

Cover page

Official title:

Sustainable-psycho-nutritional intervention program and its effects on water and carbon footprint, metabolic biomarkers, and gut microbiota in Mexican population: study protocol of a m-Health randomized clinical trial

Brief Title:

Sustainable-psycho-nutritional intervention program and its effects on health outcomes and the environment

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Note: This study protocol will be submitted to a scientific journal as a study protocol.

Abstract

Mexico is going through a major environmental and nutritional crisis, which is related to unsustainable dietary behaviors. Sustainable diets could solve both problems together. However, in Mexico and the world, an intervention program oriented to promoting sustainable diets has not been designed. This study protocol aims to design a 3-stages, 15 weeks, sustainable-psycho-nutritional digital intervention program whose objective is to promote the adherence of the Mexican population to a sustainable diet and to evaluate its effects on dietary water and carbon footprints, metabolic biomarkers, and gut microbiota of this population. The behavior change wheel model and the guide for digital interventions design will be followed. In stage 1, the program will be designed using the sustainable diets model, and the behavior change wheel model. A sustainable food guide, sustainable recipes, and food plans as well as a mobile application will be developed. In stage 2, the intervention will be carried out for 7 weeks, and a follow-up period of 7 weeks, in a sample of Mexican young adults (18 to 35 years) randomly divided into an experimental group (n=50) and a control group (n=50). The nutritional care process model will be used. Anthropometric, biochemical, clinical, dietary, environmental, socioeconomic level and cultural aspects, nutritional-sustainable knowledge, behavioral aspects, and physical activity will be considered. Thirteen behavioral objectives will be included using successive approaches in online workshops twice a week. The population will be monitored using the mobile application that will include behavioral change techniques. In stage 3, the effects of the intervention will be assessed on the dietary water and carbon footprint, lipid profile, serum glucose, and gut microbiota composition of the evaluated population. We expected to find improvements in health outcomes and a decrease in the dietary water and carbon footprints. With this study, the first theoretical-methodological approach to the sustainable-psycho-nutrition approach will be generated.

Keywords: Sustainable Diets, Behavior Change, Gut Microbiota, Environmental Impact of Diets, Nutritional and Environmental Education, Mexican Population, Water Footprint, Carbon Footprint, Eating Behavior, m-Health.

1. Introduction

The change from the traditional Mexican diet to a Western diet, generated by the nutritional transition, has not only generated prevalence's of more than 75% of metabolic alterations (obesity, type 2 diabetes, cardiovascular diseases, dyslipidemia) (1–3) and in the gut microbiota of the Mexican population (4), but it has also generated the water and carbon footprint of their diet to be the highest in the world with more than 8,000 Liters per person per day ($L\ p^{-1}d^{-1}$) (5) and 6.01 Kg $CO^2eq\ p^{-1}d^{-1}$ (6), respectively. This is linked to the aggravation of climate change, with increases of more than 1.0 °C in the average atmospheric temperatures (7) and the current water crisis that Mexico is going through, which affects 85% of the territory and has been referred to as the worst water drought in history, affecting the water supply of millions of Mexicans (1,8).

One of the proposals for the joint solution of these problems has been the adoption of sustainable and territorial diets, which in Mexico could be carried out through the recovery of its traditional diet, both pre-Hispanic and colonized, which, prepared with low-fat culinary techniques and low content of animal products, can be considered as an appropriate option from a nutritional, cultural, economic and environmental perspective, dimensions that must be present for a diet to be considered as sustainable (1,9–12).

However, to achieve the adoption of a particular diet, it is necessary to modify the eating behavior of the population (13–15). To modify both dietary and unsustainable behaviors in a population, there are multiple strategies, among which intervention programs have stood out (14,16,17). However, to date and both nationally and internationally, no intervention program whose objective is to promote both adequate nutrition to improve health and reduce the environmental impact of dietary behaviors, has been reported. This respecting cultural, social, economic, and psychological aspects of the population.

Based on the above, this study protocol aims to design a three-stage 15 weeks intervention program, based on the guide to designing interventions of the behavior change wheel model (14), which includes both nutritional and sustainability elements, in the sense of considering unsustainable dietary behaviors of the Mexican population, in addition to taking into account their social, cultural and economic aspects. In addition to these axes, the basis of behavioral modification intervention programs is psychology. Therefore, it is proposed to design a sustainable-psycho-nutritional intervention program, whose objective is to promote the adherence of the population to sustainable diets. But, in addition, it is proposed to evaluate its effects on environmental indicators, metabolic biomarkers, and gut microbiota, as well as clinical aspects and body composition in a Mexican population sample. Because of the effectiveness of technologies use in nutritional (18,19) and environmental (20,21) interventions,

the intervention program will be a digital one, for which a mobile application is being designed to evaluate and monitor the intervened population. Therefore, this will be a m-Health intervention program.

