FOOD PRACTICES OF A SELECTED GROUP OF INDUSTRIAL WORKERS IN QUEBEC

by

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ABSTRACT

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Ninety-six male industrial workers, employed by five manufacturing companies in the Montreal area, were studied to determine their breakfast habits. Data about food intakes were collected by means of a 24-hour recall, and a questionnaire was used to gather additional information. Both were administered by an experienced, bilingual nutritionist-interviewer.

Selected breakfast patterns of adult males found in the Nutrition Canada survey were confirmed in this study. However, mean energy and protein values of the reported breakfasts did not meet the standards recommended in research by Tuttle and co-workers. An attempt was made to establish a relation between breakfast habits on working days and the subjects' feelings about fatigue, energy levels, capacity to concentrate and temper changes during the late morning hours. However, the workers did not seem prepared to share this information.

Participants identified the mother as their primary source of nutrition information. This observation is significant for those developing nutrition education programmes for industrial workers.

This study required the collaboration of the local community health care department and the active participation by the companies involved.

RESUME

Département des Sciences de l'Alimentation
Maîtrise en Sciences

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Habitudes alimentaires d'un groupe selectionné de travailleurs industriels du Québec

Quatre-vingt seize travailleurs industriels, employés par cinq usines de la région de Montréal, furent questionnés afin de déterminer leurs habitudes alimentaires au petit déjeuner. Les données sur la consommation d'aliments furent recueuillies au moyen d'un rappel de 24 heures et d'un questionnaire; celui-ci permit d'obtenir quelques informations additionnelles. Les deux instruments furent administrés par une diététiste bilingue expérimentée.

Cette étude confirme certaines habitudes alimentaires chez l'adulte mâle, tel que décrit par l'enquête Nutrition Canada. Néanmoins, la moyenne des valeurs en énergie et en protéines des déjeuners étudiés ne rencontre pas les normes recommendées par Tuttle et ses collaborateurs.

Cette étude cherchait à établir s'il y avait une relation, pour les jours ouvrables des sujets, entre leurs habitudes alimentaires au petit déjeuner et leur impressions concernant les facteurs suivants: le niveau de fatigue, le degré d'énergie, la capacité de concentration et les changements d'humeur vers la fin de la matinée. Cependant les ouvriers semblent ne pas vouloir impartir ces informations.

Les participants indiquèrent que la mère était leur source principale d'information en nutrition. Ceci est important pour le développement de programmes éducatifs de nutrition pour les ouvriers.

Cette étude fut possible grâce a une collaboration active de la part du département de santé communautaire local ainsi que celle des industries qui participèrent à la recherche.

CLAIMS TO ORIGINALITY

To the author's knowledge this survey of food intake and of dietary habits of a selected group of industrial workers was the first field study focussed on this segment of the population in Quebec.

The Nutrition Canada findings with respect to the distribution of energy over the day prompted the author to investigate specifically the breakfast habits of the workers. A comparison is drawn between survey responses of workers who regularly eat breakfast and those who skip the early morning meal.

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The local industries which allowed their employess to participate in this study deserve a special thanks. They were Avon Canada Inc. of Pointe Claire, Consumer Glass Company Ltd. of Ville St. Pierre, Homelite-Terry Division of Textron Canada Ltd. of Pointe Claire, Northern Telecom Canada Ltd. of Lachine, Proctor and Gamble Inc. of Pointe Claire and Wire Rope Industries Ltd., also of Pointe Claire. The arrangements for the interviews were ably handled, usually by nurses of the employee health service units within the companies.

I wish to express my appreciation as well to Claudette Authier who conducted all the interviews and to Susan Ross who assisted with the coding of the data and their entry into the computer. Finally, I sincerely thank Mrs. Wynne Fogg for typing this dissertation.

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I INTRODUCTION

Canadian nutritionists and public health authorities have consistently expressed concern about the breakfast habits of the population. Their suspicion that many persons either skip breakfast altogether or consume very little food in the morning was confirmed when the results of a nationwide nutrition survey - Nutrition Canada - were published a few years ago (Health and Welfare Canada, 1976). However, health professionals had started to preach the virtues of a good breakfast long before the Nutrition Canada information was available. Exactly upon what they based their recommendations is not clear.

The Nutrition Policy for Québecers[1] was established following the Nutrition Canada Survey (Ministère des Affaires Sociales, Québec, 1977). Its first objective includes a specific reference to breakfast when the authors state the need "... to stress the importance of a proper breakfast." Verbal communications with a member of the study committee to define Québec's nutrition policy did not yield a definition of the term "proper breakfast".

In the process of extensive laboratory studies in the United States, specific recommendations as to the size and the composition of the breakfast meal were established (Tuttle, Wilson et al., 1949; Tuttle, Daum et al., 1950; Daum, Tuttle et al., 1950; Tuttle, Daum et al., 1952; Tuttle, Daum et al., 1954). The influence of this meal on physiologic responses was clearly shown by their experiments which involved subjects representing a wide range of age groups of both sexes.

1 Une Politique Québecoise en Matière de Nutrition.

Large-scale quantitative assessments of the impact of nutrition on work capacity are difficult to make due to the large number of variables that need to be considered (Kraut, 1972). In order to ascertain when production becomes limited by nutrition, at least one test period has to show undernutrition. During the Second World War this researcher studied industrial workers in Germany. Work performance was in close correlation with the intake of calories. When considering the regulatory mechanisms of energy needs Kraut and Korbel (1976) concluded that "... the most important condition of performance is an adequate nutritional status." There is general agreement as to the negative impact of undernutrition on work output (Kraut, 1972; Parizkova, 1972; Buzina, Horvat et al., 1972; El Batawi, 1972). However, the harmful effects of overnutrition on work performance seem less well documented (Parizkova, 1972; Shephard, 1974).

Industrialization has resulted in a steady decrease in energy expenditure due to mechanization. Non-occupational energy expenditure is often higher now than that during the work-time (Wirths, 1972). Obesity is common among Canadian adults (Health and Welfare Canada, 1973). This may well affect industrial activity as the level of obesity was found to be directly related to a decrease in work performance (Consolazio, 1972).

The eating patterns of Canadian adult males were extensively studied as part of the Nutrition Canada Survey (Health and Welfare Canada, 1976). As well, studies organized for specific purposes, e.g., heart studies, have focussed on adult males (Woolcott, 1979; Chorostecki, 1980). However, little seems known about the eating habits of industrial workers in this country, or about the impact of their diets on work output.

Labour does not appear to have explored the importance of food habits on the health of the industrial worker. In fact, unions have

traditionally focussed their attention on health and safety matters related to the environmental hazards of work and recent legislation in Québec reflects that concern.[1] Bill 17, passed in 1979, clearly establishes every worker's right to working conditions that respect safety and physical well-being. The only reference to the meals of the employees demands "... that meals be eaten in sanitary quarters at the workplace."

This thesis is, first, an attempt to describe food habits of a selected group of industrial workers in Québec. Second, it is a study of the workers' opinions about the relationship between breakfast and work capacity, and the need for nutrition education programmes at work.

1 Assemblée Nationale du Québec, Bill 17, 1979.

II LITERATURE REVIEW

The primary focus of this literature review is the food intake patterns of Canadian adult males in general, industrial workers in particular and the impact of the breakfast meal on work performance, mental well-being and the incidence of accidents at work.

Several computer searches of the literature failed to reveal publications in English concerning the dietary habits of industrial workers. These searches employed key words such as: nutrition, human nutrition, nutritional status, diet, food intake, eating pattern, meal pattern, food distribution, food habit, dietary habit, fasting, caloric requirement, energy need, energy requirement, energy expenditure, breakfast, safety, occupational health, industrial work, shift work, work capacity, work output, labour productivity, industrial employ, industrialization, work correlation, occupational group, industrial catering, factory feeding. At the same time, several government departments and organizations were contacted to seek out their knowledge on the relationship between the health and performance of industrial workers and their food habits. The following were contacted between January, 1981 and July, 1981:

- Ministère des Affaires Sociales, Québec
- National Department of Health and Welfare, Ottawa
- Canada Department of Labour, Ottawa
- The Canadian Labour Congress, Ottawa
- The International Labour Congress, Geneva, Switzerland
- The United Steelworkers of America, Pittsburgh, Pa., U.S.A.
- The Department of Industrial Relations, McGill University, Montreal
- The Department of Epidemiology and Health, McGill University, Montreal

- The Department of Human Nutrition, Agricultural University, Wageningen, The Netherlands
- The American Health Foundation, New York, U.S.A.
- National Center for Health Statistics, Hyattsville, Md., U.S.A.
- Voorlichtingsbureau voor de Voeding, 's Gravenhage, The Netherlands
- VS Services, Toronto (Industrial catering company)
- Metropolitan Life Insurance Company, New York, N.Y., U.S.A.
- The Donwood Institute, Toronto.

Of these, only the Voorlichtings Bureau voor de Voeding in the Netherlands was able to supply any useful referrals. The literature review is limited by the apparent lack of publications on the impact of diet on the output of workers in industrially developed countries. This review of the literature encompasses:

- Information available on the diet of healthy Canadian adult males
- Some dietary characteristics of male factory workers
- The effects of the breakfast meal on physiologic response, mental performance and the incidence of accidents at work.

A. THE DIET OF HEALTHY CANADIAN ADULT MALES

1. Levels of energy intake

The Canadian Federal Government conducted an extensive survey of the nutritional status and dietary intake of the population between 1970 and 1972 (Health and Welfare Canada, 1973). More than 14,000 Canadians participated in this study including 2221 men aged 20-64 years. The survey included medical and dental examinations, biochemical evaluations of blood and urine, anthropometric measurements and food intake studies. Persons from various income levels were included, but occupations

were not identified. The eating patterns of the participants are described in the Nutrition Canada Food Consumption Report (Health and Welfare Canada, 1976). It divides the adult males in three age groups: young men (20-39 years), middle-aged men (40-64 years), and those 65 years and older. The latter group is not considered in this review. Mean daily energy intake of the young men was 15.1 MJ, 18.0% above the Dietary Standard for Canada recommendation of 12.6 MJ per day (Health and Welfare Canada, 1975). Middle-aged men consumed 11.1 MJ per day, 1.0% below the recommended amount.

A recent investigation of the diets of 195 adult male office and management employees of an insurance company in Waterloo, Ontario, revealed a mean energy intake of 10.6 MJ per day. Mean age of the sample was 37.7 $\pm$ 11.7 years (Woolcott, 1979; Chorostecki, 1980). Consistent with the findings of the Nutrition Canada study was the observation that younger men within this group consumed more food than older participants did.

2. Pattern of intake throughout the day

Seventy percent of young men participating in the Nutrition Canada survey consumed some food before 0900 hours in the morning (Health and Welfare Canada, 1976). The energy contribution of food consumed before this hour was only 9.6% of the daily total. Among the middle-aged men, 78.0% of the sample consumed an average of 12.7% of the daily energy by 0900 hours in the morning. Men of both age groups consumed approximately half of the total daily calories after 1700 hours. In terms of work performance, the ideal contribution of breakfast to total daily energy intake is proposed to be considerably higher by several researchers (Tuttle, Daum et al., 1952; Cereal Institute Inc., 1962). They suggest 25.0% as a

guideline, while others consider 15.0% to be reasonable (Bouterse-van Haaren, Onneweer et al., 1975).

Frequency of eating is not reported in the Nutrition Canada Studies. Chorostecki (1980) reports a wide range of meal frequencies in a study of male office workers: of 195 participants, 31 consumed two to three meals daily, 62 reported eating four meals, 59 men took five meals per day, while 43 indicated a meal frequency between six and eleven meals. Any food consumption of 1.7 MJ or more was considered as a meal. Daily caloric intake increased as meal frequency became higher.

An investigation of the food habits of 217 male workers in Windsor, Ontario, revealed that meal frequency was affected by shift work (Maxwell and Robitaille, 1978). Day shift workers tended to eat more often than those on the afternoon or evening shifts. Caloric intake of the diets was not reported. Among the Windsor subjects 48.0% of the midnight shift workers were identified as regular drinkers, i.e., drinking at least three times per week, while 50.0% of the afternoon shift workers and 59.0% of the men on day shift drank regularly. Beer was the beverage of choice for 80.0% of the men, while 12.0% took wine. Only 8.0% selected hard liquor. Daily beer consumption amounted to two to three bottles for midnight shift workers, three to four bottles for day shift workers, and five to six bottles for those working the afternoon shift. It was found that 10.0% of the regular drinkers skipped some meals when they drank. Milk products, fruits and vegetables were often lacking in the diets of these men.

