

# **The Changing Canadian Foodscape: Implications for Population Obesity**

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A Thesis Submitted to the Faculty of Graduate Studies

In Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

Faculty of Graduate Studies

Individual Interdisciplinary Program  
(Human Nutritional Sciences)

University of Manitoba

Winnipeg, Manitoba, Canada

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## Abstract

The main purpose of this research is to describe how social and economic structures operating at different scales of influence have an impact on population overweight and obesity, and become manifest at the individual level. A mixed methods approach was used in this series of studies which facilitated a cross-scale analysis of the ecology of overweight and obesity, through linking of data at the individual and structural levels. Study one employed a cross-sectional retrospective analysis of overweight, obesity and socio-demographic indicators for 8,970,590 Canadian adults (25-64 years) using the 2005 Canadian Community Health Survey. Study two analyzed the trajectory of the energy gap (energy imbalance) in the Canadian population from 1976 to 2003, its temporal relationship to adult obesity, and estimated the relative contribution of energy consumption and expenditure to the increasing energy gap. It also assessed which foods contributed the most to changes in energy consumption over the study period. Study three used grounded theory to examine the etiology of working mothers' food choice and food provisioning decisions. The research was informed by theoretical perspectives on the ecology of obesity, embodiment and structuration. The results of this series of studies show that:

1. There are significantly higher rates of overweight and obesity in some Canadian sub-populations. Despite these differences, the prevalence of overweight and obesity is very high in all socio-demographic groups, and focusing prevention interventions in the sub-populations with higher rates would do little to decrease overall population prevalence.
2. The energy gap in Canada has widened significantly in the past two decades along with population rates of obesity. Increased energy available through the food supply is a more important driver of obesity than decreased levels of physical activity.
3. Employed mothers, who are primarily responsible for family food, frequently make poor nutritional choices for themselves and their families which increase the risk of developing poor nutritional outcomes such as overweight and obesity. Despite their desire to provide more healthy food for their family, their decisions make sense in the context of their busy lives. Their actions are pragmatic and rational, and reinforced through an obesogenic environment which includes the industrial food system; social norms; and working conditions. This environment is dynamically co-created through their individual actions.

This research concludes that influences at multiple scales create an obesogenic environment that affects the vast majority Canadians. Of particular importance are: the structure of the industrial food system (ubiquitous availability of calorie-dense processed, convenience foods); changing social norms regarding food; and working conditions. For this reason, public health interventions that focus only on education to improve lifestyle behaviours will do little to improve health outcomes, including overweight and obesity. Strategies need to focus on structural influences such as improving: food environments; social norms regarding gender, families and food; and working conditions.

## **Acknowledgements**

I would like to gratefully acknowledge all those who assisted and supported me in the process of conducting my dissertation research.

To my advisor, Dr. Gustaaf Sevenhuysen, for so capably chairing my PhD committee, for continuing to explore with me the possibilities of community nutrition, and permitting me the freedom to be self-directed during this scholarly venture.

To Dr. Barry Edginton, for serving on my PhD committee, for introducing me to sociology and challenging me with theoretical ideas and concepts, for pushing me to improve my writing skills, and sharing dozens of cinnamon buns and great conversation.

To Dr. John O'Neil for serving on my PhD committee, for teaching me that there are many ways to look at the world, and that academics have an essential role in shaping the discourse of important social issues.

To Drs. Keith Fowke and Lawrence Elliott for taking a chance that a nutritionist had something to contribute to the "Infectious Minds" training program.

To Dr. James Blanchard, for engaging with me in challenging "public health" conversations, and providing a supportive and flexible work environment to complete this dissertation.

To the University of Manitoba, the Manitoba Health Research Council, the Canadian Institutes of Health Research and International Centre for Infectious Diseases, and Dr. Marian Campbell for on-going financial support during my doctoral studies.

To my husband, Chris Green, for his undying patience, selflessness and support, without which I could never have completed this work.

To my children, Kate and Jesse, who continue to remind me of what is really important, and were always able to find something to do when mom "had to work."

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# Chapter 1

## Introduction

### **I. Statement of the Problem**

Overweight and obesity have emerged as major public health issues in many countries, including Canada (1;2). The World Health Organization estimates that globally, more than 1 billion adults are overweight or obese (3) and consider the situation an epidemic. In 2003, 48.2% of Canadian adults were overweight, with 14.9% classified as obese (4). This is a significant increase over 18 years. In 1985, 32.1% of Canadian adults were overweight, with only 5.6% classified as obese (2). This trend is not limited to adults, as Canadian children have also become progressively overweight in recent decades. New measured estimates for children age 2-17 show that overweight and obesity combined have increased from 15% in 1978/79 to 26% in 2004 (5).

Despite this rapid increase in population body weights, there has been little success with prevention and treatment strategies for overweight and obesity (6-8). While it is widely accepted that energy (caloric) imbalance is the primary cause of excess body fat mass (9), effective strategies to positively influence energy balance have been elusive. This may be in part because the majority of these initiatives have been focused at the individual level, where personal behaviour change is the targeted goal (8;10;11). Individual behaviour change may indeed be a desirable outcome; however attempts to intervene in the obesity epidemic must also factor in the effects of environmental influences which appear to play a significant role in the development of overweight and obesity. These include the availability and composition of foods for consumption;

population dietary patterns; dominant social norms regarding food and eating; population physical activity patterns; socio-economic disparities; as well as factors acting geographically at the neighborhood and regional levels. An understanding of the dynamic relationship between environmental influences, in particular the changing food environment, or “foodscape” (12), and individual level influences on obesity is critically important for the planning and implementation of effective public health intervention strategies.

## **II. Purpose of Study and Methodological Approach**

The purpose of this research is to describe how factors that have an impact on population overweight and obesity operating at different scales of influence manifest themselves at the individual level. This body of research uses a mixed methods approach that allows for the collection, analysis of and mixing of both quantitative and qualitative data in a series of studies. By bridging the “quantitative vs. qualitative” divide, this methodology produces a more comprehensive understanding of a research problem than by using either approach alone (13). A mixed methods approach is well-suited for problem-centred inquiry and allows researchers to draw from both quantitative and qualitative assumptions in their research (14). Using a mixed methods approach in this study facilitates flexible cross-scale exploration of the ecology of overweight/obesity, by collecting and integrating empirical data on the micro through to macro level forces impacting the epidemic.

The main objectives of this research are:

- a. To identify the socio-demographic and geographic factors associated with variability in overweight and obesity rates across Canada, and assess the public health significance of observed variability.
- b. To describe the current structure of the Canadian food supply and its relationship to the growing energy gap in the Canadian population.
- c. To assess how individual food choice and provisioning decisions of individuals are shaped by larger structural influences, and how, in turn, these actions contribute to shaping the larger food and social environment.

### **III. Organization of the Thesis**

The body of this thesis consists of three papers written in publishable format. The papers are:

1. **Socio-demographic and geographic analysis of overweight and obesity in Canadian adults: Is everyone at risk?** This cross-sectional, retrospective study models the socio-demographic and geographic patterns of overweight and obesity in the Canadian adult population.
2. **The growing Canadian energy gap: More the can than the couch?** This ecological study examines the temporal relationship between increasing obesity rates and the increase in per capita energy (kilocalorie) consumption, including analysis of which food commodities are contributing to increased energy consumption. The study also analyzes the relationship between population estimated energy requirements (EER) and energy consumption, and their contribution to the energy gap.

3. **Notes from the corporate kitchen: Working mothers' experiences of food choice and provisioning.** The third study uses a qualitative, grounded theory methodology to explore the complex etiology of working mothers' food choice and provisioning behaviours. This includes an examination of larger structural influences on women's food decisions, and how their actions dynamically influence these structures.

Together, these research studies create an in-depth picture of the complex relationship between growing population overweight and obesity, individual food behaviours and the larger social forces influencing those behaviours. The thesis document also contains an overarching theoretical approach, literature review, discussion and a common bibliography.

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## **Chapter 2**

### **Literature Review**

#### **I. Assessing Overweight/Obesity in Canada**

The following section will describe methods used to measure the prevalence of overweight/obesity in Canada, and trends across time and space. In addition, methods for modeling overweight/obesity against individual and ecological predictors of overweight/obesity will be discussed.

Descriptive epidemiological methods can be used to assess prevalence rates and trends (temporal and geographic) in population overweight/obesity. The standard measure used to assess individual body fat mass is Body Mass Index. This section will discuss methods used to calculate individual BMI as well as methods for measuring the prevalence of overweight/obesity in the Canadian population using BMI as a standard measure. It will also include a description of survey data sources that have measured population prevalence and trends in BMI, and the limitations of these data sources.

##### **i. Body Mass Index**

The accepted standard for measuring body fatness in large surveys is Body Mass Index (BMI). The BMI is defined as the ratio of body weight (in kilograms) to height squared (in metres), i.e.  $BMI = kg/m^2$ . It is commonly used as a measure of health status by classifying weight into health risk categories. The system is recommended for use among Canadian adults aged 18+, except for pregnant and lactating women (1). Great effort has been made to encourage all countries to adopt BMI as a standard measure of body fat mass for both adults and children (2;3). To facilitate cross-country

comparisons, an International Standard of classification using BMI has been established (see Table 1). Numerous studies have demonstrated increased health risks associated with these underweight, overweight and obese categories (3-5).

**Table 1. Body mass index: International standard**

<b>Underweight</b>	BMI < 18.5
<b>Acceptable Weight</b>	BMI 18.5-24.9
<b>Overweight</b>	BMI 25-29.9
<b>Obese</b>	BMI 30+

These BMI categories are not used for children and adolescents. Instead, BMI-for-age is plotted on gender specific growth charts developed by the Centers for Disease Control (6). Each of the BMI-for-age gender specific charts contains a series of curved lines indicating specific percentiles. The established percentile cutoff points to identify underweight and overweight in children are shown in Table 2.

**Table 2. Body mass index for children and adolescents**

<b>Underweight</b>	BMI-for-age < 5 <sup>th</sup> percentile
<b>At risk of overweight</b>	BMI-for age 85 <sup>th</sup> – 95 <sup>th</sup> percentile
<b>Overweight</b>	BMI for age ≥ 95 <sup>th</sup> percentile

There are several strengths to using BMI for measuring body fat mass. BMI can be calculated using either imperial or metric measures. Height and weight are relatively non-invasive and reliable measures to obtain from individuals, and can be collected in conjunction with other data as part of other surveys. Further, interviewers do not require extensive training or expert knowledge to measure height and weight.

The use of BMI also poses several limitations. First, the weight status of certain sub-groups may not be appropriately measured with BMI. BMI is not recommended for

young adults who have not reached full growth, adults who are naturally very lean, adults with a very muscular body build, and certain ethnic or racial groups. In addition, health risks by BMI may differ in seniors as compared to the general adult population. In seniors the “normal” or healthy range may begin slightly above BMI=18.5 and extend into the “overweight” range (BMI=25+). These limitations suggest that in some situations BMI should be used with caution when interpreting individual level data. However, for *population* purposes the current BMI classification system is useful and recommended for most population groups (1).

A second limitation is that the use of different BMI reporting cut-offs for categories of health risk often makes comparison of survey data difficult. Canadian surveys have used two standards to classify the BMI of adults, the International standard and the Canadian Standard. Table 3 shows the comparison between the two standards. Surveys conducted in Canada prior to 1994 used the Canadian standard. Surveys conducted after this time, including the National Population Health Survey and the Canadian Community Health Survey, have adopted the International standard, as recommended by the World Health Organization (3). This has allowed for comparison of reported Canadian BMI data with data reported from other countries. Fortunately, discrepancies in the use of reporting cut-offs can be reconciled by re-calculating data from earlier surveys (where available) to fit the International Standard.

**Table 3. Canadian vs. international standard for body mass index**

International Standard		Canadian Standard	
<b>Underweight</b>	BMI < 18.5	<b>Underweight</b>	BMI < 20
<b>Acceptable weight</b>	BMI 18.5-24.9	<b>Acceptable weight</b>	BMI 20-24.9
<b>Overweight</b>	BMI 25-29.9	<b>Some excess weight</b>	BMI 25 – 26.9
<b>Obese</b>	BMI 30+	<b>Overweight</b>	BMI 27+

A third limitation is that some surveys have used self-reported height and weight measures to calculate BMI. In Canada, national surveys assessing BMI have used both measured and self-reported height and weight. There is evidence that reactivity (i.e. reporting socially desirable results) is an important factor when collecting self-reported height and weight information, influencing the validity of this measure. Overweight and obesity are conditions that meet with low social approval, and people tend to underestimate their weight and overestimate their height (7). Reactivity is greater with telephone interviews than with in-person interviews (8). One Canadian study found that obesity rates doubled in the sample population (increasing to 30% of adults) when using direct measures compared with self-reported measures (9). At the same time, men typically do not weigh themselves regularly and may not know their actual weight when reporting it (8). This demonstrates the need for directly measured health data in Canada (10).

Despite these limitations, BMI is considered appropriate for measuring body fat mass and classifying individuals according to risk categories (1). The underreporting of weight with self-reported measures is a bias that is likely consistent over time, leading to a conservative estimate of overweight/obesity in the population. Despite this threat to validity, survey results can be used to observe population trends over time. For future Canadian Community Health Surveys, Statistics Canada will be collecting height and weight measures directly. This began in 2004 with cycle 2.2, which had a focus on nutrition.

## **ii. Measuring Prevalence and Trends**

Population prevalence of overweight/obesity can be estimated through surveys of individuals sampled from populations. Trends in overweight/obesity prevalence can be evaluated if surveys have been conducted at periodic intervals; they can also be evaluated across space if surveys have proportioned respondent data by specific geographic areas. Assessing population body weights is very expensive and time-consuming, and few researchers have the resources to collect primary data. Consequently, they rely on secondary data sources derived primarily from large population-level cross-sectional surveys conducted by the federal (and occasionally provincial) government. From the 1970's to the present<sup>1</sup>, a series of national surveys have collected measures of height and weight along with a host of other health-related variables (see Table 4). These surveys have not been part of a continuous surveillance process and were often mounted by different agencies, with different sample populations and sizes, and different methodologies. Some of the surveys collected direct measures of height and weight, while others relied on self-reported data. Data were collected both in-person and through telephone interviews. BMI has been reported using both Canadian and International standards. This has made analyzing trends in Canadian overweight/obesity particularly challenging (10). Attempts have been made by several researchers, however, to reconcile the data according to the International Standard of Body Mass Index, and with age-specific categories (11-14). This work has allowed for a rigorous and equitable comparison of survey results over time.

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<sup>1</sup> The Canadian Weight-Height Survey was conducted in 1953 with a sample size of 22,000. Height and weight were measured, but the original data no longer exists.

**Table 4. Canadian surveys collecting height and weight data**

<b>Survey</b>	<b>Year(s)</b>	<b>Height and Weight Data Collection Method</b>
Canadian Weight-Height Survey	1953	Measured (original data no longer available)
Nutrition Canada Survey	1971-1972	Measured
Canada Health Survey	1978-1979	Measured
Canada Fitness Survey	1981	Measured
Health Promotion Survey	1985,1990	Self-reported
General Social Surveys	1985,1991	Self-reported
Canada Heart Health Surveys	1986-1992	Measured
Campbell's Survey on the Well-being of Canadians	1988	Self-reported
National Longitudinal Study of Children and Youth	1996	Parental-reported
National Population Health Survey	1994,1996,1998	Self-reported
Canadian Community Health Survey	2000-01; 2003	Self-reported
Canadian Community Health Survey	2004	Measured
Canadian Community Health Survey	2005	Self-reported & measured

Macdonald and colleagues estimated prevalence of overweight/obesity in the Canadian adult population using a series of Canadian Heart Health Surveys conducted in 10 Canadian provinces between 1986 and 1992 (15). Trained nurses measured height and weight for all respondents drawn from a probability sample of 29,855 people. Data from the surveys were converted to BMI and aggregated to provide a national estimate of overweight/obesity prevalence. Age- and gender-specific results were reported, and results were standardized to the 1986 Canadian population.

Katzmarzyk assessed temporal trends in overweight/obesity prevalence by comparing data for adults across eight Canadian surveys conducted between 1953 and 1998 (16). The surveys used both measured and self-reported data collection. BMI data were not available for the 1953 survey (Canadian Weight-Height Survey) because the original data no longer exists, but data were available for the other seven surveys.

Estimates of stature and body mass from each survey were weighted using sample weights provided by each survey, and the 50<sup>th</sup> and 75<sup>th</sup> percentiles for height and weight were determined for all surveys and regressed on each survey year to quantify the temporal trends. Qualitative changes in the distribution of BMI were examined using Tukey mean-difference plots. Results were reported for both men and women.

Torrance, Hooper and Reeder assessed overweight/obesity in Canadian adults by analyzing national population-level data from 1970 to 1992 (12). International standards for BMI were used. They partitioned the surveys into two groups; surveys using self-reported measures and surveys using in-person measures of height and weight. The in-person surveys resulted in higher estimates of overweight/obesity than the self-reported surveys, however both groups showed an increase over time.

Tremblay, Katzmarzyk and Willms used three nationally representative cross-sectional surveys to assess temporal changes in BMI for both Canadian adults and children between 1981 and 1996 (14). International standards for BMI were used for both adults and children. Reported results were age- and gender-specific for both children and adults.

All of the above studies generated results indicating a steady temporal increase in overweight/obesity in Canada over several decades for both children and adults. The rate of increase in overweight/obesity was observed to be more rapid in children than in adults.

Several authors have examined geographic variability in overweight/obesity. Willms, Tremblay and Katzmarzyk assessed geographic variations in the rate of overweight/obesity in Canadian children (17). Two nationally-representative cross-



sectional surveys were used to estimate the prevalence of overweight and obesity among boys and girls ages 7 to 13 years, from 1981 to 1996. Data were analyzed by province, and adjusted for age and sex. Study results demonstrated that while rates of overweight and obesity increased for all children in Canada, the rate of increase varied geographically, with the Atlantic provinces experiencing the greatest increase.

Vanasse and colleagues compared regional obesity rates across Canadian health region geographies. Heights and weights were self-reported. They demonstrated significant variability from a low rate of 6.2% in Vancouver to 46.5% in Aboriginal geographies (18).

### **iii. Modeling Overweight/Obesity in the Canadian Population**

Prevalence data can be modeled statistically to demonstrate relationships between overweight/obesity and a variety of predictor variables measured at the ecological or individual level. These variables can include a variety of socio-demographic indicators such as age, gender, socio-economic status, ethnic background and household family structure.

Cairney and Wade examined the relationship between socio-demographic factors, lifestyle behaviours, and body weight (19). They used the 1994 National Population Health Survey and conducted secondary data analysis. Logistic regression was used to model BMI against age, gender, marital status, education, income adequacy, occupation, region and birthplace, smoking and alcohol consumption. The study demonstrated that BMI was significantly graded by most socio-demographic and lifestyle variables.

Also using logistic regression, Willms, Tremblay and Katzmarzyk assessed the relationship of income and family background to BMI in Canadian children (17). Several

variables were demonstrated to be protective against overweight/obesity including high family income, high level of paternal education, and small family size. The authors also found that variability in overweight/obesity over time was greater than variability across geography or demographic groupings.

Vanasse and colleagues modeled low level of leisure-time physical activity and low fruit and vegetable consumption against obesity across Canadian geographies. Both variables were shown to be good predictors of high rates of obesity (18).

Modeling variables for their relationship to overweight/obesity provides insights into the important predisposing factors associated with overweight/obesity. These factors can then be explored for their role in developing appropriate preventive policies and programs.

## **II. Methods for Assessing Dietary Intake**

There are several methods for estimating food and nutrient consumption in populations. Information from a variety of methods can contribute to the development of a dietary pattern for individuals and/or groups. A dietary pattern is characterized by consumption of a variety of foods with complex combinations of nutrients (20). It also considers food groupings, where food is purchased and consumed, what format the food is in, influences on food choice and consumer behaviours, attitudes and knowledge related to diet and health (21). The three methods most relevant to epidemiological studies of dietary pattern are individual dietary assessment, food disappearance surveys and household food expenditure surveys. A fourth source of data comes from industry surveys on production and sales of food products. These will be reviewed below, followed by a brief discussion of estimating trends in population energy intakes.

**i. Individual Dietary Assessment**

Estimating the food and nutrient intakes of individuals requires the use of a variety of dietary assess methods. Each method has a particular function and data are limited to certain uses. Dietary surveys usually employ a combination of methods including 24-hour recalls, food diaries and semi-quantitative food frequency questionnaires. Selection of the assessment method(s) will depend on the population being studied, financial and human resources available, and end-use of the data. Large dietary survey data are typically used to compare dietary intakes and related health outcomes between populations, and between population sub-groups (22).

Individual dietary surveys would provide a cornerstone of any national nutrition monitoring and surveillance system if conducted on a regular basis using a nationally representative sample. Unfortunately, however, the high cost of these surveys has prohibited their implementation in many countries (23). Canada is no exception. The last nationally representative nutrition survey, the Nutrition Canada Survey, was conducted in 1970-72 (24). Since then, four provincial surveys have been completed in Ontario, Manitoba, Nova Scotia and Quebec. These surveys cannot be considered nationally representative, and they did not use the same dietary assessment instruments, making comparisons between provinces difficult.

The first two cycles of the Canadian Community Health Survey (1.1 in 2000-01 and 2.1 in 2003) asked a small number of questions regarding fruit and vegetable consumption. The CCHS is conducted by Statistics Canada to provide regular cross-sectional estimates of health determinants, health status and health system utilization for 136 health regions across Canada (25). The sample size was 130,000 and respondents

were asked about the number of times per day that they ate fruit and vegetables. Respondents were not asked about quantities of food consumed, only frequency of consumption (26). Cycle, 2.2 had a smaller sample of 30,000 and focused on nutrient intake, using the 24-hour recall method. Results were released in June 2005. Unfortunately this is a “one-time” survey and there is no commitment to on-going surveillance of nutrition in Canada (8). One shortcoming of the CCHS is that, while considered “nationally representative”, it does not sample from First Nations reserve communities or members of the Canadian Armed Forces.

A major limitation of individual dietary assessment using self-reported methods is potential underreporting of food intake. This has been demonstrated in several studies that found up to 500 kcal per day discrepancy (7;27;28). This is a serious threat to validity when performing correlation studies of dietary composition and health outcomes such as overweight/obesity. The degree of underreporting is in some instances related to Body Mass Index (BMI), i.e. the higher the BMI, the greater the underreporting, resulting in a flat slope structure. Researchers have demonstrated that individuals underreport intake of “unhealthy” foods, and that underreporting increases with increased Body Mass Index (7;28). Data gathered through this method is still considered useful and appropriate to use in aggregated form (22).

## **ii. Food Disappearance Surveys (Food Balance Sheets)**

Another method for assessing dietary trends is the use of food disappearance surveys, also known as food balance sheets. Many countries, including Canada, collect data on “apparent per capita food consumption” which is recorded on food balance sheets. In Canada, this information has been collected and reported since 1960. It is

updated annually and is available electronically in the program “FoodStats” published by Statistics Canada (29). These data are referred to as “disappearance” or “consumption” data, and represent the “residual” food available for purchase by the Canadian population within the calendar year, prior to the retail level (i.e. after the manufacturing/processing stage).

The “residual” food data are obtained using a supply-disposition method. Beginning stocks are determined on January 1 through farm surveys, production/manufacturing reports and import/export data. Ending stocks are measured on December 31, deducting remaining stocks, exports, manufacturing uses, livestock feed, and waste (loss in processing and storage) from the beginning supply. The waste factors do not allow for losses in retail stores, households, private institutions or restaurants. This would include spoilage of fresh produce and other perishable foods, damaged goods, and goods lost during transportation.

The per capita values are determined using the Canadian population at July 1 for the determinate year. Figures are reported in units relevant to the particular food or food group (e.g. soft drinks: litres/person/year; potatoes: kilograms/person/year).

Although Statistics Canada titles the report “Food Consumption in Canada” it is important to note that these figures do not represent actual quantities of food consumed, but rather what is *available for purchase* by the population at the retail level. In the database “FoodStats,” foods are reported by “disappearance,” for example:

*apples fresh – disappearance – retail weight (kg/person).*

These data, in fact, overestimate consumption and, as indicated, do not account for food wasted in retail stores, households, private institutions or restaurants. It is estimated

that this “wastage” represents an overestimation of approximately 25-30 percent (30). In 2003, Statistics Canada began modeling actual quantities of food consumed by accounting for wastage at retail, household, cooking and plate levels. A new reporting category, “consumed”, has been introduced retrospectively to 1960.

Since 1976 Statistics Canada has also calculated estimates of nutrients, which disappear correspondingly with the food supply. These include energy (kilocalories), fat, carbohydrate and protein along with a variety of micronutrients. Statistics Canada estimates the per capita amount of each type of nutrient consumed on a daily basis. These estimates are derived by applying nutritional equivalent factors to the per capita retail weight of each food/food category, then adjusting for losses at the retail and consumer levels. The resulting values are estimates of the amounts of nutrients “consumed” per capita (31).

Several factors limit the use of disappearance/consumption data. Values are derived on a per capita basis using the entire Canadian population in any given year, making it impossible to estimate consumption for sub-sets of the population (e.g. specific age groups, ethnic groups, income groups, geographic regions). The inability to break down consumption by age group provides a particular challenge when attempting to link energy and nutrient levels with other data such as health and disease trends, socio-environmental indicators (e.g. income) or other nutrition surveys.

The data do not track foods produced and consumed outside commercial food activities, such as food obtained through hunting and fishing, home gardening, and gathering wild fruits and berries. This could lead to a bias in the data, where meat, fish, vegetables, and to some extent fruits, are consistently underestimated in the total supply.

Disappearance data provide information on primarily “raw” and minimally processed foods. This makes it difficult to track trends in the many value-added foods available in the marketplace. There are thousands of new food products introduced every year which are not directly reflected in the disappearance food categories. For example, FoodStats reports disappearance data on both “breakfast food” and “cereal products” but not the specific types of breakfast foods. Consequently, if researchers were attempting to assess changes in availability of highly sweetened, low-fibre breakfast cereals marketed to children, they would be unable to do so using only disappearance data.

Despite these limitations, food disappearance data are an important contribution to monitoring the dietary pattern of Canadians. The data can be analyzed to ascertain the nutrient profiles of different food categories and how these change over time. Also, the consistency in methodology and duration of the data collection (since 1960) allow for good comparison at a population level. The data also provides a context for examining other trends such as food purchasing habits, restaurant use, food preparation and individual food and nutrient intakes. These data sources aggregate to form an overall picture of the Canadian dietary pattern, of which the disappearance data are a key component.

### **iii. Household Food Expenditure Surveys**

Statistics Canada conducts the “Food Expenditure Survey” every two years using a voluntary sample survey (32). It is a supplement to the “Survey of Household Spending” and provides more detailed information on food expenditure. The most recent data are for 2001, which were released in 2003. The stratified, multi-stage sample was selected from another Statistics Canada survey sampling frame (Labour Force Survey).

The survey covered more than 98% of the population, however some groups were excluded such as individuals living on First Nations reserves or in institutional facilities, and members of the Armed Forces.

Two data collection instruments were used: 1) a questionnaire on socio-demographic characteristics plus eating habits (i.e. information on the household's purchasing habits and food expenditures if away from home overnight during the previous month) and 2) two weekly diaries to record what types of food are purchased and from where (e.g. type of restaurant, store, how much money spent) and where the foods were eaten (excluding those while on a trip overnight or longer). Starting in 2001, participants were asked to attach grocery store receipts to their diaries. This was to help identify certain food commodities or find unreported weights. The Household Food Expenditure survey has been conducted since 1953, however data are available electronically only since 1984.

Household food surveys tend to overestimate consumption of bread, potatoes, pulses, vegetables, fruit, milk and vegetable oils compared with individual dietary surveys (23). This may be due to food being purchased, but not consumed or stored in the home longer than the survey time period (30). The reporting of how much money is spent on food may not reflect how much food is actually consumed, because some food may be wasted. Household food losses occur due to over-purchasing, over-preparation, cooking losses, plate waste, spoiled leftovers, breakage, spillage, and package failure (33). A further limitation of this data is the collection and reporting at the household level. This makes it difficult to link dietary intakes with other individual characteristics such as health outcomes.



In spite of these limitations household food expenditure information is valuable for examining dietary trends because data are collected at regular time intervals using consistent methods. In addition to actual foods purchased, this survey also elicits information on food habits such as where respondents purchase and consume food. The survey also collects important socio-demographic information, allowing for comparison of household income tertiles with food purchasing patterns.

