



ISRAEL CENTER FOR DISEASE CONTROL (ICDC)

Mabat Youth - First Israeli National Health and Nutrition Survey in 7th-12th grade students 2003-2004

BACKGROUND

National health and nutrition surveys are an essential and efficient means to describe the general health, lifestyles and nutritional status of the population. The findings of these surveys provide scientific data which serve decision and policy makers in the formulation of policy and planning of interventions, for the population at large as well as for specific population groups. The information generated from the surveys serves as a basis for the evaluation of health indicators in the population, the monitoring of changes over time, and the identification of sub-population groups at increased risk of morbidity.

National health and nutrition surveys are undertaken periodically in many countries, such as the United States, Australia, Belgium, England, Norway, Holland, New Zealand and Egypt, in accordance with the recommendations of the WHO (World Health Organization) and the FAO (Food and Agriculture Organization). In Israel, the lack of information has hindered the development of health promotion programs and delayed the formulation of guidelines for the Israeli population as a whole as well as for specific subgroups of the population.

The MABAT Survey - the First National Health and Nutrition Survey - was carried out in 1999-2001 among adults aged 25-64. This was the primary stage of a long-term process of monitoring the health and nutrition status of the population. The survey findings facilitate the formulation and implementation of health-related policy in Government ministries connected with the field. The aim was that these health-related policies should be reflected in programs implemented within academic institutions, industry, non-governmental and voluntary organizations; the overall goal being to create a healthier Israel. In addition, it facilitated the development of more efficient tools for nutritional assessment appropriate for the Israeli population, based on the information collected from the survey, such as the development of the Israeli Food Frequency Questionnaire (FFQ).

The MABAT Youth Survey (MABAT Tzair) – the National Health and Nutrition Survey for students of Grades 7-12 - is a further step in the process of monitoring the nutrition status of the population over time, and it is a direct continuation of the first MABAT Survey. The aim of

the survey is to assess and monitor food consumption, nutrition, growth, malnutrition, overweight and exercise habits of Israeli children, and provide information to policy formulators and decision makers, on matters of food and nutrition.

Until the present, no national survey of youth of this dimension had been carried out, with only some very specific research studies being conducted, such as: food consumption in rural settlements (Bavli, 1963), Vitamin C intake (Winter 1966), eating habits and obesity (Kaufman 1975), food intake (Kaufman 1982) and food intake and measurements (Palti 1997).

Specific Objectives of the Survey

1. To assess the average daily nutrient intake of children and youth in terms of energy levels, macronutrients, fiber, fatty acids, cholesterol, vitamins and minerals.
2. To identify and classify meals and food combinations.
3. To assess the average daily intake of food contaminants (drug residues, pesticide residues, heavy metals) and of food colors and nutrition supplements.
4. To assess the prevalence and types of food sensitivities.
5. To evaluate the degree of adherence to accepted dietary guidelines as regards to nutrient intake, and to identify populations at risk.
6. To assess the knowledge and attitudes of children concerning health and nutrition, and their use of health services.
7. To assess the frequency of health-related behaviors in the population (e.g. smoking, physical activity, dental health, and other behaviors).
8. To describe the anthropometric (body build) status of the youth population (weight for age, height for age, weight for height, BMI for age, sitting height, waist, mid-arm and hip circumferences).
9. To facilitate the development of a food frequency questionnaire (FFQ) for Israeli children and youth.

METHODS

Study population

The study population was based on a sample from Ministry of Education lists, using pre-defined variables: population group (Jewish, Arab and Bedouin, Druze), stream (state, state religious), school level (middle school - grades 7-9, high school - grades 10-12), and welfare level (low, high). The welfare levels 1-5 indicate a higher socioeconomic level for the area where the school is situated, with welfare level 1 being the highest socioeconomic level. The

welfare levels 6-10 indicate a lower socioeconomic level, with level 10 being the lowest. The inclusion criteria specified that students be in Grades 7-12 in Israel, studying in the religious or state stream or in Arab, Druze or Bedouin schools. Schools from the ultra religious (haredi) sector were not included, nor were independent, private or boarding schools.