3. Percentage contribution of protein, carbohydrate, fat and alcohol to total daily energy intake

When comparing the relative contribution of the energy-yielding nutrients in the diets of young and middle-aged men participating in the

Nutrition Canada Survey, it was found that the various sources of energy were almost identically distributed for both groups. Mean contribution of protein to energy was 14.1% for both groups. The younger men obtained 41.1% of daily energy from fat, the middle-aged men 39.8%. Carbohydrates contributed 41.6% and 42.8%, respectively, to daily energy intake. Reported alcohol consumption accounted for approximately 4.0% of the calories in both groups.

Similar findings were reported in a study of 195 male office and management employees (Chorostecki, 1980). Average protein intake of those men contributed 15.0% of daily calories, fat accounted for 40.0%, carbohydrates supplied 43.0% and alcohol 3.0%. As adults advance in age the energy value of the diet tends to decrease (Health and Welfare Canada, 1976; Chorostecki, 1980). The percentage contribution of the energy-yielding nutrients seems little affected by the actual energy level of the diet in both studies.

After reviewing the Nutrition Canada results with respect to diet-related health problems, the Québec Social Affairs Department developed a Nutrition Policy aimed at improving the health status of Québecers (Ministère des Affaires Sociales, Québec, 1977). The objectives stated in this document include specifically a 25.0% reduction in fat consumption and a 50.0% reduction in sugar intake, coupled with a higher consumption of complex carbohydrates. The Nutrition Policy offers no specific suggestions to lower protein intake, even though current dietary practices favour a protein intake far in excess of the Canadian Standards (Health and Welfare Canada, 1975).

4. Nutritional adequacy of the diet of adult males in Canada

The Nutrition Canada Survey used a 24-hour dietary recall to establish the nutrient intakes of the subjects. Results of the study showed that mean nutrient intakes were adequate for young men while middle-aged males sometimes lacked thiamin, a vitamin of the B-complex. The apparent low blood levels of folate were later found to be in error (Health and Welfare Canada, 1976).

Mean nutrient adequacy in a group does not guarantee adequacy on the individual level. Evidence of this can be found in a recent study by Chorostecki (1980). This researcher found little reason for concern when mean nutrient intakes for a group of 195 men were reported. However, 65.0% of the subjects were deficient in Vitamin A intake, almost a third of the men were short of calcium in the diet and half of them were found to consume inadequate amounts of thiamin. Smaller numbers showed deficient intakes of riboflavin, vitamin D, iron and vitamin C.

Obesity, as judged by anthropometric measurements, was found in more than half of the adult males participating in the Nutrition Canada study (Health and Welfare Canada, 1973).

A study of 217 Ontario men concluded that only 19.0% of the subjects interviewed consumed adequate diets (Maxwell and Robitaille, 1978). The methodology applied in this study differed considerably from investigations discussed previously. Maxwell and Robitaille established adequacy of diet according to the number of food portions consumed within each of the four food groups of the Canada Food Guide (Health and Welfare Canada, 1977). Individual nutrient intakes were not calculated in this study. Less than one-third of the subjects consumed adequate amounts of fruits and

vegetables even though this study was conducted during summer months, when supplies are generally plentiful. Many men perceived milk to be no longer needed in the diet of adults. They replaced this beverage by substantial amounts of beer. This study concluded that the adequacy of the diet improved as meal frequency increased among day- and afternoon-shift workers: 58.0% of the day-shift workers consumed three or more meals per day and 18.0% of them met the requirements of a "complete diet", defined as a food intake which includes at least the Canada Food Guide recommendations for adults in all of the four food groups. A further 33.0% consumed adequate amounts in three out of the four food groups. Just over 40.0% of the afternoon-shift workers ate three or more meals per day. Of these, only 14.0% obtained a complete diet, another 31.0% were adequate in three areas. A surprising observation was made with respect to midnight-shift workers. Most of these men brought their meals from home, as company cafeterias and fast-food outlets are closed for most of their working hours. It was found that 30.0% of these men consumed complete diets and another 35.0% consumed adequate amounts in at least three out of four food groups.

B. SOME DIETARY CHARACTERISTICS AND FOOD CONSUMPTION PATTERNS OF MALE FACTORY WORKERS IN INDUSTRIALLY DEVELOPED COUNTRIES.

1. Energy level of the diet

The individual's energy needs are determined by the accumulated requirements for basal metabolism, specific dynamic action of food and muscular activity (Pekkarinen, 1972; Shils, 1979; Consolazio, 1972). Automation in industry has lowered the energy requirements of work to the point where non-occupational energy expenditure is higher for many workers than that used for job related activities (Wirths, 1972).

In countries where food supply is plentiful caloric adequacy is often surpassed, resulting in obesity amongst the population (Health and Welfare Canada, 1973; Luyken and Leegwater, 1978; Bronswijk and van Ramshout, 1978). The mean energy intakes of male industrial workers reported by researchers in industrially developed countries vary from 9.7 MJ in Finland (Harju, 1977) to 15.9 MJ in the Netherlands (Luyken and Leegwater, 1978). Energy intake in excess of need was common in Dutch workers employed by the Ford-Nederland automotive company: 52.6% of the volunteers in a nutrition survey were found to be obese as evidenced by skinfold measurements of subcutaneous fat (Luyken and Leegwater, 1978).

An investigation involving 200 male workers in an automobile assembly plant in Belgium found very high caloric intakes as well (Hendrikx and Lombaerts, 1970). Workers bringing their lunch from home consumed 15.4 MJ daily compared to cafeteria users with an average of 13.8 MJ per day. The only Canadian nutrition study of automotive workers fails to report the caloric intake of the subjects (Maxwell and Robitaille, 1978).

Construction workers living alone in Zagreb, Yugoslavia, were reported to have difficulty meeting their energy requirements (Buzina, Horvat et al., 1972). Their fellow workers who had their families well settled in the city, or those who commuted to work from the farming villages around the city, did not experience similar problems.

Inadequate caloric intake does not appear to be common in adult Canadian males (Health and Welfare Canada, 1973). Obesity, as judged by ponderal index ($^{H}/\sqrt[3]{W}$), was found in more than half of the adult males who participated in the Nutrition Canada study.

2. Proportional contribution of protein, carbohydrates, fat and alcohol to daily energy intake of industrial workers

Remarkable similarities are found in the proportional contribution of the energy-yielding nutrients to daily energy intake in all but one of the studies reviewed.

Protein

The percentage contribution of protein to energy varied from a low of 11.8% in automotive workers in Belgium (Hendrikx and Lombaerts, 1970) to a high of 14.1% in Finnish industrial workers (Harju, 1977). The Nutrition Canada Food Consumption Patterns Report (1976) shows that Canadian adult males also receive 14.1% of daily calories from protein. Pekkarinen (1972) observes that the proportional intake of protein is usually the same, irrespective of the level of physical activity and caloric intake, in countries where food supply is plentiful. Protein deficiencies are thus uncommon when adequate food is available. One exception to this general rule was found in a study involving 400 construction workers in Zagreb, Yugoslavia (Buzina, Horvat et al., 1972). Here the investigators observed that 30.0% of the young workers who were living alone in the city did not meet daily protein requirements. The diet of these workers, aged 24-39 years, was found to be inadequate with respect to several other nutrients as well. Absenteeism due to illness was very high in this group.

Fat

Fat contributed 38.2% of the daily calories in the diet of Finnish industrial workers (Harju, 1977), while Belgian workers were reported to obtain 44.5% of daily energy from fat (Hendrikx and Lombaerts, 1970). In their study, cafeteria users consumed less total calories but

relatively more fat than those bringing a lunch from home. The Nutrition Canada findings show a fat intake of 39.8% among middle-aged men and 41.1% for 20-39 year-old males.

Carbohydrates

Dutch industrial workers were found to obtain 39.0% of their energy from carbohydrates (Luyken and Leegwater, 1978). Harju (1977) reports proportional contribution of this nutrient to be 47.7% in Finnish workers. Canadian adult males are reported to obtain about 40.0% of their calories from carbohydrates (Health and Welfare Canada, 1976). The low fibre content in the diet of Canadian men suggests that a large proportion of the carbohydrates consumed are highly refined.

Alcohol

Alcohol contributed from 3.2% (Hendrikx and Lombaerts, 1970) to 6.0% (Luyken and Leegwater, 1978) of the calories in the diets of industrial workers. When Maxwell and Robitaille studied the diets of 217 Ontario automotive workers, they found the majority of the men to be regular drinkers. As noted previously, the proportional contribution of the nutrients could not be calculated from the data in this study. Nutrition Canada reported alcohol to make up approximately 4.0% of the daily calories in the diets of Canadian males.

3. Breakfast habits of male factory workers and their impact on food intake during the rest of the day

The Nutrition Canada Food Consumption Report (Health and Welfare Canada, 1976) showed that many people in this country either omit breakfast entirely, or eat a very small meal in the morning. No information could be found on breakfast patterns of factory workers in Canada. Maxwell and Robitaille (1978) reported that 58.0% of the day-shift workers in their

study consumed three or more meals per day, compared to 42.0% of the afternoon-shift workers and only 38.0% of those working the midnight shift. It was not specified in their report which meal was skipped most often.

Bouterse-van Haaren, Onneweer, et al., (1975) suggested that the frequency of breakfast consumption among factory workers in Holland was influenced by shiftwork, age and marital status of the subject. Young, unmarried men appeared to miss breakfast more often than older and/or married participants in their study. Thirty per cent of "early shift" workers (their working hours are from 6:00 A.M. to 2:00 P.M.) reported never eating breakfast, compared to twenty percent of those working the "regular shift."[1] Out of 51 early-shift workers in this study, 43 consumed some food at work before lunch while only 25 of the regular-shift workers reported snacking during the morning. Non-breakfast eaters were found to eat larger snacks during the morning.

The omission of breakfast was a common practice among automotive workers at the Ford-Nederland factory as well (Luyken and Leegwater, 1978). Specific figures are not given, but the investigators observed that many workers replaced breakfast with a meal containing the typical Dutch breakfast foods (bread, cheese, cold cuts, beverage) early during the working hours. The researchers accepted this as an acceptable alternative.

Tuttle and Herbert (1960) conducted experiments on the effect of the midmorning meal on work capacity among a small group of industrial workers who omitted breakfast during some of the experimental periods. The data seem to indicate that work capacity is higher when an adequate breakfast is consumed. It would appear from their two-year experiments

1 Working hours were not specified.

that a mid-morning meal cannot adequately replace a breakfast meal. It is also interesting to note that the addition of a mid-morning meal to an adequate breakfast resulted in no advantages as far as maximum work output was concerned.

Maurice Shils (1978) cites the Hawthorn experiment conducted by Roethlisberger and Dickson (1946) to make the point that factors other than food may be responsible for changes in work output. In the Hawthorn experiment, when women engaged in assembling telephones were given extra snacks, their output increased; however, when only a rest period was given without food, their output also rose. The researchers concluded that recognition by the workers that management was concerned about the well-being of the employees was an important general factor influencing work output.

C. THE EFFECT OF THE BREAKFAST MEAL ON PHYSIOLOGIC RESPONSE, MENTAL PERFORMANCE AND ON THE INCIDENCE OF ACCIDENTS AT WORK

At the first International Symposium on Nutrition and Work, Consolazio stated: "Work capacity is dependent on many factors, including physical condition, technical skill, coordination, muscular strength to overcome a given load, motivation to perform at the best of one's ability, limitation of all the inhibiting psychological factors and optimal nutrition." Of all these factors adequate nutritional status is the most important condition of work performance (Kraut and Korbel, 1972).