We hypothesized that a sustainable-psycho-nutritional intervention digital program can modify the eating behavior of a Mexican population group and guide it towards a sustainable diet, generating decreases in glucose levels, total cholesterol (TC), LDL cholesterol (LDL-C), and triglycerides (TG), and increases in HDL cholesterol (HDL-C) levels. Likewise, we hypothesized that this type of program can modify the composition of the gut microbiota of the population, promoting the proliferation of bacteria related to metabolic health; reduce the water and carbon footprint of the sample's diets; maintain adequate body fat levels in the population with an adequate body fat percentage or reduce them in the overweight or obese population; maintain blood pressure levels in the healthy population and lower them in the population with high blood pressure, and reduce the presence of acanthosis nigricans.

2. Methods

It is proposed to carry out a quasi-experimental longitudinal study of three stages that will be related to each other.

2.1 Stage 1: Design of the program

A sustainable-psycho-nutritional intervention program will be designed based on the characteristics of a sustainable diet for the national context of Mexico, adaptable to any regional context. It will include a mobile application that is being designed for this project, which will include a sustainable food guide, sustainable-psycho-nutritional workshops, sustainable recipes and food plans, and behavioral change techniques. The program will be designed based on the sustainable diets model (12) and concept (9), the behavior change wheel model (14), the guideline for the development and evaluation of digital behavioral interventions in health care (19), and on the guide to designing interventions of the behavior change wheel, which incorporate 3 stages and 8 development steps (22).

2.1.1 Mobile application design

A mobile application (app) will be developed in collaboration with software and mobile applications developers and will be based on the user-centered methodology (23), and on the guide for the design of digital interventions by West and Michie (24). It will contain the following behavioral modification techniques: education

through workshops videos (13); persuasion by sending messages of risks and benefits (25), encouragement and coercion using token economy (13), nudges by messaging (26), self-monitoring by graphical progress viewing (27,28), successive approaches by behavioral objectives addressing (13), and guides (14), through a sustainable food guide that will be designed by means of linear programming optimization (29,30) using MATLAB®, and graphic design programs such as Adobe Illustrator® and BioRender®. This guide will be designed based on the recommendations of the FAO for the development of dietary guidelines (31) and on the Mexican Food Equivalent System (32). For the token economy system, cut-off points will be established to be charged to the app (Supplementary Material 1). Additionally, educational workshops and meal plans will be designed, following the model of sustainable diets of Johnston et al. (12), and using the Nutriecology® Nutritional-Ecological software and the Nutrimind® Software for diet calculation. Likewise, the guidelines for the prescription of meal plans, menu design, and recipes for the Mexican population will be followed (33). Prior to the launch of the mobile application, its feasibility, acceptability, quality, and usability will be assessed. Also, it will be evaluated following the APEASE criteria, which include evaluating the 1) Affordability, 2) Practicability, 3) Effectiveness, and Cost-effectiveness, 4) Acceptability, 5) Side-effects/safety, and 6) Equity.

2.1.2 Behavior change intervention design process

The process of design of the intervention is shown in Table 1. The process of understanding the behavior, including the problem definition (1–3,5,6), the selected target behaviors, and what needs to be modified from them (12,13,27,34–36) are described. Also, the selected intervention functions (37), as well as the selected policy categories from the behavior change wheel model, are presented.

Table 1. Design of the Sustainable-Psycho-Nutritional intervention program according to the behavior change wheel model and guide for interventions design

Stage 1: Understand the behavior	
Step 1: Define the problem in behavioral terms	This step will be based on the available scientific evidence on the country's dietary and environmental situation, which reveals high prevalence's of overweight, obesity, and associated pathologies such as type 2 diabetes, dyslipidemia, and hypertension (1,2,6). Also, the highest values of dietary water and carbon footprints were found (5,6). These problems are mainly related to inadequate food consumption (which will be further detailed) and lack of physical activity (1).
Step 2: Select target behavior	The target behaviors will be lack of physical activity performance, inadequate consumption of Mexican foods and dishes, fruits and vegetables, whole grains, legumes, seeds and healthy fats, dairy products, eggs, fish and shellfish, chicken, red meat (beef and pork, and, in some cases, goat and lamb) and processed, ultra-processed foods and added and free sugars, as well as foods high in trans and saturated fats.
Step 3: Specify the target behavior	Targets behaviors will be established as a goal-setting strategy, which has been reported to be one of the most effective methods for modifying dietary behaviors (27). Also, they will be addressed as successive approximations toward a sustainable diet, another effective behavior change technique (13,33). Targets behaviors will be:
Step 4: Identify what needs to change	<ol style="list-style-type: none"> 1. Increase physical activity. 2. Increase the consumption of sustainable Mexican foods and dishes. 3. Increase the consumption of fruits and vegetables. 4. Increase the consumption of whole grains. 5. Increase the consumption of legumes. 6. Increase the intake of seeds and healthy fats. 7. Reduce dairy consumption. 8. Reduce the consumption of eggs. 9. Reduce consumption of fish and shellfish. 10. Reduce chicken consumption. 11. Reduce the consumption of red (beef, pork, goat, and lamb) and processed meats. 12. Reduce the consumption of ultra-processed foods. 13. Reduce the intake of added and free sugars, as well as foods with a high content of trans and saturated fats. <p>All foods whose consumption will be promoted will be aligned with the sustainability characteristics for the Mexican context (12), on the recommendations of a healthy diet provided by the WHO (35), and on the model QC7G for food and nutrition education, that will specify which foods to select, in which quantities, when to consumed them and how to prepare them. In addition to when to perform physical activity, specifying type and duration (13).</p>
Stage 2: Identify intervention options	
Step 5: Intervention functions	The intervention functions from the behavior change wheel model will be: education, persuasion, incentivization, and coercion. These will be verified in relation to the APEASE criterion Michie et al. (36).