Sampling methods and contact with schools

The program nQuery was used to calculate sample size. The sample size was calculated based on an estimation of the number of students with 30% or more of their daily energy intake from fat. Assuming that 40% meet this criterion and a 95% confidence interval, a sample size of 369 pupils for each age group, stream, sector and socioeconomic level would give statistically significant information regarding the percentage of those consuming more than 30% of daily calories from fat.

The sample size calculated using the fat intake estimation was 4,800 students country wide, in Grades 7-12. However, it was decided that the sample would be 5,760 students (20% over-sampling), assuming that there were likely to be problems of schools' compliance, partially completed questionnaires, and problems of individual compliance, including non-compliance with the anthropometric measurements.

The sampling method was the cluster method. A list of 1000 schools was received from the Ministry of Education. Schools were divided into sub-groups (cells), according to population group, stream, school level and socioeconomic status. After distribution into the different cells, schools were randomly selected for each cell, with the number of schools sampled being as per the number of classes required, according to the sample size calculation. For each cell, there was over-sampling, (not according to the population distribution), in order to enable comparisons between different groups.

Attention was also paid to geographic distribution within the districts. For each school, the grade level (7-12) which would participate was randomly selected.

Once the sampling of schools was complete, the schools were contacted. The actual class within each grade level was randomly selected by the survey coordinator from amongst all the classes in the grade level. Alternately, a date was selected, and a class that did not have a test or some other classroom activity on the suggested survey date was selected.

During the period of data collection, continuous follow-up of the number of students within each stream, grade level and sector was carried out, and adjustments made as necessary so as to have the appropriate number of students.

Status codes were established and used to document the communications with the schools. The 24-hour dietary recalls were planned to be carried out on 10% of the students randomly selected. In the 24-hour recall the students were asked what they had eaten on the previous day (see "24-hour recall").

Response rates

School compliance

From among the 198 eligible Jewish schools, students were sampled in 179 schools. 17 schools (8.6%) refused to take part, mainly due to overscheduling or absence of agreement with survey contents and conditions and two schools agreed, but the survey was not carried out there (the survey was completed before a survey date convenient to both sides could be fixed). In the Arab sector, all but two of the 59 schools approached agreed to take part.

Student compliance

In the Jewish sector, 5448 students were enrolled in the classes surveyed. 4667 questionnaires were received (85.7%). 158 students (2.9%) refused to take part. The refusal was expressed in one of two ways: lack of parental consent to his/her child's participation, or student refusal. Within the Arab sector, 1945 students were enrolled in the classes surveyed. 94% took part in the survey. 1.2% of the students refused to take part.

The remaining students (both in the Jewish sector and in the Arab sector) were absent from school on the day of the Survey, and did not complete questionnaires at a later date.

Analysis of differences

In an attempt to assess the extent of possible non-response bias, differences between schools that agreed to participate and those that did not, were examined.

In the Jewish sector, 17 schools refused to take part. An examination of the characteristics of those schools, as compared to those who took part, showed that (non participating) schools were more often from the state religious stream (59% amongst those refusing, 48% amongst schools surveyed). Similarly, the average welfare level amongst the schools refusing was 4, while among the participating schools, the average was 6. Thus, schools that refused were situated in more affluent environments.

Data collection

Data collection was planned to take place over an entire school year, in order to reflect the eating habits of this population over an entire year, in different seasons, on all days of the week. In practice, the survey was carried out in the months of May-June 2003, and September through March 2004. The survey did not include data collection during the school vacations, including the summer vacation months of July- August 2003.

The questionnaire

The questionnaire had 4 sections: a food frequency and height/weight questionnaire, a lifestyle and health habits questionnaire, anthropometric measurements and a 24-hour food recall with some additional questions on fruit and vegetable intake.