The body needs to be supplied regularly with energy and nutrients to cover the requirements of basal metabolism, physical activity, growth and nutrient losses (Hamilton and Whitney, 1979; Robinson, 1978; Fleck, 1981;

Kreutler, 1980). A number of well-controlled studies demonstrating the relation between breakfast and work performance were performed by Tuttle and co-workers between 1949 and 1962. Breakfasts of different size and composition were used in these studies. Several experiments were done as well to measure the effect of the omission of the breakfast meal.

1. The effect of breakfast on physiologic response

Specific tests are commonly used to register physiologic changes resulting from stress caused by experimentally altered food consumption patterns (Tuttle et al., 1952; Brent-Keiles, 1949). Frequently used tests include neuromuscular tremor magnitude, maximum grip strength, grip strength endurance, maximum work rate, maximum work output, oxygen required to do a specified amount of work, simple and choice reaction time, changes in blood sugar levels. A brief description of these tests is included as Appendix A. Some investigators record subjective findings as well, for example: hunger, weakness, headache, degree of well-being, changes in behaviour or in attitude and in scholastic achievement.

During the experiments a variety of breakfast regimens were used. The "basic breakfast" used was a meal providing one-fourth of the daily energy and protein requirements and consisting of common breakfast foods such as fruit, cereals with milk and sugar, buttered toast with jelly, eggs, milk. Coffee was excluded. To compare physiologic responses following breakfasts of different size and composition, the experiments included a "heavy breakfast" (60 per cent more calories and protein than the basic breakfast), a "light breakfast" (providing 60 per cent less calories and protein than the basic breakfast), a low-protein breakfast (providing 100 per cent of the calories but only 40 per cent of the protein found in the basic breakfast). Further experiments were done when only black coffee

was provided in the morning or when the subjects consumed no food nor drink at all. The influence of size and content of the various breakfasts on physiologic responses was studied in healthy male and female subjects over a wide age range (Tuttle, Daum et al., 1950; Daum, Tuttle et al., 1950; Tuttle, Daum et al., 1952; Tuttle, Wilson et al., 1949; Tuttle, Daum et al., 1954; Steele, Clayton et al., 1952; Orent-Keiles and Hallman, 1949). It was observed that individuals of different age groups react in similar ways to some of the tests while showing opposing findings in other tests.

Choice Reaction Time

On the basis of mean results, the omission of breakfast did not seem to affect Choice Reaction Time in young school boys (Tuttle, Daum et al., 1954) or the elderly (Tuttle, Daum et al., 1952). Young women, on the other hand, were found to show significantly increased Choice Reaction Time when no breakfast was consumed, or only black coffee was taken, compared to the results on a basic 600-calorie meal in the morning.

Neuromuscular Tremor Magnitude

Most subjects studied recorded a significant increase in neuromuscular tremor magnitude as a result of the omission of breakfast, or the consumption of black coffee only, compared to results obtained following a basic breakfast. Only young boys seemed unaffected by the omission of breakfast.

Maximum Grip Strength and Grip Strength Endurance

These tests were done only in young boys and in men over sixty. The old men did much better in both tests when a basic breakfast had been consumed, while young boys seemed unaffected by a lack of food in the morning.

Maximum Work Output

This test was included for subjects in various age groups. The results were similar in all groups and demonstrated clearly that work capacity suffers severely when no breakfast is consumed. In a group of old men this test was replaced by one registering oxygen requirement for specific, short-term, light work. Those having consumed a basic breakfast required less oxyten than the men who had had no food during the morning.

Maximum Work Rate

Maximum work rate was recorded for the school boys only. Skipping breakfast reduced the maximum work rate in all subjects, for some by as much as 30.0%.

Identical physiologic-response experiments with young men and young women led investigators to conclude that men react to the omission of breakfast in a more pronounced way than women: severe fatigue reactions followed strenuous work. Dizziness, nausea and vomiting were common among the men, who also compained frequently of hunger (Tuttle, Daum et al., 1950).

A protein-rich breakfast causes the blood glucose to remain above the fasting level longer than a meal providing mainly carbohydrate and fat (Addison, Tuttle et al., 1953; Orent-Keiles ahd Hallman, 1949). It was found that the blood glucose of young men and women who had consumed 22 to 25 grams of protein at breakfast remained above the fasting level three and one-half to four hours. Low-protein meals, high in carbohydrate or fat, raised the blood sugar above the fasting level for two and three hours, respectively. The sustained higher blood sugar levels and the accompanying sense of well-being seemed

to be related more to the quantity of protein in the meal than to the caloric value (Orent-Keiles and Hallman, 1949). Nine women laboratory workers served as volunteer subjects in a two-year breakfast study by these researchers. Light meals composed of common breakfast foods provided varying amounts of calories and protein. The smallest meal consisted of black coffee only; the largest one provided 25 grams of protein and about 750 kcalories (3.1 MJ). During a three-hour test period, immediately following the breakfast meal, those consuming only black coffee experienced a fall in blood sugar below the fasting level. Common complaints included headache, hunger, weakness and lassitude. Breakfasts containing 7-17 grams of protein and 360-520 kcals (1.5-2.1 MJ) caused a rapid increase in blood sugar from the fasting level and a return to this level in three hours. Breakfasts containing 22 grams of protein and about 500 kcals (2.1 MJ) caused a slower return to fasting blood sugar levels than a meal of the same energy value but low in protein. The quality of the protein consumed appeared to be less important than the quantity (Coleman, Tuttle et al., 1953).

An interesting observation is made in a study of fifteen teenage girls (Ohlson and Parente-Hart, 1965). It was found that girls selecting a high-protein breakfast consumed almost one-third less sugar and 10.0-20.0% less energy daily than those eating a lower-protein meal in the morning.

The size of the breakfast meal did not seem to impact on the performance of school boys in the late morning hours (Daum, Tuttle et al., 1955). Male college students, on the other hand, did not react favorably to a 1000-calorie (4.2 MJ) breakfast and recorded substantially decreased work output when compared to a basic 600-calorie (2.5 MJ) meal (Tuttle and Daum, 1952). Tremor magnitudes were increased as a result of the heavier

meal and some complained about nausea and vomiting. Oxygen requirements were higher in older men when a heavy breakfast was consumed and Choice Reaction Time was also negatively affected (Tuttle, Daum et al., 1953). These results suggest that a breakfast which supplies substantially more than 25.0% of total daily energy requirements may not be beneficial to adults.

The effect of the midmorning break on maximum work output of factory workers was investigated by Tuttle and Herbert (1960). Test periods included: no breakfast and no midmorning snack, no breakfast plus a midmorning snack, breakfast plus a midmorning snack and midmorning snack only. Results indicated that work output was consistently lower when no breakfast was consumed. When a midmorning snack was added to an adequate breakfast, this addition added nothing to the work capacity of seventeen out of eighteen men. The same midmorning meal, given to subjects omitting breakfast, did improve the work capacity in almost half of the participants. The authors conclude that for optimum work capacity an adequate breakfast is of more value than any other food intake pattern used during these experiments.

2. The effect of breakfast omission on mental performance

The relationship between diet and work capacity is a complex one. Few studies have been done on the effect of breakfast on mental efficiency, possibly due to the difficulties involved in assessing mental efficiency in quantitative terms.

Richards (1972) conducted mental performance tests with a group of eighteen laboratory workers. Nine of the subjects habitually omitted breakfast prior to the experiment, while the other nine were used to eating a moderate meal in the morning. During the first test period the particip-

ants followed their previously established breakfast routine. Subsequent tests were arranged so that each of the participants performed the four mental-skill tests (visual-search test, short-term memory test, error-vigilance test and coding test) twice after having eaten a standard 450-calorie (1.9 MJ) breakfast and twice without breakfast. Richards found that changes in the test results could not be attributed to altered eating patterns. The researcher suggested that the influence of stress due to a departure from previously established habits may have been a factor when lower scores were obtained in some tests. Increased familiarity with the specific tests was thought to be responsible for higher scores in some tests as the experiments proceeded. She further concluded that the occasional departure from the normal dietary routine was more harmful than the habitual omission of breakfast.

In another study, carried out by Orent-Keiles and Hallman (1949), to establish the relation of different breakfast meals to blood glucose levels, it was observed that unfavorable subjective symptoms such as hunger, weakness, headache and lassitude were often reported when blood sugar levels were low as a result of a non-caloric breakfast consisting of black coffee only.

Children

Tuttle, Daum et al., (1954) made a subjective evaluation of the academic performance and of behaviour in school children omitting breakfast. Teachers' observations and academic records were used to measure attitudes and scholastic performance of twenty-five boys ranging in age from twelve to fourteen years. At the conclusion of seventeen weeks of testing it was the consensus of the school authorities that the omission of breakfast had a definitely detrimental effect on the behaviour of the boys and their academic progress.

3. The impact of the omission of breakfast on accident incidence.

Evidence of the effect of breakfast omission on accident incidence is extremely scarce. Only one study addressing this topic could be found.

Metabolic requirements of work, diet and accident incidence of fifty-seven forge workers were investigated by Brooke, Toogood et al. (1980). It was found that the men were often overnight-fasted at the start of work. Over the day, energy intake followed a linear function with time, but high energy expenditure was confined to the first nine hours of the working day, creating an imbalance between energy intake and output within the day. When subjects were given a dietary supplement of glucose syrup early in the working day the incidence of accidents decreased in comparison to that for periods when they received a low-energy dietary supplement, or to that of the previous four months. The researchers concluded that energy imbalance as a result of poor food-consumption patterns led to fatigue, which in turn was responsible for lower work performance and an increase in accidents at work.

4. Conclusion

Relatively few field studies have been done to observe the effects of different breakfast meals on physical and/or mental performance of workers in industrially developed countries. It is difficult to make general assumptions on the basis of the studies reviewed because the stress of the environmental settings and of any change per se in established eating habits may have had an impact on the results that is difficult to calculate. Also, many of the studies presented in this review were conducted with very small populations.

If one accepts the results of these studies at face value, it would appear that an adequate breakfast may indeed have a positive effect on well-being and work capacity. Tuttle and co-workers in particular did find a measurable difference in several physiologic responses following breakfasts of different size and composition. Investigations of eating habits of industrial workers suggest that many consume calories in excess of need. Obesity is a common problem among workers in industrialized countries where food supply is plentiful. On the other hand, caloric and nutrient deficiencies occur frequently in the developing countries where food supply is inadequate.

It has been demonstrated that work capacity is lowered when caloric needs cannot be met. Canadian data on the dietary habits of industrial workers are almost non-existent. In general, findings described in European studies seem to indicate that the nutritional problems of industrial workers are similar to those described for adult males in the Nutrition Canada Reports. Therefore, they supply useful information for further study in this country.

III A STUDY OF FOOD PRACTICES OF A SELECTED GROUP OF INDUSTRIAL WORKERS IN QUEBEC

A. INTRODUCTION

The automation of production processes in industry has resulted in decreased energy requirements for the majority of workers in industrially developed countries (WHO, 1964). Recognizing this fact, the Food and Nutrition Board of the National Research Council (U.S.A.) has lowered the Recommended Dietary Allowances for energy in successive revisions over the last two decades (National Academy of Sciences, 1964, 1968, 1974).

Similar suggestions to lower energy intake have been made in Canada (Health and Welfare Canada, 1975). However, food practices are not always adapted to the lower caloric need as evidenced by the extent of obesity found in adults participating in the Nutrition Canada Survey (Health and Welfare Canada, 1973).

Beyond the general knowledge which may in part be applicable to industrial workers as members of the adult male population, little information has been compiled in Canada about their food practices and in particular their breakfast habits. It is intended that the present study will add to the body of information.

It has been suggested that the size and the composition of the breakfast meal have a considerable impact on the industrial worker's capacity to perform physical and mental skills (Tuttle and Herbert, 1960; Cass-Beggs and Emery, 1965).

