
No	13 (39.4%)	20 (60.6%)	
Total	17 (36.2%)	30 (63.8%)	
<b>Week 9 (n = 47)</b>			
Yes	4 (30.8%)	9 (69.2%)	0.74
No	13 (38.2%)	21 (61.8%)	
Total	17 (36.2%)	30 (63.8%)	
<b>Week 12 (n = 47)</b>			
Yes	4 (44.4%)	5 (55.6%)	0.70
No	13 (34.2%)	25 (65.8%)	
Total	17 (36.2%)	30 (63.8%)	
<b>Week 15 (n = 45)</b>			
Yes	3 (25.0%)	9 (75.0%)	0.33
No	14 (42.4%)	19 (57.6%)	
Total	17 (37.8%)	28 (62.2%)	
<b>Week 18 (n = 42)</b>			
Yes	2 (25.0%)	6 (75.0%)	0.44
No	15 (44.1%)	19 (55.9%)	
Total	17 (40.5%)	25 (59.5%)	

Percentage of given exercise category or the total are shown in parentheses. Fisher’s exact test was used to test the association between meeting WHO’s aerobic exercise recommendation and achieving a pCR. No statistically significant associations were observed. Week 0 indicates baseline. Week 18 indicates end of cycle 6. Abbreviations: World Health Organization (WHO), pathological complete response (pCR).



**Figure 18.** Rate of pCR in each resistance training exercise category over time. Fisher's exact test was used to test the association between meeting (n = 8) or not meeting (n = 33) WHO's resistance training exercise recommendation and achieving a pCR. No statistically significant differences between resistance training exercise categories were observed. Week 0 indicates baseline. Week 18 indicates end of cycle 6. Abbreviations: World Health Organization (WHO), pathological complete response (pCR), recommendation (rec).

## CHAPTER 6: CONCLUSIONS, LIMITATIONS AND FUTURE DIRECTIONS

### **6.1 Summary of Results by Thesis Objective**

*Objective 1:* Determine how QoL changed from baseline to the end of neoadjuvant chemotherapy among breast cancer patients in the DHA WIN cohort and determine the role of DHA and exercise in mitigating potential changes.

It was hypothesized that perceived QoL would decrease from baseline to the end of chemotherapy and that this decrease would be less severe in the DHA group. All subscales of the FACT questionnaires (except emotional well-being) and the FACIT-Fatigue scale decreased from baseline to the end of cycle 6. However, emotional well-being, anxiety and happiness measures all improved over time. DHA did not statistically significantly mitigate the change over time in any QoL indicator.

It was also hypothesized that participants that met WHO's aerobic or resistance training exercise recommendation at baseline or the end of cycle 6 would experience a less severe decrease in QoL over time. Meeting WHO's aerobic exercise recommendation at baseline was associated with several maintained QoL indicators over time, including participants' FACT-G total scores, stress, anxiety and emotional well-being. Meeting this recommendation at the end of cycle 6 was also associated with maintained QoL indicators over time, including participants' FACT-G total scores and functional well-being.

Meeting WHO's resistance training recommendation at baseline was associated with maintained FACT-G and FACT-B total scores over time. Meeting

this recommendation at the end of cycle 6 was associated with maintained functional well-being and FACT-B trial outcome indices over time.

*Objective 2:* Describe participants' aerobic and resistance training exercise levels throughout the trial and compare them between treatment groups, and determine whether meeting exercise recommendations predicted achieving a pCR.

Most women did not meet WHO's aerobic or resistance training exercise guidelines in either treatment group. Less than 35% of total participants met the aerobic exercise recommendation and less than 30% of total participants met the resistance training recommendation at any given timepoint throughout the trial.

The DHA treatment did not significantly affect the change in mean weekly aerobic exercise or resistance training frequency over time. Overall, mean aerobic exercise was statistically significantly lower at week 12 and week 18 compared to baseline. Similarly, mean resistance training frequency was lower at week 12 compared to baseline in the whole sample.

There were no statistically significant differences in the percentage of the DHA or placebo groups that met either the aerobic or resistance training exercise recommendation at baseline. It was hypothesized that a greater percentage of the DHA group would meet WHO's aerobic and resistance training guidelines compared to the placebo group at the end of chemotherapy. Contrary to this hypothesis, a greater percentage of the placebo group met WHO's resistance training guideline at the end of cycle 6, compared to the DHA group. The

percentages of the DHA and placebo groups that met WHO's aerobic exercise recommendation at the end of cycle 6 were not significantly different.

It was hypothesized that meeting WHO's aerobic or resistance training exercise recommendations at baseline or the end of cycle 6 would increase the likelihood of achieving a pCR. However, meeting either recommendation at any timepoint was not associated with achieving a pCR.

*Objective 3:* Describe the estimated daily dietary intake of DHA WIN participants at study entry with the CCHS and Canadian DRIs and compare daily intake between the DHA and placebo groups.

Estimated average daily dietary intake of macronutrients, cholesterol, sodium, sugar and dietary fiber were not statistically significantly different between the DHA and placebo groups at baseline. Compared to Albertan women that completed the 2015 CCHS, the estimated daily intake of the DHA WIN cohort was greater for protein, total fat, total monounsaturated fatty acids, sodium and dietary fiber. Compared to the CCHS cohort, a greater percentage of the DHA WIN cohort was above the AMDR for fat and carbohydrate.

## **6.2 Discussion of the Major Findings**

This study examined several secondary outcomes from the DHA WIN clinical trial, which was designed to assess the effect of DHA supplementation (4.4 g/day) on treatment efficacy in women with breast cancer undergoing neoadjuvant chemotherapy. The outcomes analyzed in this thesis research included estimated daily dietary intake at study entry, exercise levels at baseline,

the start of cycles 2 to 6 and the end of cycle 6, QoL at baseline and the end of chemotherapy, and pCR after surgery.

Compared to Albertan women that completed the 2015 CCHS, estimated mean dietary intake of total protein, fat, monounsaturated fat, sodium and dietary fiber were higher in the DHA WIN cohort. Consistent with these findings, Tapan *et al.* (2020) found that estimated daily intake of total fat and monounsaturated fat was significantly greater in breast cancer patients compared to a group of apparently healthy controls [120]. However, the authors did not find significant differences between the groups for estimated daily intake of total protein, sodium or dietary fiber. These inconsistent findings, as well as ASCO's conclusion that there is insufficient evidence to recommend specific dietary interventions during cancer treatment [68] highlights the need for further investigation regarding nutrient intake and breast cancer risk as well as optimal dietary intake during chemotherapy.

A greater percentage of the DHA WIN cohort had diets that were above the AMDRs for carbohydrate and fat compared to the CCHS cohort. This finding is important to highlight because intake within the AMDRs have been associated with reduced risk of chronic disease [85, 121]. In addition, the World Cancer Research Fund International has developed recommendations for cancer prevention, including eating at least 30 g of fiber and 400 g of fruit and vegetables per day [122], while limiting intake of 'fast foods' and other processed foods high in fat, starches or sugars [123]. On average, the estimated daily intake of the DHA WIN cohort was 20.6 g/day of dietary fiber, about 10 g/day below the recommended intake for cancer prevention. However, the World Cancer Research Fund International and American Institute for Cancer Research have also concluded that there is limited evidence on the associations between *breast cancer* risk and various nutrients, including fat, carbohydrates, protein, dietary fiber, cholesterol and sugar [124]. This

further emphasizes the importance of future studies investigating the relationship between dietary intake and risk of breast cancer.

All subscales of the FACT questionnaires (except emotional well-being) as well as the FACIT-Fatigue scale decreased from baseline to the end of cycle 6 in both the DHA and placebo groups, indicating a poorer perceived QoL and greater level of perceived fatigue at the end of chemotherapy. These findings are consistent with previous studies that have reported a reduction in QoL and increased fatigue among breast cancer patients receiving neoadjuvant chemotherapy [47-49]. Anxiety decreased, while emotional well-being and happiness measures improved from baseline to the end of cycle 6. These are in line with findings from Lee *et al.* (2022), who found that anxiety in breast cancer patients was highest prior to beginning neoadjuvant chemotherapy, which gradually improved during treatment [51]. Lee *et al.* (2022) also found that depression was higher during neoadjuvant chemotherapy, compared to before and after treatment, highlighting the possibility that certain QoL indicators decreased during treatment in the present study, but rebounded at the end of chemotherapy.

There have been mixed findings regarding the effects of DHA on QoL among breast cancer patients [7, 54]. In the current study, DHA did not appear to mitigate changes in QoL. This is consistent with the previous study done by de la Rosa Oliva *et al.* (2019), who found that supplementation of EPA and DHA during six months of chemotherapy did not result in significant differences in fatigue, nausea, drowsiness, appetite and dyspnea [54].

It is important to consider clinical significance when interpreting the results of the current study. The minimal clinically important difference (MCID) is defined as “the smallest change that is important to patients” [125, 126] and is important when considering clinical relevance [126]. One can consider whether changes over time within a given group are clinically relevant.

Furthermore, one can assess whether the difference between groups' mean changes (i.e. the mean difference) is clinically significant. MCIDs have previously been determined for several of the QoL subscales that were included in this study, including the FACT-G (4-7 points), physical well-being (2-3 points), social well-being (0.7-2 points), emotional well-being (1-2 points), functional well-being (2-3 points), fatigue subscale (3-4), FACT-B (7-8 points), BC subscale (2-3 points) and the FACT-B TOI (5-6 points) [127-131]. The changes in these subscales over time were clinically significant in both the DHA and placebo groups (Table 7), and mean differences between groups were not clinically relevant for any of the aforementioned subscales. This supports the finding that DHA did not mitigate changes in these QoL indicators.

Meeting WHO's aerobic exercise recommendation at baseline appeared to have statistically significant positive effects on participants' FACT-G total scores, taxane subscale scores, anxiety, emotional well-being, stress and happiness. Mean differences between groups were considered clinically relevant for emotional well-being and functional well-being, and favoured the group that met the recommendation at baseline. Similarly, meeting WHO's aerobic exercise recommendation at the end of cycle 6 appeared to have a statistically significant positive effect on participants' FACT-G total scores, functional well-being and happiness. Clinically meaningful mean differences were observed for the FACT-G subscale and functional well-being, which favoured the group that met the recommendation at the end of cycle 6. The positive effects of aerobic exercise observed in the current study are consistent with previous studies that have demonstrated the ability of physical activity to alleviate fatigue and improve HRQoL in patients with cancer [3, 4]. In contrast, the BC subscale decreased more in the group that met the recommendation, and the mean difference between groups for this subscale was clinically meaningful, but did not reach statistical significance.



Similar to aerobic exercise, resistance training exercise appeared to positively affect several QoL indicators. With regards to statistical significance, meeting WHO's resistance training recommendation at baseline appeared to have a positive effect on participants' FACT-G total scores, FACT-B total scores, anxiety and happiness. Mean differences between groups were clinically relevant for the FACT-G subscale, social well-being, emotional well-being and FACT-B total scores, which all favoured the group that met the recommendation. Meeting WHO's resistance training recommendation at the end of cycle 6 appeared to have positive effects on participants' functional well-being and FACT-B TOIs. In addition to these statistically significant effects, there were clinically meaningful differences between groups for the FACT-G subscale, functional well-being, FACT-B subscale, FACT-B TOI and social well-being. Outcomes for all of these subscales favoured the group that met the recommendation, except the social well-being subscale, which decreased less among those that did not meet the recommendation at the end of cycle 6, but this group effect was not statistically significant. Together, these findings suggest that aerobic and resistance training exercise before and during treatment may mitigate the negative effect of neoadjuvant chemotherapy on various QoL indicators in patients with breast cancer which offers further support for the recommendations provided by WHO, ASCO and ACSM for cancer survivors [66, 67, 132].

On average, aerobic exercise and resistance training frequency declined over time in the DHA WIN cohort. Mean aerobic exercise was significantly lower at week 12 and 18 compared to baseline, while mean resistance training frequency was significantly lower at week 12 compared to baseline. This was expected as side effects of chemotherapy have been shown to impede physical activity in breast cancer patients [133]. It is important to note that recall or response bias

inherent to self-report methods for physical activity may have contributed to the fluctuation in exercise levels over time [134].

Meeting WHO's exercise recommendations was not associated with achieving a pCR. This is consistent with Baker *et al.* (2022) who found no relationship between pre-treatment levels of physical activity and pCR [73]. In contrast, Sanft *et al.* (2023) found that breast cancer patients randomized to a home-based exercise and nutrition intervention were more likely to achieve a pCR than the control group [74]. The intervention in the study by Sanft *et al.* (2023) consisted of exercise and nutrition counselling that promoted adherence to physical activity guidelines (i.e.  $\geq$  150 minutes/week of aerobic exercise and twice-weekly resistance training) and a predominantly plant-based diet, but did not specifically consider DHA intake. These mixed findings highlight the need for additional RCTs investigating the association between exercise and pCR in breast cancer patients.

### **6.3 Strengths and Limitations of the Thesis Research**

The DHA WIN clinical trial was the first phase II RCT designed to assess the effects of DHA supplementation concomitant with neoadjuvant chemotherapy on patients with non-metastatic breast cancer [19]. The DHA intervention was minimally invasive, and self-administered dietary, exercise and QoL questionnaires were cost-effective and resulted in a small respondent burden [93]. QoL questionnaires combined measures for several indicators, which provided a comprehensive assessment of patients' QoL.

The thesis research was also subject to several limitations that are important to consider. First, the DHA WIN RCT was powered to assess changes in the Ki67 index, which was the primary outcome of the trial. Lack of statistical significance observed for QoL and exercise outcomes may

be due, in part, to lack of statistical power to examine these secondary outcomes. The quality and quantity of dietary intake has been shown to change in women with breast cancer undergoing chemotherapy [135]. However, since FFQs were only completed at study entry, estimated baseline dietary intake could not be compared to intake during or after treatment. Limitations inherent to FFQs are also important to consider. For example, recall of food intake over the past year may be imprecise, and actual intake may influence reporting of past intake [93]. In addition, a diagnosis of breast cancer may contribute to bias of dietary history collected after diagnosis [136]. It is also possible that the pre-specified food list did not accurately reflect items and portions that the individual typically consumed [87]. Similarly, recall and response bias must be considered for the exercise questionnaires [134].

#### **6.4 Future Directions and Recommendations**

In addition to supportive care benefits, exercise has the potential to be utilized as a cancer treatment [96]. However, exercise must demonstrate benefit in a specific clinical setting (i.e. specific cancer type and treatment protocol) before it can be integrated into clinical practice guidelines as a cancer treatment [96]. Therefore, it is important to conduct RCTs that examine the effects of different types and doses of exercise on long-term and patient-reported outcomes in this population.

Further, meeting the Physical Activity Guidelines for Americans both before and after treatment has been associated with reduced recurrence and mortality in patients with breast cancer [137]. This highlights the importance of assessing relapse-free survival and overall survival in future studies to better understand the long-term implications of physical activity in patients with breast cancer.