Food Frequency questionnaire

This questionnaire assessed three aspects of food consumption: food types, serving size and frequency of consumption. Regarding the list of foods, the students were asked to report on their regular intake on a daily or weekly or monthly basis. In the food frequency questionnaire of MABAT Youth, amounts of one serving were listed for each food and the students were asked to indicate the amount they usually consumed either daily or weekly. The questionnaire was designed for self-completion. The food frequency questionnaire consisted of 95 items from the following groups: dairy products, meat and fish, eggs, legumes, bread, cereals, baked goods, fruit, vegetables, fats, sauces and spreads, sweeteners, confectionery, snacks and drinks. The pilot study within the Arab sector indicated that main foods on the FFQ list are not consumed in the Arab sector. Therefore, after consultation with nutrition experts from this sector, some food items were replaced with those more frequently consumed within the Arab sector.

Lifestyle and health habits questionnaire

This section included questions on the following subjects: eating and dieting habits, body build, food allergy and sensitivity, nutrition supplement use, knowledge and attitudes regarding sources of nutrition information, health status, exercise, leisure activities, smoking, alcohol intake, questions for boys and girls on sexual maturation, dental habits, bowel movement habits, and socio-demographic details on the child and his family. This section of the questionnaire was completed by the student himself/herself.

The 24-hour recall

In the 24-hour food recall, conducted on 578 students (9.2%), the students were asked to recall their food consumption in the 24 hours prior to the interview. In order to assist the interviewee in identifying food types and quantities during the food recall, the "Food and Food Quantities Guide" was used. This Guide is based partly on the Food Information Booklet of the United States Department of Agriculture. The Guide includes detailed questions about food, and many photographs of common Israeli foods. The first version of the Guide was published by the Israel Center for Disease Control in November 1998. An additional version of the Guide was prepared in Arabic and adapted to the eating habits of the Arab population of Israel. This version includes also photographs of foods common in

Arab cuisine. During the interview in the MABAT Youth Survey, the interviewers used cards, the Food and Food Quantities Guide, and measuring aids such as a measuring cup, a tablespoon and a teaspoon, in order to facilitate quantification of foods consumed.

Anthropometric measurements

At the end of the interview, the interviewers carried out anthropometric measurements on all the students of the class surveyed. Measurements carried out included: height, weight, sitting height, waist circumference, hip circumference and mid upper arm circumference.

Each measurement was carried out twice and both results recorded.

Each measurement was carried out twice and both results recorded. Height (standing) and weight were measured without shoes. If the student refused to remove his shoes, a note was made including shoe type and heel height. Waist and hip circumference measurements were carried out in light clothing. If this was not possible, the type of clothing worn was noted. The mid-arm circumference measurement was carried out on a singlet or with the sleeve raised. If this was not possible, the measurement was carried out on the garment, and the type of garment noted. **Weight** was measured using portable analog scales with dial, with maximum measurement of 130 kg, with accuracy to 0.5 kg. The scales were placed on the (non-carpeted) floor, calibrated to zero before commencement of weighing, and the student was requested to remove shoes and heavy clothing or heavy objects. If the two measurements differed by more than 1 kg, the student was measured a third time. **Standing height** was measured using a flexible measuring tape, with maximum measurement of 1.5 meter, which was affixed to the wall at a height of 50 cm from the floor. The student was asked to stand with his back adjacent to the wall, heels together to the wall. A fixed aluminum angle was used to determine intersection of top of the head with the wall. If the two measurements differed by more than 0.4 cm, the student was measured a third time. **Sitting height** was measured with the student asked to sit upright on a stool with his back to the wall on which the flexible measuring tape was affixed. The tape was affixed to the wall from a point upwards from the flat section of the seat. Thus, the measure was from the point of contact of the buttocks with the seat, until the top of the head, Similarly to the standing height measurement, the fixed aluminum angle was used to determine intersection of top of the head. The two measurements differed by more than 0.4 cm; the student was measured a third time. **Waist circumference** was measured using the flexible measuring tape. The tape was placed horizontally on the student, at the waist level, at the narrowest part of the body, at the place of the "fold" formed when bending to the side. If the two measurements differed by more than 0.5cm, the student was measured a third time. **Hip circumference** was also carried out using the flexible measuring tape, with maximum measurement to 1.5 meter. The tape was placed horizontally on the student's hips, at the widest part of the hips. If the two

measurements differed by more than 0.5cm, the student was measured a third time. The **mid-arm circumference** measurement was also carried out using the flexible tape. The student was asked to bend his right arm to a 90-degree angle, with the palm facing upwards. The interviewer located the upper point of the acromion, and marked the spot with an X, using colored tailor's chalk. One end of the flexible tape was placed on the elbow at the most distal point of the olecranon and ulna bone and marked with an X. The interviewer then placed the flexible tape between the two marked points, marked the midpoint with an X, and asked the student to straighten his/her arm. The interviewer then placed the tape around the mid arm, at the midpoint, without applying pressure to underlying tissues, and measured the circumference. If the two measurements differed by more than 0.5cm, the student was measured a third time.