Table 1. Continuation: Design of the Sustainable-Psycho-Nutritional intervention program according to the behavior change wheel model and guide for interventions design

Stage 2: Identify intervention options	
Step 6: Policy categories	<p>The policy category of the behavior change wheel model will be the guidelines. Therefore, a nutritional-sustainable food guide will be designed, using linear programming optimization (29, 30), based on the FAO recommendations for the development of dietary guidelines (31), and covering the elements of the sustainable diets model (12) as follows: 1) Wellness and Health: ABCD; A: anthropometric and body composition data (body weight and height, BMI, percentage of body fat, visceral fat, muscle mass, waist, and hip circumference, as well as waist-hip ratio); B: biochemical data (serum glucose, lipid profile and gut microbiota); C: clinical data (signs of nutrient deficiencies, acanthosis nigricans, and blood pressure). 2) Biodiversity, environment, and climate: carbon footprint and gray water footprint. 3) Equity and fair trade: food prices and socioeconomic level of the population. 4) “Eco-friendly”, local, and seasonal foods: green and blue water footprint, locally produced and seasonal foods. 5) Cultural heritage and skills: Traditional Mexican diet, Mexican Diet Quality Index Adapted (IACDMx), and nutritional education based on a traditional diet. 6) Food needs, nutrients, food security, and access: personalized food plan according to individual requirements, preferences, and contexts. Figure 1 shows an adaptation of the model of sustainable diets of Johnston et al. (12) for this protocol characteristics.</p> <p>Subsequently, this nutritional-sustainable food guide will be accompanied by a system of equivalent foods (32) that, in addition to incorporating the food's nutrients, will integrate their environmental impact. The calculation of the environmental impact will be made based on the calculation of the total, green, blue, and gray water footprint, using the Water Footprint Assessment method for Mexico (5). Likewise, the greenhouse gas emissions of foods will be calculated, using the Life Cycle Assessment method for food production and processing through pre-quantified databases (55,56,57). The prices and cultural characteristics of the main consumed foods in Mexico will be included (5,32). Prices will be obtained based on fieldwork in supermarkets, and a review of supermarket databases, while cultural aspects will be determined based on a literature review of the traditional Mexican diet (1,10).</p> <p>Once sustainability dimensions are calculated, a sustainable recipe book will be developed, including examples of food plans with individualization options. These food plans will be made up of a distribution of equivalent food rations (32) and examples of menus that meet the nutritional and sustainability characteristics of the Mexican population, with adaptations options.</p>
Stage 3: Identify content and implementation options	
Step 7: Behavior change techniques	<p>Specific behavior change techniques will be used covering the selected intervention functions as follows:</p> <ul style="list-style-type: none"> • Education: successive approximations in the workshops addressing the target objectives. • Persuasion: Nudges, risk, and benefits communication. • Incentivization, coercion, and monitoring: messaging, remainders, and token economy through food registers by writing and photos on the mobile application. • Social support: forum in the mobile app where participants can share pictures of their foods and their physical activity performance. Also, will be able to like the photos of other participants and comment on the photos. Also, a chat for the resolution of doubts between user and administrator will be included in the mobile application.
Step 8: Mode of delivery	The mode of delivery will be digital since a mobile application is being designed and the workshops will be delivered by digital platforms in videos.