#### **iv. Industry Surveys**

An important but often elusive source of data for assessing dietary patterns is surveys conducted by private businesses. The food industry produces a wealth of such proprietary data, which is often inaccessible to academic researchers due to its prohibitive cost. For example, the “Food and Consumer Products Manufacturers of Canada” regularly conduct surveys and compiles reports such as the “Food and Consumer Products Industry Profile” (34). Non-members can access the web link plus receive a printed copy of the report for \$8,750 CAD (the cost for members is \$2,500). Such reports provide detailed information on product sales, consumer trends and profiles, and industry projections. Often summaries of reports are available free of charge, and provide important broad statistical information such as yearly sales increases in certain product categories (35).

Agriculture and Agri-Food Canada, a federal government agency, tracks and reports data on food production and sales in Canada. These data are collected for various processing sectors including the confectionery, red meat, dairy, snack food, fruit and vegetable, and soft drink industries. Data are collected from Statistics Canada Food Statistics and industry surveys (e.g. Annual Survey of Manufacturers). The reports are

free of charge, but are not produced regularly; however all sectors have had a report issued within the last three years (36). Agriculture and Agri-Food Canada also compile an annual report of consumer spending on food titled “Retail Sales Data” (37). Data for this report are collected by the marketing firm ACNielsen at grocery stores, consumer panels and warehouse shipment reports (38).

When used with other food data sources, these industry profiles provide an important context for examining the overall Canadian dietary pattern. Data gathered from these sources can provide important information on consumer habits and trends as they relate to overweight/obesity in the population.

**v. Assessment of Trends in Energy Intake**

As indicated, Canada does not conduct on-going surveillance of population nutrient intakes through dietary surveys. This makes it methodologically difficult to link temporal changes in dietary intakes/patterns with changes in body fat mass in the population. In the absence of dietary survey data, ecological approaches have been employed. Harnack and colleagues used ecological data to assess the relationship between temporal trends in energy intakes and overweight/obesity in the United States (39). These authors conducted literature searches in medical, agriculture and business databases to identify data regarding quantities and types of foods available between 1970 and 1998. A major source of data was food disappearance data from the US Department of Agriculture, US Food Supply Series. Further information was gathered on trends in food purchasing, food preparation, and eating habits for the years under review. This allowed authors to contextualize the findings on energy intake with other relevant

ecological information. Results showed a steady temporal increase in population energy intake from 1970 to 1998.

### **III. Conceptualization of Obesity: Causes and Influences**

Multiple explanations for the recent and rapid increase in overweight and obesity prevalence have been put forth. Each are each rooted in a different set of assumptions about how humans, as biological and social beings, interact with the external world. Several of these views are expanded upon below. Further, some authors have challenged the notions of overweight and obesity, arguing they are socially constructed and reflect a discriminatory bias against individuals. This author accepts the medicalized constructs of overweight and obesity, and the perspectives examined in this paper are based on the following common assumption:

1. Overweight/obesity is a “real” phenomenon; i.e. a corporeal state classified as a Body Mass Index (BMI)<sup>2</sup> greater than or equal to 25.
2. Overweight/obesity has real and significant health consequences including increased risk of developing type 2 diabetes, cardiovascular diseases, osteoarthritis and several cancers, which negatively impact morbidity, mortality and quality of life (40).

#### **i. Individual Biology**

The biological explanation for the overweight/obesity epidemic argues that individuals accumulate excess body fat mass because of defective or maladaptive biological processes. This perspective suggests that the obesity epidemic can be best

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<sup>2</sup> Body Mass Index is calculated by dividing an individual's weight in kilograms by height in metres squared.

addressed through further research into the obesogenic biological mechanisms, and their eventual modification through pharmaceutical, surgical and lifestyle interventions. This section will review two biological pathways that have been proposed as being important for the development of overweight/obesity: genetic predisposition and disrupted hormonal regulation.

### **Genetic Predisposition**

Genetic predisposition has been proposed as a major explanatory factor in the development of obesity (41). One of the most pervasive theories regarding a genetic causation is the “thrifty genotype” hypothesis posited by Neel (42). This theory suggests that gene variants were selected over the course of evolution, maximizing survival in times of inadequate nutrient availability. These genes, it is proposed, would increase survival of humans in times of famine by maintaining fat stores in order to support fertility and breastfeeding, and therefore the continuance of the species. It is further hypothesized that certain racial groups (Aboriginals, African-Americans, Hispanics) have a predisposition toward the thrifty genotype because of their more recent hunter/gatherer roots, and because they have demonstrably higher rates of overweight/obesity than other population groups. Research to date, however, has not discovered the thrifty gene.

The thrifty genotype hypothesis has more recently been modified to the “susceptible genotype” hypothesis, which suggests that certain genes increase the risk of overweight/obesity but are not in themselves sufficient to explain overweight/obesity (43). It is hypothesized that these genes were phenotypically “silent” in the past but are now expressed in the current “obesogenic environment,” accounting for variations in

energy requirements, energy utilization, muscle metabolic characteristics and taste preferences.

Despite extensive research into the genetic influences on body weight, neither a single-gene mutation nor a specific series of genes have been identified which cause overweight/obesity, which is now being recognized as a complex phenotype involving numerous susceptibility genes (41). Further, the human genome has not changed in the last fifty years during which the rapid rise in overweight/obesity has occurred. While genes play an essential role in all biological processes, genetic predisposition is clearly an inadequate explanation for the emerging epidemic of overweight/obesity in the Canadian population.

#### **Disrupted Hormonal Regulation**

Disrupted hormonal regulation has also been proposed as a cause of overweight/obesity in humans. Hormones are chemical substances in the body that regulate the function of organs and cells. Recent research has focused on the role of the hormone leptin, which has been identified as a key component in the regulation of appetite and body weight. When individuals are at a particular set point for body weight they produce leptin in an amount that maintains energy balance and body weight. Additional body fat releases more leptin, which signals the hypothalamus to curb appetite. In animal models this results in reduced caloric intake, bringing down body fat mass. Studies in humans, however, have provided less predictable results. Many obese individuals have high levels of leptin without corresponding appetite suppression, suggesting they may be resistant to leptin. Other obese individuals have been observed to have low circulating levels of leptin. Treatment with exogenous leptin does not appear to

have any effect (44). Leptin appears to be an important biological mediator of weight gain, however further research is clearly warranted to understand its role in humans.

### **Limitations of the Individual Biology Perspective**

Although understanding the biological mechanisms involved in accumulating excess body fat mass is essential to understanding the increase in population overweight/obesity, there are limitations to this perspective. Firstly, an “obesity gene” or discrete group of genes that can explain a significant proportion of the observed variation in overweight/obesity rates in Western populations has never been identified (41). Secondly, a significant proportion of overweight/obesity and dietary research is conducted on animals, and is difficult to extrapolate to free-living humans. Thirdly, genetic or hormonal explanations for increased overweight/obesity locate the causes of obesity within one’s individual biology. This has the effect of rendering invisible larger socio-environmental influences on body weight. Further, positing that genes interact bi-directionally with environments is problematic. As epidemiologist Nancy Krieger suggests, people, not genes, interact with environments (45). The idea that genes somehow “come alive” in certain environments obfuscates the complex interactions of other biological, psychological and social factors, which constitute the experience of an individual in that environment. This brief review of biological pathways to overweight/obesity reveals that biology alone cannot account for the recent and rapid increase in population overweight/obesity.

### **ii. Lifestyle Behaviour**

The lifestyle behaviour explanation argues that the population is becoming overweight/obese due to the adoption of unhealthy personal habits and behaviours, in

particular unhealthy diets (overconsumption of fat, highly-processed carbohydrates and kilocalories) and inadequate physical activity. This perspective can, in large part, be traced back to the publication of the Lalonde report, *A New Perspective on the Health of Canadians*, in 1977 (46). This Government of Canada report used empirical data for the first time to highlight the negative impact of lifestyle behaviours on health outcomes. It proposed the compelling idea that individual actions (such as quitting smoking, exercising and eating healthy foods) could prevent disease, with the added bonus of cost savings in health care. What followed was the development of professions (health promoters, nurse health educators, public health dietitians), government ministries (expanded departments of public health and, in Manitoba the recently created “Ministry of Healthy Living”), social marketing (e.g. Vitality, ParticipAction), a multi-billion dollar weight-loss industry, and a public discourse regarding personal responsibility for health. Individual responsibility for regulation of body weight through healthy eating and physical activity became institutionalized through the subsequent discourse and practices of these institutions. The major component of most public health campaigns designed to address overweight/obesity was, and remains, lifestyles education: mass media messaging, pamphlets and education sessions exhorting individuals to make healthy choices.

The lifestyle behaviour perspective is consistent with rational choice theory, which evolved from public choice theory of microeconomics as a way of explaining how individuals and interest groups make economic and political decisions. Rational choice presupposes that individual social actors “operate on the basis of rational self-interest, seeking to maximize satisfaction at the least cost within the limits imposed by the

information at hand” (47). Central to this theory is the view of individuals as the basic unit of analysis, which is consistent with neo-liberal values of individuality, choice and freedom. The lifestyle behaviour perspective accords agency to individuals, which, according to Giddens, refers to the capability which individuals have for carrying out intended actions throughout their day-to-day lives (48). They can choose different paths for themselves than those frequently imposed by structures operating at a larger level. This perspective provides the opportunity to “take control” over one’s life course with respect to body weight and health through the actions of eating and exercise. Many Canadians identify with these values. According to a 2003 Ipsos-Reid survey titled *Canadians and Obesity*, 75% of Canadians think individuals are responsible for obesity (49).

#### **Limitations of the Lifestyle Behaviour Perspective**

The lifestyle behaviour perspective has several limitations. First, locating responsibility within individuals does not acknowledge how larger social, environmental, economic and political structures have an impact on food choice and availability, economic resource distribution and the built environment. Research shows that behavioural choices are heavily structured by one’s material conditions of life, and that lifestyle risk factors account for only part of the variation in the incidence and death from various diseases (50). Further, significant changes in the food supply and how food is marketed and distributed structure food intake outside of individual “choice” (51). Second, focusing on individual characteristics as a means of explaining health outcomes serves to “blame the victim” for their own shortcomings with respect to maintaining their health. Petersen and Lupton argue that public health measures identify “high-risk”



groups (based on their lifestyle behaviours) as “abnormal” and seek to “normalize”<sup>3</sup> them through the promotion of self-regulatory means (diet and exercise) (53). This high-risk group constitutes the “other” and represents a threat to the rest of the community, in particular those providing health care. “Othering” involves making moral judgments about individuals when conceptualizing health risk; those who don’t adopt healthy lifestyles are moral failures. Excess body weight becomes the fault of the individual. An example of this is how Aboriginal Canadians have been labeled “high-risk” for developing high rates of overweight/obesity and related health disorders (54). Finally, inherent in the lifestyle imperative is the assumption that adequate knowledge and attitudes predispose individuals to adopting healthy behaviours (55). An abundance of intervention and observational studies have demonstrated that providing adequate knowledge through health education programs does not produce improved lifestyles (56-58). Most adult members of the Canadian population know that healthy eating and exercise are a prerequisite for healthy body weight, yet overweight/obesity rates continue to climb (14). Adequate knowledge of “risk factors” is clearly insufficient to produce the requisite lifestyle changes, and focusing on “risk factors” has the potential to marginalize certain population sub-groups.

This discussion demonstrates how the lifestyle perspective resonates with Canadian values of individualism, freedom and personal choice and carries the prospect of taking control of one’s health, yet has serious limitations. It provides an inadequate

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<sup>3</sup> Normalize: Identification of ‘abnormal’ forms (persons) through surveillance techniques; through this identification society can encourage (coerce) people to regulate and achieve her/his own conformity within the established rules (Shawver L, Foucault Dictionary Project: <http://www.california.com/~rathbone/foucault10.htm>).

explanation, however, for the emerging overweight/obesity epidemic, as it does not acknowledge larger forces that impact body weight.

### III. **Socio-Economic Determinants of Health**

It is well-established that socio-economic status affects health status. Poor people tend to be sicker and live shorter lives than wealthier counterparts (59;60). The health effects of socio-economic inequality have often been observed to be independent of lifestyle behaviours (50). It has also been documented that overweight/obesity is over-represented in some lower socio-economic groups in Canada (17). There are several pathways that may explain this phenomenon.

Low-income people tend to experience food insecurity, a condition where individuals are unable to meet their food needs in a dignified, personally-acceptable manner. Food insecurity may lead to a reliance on various forms of food assistance, such as food banks. The food procured through food banks is often of lower nutritional quality, consisting disproportionately of high-kilocalorie processed, packaged foods with few perishables such as milk, fruits and vegetables. The resultant dietary pattern of low-income people dependent on charitable food sources such as food banks has been referred to as the “welfare diet” and is considered to contribute to overweight/obesity and other poor health outcomes (61).

Another pathway is the “feast-famine” experience of low-income persons who have restricted diets during periods of the month when money is short, then purchase “celebration” foods when pay or welfare cheques arrive. These foods are perceived as “rewards” given to family members (typically children) for the previous period of

restricted food choice. The foods are often of dubious nutritional value, including high-kilocalorie snack and fast foods, and may contribute to overweight/obesity (62).

Still other factors negatively impacting access to healthy food include lack of access to adequate grocery retailers, lack of transportation to acquire food, and lack of cooking facilities (63). Inadequate nutrition knowledge and food preparation skills may also contribute to the development of overweight/obesity. These circumstances, combined with lack of access to recreation and physical activity opportunities, can result in excess body fat mass.

#### **Limitations of the Socio-economic Determinants of Health Perspective**

The socio-economic determinants of health perspective suggests that social inequality, exacerbated by food insecurity, is responsible for the epidemic of overweight/obesity. One serious limitation to this explanation is the observation that overweight/obesity is widespread in the population. Almost half of Canadian adults are overweight or obese, yet only 13.6% of Canadians are considered “low-income” (64). While evidence suggests that low-income Canadians have a disproportionate burden of overweight/obesity, Canadians of other socio-economic levels are not immune to gaining excess weight. There appear to be other causal pathways operating to promote overweight/obesity in all socio-economic groups.

#### **IV. Consumer Culture**

Consumer culture proposes that excessive consumption of food, technology and entertainment products, in particular those which are branded and heavily marketed, leads to overweight/obesity through excess kilocalorie intake and reduced physical activity. Materialism and consumerism are core values of neo-liberal societies. They are also an

integral part of capitalist and post-capitalist economies (65;66). According to Jackson, “consumption is not some interesting but insignificant byway in the development of modern life, it is intrinsic to the dynamic organization of economic society and to the human experience of being and becoming modern” (67).

It is important to distinguish between “consumption” and “consumerism.”

“Consumption” refers to the purchase and use of goods, leisure activities and services while “consumerism” is the motivating ideology pervading modern capitalism that prioritizes the production, sale and acquisition of consumer goods and services.

“Consumer culture” refers to the norms and values of a consumer society where cultural goods are commodities and cultural activities are mediated through consumption (68).

Several aspects of consumer culture will be explored for their contribution to overweight/obesity, including commodification of food; identity and social distinction; commerce and culture; and the work-consume cycle.

### **Commodification of Food**

Food and eating are unique aspects of all human life; they are the very basis for sustaining life. However, unlike other fundamental elements such as air, or public goods such as water, food is a commodity bought and sold in the marketplace. The commodification of food, specifically the branding of value-added food products, has intensified in recent decades. Food has a unique status however; unlike other consumer goods, which are not required for sustaining life, food is an absolute necessity for living. These life-giving properties make it the “ultimate ‘consumable’ commodity” (69). Humans literally embody the foods they eat. In the late twentieth and early twenty-first

centuries, the embodiment of commodified food appears to have led to excess kilocalorie consumption and overweight/obesity.

Food manufacturers and retailers promote sales through branding, a process that further signifies food as a commodity. Branding helps customers distinguish between products and cultivates through logo placement and recognition. Companies spend billions of dollars on strategies to gain this loyalty from cradle to grave (70). It is estimated that children see 20,000 television commercials a year, of which more than 60% promote sugared cereals, candy, fatty foods and toys (frequently together) (71). Hence, children as young as three ask to go out for “McDonald’s” rather than dinner; all brown soft drinks are “Coke”; and all breaded spheres of chicken by-products are “McNuggets.”

As discussed in the section political economy of the food system, companies rely on the proliferation of value-added, branded (commodified) products with high profit margins for maximization of profits. This can be demonstrated by examining the percentage of return realized by different segments of the supply chain: for example, the retail price of bread has approximately tripled since 1975, from 43¢ to \$1.39. The price for wheat did not increase during this time; therefore all increases in profits were realized by the millers, baking companies and retailers (in some cases these are all owned by the same corporation). Similar trends have been documented for many other food products (72).

Branded, commodified food products are consumed frequently in Canada, and increasingly around the globe. Kilocalorie-dense fast foods, soft drinks and snack foods are highly profitable, and their consumption is at an all-time high (73-75). The evidence

of this consumption is not only in the financial reports of the agri-food companies; it is embodied in the increasingly overweight/obese Canadian population.

### **Identity and Social Distinction**

Food is not consumed merely for its nutrient value or to alleviate hunger; it is also consumed because of the cultural values and social norms that surround it. Food manufacturers expropriate these values and norms for use in advertising and marketing. They seek to create images into which consumers can fit themselves. These images constitute the “exchange value” of a product and account for why manufacturers and retailers can charge high prices for foods whose “use value” (purpose or utility) is much lower (76). Perhaps the most extreme example of this is the bottling and selling of water, however many food products have high exchange values which relate to their cultural significance.

Children and youth identify strongly with branded, value-added foods such as fast food, packaged snack foods and soft drinks (77). They display a high level of sophisticated consumer-related skills, many of which are acquired through television viewing, an extremely popular activity. A recent Canadian Teachers Federation survey found that forty-eight percent of Canadian kids aged 8-15 have their own television set and thirty five percent have their own DVD player (78). Food manufacturers and retailers use this identification to promote and sell more products. Proliferation of these foods in the marketplace coupled with strong consumer identification can lead to “passive over-consumption” and overweight/obesity (79;80).

For Bourdieu, the signs associated with consumer goods are a means to distinguish one’s self (and one’s group) according to class lines (81). This is relevant to

some types of food; lobster, champagne and truffles are all “signs” of a sophisticated palate, as well as cultural and economic capital. However, as society moves into a post-capitalist (and post-modernist) phase, these traditional class boundaries are blurring. Goods now have what Baudrillard refers to as a “floating signifier” effect (68). Signifiers float freely, with only the loosest connection to actual objects. Consequently, fast food burgers and fries are no longer relegated to working class families on limited incomes; high-income families are frequent consumers of fast food. At the same time, low, middle, and upper-income families can dine on lobster and other seafood specialties fairly inexpensively at Red Lobster chain restaurants.

Many fast and processed foods carry signifiers that are communicated through sophisticated advertisements. These products become what Lupton refers to as “dematerialized foods”, which rely upon their appearance and symbolic value for their identification, rather than their nutritional or even palatability properties (69). PepsiCo’s “GenerationNext” campaign, launched in 1997, imbued Pepsi with meaning about “everything that is young and fresh, a celebration of the creative spirit. It is about the kind of attitude that challenges the norm with new ideas at every step of the way” (82). Beer is associated with sex and fun; these ads invariably show attractive young women with large breasts. Convenience foods such as Pizza Pops®, Ritz Snack Sandwiches®, Lunchables® and the dizzying array of sweetened breakfast cereals are saturated with signs of on-the-go youth engaged in busy, fulfilled lives; too busy to be weighed down with mundane activities such as preparing food. These products are aggressively marketed, often in conjunction with other “youthful” consumer goods such as DVD’s, electronic games and music CD’s.

Culturally-signified foods are also marketed to busy adults, particularly women who have the primary responsibility for feeding the family. This role is a highly signified cultural act of love, yet many women feel guilt and time pressure around this domestic task. Food manufacturers play upon these feelings. Food products such as home meal replacements and baked goods are associated with love, caring for family and home cooking. “Homestyle”, and “home-made taste” are part of the marketing lexicon. The 2003 report “The U.S. Market for Sweet Baked Goods” states that important trends for retailers are “quick, convenient yet tastes-like-homemade products...” and associating products with “Tastes like Mom’s” (83). As the convenience and home meal replacement market segments increase, more and more of these signs will be expropriated to sell products. One wonders, however, what the meaning of “tastes like mom’s” will have with future consumers, since truly home-made foods are becoming a rarity in many families.

### **Work-Consume Cycle and Convenience**

Yet another element of the “Consumer Culture” perspective of overweight/obesity is the “work-consume” cycle. This suggests that the more one works at paid employment, the more one must consume (because there is less time to do tasks oneself), which in turn necessitates further paid employment to pay for these consumer goods. The “work-consume” cycle can be traced back to the advent of more efficient manufacturing processes and mass-produced goods during the 20<sup>th</sup> century. This unprecedented leap in efficiency was predicted to bring increased leisure time and improved quality of life to the masses. This utopia was only partially realized. While one cannot deny that massive increases in food production, housing quality,



entertainment, technology, household amenities and scores of other goods have helped lift hundreds of millions of people out of poverty and improved their quality of life (66), the extensive leisure time envisioned for the present never materialized. As production outputs increased with less human work (as happened in industrial economies), there were two possible outcomes for workers: increased wages while holding work hours constant, or greater leisure time while holding wages constant. The former has been the dominant model in industrial societies and has resulted in the creation of what Cross calls “a harried leisure class of consumers” engaged in “an ever-expanding, hectic cycle of consumption” (68). However, in recent years real wages have stagnated or decreased for many middle- and low-income Canadians, and many families have shifted to both parents working outside the home to compensate (84).

Despite the stagnation in wages for some, society has witnessed ever-rising consumption as more and more aspects of life have become commodified. Leisure and entertainment activities, domestic tasks, physical activity, romance and increasingly body altering processes (e.g. botox to plastic surgery) can all be acquired through the market. The need for more consumables requires more income typically derived through paid employment, and the lack of free time necessitates the purchase of more commodities: childcare, clothing, vehicles, household cleaning, recreation activities and entertainment, to name a few. One major area of the domestic domain that has been “out-sourced” is food preparation. Research indicates that food preparation is the most commonly “out-sourced” domestic task (85). The fastest growing segment of the food industry is in home meal replacement products. The time spent preparing meals has decreased significantly, and is currently half what it was 25 years ago (86). Today, Canadians

spend between 40 and 52 minutes preparing food each day (87). When one factors in an average of three meals per day, along with snacks, this leaves little time to prepare food from basic ingredients, leading to greater consumption of fast, processed and prepared foods. Canadians are also consuming more meals away from home. Forty percent of meals are now consumed outside the home, many of them in fast food restaurants (26% of dollars spent in restaurants in 2001) (88). This increased reliance on out-sourced food has also resulted in a mass “de-skilling” of the population with regard to food preparation (89). This is frequently represented as a benefit, through the discursive practices of food manufacturers and their advertisements, which suggest that less time spent cooking will turn into more important “family time”. However, unlike other domestic activities such as laundry and house cleaning, the out-sourcing of food preparation can lead to unintended externalities, perhaps more appropriately referred to as “internalities”: excess body fat mass due to a processed, convenient diet high in kilocalories.

Canadians are not immune to this work-consume cycle and Statistics Canada reports that more Canadians than ever are experiencing “time poverty”. One-third of Canadians aged 25 to 44 identified themselves as “workaholics” and more than half admitted to worrying that they do not have enough time to spend with their family and friends, according to data from the most recent General Social Survey from Statistics Canada (90). This “time poverty” has arisen for a variety of reasons, only a few of which will be discussed here.

The arrival of neo-liberal economic policies in the 1980’s led to “down-sizing” and a reduction in real wages for many workers, necessitating their full-time (and sometimes more) participation in the paid workforce. According to the Personal Security

Index 2003, the “poverty gap”<sup>4</sup> widened from \$3,600 to \$3,900 from 1989 to 2000 (91). The increase is not huge, but is significant for those people living on low incomes. This, along with the increased trend of low-paying service jobs without substantial pay or benefits, has led to more dual-income (and single-parent working) families, which has in turn led to additional stress due to juggling the competing time demands of family, home and work (87). During this time increasing numbers of women entered the paid workforce, for economic reasons and due to the growing feminist movement. In 1976, 42 percent of women were employed outside the home; by 2001 this had risen to 56 percent (92). This trend had a significant impact on the role of domestic food in family life, specifically reduced time devoted to preparing food. While the women’s movement contributed (arguably) to the emancipation of women from many domestic duties, in the case of food preparation, other family members did not step in to take over these tasks. Despite major shifts in female roles over the past decades (93;94), domestic food preparation was, and remains a highly gendered activity (95;96).

Food preparation has historically been a female gendered domain. While many women continue to derive part of their identity from this work, the feminist movement to a large degree eschewed this domestic task. Women still cook but for many women this is no longer a source of pride and mastery (one could argue that for many women it never was, but was rather an assigned role). Society places a low value on this work, which still needs to be done. Cooking was (is) associated with feminine pursuits, and women who aspire to domestic competency are viewed as anti-feminist, “backward,” or upper-

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<sup>4</sup> Statistics Canada defines the poverty gap as the amount of money that would be necessary to raise the income of every poor Canadian up to the poverty line.; the pre-tax Low Income Cut-Off (LICO) is used to determine this. (Tsoukalas, S and Mackenzie, A. The personal security index 2003: five years later. Canadian Council on Social Development. 2003).

class women searching for meaning in their privileged lives following celebrities such as Martha Stewart (97). They also frequently have paid domestic help to ease the workload. For the majority of multi-tasking women, preparing healthy food for themselves and their families is desirable but often not achieved due to time pressures. They are still responsible for family food, but are now also responsible for earning income, thus doing “double duty”.

Dominant norms of masculinity do not include food preparation (with the exception of professional chefs, whose work is not considered “domestic” or feminine). Boys and men are not encouraged to develop domestic competencies, despite some relaxation of these standards within some groups (typically younger, educated and professional men). Dominant forms of masculinity view activities such as cooking and baking as feminized, “wimpy,” and “sissy.” A man with an inordinate interest in domestic food preparation is likely to be labeled “gay” (98). However, unlike the presumably innocent acceptance or rejection of other gendered activities, such as watching televised sports or wearing certain clothing, the rejection of food preparation as feminine is likely to have a profound impact on one’s health and longevity.

The day-to-day task of food preparation is not seen as a valuable skill in contemporary culture. Parents encourage academic over domestic pursuits for their children, in particular math and sciences (99), as these are perceived to best prepare children for a future career. A recent survey by a leading “educational” toy manufacturer, LeapFrog Canada, found that three-quarters of mothers surveyed were concerned about their children’s ability to compete in the global economy (100). Such concerns prompt parents to purchase from a growing line of “educational” toys, giving

their preschool children an “early start” to make them more competitive academically once they enter school (101). Though this was not a scientific study, the results show that math, reading and technology skills trump domestic life skills in a competitive consumer world.

In summary, food is an essential component of gendered, cultural and economic processes. Although it is a highly signified commodity, and required by all members of society, the act of domestic food preparation has low social value. As a result, food manufacturers and their convenient, value-added products have filled the domestic food preparation void. As discussed earlier, many of these products are “ready-to-eat” and calorie-dense, making them easy to over-consume, contributing to overweight/obesity.

### **Limitations of the Consumer Culture Perspective**

The consumer culture perspective does not acknowledge the role individuals play in determining their individual choices regarding food. There are also a growing number of movements that resist consumer culture. One example is the voluntary simplicity movement, which promotes decreased consumption, concern for the environment and finding happiness and satisfaction through community and interpersonal relationships. Another example is the media foundation “Adbusters”, which advocates opposition to media concentration and corporate hegemony through activities including their magazine and annual social marketing campaigns, “Buy Nothing Day” and “Turn Off TV Week.” Further, not everyone is destined to become overweight/obese in the current food environment; to date, half of Canadian adults are not overweight or obese (102). This perspective therefore provides an incomplete explanation for the emerging overweight/obesity epidemic.

## **V. Built Environment**

The built environment explanation for the overweight/obesity epidemic argues that overweight/obesity is a product of the modern environment, which includes homes, schools, workplaces, highways, urban sprawl, and air pollution as well as access/lack of access to healthy food, opportunities for physical activity, and leisure time (103). This perspective argues that modern urban (and increasingly many rural) communities have become pedestrian-hostile, activity-discouraging, and fast food-intensive. This contributes to inactivity and excess kilocalorie intake, resulting in overweight/obesity.