Over a period of almost two years Tuttle and Herbert conducted experiments in an American industrial plant to study the effect of breakfast omission on the capacity to work. They also checked work performance following breakfast meals of various sizes with and without mid-morning

snacks. Their findings showed a significantly higher work capacity for all subjects when an adequate breakfast was consumed, than when this meal was omitted. They observed no increase in maximum work output when a mid-morning snack was added to an already adequate breakfast. In only half of the subjects omitting breakfast did the mid-morning snack increase maximum work capacity over the fasting level. The reduction in maximum work output with no breakfast averaged 28.0% in their subjects. In some workers the loss exceeded 35.0%. Cass-Beggs and Emery (1965) suggest that "... adequate food and drink, at appropriate intervals, can prevent bodily states of low energy and low temperature which are conducive to feelings of fatigue/distress." When comparing the impact of meals high in protein, fat and carbohydrate, they reported that a low energy state and hunger are postponed longest by a high-protein meal and least by a high-carbohydrate meal. They suggested that with the existing meal patterns of manual workers in England (a small, early A.M. high-carbohydrate meal) a substantial proportion of these people may have a low blood-sugar level as early as 9:30 A.M. Of the manual workers having a mid-morning snack, only 17.0% ate anything to make much difference in the low energy levels caused by an inadequate breakfast. Richards (1972) does not appear in agreement with these findings. She tested mental performance in laboratory workers following a standard breakfast providing about 450 kcal (1.9 MJ). This test meal was reasonably similar to what was normally consumed by breakfast users in the group. This researcher concluded that stress caused by a departure from the "normal" pre-test routine was responsible for the majority of changes in the performance levels during the experiments. She did not find any significant differences in performance due to breakfast omission. The results of this study point out that one must be careful

in making general assumptions of the effects of nutrition on work performance.

Cass-Beggs and Emery (1965) in their studies also emphasize the non-nutritional factors that influence work output of workers such as noise, boredom, fatigue or anticipation of fatigue when working hours are extended beyond the regular shifts.

Consolazio (1972) states that " ... three basic conditions must be observed in order to maintain adequate physical fitness and work performance: (a) the general unimpaired physical and mental health of the individual; (b) adaptation to and/or control of the environment; and (c) adequate nutrition." In his opinion, nutrition does not produce a good performance, but it helps to sustain it. He further observes that obesity interferes with optimum work performance since it results in a greater workload on the heart. In fact, he accepts a direct relationship between obesity and a decrease in work performance. Specific experiments to show this relationship are not described in his review of nutritional status and work-capacity relationships.

The present study will gather information about the workers' feelings about fatigue, capacity to concentrate on their tasks, changes in energy levels and temper.

This chapter contains the details of the methodology employed, the results of the study and discussion of these results.

B. METHODOLOGY

The sampling units for this study were selected in a multi-stage process involving active participation of the Lakeshore Community Health Department (C.H.D.) in Pointe Claire, the employee health service depart-

ments in a number of industries in the West Island and the personnel directors of the companies involved.

Under Québec law[1] the regional Community Health Departments (C.H.D.) are assigned a number of responsibilities concerning occupational health within their territory. The Lakeshore C.H.D. territory includes fourteen municipalities encompassing the Ville St.Pierre-Lachine area on the east to the Ste. Anne de Bellevue area on the west.

To appreciate the C.H.D.'s role in this study - especially in the selection of the sample and their assistance in the survey design - it seems relevant to briefly list the major objectives/responsibilities of the Lakeshore Community Health Department concerning occupational health within their territory. Their mandate includes:

- to identify, quantify and evaluate the health hazards in each industry
- to counsel the employers, the workers and the health services regarding the prevention of occupational diseases
- to coordinate the implementation of specific health programmes for the industries
- to develop and coordinate the resources necessary for the implementation of health programmes
- to assure at all times to the industries, the availability of medical expertise regarding occupational health
- to assure the availability of the occupational health staff team regarding industrial hygiene
- to participate in the application of the rights to preventive reassignment of pregnant or breast-feeding workers
- to evaluate the exposure of contaminants following the request of a worker for compensation due to occupational hazards.

The occupational health team of the D.S.C. was asked to assist in the sample selection for this study because of their knowledge of the industries within

1 Bill 17, Assemblée Nationale du Québec, 1979.

the area with respect to current levels of interest in health-related activities. A list of ten companies was prepared by members of the occupational health team. The community nutritionist at the C.H.D. volunteered to introduce the researcher to staff members of the employee health services at the various companies. This nutritionist had recently conducted several nutrition-awareness programmes within the territory which proved to be very helpful in making the initial contacts with the companies. An information package explaining the purpose of the study was distributed to the nurses of the employee health services, prior to the first meeting in each company. During the introductory visits, the purpose of the study was explained and the nurses were asked to present the request for interviews with thirty male day-shift employees to the management of their respective companies, for approval. The negotiations with management followed and - after three months - resulted in four companies accepting the proposal, two giving a conditional acceptance, and four deciding not to participate. One company made its initial agreement to participate subject to its health department's capacity to recruit enough volunteers; more than thirty responded. Another company limited participation to ten of its employees. It was decided to conduct the pilot study in this industry. After reaching agreement with the six participating companies, all their employees were informed via payroll-enclosed letter of the research project, explaining eligibility and operational particulars (Appendices B, C).

The second phase of the sampling process involved a systematic random sampling of all eligible workers within the companies. A table of random numbers was used to determine the starting point in this stage of the selection process (Blalock, 1960). Thirty subjects were selected in each of five companies, ten in the company which had limited its participation to that number. The selected employees were then invited by nurses

of the company health departments to volunteer for the study. It was again made clear to the workers that the interviews would be conducted during working hours and without any loss of pay. In cases where the employee decided not to participate in the study, no replacement was made. Dillman (1978) warns against substitution when a random sample is sought, as it interferes with the random aspect of the selection process.

Nine subjects participated in the pilot study in which content procedures and time requirements were checked. Upon completion of this pre-test, the questionnaire was shortened, as the interviews could not be comfortably conducted within the established time limit of thirty minutes.

A total of 110 workers in five companies were interviewed between the middle of August and the end of October, 1981. Unexpected shift changes, language limitations and non-compliance with eligibility rules caused the disqualification of fourteen subjects.

The workers were scheduled for the interviews in cooperation with their supervisors. Availability of personnel and time away from team work had to be carefully considered, so as to arrange a schedule that would not disrupt the operation of the plant any more than absolutely necessary. One specific objective of the study was to verify the worker's breakfast habits on working days. For that reason, no interviews were scheduled on Mondays.

All the interviews were conducted by one fluently bilingual nutritionist with extensive interviewing experience with the Nutrition Canada National Survey. The 24-hour dietary recall was recorded following the Nutrition Canada Protocol (1970). Food models[1] were used to estimate serving sizes. A supplementary questionnaire was used to gather inform-

1 Courtesy of National Department of Health and Welfare, Ottawa.

ation about the breakfast habits of the workers and their perceived sense of well-being during the late morning hours.

The information gathered was then prepared for entry into the computer. Identification codes were designed to allow for a subdivision within the total group by age groups (20-29, 30-39, 40 and older) and by language (French, English and other). The dietary data were coded according to the requirements imposed by the computer programme used at McGill University. The data bank for this programme is based primarily on the U.S.D.A. Handbook No.8 (Watt and Merrill, 1963), modified for use in Canada and supplemented by data calculated at McGill University. Systematic random checks were performed to audit the data before entry into the computer. Existing S.P.S.S. programmes were modified to allow for specific analysis requirements (Nie, Hull et al., 1975). To study the relation between food practices of the subjects and selected variables, the responses to the supplementary questionnaires were analyzed separately by age groups, education, and breakfast habits of the subjects.

C. RESULTS

1. Socio-demographic Characteristics

The population sample consisted of ninety-six male day-shift workers aged 20-64 years. They were employed by five manufacturing companies on the West Island of Montreal, in a variety of functions, as shown in Table 1. The distribution of the respondents by age, language, education and household type, are given in Tables 2 - 5.

Table 1. Distribution of respondents by job title
"What is your job title?"

Operator, machinist, mechanic	65.6%
Inspector, quality control officer, security	12.5%
Maintenance, plumber, electrician	9.4%
Shipping	3.1%
Other (yardman, janitor, general work)	8.3%
Not ascertained	1.0%
	99.9%
(Number of cases)	(96)

Table 2. Distribution of respondents by age group
"To which age group do you belong?"

20 - 29	31.3%
30 - 39	21.9%
40 - 49	25.0%
50 - 64	21.9%
	100.1%
(Number of cases)	(96)

Table 3. Distribution of respondents by language
"Which language is most often spoken at home?"

French	74.0%
English	19.8%
Other	6.3%
	100.1%
(Number of cases)	(96)

Table 4. Distribution of respondents by education
"How many years of schooling did you complete?"

3 - 6 years	11.5%
7 - 11 years	65.7%
12 or more years	22.8%
	100.0%
(Number of cases)	(96)

Of those reporting less than seven years of formal education, 45.5% were 50 years or older, 27.2% were between 40 and 49 years of age. The remaining 27.3% was evenly divided between those in their twenties and thirties.

Table 5. Distribution of respondents by type of household
"Including yourself, how many are in your household?"

One adult only	5.2%
Two adults only	19.8%
One adult and child(ren)	7.3%
Two adults and child(ren)	36.5%
Other	31.2%
	100.0%
(Number of cases)	(96)

The "other" category was made up predominantly of households with more than two adults.

The pilot study indicated that the cost of food was not a factor in food selection for any of the subjects interviewed. However, in terms of ultimately planning nutrition education for industrial workers, it

seemed important to know how many persons did contribute to the household food budget. The results are shown in Table 6.

Table 6. Number of individuals contributing to the food budget
"How many persons contribute to the food budget?"

One	49.0%
Two	38.6%
Three	5.2%
Four	5.2%
More than four	2.1%
	100.1%
(Number of cases)	(96)

2. Energy intake of the respondents

The mean energy intake of the ninety-six subjects is shown in Table 7. In the same table, the energy intakes of various age groups are compared to the Nutrition Canada (Québec) findings (1976) and to the Canadian Dietary Standard (1975).

3. Protein intake of the respondents

The mean protein intake of the ninety-six men is shown in Table 8. Also, in this table, is a comparison of protein intakes by men of various age groups and the findings of Nutrition Canada (Québec). The protein intake is also compared to the Dietary Standard for Canada (1975).

Table 7. Means and standard deviations for energy of 96 men and comparisons with Nutrition Canada (Québec) findings and with the Canadian Dietary Standard

	Mean	± S.D.	Nutrition Canada (Québec)	Mean as percent of Nutrition Canada (Québec)	Canadian Dietary Standard	Mean as percent of Canadian Dietary Standard
All subjects (N = 96)						
Energy kcal	3068	± 1120	-	-	-	-
Energy MJ	12.8	± 4.7	-	-	-	-
Men 20-39 (N = 52)						
Energy kcal	3132	± 1087	3461	90.5%	3000[1]	104.4%
Energy MJ	13.8	± 4.6	14.5	90.5%	12.6[1]	104.4%
Men 40-64 (N = 44)						
Energy Kcal	2993	± 1160	2767	108.1%	2700[2] 2300[3]	110.9% 130.1%
Energy MJ	12.5	± 4.9	11.6	108.1%	11.3[2] 9.6[3]	110.9% 130.1%

1) Dietary Standard for Canada, 1975, for males 19-35 years.
2) Dietary Standard for Canada, 1975, for males 36-50 years.
3) Dietary Standard for Canada, 1975, for males 51+ years.

Table 8. Means and standard deviations for protein intake of 96 men and comparisons with Nutrition Canada (Québec) findings and with Canadian Dietary Standard

	Mean	± S.D.	Nutrition Canada (Québec)	Mean as percent of Nutrition Canada (Québec)	Canadian Dietary Standard	Mean as percent of Canadian Dietary Standard
All subjects (N = 96) Protein g	100.9	± 29.9	-	-	-	-
Men 20-39 (N = 52) Protein g	112.1	± 44.7	114.0	98.3%	56[1]	200.1%
Men 40-64 (N = 44) Protein g	105.2	± 12.5	95.0	110.7%	56[2]	187.9%

1) Dietary Standard for Canada, 1975, for males 19-35 years
2) Dietary Standard for Canada, 1975, for males 36-50 years and 51+ years.