Previous studies have demonstrated that dietary interventions, such as nutritional counselling and dietary supplementation (i.e. with EPA and/or DHA) during treatment may reduce drug-induced side effects [10]. However, ASCO has concluded that there is insufficient evidence to develop recommendations for dietary interventions to improve outcomes related to QoL or treatment toxicity [68]. This highlights the need for large clinical trials to help establish definitive dietary recommendations [10].

### **6.5 Final Conclusions**

In conclusion, most QoL indicators declined from baseline to the end of chemotherapy in both the DHA and placebo groups. However, emotional well-being, anxiety and happiness all improved over time. DHA did not significantly mitigate the change in any QoL indicators. Meeting WHO's guidelines for aerobic or resistance training exercise at baseline or the end of cycle 6 was associated with several maintained QoL indicators, including stress, anxiety, emotional well-being, functional well-being, FACT-G total scores, FACT-B total scores and FACT-B TOIs. These findings suggest that aerobic and resistance training exercise before and during treatment may mitigate the negative effect of neoadjuvant chemotherapy on various QoL indicators in patients with breast cancer. Meeting WHO's aerobic or resistance training exercise recommendation at baseline or at the end of cycle 6 was not associated with achieving a pCR, but future research investigating this potential relationship is warranted.

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# APPENDIX 1

Identification # \_\_\_\_\_

Date: \_\_\_\_\_

## **Docosahexaenoic acid (DHA) for Women with Breast Cancer in the Neoadjuvant Setting (DHA WIN)**

### Post-intervention Questionnaire

Investigators: C. Field, RD, PhD, J. Mackey, MD, S. Basi, MD, X. Zhu, MD,  
A. Joy, MD, K. King, MD, J. Price-Hiller, MD, J. Meza-Junco, MD, S. Ghosh, PhD

Funded by the Canadian Institutes of Health Research and Cross  
Cancer Institute Investigator Initiated Trials

### Instructions

Thank you for your continued participation in this study. At this post-intervention assessment, we are going to ask you many of the same questions as in the previous questionnaires. However, it is important to answer these questions based on what you are thinking and feeling right now, and not on how you answered the questions the last time. This will give us important information about how your thoughts and feelings have changed. Many of the questions may seem similar but it is important to treat each question separately and provide an answer for each. Also, if at all possible, it is important to answer all questions. However, if you feel uncomfortable answering certain questions please leave them blank. All responses are completely confidential and will never be used in any way that could link them to you. There are no right or wrong answers and all we ask is that you provide responses that are as honest and accurate as possible. The questionnaire should take about 30-45 minutes of your time to complete. If you have any questions about completing the questionnaire, please contact Marnie Newell (PhD Candidate for DHA WIN) at 492-4240 or [marnie.newell@ualberta.ca](mailto:marnie.newell@ualberta.ca).

Below is a list of statements that other people with cancer have said are important to their quality of life. Please indicate the extent to which you have experienced each of the statements during the past 7 days by circling the appropriate number using the following scale.

During the PAST WEEK:

	not at all	a little bit	some- what	quite a bit	very much
1. I have a lack of energy	0	1	2	3	4
2. I have nausea	0	1	2	3	4
3. Because of my physical condition, I have trouble meeting the needs of my family	0	1	2	3	4
4. I have pain	0	1	2	3	4
5. I am bothered by side effects of treatment	0	1	2	3	4
6. I feel sick	0	1	2	3	4
7. I am forced to spend time in bed	0	1	2	3	4
8. I feel close to my friends	0	1	2	3	4
9. I get emotional support from my family	0	1	2	3	4
10. I get support from my friends	0	1	2	3	4
11. My family has accepted my illness	0	1	2	3	4
12. I am satisfied with family communication about my illness	0	1	2	3	4
13. I feel close to my partner (or the person who is my main support)	0	1	2	3	4
14. I am satisfied with my sex life	0	1	2	3	4
15. I feel sad	0	1	2	3	4
16. I am satisfied with how I am coping with my illness	0	1	2	3	4



During the PAST WEEK:

	not at all	a little bit	some- what	quite a bit	very much
17. I am losing hope in the fight against my illness	0	1	2	3	4
18. I feel nervous	0	1	2	3	4
19. I worry about dying	0	1	2	3	4
20. I worry that my condition will get worse	0	1	2	3	4
21. I am able to work (include work at home)	0	1	2	3	4
22. My work (include work at home) is fulfilling	0	1	2	3	4
23. I am able to enjoy life	0	1	2	3	4
24. I have accepted my illness	0	1	2	3	4
25. I am sleeping well	0	1	2	3	4
26. I am enjoying the things I usually do for fun	0	1	2	3	4
27. I am content with the quality of my life right now	0	1	2	3	4
28. I have been short of breath	0	1	2	3	4
29. I am self-conscious about the way I dress	0	1	2	3	4
30. My arms are swollen or tender	0	1	2	3	4
31. I feel sexually attractive	0	1	2	3	4
32. I have been bothered by hair loss	0	1	2	3	4
33. I worry about the risk of cancer in my family	0	1	2	3	4
34. I worry about the effect of stress on my illness	0	1	2	3	4
35. I am bothered by a change in weight	0	1	2	3	4
36. I am able to feel like a woman	0	1	2	3	4
37. I have certain parts of my body where I experience significant pain.	0	1	2	3	4

During the PAST WEEK:

**FATIGUE SYMPTOMS**

	not at all	a little bit	some- what	quite a bit	very much
1. I feel fatigued	0	1	2	3	4
2. I feel weak all over	0	1	2	3	4
3. I feel listless (“washed out”)	0	1	2	3	4
4. I feel tired	0	1	2	3	4
5. I have trouble <u>starting</u> things because I am tired	0	1	2	3	4
6. I have trouble <u>finishing</u> things because I am tired	0	1	2	3	4
7. I have energy	0	1	2	3	4
8. I am able to do my usual activities	0	1	2	3	4
9. I need to sleep during the day	0	1	2	3	4
10. I am too tired to eat	0	1	2	3	4
11. I need help doing my usual activities	0	1	2	3	4
12. I am frustrated by being too tired to do the things I want to do	0	1	2	3	4
13. I have to limit my social activity because I am tired	0	1	2	3	4

During the PAST WEEK:

**TAXANE SYMPTOMS**

	not at all	a little bit	some- what	quite a bit	very much
1. I have numbness or tingling in my hands	0	1	2	3	4
2. I have numbness or tingling in my feet	0	1	2	3	4
3. I feel discomfort in my hands	0	1	2	3	4
4. I feel discomfort in my feet	0	1	2	3	4
5. I have joint pain or muscle cramps	0	1	2	3	4
6. I feel weak all over	0	1	2	3	4
7. I have trouble hearing	0	1	2	3	4
8. I get a ringing or buzzing in my ears	0	1	2	3	4
9. I have trouble buttoning buttons	0	1	2	3	4
10. I have trouble feeling the shape of small objects when they are in my hand	0	1	2	3	4
11. I have trouble walking	0	1	2	3	4
12. I feel bloated	0	1	2	3	4
13. My hands are swollen	0	1	2	3	4
14. My legs or feet are swollen	0	1	2	3	4
15. I have pain in my fingertips	0	1	2	3	4
16. I am bothered by the way my hands or nails look	0	1	2	3	4

During the PAST WEEK:

**ENDOCRINE SYMPTOMS**

	not at all	a little bit	some- what	quite a bit	very much
1. I have hot flashes	0	1	2	3	4
2. I have cold sweats	0	1	2	3	4
3. I have night sweats	0	1	2	3	4
4. I have vaginal discharge	0	1	2	3	4
5. I have vaginal itching/irritation	0	1	2	3	4
6. I have vaginal bleeding or spotting		0	1 4	2	3
7. I have vaginal dryness	0	1	2	3	4
8. I have pain or discomfort with intercourse	0	1	2	3	4
9. I have lost interest in sex	0	1	2	3	4
10. I have gained weight	0	1	2	3	4
11. I feel lightheaded (dizzy)	0	1	2	3	4
12. I have been vomiting	0	1	2	3	4
13. I have diarrhea	0	1	2	3	4
14. I get headaches	0	1	2	3	4
15. I feel bloated	0	1	2	3	4
16. I have breast sensitivity/tenderness	0	1	2	3	4
17. I have mood swings	0	1	2	3	4
18. I am irritable	0	1	2	3	4
19. I have pain in my joints	0	1	2	3	4

The questions in this scale ask you about your feelings and thoughts during the last month. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each one fairly quickly. For each question, please choose from the following alternatives:

	0	1	2	3	4
	never	almost never	some- times	fairly often	very often
<b>In the last month, how often have you...</b>					
1. been upset because of something that happened unexpectedly	0	1	2	3	4
2. felt that you were unable to control the important things in your life	0	1	2	3	4
3. felt nervous and stressed	0	1	2	3	4
4. dealt successfully with irritating life hassles	0	1	2	3	4
5. felt that you were effectively coping with important changes that were occurring in your life	0	1	2	3	4
6. felt confident about your ability to handle your personal problems	0	1	2	3	4
7. felt that things were going your way	0	1	2	3	4
8. found that you could not cope with all the things that you had to do	0	1	2	3	4
9. been able to control irritations in your life	0	1	2	3	4
10. felt that you were on top of things	0	1	2	3	4
11. been angered because of things that happened that were outside of your control	0	1	2	3	4
12. found yourself thinking about things that you have to accomplish	0	1	2	3	4
13. been able to control the way you spend your time	0	1	2	3	4
14. felt difficulties were piling up so high that you could not overcome them	0	1	2	3	4

The following question asks you to rate, on average, how happy or unhappy you felt over the past week. Please read all the statements first and then check the one statement (between 0 and 10) that best describes your average level of happiness over the past week. Check only ONE item.

On average, over the PAST WEEK I have felt:

- \_\_\_\_\_ 10. Extremely happy (feeling ecstatic, joyous, fantastic!).
- \_\_\_\_\_ 9. Very happy (feeling really good, elated!).
- \_\_\_\_\_ 8. Pretty happy (spirits high, feeling good).
- \_\_\_\_\_ 7. Mildly happy (feeling fairly good, somewhat cheerful).
- \_\_\_\_\_ 6. Slightly happy (just a bit above neutral).
- \_\_\_\_\_ 5. Neutral (not particularly happy or unhappy).
- \_\_\_\_\_ 4. Slightly unhappy (just a bit below neutral).
- \_\_\_\_\_ 3. Mildly unhappy (just a little low).
- \_\_\_\_\_ 2. Pretty unhappy (somewhat "blue," spirits down).
- \_\_\_\_\_ 1. Very unhappy (depressed, spirits very low).
- \_\_\_\_\_ 0. Extremely unhappy (utterly depressed, completely down).

This next question asks you to estimate the percentage of time, on average, that you felt happy, unhappy, and neutral (neither happy nor unhappy) over the past week. Write down your best estimates in the spaces below. Make sure the three figures add up to 100 percent.

Over the PAST WEEK:

The percentage of time I felt happy was: \_\_\_\_\_ %

The percentage of time I felt unhappy was: \_\_\_\_\_ %

The percentage of time I felt neutral was: \_\_\_\_\_ %

Total: 100 %

Below is a list of statements concerning how you might have felt or behaved in the past week. Please use the following scale to indicate how often you felt or behaved in these ways in the past week.

0	1	2	3
Rarely or none of the time time ( < 1 day)	Some of the time (1-2 days)	Much of the time (3-4 days)	Most or all of the (5-7 days)

During the PAST WEEK:

1. I felt depressed.	0	1	2	3
2. I felt that everything I did was an effort.	0	1	2	3
3. My sleep was restless.	0	1	2	3
4. I was happy.	0	1	2	3
5. I felt lonely.	0	1	2	3
6. People were unfriendly.	0	1	2	3
7. I enjoyed life.	0	1	2	3
8. I felt sad.	0	1	2	3
9. I felt that people disliked me.	0	1	2	3
10. I could not get "going".	0	1	2	3

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number that best indicates how you have felt during the past week. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer that best describes how you felt.

During the PAST WEEK:

	not at all	somewhat	moderately so	very much so
1. I felt calm	1	2	3	4
2. I was tense	1	2	3	4
3. I felt at ease	1	2	3	4
4. I worried over possible misfortunes	1	2	3	4
5. I felt frightened	1	2	3	4
6. I felt self-confident	1	2	3	4
7. I was jittery	1	2	3	4
8. I was relaxed	1	2	3	4
9. I was worried	1	2	3	4
10. I felt steady	1	2	3	4



## APPENDIX 2

### Docosahexaenoic acid (DHA) for Women with Breast Cancer in the Neoadjuvant Setting (DHA WIN) Exercise Questionnaire

For this question, we would like you to recall your average weekly exercise during the past 3 weeks. We will ask you separate questions about aerobic or endurance exercise (i.e., exercise that improves the heart and lungs such as walking or swimming) and strength or resistance exercise (i.e., exercise that improves muscular strength such as weight lifting).

When answering these questions please remember:

- only count exercise sessions that lasted 10 minutes or longer in duration.
- only count exercise that was done during free time (i.e., not occupation or housework).
- note that the main difference between the categories ‘a,’ ‘b,’ and ‘c’ is the intensity of the aerobic (endurance) exercise and category ‘d’ is for strength (resistance) exercise.
- please write the average frequency on the first line and the average duration on the second.
- if you did not do any exercise in one of the categories, please write in “0”.

Considering a typical week (7 days) over the PAST 3 WEEKS how many days on average did you do the following kinds of aerobic and strength exercise and what was the average duration each time?

	Average Frequency (days per week)	Average Duration (minutes per session)
a. VIGOROUS INTENSITY <b>AEROBIC</b> EXERCISE (HEART BEATS RAPIDLY, SWEATING) (e.g., running, aerobics classes, cross country skiing, vigorous swimming, vigorous bicycling).	_____	_____
b. MODERATE INTENSITY <b>AEROBIC</b> EXERCISE (NOT EXHAUSTING, LIGHT PERSPIRATION) (e.g., fast walking, tennis, easy bicycling, easy swimming, popular and folk dancing).	_____	_____
c. LIGHT INTENSITY <b>AEROBIC</b> EXERCISE (MINIMAL EFFORT, NO PERSPIRATION) (e.g., easy walking, yoga, bowling, lawn bowling, shuffleboard).	_____	_____
d. <b>STRENGTH/RESISTANCE</b> EXERCISE (MODERATE TO INTENSE EFFORT) (e.g., weight lifting, resistance bands, sit-ups, push-ups)	_____	_____

# APPENDIX 3

## Diet History Questionnaire II

Adapted for Canada from the National Institutes of Health  
Diet History Questionnaire II



### GENERAL INSTRUCTIONS

- Answer each question as best you can. Estimate if you are not sure. A guess is better than leaving a blank.
- Use only a black ball-point pen. Do not use a pencil or felt-tip pen. Do not fold, staple, or tear the pages.
- Shade the box next to your answer, like this:
- If you make any changes, cross out the incorrect answer and shade in the box next to the correct answer. Also draw a circle around the correct answer.
- If you mark NEVER, NO, or DON'T KNOW for a question, please follow any arrows or instructions that direct you to the next question.
- Questions on portion size use measures like cups, ounces, teaspoons and tablespoons. Metric conversions are provided below.