One of the most salient features of this perspective is the ubiquitous dependence on automobiles. Despite calls for greater public urban transportation schemes, automobile ownership continues to climb. Automobile ownership has risen in every country in the world, and Canada now has more than one car for every two people (104). This rise in car use has facilitated the growth of suburban communities, which in turn foster car dependence. These communities are often lacking safe walking spaces (e.g. sidewalks) and may have few destinations within walking distance. Even quick errands can require driving. This has contributed to the de-normalization of non-motorized transportation, for both adults and children. In 1965 approximately half of all children walked to school; today the rate is less than ten percent and as few as two percent of all trips to school are by bicycle (103). By far the most normalized means of transportation is the automobile. This dependency on the car reduces opportunities for physical activity, increasing the chances for overweight/obesity.

A second salient characteristic of the built environment is the ubiquitous access to fast, convenient, value-added foods discussed earlier in section concerned with the

political economy of food. Fast food restaurants, convenience stores, gas stations and a host of other retail outlets accessible by car permeate the urban landscape. Opportunities for fast, convenient healthy fare are far fewer. Again, this can lead to passive over-consumption of these primarily calorie-dense products, contributing to overweight/obesity.

### **Limitations to the Built Environment Perspective**

The built environment perspective argues that public policies supporting primarily market imperatives (e.g. suburban sprawl) have neglected the health of citizens. There are, however, several limitations to this explanation for overweight/obesity. Some of these are similar to those proposed for the political economy of food perspective. First, not everyone is destined to become overweight/obese; half of Canadians are at an appropriate body weight in the current environment. Second, individuals can overcome the negative aspects of the built environment through personal choices to exercise and eat healthy foods. These individuals, however, typically have the economic and educational resources to make these choices, i.e. they can join fitness clubs and participate in other paid recreation activities to maintain their body weight. Nonetheless, the built environment perspective does not provide a complete explanation for overweight/obesity in the Canadian population.

## **VI. Political Economy of Food**

Few Canadians produce a significant amount of food for their personal consumption. They instead depend on a complex supply chain of food production, manufacturing and distribution that is largely driven by corporate interests. Their dietary pattern, therefore, is shaped in large part by what is available through the market. The

political economy of food perspective purports that overweight/obesity is produced via a food system characterized by: corporate concentration of the agri-food industry; proliferation of value-added foods; dependence on foods produced outside the home; and intense marketing of unhealthy food products. Each of these characteristics will be discussed in the following sections.

### **Corporate Concentration of the Agri-Food Industry**

Food is big business. The corporate agri-food industry has become increasingly concentrated in recent years. Mergers and acquisitions have created enormous oligopolies that produce goods across the production spectrum: fertilizer, commodities, and processed foods (72). According to the Food Institute, the first half of 1998 saw a record 393 food and food-related mergers and acquisitions, up almost 33 percent over the same period a year earlier (105). The following table highlights the food sales of the top 10 food and beverage companies, for 2002/03 (105).

**Table 5. World's top 10 food and beverage companies**  
(ranked by food and beverage revenues, in millions of U.S. dollars)

	<b>Company</b>	<b>Food Sales US\$ millions</b>		<b>Company</b>	<b>Food Sales US\$ millions</b>
1	Nestlé, S.A.	54,254	14	Kirin Brewery Co. Ltd.	12,386
2	Kraft Foods Inc.	29,723	15	Asahi Breweries Ltd.	10,825
3	Unilever plc	25,670	16	Heineken N.V.	10,775
4	PepsiCo Inc.	25,112	17	Suntory Ltd.	10,545
5	Archer Daniels Midland Co.	23,545	18	General Mills Inc.	10,506
6	Tyson Foods	23,367	19	Sara Lee Corp.	9,778
7	Cargill Inc.	21,500	20	Dean Foods Co.	8,991
8	Conagra Inc.	19,839	21	Snow Brand	8,511
9	Coca-Cola Co.	19,564	22	Kellogg Co.	8,304
10	Mars Inc.	17,000	23	SABMiller plc	8,295



The top five grocery retailers in the world had sales figures in excess of \$US450 billion in 2004 (106). These retailers typically account for more than 70% of grocery sales in countries where they are present (107). Wal-Mart is the world's largest food retailer and is expected to grow considerably. Wal-Mart's supermarket sales in the United States alone are predicted to increase from \$US82 billion (2004) to \$162 billion by 2007. This represents almost one third of the expected growth in U.S. spending on grocery and drug products during 2003-2007, resulting in control of 35% of food store industry sales (108).

The size and concentration of the agri-food industry gives it tremendous power to influence supply, pricing, and consumer preferences. Food companies now dictate what crops should be grown to support their production goals (109). They also have enormous power when negotiating economic arrangements with governments. With the relaxation of trade regulations over the last two decades, the balance of power in many cases has tilted in favour of corporations that operate transnationally, enabling them to source raw materials from around the globe while simultaneously seeking new markets. This is illustrated in the following quote regarding the world's top food retailer:

Wal-Mart appears to be in no imminent danger of running afoul of federal antitrust statutes...Giants like Wal-Mart have wide latitude to do as they will to rivals and suppliers so long as they deliver low prices to consumers (110).

The primary role and motivation for the food industry is to produce cheap food and maximize profits. This is captured in the following quote from a food industry trade publication:

Food and beverage firms of all sizes are leaner and meaner. The Top 100 also are bigger than ever, posting an average sales gain of 6.7 percent last

year and topping \$684 billion. Now they're positioning themselves for more profitable growth (105).

Profits are generated from sales. The food business is highly competitive and companies employ several methods to maximize sales, using what Marion Nestle calls the “eat more” imperative (51). Two main strategies are employed: 1) sell more food, especially highly-profitable products (processed, convenience foods); 2) get consumers to switch brands, or more appropriately, switch megabrands (since switching brands may results in staying with the same parent company). These companies have enormous financial resources with which to influence consumer food purchases. They mobilize these resources to develop profitable new manufactured food products (“value-added” foods) and then market them aggressively. These foods are often of marginal nutritional quality, and their role in the development of overweight/obesity is discussed in the next section.

### **Proliferation of Value-Added Foods**

One of the biggest growth areas in food production and retailing in recent decades has been in value-added foods. This refers to the process by which raw food commodities are transformed into food products such as confectionery and snack foods (candy, soft drinks, potato chips), partially prepared foods (e.g. “Hamburger Helper,” “Kraft Dinner”) and prepared home meal replacements (e.g. fresh or frozen heat-and-serve dinners).

The proliferation of value-added foods contributes to population overweight/obesity. These foods are typically high in salt, cheap sources of fat and simple carbohydrates so they are tasty and inexpensive to manufacture. In an effort to increase sales, companies constantly flood the market with new value-added products: in 2002 13,600 new food products were introduced into the U.S. marketplace. Most of

these products are not considered “healthy” according to standards set by public health authorities: 75% were candies, condiments, breakfast cereals (primarily sugar-sweetened), beverages, bakery products and dairy products (Lang p. 140). These foods can lead to “passive over-consumption” due to their energy-density, resulting in weight gain (80;111).

In addition to the increase in the volume of value-added foods has been the trend to increased portion sizes or “super-sizing.” This is a strategy employed to garner a larger share of the food market and increase profits. Several researchers have demonstrated that portion sizes for virtually all foods have increased since the 1970’s, with the most rapid and significant increases occurring in the 1980’s and 1990’s (112;113). This trend is temporally associated with increases in overweight/obesity observed in the population (112;114). Consumption of these foods is heavily promoted by the food industry.

### **Intensive Advertising and Marketing**

The food industry attempts to influence consumer food choice through aggressive advertising and marketing. This is done through multiple channels including direct advertising in the media and product placement (making foods available for purchase in multiple settings). Companies have enormous resources at their disposal for influencing food purchases. Global advertising budgets for the top food corporations run into the billions of dollars (51) (see Table 6).

**Table 6. Advertising budgets for top food corporations**

Rank	Corporate MegaBrand	Total Advertising Spending 2002 US\$ millions
1	McDonald's	655,743
2	Wal-Mart Stores	375,331
3	Coca-Cola Company	345,090
4	Kraft Foods (Altria)	315,715
5	Burger King (Diageo)	306,147
6	Pepsi-Cola (PepsiCo)	273,135
7	Big G Cereals (General Mills)	265,749
8	K-mart	250,284
9	Quaker Oats Co (PepsiCo)	249,484

When examining these figures in the context of how much funding is allocated to prevention programs (typically between 1% and 3% of provincial health care budgets) the inequity is staggering. These companies have the economic resources to infiltrate the lives of virtually everyone in the developed world and increasingly the developing. It would be extremely difficult to find a Canadian over the age of 5 who did not recognize at least one of these megabrands. The enormity of this ability to “reach” consumers again brings into question how much “choice” consumers have when selecting food: consumers may “choose” to not purchase these items, but do not have the ability to “choose” not being exposed to the constant pressure to buy. This pressure is felt intensely by parents of young children constantly exposed to these advertisements. It is well documented that persuasive marketing practices lead to increased consumption, in direct relation to marketing intensity (115;116).

The most heavily advertised foods are those with the highest profit margins: high-kilocalorie, low-nutrient snack and convenience foods and soft drinks. For example, the largest portion of PepsiCo's business comes from the subsidiary Frito-Lay, the world's leading manufacturer of potato chips while the bulk of remaining sales are from its

enormous soft drinks line (both carbonated and non-carbonated soft drinks such as Tropicana® juice and Gatorade®).

In addition to advertising, ubiquitous availability of food products ensures maximum sales. In most Western countries (and increasingly developing nations) there is unprecedented availability of food, in particular fast and convenience foods high in kilocalories and low in nutrition. Companies pay to have their products prominently displayed in a dizzying array of venues. Virtually every public building has vending machines with soft drinks, salty snacks and candy. Gas stations, pharmacies and movie theatres all derive a significant portion of their business from food sales, typically snack and convenience foods. Chain convenience stores and fast food restaurants open twenty-four hours a day, seven days a week abound in urban centers, where the majority of Canadians live. Check-stands at businesses such as toy stores, office supply stores and hardware stores are filled with candy and snacks for the hungry shopper. There are only a few weeks during the summer when candy companies are not promoting product associated with an “occasion:” Christmas, Valentine’s day, Easter, Halloween, and Thanksgiving ‘traditions’ now include the same lot of confections re-shaped for purchase by an endless cycle of consumers. This ubiquitous availability appeals to a sense of immediate gratification (as most of these products can be consumed right away) at seemingly minimal cost.

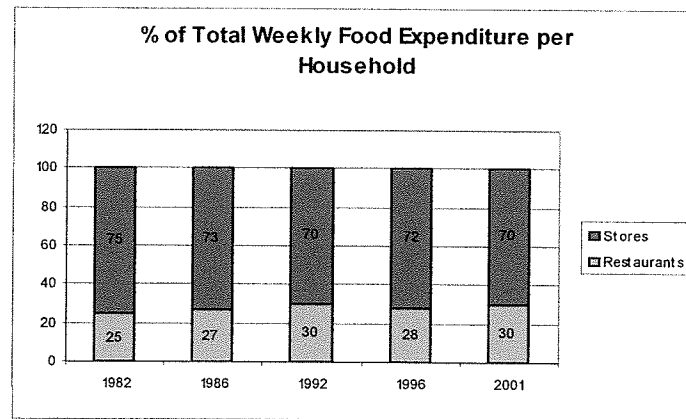
Food companies spend tremendous resources advertising and marketing their products. This investment reaps monetary rewards through increased sales (117). These sales are increasingly from food products consumed outside of the home.

### *Eating Away from Home*

An integral part of the food system is the restaurant industry, which caters to away-from home eating. The proliferation of fast-food and take-away restaurants over the past several decades has been one of the hall-marks of the contemporary food-scape. Fast food restaurants began appearing in Canada in the late 1960's, however they were mostly found in suburban areas of large cities. By the mid-1980's however, fast food restaurants were everywhere; a less than one kilometre strip on Bloor Street in Toronto had five McDonald's, three Burger Kings, Two Wendy's and Two Harvey's. Today, McDonald's has well over 30% of the Canadian market share for fast food restaurants (118). The type of food available through these establishments, and the frequency with which they are consumed appear to be contributing to increased rates of overweight/obesity.

Where once a meal eaten in this type of establishment was an occasional break from home cooking, or special occasion, fast-food restaurants are now a significant part of the North American diet. According to the latest Food Expenditure Survey data, Canadian households spent almost the same amount on food in 2001 as in 1996. During this time, however, proportionately more dollars were spent in restaurants compared with stores. This is part of a trend depicted in Figure 1 (88).

**Figure 1. Restaurant vs. store spending on food in Canada**



*Source: Statistics Canada, 2003 (32)*

In 2001, 26% of restaurant spending took place in fast-food restaurants (including take-out) with the remainder from table-service restaurants, snack bars and cafeterias. Eating in restaurants is a phenomenon seen across the socio-economic spectrum. In 2001, single-parent families headed by women spent 27 cents of every food dollar in restaurants, up from 22 cents five years earlier.

Evidence suggests that fast food restaurant meals contribute to overweight/obesity when consumed regularly. They are typically energy-dense (high in kilocalories) and low in fruits and vegetables (80). Over 30% of American children report consuming fast food every day, and children who eat fast food regularly tend to have less healthy diets, and consume excess kilocalories and fewer fruits and vegetables (79). Given the increased trend in the Canadian population of consuming food away from home, overweight/obesity will likely persist with the current fare available at most restaurants.

Perhaps one of the most compelling pieces of evidence supporting the “political economy of food” perspective comes from industry itself. Food and drink companies acknowledge that the current structure of the food supply is contributing to excess body

fat mass. This is captured in the following statement from a financial forecasting report by investment bank USB Warburg:

There is a clear long term risk to producers of fast foods, soft drinks, confectionery and snacks that anti-obesity measures will curb their ability to grow revenues in the future (119).

This report identifies large portion sizes, advertising, pricing and vending machines all as contributing to the growing problem of childhood obesity. Clearly the relationship between the food supply and overweight/obesity is not merely a fabrication of public health “nannies” attempting to control bodies.

### **Limitations of the Political Economy of Food Perspective**

The political economy of food perspective assumes that a supra-structure, the corporate food system, is responsible for the increase in overweight/obesity in the population; however there are several limitations to this perspective.

Firstly, the food industry views its practices as progressive and responsive to consumer demand; i.e. it is the consumer who dictates what products appear on the grocery store shelves. Consumers want convenient, inexpensive, time-saving food products (120), and the industry has responded by providing more choice than ever before. The following quote from a large food manufacturer illustrates how companies must be responsive to stay solvent:

Shifting consumption patterns are forcing many major companies to rethink their business strategies. Itoham Foods (No. 53) is raising productivity and expanding its line of ready-to-eat meats... Future growth will hinge on increased value-added processing (105) .

Cheap inputs (primarily in the form of cheap oil to support agriculture) keep the cost of these products low. Indeed, Canadians spend the lowest proportion of disposable income on food to date; slightly less than 9% in 2000 (121). This suggests that it is not the



corporate food system, but individuals in their quest for price and convenience, who are responsible for overweight/obesity through unhealthy choices.

Secondly, this perspective presupposes that individuals are passive recipients of a food system in which they have little autonomy to choose a healthy eating pattern for themselves. It can be argued, however, that people have free will. They can and do resist the pressures to choose unhealthy foods. Not all new food products are unhealthy and consumers now have more choice than ever. The average “hypermarket” contains over 20,000 items (109). Improved transportation infrastructures have made a wide array of fresh fruits and vegetables available year round, for consumers with the financial resources to purchase them. Bottled water, fat-reduced snack foods and products without trans fats all could be considered healthy value-added foods and sales of these products have been increasing. If consumers are overweight/obese, it is because they are making the wrong “choices.”

According to Lang, however, this notion of “choice” can be problematic. The neo-liberal cry for individual choice can be viewed as a smokescreen for food companies maintaining the right to sell sub-standard and unhealthy foods as a means of maximizing profits (109). In addition, it appears that, despite an unprecedented array of food products and interest in healthy foods, consumers all too frequently succumb to the temptations of the obesogenic food environment and consume too many unhealthy food products.

In conclusion, the political economy of food perspective suggests that the structure of the modern food system is responsible for overweight/obesity. It does not,

however, account for individual agency to choose a healthy diet and is therefore an insufficient explanation for the rise in overweight/obesity.

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## Chapter 3

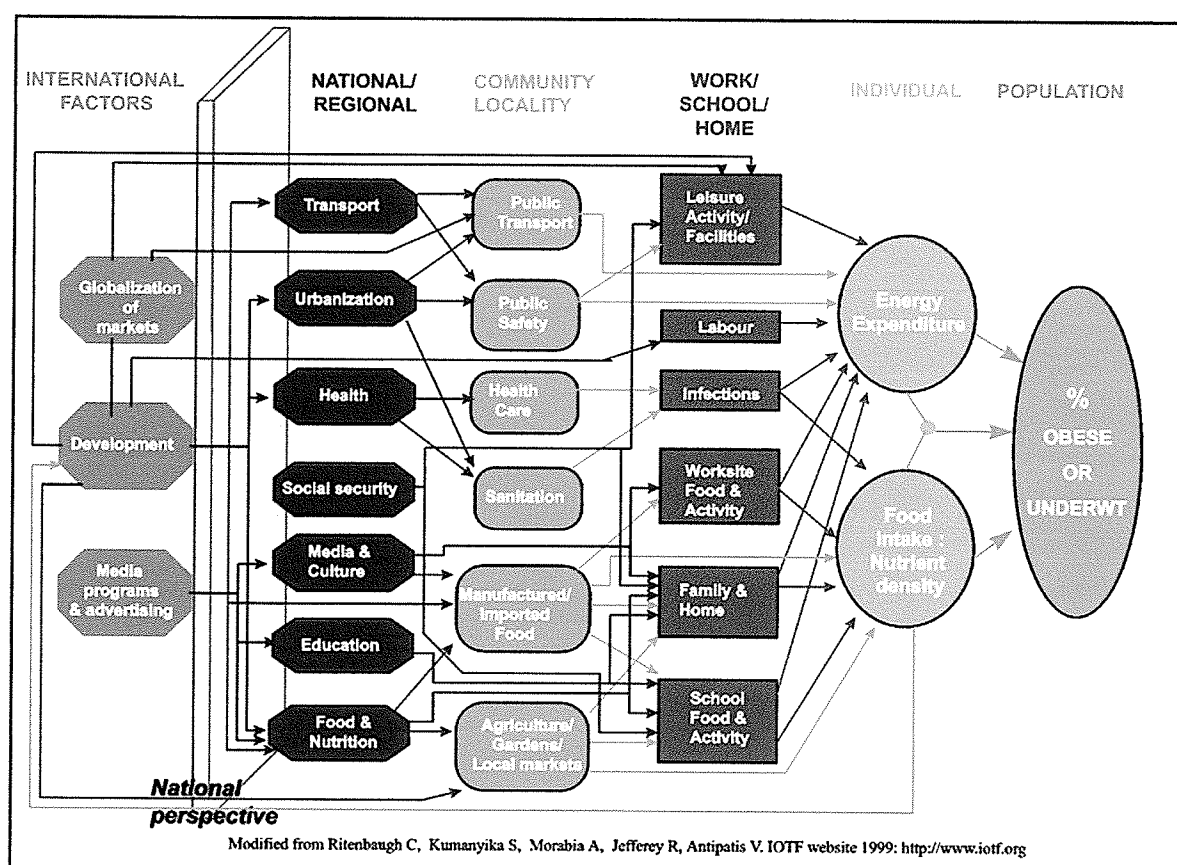
### **Theoretical Approach**

This research project uses a population health framework to inform the study design, analysis and interpretation of results. This approach differs from the traditional biomedical paradigm that locates causal factors and subsequent treatment and interventions within the individual, arguing instead that there are multiple factors at different scales, which influence the health of populations (1). While individual biological and behavioural factors are important elements of the health equation, they are insufficient to explain how health happens at a population level. Social, cultural, and economic factors at the environmental level are equally important determinants of health and include income, education, physical environments, gender, social support networks, health services, housing and working conditions. The population health perspective purports that maximizing the health of populations is best achieved through initiatives which address this broad scope of individual and collective determinants (1;2). The population health perspective employs an ecological approach to analyzing the causes and potential interventions for key health issues.

Several theoretical models have been proposed to explain patterns of overweight and obesity in populations (3-5). One of the most comprehensive is an ecological model from Kumanyika and colleagues (6) shown in Figure 1. This model depicts overweight and obesity resulting from a multiplicity of factors occurring at multiple scales of influence, from individual behaviours through to work, school, home and community, and upward further to regional, national and international factors. It demonstrates how influences at larger scales converge to impact energy balance at the individual level, and

subsequently weight status. This model succinctly incorporates and summarizes the influences on obesity described in the previous section of this document. In doing so, it visually highlights how the different explanations for obesity and overweight need to be considered simultaneously in order to develop a comprehensive understanding. It also illustrates how the diversity of factors affecting obesity operate at different scales of influence, and by doing so challenges one to think through how the factors operative at different scales dynamically inter-relate.

**Figure 1. Societal policies and processes with direct and indirect influences on the prevalence of obesity and under-nutrition**



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Theoretical models are rarely comprehensive enough to capture all elements of a particular health issue. Kumanyika's causal web, while broad in scope and inclusive, depicts the development of overweight and obesity through a unidirectional and linear chain of events from higher to lower level scales of influence. This does not capture the dynamic interplay that people who become overweight and obese have with the environments in which they are embedded. The causal web can be strengthened by incorporating theoretical ideas from other sources. In particular, Giddens' concept of structuration, Krieger's ecosocial theory and Rose's concept of high-risk strategy help to illuminate relationships between elements of the causal web.

Structuration theory (7) is particularly useful for understanding how individuals interact dynamically with their environment across time. Structuration refers to the generation of systems of interaction through duality of structure (8). Structures include traditions, institutions, moral codes and other sets of expectations, and established ways of doing things. Central to structuration is the knowledgeable, strategic and intention-driven social actor, or agent. Social agents pursue goals within the constraints and opportunities of environmental factors. They do this through the recursiveness of social life, as constituted in social practices (9). Social life is recursive in that agents (people) conduct repetitive actions in their daily lives, both individually and collectively. The recursivity, or repetition of these behaviours can remain the same, or change to varying degrees. This tension between "sameness" and change is a constant in human life, which duality of structure attempts to accommodate. Thus, the interplay of actors and environment is a reciprocally dynamic process where actions reproduce, and often change, the structural arrangements observed at higher levels of organization. For

Giddens, the structural properties of social systems are both the medium and outcome of the recursive practices that constitute those systems (9;10). Thus, individual actions are both enabled and constrained by structures, and the aggregate actions of individuals over time simultaneously reproduce and change structures. For example, the concept of cities as social structures has been relatively constant in human life for hundreds of years, yet cities as social systems have changed dramatically, as a result of the recursiveness of human actions. Humans want to live together in close proximity and have engaged in actions which facilitate this, i.e. building dwellings, other structures, and infrastructures to accommodate intensive living arrangements. However, over time, those recursive actions have resulted in very different physical and social structures, and systems, from the changing look of buildings to the layout of cities, to the sheer size of contemporary cities.

With respect to the development of obesity, individual actors make decisions within enabling and constraining structures which reciprocally influence their actions. From this perspective, actions could include food choices, food preparation methods, and choice of transportation while structures could include socio-cultural norms, the industrial food system and conditions of work (11-14). These structures are not static, but are recreated over time through the actions of individuals. This perspective would suggest that overweight and obesity are not linear products of one-way influences occurring both within and outside individuals, but rather the result of a dynamic and temporal interplay between individuals and their environments. The concept of structuration animates Kumanyika's causal web, illustrating the interactions at play in the obesogenic environment.

The causal web of obesity is further enhanced through Krieger's ecosocial theory (15;16). Krieger proposes a multi-level epidemiological framework which integrates social, biological, historical and ecological perspectives to develop new insights into determinants of population health, in particular socio-economic inequalities in health. Ecosocial theory asks the question: "Who and what drives current and changing patterns of social inequalities in health?" Krieger suggests that patterns of health, disease and well-being are biological expressions of social relations, and depicts these relations by using a visual fractal metaphor of an evolving bush of life intertwined at every scale, micro to macro. Ecosocial theory employs the concept of "embodiment" to explain the manifestation of social processes at the individual level, particularly social inequalities. Embodiment is the literal incorporation, biologically, of the material and social world. From this perspective, overweight and obesity are the embodiment of socio-environmental processes including the built environment, the food system, and socio-cultural norms.

Finally, these perspectives are further enhanced through the work done by Rose on prevention and risk (17;18). Obesity interventions have traditionally been directed to high-risk individuals or groups, including those with low income and low education, or living in geographically "at-risk" communities. Rose argues that for many public health issues, a high-risk approach is insufficient to reduce the population prevalence of the issue. For issues where the burden of ill health is not compressed within an identifiable group, ameliorating the problem in high-risk groups will do little to reduce prevalence in the population. Public health issues are complex and require examination and intervention through multiple lenses. While a variety of other theoretical perspectives



and frameworks could be brought to bear on the issue of overweight and obesity, those outlined above provide a strong theoretical basis to inform the current research project. These theoretical ideas have been used heuristically in the design of the three research studies making up this dissertation, and have informed their interpretation. They are also used as a tool to tie together and integrate the disparate results of the three studies into a comprehensive understanding of the ecology of obesity in Canada.

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## Chapter 4

### **Socio-demographic and geographic analysis of overweight and obesity in Canadian adults: Is everyone at risk?**

#### **Abstract**

**Objective:** To examine the public health implications of how overweight and obesity in Canadian adults are distributed across sociodemographic and geographic groupings (health regions).

**Design:** Cross-sectional retrospective analysis of overweight, obesity and socio-demographic indicators for 8,970,590 Canadian adults (25-64 years) using the Canadian Community Health Survey (2005). Overweight and obesity prevalence were modeled against socio-demographic indicators using Poisson regression, and were assessed geographically using choropleth maps. The Gini coefficient was used to assess the public health significance of the observed variability in obesity and overweight.

**Results:** Sixteen percent of females were obese, and 43% were overweight or obese. Nineteen percent of males were obese, and 62% were overweight or obese. Significantly elevated rate ratios for obesity in women were found for increased age, physical inactivity, visible minority status, non-immigrant status, low education level, low-income and moderate food insecurity. Significantly elevated rate ratios for obesity in men were observed for increased age, physical inactivity, non-immigrant status and visible minority status. Directionally similar but weaker trends were observed for overweight and obesity combined. Across health regions, rates of obesity varied from a low of 4.47% to a high of 23.88%. Low Gini coefficients for immigration, education, income and geography ranged from .052 to .15 for obesity and .011 to .076 for overweight and obesity combined, indicating that cases are not highly concentrated in high risk groups. Hypothetical prevention strategies focusing on high risk populations were calculated to yield a minimal decrease in the population prevalence of overweight and obesity.

**Conclusion:** Although rates of overweight and obesity were observed to be significantly graded by socio-demographic predictors and geography, the low Gini coefficient indicates that prevention programs focusing on high risk groups would minimally impact population prevalence. Paired with the observation of very high prevalence in all sub-groups, this suggests that a population-based approach to obesity prevention is warranted.

## **Introduction**

Overweight and obesity continue to be major public health issues in Canada (1;2). Studies conducted over the past several decades indicate a stubborn upward trajectory in body mass index for both adults and children (3;4). This has occurred despite a number of strategies intended to stem the tide of increasing body weights (5;6). This disturbing trend calls for a re-assessment of current approaches to understanding the phenomenon of population overweight and obesity. To date, public health interventions have tended to focus on high risk individuals and the promotion of “healthy lifestyles” through health promotion programs directed at individual behaviour change (5-7). Given the dramatic growth in population body weights in recent decades, a re-examination of the distribution of overweight and obesity in the population is warranted. This study will therefore examine how overweight and obesity in Canadian adults are distributed across sociodemographic and geographic groupings. Study results will provide important information for public health policy and program planners to use in designing effective strategic interventions to decrease the population prevalence of overweight and obesity.