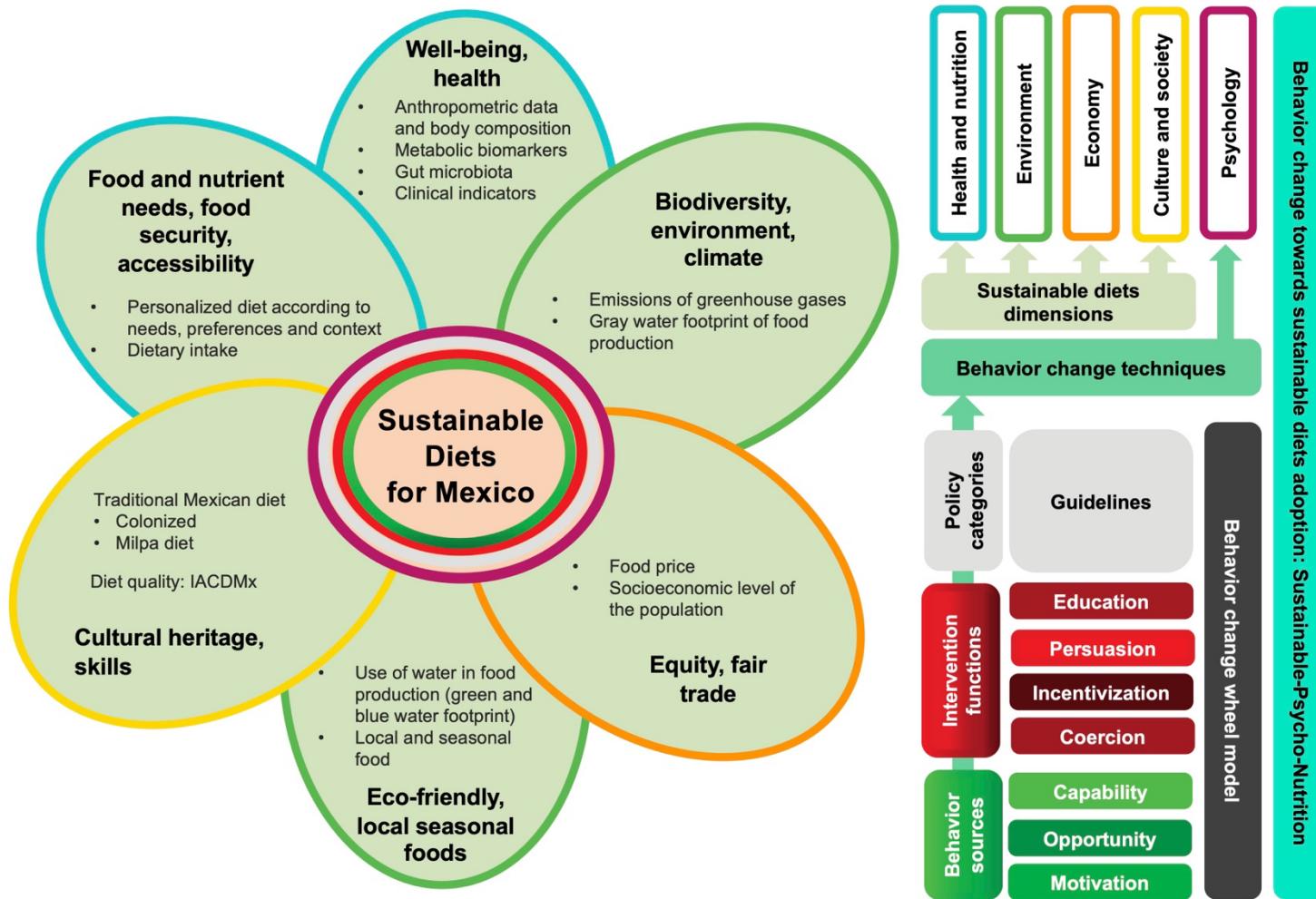


Figure 1. Sustainable-Psycho-Nutritional approach for the intervention design, based on the sustainable diets model (12), The behavior change wheel model (14), and the COM-B model (14). Own elaboration.

2.2 Stage 2: Application of the sustainable-psycho-nutritional intervention program

2.2.1 Participants

Once the intervention program has been designed, it will be applied to a sample of Mexican young adults from the south of Jalisco, randomly divided into two groups: an experimental group (n=50) and a control group (n=50). This is based on recommendations for group designs in behavior modification programs (38). The sample size is according to the minimum suggested for nutritional interventions (39,40), and taking into account the possible desertion of the participants during the intervention, which can amount to more than 50% of the initial sample (41). We will include a population between 18 and 35 years old, with Body Mass Index (BMI) values from 18.5 to 40, with or without risk factors for the development of chronic diseases, but without diagnosis with previous pharmacological treatment. The inclusion, exclusion, and elimination criteria are detailed in Supplementary Material 2 in Table SM2.1. Also, for being included in the study cut-off points to identify inadequate consumption and physical activity were established (Table SM2.2). The population will be invited to participate through social networks and posters at strategic points, such as Universities, gyms, and the downtown city. Young adults were selected as the population for this study since they are already considered adults who make autonomous food decisions, but at the same time, their young age makes them susceptible to behavioral modification. In addition, they represent parents or future parents, as well as the active population of Mexico, so providing nutritional-sustainable education to these people could generate long-term benefits for their health and that of their families (21,42,43).

2.2.2 Procedure

Participants will be evaluated following the nutritional care process model (44). The first evaluation will be performed at the beginning of the intervention at baseline, and according to individual requirements, the behavioral objectives will be individually adapted and will be addressed for 7 weeks, considering 2 objectives per week, thus providing 2 weekly educational workshops. Also, personalized food plans will be prescribed, according to the linear programming optimization (29,30) performed at MATLAB®.

After 7 weeks of educational and nutritional intervention, at week 8, the experimental population will be divided into two sub-groups, where one group will stop being intervened completely (n = 25), and another will continue to receive messages through the mobile application (n = 25) for 8 weeks. Finally, at week 15, a final evaluation will be carried out. The study design is shown in Figure 2. Participants will be evaluated in the regard of Anthropometric, Biochemical, Clinical, Dietetics, Environmental, Socioeconomic level and cultural aspects,

Nutritional-sustainable knowledge, Behavioral aspects, and Physical activity (ABCD-ESNBP). These aspects will be evaluated according to the nutritional care process model, thus identifying the problem of the population, establishing the etiology, and stating the signs and symptoms (44).