<u>Volume</u>	<u>Weight</u>
1 cup = 8 ounces = 250ml	1 ounce = 30g
1 fluid ounce = 30ml	
1 teaspoon = 5ml	
1 tablespoon = 15ml	

BEFORE TURNING THE PAGE, PLEASE COMPLETE THE FOLLOWING QUESTIONS.

Today's date:

<input type="text"/>	<input type="text"/>	/	<input type="text"/>	<input type="text"/>	/	2	0	<input type="text"/>	<input type="text"/>
month	day			year					

In what month were you born?

- |                              |                              |
|------------------------------|------------------------------|
| <input type="checkbox"/> Jan | <input type="checkbox"/> Jul |
| <input type="checkbox"/> Feb | <input type="checkbox"/> Aug |
| <input type="checkbox"/> Mar | <input type="checkbox"/> Sep |
| <input type="checkbox"/> Apr | <input type="checkbox"/> Oct |
| <input type="checkbox"/> May | <input type="checkbox"/> Nov |
| <input type="checkbox"/> Jun | <input type="checkbox"/> Dec |

In what year were you born?

1	9	<input type="text"/>	<input type="text"/>
---	---	----------------------	----------------------

Are you male or female?

- |                                 |
|---------------------------------|
| <input type="checkbox"/> Male   |
| <input type="checkbox"/> Female |

BAR CODE LABEL OR SUBJECT ID  
HERE



1. Over the past 12 months, how often did you drink **tomato juice**?

- NEVER (GO TO QUESTION 2)
- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

1a. Each time you drank **tomato juice**, how much did you usually drink?

- Less than ½ cup (4 ounces)  
 ½ to 1¼ cups (4 to 10 ounces)  
 More than 1¼ cups (10 ounces)

2. Over the past 12 months, how often did you drink **other vegetable juice**? (*Please do not include tomato juice.*)

- NEVER (GO TO QUESTION 3)
- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

2a. Each time you drank **other vegetable juice**, how much did you usually drink?

- Less than ¾ cup (6 ounces)  
 ¾ to 1¼ cups (6 to 10 ounces)  
 More than 1¼ cups (10 ounces)

3. Over the past 12 months, how often did you drink 100% **orange juice** or **grapefruit juice**?

- NEVER (GO TO QUESTION 4)
- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

3a. Each time you drank 100% **orange juice** or **grapefruit juice**, how much did you usually drink?

- Less than ¾ cup (6 ounces)  
 ¾ to 1¼ cups (6 to 10 ounces)  
 More than 1¼ cups (10 ounces)

Question 4 appears in the next column

3b. How often was the orange juice or grapefruit juice you drank **calcium-fortified**?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

4. Over the past 12 months, how often did you drink **other 100% fruit juice** or **100% fruit juice mixtures** (such as apple, grape, pineapple, or others)?

- NEVER (GO TO QUESTION 5)
- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

4a. Each time you drank **other 100% fruit juice** or **100% fruit juice mixtures**, how much did you usually drink?

- Less than ¾ cup (6 ounces)  
 ¾ to 1½ cups (6 to 12 ounces)  
 More than 1½ cups (12 ounces)

5. How often did you drink **other fruit drinks** (such as Fruité, Fruitopia, Five Alive, Sunny D, or Kool-Aid, diet or regular)?

- NEVER (GO TO QUESTION 6)
- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

Question 6 appears on the next page



Over the past 12 months...

5a. Each time you drank **other fruit drinks**, how much did you usually drink?

- Less than 1 cup (8 ounces)
- 1 to 2 cups (8 to 16 ounces)
- More than 2 cups (16 ounces)

5b. How often were your other fruit drinks **diet or low calorie**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

6. How often did you drink **milk or milk substitutes as a beverage** (NOT in coffee, NOT in cereal)?  
*(Please do not include chocolate milk, hot chocolate, and milk in milkshakes or meal replacement beverages.)*

NEVER (GO TO QUESTION 7)

- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

6a. Each time you drank **milk or milk substitutes as a beverage**, how much did you usually drink?

- Less than 1 cup (8 ounces)
- 1 to 1½ cups (8 to 12 ounces)
- More than 1½ cups (12 ounces)

6b. What kind of **milk or milk substitutes** did you usually drink?

- Whole milk
- 2% fat milk
- 1% fat milk
- Skim, nonfat, or 0.5% fat milk
- Soy milk
- Rice milk
- Almond milk
- Other

7. How often did you drink **chocolate milk or hot chocolate**?

NEVER (GO TO QUESTION 8)

- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

Question 8 appears in the next column

7a. Each time you drank **chocolate milk or hot chocolate**, how much did you usually drink?

- Less than 1 cup (8 ounces)
- 1 to 2 cups (8 to 16 ounces)
- More than 2 cups (16 ounces)

7b. How often was the chocolate milk or hot chocolate you drank **reduced-fat or fat-free**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

8. How often did you drink **milkshakes**?

NEVER (GO TO QUESTION 9)

- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

8a. Each time you drank **milkshakes**, how much did you usually drink?

- Less than 1 cup (8 ounces)
- 1 to 2 cups (8 to 16 ounces)
- More than 2 cups (16 ounces)

9. How often did you drink **meal replacement or high-protein beverages** (such as Boost, Breakfast Essential, Ensure, Slimfast or others)?

NEVER (GO TO QUESTION 10)

- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

9a. Each time you drank **meal replacement or high-protein beverages**, how much did you usually drink?

- Less than 1 cup (8 ounces)
- 1 to 1½ cups (8 to 12 ounces)
- More than 1½ cups (12 ounces)

Question 10 appears on the next page



Over the past 12 months...

10. How often did you drink **soft drinks** or **pop**?

- NEVER (GO TO QUESTION 11)
- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

10a. Each time you drank **soft drinks** or **pop**, how much did you usually drink?

- Less than 12 ounces or less than 1 regular size can or bottle (355 ml)
- 12 to 16 ounces or 1 regular size can or bottle (355 ml)
- More than 16 ounces or more than 1 regular size can or bottle (355 ml)

10b. How often were your soft drinks or pop **diet** or **calorie-free**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

10c. How often were your soft drinks or pop **caffeine-free**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

11. Over the past 12 months, did you drink **sports drinks** (such as PowerAde or Gatorade)?

- NO (GO TO QUESTION 12)
- YES

11a. How often did you drink **sports drinks** **IN THE SUMMER**?

- NEVER
- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

Question 12 appears in the next column

11b. How often did you drink **sports drinks** **DURING THE REST OF THE YEAR**?

- NEVER
- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

11c. Each time you drank **sports drinks**, how much did you usually drink?

- Less than 1½ cups (12 ounces)
- 1½ to 3 cups (12 to 24 ounces)
- More than 3 cups (24 ounces)

12. How often did you drink **energy drinks** (such as Red Bull, Rock Star, Full Throttle, or Monster)?

- NEVER (GO TO QUESTION 13)
- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

12a. Each time you drank **energy drinks**, how much did you usually drink?

- Less than 1 cup (8 ounces)
- 1 to 2 cups (8 to 16 ounces)
- More than 2 cups (16 ounces)

13. How often did you drink **beer**?

- NEVER (GO TO QUESTION 14)
- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

13a. Each time you drank **beer**, how much did you usually drink?

- Less than 1 regular size can or bottle (341 ml)
- 1 to 3 regular size cans or bottles
- More than 3 regular size cans or bottles



Question 14 appears on the next page



Over the past 12 months...

14. How often did you drink **water** (including tap, bottled, carbonated, flavoured, or vitamin added water)?

NEVER (GO TO QUESTION 15)

- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

14a. Each time you drank **water**, how much did you usually drink?

- Less than 1 cup (8 ounces)  
 1 to 4 cups (8 to 32 ounces)  
 More than 4 cups (32 ounces)

14b. How often was the water you drank **tap water**?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

14c. How often was the water you drank **bottled, sweetened water** (with low or no-calorie sweetener, including carbonated water)?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

14d. How often was the bottled sweetened water you drank **with added vitamins or minerals** (such as Aquafina Plus, Vitaminwater, or others)?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

Question 15 appears in the next column

15. How often did you drink **wine**?

NEVER (GO TO QUESTION 16)

- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

15a. Each time you drank **wine**, how much did you usually drink?

- Less than 1 glass (5 ounces)  
 1 to 2 glasses (5 to 12 ounces)  
 More than 2 glasses (12 ounces)

15b. How often was the wine you drank **red wine**?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

16. How often did you drink **liquor or mixed drinks**?

NEVER (GO TO QUESTION 17)

- |   |  |
|---|--|
| <input type="checkbox"/> 1 time per month or less | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month      | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1-2 times per week       | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 3-4 times per week       | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week       |  |

16a. Each time you drank **liquor or mixed drinks**, how much did you usually drink?

- Less than 1 shot of liquor  
 1 to 3 shots of liquor  
 More than 3 shots of liquor

Question 17 appears on the next page



Over the past 12 months...

17. Did you eat **oatmeal, Cream of Wheat, Red River, or other cooked cereal**?

- NO (GO TO QUESTION 18)
- YES

17a. How often did you eat **oatmeal, Cream of Wheat, Red River, or other cooked cereal IN THE WINTER?**

- NEVER
- 1-6 times per winter
- 7-11 times per winter
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

17b. How often did you eat **oatmeal, Cream of Wheat, Red River, or other cooked cereal DURING THE REST OF THE YEAR?**

- NEVER
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

17c. Each time you ate **oatmeal, Cream of Wheat, Red River, or other cooked cereal**, how much did you usually eat?

- Less than  $\frac{3}{4}$  cup
- $\frac{3}{4}$  to  $1\frac{1}{4}$  cups
- More than  $1\frac{1}{4}$  cups

17d. How often was **butter or margarine** added to your oatmeal, Cream of Wheat, Red River, or other cooked cereal?

- Almost never or never
- About  $\frac{1}{4}$  of the time
- About  $\frac{1}{2}$  of the time
- About  $\frac{3}{4}$  of the time
- Almost always or always

17e. Was **milk** added to your oatmeal, Cream of Wheat, Red River, or other cooked cereal?

- NO (GO TO QUESTION 18)
- YES

17f. What kind of **milk** was usually added?

- Whole milk
- 2% fat milk
- 1% fat milk
- Skim, nonfat, or 0.5% fat milk
- Soy milk
- Rice milk
- Almond milk
- Other

17g. Each time **milk** was added to your oatmeal, Cream of Wheat, Red River, or other cooked cereal, how much was usually added?

- Less than  $\frac{1}{2}$  cup
- $\frac{1}{2}$  to 1 cup
- More than 1 cup

18. How often did you eat **cold cereal**?

- NEVER (GO TO QUESTION 19)

- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

18a. Each time you ate **cold cereal**, how much did you usually eat?

- Less than 1 cup
- 1 to  $2\frac{1}{2}$  cups
- More than  $2\frac{1}{2}$  cups

18b. How often was the cold cereal you ate **Vector or PC Force Active?**

- Almost never or never
- About  $\frac{1}{4}$  of the time
- About  $\frac{1}{2}$  of the time
- About  $\frac{3}{4}$  of the time
- Almost always or always

18c. How often was the cold cereal you ate **All Bran, Fibre 1, Fibre First, 100% Bran, or All-Bran Buds?**

- Almost never or never
- About  $\frac{1}{4}$  of the time
- About  $\frac{1}{2}$  of the time
- About  $\frac{3}{4}$  of the time
- Almost always or always

Question 18 appears in the next column

Question 19 appears on the next page



Over the past 12 months...

18d. How often was the cold cereal you ate **some other bran or fibre cereal** (such as Cheerios (regular), Shredded Wheat, Raisin Bran, Bran Flakes, Mini-Wheats, Shreddies, Honey Bunches of Oats, Oatmeal Crisp or others)?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

18e. How often was the cold cereal you ate any **other type of cold cereal** (such as Corn Flakes, Rice Krispies, Frosted Flakes, Special K, Froot Loops, Cap'n Crunch, Honey Nut Cheerios, Honeycomb, or others)?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

18f. Was **milk** added to your cold cereal?

- NO (GO TO QUESTION 19)
- YES

18g. What kind of **milk** was usually added?

- Whole milk
- 2% fat milk
- 1% fat milk
- Skim, nonfat, or 0.5% fat milk
- Soy milk
- Rice milk
- Almond milk
- Other

18h. Each time **milk** was added to your cold cereal, how much was usually added?

- Less than ½ cup
- ½ to 1 cup
- More than 1 cup

19. How often did you eat **applesauce**?

- NEVER (GO TO QUESTION 20)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

Question 20 appears in the next column

19a. Each time you ate **applesauce**, how much did you usually eat?

- Less than ¼ cup
- ¼ to ¾ cup
- More than ¾ cup

20. How often did you eat **apples**?

- NEVER (GO TO QUESTION 21)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

20a. Each time you ate **apples**, how many did you usually eat?

- Less than 1 apple
- 1 apple
- More than 1 apple

21. How often did you eat **pears** (fresh, canned, or frozen)?

- NEVER (GO TO QUESTION 22)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

21a. Each time you ate **pears**, how many did you usually eat?

- Less than 1 pear
- 1 pear
- More than 1 pear

22. How often did you eat **bananas**?

- NEVER (GO TO QUESTION 23)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day



Question 23 appears on the next page





Over the past 12 months...

22a. Each time you ate **bananas**, how many did you usually eat?

- Less than 1 banana
- 1 banana
- More than 1 banana

23. How often did you eat **dried fruit** (such as prunes or raisins)? *(Please do not include dried apricots.)*

NEVER (GO TO QUESTION 24)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

23a. Each time you ate **dried fruit**, how much did you usually eat?

- Less than 2 tablespoons
- 2 to 5 tablespoons
- More than 5 tablespoons

24. Over the past 12 months, did you eat **peaches, nectarines, or plums**?

- NO (GO TO QUESTION 25)
- YES

24a. How often did you eat **fresh peaches, nectarines, or plums WHEN IN SEASON**?

- NEVER
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per season  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per season | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month      | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month   | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week       | <input type="checkbox"/> 2 or more times per day |

24b. How often did you eat **peaches, nectarines, or plums** (fresh, canned, or frozen) **DURING THE REST OF THE YEAR**?

- NEVER
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

Question 25 appears in the next column

24c. Each time you ate **peaches, nectarines, or plums**, how much did you usually eat?