## **Methods**

### **Data Sources**

This analysis is based on data derived from the Public Use Microdata File (PUMF) of the 2005 Canadian Community Health Survey (Cycle 3.1) obtained through the Data Liberation Initiative (8) at the University of Manitoba. The methodology of the survey has been detailed elsewhere (9). In brief, the target population of the survey was all persons 12 years and older living in private occupied dwellings in the 122 health regions of Canada. Excluded from the survey were populations living in First Nation

communities, institutional residents, full-time members of the Canadian Forces, and residents living in certain remote regions, primarily in northern Ontario and Quebec. With a sample size of 128,700, the survey covers approximately 98% of the Canadian population aged 12 years and older. The current study was restricted to individuals 25 to 64 years of age for two reasons. First, the secondary education variable used to model overweight/obesity rates is only meaningful in adults 25 years and older. Second, the BMI measure is valid only in adults younger than 65 years of age.

For geographic mapping, an electronic map file (shape file) was obtained from the Statistics Canada web site (10). Since the PUMF collapses the number of health regions from 122 to 101 in order to protect data confidentiality, the health region shape file was similarly modified to contain only 101 health region polygons. This was accomplished using ArcGis 9.1 (11).

### **Data Preparation and Analysis**

CCHS data was imported into STATA version 9 (12) and a program was written to extract records for individuals 25 to 64 years of age and to code survey variables into the categorical variables required for the study. The category of obese was applied to individuals with a Body Mass Index (BMI) greater than or equal to 30, while the category of overweight/obese was defined as a BMI greater than or equal to 25.

All statistical calculations were undertaken in STATA version 9 (12) using the Survey Data Analysis module, which used the survey weight on the CCHS record to impute correct parameter estimates for calculated statistics. Since the CCHS is based upon a complex sampling design, the standard error required for an assessment of statistical significance may not be estimated properly using standard statistical techniques

which do not take into account complex sampling design (9). In order to accurately estimate standard errors associated with output statistics, detailed survey design details are required including the strata and primary sampling units. The impact of a complex survey design on variance estimates can be summarized as the survey design effect, which is the ratio of the true variance associated with the survey to a comparable variance estimate from a simple random sample of the population (13). Statistics Canada suggests employing the Bootstrap resampling method in order to calculate accurate standard errors for the CCHS which takes into account the survey design effect. It proposes the use of its Bootvar program which has been developed for use on the SAS and SPSS platforms as the best way to accomplish this. However, the Bootstrap method is not available for use with the PUMF and does not support two of the statistical routines employed in this study (Poisson regression, Gini coefficient).

Since the Bootstrap method was not easily applicable to this study, and because detailed survey design details are not published for the 2005 CCHS, this study used an approximate method (13) for incorporating the design effect into more exact standard error estimates as follows. First, the survey design factor was derived by taking the square root of the average survey design effect for the 2005 CCHS of 2.51 (9). Reported standard errors were then multiplied by the survey design factor in order to derive re-scaled standard errors. In order to streamline this calculation within STATA, significance levels were set to 0.998 (instead of the normal 0.95) for all statistical routines, which is functionally equivalent to always multiplying the reported standard error by a survey design factor of 1.58 (square root of 2.51).

In order to describe the demographic and geographic distribution of overweight and obesity, rates were calculated by age, gender, and geography, and standardized where appropriate by age and/or gender using the 2005 CCHS sample population as the standard population. Geographic patterns were visualized through the production of choropleth maps, with rates of overweight and obesity classified into tertiles using the Jenks natural breaks algorithm in ArcGis 9.1 (11). To model the population characteristics associated with overweight and obesity, categorical Poisson regression analysis was employed. Poisson regression was utilized for this study since it can generate comparative rate ratios which are more easily interpreted than the odds ratio generated by logistic regression (14;15). Model predictor variables included age group, gender, education, fruit and vegetable consumption, physical activity level, immigration status, visible minority status, household income and food security.

The public health significance of the variability in rates of overweight and obesity by immigrant status, education, income, and geography were assessed using the Gini coefficient (16), a measure of inequality ranging from 0 (absolute equality in rates) to 1 (absolute inequality in rates). The Gini coefficient has been used previously to examine the geographic variability of infant mortality (16), sexually transmitted diseases (17), and campylobacter (18). The Gini coefficient is calculated by rank ordering risk categories from lowest to highest by case rate, calculating a Lorenz curve which is a plot of the cumulative proportion of cases in each risk category (x axis) against the cumulative proportion of the population in each risk category (y axis), and then calculating the percentage of the area under the axis of equality (see Figures 2a and 2b) covered by the Lorenz curve. The greater the degree to which cases are concentrated in a small number



of risk categories (i.e. distributed disproportionately in relationship to the population at risk), the greater the deflection of the Lorenz curve downwards from the axis of equality and the higher the Gini coefficient. A high Gini coefficient indicates that because the majority of cases are located in a small proportion of the population, a public health intervention would only need to focus on factors affecting a small high risk population (where most of the cases are occurring) in order to be successful in treating or preventing the majority of cases. Alternatively, a low Gini coefficient indicates that cases are spread out relatively evenly across all population groups (despite there being some small groups having very high rates), and that a public health intervention would end up treating or preventing a very small percentage of cases if it focused only on factors affecting a defined high risk group. In this study, the Gini coefficients and associated confidence intervals were calculated using the *Ineqrr* program in Stata (12), with associated Lorenz curves produced in Epi Dat 3.1 (19). Gini scores were calculated for geography (health regions) and for immigration, education, and income for both obesity and obesity/overweight.

To explore the public health planning implications of the Gini coefficients observed in this study, the decreases in the population prevalence of obesity that would occur if public health prevention programs were focused only on sub-populations at highest risk for obesity were estimated. These analyses were undertaken for adult obesity (both genders) by health region and for adult obesity in females by income. Assuming that a hypothetical public health prevention program would successfully prevent 50% of the cases of obesity in the 10% of the population at highest risk for obesity, the number of cases of obesity that would be prevented was ascertained directly from the Lorenz curve

plot. These cases were then subtracted from the total number of cases of obesity estimated by the CCHS and a revised obesity rate that would be hypothetically operative under each prevention scenario was calculated.

## **Results**

In 2005, almost 3 million (18.7%) of Canadian adults 25 to 64 years of age were obese, while close to 9 million Canadian adults (52.7%) were overweight/obese (Table 1). Rates of both obesity and overweight/obesity were the highest in males, and in both genders increased significantly with age.

Poisson regression analysis revealed that rates of both obesity and overweight/obesity were significantly graded by the demographic characteristics of the study population. The relationship between demographic characteristics and weight status was more pronounced for obesity than for overweight/obesity, and for females as compared to males. Tables 2a and 2b express the outputs of the Poisson regression analysis in terms of rate ratios. A rate ratio (rr) is the ratio of the prevalence rate in the category of interest compared to the prevalence rate in the reference or comparison category. As illustrated in Table 2a, rates of obesity were 1.52 times higher in women 55-64 years of age compared to the youngest age group, and 2.01 times higher in the most physically inactive group compared to the most physically active group. Similarly, in comparison to the reference category, significantly higher rates of obesity were observed in women who were white (rr = 1.35), were non-immigrant (rr=1.98), had less than a secondary grade level of education (rr = 1.69), a household income of less than \$15,000 (rr = 1.95) and moderate levels of food insecurity (rr = 1.99). For males, rates of obesity were observed to vary significantly and in the same direction as for females,

but only for age ( $rr = 1.43$ ), physical activity levels ( $rr = 1.48$ ), non-immigrant status ( $rr = 2.09$ ) and white racial status ( $rr = 1.53$ ). For both genders combined, significant rate ratios were observed for age, gender, physical activity, non-immigration and white racial status, education, household income and food security. Paradoxically, the relationship between obesity and education did not vary in a linear fashion, with higher obesity rates ( $rr=1.53$ ) occurring in those having some post secondary education than in study participants have completed only secondary education.

Directionally similar, but weaker trends (smaller rate ratios) were observed for overweight/obesity (Table 2b). For females, significant rate ratios were observed for age, physical activity, non-immigrant and white racial status, lower educational achievement, low household income and food insecurity. For males, significant rate ratios were observed only for age, being a long-term immigrant or non-immigrant, and white racial status. For both genders combined, significant rate ratios were observed for age, gender, physical activity level, long-term or non-immigration and white racial status, lower education, and food insecurity. Males were observed to have a rate of overweight/obesity 30% lower than females.

Figures 1a and 1b illustrate the rates of obesity and overweight by health region in Canada. Rates of obesity (Figure 1a) varied regionally from a low of 4.47% to a high of 23.83%. As shown, the highest rates of obesity were observed in the north (Northwest Territories, Nunavut), the central prairies region (Saskatchewan) and the east coast (Newfoundland, Labrador, and New Brunswick). The lowest rates of obesity were observed in southwestern British Columbia, in central Alberta, and in southern Ontario and Quebec. The major urban centers of Vancouver and lower mainland, Calgary,

Ottawa, Montreal and Toronto were included in the lowest rate regions. Similar geographic patterns were observed for rates of overweight/obesity (Figure 1b), with the lowest rates occurring in southwestern British Columbia and in southern Ontario and Quebec, with the highest rates occurring in the central prairies and the east coast. Slightly lower rates of obesity/overweight were observed in the north, varying from a low of 36.28% to a high of 71.11%.

Although obesity and obesity/overweight were observed to vary significantly by immigration status, education, income, and geography, the very low Gini coefficient values observed (Table 3) suggest that for the population as a whole the cumulative number of cases of obesity and overweight are distributed relatively equally in relation to the cumulative population in each risk category. The highest Gini coefficients observed in the study (0.153, and 0.129) were for obesity by geography (both genders) and for female obesity by income, values much closer to 0 (absolute equality) than to 1 (absolute inequality). The Lorenz curves shown in Figures 2a and 2b, show that in the case of geography, with a Gini coefficient of 0.153, only 18% of the cases of obesity are contained in the 10% of the geographically defined population having the highest risk of obesity; in the education case, with a Gini coefficient of 0.129, only 13 % of the cases of obesity are contained in the 10% of the income classified population (low-income) at highest risk of obesity.

Recalculating the obesity rates operative under the two hypothetical prevention scenarios resulted in only very modest decreases in the population prevalence of obesity. In the prevention scenario which prevented 50% of the cases of obesity in the 10% of the women having the lowest incomes and highest risk for obesity, the number of obesity

cases dropped by 6.5% and the population prevalence of obesity decreased from 15.79% to only 14.76%. Similarly, the prevention scenario which prevented half of the obesity cases in the 10% of the population living in the highest rate geographic areas of Canada resulted in a 9% drop in the number of obesity cases and a decrease in the population prevalence of obesity from 17.31% to 15.75%.

## **Discussion**

This study has demonstrated that there is significant variability in overweight/obesity across geographic and socio-demographic groupings, with stronger and more significant relationships observed for obesity than for obesity/overweight combined. Age, physical inactivity, income, education, non-immigrant status, white racial status and moderate food insecurity were predictive to varying degrees of overweight and obesity in both males and females. Overweight and obesity also varied significantly across geography, with the lowest rates observed in major urban centers.

For males and females increasing age was a strong predictor of higher rates of both overweight and obesity. This is not surprising given that metabolism slows with advancing age, increasing risk of weight gain (20;21) . What is most notable in this study, however, is the observation of dramatically higher rates of obesity and overweight in younger age groups than reported in the past (3;22). Katzmarzyk (23) has also demonstrated that there are now greater numbers of both males and females moving into the highest classes of obesity, i.e. class II (BMI = 35-39.99) or class III (BMI  $\geq$  40) than in previous years. This suggests that Canadians are experiencing an accelerated weight gain in younger ages, a conclusion that is supported by the high and increasing rates of childhood obesity currently observed in Canada (2).

Although household income was a strong predictor of overweight and obesity for females, with the highest rates of obesity and overweight observed in the lowest income quartile, paradoxically for men low income was not associated with high rates of overweight and obesity. Low income in fact appeared to be protective against overweight and obesity in men. The reason for this is not clear and requires further study.

Food insecurity was also predictive for overweight and obesity, but only for females. Food insecurity is directly related to low income (24), and the situation for poor women is frequently exacerbated by being a single parent. This has been shown to paradoxically increase BMI. Low income and food insecurity may lead to a reliance on food assistance, such as food banks. Food procured at food banks is often of low nutritional quality and high in kilocalories in the form of processed convenience foods. The resulting dietary pattern may contribute to overweight and obesity, and other poor health outcomes (25). Another possible explanation may be the “feast or famine” experience of low-income women who, along with their children, have restricted diets during periods of the month when money is short, then purchase “celebration” foods when pay or assistance cheques arrive. These foods are perceived as “rewards” for the previous period of restricted food choice, but are often high calorie snack and fast foods (26).

Low education was predictive of overweight and obesity only for women. This may be linked with low income, as women with low education levels make significantly less money than male counterparts with similar education levels (27).

Recent immigrant status appeared to be protective against both overweight and obesity. This may be because many new arrivals come from countries with low levels of overweight and obesity. For example, 57.7% % of new arrivals to Canada in 2001 were from Asian countries just entering the “nutrition transition” (28), a phenomenon where countries are rapidly adopting a Western-style diet with high levels of energy-dense animal-source and processed foods (29). These transitional countries are currently experiencing rapid increases in population body mass index, but have not reached BMI levels currently seen in Canada. This immigration pattern may explain the low rates of overweight and obesity observed in the major urban centres of Vancouver and the lower mainland of British Columbia, Calgary, Toronto, Ottawa and Montreal, as the majority new arrivals to Canada (80% in 2001) settle in these centres (28).

Visible minority status was also a significant predictor of low BMI. This contrasts with findings elsewhere, which show visible minorities such as U.S. black and Hispanic populations at higher risk of overweight and obesity (30). This may again be reflective of non-white new arrivals in Canada having lower BMIs, and foodways which pre-date the nutrition transition in their countries of origin.

Low rates of physical activity were also observed to be predictive of overweight and obesity for both genders. This is expected, since sedentary behaviour is associated with weight gain (31;32). However, decreased consumption of fruits and vegetables were not associated with higher BMI. This may be because the category for fruit and vegetables in the CCHS included juice, a significant source of kilocalories in the Canadian diet (33;34), and did not assess portion sizes. Further studies are required to determine the role of fruits and vegetables in maintaining body weight.

Although this study has demonstrated variations across socio-demographic groupings and geography, the Gini analysis suggests these differences are less significant than they may initially appear. The low Gini coefficient values observed in this study indicate that the majority of “cases” of overweight and obesity are relatively evenly distributed throughout the population, and not overly concentrated in obvious high risk-groups. While there may be pockets of more susceptible groups with very high rates of obesity and overweight, the high rates across all socio-demographic and geographic groupings suggest that the “causes” of overweight and obesity are also widely dispersed, affecting all population groups. This observation is consistent with Rose’s “high-risk strategy” critique (35). Rose argues it is imperative to know how much of the burden of ill-health (i.e. absolute number of cases) are compressed within an identifiable group where increased exposure carries increased personal risk. If the burden (and subsequent cases) are not highly concentrated in identifiable high risk sub-populations which are small in size (resulting in a low Gini coefficient) then a high risk targeted prevention approach will do little to affect the population prevalence of the health issue, since most cases are outside the high risk group. This conclusion is empirically confirmed by the study results which showed minimal decreases occurring in the population prevalence of obesity if prevention programs were able to achieve a 50% drop in the number of cases of obesity in the highest risk groups (wildly successful obesity prevention programs by any standard). The lack of clear and often paradoxical patterns in obesity risk across identifiable groups (high rates of obesity/overweight in high income men) also supports this notion that prevention programs focusing on easily identifiable high risk groups will



likely fail to achieve significant decreases in the population prevalence of obesity and overweight.

Looking at trends over time may be a useful adjunct to the study of cross-sectional variability (as was undertaken in this study) for understanding the dynamics of the obesity epidemic, and identifying opportunities for intervention. As indicated earlier, rates of overweight and obesity were observed in this study to be high in all sub-populations and significantly higher than historically observed. These significant upward temporal trends in obesity prevalence suggest that there are likely strong and fundamental forces operating across time which are systematically driving rates of obesity and overweight upward in all population groups. This idea is not a surprising one, considering the obesogenic environment that has emerged in Canada and globally over the past several decades. In particular, changes to the food environment and the built environment warrant brief discussion here.

There have been significant changes to what and how Canadians eat in recent decades, in large part due to a foodscape that encourages over-eating (39), or what Nestle calls the “eat more” imperative (36). It has become very easy to obtain and consume excess kilocalories through processed convenience foods and take-away fast food from restaurants and vending machines. In addition, soft drink consumption is higher than ever (37). These food products tend to be low in fibre and high in calories, sodium, sugar and fat (38). Winson refers to these as “pseudofoods” (39) and are ubiquitously available through an endless number of retail opportunities including convenience stores, gas stations, vending machines and fast-food restaurants. Sales of convenient, processed and

fast foods are also at an all-time high (40) and are projected to increase further in the future (41;42).

Canadians also inhabit a built environment that has changed dramatically in recent decades. This environment includes homes, schools, workplaces, highways, urban sprawl, and air pollution as well as lack of access to healthy food, opportunities for physical activity, and leisure time (43). Urban (and increasingly rural) development has led to communities which are pedestrian-hostile, activity-discouraging, and fast-food-intensive. One of the most salient features of the built environment is the ubiquitous dependence on automobiles. Automobile ownership has risen in every country in the world, and Canada now has more than one car for every two people (44). This rise in car use has facilitated the growth of suburban communities, which in turn foster car dependence. These communities often lack safe walking spaces (e.g. sidewalks) and may have few destinations within walking distance. These trends contribute to inactivity and excess kilocalorie intake, resulting in overweight and obesity.

Although the results of this study are consistent with others (1;45-47) which have shown moderately graded relationships between socio-demographic predictors and obesity/overweight, when interpreted from this wider temporal context/perspective, they bring into question the emphasis that has been placed on high-risk sub-populations and poor lifestyle choices as major explanations for overweight and obesity, and related chronic diseases (48-52). The focus on geographic and social disparities as major explanations for obesity and overweight may actually be an artifact of the cross-sectional methodology which has tended to dominate survey research into the causes of obesity. Cross-sectional methodologies by their very nature have the tendency to render invisible

important historical/temporal drivers of the epidemic such as the emerging obesogenic environment (47). This logically brings into question the emphasis on intervention strategies targeted to high-risk individuals and groups. It suggests alternatively that prevention efforts should focus on the emerging obesogenic environment which affects all population groups.

This perspective does not invalidate or deny that some identifiable social groups (i.e. low income women and certain geographical areas such as the North) are at elevated risk of obesity; rather it argues that the primary cause of the obesity epidemic is the emerging obesogenic environment, that all population groups are exposed to it, and that some populations may be more susceptible to the deleterious effects of this environment and become obese because they have fewer social resources and capacities than other more privileged groups in society. This reframing of the disparities argument, which is supported empirically by the results of this study strongly suggest that a population-wide approach to prevention of overweight and obesity is warranted. It further suggests that strategies should be shifted from high-risk individual and groups, and their subsequent lifestyle behaviours, to addressing the obesogenic environment. Further research is warranted to explore effective program and policy mechanisms at this level.

This study has a number of limitations that need to be taken into account when interpreting its results. First, the research was conducted using cross-sectional data and does not model factors across time. Cross sectional studies, and even shorter longitudinal studies, may be blind to significant etiological factors which may have developed temporally. This limitation was addressed in this study, however, through the use of the Gini analysis which highlighted the limitations of exclusively cross-sectional predictors

and explanations for the obesity epidemic. Secondly, the Canadian Community Health Survey data set has a limited number of socio-demographic variables available for analysis. There may be other important predictors of elevated BMI such as family structure, neighbourhood characteristics or work status which were not covered by the survey and could not be analyzed in this study. Thirdly, self-reported height and weight were used with the result that the rates of obesity and overweight reported in this study were most likely underestimated (53;54). The 2005 CCHS does contain measured height and weight for a sub-set of observations. However, this sub-set was too small to allow the predictive modeling and geographic analysis employed by the study. Finally, the 2005 CCHS does not contain information for the on-reserve Aboriginal population, a group at especially high risk for obesity (9). This omission may have biased the geographic patterns observed, especially in northern Canada where there is a large number of reserve communities. Despite these limitations however, this research has highlighted the need to emphasize population based prevention strategies to prevent overweight and obesity. It has provided evidence that there is likely no "magic bullet" to be found which could be used to address the obesity epidemic; rather strategies for obesity prevention are going to have to grapple with the taken for granted aspects of our increasingly obesogenic landscape which appears to be affecting all Canadians. The study has also highlighted that further research is required to understand the dimensions of this obesogenic environment and how it has evolved over time to impact the body weight of Canadians. This will require comprehensive surveillance of the Canadian diet and on-going surveys of population weight status using measured height and weight. This type of surveillance and research will be important in building the empirically based

argument that it is necessary for overweight/obesity preventions efforts to encompass true population-health strategies in order to turn the page on this insalubrious phase in Canadian public health.

**Table 1. Prevalence of obesity<sup>1</sup> and overweight/obesity<sup>2</sup> in adults (25-64 years), Canadian Community Health Survey, 2005**

<b>OBESE</b>									
<b>FEMALES</b>			<b>MALES</b>			<b>BOTH GENDERS</b>			
<b>Age Group</b>	<b>Cases</b>	<b>Cases/ 100</b>	<b>C.I. (99.8%)</b>	<b>Cases</b>	<b>Cases/ 100</b>	<b>C.I. (99.8%)</b>	<b>Cases</b>	<b>Cases/ 100</b>	<b>C.I. (99.8%)</b>
<b>25-34</b>	242 903	12.81	11.45, 14.18	312 594	15.42	13.81, 17.02	555 497	14.16	13.10, 15.22
<b>35-44</b>	329 047	13.83	12.32, 15.34	453 461	17.76	17.76, 19.41	782 508	15.86	14.74, 16.99
<b>45-54</b>	410 160	17.55	15.64, 19.46	474 471	20.36	20.36, 22.52	884 630	18.95	17.51, 20.40
<b>55-64</b>	333 358	19.42	17.74, 21.10	388 590	21.98	21.98, 24.08	721 948	20.72	19.37, 22.07
<b>All Ages</b>	1 315 467	15.79	14.96, 16.63	1 629 116	18.77	18.77, 19.72	2 944 583	17.31	17.82, 19.72
<b>OVERWEIGHT AND OBESE</b>									
<b>FEMALES</b>			<b>MALES</b>			<b>BOTH GENDERS</b>			
<b>Age Group</b>	<b>Cases</b>	<b>Cases/ 100</b>	<b>C.I. (99.8%)</b>	<b>Cases</b>	<b>Cases/ 100</b>	<b>C.I. (99.8%)</b>	<b>Cases</b>	<b>Cases/ 100</b>	<b>C.I. (99.8%)</b>
<b>25-34</b>	637 572	33.63	31.57, 35.68	1 090 256	53.78	51.51, 56.05	1 727 828	44.05	42.47, 45.62
<b>35-44</b>	922 299	38.76	36.53, 40.98	1 585 951	62.11	58.95, 64.27	2 508 250	50.85	49.26, 52.44
<b>45-54</b>	1 080 994	46.25	43.61, 48.89	1 511 101	64.83	62.21, 67.45	2 592 095	55.53	53.63, 57.44
<b>55-64</b>	955 247	55.65	53.37, 57.93	1 187 170	67.10	64.68, 69.63	2 142 417	61.50	59.80, 63.19
<b>All Ages</b>	3 596 112	43.17	41.98, 44.36	5 374 478	61.92	60.72, 63.13	8 970 590	52.74	51.88, 53.61

<sup>1</sup>BMI ≥ 30

<sup>2</sup>BMI ≥ 25

**Table 2a. Poisson regression analysis, obese<sup>1</sup> adults (25-64 years), Canadian Community Health Survey, 2005**

Predictor	FEMALES			MALES			BOTH GENDERS		
	RR	(99.8% C.I.)	Cases	RR	(99.8% C.I.)	Cases	RR	(99.8% C.I.)	Cases
<b>Age Group<sup>a</sup>:</b>									
1) 25-34 <i>R</i>	1.0	Ref	242,903	1.0	Ref	312,549	1.0	Ref	555,497
2) 35-44	1.08	(0.93,1.26)	329,047	1.15	(1.10,1.32)*	453,461	1.12	(1.04,1.24)*	782,508
3) 45-54	1.37	(1.17,1.60)*	410,160	1.32	(1.14,1.53)*	474,471	1.34	(1.20,1.49)*	884,630
4) 55-64	1.52	(1.32,1.74)*	333,358	1.43	(1.24,1.64)*	388,590	1.46	(1.32,1.62)*	721,948
<b>Gender<sup>b</sup>:</b>									
1) Male <i>R</i>	—	—	—	—	—	—	1.0	Ref	1,629,116
2) Female	—	—	—	—	—	—	0.84	(0.78,0.91)*	1,315,467
<b>Fruit &amp; Veg<sup>b,c</sup>:</b>									
1) <5x/day	1.15	(0.78,1.69)	423,385	1.22	(0.78,1.91)	667,688	1.19	(0.88,1.59)	1,091,073
2) 5-10x/day	1.02	(0.69,1.52)	317,615	0.98	(0.62,1.55)	246,134	1.0	(0.74,1.35)	563,749
3) >10x/day <i>R</i>	1.0	Ref	29,008	1.0	Ref	20,571	1.0	Ref	49,579
<b>Physical Activity<sup>b,c</sup>:</b>									
1) Active <i>R</i>	1.0	Ref	181,269	1.0	Ref	303,724	1.0	Ref	484,992
2) Mod Active	1.39	(1.16,1.66)*	300,577	1.23	(1.05,1.45)*	383,320	1.29	(1.14,1.45)*	683,896
3) Inactive	2.01	(1.72,2.36)*	823,720	1.48	(1.29,1.70)*	916,999	1.68	(1.52,1.87)*	1,740,719
<b>Immigration<sup>b,c</sup>:</b>									
1) ≤9 years <i>R</i>	1.0	Ref	39,324	1.0	Ref	48,298	1.0	Ref	
2) ≥10 years	1.47	(0.90,2.41)	173,104	1.29	(0.75,2.21)	179,361	1.37	(0.95,1.99)	87,622
3) Non-Immigrant	1.98	(1.24,3.15)*	1,103,039	2.09	(1.26,3.47)*	1,401,458	2.04	(1.44,2.89)*	352,465
<b>Culture/Race<sup>b,c</sup>:</b>									
2) Vis. Minority <i>R</i>	1.0	Ref	160,140	1.0	Ref	180,998	1.0	Ref	341,138
1) White	1.35	(1.12,1.64)*	1,138,427	1.53	(1.25,3.47)*	1,410,287	1.45	(1.26,1.66)*	2,548,713
<b>Education<sup>b,c</sup>:</b>									
1) < 2° school grad	1.69	(1.44,1.99)*	108,941	1.15	(0.96,1.38)	85,064	1.40	(1.24,1.58)*	194,005
2) 2° school grad	1.42	(1.21,1.66)*	154,345	1.18	(1.02,1.37)*	166,622	1.29	(1.15,1.43)*	320,967
3) Some post-2°	1.53	(1.25,1.87)*	90,428	1.15	(0.93,1.43)	88,776	1.32	(1.14,1.52)*	179,204
4) Post-2° grad <i>R</i>	1.0	Ref	883,344	1.0	Ref	1,132,957	1.0	Ref	2,016,301
<b>Household Income<sup>b,c</sup>:</b>									
1) < \$15,000	1.95	(1.59,2.39)*	89,606	0.92	(0.73,1.15)	51,960	1.33	(1.15,1.54)*	141,566
2) \$15-29,999	1.72	(1.44,2.06)*	158,826	0.98	(0.82,1.17)	106,427	1.27	(1.13,1.44)*	265,253
3) \$30-49,999	1.69	(1.42,2.0)*	288,184	0.97	(0.84,1.12)	248,683	1.23	(1.11,1.37)*	536,866
4) \$50-79,999	1.39	(1.18,1.64)*	337,446	1.10	(0.97,1.25)	457,773	1.20	(1.08,1.32)*	795,219
5) ≥\$80,000 <i>R</i>	1.0	Ref	301,465	1.0	Ref	597,414	1.0	Ref	898,879
<b>Food Security<sup>b,c</sup>:</b>									
0) Food Secure <i>R</i>	1.0	Ref	972,905	1.0	Ref	1,286,838	1.0	Ref	2,259,743
1) Insec-no hunger	1.76	(1.40,2.22)*	67,940	0.98	(0.70,1.38)	33,550	1.39	(1.15,1.69)*	101,490
2) Insec-moderate	1.99	(1.52,2.60)*	40,183	1.0	(0.68,1.48)*	15,296	1.56	(1.24,1.95)*	55,479
3) Insec-severe	1.73	(0.90,3.33)	7,858	1.11	(0.57,2.15)	6,312	1.39	(0.88,2.19)	14,170