2.2.3 Sustainable-psycho-nutritional indicators

The ABCD-ESNBP indicators will be included in a complete clinical history that will be uploaded to the mobile application (Supplementary Material 3) and will be evaluated as follows: A) Anthropometric: height with a Smartmet® stadiometer, weight, and body composition (percentage of body fat, muscle mass, visceral fat) with an Omron® bioimpedance scale (HBF-511T-E/HBF-511B-E), $BMI = \text{weight}/\text{height}^2$, waist and hip circumference using a Lufkin® metal tape measure. The assessment will be performed following the validated techniques of Suverza and Haua (45).

B) Biochemical: glucose and lipid profiles (TC, LDL-C, HDL-C, and TG) will be determined through blood samples that will be taken from the antecubital vein of each participant, following the protocol from the Mexican Health Secretary (46,47). Samples will be taken by specialists, after an overnight fast of 8 to 12 hours and will be centrifuged at 3500 rpm for 15 min to separate the serum. Samples will be aliquoted and stored at -20°C until the day of testing. Tourniquets, alcohol swabs, 10 mL syringes, and blood collection tubes will be required. Gut microbiota will also be analyzed, for which fecal samples will be collected in a sterile stool container using a sterile kit including gloves and a spatula that will be delivered to the participants. Once collected, the samples will be divided into aliquots and will be stored at -80 °C, following a method used for the Mexican population (4,48).

C) Clinical: a clinical history will be carried out, covering pathologies suffering, pathological family history, medicaments, and supplement use (Supplementary Material 3). Clinical signs of insulin resistance (acanthosis nigricans) will be evaluated by physical exploration, searching for hyperpigmentation and thickening of the skin with velvety, in visible flex areas (axilla, anterior ulnar area, and posterior and lateral region of the neck) (49). Signs of nutrient deficiencies or excess will also be evaluated in relation to hair, nails, mouth, tongue, edema, and mucous membranes appearance (45). Likewise, blood pressure will be evaluated with a Medstar® sphygmomanometer and following the Mexican normativity (50).