4. The percentage contribution of breakfast to daily total intake of energy and protein

For the purpose of this study, all foods consumed before the start of working hours were considered to be breakfast. Most men started work between 7:00 A.M. and 7:30 A.M. Table 9 shows the relative contribution of breakfast to daily energy and protein intakes. A review of the literature suggests that young men tend to pay less attention to the consumption of an adequate breakfast than older workers do (Buzina, Horvat et al., 1972; Bouterse-van Haaren, Onneweer et al., 1975; Luyken and Leegwater, 1978). Their results are therefore reported separately.

Table 9. Mean percentage contribution of energy and protein of breakfast to daily totals of male industrial workers

	All subjects	Men 20-29	Men 30-64
Energy	10.6%	10.4%	11.2%
Protein	9.4%	9.3%	9.4%
(Number of cases)	(N=96)	(N=30)	(N=66)

5. The impact of the size of the breakfast meal on total energy intake during the day

The subjects were divided into three groups of identical size, according to the energy content of breakfast. Group I represents the lowest reported energy intakes, Group III the highest. Mean energy intakes were then compared for the three groups. The difference in the daily energy intake of groups I and II (small and moderate breakfast eaters in Table 10) appears to be due almost entirely to the difference in the energy content of their breakfast.

Table 10. Mean energy intake of subjects as influenced by the size of the breakfast meal

	Mean energy content of breakfast	Mean energy intake per day	Mean energy content of breakfast as a percent of mean daily energy
Group I (N = 32)	69.9 kcal 0.3 MJ	2718 kcal 11.4 MJ	2.3%
Group II (N = 32)	289.3 kcal 0.3 MJ	2948.3 kcal 12.3 MJ	9.8%
Group III (N = 32)	809.8 kcal 3.9 MJ	4028 kcal 16.7 MJ	20.1%

The objectives of the supplementary questionnaire used in this survey were to gather information about the breakfast habits of the subject and to compare the perceived sense of well-being towards the late morning hours between breakfast eaters and those who as a rule skipped the breakfast meal.

6. Breakfast habits

Frequency of breakfast consumption was recorded twice during each interview. Initially the subjects were asked how often they ate breakfast during the last working week. To verify whether this pattern held true over a longer period of time and to cross check the information initially given, the subjects were, later in the interview, asked how often they skipped breakfast during the last twenty working days. Tables 11 and 12 show the responses given. Some incongruities exist between data shown in Tables 11 and 12. This is caused by the fact that the time period referred to in Table 12 for many workers was interrupted by their annual vacation or by temporary plant closings. Many reported not to remember accurately what had occurred from four to eight weeks prior to the interview. For this reason the results in Table 11 will be used

further on in this report when referring to the frequency of breakfast consumption.

Table 11. Frequency of breakfast consumption during one 5-day period
"How often during the last working week did you eat breakfast?"

Every day	64.6%
Three or four times	7.3%
One or two times	3.1%
Never	25.0%
	100.0%
(Number of cases)	(N = 96)

Table 12. Frequency of breakfast skipping on working days over a four-week period
"During the last twenty working days, how many times did you skip breakfast on working days?"

Never	68.8%
Once or twice only	3.1%
Three to ten times	13.5%
On most working days	2.1%
On all working days	11.5%
Total	99.0%
(Number of cases)	(95)
(Not ascertained)	1.0%
(Total number of cases)	(96)

It would appear that the regular breakfast eaters adhere quite strictly to a set pattern in terms of the location where the morning meal is consumed. Table 13 illustrates the frequency of use of various breakfast locations during the last full work week prior to the interview.

Table 13. Location of breakfast consumption among industrial workers

Frequency	At home	At work (cafeteria)	At work (vending machine, mobile canteen)	At a restaurant
1 x per week	2	2	0	0
2-3 x per week	8	2	0	0
4-5 x per week	54	5	0	3

This table shows that most of the regular breakfast eaters preferred to consume this meal at home. Forty-five out of the regular breakfast eaters reported eating alone, while nineteen shared the meal with members of their family. It could be assumed that the early departure for work was the main reason for which so many ate breakfast alone.

Less than 10.0% of the workers reported eating their breakfast regularly in a restaurant or a company cafeteria. The main reason for their not eating at home was the desire to sleep a little longer.

Twenty-six percent of the workers reported that they never ate breakfast. The skipping of the morning meal was much more common amongst the younger workers in the group, as illustrated in Table 14.

Table 14. Incidence of breakfast omission among industrial workers by age group

	Percentage of workers skipping breakfast
20 - 29 years (N = 30)	36.7%
30 - 64 years (N = 66)	27.3%
Total group (N = 96)	25.0%

A variety of reasons were given by subjects who missed breakfast on working days. These are reported in Table 15.

Table 15. Main reasons for breakfast omission among industrial workers "What is the main reason you did not eat breakfast on working days during the last week?"

Lack of time	40.7%
Established habit	22.2%
Incapacity to eat upon rising	14.8%
Lack of appetite	7.4%
Fear of weight gain	7.4%
Other	7.4%
	99.9%
(Number of cases)	(27)

The findings reported in this table suggest that for 14.8% of the workers the early working hours may play a role in breakfast omission.

The majority (56.0%) of those skipping breakfast substituted this meal with a mid-morning snack. Table 16 shows the type of foods selected to replace the breakfast meal.

Table 16. Common food selections of workers who substituted a mid-morning snack for breakfast
"If you did use a mid-morning meal to replace breakfast, what foods and beverages did you select?"

Bread with meat, fish, cheese or egg and a beverage	59.1%
Bread or toast or cereal, with a beverage	18.2%
Sweet roll, muffin or doughnut with a beverage	4.5%
Fruit and a beverage	4.5%
Other	13.6%
	99.9%
(Number of cases)	(22)

For all but two of the cases the beverage selected was coffee, usually with cream and sugar.

Workers who indicated that they ate breakfast only occasionally ate a very small meal such as toast and coffee or cereal with milk.

In response to a request to rate the importance of breakfast compared to other meals in the day, more than half of the subjects stated that breakfast was more important than the other meals. A summary of the responses is presented in Table 17.

Table 17. The relative importance of breakfast as perceived by a group of male industrial workers
"In comparison to the other meals in the day, how do you rate breakfast?"

Less important than lunch and dinner	27.1%
Of equal importance	19.8%
More important than lunch, dinner	53.1%
	100.0%
(Number of cases)	(96)

Almost 60.0% of the middle-aged men (40-64 years) judged breakfast to be the most important meal of the day, compared to 49.0% of the younger workers (20-39 years).

Gaining some understanding of the workers' perception of what it means to "eat well" may be helpful when preparing nutrition education materials for this group. In order not to influence their answers by listed suggestions, an open-ended question was designed to gather this information. The answers were coded and grouped in categories as shown in Table 18.

Table 18. Main factors mentioned by the workers to describe the meaning of "eating well"

"How would you describe eating well?"

Adequate quantity and good distribution of food over the day	34.4%
Nutrient adequacy and balanced nutrient intake	19.8%
Promotion of health	18.8%
Sensory aspects of food	7.3%
A combination of two or more of the factors above	9.4%
Other	8.3%
Not ascertained	2.0%
	100.0%
(Number of cases)	(96)

When asked if, by their own description of eating well, they thought they did, almost 75.0% of the subjects gave a confirming answer.

The survey question dealing with the principal source of nutrition information for the workers initially did not include the mother as a separate option in the response selections. Instead, it listed "family and friends". The subjects in the pilot study, however, firmly established the mother as their principal source of nutrition information. The question was then changed to allow a separate category for the mother. The results, shown in Table 19, confirm the opinions expressed during the pilot study.

When asked about additional sources of information, 7.3% of the workers indicated they had completed nutrition and/or cooking courses.

Table 19. Important sources of nutrition information as expressed by male industrial workers in Québec
"What is your main source of nutrition information?"

Mother	43.8%
Family and friends	16.7%
T.V., radio, newspapers, magazines	11.5%
Doctor, nurse, dietitian	1.0%
Food stores	0.0%
Don't know	27.1%
	100.1%
(Number of cases)	(96)

Many subjects expressed an interest in food-related matters, as can be seen in Table 20.

Table 20. Interest among the workers in matters related to food
"Do you like to read, hear or talk about food or food products?"

Like very much	17.7%
Like	45.8%
Indifferent	33.3%
Dislike	3.1%
Dislike very much	0.0%
	99.9%
(Number of cases)	(96)

The participants in this study were asked about their level of interest in receiving nutrition information at work. The findings, reported in Table 21, suggest that the majority of the men would appreciate such a service.

Table 21. Level of interest in receiving nutrition information at work
"Would you be interested in receiving nutrition information at work?"

Like very much	16.7%
Like	58.3%
Indifferent	21.9%
Dislike	3.1%
Dislike very much	0.0%
	100.0%
(Number of cases)	(96)

The expression of a strong interest in food does not in itself guarantee an equal enthusiasm for nutrition. The last table shows three out of every four workers in favour of providing nutrition education at the workplace. The fact that 25.0% are indifferent, or dislike this idea, indicates that participation would have to be on a voluntary basis.

In selecting food for themselves, few workers considered health or nutrition their first consideration. Table 22 presents the subjects' responses with respect to prime consideration in food selection. The question was presented in an open-ended form, followed by some options to be mentioned by the interviewer only if no immediate response was forthcoming.

The underlined words on the left in this table indicate the words that appeared as options in the second part of this question. It is interesting to note that, without exception, those who needed probing selected the first option presented.

Table 22. Prime considerations in food selection of industrial workers "What is your first consideration when selecting something to eat?"

	Without probing	With probing
No immediate response	40.6%	0.0%
Taste	29.2%	40.6%
Appeal	10.4%	0.0%
Health, nutrition	8.3%	0.0%
Hunger, appetite	6.3%	0.0%
Other	5.2%	0.0%
Calories	0.0%	0.0%
Cost	0.0%	0.0%
	100.0%	40.6%
(Number of cases)	(96)	(39)

7. The impact of breakfast on reported sense of well-being during the late morning hours

Experimental studies have shown the negative impact of breakfast omission on a variety of physiologic responses (Tuttle, Wilson et al., 1949; Tuttle, Daum et al., 1950; Daum, Tuttle et al., 1950; Tuttle, Daum et al., 1952; Tuttle, Daum et al., 1954; Tuttle and Herbert, 1960). Problems cited in these studies include: a lack of energy to complete specific tasks, fatigue, a drop in scholastic performance, temper changes. The industrial workers in the pilot study also noted that time at work appeared to pass more slowly when no breakfast was eaten. It was decided, therefore, to ask the subjects in this study about their experience with some of the reported problems.

To analyze the impact of breakfast on reported sense of well-being, the subjects were divided into two groups: those who ate breakfast

always or most of the time and those who rarely or never ate breakfast. The latter group will be referred to as non-breakfast-eaters. The table below shows the distribution of the non-breakfast-eaters by age group.

Table 23. Distribution of non-breakfast-eaters by age group

20 - 29	(N = 9)	33.3%
30 - 39	(N = 9)	33.3%
40 - 64	(N = 9)	33.3%
Total	(N = 27)	99.9%

Five specific questions in the survey were included to collect data on the workers' feelings about fatigue, lack of energy and other problems that, according to the literature, occur towards the late morning hours when breakfast is inadequate. An introductory statement to this section of the survey was read to all the respondents in order to explain that knowing more about the level of well-being during the late morning hours might increase our understanding of people's breakfast needs. Before reporting the results of this part of the survey, a few remarks seem in order about the way the subjects reacted to these questions.

The workers generally displayed a very positive attitude towards their selection as participants in the survey as well as to the content of the questionnaire. However, many of the workers made no secret of the fact that they disliked being asked to respond to any questions relating their sense of well-being to breakfast habits. Their displeasure was expressed both verbally and by sudden changes in body language. The subjects - who had been most cooperative up to that point in the interview - physically moved away from the interviewer and expressed their reservations about this section of the survey. Their reluctance to respond resulted in

vague answers. When the interviewer continued with non-threatening questions, cooperation was once again excellent. Tests of significance were not done on the findings that follow in Tables 24 to 28 because of the questionable validity of the responses.

Table 24. The extent of fatigue as reported by industrial workers "To what extent is fatigue a problem for you during the late morning hours?"