Questionnaire versions

The questionnaire was translated into Arabic, for use within the Arab, Bedouin and Druze sectors. Back translation was also carried out, in order to verify the accuracy of the translation. On completion of the translation and back translation, there were discussions with experts from within the Arab sector, and some changes to the questionnaire were made. At the completion of this process, a questionnaire identical in meaning was used, with some small differences: the question dealing with the "family tree" was omitted, and in the food frequency questionnaire, a few food items were listed in differing terms, and some foods were substituted, because of the existence of many terminology variations within Arabic, and because of lack of recognition and consumption within the Arab sector of some of the foods in the Hebrew questionnaire. Because of the sensitivity within the state religious stream to the questions on sexual maturation, and because in this sector most classes are single sex, two additional (special) versions of the questionnaire were produced. A questionnaire for boys was developed in which the questions for girls only were omitted as were the pictures depicting female body images. A questionnaire for girls was developed in which the question for boys only was omitted, the pictures depicting male body images were omitted, as was the question on oral contraceptive use.

Organization of the Survey within the classroom

The interviewers handed out the FFQ questionnaire (Part A), and when it was returned, the students received the general questionnaire (Part B). A student who had completed both parts of the questionnaire was then measured (height, weight etc) in a separate room, which had been prepared for such activity on the day of the survey.

About 10% of students who were randomly selected were interviewed face to face, and underwent a 24-hour food recall interview, as well as being asked some additional questions about consumption of fruits, vegetables and dairy products.

Management of students absent on Survey day

In order to attempt to characterize students who are absent from school, it was important that also students who were absent from class on the survey day be asked to complete questionnaires. The interviewer left with the class coordinator, together with an explanatory letter, questionnaires, to be filled out by these students. The questionnaires were to be returned to the ICDC for data entry. Those absent were also asked to indicate the reason for absence on the survey day. Students completed the questionnaires upon their return to school, and questionnaires were then transferred to the Center. 26% of the questionnaires left in the schools for students absent on the survey day were returned. In 42.3% of these "absentee" questionnaires, the reason for absence was noted. A comparison which was carried out between the questionnaires of those present and those absent did not reveal any differences in health parameters or health behavior.

The Israeli Nutrient Database - BINAT

For the statistical analysis, a nutritional database was needed, which could be used to translate the data collected on food intake into data on the nutrient components of each food item.

The existing Israeli Nutrient Data Base ("BINAT"), was expanded and updated from various sources (see below), concurrently with the collection of data, by means of the "MANA" program. The database is continuously being updated on the basis of changes in the information provided by the various data sources, which are also continually being revised. This may in the future lead to changes in some of the data presented in this publication.

The Israeli Nutrient Database is based on the following data sources

1. The USDA (United States Department of Agriculture) database. This database is the basis for the structure, the classification and identification of the foods. All the other sources are integrated into this structure.
2. Databases of other countries, such as England, Italy and Lebanon.
3. The Israeli Food Industry.
4. Laboratory tests performed by the Ministry of Health to determine the nutrient components of certain local (Israeli) foods.

5. Imputation - a method for calculating nutrient values of a local product on the basis of the nutrient values of an existing similar product, for which all the nutrient values exist.
6. Optimization - A method that enables the calculation of all nutrient values of a certain food item, after defining the components and constructing a "recipe" (a recipe is a food item consisting of a number of foods, such as: salads, soups or cakes). If some or all of the components undergo a cooking process, changes that may affect the nutrient values during this process are taken into consideration.