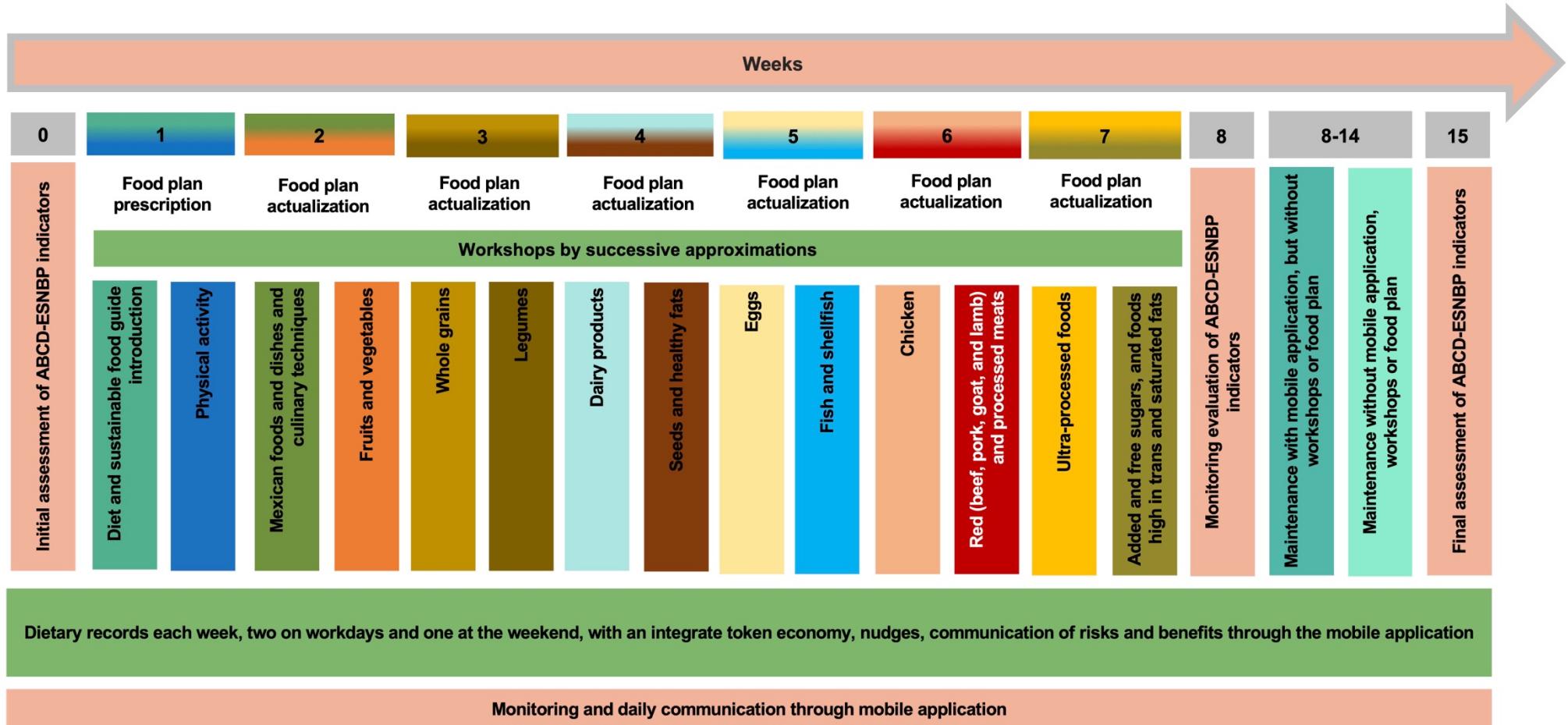


Figure 2. Study design for stage 2. Own elaboration.

D) Dietetics: caloric-nutritional intake will be assessed through 24-hour recalls and dietary records (51), and by a validated adapted Food Frequency Questionnaire (CFCA) (5,52). Diet quality will also be analyzed by an adapted version of the Mexican Diet Quality Index (ICDMx) (53). Participants will also be asked about food preparation, food shopping places, food allergies and intolerances, food preferences, and about following specific diets at the moment of the evaluation.

E) Environmental: dietary water footprint will be calculated using the Water Footprint Assessment method (54) in its version for Mexico's context (5). The water footprint of each food and food ingredients are going to be calculated. Also, water involved in cooking and food washing is going to be evaluated. Dietary carbon footprint is also going to be calculated using the Life Cycle Assessment method (7,55,56). Food system boundaries are going to be the impact of food production and processing on greenhouse gas emissions, as carried out by Fresán et al. (57). Corrections factors from converting cooked to uncooked food and peeled to unpeeled food are going to be applied. Both calculations are going to be performed in the Nutriecology® Software.

S) Socioeconomic level and cultural aspects: educational level, occupational level, and economic income are going to be evaluated according to classifications used for Mexico, which are detailed in Supplementary Material 3 (58). For this aspect, food prices are going to be investigated in fieldwork and in supermarket databases, in order to promote the consumption of accessible foods. Also, food culture related to celebrations and traditions is going to be investigated.

N) Nutritional-sustainable knowledge: it will be evaluated through a designed questionnaire (Supplementary Material 4), based on the psychological capacity presented in the COM-B model. It will include a series of questions for the evaluation of nutritional-sustainable knowledge, which will be related to the established behavioral objectives and will be based on manuals for the design of nutritional knowledge questionnaires and on questions on sustainable food consumption (59–62).

B) Behavioral aspects: all dimensions of the COM-B model will be assessed in a designed questionnaire based on Brain et al. (63) (Supplementary Material 4). The questions will be related to physical and psychological ability, automatic and reflexive motivation, and physical and social opportunity (14). Questions were adapted according to the context of sustainable diets (12): (1) Capacity: knowledge of sustainable nutrition, preparation skills food and preparation capacity; (2) Opportunity: time to eat and prepare food, access to food, and food storage; (3) Motivation: the desire to change eating habits, emotions involved in food consumption and habits that participants are willing to change.

P) Physical activity: the IPAQ questionnaire will be used, which is included in the clinical history shown in Supplementary Material 3. Besides the questionnaire, specific questions about physical activity type, frequency, intensity, and duration are going to be asked.

2.3 Stage 3: Effects of the sustainable-psycho-nutritional intervention program

As the last stage of this protocol, the corresponding laboratory analyses, and statistical tests will be carried out.

2.3.1 Metabolic biomarkers analysis

For the analysis of metabolic biomarkers, colorimetric enzymatic methods will be used using the Spinreact® S. A/S A. U (Girona, Spain) laboratory kits, for fasting glucose determination (Cat. No. 1001190), TC (Cat. No. 41022), LDL-C (Cat. No. BSIS51-E), HDL-C (Cat. No. BSIS37-E) and TG (Cat. No. 1001313) (47). The reference points for glucose values and lipid profiles will be taken from the regulations in force in Mexico (64,65).

2.3.2 Gut microbiota analysis

For the analysis of the gut microbiota, the real-time quantitative polymerase chain reaction (qPCR) method will be followed (4,48). First, DNA will be extracted from the collected stool samples, following the protocol for rapid purification of genomic DNA from stool samples. The Qiagen brand commercial kit (1066790ES, USA) will be used. This procedure integrates two stages: lysis and separation of impurities from stool samples, for which Inhibitex Buffer will be used and DNA purification will be carried out by means of centrifugation columns. Once the bacterial DNA samples are obtained, they will be stored and labeled in sterile plastic microtubes (Eppendorf 1.6 mL) at a temperature of -80°C until further analysis.