	Breakfast eaters	Non-breakfast eaters
Not a problem at all	71.0%	59.3%
A slight problem	17.4%	18.5%
A moderate problem	10.1%	18.5%
A serious problem	0.0%	0.0%
Not ascertained	1.4%	3.7%
	99.9%	100.0%
(Number of cases)	(69)	(27)

The incidence and the degree of fatigue are somewhat higher among the non-breakfast-eaters, although none of the workers considered fatigue a serious problem.

Although fewer non-breakfast-eaters are shown never to experience concentration problems, the entire percentage difference is made up when the responses "seldom" and "never" are combined. In both groups more than 80.0% of the workers indicated seldom or never to experience this problem. A few of the subjects consistently experience concentration problems whether or not they eat breakfast, as shown in Table 25.

Table 25. The relationship between breakfast and the capacity to concentrate on work towards the late morning hours
"Do you feel that it is more difficult to concentrate on your work during the late morning hours?"

	Breakfast eaters	Non-breakfast eaters
Yes, always	4.3%	3.7%
Yes, most of the time	7.2%	11.1%
Sometimes	7.2%	0.0%
Seldom	15.9%	25.9%
Never	65.2%	55.6%
Not ascertained	0.0%	3.7%
	99.8%	100.0%
(Number of cases)	(69)	(27)

Table 26. Reported incidence of lack of energy towards the late morning hours
"Do you ever find that you have less energy to do your work during the late morning hours?"

	Breakfast eaters	Non-breakfast eaters
Yes, always	8.7%	14.8%
Yes, most of the time	7.2%	3.7%
Sometimes	13.0%	[illegible].7%
Seldom	10.1%	11.1%
Never	59.4%	59.3%
Not ascertained	1.4%	7.4%
	100.0%	100.0%
(Number of cases)	(69)	(27)

The percentage of workers who indicated never to experience a lack of energy towards the late morning hours is identical for both groups and includes the majority of all respondents. A slightly higher incidence of consistent (always, most of the time) problems with concentration is found in the non-breakfast eaters, as shown in Table 26.

Table 27. The reported degree to which temper is influenced by not having eaten for several hours
"Do you feel that your temper is influenced by not having eaten for several hours?"

	Breakfast eaters	Non-breakfast eaters
Yes, definitely	13.0%	7.4%
Yes, most of the time	7.2%	3.7%
Sometimes	13.0%	0.0%
Seldom	8.7%	0.0%
Never	55.1%	85.2%
Not ascertained	2.9%	3.7%
	99.9%	100.0%
(Number of cases)	(69)	(27)

Far more breakfast-eaters reported that their temper was influenced by not eating for several hours. When the first three categories in the table are totaled, one observes a ratio of 33.2% to 11.1% of the groups confirming this relationship. Much smaller differences are seen when the results in Table 28 are compared for breakfast and non-breakfast eaters. This table shows the degree to which the respondents felt that the time passed more slowly towards the end of the morning.

Table 28. The reported degree to which respondents indicate time to pass more slowly towards the end of the morning
"In your experience, does the time pass more slowly towards the end of the morning?"

	Breakfast eaters	Non-breakfast eaters
Yes, definitely	14.5%	14.8%
Yes, most of the time	11.6%	14.8%
Sometimes	10.1%	7.4%
Seldom	14.5%	7.4%
Never	47.8%	51.9%
Not ascertained	1.4%	3.7%
	99.9%	100.0%
(Number of cases)	(69)	(27)

Close to half of the subjects in each group indicated that they never experienced this problem. For those who did, the results failed to show that the consumption of breakfast makes much of a difference.

D. DISCUSSION

The discussion of the results will encompass:

- socio-demographic characteristics of the respondents and their attitudes towards food
- energy and protein intake of the respondents
- the percentage contribution of breakfast to daily intake of energy and protein
- the impact of the size of the breakfast meal on total energy intake over the day
- reported breakfast patterns
- the impact of the breakfast meal on reported sense of well-being during the late morning hours.

1. Socio-demographic characteristics of the respondents

In the present study, sex, age and eligibility were controlled by including only male workers between the ages of twenty and sixty-five, who worked the day shift during the entire week of the interviews. This last stipulation was made so that changing shifts could not affect the breakfast routines of the workers. As it turned out, some volunteers were unable to participate due to unforeseen shift changes. Re-scheduling was attempted in these cases, but could not always be accomplished.

The distribution of the respondents by job title is shown in Table 1. The fact that all of the companies involved were manufacturing rather than service industries, explains the high percentage of operators, machinists and mechanics amongst the participants.

Within the eligibility bounds, participants were randomly selected. Table 2 shows that distribution of subjects by age group was fairly even between the young (51 subjects) and middle-aged (45 subjects) men. This is an advantage, as it eliminates the chance of over- or under-representation of individuals within any of the age groups, when results are given for the whole group.

The ratio of French- to English-speaking participants was 71:19. It is perhaps not surprising that the representation of English-speaking participants in this study is slightly higher than in the Québec population as a whole (Statistics Canada, 1982), because all of the industries involved are located in the West Island area of Montreal. The concentration of English-speaking persons has traditionally been relatively high in this area.

About two-thirds of the workers reported to have completed between seven and eleven years of education (Table 4) and of this group almost half had completed ten or eleven years. The workers were not asked to specify the type of school attended, therefore, it can not be established how many, if any, of those years were spent in trade schools.

The type of household in which one lives can have a substantial impact on food intake (Buzina, Horvat et al., 1972). Singly-living workers in their studies were found to be at increased risk for energy and nutrient deficiencies. The sample in the present study included five men living alone (Table 5). Almost all indicated that they shared main meals on a regular basis with relatives or friends. It may be assumed that this practice has a positive impact on their food intake, although one 24-hour recall cannot measure its effect. Because so few subjects were living alone, and since most reported having minimized the difficulties of buying

and cooking for one by joining friends or relatives for main meals, this group has not been dealt with separately in reporting the results of this study.

The most common family type was one including two adults and child(ren) followed by households made up of two or more adults.

Only two out of the ninety-six men reported that they were in charge of food preparation in their households. Twenty-four shared the cooking with their wives, while in forty-six households all the food was prepared by the wife. When it came to deciding what foods to buy twelve men reported making all the decisions, twenty-five shared this responsibility with their wives and in thirty-eight households the wife alone decided what foods to buy. The responsibility for the food budget was borne by one person in almost half of the households (47), and shared by two in thirty-seven households. This would seem to suggest that most of the men are part of a traditional family in which the man is the only wage earner and the wife is at home with the children.

When the workers were asked to identify their primary consideration in personal food selection, cost was never mentioned. Instead, the majority reported choosing mainly on the basis of taste (67), followed by appeal (10), health (8) and hunger or appetite (6). Forty-one percent of the respondents needed some probing to formulate an answer to this question (Appendix D, item 37). It was encouraging to note that a large percentage of the subjects indicated that they enjoyed reading or talking about food. When asked if they would be interested in receiving nutrition information at work, 75% of the men gave a positive response. It would appear from discussions with the C.H.D. Lakeshore's nutritionist, that interest in nutrition has been growing steadily over the past few years among industrial workers.

During the interviews, many of the men requested recipes that could assist them in planning and preparing meals that would respond more closely to the recommendations for health they had learned about through the media or through nutrition programmes at the work place. These findings provide useful insights for nutrition educators who are planning to develop programmes specifically geared to this segment of the population.

The results of this study were not tested for statistical significance, as the small cell sizes did not permit this being done. However, collection of base-line data on breakfast patterns of the workers and their attitudes towards this meal were among the main goals of this study.

2. Energy and protein intake of the respondents

Mean energy intake of men aged 20-39 years was 9.5% lower than the Nutrition Canada findings. Men aged 40-64, on the other hand, were found to have energy intakes averaging 8.1% higher than Nutrition Canada reported for this age group. It would appear that workers above age fifty in particular took in an excess of calories. Unless this energy is required to meet actual needs, the risk of obesity increases. Nutrition Canada observed a high prevalence of obesity in adults. It could be hypothesized that industrial workers require somewhat higher levels of energy than a sample of the overall population. However, with the high level of automation in most industries, this assumption may hold true for only a small percentage of all industrial workers. It was not possible, in the present study, to categorize individual workers according to energy expenditure for their particular tasks. It would appear that a wide range of energy needs exists between individual workers.

No anthropometric measurements were taken during the present study, thus making it impossible to report the extent of obesity among the participants. It cannot be established from the data whether or not energy requirements were met or exceeded by individual participants.

Unfortunately, the only Canadian study of industrial workers (Maxwell and Robitaille, 1978) did not look at total energy intakes. The workers' food intakes were evaluated only on the basis of compliance with the recommendations of the Canada Food Guide (1977). Several European studies were available for comparison of energy intakes. The results are shown in Table 29.

Table 29. Reported energy intakes of male industrial workers in Québec and in European countries

Researcher(s)	Country	Mean energy intake	% below or above the present study
Nymark, 1982	Canada (Province of Québec)	3068 kcal 12.8 MJ	-
Buzina, Horvat et al., 1972	Yugoslavia	3042 kcal[1] 12.7 MJ	-1%
Harju, 1977	Finland	2318 kcal 9.7 MJ	-24%
Hendrikx and Lombaerts, 1970	Belgium	3673 kcal[2] 15.4 MJ	+20%
		3286 kcal[3] 13.7 MJ	+ 7%
Luyken and Leegwater, 1978	the Netherlands	3800 kcal[4] 15.9 MJ	+24%

1 The subgroup most comparable to population in the present study

2 Workers bringing their lunch from home

3 Cafeteria users

4 52.6% of the sample were found to be obese.

To what extent the reported energy intakes corresponded to the actual energy needs cannot be ascertained from the data in all but one of the European studies. Luyken and Leegwater (1978) included anthropometric measurements in their study. Based on these data the researchers concluded that 52.6% of the workers in their study were obese.

Table 8 shows that mean protein intake of the subjects in the present study corresponds very closely to the Nutrition Canada findings. In both studies mean protein intake far exceeds the amounts recommended in the Canadian Dietary Standard (1975). Food patterns of Canadians (Nutrition Canada, 1976) show that adults tend to obtain much of the daily protein from foods that also contribute considerable amounts of animal fat. The present study did not emphasize the proportional contribution of energy from fat in the diet as its focus was not in this area. The health risks of a diet high in energy and in animal fat are well documented elsewhere (Mustard, Little et al., 1976; Norum, 1978).

Table 30 provides a summary of protein levels in the diets of industrial workers in Québec and in several European countries.

Table 30. Reported protein intakes of male industrial workers in Québec and those in several European countries

Researcher(s)	Country	Mean protein intake	% below or above the present study
Nymark, 1982	Canada (Québec)	108.9	–
Buzina, Horvat, et al., 1972	Yugoslavia	90.2	-16.7%
Harju, 1977	Finland	82.0	-24.7%
Hendrikx and Lombaerts, 1970	Belgium	113.0[1] 97.0[2]	+ 3.8% -10.9%
Luyken and Leegwater, 1978	the Netherlands	119.0	+ 9.3%

1 Workers bringing their lunch from home

2 Workers using the company cafeteria

3. The percentage contribution of breakfast to the daily intake of energy and protein

Extensive laboratory studies by Tuttle and co-workers led to the conclusion that breakfast should provide 25.0% of daily energy and protein. Bouterse-van Haaren, Onneweer et al., (1975) on the other hand, consider 15.0% to be a "reasonable" amount. The latter researchers do not specify how the lower figure is established or, for that matter, how far they judge the "reasonable" to be away from the optimal levels. For the purpose of this discussion it seems appropriate to refer to the Tuttle studies, as both methodology and results of these experiments are known.

Table 9 shows the mean percentage contribution of energy and protein to daily totals. Compared to the Tuttle recommendations, the average breakfast of the Québec workers leaves a lot to be desired. The mean figures do not indicate how many individuals actually take in 25.0%

of daily energy and protein at breakfast time. A check of the data indicates that out of fifty-two men aged 20-39 only five meet Tuttle's criteria for an optimal breakfast size with adequate protein. Amongst the forty-two men aged 40-64, only one reached this objective. Judging by the results of the physiologic response tests in the experiments conducted by Tuttle and co-workers, one might hypothesize that work output, endurance, concentration and fine motor control are presently below optimal levels in the majority of the participants in the present study. Improving the breakfast patterns of the workers might result in performing with less difficulty the same tasks that they perform now. From a management point of view, increased productivity of the workers seems to be an issue of sufficient importance to warrant careful consideration. When the figures in Table 9 are compared to the Nutrition Canada findings, the similarities are remarkable, as shown in the table below.