- Less than 1 fruit or less than ½ cup
- 1 to 2 fruits or ½ to ¾ cup
- More than 2 fruits or more than ¾ cup

25. How often did you eat **grapes**?

NEVER (GO TO QUESTION 26)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

25a. Each time you ate **grapes**, how much did you usually eat?

- Less than ½ cup or less than 10 grapes
- ½ to 1 cup or 10 to 30 grapes
- More than 1 cup or more than 30 grapes

26. Over the past 12 months, did you eat **cantaloupe**?

- NO (GO TO QUESTION 27)
- YES

26a. How often did you eat **fresh cantaloupe WHEN IN SEASON**?

- NEVER
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per season  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per season | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month      | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month   | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week       | <input type="checkbox"/> 2 or more times per day |

26b. How often did you eat **cantaloupe** (fresh or frozen) **DURING THE REST OF THE YEAR**?

- NEVER
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

Question 27 appears on the next page



Over the past 12 months...

26c. Each time you ate **cantaloupe**, how much did you usually eat?

- Less than ¼ melon or less than ½ cup
- ¼ melon or ½ to 1 cup
- More than ¼ melon or more than 1 cup

27. Over the past 12 months, did you eat **melon, other than cantaloupe** (such as watermelon or honeydew)?

- NO (GO TO QUESTION 28)
- YES

27a. How often did you eat **fresh melon, other than cantaloupe, WHEN IN SEASON?**

- NEVER
- 1-6 times per season
- 7-11 times per season
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

27b. How often did you eat **melon other than cantaloupe** (fresh or frozen) **DURING THE REST OF THE YEAR?**

- NEVER
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

27c. Each time you ate **melon other than cantaloupe**, how much did you usually eat?

- Less than 1 cup or 2 small wedges
- 1 to 3 cups or 2 medium wedges
- More than 3 cups or 2 large wedges



Question 28 appears in the next column

28. Over the past 12 months, did you eat **strawberries**?

- NO (GO TO QUESTION 29)
- YES

28a. How often did you eat **fresh strawberries WHEN IN SEASON?**

- NEVER
- 1-6 times per season
- 7-11 times per season
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

28b. How often did you eat **strawberries** (fresh or frozen) **DURING THE REST OF THE YEAR?**

- NEVER
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

28c. Each time you ate **strawberries**, how much did you usually eat?

- Less than ¼ cup or less than 4 berries
- ¼ to ¾ cup or 4 to 10 berries
- More than ¾ cup or more than 10 berries

29. Over the past 12 months, did you eat **blueberries, raspberries, saskatoon berries or blackberries**?

- NO (GO TO QUESTION 30)
- YES

29a. How often did you eat **fresh blueberries, raspberries, saskatoon berries or blackberries WHEN IN SEASON?**

- NEVER
- 1-6 times per season
- 7-11 times per season
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

Question 30 appears on the next page



Over the past 12 months...

29b. How often did you eat **blueberries, raspberries, saskatoon berries** or **blackberries** (fresh or frozen) **DURING THE REST OF THE YEAR?**

- NEVER
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

29c. Each time you ate **blueberries, raspberries, saskatoon berries** or **blackberries**, how much did you usually eat?

- Less than ¼ cup  
 ¼ to ¾ cup  
 More than ¾ cup

30. Over the past 12 months, did you eat **oranges, tangelos, mandarins, or clementines?**

- NO (GO TO QUESTION 31)  
 YES

30a. How often did you eat **fresh oranges, tangelos, mandarins, or clementines** **WHEN IN SEASON?**

- NEVER
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per season  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per season | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month      | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month   | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week       | <input type="checkbox"/> 2 or more times per day |

30b. How often did you eat **oranges, tangelos, mandarins, or clementines** (fresh or canned) **DURING THE REST OF THE YEAR?**

- NEVER
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

Question 31 appears in the next column

30c. Each time you ate **oranges, tangelos, mandarins, or clementines**, how many did you usually eat?

- Less than 1 fruit  
 1 fruit  
 More than 1 fruit

31. Over the past 12 months, did you eat **grapefruit?**

- NO (GO TO QUESTION 32)  
 YES

31a. How often did you eat **fresh grapefruit** **WHEN IN SEASON?**

- NEVER
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per season  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per season | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month      | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month   | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week       | <input type="checkbox"/> 2 or more times per day |

31b. How often did you eat **grapefruit** (fresh or canned) **DURING THE REST OF THE YEAR?**

- NEVER
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

31c. Each time you ate **grapefruit**, how much did you usually eat?

- Less than ½ grapefruit  
 ½ to 1 grapefruit  
 More than 1 grapefruit

32. How often did you eat **pineapple?**

- NEVER (GO TO QUESTION 33)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

32a. Each time you ate **pineapple**, how much did you usually eat?

- Less than ¼ cup or less than 1 medium slice  
 ¼ to ¾ cup or 1 to 2 medium slices  
 More than ¾ cup or more than 2 medium slices

Question 33 appears on the next page



Over the past 12 months...

33. How often did you eat **other kinds of fruit**?

- NEVER (GO TO QUESTION 34)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

33a. Each time you ate **other kinds of fruit**, how much did you usually eat?

- Less than ¼ cup  
 ¼ to ¾ cup  
 More than ¾ cup

34. How often did you eat **COOKED greens** (such as spinach, turnip greens, collard, mustard greens, chard, or kale)?

- NEVER (GO TO QUESTION 35)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

34a. Each time you ate **COOKED greens**, how much did you usually eat?

- Less than ½ cup  
 ½ to 1 cup  
 More than 1 cup

35. How often did you eat **RAW greens** (such as spinach, chard, or kale)? *(We will ask about lettuce later.)*

- NEVER (GO TO QUESTION 36)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

35a. Each time you ate **RAW greens**, how much did you usually eat?

- Less than 1½ cups  
 1½ to 3 cups  
 More than 3 cups

Question 36 appears in the next column

36. How often did you eat **coleslaw**?

- NEVER (GO TO QUESTION 37)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

36a. Each time you ate **coleslaw**, how much did you usually eat?

- Less than ¼ cup  
 ¼ to ¾ cup  
 More than ¾ cup

37. How often did you eat **sauerkraut or cabbage** (other than coleslaw)?

- NEVER (GO TO QUESTION 38)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

37a. Each time you ate **sauerkraut or cabbage**, how much did you usually eat?

- Less than ¼ cup  
 ¼ to 1 cup  
 More than 1 cup

38. How often did you eat **carrots** (fresh, canned, or frozen)?

- NEVER (GO TO QUESTION 39)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

38a. Each time you ate **carrots**, how much did you usually eat?

- Less than ¼ cup or less than 2 baby carrots  
 ¼ to ¾ cup or 2 to 8 baby carrots  
 More than ¾ cup or more than 8 baby carrots

Question 39 appears on the next page



Over the past 12 months...

39. How often did you eat **string beans** or **green beans** (fresh, canned, or frozen)?

- NEVER (GO TO QUESTION 40)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

39a. Each time you ate **string beans** or **green beans**, how much did you usually eat?

- Less than ½ cup  
 ½ to 1 cup  
 More than 1 cup

40. How often did you eat **peas** (fresh, canned, or frozen)?

- NEVER (GO TO QUESTION 41)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

40a. Each time you ate **peas**, how much did you usually eat?

- Less than ¼ cup  
 ¼ to ½ cup  
 More than ½ cup

41. Over the past 12 months, did you eat **corn**?

- NO (GO TO QUESTION 42)  
 YES

41a. How often did you eat **fresh corn** **WHEN IN SEASON**?

- NEVER
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per season  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per season | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month      | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month   | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week       | <input type="checkbox"/> 2 or more times per day |

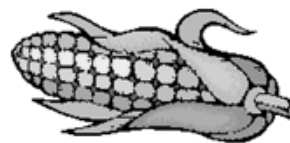
Question 42 appears in the next column

41b. How often did you eat **corn** (fresh, canned, or frozen) **DURING THE REST OF THE YEAR**?

- NEVER
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

41c. Each time you ate **corn**, how much did you usually eat?

- Less than 1 ear or less than ½ cup  
 1 ear or ½ to 1 cup  
 More than 1 ear or more than 1 cup



42. How often did you eat **broccoli** (fresh or frozen)?

- NEVER (GO TO QUESTION 43)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

42a. Each time you ate **broccoli**, how much did you usually eat?

- Less than ¼ cup  
 ¼ to 1 cup  
 More than 1 cup

43. How often did you eat **cauliflower** (fresh or frozen)?

- NEVER (GO TO QUESTION 44)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

43a. Each time you ate **cauliflower**, how much did you usually eat?

- Less than ¼ cup  
 ¼ to 1 cup  
 More than 1 cup

Question 44 appears on the next page



Over the past 12 months...

44. How often did you eat **Brussels sprouts** (fresh or frozen)?

- NEVER (GO TO QUESTION 45)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

44a. Each time you ate **Brussels sprouts**, how much did you usually eat?

- Less than 4 Brussels sprouts or less than ½ cup  
 4 to 7 Brussels sprouts or ½ to 1 cup  
 More than 7 Brussels sprouts or more than 1 cup

45. How often did you eat **asparagus** (fresh or frozen)?

- NEVER (GO TO QUESTION 46)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

45a. Each time you ate **asparagus**, how much did you usually eat?

- Less than 5 spears or less than ½ cup  
 5 to 9 spears or ½ to ¾ cup  
 More than 9 spears or more than ¾ cup

46. How often did you eat **winter squash** (such as pumpkin, butternut, or acorn)?

- NEVER (GO TO QUESTION 47)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

46a. Each time you ate **winter squash**, how much did you usually eat?

- Less than ⅓ cup  
 ⅓ to 1 cup  
 More than 1 cup

Question 47 appears in the next column

47. How often did you eat **mixed vegetables** (such as vegetable stir fry, frozen or canned mixed vegetables)?

- NEVER (GO TO QUESTION 48)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

47a. Each time you ate **mixed vegetables**, how much did you usually eat?

- Less than ½ cup  
 ½ to 1 cup  
 More than 1 cup

48. How often did you eat **onions**?

- NEVER (GO TO QUESTION 49)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

48a. Each time you ate **onions**, how much did you usually eat?

- Less than 1 slice or less than 1 tablespoon  
 1 to 5 slices or 1 to 4 tablespoons  
 More than 5 slices or more than 4 tablespoons

49. Now think about all the **cooked vegetables** you ate in the past 12 months and how they were prepared. How often were your vegetables **COOKED WITH** some sort of **fat**, including oil spray? (*Please do not include potatoes.*)

- NEVER (GO TO QUESTION 50)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |



Question 50 appears on the next page



Over the past 12 months...

49a. Which fats were usually added to your vegetables **DURING COOKING**? (Please do not include potatoes. **Mark all that apply.**)

- |  |   |
|--|---|
| <input type="checkbox"/> Margarine (including light) | <input type="checkbox"/> Corn oil                         |
| <input type="checkbox"/> Butter (including light)    | <input type="checkbox"/> Canola or rapeseed oil           |
| <input type="checkbox"/> Lard, fatback, or bacon fat | <input type="checkbox"/> Oil spray, such as Pam or others |
| <input type="checkbox"/> Olive oil                   | <input type="checkbox"/> Other kinds of oil               |
|  | <input type="checkbox"/> None of the above                |

50. Now, thinking again about all the **cooked vegetables** you ate in the past 12 months, how often was some sort of fat, sauce, or dressing added **AFTER COOKING OR AT THE TABLE**? (Please do not include potatoes.)

- NEVER (GO TO QUESTION 51)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 2 times per day         |
| <input type="checkbox"/> 1-2 times per week  | <input type="checkbox"/> 3 or more times per day |

50a. Which fats, sauces, or dressings were usually added **AFTER COOKING OR AT THE TABLE**? (Please do not include potatoes. **Mark all that apply.**)

- |  |   |
|--|---|
| <input type="checkbox"/> Margarine (including light) | <input type="checkbox"/> Vegetable oil  |
| <input type="checkbox"/> Butter (including light)    | <input type="checkbox"/> Salad dressing |
| <input type="checkbox"/> Lard, fatback, or bacon fat | <input type="checkbox"/> Cheese sauce   |
|  | <input type="checkbox"/> White sauce    |
|  | <input type="checkbox"/> Other          |

50b. If margarine, butter, vegetable oil, lard, fatback, or bacon fat was added to your cooked vegetables **AFTER COOKING OR AT THE TABLE**, how much did you usually add?

- Did not usually add these
- Less than 1 teaspoon
- 1 to 3 teaspoons
- More than 3 teaspoons

50c. If salad dressing, cheese sauce, or white sauce was added to your cooked vegetables **AFTER COOKING OR AT THE TABLE**, how much did you usually add?

- Did not usually add these
- Less than 1 tablespoon
- 1 to 3 tablespoons
- More than 3 tablespoons

Question 51 appears in the next column

51. How often did you eat **sweet peppers** (green, red, or yellow)?

- NEVER (GO TO QUESTION 52)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

51a. Each time you ate **sweet peppers**, how much did you usually eat?

- Less than 1/8 pepper
- 1/8 to 1/2 pepper
- More than 1/2 pepper

52. Over the past 12 months, did you eat **fresh tomatoes** (including those in salads)?

- NO (GO TO QUESTION 53)
- YES

52a. How often did you eat **fresh tomatoes** (including those in salads) **WHEN IN SEASON**?

- NEVER
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per season  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per season | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month      | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month   | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week       | <input type="checkbox"/> 2 or more times per day |

52b. How often did you eat **fresh tomatoes** (including those in salads) **DURING THE REST OF THE YEAR**?

- NEVER
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

52c. Each time you ate **fresh tomatoes**, how much did you usually eat?

- Less than 1/4 tomato
- 1/4 to 1 tomato
- More than 1 tomato

Question 53 appears on the next page



Over the past 12 months...

53. How often did you eat **lettuce salads** (with or without other vegetables)?

- NEVER (GO TO QUESTION 54)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

53a. Each time you ate **lettuce salads**, how much did you usually eat?

- Less than ¼ cup
- ¼ to 1½ cups
- More than 1½ cups

53b. How often did the lettuce salads you ate include **dark green lettuce**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

54. How often did you eat **salad dressing** (including low-fat) **on salads**?

- NEVER (GO TO QUESTION 55)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

54a. Each time you ate **salad dressing on salads**, how much did you usually eat?

- Less than 2 tablespoons
- 2 to 4 tablespoons
- More than 4 tablespoons

55. How often did you eat **sweet potatoes** or **yams**?

- NEVER (GO TO QUESTION 56)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

Question 56 appears in the next column

55a. Each time you ate **sweet potatoes** or **yams**, how much did you usually eat?

- 1 small potato or less than ½ cup
- 1 medium potato or ½ to 1 cup
- 1 large potato or more than 1 cup

56. How often did you eat **French fries, home fries, hash browned potatoes, or tater tots**?

- NEVER (GO TO QUESTION 57)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

56a. Each time you ate **French fries, home fries, hash browned potatoes, or tater tots** how much did you usually eat?