Data Entry

Following receipt of the questionnaires and recording of essential details, data entry of the four parts of the questionnaire was carried out (food frequency questionnaire, general questionnaire, anthropometric measurements and 24 hour recall).

Data entry was done using two programs. The food frequency questionnaire section, the general data and the anthropometric data were entered using SAS6 screens, specially developed for the questionnaire. Data of the food recalls was entered using a MAGIC-based program "MANA", especially adapted to meet the needs of the MABAT Survey.

At first the food recalls were keyed into an "entry questionnaire screen" with identifying information; after the questionnaire had been entered, the food recall itself was entered, including the rest of the information on consumption (meal, time, combination and place).

Using the "MANA" program it is possible, at any given stage, to produce 3 different files (reports):

- a. "EAT" files, which summarize what was eaten (names, codes and quantities of items consumed, meals, combinations, times and places of meals) from the "MANA" program. These files are imported to the "SAS" program for further analysis;
- b. "GROW" files, which sum up the total nutrient intake of each individual from the "MANA" program. These files are imported to the "SAS" program, for further statistical analysis.
- c. The "FOOD" file, which consists of a list of all the food items existing in the data base, and includes nutrient values per 100 grams of food. The file is produced in CSV format, where for every item in it there is a name, code and values of 49 nutrients. It can be saved in EXCEL format. This file is imported to the "SAS" program for further analysis.

Quality Control

Various quality control checks were maintained.

Quality control at data collection level: The management staff directly observed a sample of the interviews for each interviewer.

Quality control of data was carried out both on the food frequency data, general data and measurements, and on the food data from the 24-hour recalls. Checking of the SAS data entry was done by comparing keyed-in data from the questionnaire with the answers from the original questionnaire; by checking of frequency distributions, and by logic checks for outliers and errors. Where data entry errors were found, these were corrected. After completion of data entry and corrections the data were analyzed using the SAS program. After completion of entry of the 24-hour food recall data, reports summarizing the food intake were produced in an Excel format. These reports were checked for outliers, inappropriate quantities, and hours that did not match meals, missing quantities, and correct use of codes. Where data entry errors were found, these were corrected. After completion of food data entry and corrections, final Excel reports were prepared.

222 questionnaires were not included in the analyses because of partial data and lack of integrity of answers. 6,274 questionnaires were included in the final analyses; 4,520 (72%) were in Hebrew and 1,754 (28%) in Arabic.

Calibration

Two methods were used to collect data on dietary intake:

1. All students completed a Food Frequency questionnaire, adapted for the survey needs. This method accurately assesses food intake distribution within the population, but gives an overestimate of mean intake, by around 20%.
2. 10% of students were interviewed using the 24-hour recall method. Data collected using this method gives an accurate measure of mean intake. However, this method underestimates true intake by about 20%.

In order to correctly estimate intake in our publication, the food frequency questionnaires were calibrated, based on the 24 hour recalls. Regression analysis was carried out on 487 questionnaires (of students who completed satisfactorily questionnaires of both types). The regression coefficient, determined separately for each nutrient, was used to calibrate the mean intakes of all the students based on the FFQ method.

The regression coefficients were calculated only for the nutrients that were published. For the nutrients not published by the Ministry of Health, regression coefficients were not calculated.

Regression coefficients calculated are presented in the following table:

Nutrient	Regression Coefficient
Energy	0.978256
Protein	0.75871
Carbohydrates	0.81421
Total fat	0.75669
Saturated Fatty Acids	0.82451
Polyunsaturated Fatty Acids	0.69965
Monounsaturated Fatty Acids	0.75347
Docosapentaenoic acid (DPA)	0.81345
Eicosapentaenoic acid (EPA)	0.62273
Docosahexaenoic acid (DHA)	0.75314
α -Linolenic acid	0.74829
Cholesterol	0.64436
Dietary Fiber	0.83120
Vitamin C	0.91734
Vitamin A	0.89021
Vitamin E	0.63131
Vitamin B12	0.75742
Folate	0.80086
Calcium	0.84285
Iron	0.73065
Sodium	0.82569
Potassium	0.84202
Magnesium	0.80093
Zinc	0.71387