Table 31. Mean percentage contribution of the breakfast meal to daily totals for energy and protein, compared to the Nutrition Canada findings

	Mean percentage of daily energy from breakfast	Mean percentage of daily protein from breakfast
Nymark, 1982	10.6	9.4
Nutrition Canada findings	10.4^{1} 12.5^{2}	8.4^{1} 10.0^{2}

1 Men aged 20-39 years

2 Men aged 40-64 years

One might assume that the breakfast habits of the industrial workers are not substantially different from those reported by Nutrition Canada (1976).

The problem remains that the breakfast patterns of Canadian men may need considerable change in order to meet the standards set by Tuttle and co-workers. After extensive laboratory studies, these researchers concluded that the breakfast meal should contribute one-quarter of daily energy- and protein-intake to reach maximum work capacity. In terms of protein intake it would appear sensible to base recommendations on desirable rather than on actual protein intake, given the fact that the actual protein intake is often at almost double the level recommended.

4. The impact of the size of the breakfast meal on total energy intake over the day

As described previously, the subjects were divided into three groups based on the energy value of the breakfast meal. Those eating the smallest breakfast (mean energy value 62.9 kcal, 0.3 MJ) also reported the lowest energy intake for the entire day. Breakfast contributed only 2.3% of daily energy for this group. Those eating the largest breakfasts (mean energy value 809.8 kcal, 3.9 MJ) showed a daily energy intake 48.2% higher than the small breakfast-eaters. Their breakfast contributed 20.1% of daily energy.

From these results one can observe that even those consuming the large breakfast meal did not meet the Tuttle standards for relative energy distribution. It must be remembered that the total daily energy intake in the Tuttle experiments was based on estimated need, whereas the present study reported the subjects' actual food intakes. These were in no way controlled or manipulated. For the large eaters in the present study, it may well be that breakfast, in effect, is of more than adequate size, while the real problem lies in too large a food intake in the whole day.

5., Reported breakfast patterns

Table 11 shows the frequency of breakfast consumption over a period of one five-day working week. Whether or not breakfast is consumed appears to be an all-or-nothing situation. This finding is congruent with observations made by Bouterse-van Haaren, Onneweer et al. (1975). In order to cross check the reported breakfast frequency, and to verify that patterns indicated in Table 11 would hold true over a longer period of time, the subjects were asked to indicate how often each skipped breakfast during their last twenty working days. The results in Table 12 show that slight inconsistencies occur between the two sets of data. The interviewer explained these differences by the fact that "the last twenty working days" were interrupted for most workers by their annual vacation and/or by temporary plant closings. Many workers had trouble remembering exact frequency of missing meals over such a long period of time.

A very high percentage of the breakfast-eaters have this meal at home. Since only four of ninety-six workers reported using the company cafeteria regularly for breakfast, the participating companies were asked to report the operating hours of their cafeterias. It appeared that in four out of five companies the cafeteria opens well before the start of the day shift, and offers a full range of breakfast options. Thus it would appear that the location of breakfast is mainly determined by personal preference.

The workers who habitually omit breakfast were asked to state the main reason for doing so. In order not to influence the responses, this information was obtained by the use of an open-ended question. A lack of time was blamed most often for the skipping of the breakfast meal. It would appear that a few extra minutes of sleep in the morning were especially treasured by the younger workers.

As previously reported, the few who eat breakfast only occasionally consume a very small meal in the morning when they do not skip breakfast. The majority of non-breakfast-eaters substituted a mid-morning snack for the skipped breakfast. At first glance this measure may appear to lessen the disadvantage of skipping breakfast. However, this view is not supported by Tuttle and Herbert (1960), who concluded that a mid-morning meal cannot adequately replace the breakfast meal.

Fifty-one out of ninety-six workers considered breakfast to be the most important meal in the day. Nineteen thought breakfast to be of equal importance to the other meals, while twenty-six men rated breakfast less important. The last number corresponds well with the number of non-breakfast-eaters in the present study (27).

6. The impact of breakfast on the reported sense of well-being during the late morning hours

In light of the questionable validity of the responses to items 24-28 in the survey questionnaire (Appendix D) it is difficult to draw many conclusions about the results obtained. Weisberg (1977) warns that "... survey results must be discounted not only for sampling error but an allowance must be made for meaningless answers - or random noise - in the data."

It would appear that the "random noise" was caused by concern on the part of the workers that the information requested might somehow be used to their disadvantage. The same questions had provoked no anxiety whatsoever when the pilot study was conducted, and the negative reactions were therefore not expected.

Some assumptions can be made to explain these reactions of the workers. It is possible that the questions were perceived as an invasion

of personal privacy, and therefore impertinent. It could also be argued that the workers - aware of poor economic conditions - were unwilling to admit in any way to experiencing problems that might affect work capacity.

A review of the responses by subjects participating in the pilot study seems to indicate that these workers did not have the same reservations about this block of questions, as evidenced by the distribution of their responses. It might be hypothesized that the workers participating in the pilot study felt distinctly more secure about worker-management relations in their particular company than the other workers did. However, no evidence can be provided to confirm this speculation.

IV. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The present study focussed on the energy and protein contributions of the breakfast meal to daily totals for energy and protein intake in a group of ninety-six male industrial workers in Québec. The workers' feelings towards fatigue, energy levels, capacity to concentrate and temper changes during the late morning hours were also investigated.

1. Breakfast patterns of adult workers found in the Nutrition Canada survey were confirmed in the population of the present study. Both energy and protein intake of the subjects in this study showed a remarkable similarity to the Nutrition Canada findings.

2. In both the present investigation and in the Nutrition Canada studies, breakfast contributed a much lower percentage of daily energy and protein than that experimentally determined to be optimal by Tuttle and co-workers. On the basis of the latter studies one could assume that work capacity of the participants in the present study might be adversely affected by their current breakfast habits. In order to confirm this, extensive larger field studies would need to be conducted. Experience gained during the present study suggests that - while participating industries were most cooperative - the organization of such studies is not a simple task: it requires the active participation and support of a large number of individuals to prepare a study of this type within industry. The present economic conditions are not favourable for obtaining any employer's permission for the workers to be absent from production-oriented activities. Furthermore, the production process is disrupted when one member of a production team is excused to participate in an interview, thus making scheduling difficult.

3. The frequency of breakfast omission was higher among the younger workers in this study. This confirms findings described in the literature. In planning nutrition education programmes specifically aimed at industrial workers, special efforts need to be made to encourage the younger workers to participate.

4. The major source of nutrition information for the population in this study was the mother. Improving the nutrition knowledge levels of young women would seem a must. A well-informed mother would be an important multiplication agent for information the nutritionist seeks to share with the population. For future research it would be of interest to determine the level of nutrition knowledge of women, whom the present study found to be so highly regarded as resource agents. As well, it would be important to find out which resources the women utilise to update their knowledge of nutrition.

5. Reluctance on the part of the workers to respond to questions relating their breakfast habits to their experience with fatigue, level of energy, capacity to concentrate and temper changes toward the late morning hours resulted in evasive, vague answers. The findings reported in this section are therefore of questionable validity. A pilot study with nine subjects did not give any indication of the level of sensitivity towards these questions. Should further investigations be done in this area, the research tool will need to be very carefully pre-tested.

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APPENDIX A

A description of tests[1] used to measure physiologic responses

- Choice reaction time is the interval elapsing between the appearance of a stimulus and the response to it.

- Neuromuscular tremor magnitude. Static tremors are recorded from the index finger of the outstretched arm which is supported by voluntary resistance against the force of gravity. Tremor rate and amplitude are combined and expressed as square centimeters.

- Maximum grip strength. This test records in pounds the pressure applied to the handles of a dynamometer.

- Grip strength endurance is obtained by having the subject grip the dynamometer maximally for one minute and determining the average pressure maintained during this time.

- Maximum work output is measured by the bicycle ergometer. The subject rides the bicycle at maximum effort. Work output is then recorded as kilograms per minute.

- Maximum work rate is determined by finding the greatest voltage developed during the one-minute bicycle ergometer test. It is expressed as kilograms per minute.

- Oxygen requirement.[2] The amount of oxygen required to do a specific amount of work.

1 Tuttle, W.W., Daum, K., Imig, C.J., Randall, B., and Schumacher, M.T. Effect of omitting breakfast on the physiologic response of the aged. J. Am. Diet. Assoc. 28: 118, 1952.

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2 Often used for aging subjects for whom the use of the bicycle ergometer might present a danger to health.

APPENDIX B

TO: All Employees

FROM: Health Services Department

SUBJECT: Nutrition Research

The School of Food Science of McGill University is conducting a research study to determine the food consumption patterns of industrial workers in this region.

The objective of this study is to collect data for the purpose of developing nutrition education programs in preventive health care.

All male day-shift workers, aged 20 to 64, qualify for participation in this research.

A fluently bilingual nutritionist will meet once with each participant for about 30 minutes during working hours. The Company has agreed to allow the selected employees to participate without any loss of pay.

The confidentiality of the volunteers will be protected by computer coding and analysis of the data obtained.

Within the next few days some of you will be contacted by the nurse to seek your cooperation for this study. The interviews will take place during August and September of this year.

APPENDIX C

A: Tous les employés

DE: Service de Santé

SUJET: Recherche en nutrition

L'Ecole des Sciences de l'Alimentation de l'Université McGill fait une recherche sur les habitudes alimentaires des travailleurs industriels de la région.

Le but de cette recherche est d'obtenir l'information nécessaire à la préparation de programmes d'éducation en nutrition.

Des hommes, de 20 à 64 ans qui travaillent le jour, seront choisis pour participer à cette étude.

Une nutritioniste bilingue rencontrera les participants pour une entrevue de trente minutes pendant les heures de travail. La Compagnie a accepté que les employés choisis participent à cette recherche sans perte de salaire.

La compilation et l'analyse des données seront faites par ordinateur de manière à assurer l'anonymat des volontaires.

D'ici quelques jours le service de santé sera en contact avec certains d'entre vous pour vous inviter à participer à cette recherche sur les habitudes alimentaires. Les entrevues auront lieu entre la mi-Août et la fin de Septembre.

NUTRITION SURVEY

No. Response

A. 24-Hour Recall

B. Additional Questions

1. Yesterday's food intake was

   1. typical
   2. less than normal
   3. more than normal

   1 _____

2. Do you presently take vitamin-mineral supplements?

   1. no
   2. yes - daily - self-prescribed
   3. yes - occasionally - self-prescribed
   4. yes - daily - on medical advice
   5. yes - occasionally - on medical advice

   2 _____

3. Are you on a diet?

   1. no
   2. yes, self-imposed
   3. yes, prescribed by physician or dietician

   3 _____

I am now going to ask you a few questions about breakfast

4. How often during the last working week did you eat breakfast?

   1. every day — 4 go to no. 9
   2. three or four times — 4 go to no. 9 _____
   3. one or two times — 4 go to no. 5
   4. never — 4 go to no. 5 _____

5. What is the main reason you did not eat breakfast on working days during the last week?

   _____ 5

6. Are there other reasons for not eating breakfast on working days?

   _____ 6

		No.	Response
7.	Did you take a mid-morning meal or snack on days that you ate no breakfast? 1. yes 2. no 3. sometimes	7	-----
8.	If you did use a mid-a.m. meal to replace the breakfast, what foods and beverages did you select?	8	open
	_____		
	_____		
	_____		
	_____		
9.	Where did you take breakfast on working days?		
	at home 1x		1
	2x		2
	3x	9	3
	4x		4
	5x		5 - go to no. 16
10.	at work (cafeteria)		
	1x		1
	2x		2
	3x	10	3
	4x		4
	5x		5 - go to no. 14
11.	at work (vending machines)		
	1x		1
	2x		2
	3x	11	3
	4x		4
	5x		5 - go to no. 14
12.	at work (cantine mobile)		
	1x		1
	2x		2
	3x	12	3
	4x		4
	5x		5 - go to no. 14

		No.	Response
13.	at restaurant or snack bar		
	1x	13	1
	2x		2
	3x		3
	4x		4
	5x		5 - go to no. 14
14.	What is the main reason for eating breakfast away from home on working days?	14	open
15.	Are there any other reasons for eating breakfast away from home on working days?	15	open
16.	Do you usually eat breakfast 1. alone 2. with members of the family 3. with other person(s)	16	-----
17.	If you eat breakfast only occasionally, which foods and beverages would you select?	17	open
18.	In comparison to the other meals in the day, how do you rate breakfast? 1. less important than lunch, dinner 2. of equal importance 3. more important than lunch, dinner	18	-----
19.	Do you usually consume a mid-morning snack? 1. yes, always 2. most days 3. only on days I miss breakfast 4. occasionally 5. never	19	-----

No. Response

20. Do you select a bigger-than-normal mid-morning snack when you skip breakfast?

1. yes
2. no
3. occasionally
4. not applicable

20 -----

21. During the last twenty working days, how many times did you skip breakfast on working days?

1. never
2. once or twice only
3. between 3 and 10 times
4. on most working days
5. on all working days

21 -----

22. Do you feel differently at work on days that you skip breakfast?

1. yes
2. no

22 -----

23. If yes, explain:

_____

_____

_____

An important part of understanding people's breakfast requirements has to do with how people feel after they have worked for several hours in the morning. Could you please tell us how you generally feel during the late morning hours?