- Less than 10 fries or less than ½ cup
- 10 to 25 fries or ½ to 1 cup
- More than 25 fries or more than 1 cup

56b. How often did the French fries, home fries, hash browned potatoes, or tater tots you ate include **poutine (with gravy and cheese)**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

57. How often did you eat **potato salad**?

- NEVER (GO TO QUESTION 58)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

57a. Each time you ate **potato salad**, how much did you usually eat?

- Less than ½ cup
- ½ to 1 cup
- More than 1 cup

58. How often did you eat **baked, boiled, or mashed potatoes**?

- NEVER (GO TO QUESTION 59)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

Question 59 appears on the next page





Over the past 12 months...

58a. Each time you ate **baked, boiled, or mashed potatoes**, how much did you usually eat?

- 1 small potato or less than ½ cup
- 1 medium potato or ½ to 1 cup
- 1 large potato or more than 1 cup

58b. How often was **sour cream** (including low-fat) added to your potatoes, **EITHER IN COOKING OR AT THE TABLE?**

- Almost never or never (GO TO QUESTION 58d)
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

58c. Each time **sour cream** was added to your potatoes, how much was usually added?

- Less than 1 tablespoon
- 1 to 4 tablespoons
- More than 4 tablespoons

58d. How often was **margarine** (including light) added to your potatoes, **EITHER IN COOKING OR AT THE TABLE?**

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

58e. How often was **butter** (including light) added to your potatoes, **EITHER IN COOKING OR AT THE TABLE?**

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

58f. Each time **margarine** or **butter** was added to your potatoes, how much was usually added?

- Never added
- Less than 1 teaspoon
- 1 to 3 teaspoons
- More than 3 teaspoons

58g. How often was **cheese** or **cheese sauce** added to your potatoes, **EITHER IN COOKING OR AT THE TABLE?**

- Almost never or never (GO TO QUESTION 59)
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

Question 59 appears in the next column

58h. Each time **cheese** or **cheese sauce** was added to your potatoes, how much was usually added?

- Less than 1 tablespoon
- 1 to 3 tablespoons
- More than 3 tablespoons

59. How often did you eat **salsa**?

- NEVER (GO TO QUESTION 60)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

59a. Each time you ate **salsa**, how much did you usually eat?

- Less than 2 tablespoons
- 2 tablespoons to ½ cup
- More than ½ cup

60. How often did you eat **ketchup**?

- NEVER (GO TO QUESTION 61)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

60a. Each time you ate **ketchup**, how much did you usually eat?

- Less than 2 teaspoons
- 2 to 6 teaspoons
- More than 6 teaspoons

61. How often did you eat **stuffing, dressing, or dumplings**?

- NEVER (GO TO QUESTION 62)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

61a. Each time you ate **stuffing, dressing, or dumplings**, how much did you usually eat?

- Less than ½ cup
- ½ to 1 cup
- More than 1 cup

Question 62 appears on the next page



Over the past 12 months...

62. How often did you eat **chili**?

- NEVER (GO TO QUESTION 63)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

62a. Each time you ate **chili**, how much did you usually eat?

- Less than 1 cup  
 1 to 1¾ cups  
 More than 1¾ cups

63. How often did you eat **Mexican foods** (such as tacos, tostados, burritos, tamales, fajitas, enchiladas, quesadillas, or chimichangas)?

- NEVER (GO TO QUESTION 64)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

63a. Each time you ate **Mexican foods**, how much did you usually eat?

- Less than 1 taco, burrito, etc.  
 1 to 2 tacos, burritos, etc.  
 More than 2 tacos, burritos, etc.

64. How often did you eat **baked beans**? (*Please include canned, ready-made, or homemade.*)

- NEVER (GO TO QUESTION 65)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

64a. Each time you ate **baked beans**, how much did you usually eat?

- Less than ½ cup  
 ½ to 1 cup  
 More than 1 cup

Question 65 appears in the next column

65. How often did you eat **other cooked dried beans** (such as pintos, kidney, black-eyed peas, lima, lentils, soybeans, or refried beans)? (*Please do not include bean, pea or lentil soups, or chili.*)

- NEVER (GO TO QUESTION 66)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

65a. Each time you ate **other beans**, how much did you usually eat?

- Less than ¼ cup  
 ¼ to ¾ cup  
 More than ¾ cup

65b. How often were the other beans you ate **refried beans, beans prepared with any type of fat, or with meat added**?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

66. How often did you eat **other kinds of vegetables**?

- NEVER (GO TO QUESTION 67)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

66a. Each time you ate **other kinds of vegetables**, how much did you usually eat?

- Less than ¼ cup  
 ¼ to ½ cup  
 More than ½ cup

67. How often did you eat **rice or other cooked grains** (such as bulgur, cracked wheat, or millet)?

- NEVER (GO TO QUESTION 68)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

Question 68 appears on the next page



Over the past 12 months...

67a. Each time you ate **rice** or **other cooked grains**, how much did you usually eat?

- Less than 1/2 cup
- 1/2 to 1 1/2 cups
- More than 1 1/2 cups

67b. How often was **butter**, **margarine**, or **oil** added to your rice or other cooked grains **IN COOKING OR AT THE TABLE**?

- Almost never or never
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

68. How often did you eat **pancakes**, **waffles**, or **French toast**?

- NEVER (GO TO QUESTION 69)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

68a. Each time you ate **pancakes**, **waffles**, or **French toast**, how much did you usually eat?

- Less than 1 medium piece
- 1 to 3 medium pieces
- More than 3 medium pieces

68b. How often was **margarine** (including light) added to your pancakes, waffles, or French toast **AFTER COOKING OR AT THE TABLE**?

- Almost never or never
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

68c. How often was **butter** (including light) added to your pancakes, waffles, or French toast **AFTER COOKING OR AT THE TABLE**?

- Almost never or never
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

Question 69 appears in the next column

68d. Each time **margarine** or **butter** was added to your pancakes, waffles, or French toast, how much was usually added?

- Never added
- Less than 1 teaspoon
- 1 to 3 teaspoons
- More than 3 teaspoons

68e. How often was **syrup** added to your pancakes, waffles, or French toast?

- Almost never or never (GO TO QUESTION 69)
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

68f. Each time **syrup** was added to your pancakes, waffles, or French toast, how much was usually added?

- Less than 1 tablespoon
- 1 to 3 tablespoons
- More than 3 tablespoons

69. How often did you eat **lasagna**, **stuffed shells**, **stuffed manicotti**, **ravioli**, or **tortellini**? (*Please do not include spaghetti or other pasta.*)

- NEVER (GO TO QUESTION 70)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

69a. Each time you ate **lasagna**, **stuffed shells**, **stuffed manicotti**, **ravioli**, or **tortellini**, how much did you usually eat?

- Less than 1 cup
- 1 to 2 cups
- More than 2 cups

70. How often did you eat **macaroni and cheese**?

- NEVER (GO TO QUESTION 71)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

70a. Each time you ate **macaroni and cheese**, how much did you usually eat?

- Less than 1 cup
- 1 to 1 1/2 cups
- More than 1 1/2 cups

Question 71 appears on the next page



Over the past 12 months...

71. How often did you eat **pasta salad** or **macaroni salad**?

- NEVER (GO TO QUESTION 72)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

71a. Each time you ate **pasta salad** or **macaroni salad**, how much did you usually eat?

- Less than ½ cup  
 ½ to 1 cup  
 More than 1 cup

72. Other than the pastas listed in Questions 69, 70, and 71, how often did you eat **pasta, spaghetti, or other noodles**?

- NEVER (GO TO QUESTION 73)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

72a. Each time you ate **pasta, spaghetti, or other noodles**, how much did you usually eat?

- Less than 1 cup  
 1 to 3 cups  
 More than 3 cups

72b. How often did you eat your pasta, spaghetti, or other noodles with **tomato sauce** or **spaghetti sauce made WITH meat**?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

72c. How often did you eat your pasta, spaghetti, or other noodles with **tomato sauce** or **spaghetti sauce made WITHOUT meat**?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

Question 73 appears in the next column

72d. How often did you eat your pasta, spaghetti, or other noodles with **margarine, butter, oil, or cream sauce**?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

73. How often did you eat **bagels** or **English muffins**?

- NEVER (GO TO INTRODUCTION TO QUESTION 74)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

73a. How often were the bagels or English muffins you ate **whole wheat**?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

73b. Each time you ate **bagels** or **English muffins**, how many did you usually eat?

- Less than 1 bagel or English muffin  
 1 bagel or English muffin  
 More than 1 bagel or English muffin

73c. How often was **margarine** (including light) added to your bagels or English muffins?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

73d. How often was **butter** (including light) added to your bagels or English muffins?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

73e. Each time **margarine** or **butter** was added to your bagels or English muffins, how much was usually added?

- Never added  
 Less than 1 teaspoon  
 1 to 2 teaspoons  
 More than 2 teaspoons

Introduction to Question 74 appears on the next page



Over the past 12 months...

73f. How often was **cream cheese** (including low-fat) spread on your bagels or English muffins?

- Almost never or never  
(GO TO INTRODUCTION TO QUESTION 74)
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

73g. Each time **cream cheese** was added to your bagels or English muffins, how much was usually added?

- Less than 1 tablespoon
- 1 to 2 tablespoons
- More than 2 tablespoons

The next questions ask about your intake of breads other than bagels or English muffins. First, we will ask about bread you ate as part of sandwiches only. Then we will ask about all other bread you ate.

74. How often did you eat **breads, rolls or flatbreads** (such as pita, roti and tortillas) **AS PART OF SANDWICHES** (including burger and hot dog rolls)?

- NEVER (GO TO QUESTION 75)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

74a. Each time you ate **breads, rolls or flatbreads AS PART OF SANDWICHES**, how many did you usually eat?

- 1 slice or 1/2 roll or flatbread
- 2 slices or 1 roll or flatbread
- More than 2 slices or more than 1 roll or flatbread

74b. How often were the breads, rolls or flatbreads that you used for your sandwiches **white** (including burger and hot dog rolls)?

- Almost never or never
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

Question 75 appears in the next column

74c. How often was **mayonnaise or mayonnaise-type dressing** (including low-fat) added to the breads, rolls or flatbreads used for your sandwiches or wraps?

- Almost never or never (GO TO QUESTION 74e)
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

74d. Each time **mayonnaise or mayonnaise-type dressing** was added to the breads, rolls or flatbreads used for your sandwiches or wraps, how much was usually added?

- Less than 1 teaspoon
- 1 to 3 teaspoons
- More than 3 teaspoons

74e. How often was **margarine** (including light) added to the breads, rolls or flatbreads used for your sandwiches or wraps?

- Almost never or never
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

74f. How often was **butter** (including low-fat) added to the breads, rolls or flatbreads used for your sandwiches or wraps?

- Almost never or never
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

74g. Each time **margarine or butter** was added to the breads, rolls or flatbreads used for your sandwiches or wraps, how much was usually added?

- Never added
- Less than 1 teaspoon
- 1 to 2 teaspoons
- More than 2 teaspoons

75. How often did you eat **breads, dinner rolls or flatbreads, NOT AS PART OF SANDWICHES?**

- NEVER (GO TO QUESTION 76)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

Question 76 appears on the next page



Over the past 12 months...

75a. Each time you ate **bread**s, **dinner rolls** or **flatbread**s, **NOT AS PART OF SANDWICHES**, how much did you usually eat?

- 1 slice or 1 dinner roll or ½ flatbread
- 2 slices or 2 dinner rolls or 1 flatbread
- More than 2 slices or dinner rolls or more than 1 flatbread

75b. How often were the breads, rolls or flatbreads you ate **white**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

75c. How often was **margarine** (including light) added to your breads, rolls or flatbreads?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

75d. How often was **butter** (including light) added to your breads, rolls or flatbreads?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

75e. Each time **margarine** or **butter** was added to your breads, rolls or flatbreads, how much was usually added?

- Never added
- Less than 1 teaspoon
- 1 to 2 teaspoons
- More than 2 teaspoons

75f. How often was **cream cheese** (including low-fat) added to your breads, rolls or flatbreads?

- Almost never or never (GO TO QUESTION 76)
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

Question 76 appears in the next column

75g. Each time **cream cheese** was added to your breads, rolls or flatbreads, how much was usually added?

- Less than 1 tablespoon
- 1 to 2 tablespoons
- More than 2 tablespoons

76. How often did you eat **jam**, **jelly**, or **honey** on bagels, muffins, bread, rolls, or crackers?

- NEVER (GO TO QUESTION 77)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

76a. Each time you ate **jam**, **jelly**, or **honey**, how much did you usually eat?

- Less than 2 teaspoons
- 2 to 4 teaspoons
- More than 4 teaspoons

77. How often did you eat **peanut butter** or **other nut butter**?

- NEVER (GO TO QUESTION 78)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

77a. Each time you ate **peanut butter** or **other nut butter**, how much did you usually eat?

- Less than 1 tablespoon
- 1 to 2 tablespoons
- More than 2 tablespoons

78. How often did you eat **roast beef** or **steak IN SANDWICHES**?

- NEVER (GO TO QUESTION 79)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

Question 79 appears on the next page



Over the past 12 months...

78a. Each time you ate **roast beef** or **steak IN SANDWICHES**, how much did you usually eat?

- Less than 1 slice or less than 2 ounces
- 1 to 2 slices or 2 to 4 ounces
- More than 2 slices or more than 4 ounces

79. How often did you eat **turkey** or **chicken COLD CUTS** (such as loaf, luncheon meat, turkey ham, turkey salami, or turkey pastrami)? *(We will ask about other turkey or chicken later.)*

- NEVER (GO TO QUESTION 80)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

79a. Each time you ate **turkey** or **chicken COLD CUTS**, how much did you usually eat?

- Less than 1 slice
- 1 to 3 slices
- More than 3 slices

80. How often did you eat **luncheon** or **deli-style ham**? *(We will ask about other ham later.)*

- NEVER (GO TO QUESTION 81)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

80a. Each time you ate **luncheon** or **deli-style ham**, how much did you usually eat?

- Less than 1 slice
- 1 to 3 slices
- More than 3 slices

80b. How often was the luncheon or deli-style ham you ate **light, low-fat, or fat-free**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

Question 81 appears in the next column

81. How often did you eat **other cold cuts** or **luncheon meats** (such as bologna, salami, corned beef, pastrami, or others, including low-fat)? *(Please do not include ham, turkey, or chicken cold cuts.)*

- NEVER (GO TO QUESTION 82)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

81a. Each time you ate **other cold cuts** or **luncheon meats**, how much did you usually eat?

- Less than 1 slice
- 1 to 3 slices
- More than 3 slices

81b. How often were the other cold cuts or luncheon meats you ate **light, low-fat, or fat-free**? *(Please do not include ham, turkey, or chicken cold cuts.)*

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

82. How often did you eat **canned tuna** (including in salads, sandwiches, or casseroles)?

- NEVER (GO TO QUESTION 83)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

82a. Each time you ate **canned tuna**, how much did you usually eat?