<sup>1</sup> BMI ≥ 30

<sup>a</sup> adjusted for gender for “Both Genders” category only

<sup>b</sup> adjusted for age

<sup>c</sup> adjusted for age and gender for “Both Genders” category only

\*significant at p<0.002

**Table 2b. Poisson regression analysis, overweight/obese<sup>1</sup> adults (25-64 years), Canadian Community Health Survey, 2005**

Predictor	FEMALES			MALES			BOTH GENDERS		
	RR	(99.8%CI)	Cases	RR	(99.8%CI)	Cases	RR	(99.8%CI)	Cases
<b>Age Group<sup>a</sup>:</b>									
5) 25-34 <i>R</i>	1.0	Ref	637,572	1.0	Ref	1,090,256	1.0	Ref	1,727,828
6) 35-44	1.15	(1.06,1.25)*	922,299	1.15	(1.09,1.22)*	1,585,951	1.15	(1.10,1.21)*	2,508,250
7) 45-54	1.38	(1.27,1.50)*	1,080,994	1.21	(1.14,1.28)*	1,511,101	1.26	(1.20,1.32)*	2,592,095
8) 55-64	1.65	(1.54,1.78)*	955,247	1.25	(1.18,1.32)*	1,187,170	1.39	(1.33,1.46)*	2,142,417
<b>Gender<sup>b</sup>:</b>									
3) Male <i>R</i>	—	—	—	—	—	—	1.0	Ref	5,374,478
4) Female	—	—	—	—	—	—	0.70	(0.67,0.72)*	3,596,112
<b>Fruit &amp; Veg<sup>b,c</sup>:</b>									
4) <5x/day	1.02	(0.84,1.25)	1,139,785	1.09	(0.91,1.29)	2,154,975	1.05	(0.92,1.20)	3,294,758
5) 5-10x/day	0.97	(0.80,1.19)	913,057	1.04	(0.87,1.24)	940,696	1.0	(0.87,1.14)	1,853,753
6) >10x/day <i>R</i>	1.0	Ref	87,329	1.0	Ref	74,918	1.0	Ref	162,246
<b>Physical Act<sup>b,c</sup>:</b>									
4) Active <i>R</i>	1.0	Ref	647,576	1.0	Ref	1,268,731	1.0	Ref	1,916,308
5) Mod Active	1.18	(1.08,1.28)*	910,129	1.04	(0.99,1.10)	1,351,167	1.09	(1.04,1.14)*	2,261,296
6) Inactive	1.37	(1.27,1.48)*	2,009,411	1.04	(0.99,1.09)	2,679,689	1.15	(1.11,1.20)*	4,689,100
<b>Immigration<sup>b,c</sup>:</b>									
4) ≤9 years <i>R</i>	1.0	Ref	145,252	1.0	Ref	249,879	1.0	Ref	395,130
5) ≥10 years	1.21	(0.97,1.50)	533,770	1.13	(0.97,1.31)*	776,447	1.16	(1.02,1.31)*	1,310,217
6) Non-Immigrant	1.40	(1.15,1.71)*	2,917,090	1.29	(1.13,1.48)*	4,348,153	1.33	(1.19,1.49)*	7,265,242
<b>Culture/Race<sup>b,c</sup>:</b>									
2) Vis. Minority <i>R</i>	1.0	Ref	475,260	1.0	Ref	710,468	1.0	Ref	1,185,728
2) White	1.21	(1.10,1.34)*	3,049,991	1.27	(1.18,1.37)*	4,534,480	1.25	(1.17,1.33)*	7,584,470
<b>Education<sup>b,c</sup>:</b>									
5) < 2° school grad	1.36	(1.25,1.47)*	255,474	0.98	(0.91,1.05)	241,266	1.15	(1.09,1.21)*	496,740
6) 2° school grad	1.21	(1.12,1.31)*	379,298	1.03	(0.97,1.10)	495,401	1.11	(1.05,1.16)*	874,699
7) Some post-2°	1.23	(1.10,1.37)*	207,534	0.99	(0.90,1.08)	260,348	1.08	(1.01,1.16)*	467,882
8) Post-2° grad <i>R</i>	1.0	Ref	2,524,264	1.0	Ref	3,874,291	1.0	Ref	6,398,556
<b>Household Income<sup>b,c</sup>:</b>									
6) < \$15,000	1.27	(1.14,1.43)*	195,229	0.76	(0.68,0.86)*	154,021	0.97	(0.89,1.05)	349,250
7) \$15-29,999	1.21	(1.10,1.33)*	371,437	0.79	(0.73,0.87)*	309,627	0.96	(0.90,1.02)	681,064
8) \$30-49,999	1.25	(1.15,1.36)*	706,962	0.86	(0.81,0.92)*	792,320	1.0	(0.95,1.05)	1,499,283
9) \$50-79,999	1.15	(1.06,1.24)*	911,915	0.97	(0.92,1.01)	1,444,676	1.02	(0.98,1.07)	2,356,590
10) ≥\$80,000 <i>R</i>	1.0	Ref	985,790	1.0	Ref	2,140,754	1.0	Ref	3,126,544
<b>Food Security<sup>b,c</sup>:</b>									
4) Food Secure <i>R</i>	1.0	Ref	2,782,467	1.0	Ref	4,341,777	1.0	Ref	7,124,244
5) Insec-no hunger	1.31	(1.15,1.49)*	145,053	0.94	(0.81,1.08)	110,069	1.12	(1.01,1.23)*	255,122
6) Insec-moderate	1.45	(1.25,1.68)*	83,672	0.90	(0.75,1.07)	46,576	1.18	(1.05,1.33)*	130,248
7) Insec-severe	1.39	(1.01,1.93)*	17,943	0.85	(0.63,1.13)	16,371	1.07	(0.84,1.35)	34,314

<sup>1</sup> BMI ≥ 25

<sup>a</sup> adjusted for gender for “Both Genders” category only

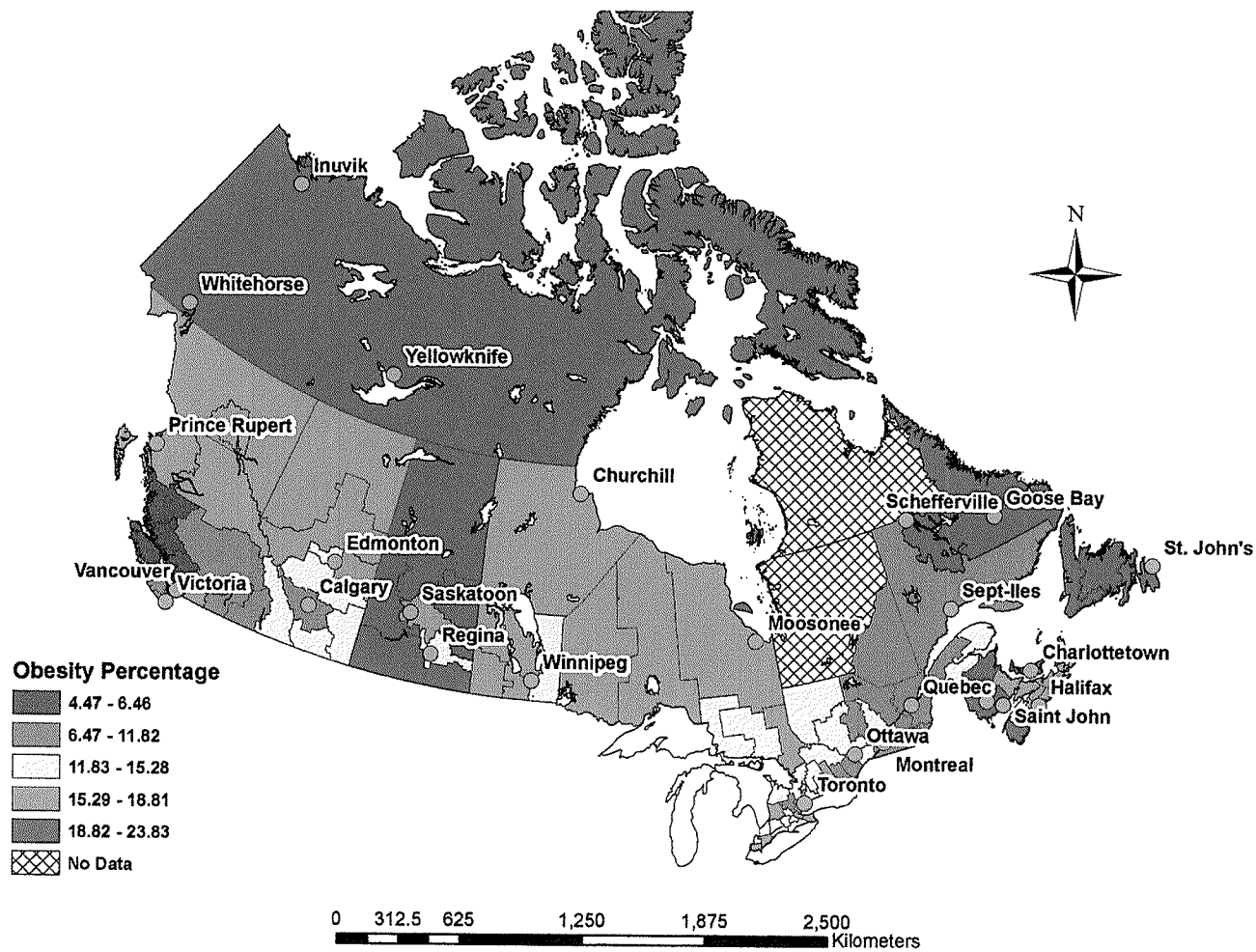
<sup>b</sup> adjusted for age

<sup>c</sup> adjusted for age and gender for “Both Genders” category only

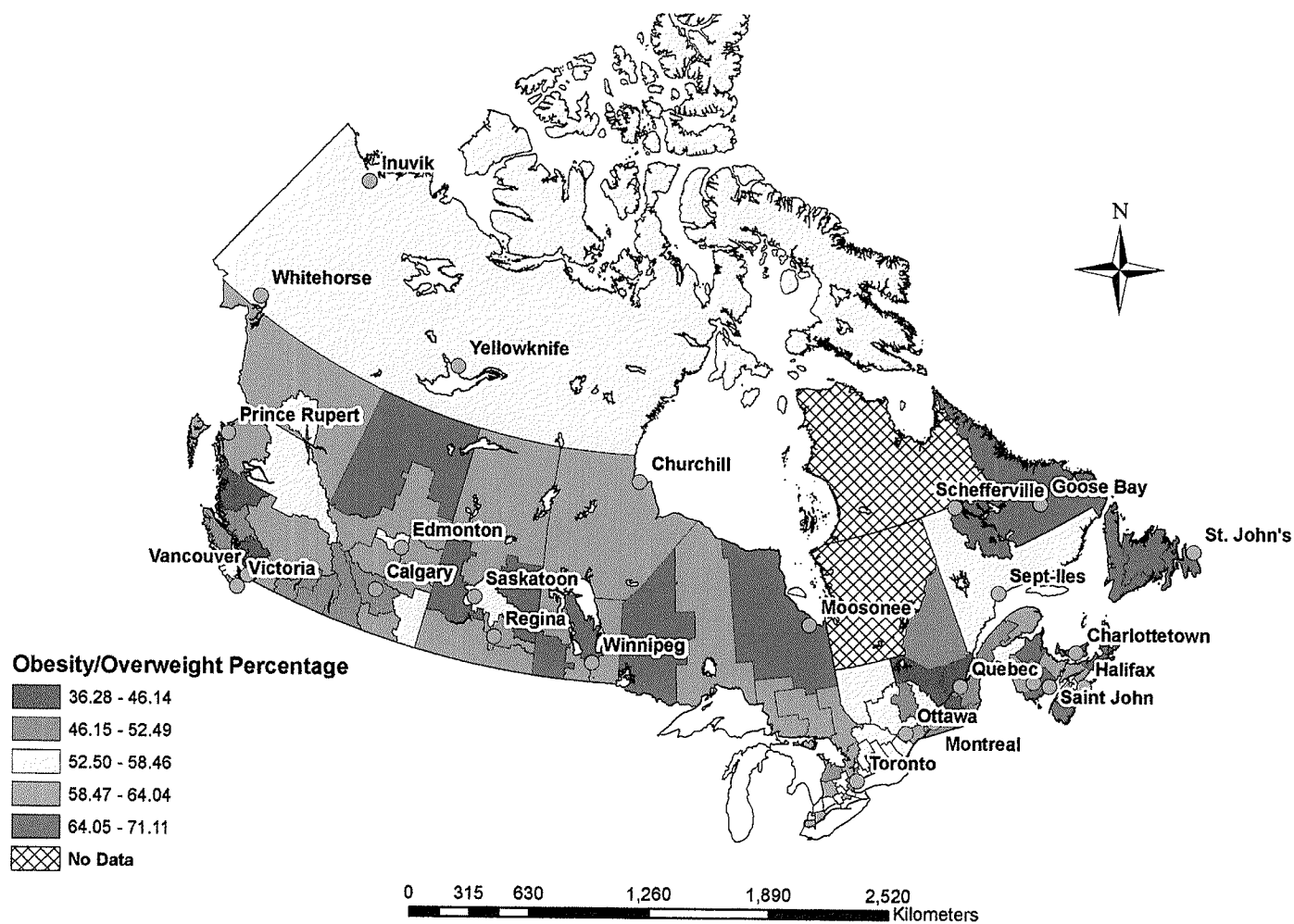
\*significant at p<0.002



**Figure 1a. Adult obesity (BMI  $\geq 30$ ) prevalence by health region, age and sex standardized to the 2005 Canadian population (25-64), Canadian Community Health Survey, 2005.**



**Figure 1b. Adult overweight/obesity (BMI  $\geq 25$ ) prevalence by health region, age and sex standardized to the 2005 Canadian population (25-64), Canadian Community Health Survey, 2005.**



**Table 3. Gini coefficient analysis for adult (25-64 years) obesity<sup>1</sup> and overweight/obesity<sup>2</sup> prevalence, Canadian Community Health Survey, 2005**

	OBESE						OVERWEIGHT/OBESE					
	Female	(99.8% C.I.)	Male	(99.8% C.I.)	Female & Male	(99.8% C.I.)	Female	(99.8% C.I.)	Male	(99.8% C.I.)	Female & Male	(99.8% C.I.)
<b>Immigration</b>	.06	.04,.16	.078	.01,.17	.07	.03,.17	.032	.04,.11	.026	.01,.07	.029	.02,.08
<b>Education</b>	.086	.00,.17	.03	.00,.06	.056	.00,.11	.049	.00,.10	.004	.01,.02	.022	.00,.04
<b>Income</b>	.129	.01,.25	.026	.00,.06	.052	.00,.10	.056	.01,.11	.04	.00,.08	.011	.00,.02
<b>Geography</b>	.17	.13,.20	.16	.11,.21	.15	.12,.19	.094	.07,.12	.066	.04,.09	.076	.05,.10

<sup>1</sup>BMI $\geq$ 30

<sup>2</sup>BMI $\geq$ 25

**Figure 2a. Gini coefficient, adult (males and females, 25-64 years) obesity (BMI $\geq$ 30) by health region**

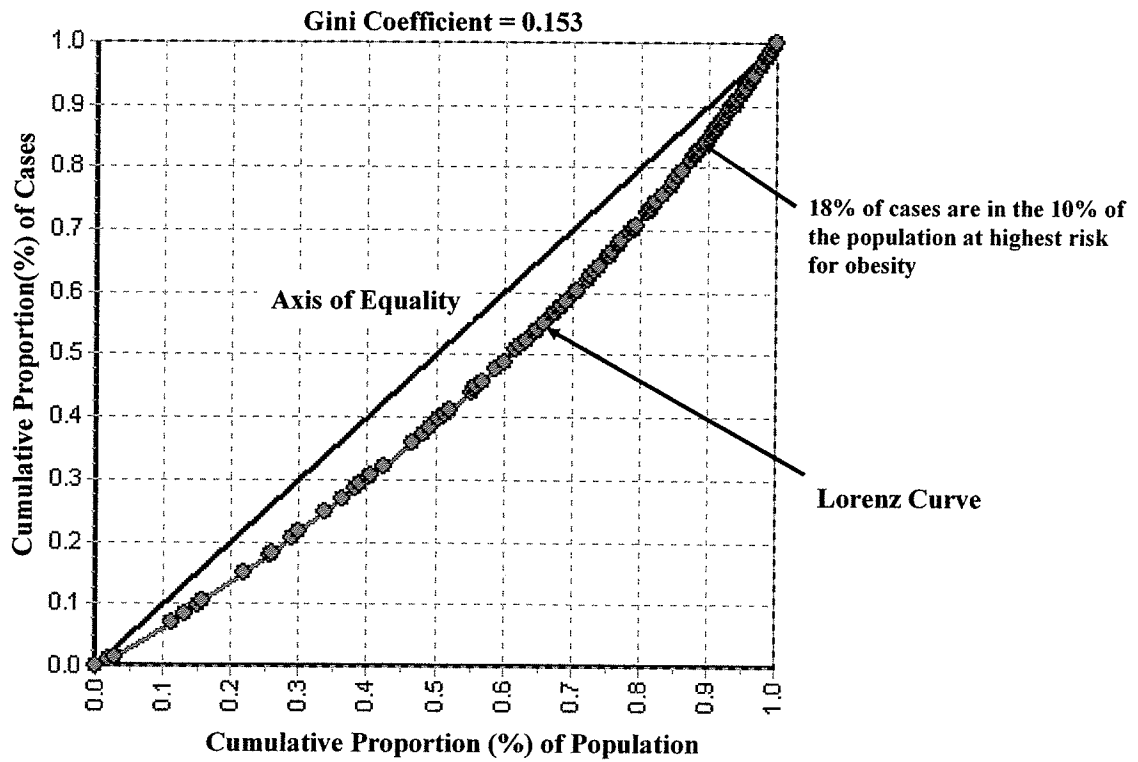
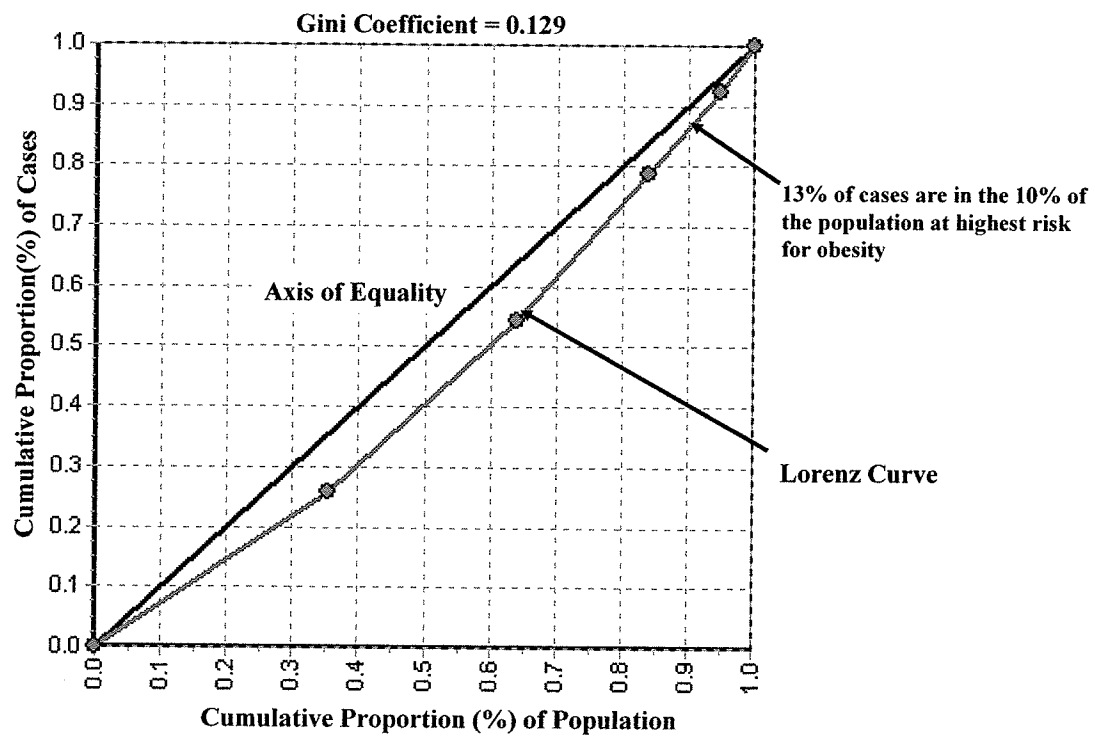


Figure 2b. Gini coefficient, adult (females 25-64 years) obesity (BMI $\geq$ 30), by income



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## Chapter 5

### **The growing Canadian energy gap: More the can than the couch?**

#### **Abstract**

**Objective:** This study describes the trajectory of the energy gap (energy imbalance) in the Canadian population from 1976 to 2003, its temporal relationship to adult obesity, and estimates the relative contribution of energy consumption and energy expenditure to the increasing energy gap. It also assesses which foods contributed the most to changes in energy consumption over the study period.

**Design:** Annual estimates of the energy gap were derived by subtracting population adjusted per capita daily energy requirements (derived from Dietary Reference Intakes) from per capita daily energy consumption (obtained from national food balance sheets). Food balance sheets were used to assess which foods contributed to changes in energy consumption. Adult obesity rates were derived from six national surveys, and the relationship to the energy gap was assessed through regression analysis.

**Results:** Between 1976 and 2003, per capita daily energy intake increased by 417 kilocalories, and increased energy consumption was the major driver of the increased energy gap in the Canadian population. Salad oils, wheat flour, soft drinks and shortening accounted for the majority of the net increase in energy consumed. Adult obesity was significantly correlated with the energy gap over the study period.

**Conclusions:** The widening energy gap is being driven primarily by increased energy consumption. The food commodities driving the widening energy gap are major ingredients in many highly processed, energy dense convenience foods, which are being consumed with increasing frequency in Canada. These results suggest that policies to address population obesity must include have a strong nutritional focus with the objective of decreasing energy consumption at the population level.

## **Introduction**

The prevalence of obesity has increased dramatically around the world in the past several decades, and Canada is no exception. Between 1985 and 2003 obesity in Canadian adults increased almost three fold, from 5.6% to 14.7% (1;2). This trend presents a major public health problem, as obesity is associated with many adverse health outcomes including type 2 diabetes, cardiovascular disease, musculo-skeletal disorders and several cancers (3;4).

There is consensus in the scientific community that obesity is a growing problem, and is the result of an increasing energy imbalance, or too much energy (kilocalories) consumed for the amount of energy expended (3;5-8). This energy imbalance, or “energy gap”, is an important concept for examining obesity because it is a quantitative measure of the potential for weight loss or gain in a population. Researchers, however, have only recently begun to use this concept in population studies of obesity (9-11). One possible reason is that there is no agreement as to whether the greater contributor to obesity is excess energy intake from food or lower energy requirements from decreased physical activity (8;12;13). This disagreement is due in significant part to the difficulty of measuring population dietary intakes and physical activity levels reliably over long periods of time (14-16). This disagreement may also be due in part to the vested interests of the food industry who might find it convenient to argue that increasing population obesity rates have little to do with over-consumption of their products, and more to do with consumer inactivity. Clarity regarding the causes of the energy gap is therefore critically important because of the significance this has for the development of public health policies and programs to stem the rising tide of obesity in Canada and

around the world. If it was determined, for example, that the major cause of the energy gap at the population level was insufficient physical activity, then it could be argued that public health programs addressing the obesity epidemic should focus primarily on increasing the physical activity levels of the population. Conversely, if it was determined that the primary cause of the energy gap was excessive caloric intake, then it could be argued that public health programs to prevent obesity should focus on modifying the nutritional habits of the population.

This ecological study will therefore describe the trajectory of the energy gap in the Canadian population from 1976 to 2003, its relationship to the population prevalence of obesity, and will provide estimates of the relative contributions of energy consumption and estimated energy requirements (EER) to the energy gap. This will be undertaken for 4 different empirically based scenarios based upon varying assumptions about temporal trends in per capita EER between 1976 and in 2003. The study will also examine changes that have occurred in Canadian food consumption patterns over the study period that may be contributing to observed trends in energy consumption. Study conclusions will focus on the public health implications of study results.

### **Materials and Methods**

Estimates of daily per capita consumption of energy (kilocalories) and changes in consumption of individual foods for the years 1976 to 2003 were derived from Canadian food balance sheets (17). These are periodic statistics, collected annually, which give the total quantity of foodstuffs in Canada. The data are compiled using a supply-disposition method, where beginning stocks are determined on January 1 through farm surveys, production/ manufacturing reports and import/export data. Ending stocks are measured

on December 31, deducting remaining stocks, exports, manufacturing uses, livestock feed, and waste (loss in processing and storage) from the beginning supply (18). The per capita amount of each food item available for human consumption is derived by dividing the total quantity of food by the total population for each year. The resulting data are categorized as “consumed” figures, which account for further wastage at the retail, household, cooking and plate levels (18). Food balance sheets were chosen as a data source for estimating changes in Canadian food consumption patterns since there has been no ongoing surveillance of Canadian dietary intakes through population-based surveys. Food balance sheet data has been shown to be valid for estimating trends in consumption over time for foods, energy, and some nutrients (19;20).

Estimates of obesity prevalence rates for Canadian adults (20-64 yrs of age) were obtained from seven national surveys conducted between 1986 and 2003 (1;21;22). All heights and weights were self-reported. Obesity was defined as having a body mass index (BMI) of 30 kg/m<sup>2</sup> or greater. An average filter smoothing routine was used to interpolate obesity prevalence estimates for between survey years using Stata 9 (23), yielding obesity prevalence estimates for each year from 1986 to 2003.

To calculate the annual per capita EER for the total Canadian population while controlling for changing population age structure, published estimates of energy requirements (24;25) were applied to the entire Canadian population structure (ages 0 and up) from 1978 to 2003 on an age and gender specific basis (26). This method of calculating average per capita EER over time was undertaken to ensure annual estimates could be compared over the study period without being biased by significant increases or decreases in the size of population groups with unique caloric requirements (i.e. the

elderly, adolescents). Three scenarios of EER were calculated based upon published assumptions concerning average physical activity levels of the population. These were: sedentary (light physical activity associated with typical daily living); moderately active (walking 1/5 to 3 miles per day in addition to light physical activity associated with daily living); and active (walking more than 3 miles per day in addition to light physical activity associated with daily living) (25).

For each of the three levels of daily per capita EER (sedentary, moderately active, active), which were assumed to hold constant across the study period, the energy gap for each year of the study was calculated by subtracting the daily per capita EER from the estimated daily per capita energy consumption. To explore the implications that a decreasing trend in daily per capita EER over the study period would have on study results, the energy gap for one additional scenario (moderate physical activity level in 1976 progressing to a sedentary physical activity level by 2003) was also calculated. This was computed using a time weighted average of the moderate and sedentary scenario values for annual per capita daily EER, with 100% of the weight given to the moderate scenario input values in 1976 (and 0% weighting given to the sedentary scenario input value), decreasing progressively in linear fashion to 0% weighting of the moderate scenario input value by 2003 (with 100% weighting given to the sedentary scenario input value). The energy gap for this fourth scenario was calculated as above by subtracting the estimated daily per capita EER from the estimated daily per capita energy consumption.

The relationship of the four estimates of annual per capita daily EER to annual per capita daily energy consumption was assessed by visually plotting temporal trends. The

relationships of per capita daily energy consumption, and the four scenario based energy gaps to the population prevalence of obesity were also assessed visually by plotting temporal trends, and analytically through regression analysis (Pearson's R) using Stata 9.0 (23). All regression calculations were adjusted for the potential effect of serial autocorrelation in the data, using Newey West standard error correction, and were restricted to the years 1986 to 2003 (the year range for which obesity data was available).

To partition out the relative contribution of energy requirements (proxy for physical activity) and energy consumption to the change in the energy gap observed over the study, attributable fractions for both factors were calculated. This was accomplished by calculating the change in the annual per capita EER and annual per capita energy consumption between 1976 and 2003 for each of the four scenarios and dividing these into the total change in the energy gap that occurred between 1976 and 2003.

Changes in food consumption patterns over the study period were determined by rank ordering food commodities from Canadian food balance sheets by changes in energy consumed over the study period in order to identify individual food items making the largest contributions to changes in caloric intake between 1976 and 2003.