24. To what extent is fatigue a problem for you during the late morning hours?

1. not a problem at all
2. a slight problem
3. a moderate problem
4. a serious problem

24 -----

25. Do you feel that it is more difficult to concentrate on your work during the late morning hours?

1. yes, always
2. yes, most of the time
3. sometimes
4. seldom
5. never

25 -----

		No.	Response
26.	Do you ever find that you have less energy to do your work during the late morning hours? 1. yes, always 2. yes, most of the time 3. sometimes 4. seldom 5. never	26	-----
27.	Do you feel that your temper is influenced by not having eaten for several hours? 1. yes, definitely 2. yes, most of the time 3. sometimes 4. seldom 5. never	27	-----
28.	In <u>your</u> experience, does the time pass more slowly towards the end of the morning? 1. yes, definitely 2. yes, most of the time 3. sometimes 4. seldom 5. never	28	-----

<u>I am now going to ask your opinion in general on eating and food.</u>

29.	How would you describe eating well? _____ _____ _____	29	open
30.	By your own description of eating well, would you say that you do eat well? 1. yes 2. no	30	-----
31.	If no, why? _____ _____ _____	31	open
32.	What is your main source of nutrition information? 1. mother 2. TV-radio, newspapers, magazines 3. family and friends 4. doctor, nurse or dietician 5. food stores	32	-----

		No.	Response
33.	Other sources of nutrition information? _____ _____	33	open
34.	Do you like to read, hear or talk about food or food products? 1. like very much 2. like 3. indifferent 4. dislike 5. dislike very much	34	-----
35.	Would you be interested in receiving nutrition information at work? 1. like very much 2. like 3. indifferent 4. dislike 5. dislike very much	35	-----
36.	What is your first consideration when selecting something to eat? _____	36	open
	(If probing is necessary)		
37.	Would it be 1. taste 2. calories 3. cost 4. health 5. other: _____	37	-----
38.	Who usually decides what food to buy? 1. wife 2. husband 3. husband and wife 4. other adult: _____ 5. child aged 12-18	38	-----
39.	Who usually prepares the food? 1. wife 2. husband 3. husband and wife 4. other adult: _____ 5. child aged 12-18	39	-----

		No.	Response
40.	Including yourself, how many are in your household? 1. one adult only 2. two adults only 3. one adult and child(ren) 4. two adults and child(ren) 5. other: _____	40	-----
41.	How many persons contribute to the food budget? 1. one 2. two 3. three 4. four 5. more than four	41	-----

A few questions about yourself

42.	To which age group do you belong? 1. 20-29 2. 30-39 3. 40 49 4. 50-64	42	-----
43.	Which language is most often spoken at home? 1. French 2. English 3. Italian 4. other: _____	43	-----
44.	How many years of schooling did you complete? _____	44	open
45.	What is your job title? _____ _____	45	open

APPENDIX E

ENQUETE NUTRITION

	Numéros	Réponse
A. RAPPEL DE 24 HEURES		
B. AUTRES QUESTIONS		
1. Hier, votre consommation d'aliments était:		
1. typique d'une journée 2. moins que la normale 3. plus que la normale	1	-----
2. En ce moment, prenez-vous des suppléments de vitamines et minéraux?		
1. non 2. oui, chaque jour, prescrits par vous-même 3. oui, occasionellement, prescrits par vous-même 4. oui, chaque jour, prescrits par le médecin 5. oui, occasionnellement, prescrits par le médecin	2	-----
3. En ce moment, suivez-vous une diète?		
1. non 2. oui, votre décision personnelle 3. oui, prescrite par un médecin ou une diététiste	3	-----
Je vais maintenant vous poser quelques questions sur le déjeuner		
4. Les cinq derniers jours travaillés, combien de fois avez-vous déjeuner?		
1. chaque jour 2. trois ou quatre jours 2. deux ou trois jours 4. jamais	4	----- 1&2 à no. 9 3&4 à no. 5
5. Quelle est la raison principale pour laquelle vous n'avez pas déjeuné les cinq derniers jours de travail?		
_____	5	

Numéros Réponse

6. Y a-t-il d'autres raisons pour lesquelles vous ne déjeunez pas?

_____

_____ 6

7. Durant l'avant-midi avez-vous pris une collation/repas les jours où vous n'avez pas déjeuné?

1. oui
2. non
3. quelques fois 7 -----

8. Si vous avez pris une collation/repas les jours où vous n'avez pas déjeuné, qu'avez-vous mangé/bu?

_____

_____

_____ 8

9. Si vous avez déjeuné où avez-vous pris votre déjeuner les jours travaillés:

à la maison 1x
2x
3x
4x
5x 9 -----
si 5x, à no. 16

10. au travail (cafétéria)

1x
2x
3x
4x
5x 10 -----
si 5x, à no. 14

11. au travail (machines distributrices)

1x
2x
3x
4x
5x 11 -----
si 5x, à no. 14

12. au travail (cantine mobile)

1x
2x
3x
4x
5x 12 -----
si 5x, à no. 14

		Numéro	Réponse
13.	au restaurant/casse-croûte 1x 2x 3x 4x 5x	13	----- si 5x, à no. 14
14.	Quelle est la principale raison pour laquelle vous prenez votre déjeuner hors de la maison les jours travaillés? _____	14	
15.	Y a-t-il d'autres raisons pour lesquelles vous prenez votre déjeuner hors de la maison les jours travaillés? _____ _____	15	
16.	Lorsque vous déjeunez, avec qui déjeunez-vous? 1. seul 2. avec d'autres membres de votre famille 3. avec une autre personne	16	-----
17.	Si vous déjeunez occasionnellement, quels aliments et breuvages prenez-vous ordinairement? _____ _____ _____	17	
18.	Comment évaluez-vous l'importance du déjeuner en comparaison des autres repas? 1. moins important que le dîner ou le souper 2. d'importance égale 3. plus important que le dîner ou le souper	18	-----
19.	Ordinairement, prenez-vous une collation durant l'avant-midi? 1. toujours 2. presque à tous les jours 3. seulement les jours ou je n'ai pas déjeuné 4. occasionnellement 5. jamais	19	-----

	Numéros	Réponse
20. Les jours où vous ne déjeuner pas, avez-vous tendance à prendre une collation plus grosse que d'habitude? 1. oui 2. non 3 à l'occasion 4. ne s'applique pas	20	-----
21. Les vingt (20) derniers jours de travail, combien de fois n'avez-vous pas le déjeuner? 1. jamais 2. une ou deux fois seulement 3. entre trois et dix fois 4. la plupart des jours travaillés 5. tous les jours travaillés	21	-----
22. Les jours ou vous ne déjeunez pas, vous sentez-vous différent au travail? 1. oui 2. non	22	-----
23 Si oui, expliquez _____ _____ _____	23	

Une chose importante qui va nous permettre de comprendre le besoin qu'on les gens de déjeuner, se rapporte à comment les gens se sentent après avoir travaillé quelques heures le matin. Pouvez-vous nous dire, en général, comment vous vous sentez durant les dernières heures de l'avant-midi?

24. Pour vous, jusqu'à quel point la fatigue devient un problème durant les dernières heures de l'avant-midi? 1. aucun problème 2. un léger problème 3. un moyen problème 4. un sérieux problème	24	-----
25. Sentez-vous qu'il est plus difficile de concentrer sur votre travail durant les dernières heures de l'avant-midi? 1. oui, toujours 2. oui, la plupart du temps 3. quelques fois 4. rarement 5. jamais	25	-----

Numéros Réponse

26. Trouvez-vous que vous avez moins d'énergie au travail durant les dernières heures de l'avant-midi?

1. oui, toujours
2. oui, la plupart du temps
3. quelques fois
4. rarement
5. jamais

26 -----

27. Sentez-vous votre humeur influencé par le fait de ne pas avoir mangé pour quelques heures?

1. oui, définitement
2. oui, la plupart du temps
3. quelques fois
4. rarement
5. jamais

27 -----

28. Trouvez-vous que le temps est plus long vers la fin de l'avant-midi?

1. oui, définitement
2. oui, la plupart du temps
3. quelques fois
4. rarement
5. jamais

28 -----

Je vais maintenant vous demander votre opinion sur l'alimentation en général.

29. Bien manger - pour vous, qu'est-ce que ça veut dire? 29

_____

_____

_____

30. D'après ce que vous venez de me dire, est-ce que vous considérez que vous mangez bien?

1. oui
2. non

30 -----

31. Si non, pourquoi? 31

_____

_____

_____

Numéros Réponse

32. Quelle est votre principale source d'information en nutrition?

1. mère
2. T.V., radio, journaux, revues
3. famille et amis(s, es)
4. médecin, infirmière, diététiste
5. magasins d'alimentation

32 -----

33. Autre sources d'information en nutrition?

_____

_____ 33

34. Aimez-vous lire, parler ou entendre parler d'aliments ou d'alimentation?

1. aime beaucoup
2. aime ça
3. indifférent
4. n'aime pas
5. déteste

34 -----

35. Ici au travail, seriez-vous intéressé à recevoir de l'information en nutrition

1. aime beaucoup
2. aime ça
3. indifférent
4. n'aime pas
5. déteste

35 -----

36. Quelle est la première chose qui vous motive quand vous choisissez quelque chose à manger?

_____ 36

37. (S'il y a nécessité de spécifier)

Serait-ce:

1. goût
2. calories
3. coût
4. santé
5. autre: _____

37 -----

	Numéros	Réponse
38. Ordinairement, qui prend les décisions concernant l'achat des aliments? 1. épouse 2. mari 3. épouse et mari 4. autre adulte 5. enfant, âgé 12-18 ans	38	-----
39. Ordinairement, qui cuisine les aliments? 1. épouse 2. mari 3. épouse et mari 4. autre adulte 5. enfant, âgé 12-18 ans	39	-----
40. En vous incluant, combien de personnes demeurent à votre domicile? 1. 1 adulte seulement 2. 2 adultes seulement 3. 1 adulte avec des enfants 4. 2 adultes avec des enfants 5. autre, spécifiez	40	-----
41. Combien de personnes contribuent au budget alimentaire? 1. 1 2. 2 3. 3 4. 4 5. plus que 4	41	-----

Quelques questions sur vous-même:

42. A quel groupe d'âge appartenez-vous? 1. 20 - 29 ans 2. 30 - 39 ans 3. 40 - 49 ans 4. 50 - 64 ans	42	-----
43. Quelle est la langue d'usage à la maison? 1. français 2. anglais 3. italien 4. autre, spécifiez	43	-----

	Numéro	Réponse
44. Indiquez le niveau de scolarité que vous avez complété 1. école élémentaire 2. école secondaire 3. école technique 4. C.E.G.E.P. 5. université	44	-----
45. Quel est votre emploi actuel?	45	