- Less than ¼ cup or less than 2 ounces
- ¼ to ½ cup or 2 to 3 ounces
- More than ½ cup or more than 3 ounces

82b. How often was the canned tuna you ate **water-packed**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

Question 83 appears on the next page



Over the past 12 months...

82c. How often was the canned tuna you ate **prepared with mayonnaise or other dressing** (including low-fat)?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

83. How often did you eat **GROUND chicken or turkey**? (We will ask about other chicken and turkey later.)

- NEVER (GO TO QUESTION 84)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

83a. Each time you ate **GROUND chicken or turkey**, how much did you usually eat?

- Less than 2 ounces or less than ½ cup
- 2 to 4 ounces or ½ to 1 cup
- More than 4 ounces or more than 1 cup

84. How often did you eat **beef hamburgers or cheeseburgers** from a **FAST FOOD** or **OTHER RESTAURANT**?

- NEVER (GO TO QUESTION 85)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

84a. Each time you ate **beef hamburgers or cheeseburgers** from a **FAST FOOD** or **OTHER RESTAURANT**, what size did you usually eat?

- Small hamburger (such as a regular Burger King or McDonald's Hamburger)
- Medium (such as McDonald's or Burger King Double Burger or Cheeseburger)
- Large (such as Burger King Whopper or Double Whopper or a McDonald's Double Quarter Pounder)

Question 85 appears in the next column

84b. Each time you ate **beef hamburgers or cheeseburgers** from a **FAST FOOD** or **OTHER RESTAURANT**, how much did you usually eat?

- Less than 1 burger
- 1 burger
- More than 1 burger

84c. How often did you have **cheeseburgers** rather than **hamburgers** from a **FAST FOOD** or **OTHER RESTAURANT**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

85. How often did you eat **beef hamburgers or cheeseburgers** that were **NOT** from a **FAST FOOD** or **OTHER RESTAURANT**?

- NEVER (GO TO QUESTION 86)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

85a. Each time you ate **beef hamburgers or cheeseburgers** that were **NOT** from a **FAST FOOD** or **OTHER RESTAURANT**, how much did you usually eat?

- Less than 1 patty or less than 2 ounces
- 1 patty or 2 to 4 ounces
- More than 1 patty or more than 4 ounces

85b. How often were these beef hamburgers or cheeseburgers made with **lean** or **extra lean ground beef**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

86. How often did you eat **ground beef in mixtures** (such as meatballs, casseroles, chili, or meatloaf)?

- NEVER (GO TO QUESTION 87)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

Question 87 appears on the next page





Over the past 12 months...

86a. Each time you ate **ground beef in mixtures**, how much did you usually eat?

- Less than 3 ounces or less than ½ cup
- 3 to 8 ounces or ½ to 1 cup
- More than 8 ounces or more than 1 cup

87. How often did you eat **hot dogs, wieners or frankfurters**? (Please do not include sausages or vegetarian hot dogs.)

NEVER (GO TO QUESTION 88)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

87a. Each time you ate **hot dogs, wieners, or frankfurters**, how many did you usually eat?

- Less than 1 hot dog
- 1 to 2 hot dogs
- More than 2 hot dogs

87b. How often were the hot dogs, wieners, or frankfurters you ate **light or low-fat**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

88. How often did you eat **beef mixtures** (such as beef stew, beef curry, beef pot pie, beef and noodles, or beef and vegetables)?

NEVER (GO TO QUESTION 89)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

88a. Each time you ate **beef mixtures**, how much did you usually eat?

- Less than ½ cup
- ½ to 1½ cups
- More than 1½ cups

Question 89 appears in the next column

89. How often did you eat **roast beef or pot roast**? (Please do not include roast beef or pot roast in sandwiches.)

NEVER (GO TO QUESTION 90)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

89a. Each time you ate **roast beef or pot roast**, how much did you usually eat?

- Less than 2 ounces
- 2 to 6 ounces
- More than 6 ounces

90. How often did you eat **steak** (beef)? (Please do not include steak in sandwiches)

NEVER (GO TO QUESTION 91)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

90a. Each time you ate **steak** (beef), how much did you usually eat?

- Less than 3 ounces
- 3 to 7 ounces
- More than 7 ounces

90b. How often was the steak you ate **lean steak**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

91. How often did you eat **pork or beef spareribs**?

NEVER (GO TO QUESTION 92)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

Question 92 appears on the next page



Over the past 12 months...

91a. Each time you ate **pork** or **beef spareribs**, how much did you usually eat?

- Less than 4 ribs
- 4 to 12 ribs
- More than 12 ribs

92. How often did you eat **roast turkey, turkey cutlets, or turkey nuggets** (including in sandwiches)?

NEVER (GO TO QUESTION 93)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

92a. Each time you ate **roast turkey, turkey cutlets, or turkey nuggets**, how much did you usually eat? *(Please note: 4 to 8 turkey nuggets = 3 ounces.)*

- Less than 2 ounces
- 2 to 5 ounces
- More than 5 ounces

93. How often did you eat **chicken mixtures** (such as salads, sandwiches, casseroles, chicken curries, stews, or other mixtures)?

NEVER (GO TO QUESTION 94)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

93a. Each time you ate **chicken mixtures**, how much did you usually eat?

- Less than 1/2 cup
- 1/2 to 1 1/2 cups
- More than 1 1/2 cups

Question 94 appears in the next column

94. How often did you eat **baked, broiled, roasted, stewed, or fried chicken** (including nuggets)? *(Please do not include chicken in mixtures.)*

NEVER (GO TO QUESTION 95)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

94a. Each time you ate **baked, broiled, roasted, stewed, or fried chicken** (including nuggets), how much did you usually eat?

- Less than 2 drumsticks or wings, less than 1 breast or thigh, or less than 4 nuggets
- 2 drumsticks or wings, 1 breast or thigh, or 4 to 8 nuggets
- More than 2 drumsticks or wings, more than 1 breast or thigh, or more than 8 nuggets

94b. How often was the chicken you ate **fried chicken** (including deep fried) or **chicken nuggets**?

- Almost never or never
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

94c. How often was the chicken you ate **WHITE meat**?

- Almost never or never
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

94d. How often did you eat chicken **WITH skin**?

- Almost never or never
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

95. How often did you eat **baked ham or ham steak**?

NEVER (GO TO QUESTION 96)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

Question 96 appears on the next page



Over the past 12 months...

95a. Each time you ate **baked ham** or **ham steak**, how much did you usually eat?

- Less than 1 ounce
- 1 to 3 ounces
- More than 3 ounces

96. How often did you eat **pork** (including chops, roasts, and in mixed dishes)? *(Please do not include ham, ham steak, or sausage.)*

NEVER (GO TO QUESTION 97)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

96a. Each time you ate **pork**, how much did you usually eat?

- Less than 2 ounces or less than 1 chop
- 2 to 5 ounces or 1 chop
- More than 5 ounces or more than 1 chop

97. How often did you eat **gravy** on meat, chicken, potatoes (**NOT** including poutine), rice, etc.?

NEVER (GO TO QUESTION 98)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

97a. Each time you ate **gravy** on meat, chicken, potatoes, rice, etc., how much did you usually eat?

- Less than 1/8 cup
- 1/8 to 1/2 cup
- More than 1/2 cup

98. How often did you eat **liver** (all kinds) or **liverwurst**?

NEVER (GO TO QUESTION 99)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

Question 99 appears in the next column

98a. Each time you ate **liver** or **liverwurst**, how much did you usually eat?

- Less than 1/2 ounce
- 1/2 to 3 ounces
- More than 3 ounces

99. How often did you eat **bacon** (including low-fat)?

NEVER (GO TO QUESTION 100)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

99a. Each time you ate **bacon**, how much did you usually eat?

- Fewer than 2 slices
- 2 to 4 slices
- More than 4 slices

99b. How often was the bacon you ate **light, low-fat, or lean**?

- Almost never or never
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

100. How often did you eat **sausage** (including low-fat)?

NEVER (GO TO QUESTION 101)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

100a. Each time you ate **sausage**, how much did you usually eat?

- Less than 2 small links or less than 1 large link
- 2 to 5 small links or 1 to 2 large links
- More than 5 small links or more than 2 large links

100b. How often was the sausage you ate **light, low-fat, or lean**?

- Almost never or never
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

Question 101 appears on the next page



Over the past 12 months...

101. How often did you eat **fried shellfish** (such as crab, lobster, scallops, or shrimp)?

- NEVER (GO TO QUESTION 102)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

101a. Each time you ate **fried shellfish**, how much did you usually eat?

- Less than 1 ounce  
 1 to 3 ounces  
 More than 3 ounces

102. How often did you eat **shellfish** (such as crab, lobster, scallops, or shrimp) **that was NOT FRIED**?

- NEVER (GO TO QUESTION 103)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

102a. Each time you ate **shellfish that was NOT FRIED**, how much did you usually eat?

- Less than 1 ounce  
 1 to 4 ounces  
 More than 4 ounces

103. How often did you eat **dark or oily fish** like **salmon, fresh tuna, trout, or mackerel**?

- NEVER (GO TO QUESTION 104)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

103a. Each time you ate **dark or oily fish**, how much did you usually eat?

- Less than 2 ounces  
 2 to 6 ounces  
 More than 6 ounces

Question 104 appears in the next column

104. How often did you eat **ready-to-eat battered fish** or **fish sticks**, including in fast food sandwiches (not including shellfish)?

- NEVER (GO TO QUESTION 105)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

104a. Each time you ate **ready-to-eat battered fish** or **fish sticks**, how much did you usually eat?

- Less than 2 ounces or less than 1 fillet  
 2 to 6 ounces or 1 fillet  
 More than 6 ounces or more than 1 fillet

105. How often did you eat **white or lean fish** like **cod, sole, perch, or pike** (do not include ready-to-eat battered fish or fish sticks)?

- NEVER (GO TO INTRODUCTION TO QUESTION 106)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

105a. Each time you ate **white or lean fish**, how much did you usually eat?

- Less than 2 ounces or less than 1 fillet  
 2 to 5 ounces or 1 fillet  
 More than 5 ounces or more than 1 fillet

**Now think about all the meat, poultry, and fish you ate in the past 12 months and how they were prepared.**

106. How often was **oil, butter, margarine, or other fat** used to **FRY, SAUTE, BASTE, OR MARINATE** any meat, poultry, or fish you ate? (*Please do not include deep frying.*)

- NEVER (GO TO QUESTION 107)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

Question 107 appears on the next page



Over the past 12 months...

106a. Which of the following **fats** were regularly used to prepare your meat, poultry, or fish? **(Mark all that apply.)**

- |  |   |
|--|---|
| <input type="checkbox"/> Margarine (including light) | <input type="checkbox"/> Corn oil                         |
| <input type="checkbox"/> Butter (including light)    | <input type="checkbox"/> Canola or rapeseed oil           |
| <input type="checkbox"/> Lard, fatback, or bacon fat | <input type="checkbox"/> Oil spray, such as Pam or others |
| <input type="checkbox"/> Olive oil                   | <input type="checkbox"/> Other kinds of oils              |
|  | <input type="checkbox"/> None of the above                |

107. Thinking about the **MEAT** you ate, how often was it cooked by **broiling, grilling, barbecuing, or pan-frying**? (Do not include poultry or fish).

- NEVER (GO TO QUESTION 108)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

107a. Each time you ate meat that was cooked by broiling, grilling, barbecuing, or pan-frying, what was the **outside appearance** of the meat?

- Light brown  
 Medium brown  
 Heavily browned or blackened

107b. Each time you ate meat that was cooked by broiling, grilling, barbecuing, or pan-frying, what was the **inside appearance** of the meat?

- Red (rare)  
 Pink (medium)  
 Brown (well-done)

108. How often did you eat **tofu**?

- NEVER (GO TO QUESTION 109)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

108a. Each time you ate **tofu**, how much did you usually eat?

- Less than ¼ cup or less than 2 ounces  
 ¼ to ¾ cup or 2 to 6 ounces  
 More than ¾ cup or more than 6 ounces

Question 109 appears in the next column

109. How often did you eat **soy burgers** or **soy meat-substitutes**?

- NEVER (GO TO QUESTION 110)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

109a. Each time you ate **soy burgers** or **soy meat-substitutes**, how much did you usually eat?

- Less than ¼ cup or less than 2 ounces  
 ¼ to 1 cup or 2 to 8 ounces  
 More than 1 cup or more than 8 ounces

110. Over the past 12 months, did you eat **soups**?

- NO (GO TO QUESTION 111)  
 YES

110a. How often did you eat **soup IN THE WINTER**?

- NEVER
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per winter  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per winter | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month      | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month   | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week       | <input type="checkbox"/> 2 or more times per day |

110b. How often did you eat **soup DURING THE REST OF THE YEAR**?

- NEVER
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

110c. Each time you ate **soup**, how much did you usually eat?

- Less than 1 cup  
 1 to 2 cups  
 More than 2 cups

Question 111 appears on the next page



Over the past 12 months...

110d. How often were the soups you ate **bean, pea, or lentil soups**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

110e. How often were the soups you ate **cream soups** (including chowders)?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

110f. How often were the soups you ate **tomato or vegetable soups** (NOT cream soups)?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

110g. How often were the soups you ate **broth soups** (including chicken) **with or without noodles or rice**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

111. How often did you eat **pizza**?

- NEVER (GO TO QUESTION 112)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

111a. Each time you ate **pizza**, how much did you usually eat?

- Less than 1 slice or less than 1 mini pizza
- 1 to 3 slices or 1 to 2 mini pizzas
- More than 3 slices or more than 2 mini pizzas

111b. How often did you eat pizza with **pepperoni, sausage, or other meat**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

Question 112 appears in the next column

112. How often did you eat **crackers**?

- NEVER (GO TO QUESTION 113)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

112a. Each time you ate **crackers**, how many did you usually eat?

- Fewer than 4 crackers
- 4 to 8 crackers
- More than 8 crackers

113. How often did you eat **corn bread or corn muffins**?

- NEVER (GO TO QUESTION 114)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

113a. Each time you ate **corn bread or corn muffins**, how much did you usually eat?

- Less than 1 piece or muffin
- 1 to 2 pieces or muffins
- More than 2 pieces or muffins

114. How often did you eat **baking powder biscuits, including scones or tea biscuits**?

- NEVER (GO TO QUESTION 115)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

114a. Each time you ate **baking powder biscuits including scones or tea biscuits**, how many did you usually eat?

- Fewer than 1 biscuit
- 1 to 2 biscuits
- More than 2 biscuits

Question 115 appears on the next page



Over the past 12 months...

115. How often did you eat **potato chips** (including low-fat, baked, or low-salt)?

- NEVER (GO TO QUESTION 116)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

115a. Each time you ate **potato chips**, how much did you usually eat?