## **Results**

Table 1 summarizes the changes in the annual rates of adult obesity, annual per capita daily energy consumption and per capita daily EER, and the resulting energy gaps. As shown, the estimated average per capita caloric intake increased from 2349 calories in 1976 to 2766 calories in 2003, a 17% increase. Over this same time period, the average per capita daily EER for the base input scenarios 1, 2 and 3 (constant per capita daily EER between 1976 and 2003) remained relatively constant, while the per capita daily

EER for scenario 4 (moderately active in 1976, sedentary in 2003) fell by 213 calories. In 2003, all EER scenarios were observed to have a significant energy gap, ranging from 415 to 924 calories. Between 1985 and 2003, the estimated rates of adult obesity increased from 5.6% to 14.9%.

Figure 1 illustrates the widening gap between estimated per capita energy consumption and the four EERs between 1976 and 2003. The energy gaps increased in size from a high of 630 calories per day in scenario 4 (moderately in 1976 progressing to sedentary in 2003) to a low of 387 calories per day in scenario 3 (active in 1976 and active in 2003).

Figures 2a and 2b superimpose the per capita daily energy gap for all four scenarios and the per capita daily energy consumption against the adult obesity rate. As illustrated, all variables exhibit a significant upward trend over time, with an apparent positive temporal relationship between the four energy gap trend lines, per capita estimated daily energy consumption, and adult obesity. This visual impression is confirmed by the results of correlation analysis (Table 2) level which found strong and significant relationships between all predictor variables and obesity (all Pearson R values greater than 0.90 and significant at the  $p < 0.0001$  level).

In scenarios 1 to 3, where a constant level of physical activity was assumed to have occurred over the study period, as expected very small changes in per capita daily EER were observed between 1976 and 2003 (Figure 1). As a result, approximately 100% of the increase in the energy gap observed in these scenarios can be attributed to an increase in caloric consumption (and 0% attributed to a change in physical activity). In scenario 4, where physical activity was assumed to have decreased from moderate to



sedentary levels between 1976 and 2003, per capita caloric requirements decreased by 213 calories and the energy gap increased by 630 calories. Of this 630 calorie increase, 67% (417 calories) were due to increased caloric consumption between 1976 and 2003, while 33% (213 calories) were due to a decrease in EER (decreased physical activity).

Between 1976 and 2003, the consumption of most food commodities did not increase or decrease appreciably. However, the consumption of a small number of food commodities did change significantly. As illustrated in Figure 3, just seven food commodities (salad oils, wheat flour, soft drinks, shortening, rice, chicken and cheese) were responsible for increasing the per capita daily caloric intake by 440 calories over the study period, accounting for more than 80% of the total increase in per capita energy consumption. Salad oils, wheat flour and soft drinks were responsible for over half the observed increase in kilocalories. The consumption of five food commodities (beef, butter, fluid milk, margarine and eggs) decreased substantially over the same time, accounting for over 95% of the total decrease in energy consumption in foods experiencing a drop between 1976 and 2003.

## **Discussion**

This study has demonstrated that both per capita daily energy consumption and the per capita daily energy gap in the Canadian population have increased significantly between 1976 and 2003, with the greatest increases occurring after the mid-1980's. The study has also shown that these increases are temporally related to the increase in the rates of adult obesity in Canada. Evidence also indicates that the widening energy gap is being driven primarily by increasing energy consumption and not by decreasing energy requirements of the population. In the three scenarios, which assumed a constant per

capita daily EER between 1976 and 2003, 100% of the increase in the energy gap was estimated to be due to an increase in per capita daily energy consumption. In the scenario which assumed that individuals became more sedentary between 1976 and 2003, the majority of the increase in the energy gap was still accounted for by an increase in per capita daily energy consumption.

These results are consistent with those from Harnack and colleagues, which show energy availability in the U.S. food supply increasing by 15% between 1970 and 1994 (27). They are also consistent with Bleich and colleagues who have modeled the attributable fraction of obesity due to energy in and energy out for a number of developed countries (28). They concluded that physical activity in Canada did not change appreciably from 1990 to 2001, and 100% of the attributable fraction of obesity was due to calories in rather than calories out. Jeffrey and Linde (29) also concluded that decreasing intentional energy expenditure, i.e. physical activity, is unlikely to be the primary cause of recent increases in population obesity since the majority of human energy requirements are non-modifiable, with 60-80 per cent of caloric intake required to maintain temperature homeostasis and basic metabolic functions. They argue that since most industrialized populations were already relatively sedentary at the beginning of the obesity epidemic, it is unlikely that substantial decreases in intentional energy expenditure have occurred in the past twenty years (30). Recent research also suggests that more than 60 minutes per day of moderate to intense physical activity is required to sustain modest weight loss, a goal that may not be attainable given the busy nature of modern lifestyles (31).

Most interestingly, this study demonstrates that a relatively small cluster of food commodities is driving increased per capita energy consumption. Fats and oils are major ingredients in many sweet baked goods (pastries, donuts, cookies, cakes), prepared convenience foods (breaded deep-fried foods, frozen/prepared meals and side dishes, frozen pizzas/pizza pockets, and salad dressings), potato chips and other salty snacks, French Fries and other deep-fried fare. Shortening is used both by the processed food industry to extend the shelf-life of foods, and the fast food industry for deep-frying. Wheat flour, primarily the white refined version, is also a main ingredient in many of these foods. Increased rice consumption may be reflective of immigration patterns. In 1971, 4% of Canadian immigrants came from Asia, where rice is a staple; by 2001 this had risen to 37% (32). Chicken has displaced beef to some degree; it is also a popular fast food item, frequently breaded and deep-fried. Cheese is a main ingredient in many commercially-prepared foods such as pasta dishes, hand-held pizza pockets and pizza, the fastest-growing sub sector in the Canadian fast food market (33). Soft drinks are a major source of simple carbohydrates in the form of high fructose corn syrup and are a staple in the diet of many children and adults (34;35). Many of these foods are consumed synergistically, contributing to increasing per-capita energy consumption.

The results of this study are consistent with the observation that Canadians are inhabiting an increasingly obesogenic food environment characterized by readily available energy-dense foods and promotion of excessive food intake (36-38). Sales of ready-to-eat commercially prepared meals and snack foods doubled between 1990 and 2003, and these products are available at an astonishing number of outlets (39-41). Consumption of foods prepared outside the home, either in restaurants or as take-away

fare, has increased significantly over the last two decades (42). One example of these trends has been the proliferation of the Tim Horton donut franchise in Canada, which grew from 52 restaurants in 1977 to 3,359 restaurants in 2007 (43). Underlying these trends are: lack of time to prepare food; women working outside the home; waning food preparation skills; and aggressive promotion of low-nutrition foods, in particular to children (39;44;45). These trends are predicted to continue into the future (39;46).

This study has a number of limitations which must be taken into account when interpreting its results. First, despite new methods to model “consumed” data, food balance sheets report food amounts and energy values that may still not account for total wastage. Further, values are derived on a per capita basis using the entire Canadian population in any given year, making it impossible to estimate consumption for sub-sets of the population based on, for example, age or gender. Secondly, the results of this ecological study cannot be used to suggest direct causation between Canadian food consumption patterns and obesity. Representative studies of individual food and nutrient intakes and energy requirements are warranted to further illuminate the complex etiology of obesity in the Canadian population. Results are, however, consistent with previous studies showing similar trends in per capita energy supply and obesity in other industrialized countries (20;27).

This study has significant public health implications for addressing the obesity epidemic in the Canadian population. As study results suggest, the increases in obesity observed over the past several decades appear to be primarily due to increased energy consumption and minimally due to decreasing physical activity. This means that public health policy and program decision makers must resist the argument of the food industry

that increasing population obesity rates have little to do with over-consumption of their products and more to do with consumer physical inactivity (i.e. “obesity is “about the couch and not the can”) (47). Obesity prevention initiatives should therefore have a strong nutritional focus with the objective of decreasing energy consumption at the population level. This does not diminish the need to promote physical activity which has a clearly demonstrated role in the prevention and treatment of obesity and chronic illness (48;49). Rather the results of this study suggest that obesity prevention efforts will have a low chance of success if they focus primarily on increasing physical activity without addressing the issue of increasing caloric consumption. This will not be an easy task given the strength and trajectory of the modern food system and current consumer nutritional habits. However, public health professionals can play an important role by advocating for policies that reduce the impact of the obesogenic environment. Two comprehensive strategies have been put forth by the World Health Organization’s (WHO) and the American Heart Association (AHA) (50;51). The WHO’s *Global strategy on diet, physical activity and health* and the AHA’s *Population-based prevention of obesity* both advocate for a multi-sectoral, population-based approaches including environmental support for healthy diets through the creation of public policies that promote the availability and accessibility of low-fat, high-fibre foods which minimize the over-consumption of calories. Story and colleagues (52) have delineated a similar series of policies and environmental approaches that support healthy food and eating environments. Public health professionals also need to advocate for further research into the Canadian dietary pattern and its relationship to larger social and economic forces in

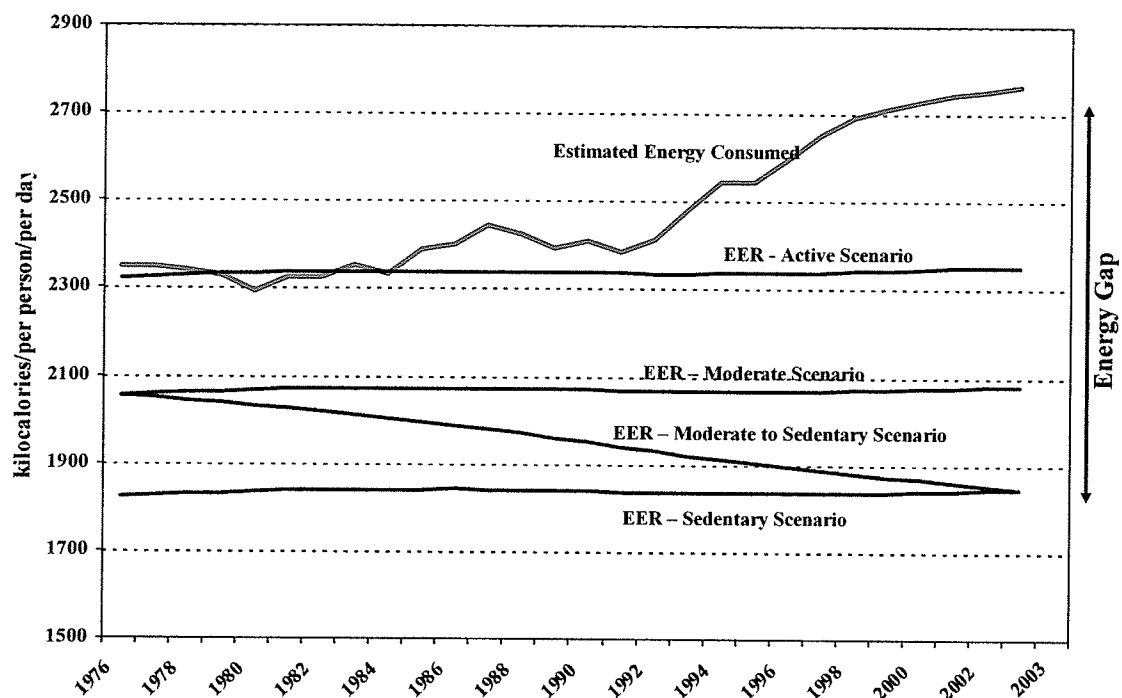
order to design and implement realistic solutions urgently required to address escalating population obesity.

**Table 1. Adult obesity<sup>1</sup> prevalence (1985-2003), daily per capita estimated energy consumption, estimated energy requirement (EER) and energy gap (1976 – 2003) – 3 year intervals**

YEAR	1976	1979	1982	1985	1988	1991	1994	1997	2000	2003	Change in Energy Gap 1976-2003
<b>Adult Obesity Prevalence (cases/100)</b>				5.60	7.86	10.08	13.40	13.87	14.63	14.90	
<b>Estimated Energy Consumption (kilocalories)</b>	2349	2331	2326	2388	2427	2387	2544	2653	2727	2766	
<b>ESTIMATED ENERGY REQUIREMENT (EER) AND ENERGY GAP:</b>											
<b>1. EER (Sedentary)</b>	1825	1833	1839	1841	1841	1837	1835	1835	1839	1842	
<b>Energy Gap (Sedentary)</b>	524	498	486	547	587	549	709	818	889	924	400
<b>2. EER (Moderately Active)</b>	2055	2064	2070	2071	2071	2068	2067	2068	2073	2077	
<b>Energy Gap (Moderately Active)</b>	294	267	256	317	356	318	477	585	654	689	395
<b>3. EER (Active)</b>	2322	2332	2338	2338	2338	2336	2336	2339	2346	2351	
<b>Energy Gap (Active)</b>	28	-1	-12	50	89	51	208	314	381	415	387
<b>4. EER (Moderate 76 to Sedentary 2003)</b>	2055	2038	2018	1995	1969	1940	1912	1887	1865	1842	
<b>Energy Gap (Moderate 76 - Sedentary 2003)</b>	294	293	307	393	459	447	632	766	863	924	630

<sup>1</sup>BMI≥30

**Figure 1. Per capita daily estimated energy consumed and per capita daily estimated energy requirement (EER) – four physical activity scenarios (1976-2003)**

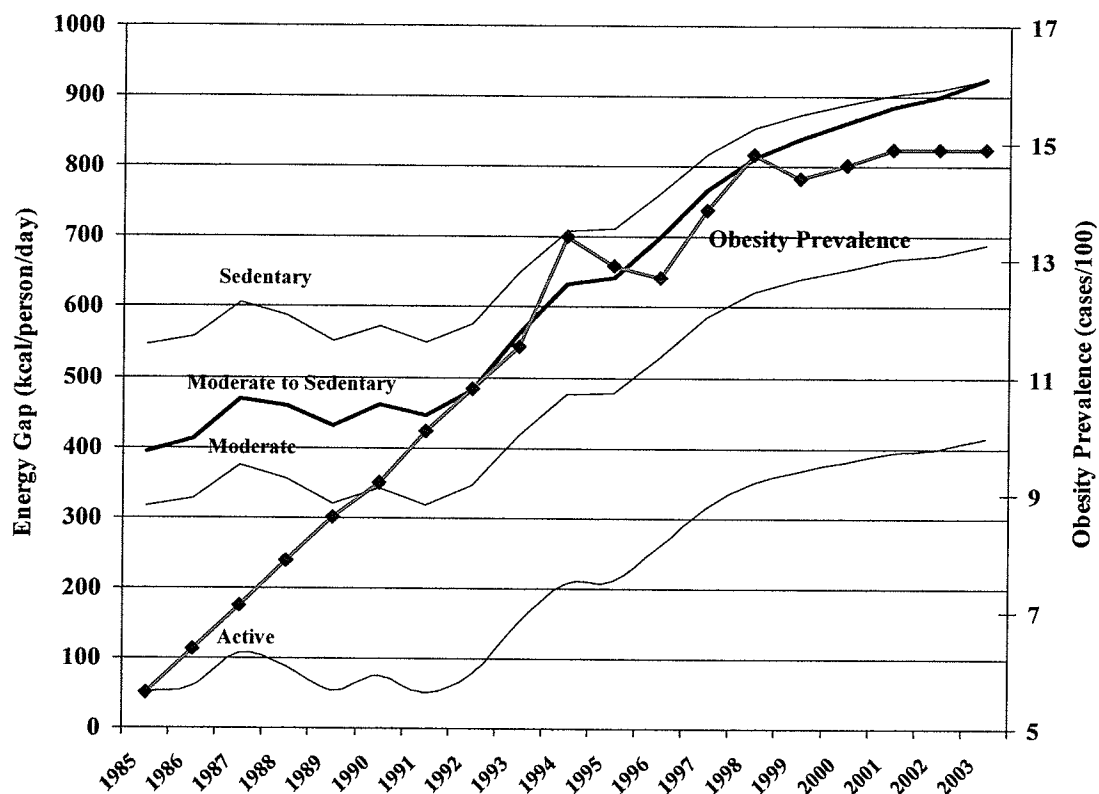


**Legend:**

- Estimated Energy Consumed: kilocalories/person/day
- Estimated Energy Requirement/person/day: Active Scenario ( $\geq 60$  minutes/day moderate physical activity)
- Estimated Energy Requirement/person/day: Moderate Scenario (30-60 minutes/day moderate physical activity)
- Estimated Energy Requirement/person/day: Sedentary Scenario ( $\leq 30$  minutes/day moderate physical activity)
- Estimated Energy Requirement/person/day: Moderately Active (1976) decreasing to Sedentary (2003)



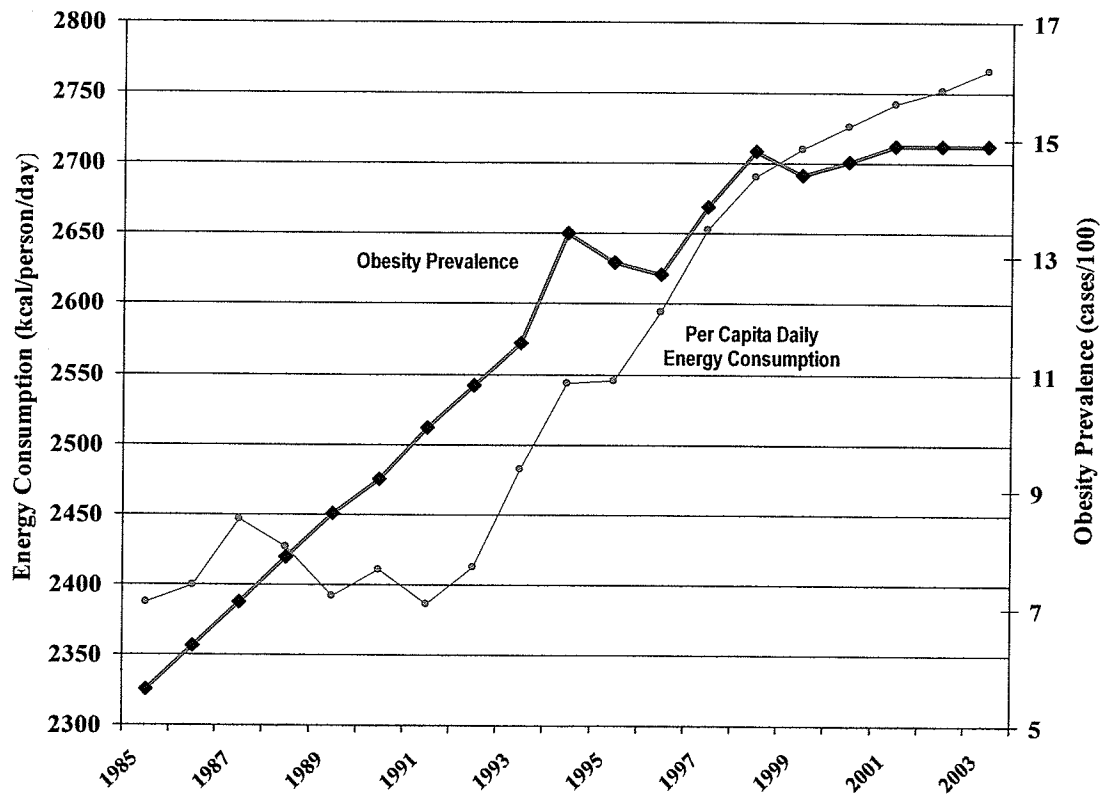
**Figure 2a. Energy gap (estimated energy consumption minus estimated energy requirement for 4 physical activity scenarios) and adult obesity (BMI  $\geq 30$ ) prevalence (1985-2003)**



**Legend:**

- Obesity Prevalence: 1985 - 2003
- Active Energy Gap ( $\geq 60$  minutes/day moderate physical activity)
- Moderate Energy Gap (30-60 minutes/day moderate physical activity)
- Sedentary Energy Gap ( $\leq 30$  minutes/day moderate physical activity)
- Moderately Active (1976) decreasing to Sedentary (2003) Energy Gap

**Figure 2b. Per capita daily estimated energy consumption and adult obesity (BMI $\geq$ 30) prevalence (1984 – 2003)**

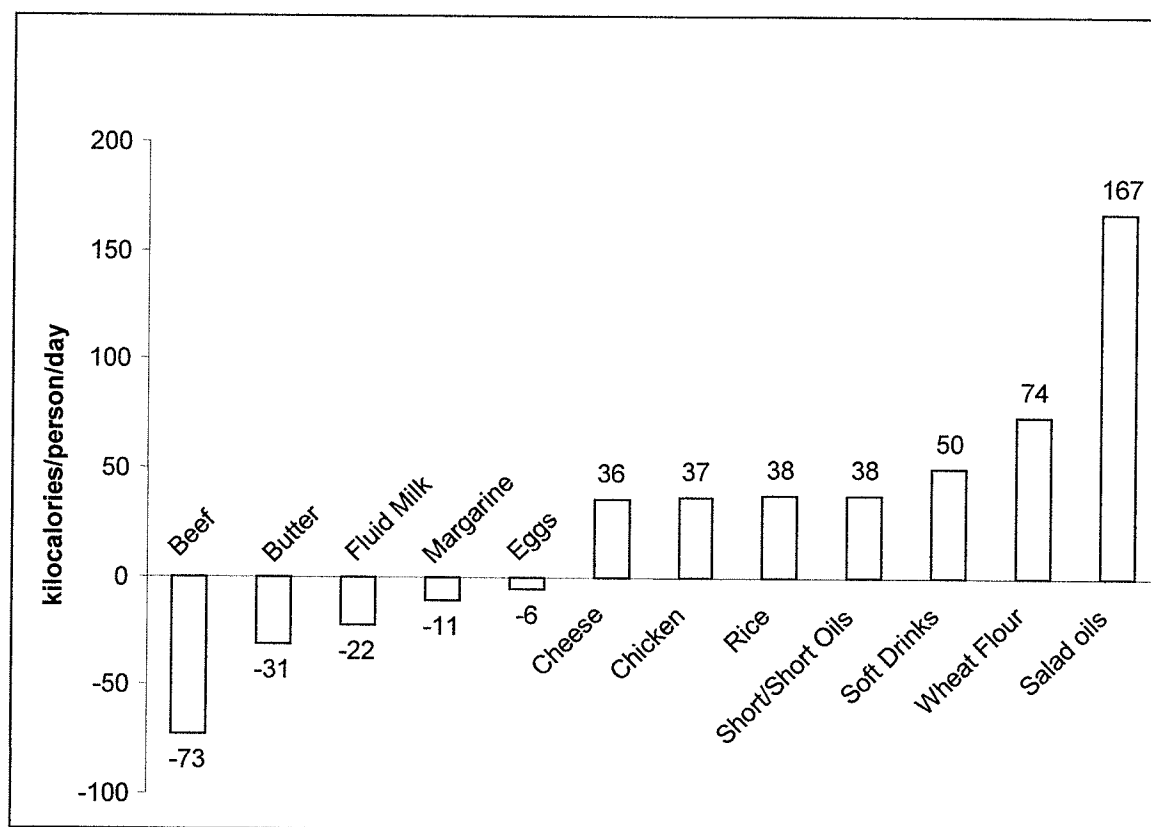


**Table 2. Regression analysis of adult obesity<sup>1</sup> prevalence vs. scenario-based energy gaps and estimated energy consumption (1985-2003)**

	<b>Pearsons R</b>	<b>Regression Coefficient</b>	<b>95% C.I.</b>	<b>P Value</b>
<b>Energy Gap (Sedentary)</b>	0.903	0.0199	0.01, 0.03	p< .0001
<b>Energy Gap (Moderately Active)</b>	0.902	0.0201	0.01, 0.03	p< .0001
<b>Energy Gap (Active)</b>	0.902	0.0205	0.01, 0.03	p< .0001
<b>Energy Gap (Moderately Active in 1976 to Sedentary in 2003)</b>	0.926	0.0155	0.01, 0.02	p< .0001
<b>Estimated Energy Consumption</b>	0.896	0.0197	0.01, 0.03	p< .0001

<sup>1</sup>BMI≥30

**Figure 3. Major foods contributing to net per capita energy change (1976-2003)**



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## Chapter 6

### **Notes from the corporate kitchen: Working mothers' experience of food choice and food provisioning**

#### **Abstract**

This research examined the etiology of working mothers' food choice and food provisioning decisions using a qualitative, grounded theory methodology. Study participants consisted of nine middle-income mothers of elementary school-age children, employed outside the home, and living in Winnipeg, Canada in 2006. Semi-structured interviews were conducted using the Food Choice Map. Each participant was interviewed twice. Results demonstrated that the women exhibited multiple and conflicting identities with respect to food choice and provisioning. As "good mothers" they were the primary food and nutrition caregivers for the family, desiring to provide healthy, homemade foods their families preferred at shared family meals, despite having adequate nutrition knowledge. At the same time, they were also seeking to be independent selves within the context of a busy modern family. Lack of time due to working outside the home and children being engaged in extracurricular activities, and increased autonomy of children with respect to food choices, were significant influences on their food choice and provisioning. This resulted in frequently being unable to live up to their expectations of consistently providing healthy homemade foods and having shared family meals, despite having adequate nutrition knowledge. To ensure their families were fed they frequently relied on processed convenience and fast foods despite their acknowledged inferior nutritional status. Using Giddens' structuration theory, the dynamic relationships between the women's food choice and provisioning actions, their identities and larger structures including socio-cultural norms, conditions of work and the industrial food system were explored. The ensuing dietary pattern of the women increases the risk of developing poor health outcomes, including overweight and obesity. These results have important implications for public health responses to improve population nutrition and decrease overweight and obesity. Strategies which focus on education to improve lifestyle behaviours will do little to improve nutritional outcomes since nutrition only plays one part in food choice. Much greater emphasis must be placed on structural influences such as the industrial food system; social norms regarding gender, families and food; and working conditions.

## **Introduction**

Obesity has become a major public health issue globally. In Canada, the rate of adult obesity more than doubled from 10% in 1972 to 23% in 2004 (1). In 1978 15% of Canadian children were overweight or obese; by 2004 this had increased to 26% (2). Overweight and obesity are related to negative health consequences such as type 2 diabetes, cardiovascular disease, joint problems and some cancers (3). Eating habits and body weight, particularly in children, are linked to the nutritional habits of other family members (4).

Women are the primary food providers in Canadian families, despite their increased participation in the paid workforce and social shifts to greater gender equality (5). There is an increasing understanding that women, especially those working at paid employment, inhabit a complex foodscape where nutrition knowledge may only play a limited role in food choice (6;7). Other factors influencing food choice include lack of time for food preparation, individual tastes of family members, changing societal attitudes towards food preparation, and the ready availability of convenience foods requiring reduced preparation time (8-10). This suggests that in order to design public health programs to effectively address rising obesity rates, it is critically important to understand how working mothers navigate their food environments, and to identify their relationship to more distal social forces influencing their food choice and food provisioning behaviours.

Using a qualitative research methodology, this paper will explore the complex etiology of women's food choice and food provisioning behaviour. Here, food choice refers to women's personal decisions about what they eat, while food provisioning

captures the broader decisions and actions around food acquisition and preparation for them and their families. The results of this study will be used to identify how public health programs and policies can be better designed to effectively improve the food and nutrition intakes of Canadians, in particular young families, and decrease the risk for overweight and obesity.

### **Study Design**

An interpretivist approach was used in this grounded theory study to better understand the phenomena of food choice and food provisioning in mothers who are employed outside the home. This approach emphasizes understanding, seeks patterns and connections rather than causality, and views social life as processual (11).

### **Sample Selection and Recruitment**

Middle-income mothers living in the city of Winnipeg, Canada (population approximately 650,000) were purposively recruited. All participants were born in Canada, worked at least half-time at paid employment, lived with a spouse working full-time, had at least one child between ages 5 and 12, had some post-secondary education, and self-identified as having the primary responsibility for acquiring and preparing food for her family. This demographic group was chosen because they have several advantages with regard to food provisioning: they are in a co-habiting relationship with another adult who can presumably help with shopping and cooking, they have some post-secondary education, and they have adequate incomes for buying food. Interviews were conducted with nine participants using a constant comparison method. All nine participants were interviewed a second time, and two were interviewed a third time for a total of 20 interviews.

## **Methods**

### **Food Choice Map**

Participants were asked questions using the Food Choice Map (FCM), a semi-structured interview technique that consists of a food choice board stratified according to time of day (when food is consumed) and frequency of consumption per week, plus magnetized food icons from eight food groups (12). The interviewer places the magnetized food icons on the board as a representation of the respondent's average weekly food pattern in response to guiding questions regarding food choices.