Next, the purity of the DNA will be verified, and its concentration will be determined using a NanoDrop Lite spectrophotometer (Thermo Scientific, Waltham, MA, USA). 1 µL of the DNA stock of each sample will be placed on the lens of the equipment and the sample will be read at a wavelength of 260 nm for DNA quantification and at 280 nm for protein quantification. The purity will be determined by calculating the index performed by the team, by dividing the reading at 260 nm by the reading at 280 nm and will be considered acceptable in a range of 1.5 to 2. The concentration of the purified coproDNA sample will be measured by their absorbance ratio of 260/280 nm using the same spectrophotometer. This analysis corresponds to the absorbance index of nucleic acids and provides the final concentration in ng/µL (4,48,66).

Once the previous analyzes have been completed, the identification of the gut microbiota will be carried out using the qPCR molecular technique, on the StepOne Applied BioSystems platform, using the SYBR Green reagent as DNA detection chemistry. This reagent is considered an agent that intercalates into the DNA double helix and fluoresces as the DNA copies are synthesized. Therefore, at a higher concentration of the DNA of interest (bacterial), the equipment will record a higher fluorescence signal. In this case, the analysis of interest will be carried out in the V3-V4 hypervariable region of the bacterial 16S rRNA gene. For this analysis, specific primers, which are detailed in Supplementary Material 5 will be used. The bacterial load and relative abundance of the main bacteria present in the intestine (Firmicutes and Bacteroidetes) (4,67,68) will be determined, as well as those related to particular types of diets, for example, *Lactobacillus* and *Bifidobacterium* that are related to healthy, vegetarian and Mediterranean diets (67,69,70), *Faecalibacterium prausnitzii* that is related to healthy diets and an anti-inflammatory effect (41,71–73), as well as *Akkermansia muciniphila*, which besides of being related to anti-inflammatory effects is associated to the consumption of the Mexican pre-Hispanic diet (41,70,72,74,75). The presence of *Prevotella copri* will also be identified, which is one of the bacteria most related to plant-based diets and is considered anti-inflammatory and glucose modulator (75,76). The presence of *Bilophila wadsworthia* will also be identified, as it is related to diets with a high content of foods of animal origin, mainly dairy and meat (71,77), as well as in westernized diets (67,78). Likewise, the presence of *Clostridium coccoides* will be analyzed, as it is related to obesity (48) and a high fat intake (79). Also, *Streptococcus thermophilus* will be included because it is related to dairy consumption (71,80). The exact procedure to follow regarding the qPCR run, as well as the specific conditions and temperatures of the analysis, are presented in the investigation of Rodríguez-Lara et al. (48), which will serve as the guide for this research project.

2.3.3 Evaluation of the adherence to the program

To measure the adherence of the intervened population to the program, an adapted questionnaire will be applied based on that of Gila-Díaz et al. (81), which will consist of the contrast of the recommendations provided with the performance of the behaviors to promote. For example, questions about the type and intensity of physical activity performed and the amount and frequency of consumption of each of the foods included in the behavioral objectives will be included. This questionnaire is shown in Supplementary Material 6.

2.3.4 Statistical analyses

The distribution of the data will be analyzed with the Kolmogorov Smirnov test. Descriptive analysis will be performed, including means, standard deviations, and medians. Next, the effects of the program on the selected variables will be assessed by comparing them between evaluations and between groups with t-student tests for paired and unpaired data, respectively, if a normal distribution is found. For no normally distributed data, the Wilcoxon test (repetitive measures) and the U de Mann Whitney test (independent groups) will be used. For no categorical variables, the chi-squared test will be used. Correlation analyses will also be performed, considering Pearson correlation for normally distributed data and Spearman correlations for no normally distributed data. Likewise, simple, and multiple linear regression models will be carried out, as well as binary logistic regression analysis, to identify relationships and risks between variables. Statistical analysis will be performed at STATA V12® program.

2.4 Ethical and biosafety considerations

This project has been already evaluated and approved by the Ethics Committee of the Center for Studies and Research in Behavior, of the University Center for Biological and Agricultural Sciences (CUCBA) from the University of Guadalajara with the number CUCBA/CEIC/CE/002/2022 and by the Technical Research Committee of the University Center of the South (CUSUR), with the number 2021D001. This protocol will also be registered on Clinical Trials.gov. When performing the intervention, the Declaration of Helsinki (82) and biosafety protocols of the Secretary of Health of Mexico (83) will be followed all the time. All participants will sign an informed consent (Supplementary Material 7) and their identities will be protected by the Federal Law on Protection of Personal Data Held by Private Parties (84).

Both due to regulations in research with human beings, and due to the situation of the COVID-19 pandemic, a strict biosafety protocol will be followed, where mouth covers will be always worn, both by the evaluating staff and by the participants. Likewise, the sample collection personnel will wear protective glasses and sterile gloves and constant disinfection of the work area will be carried out. In addition, hazardous biological waste will be disposed of in a special trash can in accordance with the provisions of the Ministry of Health (85).