- Fewer than 10 chips or less than 1 cup
- 10 to 25 chips or 1 to 2 cups
- More than 25 chips or more than 2 cups

116. How often did you eat **corn chips** or **tortilla chips** (including low-fat, baked, or low-salt)?

- NEVER (GO TO QUESTION 117)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

116a. Each time you ate **corn chips**, how much did you usually eat?

- Fewer than 10 chips or less than 1 cup
- 10 to 25 chips or 1 to 2 cups
- More than 25 chips or more than 2 cups

117. How often did you eat **popcorn** (including low-fat)?

- NEVER (GO TO QUESTION 118)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

117a. Each time you ate **popcorn**, how much did you usually eat?

- Less than 1½ cups, popped
- 1½ to 5 cups, popped
- More than 5 cups, popped

Question 118 appears in the next column

118. How often did you eat **pretzels**?

- NEVER (GO TO QUESTION 119)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

118a. Each time you ate **pretzels**, how many did you usually eat?

- Fewer than 7 average twists
- 7 to 20 average twists
- More than 20 average twists

119. How often did you eat **peanuts, walnuts, almonds, or other nuts**?

- NEVER (GO TO QUESTION 120)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

119a. Each time you ate **peanuts, walnuts, almonds, or other nuts**, how much did you usually eat?

- Less than ¼ cup
- ¼ to ½ cup
- More than ½ cup

119b. How often were the nuts you ate **peanuts**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

120. How often did you eat **flaxseeds**?

- NEVER (GO TO QUESTION 121)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

120a. Each time you ate **flaxseeds**, how much did you usually eat?

- Less than 1 tablespoon
- 1 to 2 tablespoons
- More than 2 tablespoons

Question 121 appears on the next page



Over the past 12 months...

121. How often did you eat **other seeds**, like **sunflower** or **pumpkin seeds**?

- NEVER (GO TO QUESTION 122)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

121a. Each time you ate **other seeds**, how much did you usually eat?

- Less than 2 tablespoons  
 2 tablespoons to ½ cup  
 More than ½ cup

122. How often did you eat **energy** or **high-protein bars**, (such as Power Bars, Vector, Clif, Luna, Isoflex or others)?

- NEVER (GO TO QUESTION 123)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

122a. Each time you ate **energy** or **high-protein bars**, how much did you usually eat?

- Less than 1 bar  
 1 bar  
 More than 1 bar

123. How often did you eat **yogurt** (NOT including frozen yogurt)?

- NEVER (GO TO QUESTION 124)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

123a. Each time you ate **yogurt**, how much did you usually eat?

- Less than ½ cup or less than 1 container  
 ½ to ¾ cup or 1 container  
 More than ¾ cup or more than 1 container

Question 124 appears in the next column

123b. How often was the **yogurt** you ate **low-fat** or **fat-free**?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

124. How often did you eat **cottage cheese** (including low-fat)?

- NEVER (GO TO QUESTION 125)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

124a. Each time you ate **cottage cheese**, how much did you usually eat?

- Less than ¼ cup  
 ¼ to ¾ cup  
 More than ¾ cup

125. How often did you eat **cheese** (including low-fat; including on cheeseburgers or in sandwiches or subs, NOT including cream cheese)?

- NEVER (GO TO QUESTION 126)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

125a. Each time you ate **cheese**, how much did you usually eat?

- Less than ½ ounce or less than 1 slice  
 ½ to 2 ounces or 1 to 2 slices  
 More than 2 ounces or more than 2 slices

125b. How often was the cheese you ate **low-fat**?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

Question 126 appears on the next page





Over the past 12 months...

126. How often did you eat **frozen yogurt, sorbet, or ices** (including low-fat or fat-free)?

- NEVER (GO TO QUESTION 127)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

126a. Each time you ate **frozen yogurt, sorbet, or ices**, how much did you usually eat?

- Less than ½ cup or less than 1 scoop  
 ½ to 1 cup or 1 to 2 scoops  
 More than 1 cup or more than 2 scoops

127. How often did you eat **ice cream or ice cream bars** (including low-fat or fat-free)?

- NEVER (GO TO QUESTION 128)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

127a. Each time you ate **ice cream or ice cream bars**, how much did you usually eat?

- Less than ½ cup or less than 1 scoop  
 ½ to 1 cup or 1 to 2 scoops  
 More than 1 cup or more than 2 scoops

127b. How often was the ice cream you ate **light, low-fat, or fat-free**?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

128. How often did you eat **cake** (including low-fat or fat-free)?

- NEVER (GO TO QUESTION 129)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

Question 129 appears in the next column

128a. Each time you ate **cake**, how much did you usually eat?

- Less than 1 medium piece  
 1 medium piece  
 More than 1 medium piece

129. How often did you eat **cookies or brownies** (including low-fat or fat-free)?

- NEVER (GO TO QUESTION 130)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

129a. Each time you ate **cookies or brownies**, how much did you usually eat?

- Less than 2 cookies or 1 small brownie  
 2 to 4 cookies or 1 medium brownie  
 More than 4 cookies or 1 large brownie

130. How often did you eat **doughnuts, sweet rolls, Danish, or Pop-Tarts**?

- NEVER (GO TO QUESTION 131)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

130a. Each time you ate **doughnuts, sweet rolls, Danish, or Pop-Tarts**, how much did you usually eat?

- Less than 1 piece  
 1 to 2 pieces  
 More than 2 pieces

131. How often did you eat **sweet muffins or dessert breads** (such as banana bread, blueberry muffins, or lemon loaf, including low-fat or fat-free)?

- NEVER (GO TO QUESTION 132)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

Question 132 appears on the next page



Over the past 12 months...

131a. Each time you ate **sweet muffins** or **dessert breads**, how much did you usually eat?

- Less than 1 medium piece
- 1 medium piece
- More than 1 medium piece

132. How often did you eat **fruit crisp, cobbler, or strudel**?

- NEVER (GO TO QUESTION 133)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

132a. Each time you ate **fruit crisp, cobbler, or strudel**, how much did you usually eat?

- Less than ½ cup
- ½ to 1 cup
- More than 1 cup

133. How often did you eat **pie**?

- NEVER (GO TO QUESTION 134)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

133a. Each time you ate **pie**, how much did you usually eat?

- Less than ⅛ of a pie
- About ⅛ of a pie
- More than ⅛ of a pie

**The next four questions ask about the kinds of pie you ate. Please read all four questions before answering.**

133b. How often were the pies you ate **fruit pie** (such as apple, blueberry, others)?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

Question 134 appears in the next column

133c. How often were the pies you ate **cream, pudding, custard, or meringue pie**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

133d. How often were the pies you ate **pumpkin or sweet potato pie**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

133e. How often were the pies you ate **pecan pie**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

134. How often did you eat **chocolate candy**?

- NEVER (GO TO QUESTION 135)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

134a. Each time you ate **chocolate candy**, how much did you usually eat?

- Less than 1 average bar or less than 1 ounce
- 1 average bar or 1 to 2 ounces
- More than 1 average bar or more than 2 ounces

135. How often did you eat **other candy**?

- NEVER (GO TO QUESTION 136)
- 1-6 times per year
- 7-11 times per year
- 1 time per month
- 2-3 times per month
- 1 time per week
- 2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 or more times per day

135a. Each time you ate **other candy**, how much did you usually eat?

- Fewer than 2 pieces
- 2 to 6 pieces
- More than 6 pieces

Question 136 appears on the next page



Over the past 12 months...

136. How often did you eat **eggs, egg whites, or egg substitutes** (NOT counting eggs in baked goods or desserts)? *(Please include eggs in salads, quiche, soufflés, and sandwiches.)*

NEVER (GO TO QUESTION 137)

- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

136a. Each time you ate **eggs**, how many did you usually eat?

- 1 egg  
 2 eggs  
 3 or more eggs

136b. How often were the eggs you ate **egg substitutes or egg whites only**?

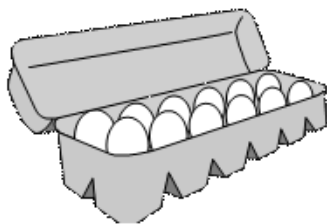
- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

136c. How often were the eggs you ate **regular whole eggs**?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

136d. How often were the eggs you ate **cooked in oil, butter, or margarine**?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always



Question 137 appears in the next column

136e. How often were the eggs you ate part of **egg salad**?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

137. How many cups of **coffee**, caffeinated or decaffeinated, did you drink? *(Please do not include coffee drinks such as Latte, Mocha, Cappuccino, or Frappuccino.)*

NONE (GO TO QUESTION 138)

- |  |   |
|--|---|
| <input type="checkbox"/> Less than 1 cup per month | <input type="checkbox"/> 5-6 cups per week      |
| <input type="checkbox"/> 1-3 cups per month        | <input type="checkbox"/> 1 cup per day          |
| <input type="checkbox"/> 1 cup per week            | <input type="checkbox"/> 2-3 cups per day       |
| <input type="checkbox"/> 2-4 cups per week         | <input type="checkbox"/> 4-5 cups per day       |
|  | <input type="checkbox"/> 6 or more cups per day |

137a. How often was the coffee you drank **decaffeinated**?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

138. How often did you drink **coffee drinks**, such as **Latte, Mocha, Cappuccino, or Frappuccino** (including caffeinated or decaffeinated, hot or cold)?

NEVER (GO TO QUESTION 139)

- |   |  |
|---|--|
| <input type="checkbox"/> Less than 1 time per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1-3 times per month        | <input type="checkbox"/> 2-3 times per day       |
| <input type="checkbox"/> 1 time per week            | <input type="checkbox"/> 4-5 times per day       |
| <input type="checkbox"/> 2-4 times per week         | <input type="checkbox"/> 6 or more times per day |
| <input type="checkbox"/> 5-6 times per week         |  |

138a. Each time you drank **coffee drinks**, how much did you usually drink?

- Less than 8 ounces (250 ml)  
 8 to 16 ounces (250 to 500 ml)  
 More than 16 ounces (more than 500 ml)

138b. How often were the coffee drinks you drank **decaffeinated**?

- Almost never or never  
 About ¼ of the time  
 About ½ of the time  
 About ¾ of the time  
 Almost always or always

Question 139 appears on the next page



Over the past 12 months...

139. How many glasses, cans, or bottles of **COLD** or **ICED** tea, caffeinated or decaffeinated, did you drink?

- NONE (GO TO QUESTION 140)
- Less than 1 glass, can or bottle per month
- 1-3 glasses, cans or bottles per month
- 1 glass, can or bottle per week
- 2-4 glasses, cans or bottles per week
- 5-6 glasses, cans or bottles per week
- 1 glass, can or bottle per day
- 2-3 glasses, cans or bottles per day
- 4-5 glasses, cans or bottles per day
- 6 or more glasses, cans or bottles per day

139a. How often was the cold or iced tea you drank **decaffeinated** or **herbal**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

139b. How often was the cold or iced tea you drank **presweetened** with **sugar** or **artificial sweeteners** (such as Splenda, Equal, Sweet'N Low, or others)?

- Almost never or never (GO TO QUESTION 140)
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

139c. What kind of **sweetener** was added to your presweetened cold or iced tea most of the time?

- Sugar or honey
- Artificial sweeteners (such as Splenda, Equal, Sweet'N Low, or others)

Question 140 appears in the next column

140. How many cups of **HOT** tea, caffeinated or decaffeinated (including herbal), did you drink?

- NONE (GO TO QUESTION 141)
- Less than 1 cup per month
- 1-3 cups per month
- 1 cup per week
- 2-4 cups per week
- 5-6 cups per week
- 1 cup per day
- 2-3 cups per day
- 4-5 cups per day
- 6 or more cups per day

140a. How often was the hot tea you drank **herbal**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

140b. How often was the hot tea you drank **green** tea?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

140c. How often was the hot black tea and/or the green tea you drank **decaffeinated**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

141. Over the past 12 months, did you add **sugar**, **honey** or **other sweeteners** to your tea or coffee (hot or iced)?

- NO (GO TO QUESTION 142)
- YES

141a. How often did you add **sugar** or **honey** to your coffee or tea (hot or iced)?

- Almost never or never (GO TO QUESTION 141c)
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

Question 141c appears on the next page

Question 142 appears on the next page



Over the past 12 months...

141b. Each time **sugar** or **honey** was added to your coffee or tea, how much was usually added?

- Less than 1 teaspoon
- 1 to 3 teaspoons
- More than 3 teaspoons

141c. How often did you add **artificial sweetener** (such as Splenda, Equal, Sweet'N Low, or others) to your coffee or tea?

- Almost never or never (GO TO QUESTION 142)
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

141d. What kind of **artificial sweetener** did you usually use?

- Equal, NutraSweet, or aspartame
- Sweet'N Low or cyclamate
- Splenda or sucralose
- Hermetas or saccharin
- Herbal sweeteners like Stevia

141e. Each time **artificial sweetener** was added to your coffee or tea, how much was usually added?

- Less than 1 packet or less than 1 teaspoon
- 1 packet or 1 teaspoon
- More than 1 packet or more than 1 teaspoon

142. Over the past 12 months, did you add **whiteners** (such as cream, milk, or non-dairy creamer) to your tea or coffee?

- NO (GO TO QUESTION 143)
- YES

142a. How often was **non-dairy creamer** added to your coffee or tea?

- Almost never or never (GO TO QUESTION 142d)
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

Question 142d appears in the next column

Question 143 appears on the next page

142b. Each time **non-dairy creamer** was added to your coffee or tea, how much was usually used?

- Less than 1 teaspoon
- 1 to 3 teaspoons
- More than 3 teaspoons

142c. What kind of **non-dairy creamer** did you usually use?

- Regular powdered
- Low-fat or fat-free powdered
- Regular liquid
- Low-fat or fat-free liquid

142d. How often was **cream** or **half and half** added to your coffee or tea?

- Almost never or never (GO TO QUESTION 142f)
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

142e. Each time **cream** or **half and half** was added to your coffee or tea, how much was usually added?

- Less than 1 tablespoon
- 1 to 2 tablespoons
- More than 2 tablespoons

142f. How often was **milk** added to your coffee or tea?

- Almost never or never (GO TO QUESTION 143)
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

142g. Each time **milk** was added to your coffee or tea, how much was usually added?

- Less than 1 tablespoon
- 1 to 3 tablespoons
- More than 3 tablespoons

142h. What kind of **milk** was usually added to your coffee or tea?

- Whole milk
- 2% milk
- 1% milk
- Skim, nonfat, or 0.5% fat milk
- Evaporated or condensed (canned) milk
- Soy milk
- Rice milk
- Almond milk
- Other

Question 143 appears on the next page



Over the past 12 months...