Participants are also prompted to explore their reasons for food choices, including personal, social, and economic reasons. Sample questions are shown in Table 1. A general pattern of understanding emerges from the narrative data and develops into broader themes of food choice, revealing patterns and meanings that are often hidden. These help articulate the manner in which these influences, patterns and meanings are embedded in everyday behaviour surrounding food (13).

**Table 1. Sample semi-structured interview questions**

What foods or beverages do you eat or drink very often?
Which of these meals do you eat alone? With other? Who are they?
Does your family eat meals similar to you?
Are these foods you would ideally choose for yourself?
You mentioned that your family eats dinner together. Is this important to you?

Each participant signed a consent form and the study received approval from the Research Ethics Board at the University of Manitoba. The primary author conducted all interviews, which were digitally recorded. Verbatim transcripts were made from the recordings and reviewed for accuracy.

### **Data Analysis and Interpretation**

The study employed a grounded theory approach, and the constant comparison method was used to analyze data (14). Key issues and recurrent events in the data were coded using NVivo 7 software (15), and became categories for focus. Additional data were collected through subsequent interviews to provide further incidents of the categories of focus. Memos were constructed in relation to the categories being explored. Additional categories and meanings were added to the coding scheme as they emerged from the data. Data from new cases were compared with existing cases, and categories and themes were revised as per the method described by Dye (16). First level codes were ranked to reveal those coded most frequently, and those coded for the majority of participants. These were used to construct more theoretical categories of focus.

Data was sampled theoretically to further develop emergent theories until no new themes emerged from the data, and theoretical saturation was reached (11). Concept maps were constructed as schematic representations of ideas and emerging themes, and relationships between those ideas and themes (17). To validate results, member checking was done to confirm findings with participants, and the primary author met with several qualitative experts to discuss and review findings. Finally, results were interpreted within the context of empirical research and existing theoretical perspectives.

### **Results**

The following major themes emerged which reflect the women's values and beliefs of food choice and provisioning, and illustrate the complex food environment the women inhabit as they provide their families with food:

- a. Preparing good, healthy food consistently takes more time than is available.

- b. It is important to accommodate family members' likes and dislikes when planning and preparing food.
- c. Families should eat together.
- d. Food choices can have an important effect on personal health.

These themes also embody the dilemmas and contradictions women face as their ideals and knowledge of optimal nutrition for their families collide with the realities of their everyday lives. Further theoretical sampling/analysis of these themes revealed that the women's values and beliefs co-create a set of complex, fractured and often conflicting food provisioning identities. These identities, important at both the individual and family levels, are reflected in the everyday pragmatic food provisioning practices of the women, while these practices in turn serve to reinforce and recreate their identities, values and beliefs, and larger socio-cultural and economic structures. Finally, this interconnected system of structures, values, beliefs, identities and food practices coalesce to potentially impact health outcomes, including overweight and obesity.

### **Values and Beliefs Regarding Food Provisioning**

#### ***a. Preparing good, healthy food consistently takes more time than is available.***

All but one of the study participants expressed that a lack of time due to a busy family life impacted their food choices and food providing activities. Overwhelmingly participants perceived that this was due to working at paid employment and children's activities outside the home, typically in the evening. Lack of time was felt to significantly affect their ability to have more input into family food, i.e. making it more healthy and enjoyable.

"On busy days – lots of them when rushing home from work and going to sports activities – we get take out – pizza, burgers, sandwiches, and there would be a pop with that."

“And there’s just no time because of work, both parents are working, and two kids in school, and two kids having outside activities, and at least one parent doing activity outside... and it boils down to the time, but there’s nobody at home during the day to do all of this, right? Like I think back when I was at home, a stay-at-home mom, you have all the time in the world to prepare those things, and now you’re just exhausted and just...just exhausted and frustration, and you just say to heck with it, I’m just making this, right, then that’s what happens, right?”

Lack of time also led to feelings of stress.

“And I find, you know, for a month or two we’re really great. And then everything just kind of slowly falls apart and you kind of, you know, sink to the lowest denominator and you’re, you know, doing the running to whatever just to function, like Subway, or whatever.”

“Life is far too rushed! Especially if you’re only getting home at, like anything after five is just a disaster. If you’re not home before quarter to five its like, you’re not going to make it! ‘Cause there’s evening events that are going to start and it’s like, oh man, now it’s the rush and a panic.”

***b. It is important to accommodate family members’ likes and dislikes when planning and preparing food.***

All participants were much attuned to their individual family members’ food likes and dislikes. This became evident as they created their own food choice map. While the map is intended for their personal food choices, every participant quickly shifted into discussing their choices in the context of the family’s choices, likes and dislikes. They frequently suppressed their own food preferences to meet other family members’ tastes.

“I have no idea what my favourite food is. I know what everybody else’s is, but when it comes to mine, I don’t. Because my focus is always on what everybody else wants.”

Though cognizant of their tastes, the women thought that family members, especially children, should eat what they are served and be appreciative of the food and effort that went into making it. In spite of this belief, women described capitulating to picky children, and regularly served foods they knew their family preferred, even if, at times, they were deemed not very nutritious.



“My daughter’s very picky, so who knows what she’ll eat what nights (laughter)... it’s usually just a Pizza Pop or leftovers of a quick bowl of soup. We try to get her to eat what we eat, but it’s challenging. You don’t want it to be a battle ground. You have to pick your battles, like school work might be more important than dinner; you don’t want it to be a battle.”

In order to accommodate the family, some women would serve a variety of foods at one meal to ensure everyone had a “choice”. This was felt to be a change from when they were growing up when there was little choice offered at the table.

“I don’t remember my parents doing that [making different meals], and we all had different likes and dislikes. You kind of sucked it back and ate what they gave you! (laughter)”

While most of the women enjoyed cooking, most felt they didn’t have enough time to cook in the manner, and the foods, they would ideally like to. In many cases the women felt they came up short in terms of their own expectations of the meal, such as preparing more homemade and/or nutritious foods.

“Uh, canned soup, never homemade (laughter). Chicken noodle.”

“Well, the biggest night is swimming and to be honest usually I just prepare something quick for the kids on the way out and then we pick my husband up from work and we end up eating something at 9 o’clock at night after the kids are in bed. That’s when we have our dinner and it’s not always healthy!”

Not everyone enjoyed cooking, however. For one woman, this was tied to a sense of appreciation from her family.

“No, hate it. It’s a waste of time. It takes many more percentage of time to make than the people who are eating it enjoy it. Definitely. If they could sit down and enjoy it just as long as it took me to make it, that would be fine. But boys can wolf down their food in five minutes flat and then they’re off! Doing something else, so yeah, it’s a waste of time.”

### ***c. Families should eat together.***

In spite of struggles expressed around food provisioning, every woman thought that eating together as a family was extremely important. Breakfast and lunch were

rarely eaten together, so dinner was the primary focus for the ritual of the shared family meal. This was a time to discuss both what happened during the day and plans for the evening.

“Well, it’s just important. I mean it’s a time to sort of touch base with each other again. But I should qualify it, because now lacrosse season’s starting up (laughter) so, you know, all winter it was great and it probably won’t happen again until the summer! You know, but it is important, because in the morning we’re all rushing like crazy, we’re all off in different directions and that’s kind of the time when you sort of re-connect.”

Despite the desire to have the family eat the evening meal together, this did not always happen due to busy and sometimes conflicting schedules of family members. This was stressful for the women, and they felt it had a negative impact on family life and nutritional health.

“We have activities that start in the evenings, they sometimes start at six, sometimes six thirty, sometimes seven. So if I don’t get dinner on the table by about quarter after five, the chances of us actually sitting down, and the family and eating it, and then being able to make our activities, becomes harder and harder to figure how we’re going to actually do this as a family, and that really bothers me.”

“There’s days when we don’t have the opportunity to do it [eat together] because, you know, it’s maybe absolutely chaos – we all tend to eat much worse than when we sit down at the table and eat a meal.”

Eating together was considered a ritual and a continuation of family norms these women experienced as children. The content of the meals has changed over time, but the importance of the shared meal is still strong. Special occasions and holidays afforded an opportunity to enhance the ritualized aspect of the meal, with more effort going into preparing the meal with special home-made dishes or special occasion foods (e.g. birthday cake). On these occasions extended family members and significant others were often present. Despite the desire to cook more elaborate meals on special occasions, this could also be stressful, again due to lack of time.

“There’s never enough time to make all the things, and the big meals, you know, like Thanksgiving a couple weeks ago or whatever, it’s a full day of work to get the stuff on the table, and that’s great when you have the time, but when you work it’s a tough balance.”

***d. Food choices can have an important effect on personal health.***

Every participant believed strongly that diet had the ability to influence health. Certain foods were commonly believed to convey health (e.g. vegetables, fruit, milk, meat) while others were viewed as unhealthy or less healthy (e.g. “fast food”, “processed food”, butter, soft drinks). Many of the foods children preferred were viewed as unhealthy by the mothers, but were frequently purchased because they knew they would be eaten, or it was believed that the children should have their way at least some of the time. These foods included French fries, Pizza Pops®, tinned pasta, fast food and sweets. Women negotiated with children to eat healthy foods, and were pleased when children willingly ate these.

“Lots of leftover pizza. We’re [son] into hotdogs, and uh, they have a lovely cafeteria that makes fries, so he... actually he doesn’t eat that very frequently. That’s a treat every few weeks, but he’s, yeah, he’s into more that kind of stuff, as opposed to the sandwiches... he’s forced to eat that a couple times a week, but his druthers are to take something he can nuke. A dietitian’s nightmare (laughter) at least it’s homemade pizza that he’s taking!”

Vegetables were universally viewed as an optimally healthy food, yet all participants felt they and their families did not eat enough, even though the women expressed a desire to. Reasons for this included: children not liking vegetables; they took too much time and work to prepare; it wasn’t worth making them only for themselves; and the women didn’t want to risk wasting time making them if they weren’t going to be eaten.

“In my perfect world there'd be way more fruits and vegetables because I mean that's way better for you but we don't do that nearly as much as we should, I mean, we're not the uh, ideal food group people, by any way shape or form, and it's, you know, it's a struggle, you know.”

Most participants consciously stated that they and their families should eat “better”, or more nutritiously, than they were currently. Promoting nutritional health was juxtaposed with pleasing family members’ tastes, with taste and convenience often winning out. This contradiction was not lost on the women, and they made efforts to try and accommodate both.

“You’re trying to balance diet versus different personalities and appetites, and you try to make it all come together in the best way possible.”

### **Food Provisioning Identities**

The women in this study engaged in food provisioning activities that reflect different identities, which emerge in different personal, family and social contexts. These were revealed through theoretical sampling and are outlined below.

#### ***a. The Good Mother***

All participants identified that they had the primary responsibility for providing food for, and promoting the nutritional health of their families. They see themselves as the gatekeepers of food and nutrition for their families, and subsequently their health. In this role as nurturer, they pride themselves on having good nutritional knowledge, try to pass on this knowledge to their families, and aspire to feed their families nutritious foods.

“That's sort of my relaxation when I get home from work, I love to be in the kitchen to cook. Cause it's not... it's my work to a certain degree and, so, that's what I do.”

The women desired to be “good mothers,” who want to please but also want the best for their families. They want to provide good-tasting, preferably homemade, healthy foods that their families like, and show appreciation for. Providing food strengthens and

reinforces emotional bonds between the women and their family members. The desire to please was not always for emotional gratification. They put their own desires aside at times to keep peace at the dinner table, and make family life less conflicted. The women also felt they made better choices for family foods than their husbands would, in spite of feeling they did not, at times, have sufficient help with food provisioning:

“Sometimes I wish he would help a bit more, but I still think I'm better off with the majority of it. Because, I said, I don't think he would make as good of choices. He would give the kids Pizza Pops for lunch every day, and... vegetables?! Who cares? What do you need vegetables for!?”

At the same time, some participants expressed feeling guilty if they did not serve the foods their children wanted. These decisions were further rationalized by saying they made the meal go smoother, without resistance and arguing.

“I would feel horrible if I gave my kids something that they hated and I insisted that they ate it, and maybe it was going to make them sick, or... you know, that they would hate me forever because I forced them to eat a tomato. Yeah, it is, it's guilt... guilt is a whole other world. (laughter). Although they have no qualms about making you feel guilty about things! Right? (laughter).”

#### ***b. Independent Self***

The participants in this study are independent women. They value having their own paid employment, for both financial and personal growth reasons. All the women had some post-secondary education, and many felt it was important to work in occupations that gave them a sense of themselves outside the context of their roles as mother/wife. These women also felt they were worthy of having their own food needs met, even if this did not happen frequently. Fulfilling the identity of an independent self, however, requires time commitment away from the family, and away from food provisioning. To cope, the women enlisted spouses to help with food providing, but with varying degrees of success.

“[Help with] groceries? No (laughter), not very often! I mean, you know, if I’m really really strapped he will go out but that’s not that often. He really doesn’t like grocery shopping.”

“No, not often [help with dinner]. Sometimes [husband] will, on Wednesdays if I’m late for my class, like he’ll buy this or get that out of the freezer, no problem, but (sighing) I still have to ask him to do it!”

Although women would put their own food preferences aside at family mealtimes, they also ensured they occasionally met their own tastes.

“I’ll have these spurts of when I’ll make my own lunch for a while, and then I’ll go through spurts where I’ll just buy lunch. It’s kind of like, I’m tired - I don’t feel like doing this I’m already helping the kids organize their lunches, I’m done. I’m going to work, and I’m going to treat myself to Pad Thai!”

### ***c. Busy, Cohesive Family***

All the women in this study characterized their family lives as being extremely busy. This was primarily due to two reasons. First, they work outside the home.

Participants described how this contracted their food preparation time, especially in the evening, frequently resulting in the use of convenience foods or take-away from restaurants while foregoing vegetables that take time to prepare, and might not be eaten.

Second, children are engaged in multiple extracurricular events such as sports and cultural activities. Every participant indicated that their children were involved in activities outside school. These activities were deemed important for children’s development. The busy-ness of family life was accepted as normal for these women, despite their realization that it led to stress and sometimes had negative impacts on other areas, such as food provisioning.

“The kids are having extras, you know, the extra sports or the other things, so we’re running to McDonalds or we’re running to Subway to manage it.”

At the same time, connecting their family through food was important for all study participants. As discussed, this was a time for sharing the day's events and making plans for the evening, and resulted in family members eating more nutritious foods.

### **Food Choice and Food Provisioning Practices: The Pragmatic Coper**

At the nexus of these identities is a point of struggle where the women attempt to balance their ideal perceptions of their food provisioning role and the reality of the food landscape, shifting social norms and their busy lives. Facing these challenges, they have become “pragmatic copers” who manage to feed their families day in and day out, using a variety of strategies which work for them. They made compromises which get the food on the table (or in the lunch bag), produce minimum negative response from family members, and reduce the amount of time spent preparing food. This results in an increased reliance on convenience foods that take less time to prepare; eating at (or taking away foods from) restaurants; allowing family members, especially children, to consume foods they have a high probability of eating (these tended to be processed convenience foods such as frozen chicken fingers, Pizza Pops, tinned soup, tinned pasta, pizza); and serving fewer foods that are not preferred by family members, or are perceived to go to waste (e.g. fruits and vegetables).

“I’m hardly making it [pizza] at home now, so I’m more like occasionally ordering it in. When I do [make it at home], I use the Pillsbury dough, and rip it out and – you know, or if I bought some of the other prepackaged stuff, pizza dough, you know?”

“A really really bad week, would be about one in six, and then we might eat out about three times that week.”

These practices, as acknowledged by the women, are not always “ideal” in terms of being healthy and promoting good eating habits. While they strive to meet their ideals, they are aware of their shortcomings, which are explained by their life circumstances.

“It’s just very busy. So you have this ideal of how you want things to run and I find that, you know, Sunday night, that’s when we do the meal plan and [husband] usually does the shopping on Monday, but I mean life is busy, it’s just crazy busy, so I find it’s really hard to stay on track.”

Other strategies, with varying degrees of success, include getting other family members to assist with meal preparation, planning meals ahead, and eating leftovers.

“My mother said ‘don’t cook a big meal for Easter’ and I said ‘of course I’m gonna cook a big meal – what the hell else are we going to eat all week?!’” (laughter)

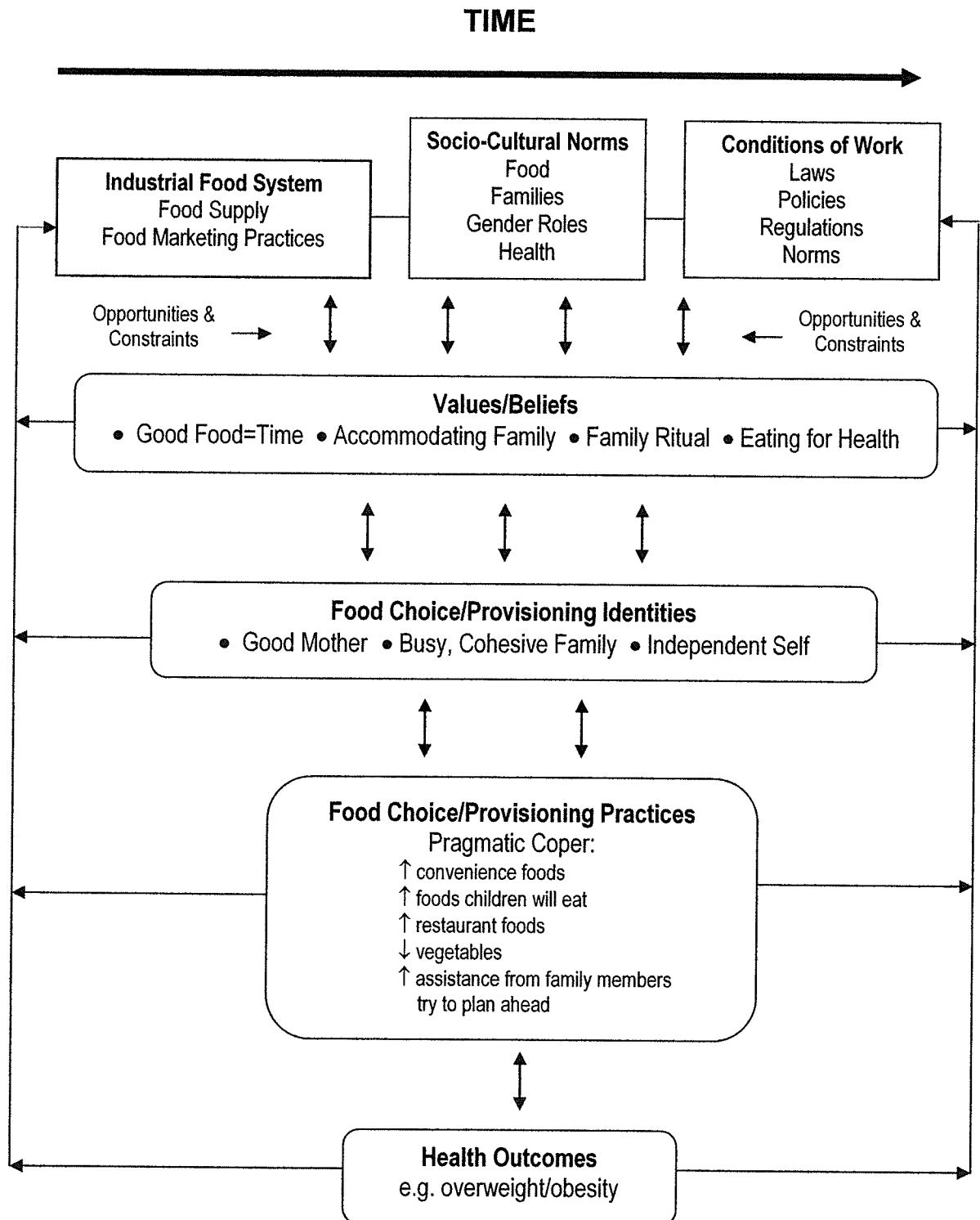
Adopting these strategies left time to engage other busy aspects of family life, such as their own employment, their children’s participation in extracurricular activities, and other commitments. Women felt ambivalent about these strategies, however, either in terms of their health impacts or their success.

### **Conceptual Model**

Figure 1 is a conceptual model which emerged from this analysis. It links the food choice and provisioning practices of the women with their values, beliefs and identities. These are further located within a larger system of structures that mutually create, reinforce, and over time, change the model components through a dynamic process. Central to the scheme are the women’s food choice and providing actions. These women were adept at employing a variety of creative strategies to ensure they and their families were fed on an ongoing basis. These actions result in dietary practices that have an impact on health and well-being. The model components and relationships are elaborated further in the Discussion.



**Figure 1. Dynamic influences on food choice/provisioning of mothers employed outside the home**



## **Discussion**

This study illuminates the complex processes of food choice and food provisioning among employed mothers of school-age children. The use of a grounded theory approach allowed the exploration of patterns and connections, and the merging of participants' experiences and perspectives with other theoretical concepts. This unique contribution to the public health nutrition literature provides a rich understanding of individual food choice and provisioning decisions by placing them in a broader familial and social context.

The study demonstrated that the women experienced significant dilemmas and contradictions with respect to feeding themselves and their families. A lack of time for adequate food provisioning due to working outside the home and a very busy family life, and increased food choice autonomy of children are the main reasons for these dilemmas and contradictions. This struggle is exacerbated by the women's perception of their role as family nutrition gatekeeper, the role of their family as a busy, yet cohesive social unit, and their perceptions of nutrition and health. These results are not surprising, given contemporary trends in work life, parenting styles, and the food system, and have important implications for public health responses to address the nutritional health of families, including overweight and obesity. The interrelationship between their self-identities, their food provisioning practices and the larger environments are depicted in the conceptual model (Figure 1), and elaborated on below.

## **Identity**

Identity is considered to be both an entity and an ongoing, dynamic process whereby individuals develop, evaluate and re-evaluate their mental self-image in the

context of others in their environment (18). The conceptualization of identities related to food choice has been explored by other authors (19-21). Studying identities in food and eating reveals the images people construct about themselves, and how these interact with their sense of self and daily food activities (20). The women in this study see themselves in the context of their families, peers, and wider social norms, however their identities are not congruent.

On the one hand the women view themselves as good mothers who are responsible for ensuring the nutritional health and well-being of their families, allow children to express themselves and be independent, and frequently put aside their own food desires in service of other family members. Highly valued social ideals exist for women feeding their families. Food and feeding create strong emotional ties between family members, especially love, and in particular maternal and wifely love (22;23). Mother is the major influence on family food choices (24). As Charles and Kerr (25) observed, “an important aspect of women’s role within the family is to provide proper family meals for men and children.” This defines her role as wife/mother who provides good, wholesome, nutritious home-cooked food.

On the other hand, the women are autonomous selves seeking personal growth and satisfaction, as well as financial independence, through working outside the home. More and more women are balancing domestic responsibilities with paid employment. In 1986, 70% of women worked at paid employment; by 2005 this had increased to 81% with the length of time at work also increasing (26).

The “good mother” and “independent self” are located within the identity of a busy yet cohesive modern family. While the women felt it was extremely important to

eat meals together as a family, they also described their children being involved in many activities outside school. This was felt to be beneficial for their development, yet it restricted the opportunity for family meals. Indeed, there is a growing consensus that many children are “over-programmed” which can result in stress for the child, and important time taken away from the family (27).

The food provisioning practices described by the participants are conflicting, reflecting different identities at different times. The “good mother” aspires to provide homemade, nutritious yet acceptable foods whenever possible at communal meals while the “independent self” relies on convenience and fast foods to compensate for reduced food preparation time. This contradiction is not lost on the women, who feel considerable stress as a result.

### **Values and Beliefs**

The women’s food choice/provisioning activities are also a reflection of knowledge, values and beliefs that constitute a personal food system (28). Values are important in self-definition and are the enduring beliefs that guide behaviour, including food choice behaviour (28;29). The values and beliefs expressed by the women in this study are not a cohesive set, but conflict and compete with each other. The women prioritize their values situationally; for example eating healthy food is sometimes marginalized for time-saving convenience foods so the family can participate in extracurricular activities. Accommodating children’s food preferences frequently trumps taking the time to prepare vegetables that may be rejected. Though contradictory, these food provisioning practices are pragmatic and “make sense” in their different contexts.

The women's values, beliefs and identities did not develop in a vacuum. They are located within a larger socio-cultural environment which is bi-directionally influential. This process is best illuminated through Giddens' concept of structuration, which provides a powerful way of looking at the relationship between individual actions and structures across time (30). Structures include traditions, institutions, moral codes and other sets of expectations, and established ways of doing things (31). Structuration refers to the generation of systems of interaction through duality of structure. Central to structuration is the knowledgeable, strategic and intention-driven social agent, who pursues goals within the constraints and opportunities of environmental factors. This is achieved through the recursiveness of social life, or the repetitive actions conducted in agents' daily lives, both individually and collectively. The interplay of actors and environment is a reciprocally dynamic process where actions reproduce, and often change, the structural arrangements observed at higher levels of organization (31;32). The women in this study pursued their food choice/provisioning goals within enabling and constraining structures which reciprocally influenced their food provisioning actions. The cultural structure of the "good mother" has proved resilient across time and place, however the means to achieve this role have changed significantly in recent years. The women in this study fulfill their idea of the good mother through the provision of daily family meals, but the contents of those meals are dramatically different than in past generations. Few homemade foods appear, and convenience foods are the norm. Also, these foods are marketed and readily provided by a corporate food system that invokes and perpetuates the image of the good mother through advertising and branding (33;34).

### **Time Poverty, Gender and Pleasing Palates**

The women in this study identified that they have restricted time for preparing healthy, nutritious foods with few processed ingredients and as a result choose too many processed convenience foods and too few fruits and vegetables. This caused them considerable stress, as they felt their families should be eating “better.” Working outside the home and the busy extra-curricular life of children were the primary reasons for their time poverty. This time poverty-stress dynamic has been observed throughout the Canadian population. Increased workplace participation and increased workload have led to a shortage of time for daily activities. Canadians work on average 8.9 hours per day at paid employment, an increase of one half hour per day from 1986 (35). This has translated into less time spent with the family during a typical workday, including fewer meals eaten at home and less time spent preparing meals (35). The time spent on meal preparation is half what it was 25 years ago (36). Evidence suggests that Canadian mothers feel time scarcity more acutely than fathers (37;38). Sixty-nine percent of full-time employed women with children report feeling rushed every day, and 41% report being severely time crunched (38). Despite men’s increased participation in housekeeping and food related tasks such as shopping and cooking (35), women still perform the majority of these tasks, and continue to identify as the primary decision-maker regarding family food (26;39;40). All but one study participant reported feeling stressed by the demands of family food provisioning and insufficient time. This is reinforced by the continued perception of domestic food preparation as a feminine norm (41).

Another source of stress for participants was the increased food choice autonomy exhibited by children, and their own willingness to acquiesce to their preferences despite feeling that their children's choices were nutritionally inferior. They frequently "gave in" to picky children's tastes, at the expense of serving healthier foods. This is consistent with studies showing that children have increasing influence over family menus, in large part the result of more child-centred parenting attitudes which grant children more freedom and choices (42;43).

The women in this study frequently did not live up to their ideals of food choice and provisioning for themselves and their families. They felt ambivalent about using processed convenience food products, despite their increased acceptance. There are residual shades of moral disapprobation associated with their use; a good wife and mother should provide nutritious, good-tasting homemade foodstuffs as a symbol of her love and commitment to the family. At the same time, these foods are a provisional response to the chaos and complexity of modern everyday life (33). Warde suggests it is the confluence of time and space that create this unprecedented demand for convenience foods; lack of time due to women working at paid employment, and dislocation of family members out of the home to other spaces for eating (33).

### **Contemporary Foodscape**

The modern industrial food system plays an important role in shaping consumer food choices and food provisioning practices through marketing and availability of products through a multitude of food retail spaces. All participants in the study purchased foods from major grocery stores as well as restaurants. They described using an array of foods, including a significant number of processed convenience foods, in the

production of family meals. Further, different family members frequently ate different foods during the same meal. Study participants perceived this phenomenon to be a shift from a generation ago, attributed in part to the plethora of ready-to-serve convenience foods available through the market. This perception is confirmed by recent market trend analyses which have shown that the two categories experiencing some of the largest growth in the food sector are snack foods, including hot snacks, and frozen prepared meal entrees (44;45). Snack foods now account for one quarter of calories consumed by Canadians (46). Consumption of foods prepared and eaten outside the home, either in restaurants or as take-away fare, has also increased significantly over the last two decades (47). Recipes in women's magazines have shifted over the past several decades to increasingly promote ease and speed of preparation, plus brand name processed foods as ingredients (33).

While women remain the primary nutrition gatekeeper for the family, social expectations of food provisioning have changed dramatically in recent years. Truly homemade foods are still prized for quality and flavour, and are considered an important contributor to family identity (48;49) yet are becoming increasingly rare (50;51). This was noted by study participants, who felt it was important to serve unprocessed homemade foods, yet frequently did not have the time to prepare them. Convenience foods in a variety of stages of preparation are the norm in most households, provided by a relatively small number of multi-national food corporations (52;53).

### **Pragmatic Copers and Structures**

The food choice and provisioning actions of the women in this study are not a unidirectional result of structural influences. Indeed, as Giddens purports, these actors



actively participate in shaping and shifting structures (31). As observed, women's continued role as the dominant food providers, and their related actions (planning, shopping, cooking, coordinating meals) recreate and reinforce social expectations of gender roles, in particular the expectation that women are responsible for family food. The women understand that these social expectations exist, and both embrace and resist them. They accept, and frequently take pride in, the responsibility of primary food provider. They want to please family members by making and serving preferred foods. They also want to be independent, work outside the home, and declare that the burden of responsibility needs to shift. To this end they attempt to engage other family members to assist with meal provisioning and avail themselves of the vast array of convenience and fast food products available in the marketplace, thus shifting social norms regarding appropriate food for families. In order to purchase these foods, women must participate in the paid workforce, reducing time for food preparation and strengthening the need for quick-to-prepare foods. The capacity of the food system to quickly and conveniently supply these products is reinforced through consumers creating demand for certain food products. Indeed, in the 21<sup>st</sup> century, the dominant food trend in Canada is the demand for products that take little or no time to prepare (53).

### **Convenience Dietary Pattern and Health**

Giddens suggests that structures can both constrain and enable actions through common frames of meaning (31). The structures described here impact the women's food provisioning actions both positively and negatively. On the positive side, these structures facilitate the timely and efficient feeding of families, free mothers and others from the kitchen, and allow for the pleasing of multiple tastes and palates. As described,

the changing structure of the food supply offers a vast array of prepared convenience foods. Shifting norms around food also permit the use of these foods frequently, saving time and guilt about not preparing food from scratch. Working outside the home and earning money provides income for purchasing these foods.

On the negative side, however, these structures reinforce food provisioning actions in ways potentially deleterious to family health including increasing the risk for obesity. These actions include less time for food provisioning, consumption of too many processed convenience foods, and a decreased frequency of family meals. This is not to blame women for these practices, but rather an attempt to explain women's actions outside the rubric of individual choice and decision-making. As observed, the study participants described feeling conflicted about the foods they choose for themselves and their families, in large part because there are too many processed convenience and snack foods and not enough fruits and vegetables. The women also felt conflicted about the low frequency of family meals. Processed convenience and snack foods tend to have less than optimal nutritional content. They are frequently high in salt, fat and sugar, and low in fibre and other essential nutrients. A dietary pattern high in salt, fat and sugar and low in fruits and vegetables is associated with a higher risk of overweight/obesity and related conditions (54). Research has also found a correlation between frequency of family meals and quality of dietary intake (27;55). The food provisioning practices of the women in this study are not unexpected given that "other foods" (foods and beverages that are not part of the four major groups) including fats and oils; foods that are mostly sugar; high-fat and/or high-salt foods such as potato/corn chips; and soft drinks now account for 22% of the total calories consumed by Canadians (46). In addition, a

majority of Canadian adults eat fewer than five servings of vegetables and fruit per day, and seven out of 10 children aged 4 to 8 do not meet the five-serving minimum recommendation (46). This is consistent with the patterns described by the study participants.

### **Public Health Implications**

These results suggest that the food provisioning practices described by the study participants may be putting themselves and their families at risk for developing overweight and obesity, and other nutrition-related disorders. These findings have significant implications for public health interventions aimed at reducing population overweight and obesity. They suggest that education and behavior change interventions would have little impact on the food provisioning behavior of women, the primary nutrition gatekeepers for families. As illustrated, the food provisioning decisions of participants were not the result of a lack of information on healthy eating, nutrition labels, quick meal ideas, or other educational initiatives. These were middle-class women, with seemingly adequate knowledge and resources to support healthy food provisioning activities. They were able to articulate significant barriers to changing their own, and their family's dietary intakes. They also felt that they were doing an adequate, if not ideal job of feeding their families, considering their circumstances (too little time, easy availability of convenience foods, family members' preferences and attitudes toward food, and having the role of nutrition gate-keeper for the family).

This suggests that public health and other decision- and policy-makers must look to the structural influences on family food choice/provisioning if they are serious about reversing the alarming upward trend in population body weights. The confluence of

workplace policies and practices, composition of the food supply, and shifting norms surrounding food provisioning provide an ideal substrate for poor nutritional outcomes, including overweight and obesity. Given the complex foodscape inhabited by the women in this study (and likely most Canadians), continuing to educate individuals about healthy food choices will do little to improve the nutritional health of the population.

This does not mean that the women in this study do not have control over their food decisions, and are passive pawns to the food system. They do indeed make rational choices which serve an important purpose – getting their families fed in an efficient, acceptable manner. However, what is important here is that the food environment in which these decisions are made stack the cards against a healthy diet. To help improve the food decisions of women and their families, bold new strategies need to be explored. These may include reducing the average work-week and/or providing more flexibility for employees to work part-time. These initiatives are ambitious, however, and may be difficult to realize in the short term given the relatively conservative nature of the Canadian business community. It may be more feasible to focus on a sector that may be easier to influence, such as education. Providing healthier institutional food-service through schools (elementary through secondary) may relieve pressures on busy working parents. In particular, a universal school lunch, and possibly breakfast, program could be investigated and assessed for both its cost and nutritional impact. Nutritional standards would be set, yet local school boards could organize menus to reflect local tastes and preferences, and available foods. Such a program could be funded through federal transfer payments to provinces, and paid for partially through health care transfers. Revenues could be recovered to a degree through sliding-scale payment schemes. This

would help ease the time poverty experienced by parents with respect to food preparation. At the same time, strategies to promote the uptake of more family food responsibility by males should be explored. Public health can play a key role in championing these strategic shifts in policies and programming.

### **Limitations**

This study has several limitations that need to be taken into consideration when interpreting the results. First, it likely did not capture the full breadth of influences on participants' food choices. Food choice is a complicated process influenced by individual biological and psychological traits, ethno-cultural background, and socio-economic status. All are important antecedents that may modify the conclusions found here. Second, the study used a small sample of women who may not be representative of the wider population of working mothers. Women in different age groups and different domestic relationships, single women and women from different socio-cultural backgrounds may have very different experiences of food provisioning. However, by studying the food provisioning practices of a "best case" middle class group of women, a group having the educational and economic resources to make healthy food choices (but often do not), this paper has highlighted the barriers to healthy food provisioning that are likely exacerbated in women with fewer resources. Finally, the study did not quantitatively examine the food and dietary intakes of study participants. This limits the ability to draw conclusions about implications for health outcomes, such as the effect on body mass index. Nonetheless, the qualitative methods applied here revealed a rich understanding of how larger structures are embedded within the individual women's food provisioning practices, and how these food providing practices have the very real

potential to negatively impact nutritional health and related outcomes such as obesity.

Further research is required to quantitatively assess dietary intakes, and examine the food choice/provisioning processes of other demographic groups.

### **Conclusion**

This study has illuminated the complex process of food provisioning experienced by a group of middle-class Canadian women, including the significant compromises they feel they must make as primary gatekeeper of their family's food and health needs.

Understanding how food provisioning decisions and actions are embedded in a complex set of values, beliefs and identities reciprocally shaped by larger societal structures can provide important background information for public health planners and policy-makers to develop strategic and effective interventions for addressing overweight and obesity.

These results help move the intervention spotlight away from individual behaviour-change strategies to wider societal changes aimed at improving population nutrition.

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## **Chapter 7**

### **Summary**

The main purpose of this dissertation was to describe how social and economic structures operating at different scales of influence impact population overweight and obesity, and become manifest at the individual level. A mixed methods approach was used in this series of studies which facilitated a cross-scale analysis of the ecology of overweight and obesity, through linking of data at the individual through to structural levels. The three papers which make up the body of this thesis have concluded the following:

1. There are significantly higher rates of overweight and obesity in some Canadian sub-populations than in others. Despite these differences, the prevalence of overweight and obesity is very high in all socio-demographic groups, and focusing prevention interventions in the sub-populations with the highest rates would do little to decrease overall population prevalence of overweight and obesity. This highlights the need for public health prevention programs to address the obesogenic environment affecting all Canadians, rather than focusing on high-risk sub-populations.
2. The energy gap in Canada has widened significantly in the past two decades in tandem with increasing population rates of obesity. The widening energy gap is being driven primarily by increased energy consumption, and not decreased energy requirements (physical activity). Obesity prevention programs must therefore have a significant nutritional focus with the objective of reducing energy intake from the plethora of calorie-dense foods available to consumers.

3. Employed mothers, who are primarily responsible for family food, frequently make poor nutritional choices for themselves and their families which increase the risk of developing negative health outcomes such as overweight and obesity. Despite their desire to provide more healthy food for their family, these women's decisions make sense in the context of their busy lives. Their actions are pragmatic and rational, and reinforced through an obesogenic environment which includes the industrial food system; social norms; and working conditions. This environment is dynamically co-created through their individual actions. Public health interventions which focus on education to improve lifestyle behaviours will have little impact on nutritional outcomes in this group, including overweight and obesity, since lack of nutritional knowledge does not appear to be the barrier to improved nutritional habits. Public Health prevention strategies therefore need to focus on structural influences driving nutrition behavior including improving food environments; social norms regarding gender, families and food; and working conditions.

Taken together, the results of these three studies have demonstrated that the influences on food choices and bodyweight are indeed multi-facteted and occurring at multiple scales. The mixed methods approach used in this research has facilitated the “unpacking” of several components of Kumanyika’s causal web of influences on body weight (1), to reveal how influences at different scales are dynamically interconnected in a complex ways consistent with Giddens’ structuration theory (2), Kriegers eco-social theory (3;4), and Rose's population prevention paradox (5). As these studies have shown, the food provisioning behaviors of working middle class mothers can only be

fully appreciated by consideration of the obesogenic web of distal influences which create significant incentives at the individual/family level to purchase and consume highly processed convenience foods, at the expense of healthier alternatives. For example, low intake of fruits and vegetables and high intake of processed convenience foods were observed to be related to the employment and family experiences of working mothers, and the resulting time poverty. The use of ready-to-eat foods makes life easier for women, who feel responsible for their families' nutritional well-being, even if these products are of inferior nutritional value. By purchasing these foods, however, these women are collectively creating a foodscape (6) which constrains their ability to provide nutritious foods for their families, through their demand for convenience foods that the industrial food system readily responds to by producing and marketing more of the same. As has been illustrated, the result of all of this has now become "embodied" by the Canadian population as unprecedented levels of overweight/obesity, as they consume higher and higher levels of calorie dense convenience foods above and beyond their energy requirements. The pervasiveness of negative obesogenic environmental influences across all population groups was confirmed by the observation of dramatically increasing rates of obesity in the Canadian population over the past two decades and high rates of obesity in all population groups. These results indicate then, that we can only understand what is happening at the individual level by auditing behaviour and biological outcomes to larger forces located well outside the individual.

These research results have significant program, policy and further research implications for addressing overweight and obesity in the Canadian population. First, continuing to direct prevention and treatment interventions at individual lifestyle

behaviour change (diet and physical activity), or addressing socio-economic inequalities as the main strategy (7) will do little to impact the population prevalence of overweight and obesity. As demonstrated, the forces which impact body weight are wide-spread, robust and stubborn, and will require coordinated efforts at multiple levels, with significant effort directed to macro-level structures, in order to change the obesogenic environment. This is consistent with Rose's postulate on prevention (5), which states that when the burden of illness is widely distributed throughout a population, a high-risk intervention approach will do little to bring down population prevalence. To address overweight/obesity, a mass population strategy should be marshaled, with government taking the lead.

Second, prevention strategies must address cross-scalar influences on body weight, with a major focus on reducing unnecessary energy intake. Several such strategies have been proposed, including the *Global strategy on diet, physical activity and health* from the World Health Organization (8) and the American Heart Association's *Population-based prevention of obesity* (9). Both strategies stress that a multi-sectoral, population-based approach to obesity is warranted, including environmental support for healthy diets through public policies which promote the norm, availability and accessibility of low-fat, high-fibre foods which minimize the over-consumption of calories. Some examples include restricting television advertising of unhealthy food products to children; providing all citizens with a living wage; more flexible work arrangements; promoting alternate forms of transportation to personal automobiles; subsidizing healthy foods for individual purchase and through institutional foodservice

foodservice venues, such as government and school cafeterias; and removing government agriculture subsidies of commodities such as sugar, corn and cheap oils.

There are, however, significant barriers to targeting structural influences on overweight/obesity. For example, policies designed to impact the food system may pose a significant threat to corporations that have a vested interest in expanding the status quo. Governments may find it more politically expedient to target individual behaviours and biology through policies and programs, because they do not put at risk the financial interests of the food industry. Further, legislation that promotes the interests of employees (e.g. though reduced or more flexible work hours) would be perceived as negative for business. Any attempts to seriously impact these will likely be met with significant resistance from corporations, where they feel their bottom line will be affected. In addition, neo-liberal societies such as Canada may view attempts to regulate markets (e.g. with instruments that limit or tax the sale of unhealthy foods) as both economically restrictive and interfering in personal choice and freedom. This creates a difficult position for governments attempting to balance their own health budgets while simultaneously meeting needs for economic growth within the current logic of the post-capitalist world economy. Strategies aimed at more receptive sectors, such as education, may produce smaller, more incremental changes that help create awareness of the issue and support for more far-reaching changes over time. Pressure for action will also mount as costs increase to provide health care services to an ever expanding proportion of Canadians experiencing the ill effects of obesity.

The results of this dissertation should not be interpreted, however, to suggest that public health strategies to address overweight and obesity should never be developed for

high-risk or vulnerable populations, such as low-income women. Members of these groups may have fewer resources to cope with the obesogenic environment. They are often responsible for the health of their families, and should receive demonstrably beneficial programs which address health-related social justice issues such as food insecurity, early child development (including nutrition) and income inequity. Results are also not meant to suggest that behaviour-change strategies should be completely abandoned. Evidence-based nutrition education programs delivered through various channels including schools and workplaces are likely to increase in effectiveness when implemented within a supportive environment. Further, these results do not imply that increasing physical activity in the population is not necessary. Physical activity promotion should be a cornerstone of any overweight/obesity prevention strategy. Increased energy expenditure has been clearly demonstrated to help maintain appropriate BMI (10). However, unless serious attention is given to improving population nutrition, specifically reducing energy intake across all groups, physical activity promotion alone is unlikely to reduce population prevalence of overweight/obesity.

This research has made an important contribution to the growing body of literature on the complex etiology of overweight/obesity, and potential responses. It adds significant value and insight to previous research studies by demonstrating the dynamic interplay between individual behaviour with respect to food choice and provisioning, and the larger structures in which those behaviours occur. This is the first research study demonstrating that there has been a significant increase in the amount of energy available for consumption in Canada, and that this increased energy supply is correlated with the



pervasive and persistent increases in overweight and obesity across the Canadian population.

This dissertation also has implications for further research. By demonstrating how the complex etiology of overweight and obesity does not lend itself to traditional research models, such as randomized clinical trials where linear causation can be demonstrated, it provides an important example of how diverse research methods can be brought together to cut across and link different scales of influence, connecting biological and social factors. This hopefully sets the stage for innovative research approaches such as ecological studies, mixed methods approaches, multi-level modeling, and new units of analysis to better understand the complex ecology of obesity and overweight. For example, Sobol suggests that understanding the global influences on diet requires that global governments, global corporations, global media, global food systems and global diseases must be analyzed and understood in addition to traditional models seeking to explain differences in individuals or groups of individuals through biological or behavioural mechanisms (11).

Finally, it is anticipated that this thesis will become part of the growing body of research intended to influence public health policies and programs, through an understanding of the trans-population, structural influences on body weight and their relationship to individual food choice and provisioning behaviours. As Virchow stated “The history of epidemics is the history of disturbances of human culture” (5). Public health can play an important role in documenting and articulating how obesity is the result of cultural disturbances, not merely bad choices by misguided consumers.

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## **Appendix A**

### **Approvals**

1. Joint-Faculty Research Ethics response
2. Joint-Faculty Research Ethics approval
3. Joint-Faculty Research Ethics amendment approval



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OFFICE OF RESEARCH  
SERVICES

Office of the Vice-President (Research)

244 Engineering Building  
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24 November 2005

**TO: Joyce Slater**  
Principal Investigator

**FROM: Wayne Taylor, Chair**  
Joint-Faculty Research Ethics Board (JFREB)

**Re: Protocol #J2005:143**  
**"An Exploration of Socioenvironmental Influences on Obesity in the Canadian Population"**

---

Your above-noted protocol was reviewed by members of the Joint-Faculty Research Ethics Board. A few concerns were noted and are listed below:

1. Please specify where the raw data will be stored.
2. Please provide a memorandum that notifies the Winnipeg School Division of the research and allows them to consent to the research.

Approval is pending your response to the above items. Your written response, **including a cover letter which addresses each of the above items, and includes any revised forms**, should be sent to Margaret (Maggie) Bowman, Human Ethics Coordinator, 244 Engineering Building ([margaret\\_bowman@umanitoba.ca](mailto:margaret_bowman@umanitoba.ca)). If you have questions, please contact the Chair at 474-8877.



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### APPROVAL CERTIFICATE

25 November 2005

**TO:** **Joyce Slater** (Advisor G. Sevenhuysen)  
Principal Investigator

**FROM:** **Wayne Taylor, Chair**  
Joint-Faculty Research Ethics Board (JFREB)

**Re:** **Protocol #J2005:143**  
**"An Exploration of Socioenvironmental Influences on Obesity in the Canadian Population"**

---

Please be advised that your above-referenced protocol has received human ethics approval by the **Joint-Faculty Research Ethics Board**, which is organized and operates according to the Tri-Council Policy Statement. This approval is valid for one year only.

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Secretariat in advance of implementation of such changes.

**Please note:**

- if you have funds pending human ethics approval, the auditor requires that you submit a copy of this Approval Certificate to Kathryn Bartmanovich, Research Grants & Contract Services (fax 261-0325), including the Sponsor name, before your account can be opened.
- if you have received multi-year funding for this research, responsibility lies with you to apply for and obtain Renewal Approval at the expiry of the initial one-year approval; otherwise the account will be locked.



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## AMENDMENT APPROVAL

17 August 2006

**TO:** **Joyce Slater** (Advisor G. Sevenhuysen)  
Principal Investigators

**FROM:** **Wayne Taylor, Chair**  
Joint-Faculty Research Ethics Board (JFREB)

**Re:** **Protocol #J2005:143**  
**"An Exploration of Socioenvironmental Influences on Obesity in the Canadian Population"**

---

This will acknowledge your e-mail dated 15 August, 2006 requesting amendment to the above-noted protocol.

**Approval is given for this amendment.** Any other changes to the protocol must be reported to the Human Ethics Secretariat in advance of implementation.

## **Appendix B**

### **Study Materials: Notes from the corporate kitchen: Working mothers' experiences of food choice and food provisioning**

1. Study recruitment flyer
2. Soci-demographic questionnaire
3. Criteria for study inclusion
4. Consent form
5. Food choice map – guiding questions
6. Food choice map - example



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## **ARE YOU INTERESTED IN PARTICIPATING IN A UNIVERSITY OF MANITOBA RESEARCH STUDY?**

I am a PhD student doing a study looking at people's  
food and eating habits.

### **WHAT'S REQUIRED:**

About an hour of your time,  
at your convenience, to be interviewed.

#### **IF YOU ARE:**

An adult woman,

*and*

A parent of elementary school-age children

*and*

Work outside the home half-time or more...

**I WOULD BE INTERESTED IN SPEAKING TO YOU!**

Everything discussed is completely confidential and you  
can withdraw at any time!

Please give Joyce a call at:



## Socio-Demographic Questionnaire

I.D.# \_\_\_\_\_

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

1. Age: \_\_\_\_\_ years

3. Children living with respondent full-time:

age _____	grade _____	sex _____
age _____	grade _____	sex _____
age _____	grade _____	sex _____
age _____	grade _____	sex _____
age _____	grade _____	sex _____
age _____	grade _____	sex _____

4. Occupation: \_\_\_\_\_

## Criteria for Study Inclusion

I.D.# \_\_\_\_\_

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

1. Is respondent female? \_\_\_\_\_ Yes \_\_\_\_\_ No
2. Is respondent married or living in a common-law relationship? \_\_\_\_\_ Yes  
\_\_\_\_\_ No
3. Does respondent have at least one child in grades Kindergarten to six?  
\_\_\_\_\_ Yes \_\_\_\_\_ No
4. Does the child live at home with the respondent full-time?  
\_\_\_\_\_ Yes \_\_\_\_\_ No
5. Does respondent identify herself as having primary responsibility for acquiring  
and preparing food for her family? \_\_\_\_\_ Yes \_\_\_\_\_ No
6. Does respondent work at paid employment outside the home at least 0.5  
FTE? \_\_\_\_\_ Yes \_\_\_\_\_ No
7. Does respondent identify her family as being "middle" income and not "low" or  
"high" income? \_\_\_\_\_ Yes \_\_\_\_\_ No
8. Was respondent born in Canada? \_\_\_\_\_ Yes \_\_\_\_\_ No

# YES responses \_\_\_\_\_ # NO responses \_\_\_\_\_

Suitable for study: \_\_\_\_\_ Yes \_\_\_\_\_ No



## CONSENT FORM

Faculty of Human  
Ecology

Winnipeg, Manitoba  
Canada R3T 2N2  
Phone: (204) 474-9901  
Fax: (204) 474-7503

Research Project Title: Exploring Influences on Food Choice with the Food  
Choice Map

**Researcher:** This research is being conducted by a Ph.D. student, Joyce Slater, as part of her thesis project. Ms. Slater is being supervised by Dr. Gustaaf Sevenhuysen, Dean of Human Ecology at the University of Manitoba. Contact information for J. Slater is: [jslater@mts.net](mailto:jslater@mts.net) or \_\_\_\_\_; contact information for Dr. Sevenhuysen is [gust@cc.umanitoba.ca](mailto:gust@cc.umanitoba.ca) or 474-9556.

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and understand any accompanying information.

**Purpose:** The purpose of this study is to explore reasons for, and influences on, food choices that individuals make in their daily lives. The purpose is not to make an assessment or judgment of the respondent's food choices, or the overall quality of the respondent's diet. The nature of this study is such that the results cannot be applied to other people, however the interviews may generate insights that will be useful to future researchers, educators and policy planners. Results from this study will be written into a manuscript for publication.

**Procedures.** This is an interview study. It should take about an hour at a meeting time and place that is agreeable to both you and the interviewer. The main purpose of the interview is to ask you some questions about your food choices over a one-week period. We will start with some background questions such as your age, family structure, income range and occupation. We will be using a magnetic board called the "Food Choice Map" to record your food choices. There will also be some interview questions focusing on factors that influence your food choices. THERE ARE NO RIGHT OR WRONG ANSWERS. What you think is what is important.

**Recording Devices:** We would like your permission to record the interview because it is not possible to write as fast as people talk. The interview results will be more accurate if your actual words are recorded. The recording will be typed into transcripts so that your explanations can be studied. The recording will not be used for any other purpose and will be erased at the end of the study.

**Risks:** In all research projects carried out by the university, the person doing the project must point out any risks or discomforts associated with the study. We do not think this study will cause any problems for you other than taking up your time to answer questions, and although we don't think this will happen, asking questions may bring up personal problems. **You may refuse**

**to answer any questions that you do not wish to answer.** Just let the interviewer know if you would like to skip any questions.

**Benefits:** We do not expect the study to have any direct benefits for you. You will not receive any payment for taking part in the study. You may find the opportunity to reflect on your experience and may be interested in the study results. Findings may be useful to the future researchers, educators and policy-planners.

**Confidentiality:** The consent form will be the only record with your name on it. The consent form and the interview recording will be kept in a locked cabinet in a locked room. Records of the interview with you will be coded only with a number. The research team (J. Slater and the supervising committee) will only have access to the records after your name has been changed. Any reports written about this project will not mention your name or provide any description of you that would identify you.

**Feedback:** You may be asked to provide feedback on the study results of your interview through either a focus group or individually. This is completely optional. You are also entitled to receive copies of reports that are written up after the interviews are completed. If you would like a copy of these reports, please provide your contact information below:

Address:

---

\*\*\*\*\*

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and/or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation. You can also obtain further information about the study from: Joyce Slater, or [jslater@mts.net](mailto:jslater@mts.net).

This research has been approved by the Joint-Faculty Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Secretariat at 474-7122 or e-mail: [Margaret\\_Bowman@umanitoba.ca](mailto:Margaret_Bowman@umanitoba.ca). A copy of this consent form has been given to you to keep for your records and reference.

---

Participant's Signature

---

Date

---

Researcher/s Signature

---

Date

## **Food Choice Map – Question Guide (JS)**

**ALWAYS REFER TO THE MAP AS A BASIS FOR ASKING QUESTIONS!**

NB: Always go across the FCM first when creating the Map!

### Creating the Map

What foods or beverages do you eat or drink very often?

When is the first time you have this?

What other foods or beverages do you usually eat/drink at that time?

In a usual week, how many (**MEAL**) would you have this?

On the other days do you not eat (meal) or do you eat something different?

**OR**

On other days do you eat a different type of (**MEAL**)?

What other foods or beverages do you usually eat/drink at that time?

In a usual week, how many (**MEAL**) would you have this?

On the other days do you not eat (**MEAL**) or do you eat something different?

**OR**

On other days do you eat a different type of (**MEAL**)?

After (**MEAL**) do you eat anything?

What other foods or beverages do you usually eat/drink at that time?

In a usual week, how many (**MEAL**) would you have this?

On the other days do you not eat (**MEAL**) or do you eat something different?

**OR**

On other days do you eat a different type of (**MEAL**)?

**Do not ask direct questions about foods. E.g. instead of asking about dessert, ask:**

**“Is it your habit to eat something sweet at meals or at other times of the day?”**

**OR**

**“What goes well with (FOOD/MEAL)?”**

**OR**

**“How do you like to make your (pizza, sandwich, lasagna, chicken...)?**

**REPEAT UNTIL MAP COMPLETED.**

### Social Context

Which of these meals do you eat alone? With others? Who are they?

If you don't eat with family, where do they eat?

Does your family eat similar meals to you?

Where do you eat these meals?

Have you changed the amounts you eat of any of these foods over the past year?

Did you plan to make that change?

Do you eat the same or different than the rest of your family? If different, can you say why?

Where do you get these foods?

Why do you get them there?

How often do you shop for groceries?

Do you depend on anyone to help you get these foods?

Does anyone other than yourself decide what food to purchase?

Are any of these foods particularly expensive or difficult to get?

### Establishing Limits

(Referring to map): I notice you eat \_\_\_\_ more than \_\_\_\_\_. Why is that?

Are there days or other times when you eat at other times than the meal pattern shown in your map?

### Other

Do you ever eat in restaurants or cafeterias or other take-away food places?

(If YES): Who eats there with you? Kids? Family? Co-workers? Friends?

When you eat out, does (**MEAL**) look like this (refer to map)?

Do you prepare any of these foods at home, but eat them elsewhere? (e.g. work)?

You choose good food. Are these foods you would ideally choose for yourself?

Which foods are particularly important for your health? Your family's?

Which foods do you prepare yourself?

It looks like you like to prepare food – do you? Do you feel you have sufficient time to prepare food?

Does anyone help you prepare these foods?

Do you feel you have sufficient help with food preparation?

We have covered a lot of ground. You have created a map of good foods here. I appreciate the time you have given me to do this. Is there anything we've missed or you would like to add?

# FOOD CHOICE MAP



RESPONDENT #:

LOCATION:

DATE:

INTERVIEWER:

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TIME	1x / Week	2x / Week	3x / Week	4x / Week	5x / Week	6x / Week	7x / Week
EARLY (1)							
ERVING IZE							
SNACK 1 (2)							
ERVING IZE							
MID DAY (3)							
ERVING IZE							



SERVING SIZE

LATE (6)

SNACK 2 (4)

SERVING SIZE

MID D