143. How often was **sugar** or **honey** added to foods you ate (such as on cereal, fruit, or yogurt)? (*Please do not include sugar in coffee, tea, other beverages, or baked goods.*)

- NEVER (GO TO INTRODUCTION TO QUESTION 144)
- |  |  |
|--|--|
| <input type="checkbox"/> 1-6 times per year  | <input type="checkbox"/> 2 times per week        |
| <input type="checkbox"/> 7-11 times per year | <input type="checkbox"/> 3-4 times per week      |
| <input type="checkbox"/> 1 time per month    | <input type="checkbox"/> 5-6 times per week      |
| <input type="checkbox"/> 2-3 times per month | <input type="checkbox"/> 1 time per day          |
| <input type="checkbox"/> 1 time per week     | <input type="checkbox"/> 2 or more times per day |

143a. Each time **sugar** or **honey** was added to foods you ate, how much was usually added?

- Less than 1 teaspoon  
 1 to 2 teaspoons  
 More than 2 teaspoons

The following questions are about the kinds of margarine, mayonnaise, sour cream, cream cheese, and salad dressing that you ate. If possible, please check the labels of these foods to help you answer.

144. Over the past 12 months, did you eat **margarine**?

- NO (GO TO QUESTION 145)  
 YES

144a. How often was the margarine you ate **light** or **low-fat** (stick or tub)?

- Almost never or never  
 About 1/4 of the time  
 About 1/2 of the time  
 About 3/4 of the time  
 Almost always or always

145. Over the past 12 months, did you eat **butter**?

- NO (GO TO QUESTION 146)  
 YES

145a. How often was the butter you ate **light** or **low-fat**?

- Almost never or never  
 About 1/4 of the time  
 About 1/2 of the time  
 About 3/4 of the time  
 Almost always or always

Question 146 appears in the next column

146. Over the past 12 months, did you eat **mayonnaise** or **mayonnaise-type dressing**?

- NO (GO TO QUESTION 147)  
 YES

146a. How often was the mayonnaise you ate **light**, **low-fat** or **fat-free**?

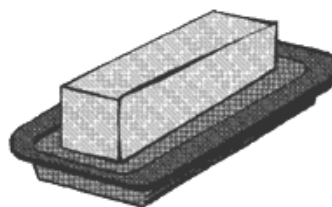
- Almost never or never  
 About 1/4 of the time  
 About 1/2 of the time  
 About 3/4 of the time  
 Almost always or always

147. Over the past 12 months, did you eat **sour cream**?

- NO (GO TO QUESTION 148)  
 YES

147a. How often was the sour cream you ate **light**, **low-fat**, or **fat-free**?

- Almost never or never  
 About 1/4 of the time  
 About 1/2 of the time  
 About 3/4 of the time  
 Almost always or always



148. Over the past 12 months, did you eat **cream cheese**?

- NO (GO TO QUESTION 149)  
 YES

148a. How often was the cream cheese you ate **light**, **low-fat**, or **fat-free**?

- Almost never or never  
 About 1/4 of the time  
 About 1/2 of the time  
 About 3/4 of the time  
 Almost always or always

Question 149 appears on the next page



Over the past 12 months...

149. Did you eat **salad dressing**?

- NO (GO TO INTRODUCTION TO QUESTION 150)
- YES

149a. How often was the salad dressing you ate **light, low-fat, or fat-free**?

- Almost never or never
- About ¼ of the time
- About ½ of the time
- About ¾ of the time
- Almost always or always

The following two questions ask you to summarize your usual intake of vegetables and fruits. Please do not include salads, potatoes, or juices.

150. Over the past 12 months, how many servings of **vegetables** (not including salad or potatoes) did you eat per week or per day?

- |   |  |
|---|--|
| <input type="checkbox"/> Less than 1 per week | <input type="checkbox"/> 2 per day         |
| <input type="checkbox"/> 1-2 per week         | <input type="checkbox"/> 3 per day         |
| <input type="checkbox"/> 3-4 per week         | <input type="checkbox"/> 4 per day         |
| <input type="checkbox"/> 5-6 per week         | <input type="checkbox"/> 5 or more per day |
| <input type="checkbox"/> 1 per day            |  |

151. Over the past 12 months, how many servings of **fruit** (not including juices) did you eat per week or per day?

- |   |  |
|---|--|
| <input type="checkbox"/> Less than 1 per week | <input type="checkbox"/> 2 per day         |
| <input type="checkbox"/> 1-2 per week         | <input type="checkbox"/> 3 per day         |
| <input type="checkbox"/> 3-4 per week         | <input type="checkbox"/> 4 per day         |
| <input type="checkbox"/> 5-6 per week         | <input type="checkbox"/> 5 or more per day |
| <input type="checkbox"/> 1 per day            |  |

152. Over the past month, which of the following foods did you eat **AT LEAST THREE TIMES**? (*Mark all that apply.*)

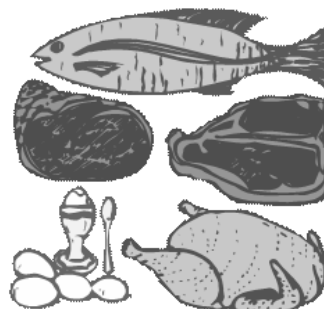
- |   |   |
|---|---|
| <input type="checkbox"/> Avocado, guacamole                                   | <input type="checkbox"/> Game Meat (such as bison, wild goose, venison) |
| <input type="checkbox"/> Beef jerky   | <input type="checkbox"/> Granola bars                                   |
| <input type="checkbox"/> Cheesecake   | <input type="checkbox"/> Hot peppers                                    |
| <input type="checkbox"/> Chocolate, fudge, or butterscotch toppings or syrups | <input type="checkbox"/> Jell-O, gelatin                                |
| <input type="checkbox"/> Chow mein noodles                                    | <input type="checkbox"/> Mangoes  |
| <input type="checkbox"/> Croissants   | <input type="checkbox"/> Olives   |
| <input type="checkbox"/> Dark chocolate                                       | <input type="checkbox"/> Pickles or pickled vegetables or fruit         |
| <input type="checkbox"/> Dried apricots                                       | <input type="checkbox"/> Plantains                                      |
| <input type="checkbox"/> Dried curcumin, turmeric                             | <input type="checkbox"/> Pork neck bones, hock, head, feet              |
| <input type="checkbox"/> Dried oregano, rosemary, thyme                       | <input type="checkbox"/> Pudding or custard                             |
| <input type="checkbox"/> Egg rolls  | <input type="checkbox"/> Sushi  |
| <input type="checkbox"/> Fresh basil, cilantro, or parsley                    | <input type="checkbox"/> Veal, lamb                                     |
|   | <input type="checkbox"/> Whipped cream, regular                         |
|   | <input type="checkbox"/> Whipped cream, substitute                      |
|   | <input type="checkbox"/> NONE   |

153. For **ALL** of the past 12 months, have you followed any type of **vegetarian diet**?

- NO (GO TO INTRODUCTION TO QUESTION 154)
- YES

153a. Which of the following foods did you **TOTALLY EXCLUDE** from your diet? (*Mark all that apply.*)

- Meat (beef, pork, lamb, etc.)
- Poultry (chicken, turkey, duck, etc.)
- Fish and shellfish
- Eggs
- Dairy products (milk, cheese, etc.)



Introduction to Question 154 appears on the next page



The next questions are about your use of vitamin pills or other supplements.

154. Over the past 12 months, did you take any **multivitamins**, such as One-a-Day-, Centrum-, or Prenatal-type multivitamins (as pills, liquids, or packets)?

- NO (GO TO INTRODUCTION TO QUESTION 156)  
 YES

155. How often did you take **One-a-Day-, Centrum-, or Prenatal-type** multivitamins?

- Less than 1 day per month  
 1-3 days per month  
 1-3 days per week  
 4-6 days per week  
 Every day

155a. Did your **multivitamin** usually contain **minerals** (such as iron, zinc, etc.)?

- NO  
 YES  
 Don't know

155b. Was your **multivitamin** usually a **Prenatal-type**?

- NO  
 YES  
 Don't know

155c. For how many years have you taken **multivitamins**?

- Less than 1 year  
 1-4 years  
 5-9 years  
 10 or more years

155d. Over the past 12 months, did you take any **vitamins, minerals, or herbal supplements** other than your multivitamin?

- NO

**Thank you very much for completing this questionnaire! Because we want to be able to use all the information you have provided, we would greatly appreciate it if you would please take a moment to review each page making sure that you:**

- Did not skip any pages and
- Crossed out the incorrect answer and circled the correct answer if you made any changes.

- YES (GO TO INTRODUCTION TO QUESTION 156)

Introduction to Question 156 appears in the next column

These last questions are about the vitamins, minerals, or herbal supplements you took that are **NOT** part of a One-a-Day-, Centrum-, or Prenatal-type of multivitamin.

Over the past 12 months...

156. How often did you take **Antacids that contain Calcium such as Tums or Rolaids**?

- NEVER (GO TO QUESTION 157)  
 Less than 1 day per month  
 1-3 days per month  
 1-3 days per week  
 4-6 days per week  
 Every day

156a. When you took **Antacids that contain Calcium such as Tums or Rolaids**, about how many tablets or lozenges did you take in one day?

- Less than 1  
 1  
 2  
 3  
 4 or more  
 Don't know

156b. Was your Antacid usually **extra strength**?

- NO  
 YES  
 Don't know

156c. For how many years have you taken **Antacids that contain Calcium such as Tums or Rolaids**?

- Less than 1 year  
 1-4 years  
 5-9 years  
 10 or more years

157. How often did you take **Calcium** (with or without Vitamin D) (**NOT** as part of a multivitamin in Question 155 or antacid in Question 156)?

- NEVER (GO TO QUESTION 158)  
 Less than 1 day per month  
 1-3 days per month  
 1-3 days per week  
 4-6 days per week  
 Every day

Question 158 appears on the next page





Over the past 12 months...

157a. When you took **Calcium**, about how much elemental calcium did you take in one day?  
(If possible, please check the label for elemental calcium.)

- Less than 500 mg
- 500-599 mg
- 600-999 mg
- 1,000 mg or more
- Don't know

157b. Did your **Calcium** usually contain **Vitamin D**?

- NO
- YES
- Don't know

157c. Did your **Calcium** usually contain **Magnesium**?

- NO
- YES
- Don't know

157d. Did your **Calcium** usually contain **Zinc**?

- NO
- YES
- Don't know

157e. For how many years have you taken **Calcium**?

- Less than 1 year
- 1-4 years
- 5-9 years
- 10 or more years

158. How often did you take **Vitamin D** on its own or as part of a calcium supplement (**NOT** as part of a multivitamin in Question 155)?

- NEVER (GO TO QUESTION 159)
- Less than 1 day per month
- 1-3 days per month
- 1-3 days per week
- 4-6 days per week
- Every day

158a. When you took **Vitamin D**, about how much did you take in one day?

- Less than 400 IU
- 400-799 IU
- 800-999 IU
- 1,000 IU or more
- Don't know

Question 159 appears in the next column

158b. For how many years have you taken **Vitamin D**?

- Less than 1 year
- 1-4 years
- 5-9 years
- 10 or more years

159. How often did you take **Iron** (**NOT** as part of a multivitamin in Question 155)?

- NEVER (GO TO QUESTION 160)
- Less than 1 day per month
- 1-3 days per month
- 1-3 days per week
- 4-6 days per week
- Every day

159a. For how many years have you taken **Iron**?

- Less than 1 year
- 1-4 years
- 5-9 years
- 10 or more years

160. How often did you take **Folic Acid** (**NOT** as part of a multivitamin in Question 155)?

- NEVER (GO TO QUESTION 161)
- Less than 1 day per month
- 1-3 days per month
- 1-3 days per week
- 4-6 days per week
- Every day

160a. When you took **Folic Acid**, about how much did you take in one day?

- Less than 0.4 mg
- 0.4-0.9 mg
- 1.0 mg
- More than 1.0 mg
- Don't know

160b. For how many years have you taken **Folic Acid**?

- Less than 1 year
- 1-4 years
- 5-9 years
- 10 or more years

Question 161 appears on the next page



**Over the past 12 months...**

161. How often did you take **Vitamin C** (**NOT** as part of a multivitamin in Question 155)?

- NEVER (GO TO QUESTION 162)
- Less than 1 day per month
- 1-3 days per month
- 1-3 days per week
- 4-6 days per week
- Every day

161a. When you took **Vitamin C**, about how much did you take in one day?

- Less than 500 mg
- 500-999 mg
- 1,000-1,499 mg
- 1,500-1,999 mg
- 2,000 mg or more
- Don't know

161b. For how many years have you taken **Vitamin C**?

- Less than 1 year
- 1-4 years
- 5-9 years
- 10 or more years

162. How often did you take **Vitamin E** (**NOT** as part of a multivitamin in Question 155)?

- NEVER (GO TO INTRODUCTION TO QUESTION 163)
- Less than 1 day per month
- 1-3 days per month
- 1-3 days per week
- 4-6 days per week
- Every day

162a. When you took **Vitamin E**, about how much did you take in one day?

- Less than 400 IU
- 400-799 IU
- 800-999 IU
- 1,000 IU or more
- Don't know

162b. For how many years have you taken **Vitamin E**?

- Less than 1 year
- 1-4 years
- 5-9 years
- 10 or more years

Introduction to Question 163 appears in the next column

**The next two questions ask you about other supplements you took more than once per week.**

163. Please mark any of the following **single supplements** you took more than once per week (**NOT** as part of a multivitamin in Question 155):

- |  |   |
|--|---|
| <input type="checkbox"/> B-6           | <input type="checkbox"/> Occu-vite/Eye health |
| <input type="checkbox"/> B-complex     | <input type="checkbox"/> Potassium            |
| <input type="checkbox"/> B-12          | <input type="checkbox"/> Selenium             |
| <input type="checkbox"/> Beta-carotene | <input type="checkbox"/> Vitamin A            |
| <input type="checkbox"/> Magnesium     | <input type="checkbox"/> Zinc                 |

164. Please mark any of the following **herbal, botanical, or other supplements** you took more than once per week.

- |   |   |
|---|---|
| <input type="checkbox"/> Chondroitin        | <input type="checkbox"/> Ginseng            |
| <input type="checkbox"/> Coenzyme Q-10      | <input type="checkbox"/> Glucosamine        |
| <input type="checkbox"/> Echinacea          | <input type="checkbox"/> Peppermint         |
| <input type="checkbox"/> Energy supplements | <input type="checkbox"/> Probiotics         |
| <input type="checkbox"/> Fish oil/Omega-3's | <input type="checkbox"/> Red clover         |
| <input type="checkbox"/> Flaxseed oil       | <input type="checkbox"/> Saw palmetto       |
| <input type="checkbox"/> Garlic             | <input type="checkbox"/> Soy supplement     |
| <input type="checkbox"/> Ginger             | <input type="checkbox"/> Sports supplements |
| <input type="checkbox"/> Ginkgo biloba      | <input type="checkbox"/> St. John's wort    |
|   | <input type="checkbox"/> Other              |

165. Is there anything else you eat at least once a month? Please write name of food, frequency and amount (optional).

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