3. Discussion

By developing this program, we would be generating the first bases for the Mexican population (and future populations) to achieve a healthy and sustainable diet that can have positive effects on health outcomes and decrease the environmental impact of food consumption; thus addressing two of the main problems afflicting the

world population. Also, we are proposing a new concept: The Sustainable-Psycho-Nutrition, which is proposed as an approach based on behavioral science that integrates the psychological, social, cultural, economic, nutritional, and environmental aspects of eating behavior, whose objective is to generate the necessary bases to carry out behavioral change interventions, to guide the eating behavior of the population, towards sustainable eating behaviors. Within this term, we also launch the nutritional-ecological education, whose objective is to get people to acquire and perform the appropriate behavioral repertoire to determine what, how much, when, and how to eat, in relation to when, how much, and how energy is spent to maintain or recover their physical well-being, considering at all times the environmental impact of their behaviors and selecting the most sustainable foods, regarding the environment, culture, economy, preferences, food security, health, nutrition, among other factors (13).

Besides those aspects, the mobile application that we are currently developing is going to be a tool that will facilitate the promotion of sustainable diets first at the national level in Mexico, and forward, worldwide. Also, we will generate the first sustainable food guide for Mexico's context that will consider not only sustainability aspects but psychological and behavioral aspects. Moreover, the workshops, recipes, and food plans that we are creating are going to serve as tools for the health and environmental sector of the country to promote the consumption of sustainable diets. Finally, the link between gut microbiota and sustainable diets is a new aspect that this study will be characterized for the first time, specifically for the Mexican population. Finally, this project intends to bring attention to the importance of considering behavioral interventions and techniques for promoting sustainable diets.

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Supplementary Material

Supplementary Material 1. Token economy system cut-off points

Table SM1.1. Scores according to the frequency of physical activity according to the type of activity

Physical activity	Frequency for obtaining points	Score
Cardiovascular exercises (any including Walking, Jogging, Running, Aerobics, Zumba or dance, Cycling, Swimming)	Once a week	1
	2 times a week	2
	3 times a week	3
	4 times a week	4
	5 times a week	5
	6 times a week	6
	7 times a week	7
or		
Strength or resistance exercises (any including Crossfit, Weights, Multifunctional Focused exercises (for example, sit-ups, squats, push-ups)	< once a week	0
Combination of cardio and strength exercises	Once a week	1
	2 times a week	2
	3 times a week	3
	4 times a week	4
	5 times a week	5
	6 times a week	6
	7 times a week	7
	< once a week	0

Table SM1.2. Scores according to duration and intensity according to the type of physical activity

Type	Duration	Intensity	Score
Cardiovascular exercises (any including Walking, Jogging, Running, Aerobics, Zumba or dance, Cycling, Swimming)	Less than 10 minutes	Mild	0.5
	10 to 29 minutes	Mild	1
	30 to 59 minutes	Mild	2
	60 to 120 minutes	Mild	3
	More than 120 minutes, but less than 240 minutes	Mild	4
	More than 240 minutes	Mild	4 points and send a message not to exceed the amount of exercise
	Less than 10 minutes	Moderate	1
	10 to 29 minutes	Moderate	2
	30 to 59 minutes	Moderate	4
	60 to 120 minutes	Moderate	6
Strength or resistance exercises (any including Crossfit, Weights, Multifunctional Focused exercises (for example, sit-ups, squats, push-ups)	More than 120 minutes, but less than 240 minutes	Moderate	8
	More than 240 minutes	Moderate	8 points and send a message not to exceed the amount of exercise
	Less than 10 minutes	Intense	2
	10 to 29 minutes	Intense	4
	30 to 59 minutes	Intense	8
	60 to 120 minutes	Intense	12
	More than 120 minutes, but less than 240 minutes	Intense	16
	More than 240 minutes	Intense	16 points and send a message not to exceed the amount of exercise
	Less than 10 minutes of each	Mild	1
	10 to 29 minutes of each	Mild	2
Combination of cardio and strength exercises	30 to 59 minutes of each	Mild	4
	60 to 120 minutes of each	Mild	6
	More than 120 minutes, but less than 240 minutes of each	Mild	8
	More than 240 minutes of each	Mild	8 points and send a message not to exceed the amount of exercise
	Less than 10 minutes of each	Moderate	2
	10 to 29 minutes of each	Moderate	4
	30 to 59 minutes of each	Moderate	6
	60 to 120 minutes of each	Moderate	8
	More than 120 minutes, but less than 240 minutes of each	Moderate	10
	More than 240 minutes of each	Moderate	8 points and send a message not to exceed the amount of exercise
	Less than 10 minutes of each	Intense	4
	10 to 29 minutes of each	Intense	8
	30 to 59 minutes of each	Intense	16
	60 to 120 minutes of each	Intense	24
	More than 120 minutes, but less than 240 minutes of each	Intense	32
	More than 240 minutes of each	Intense	32 points and send a message not to exceed the amount of exercise

Table SM1.3. Scores according to the frequency of food consumption by groups

Food group	Points for consumption frequency	Score
Mexican food and dishes	Once a week	1
	2 times a week	2
	3 times a week	3
	4 times a week	4
	5 times a week	5
	6 times a week	6
	7 times a week	7
	< once a week	0
Mexican desserts and drinks	Once a week	1
	2 times a week	0
	3 times a week	0
	4 times a week	0
	5 times a week	0
	6 times a week	0
	7 times a week	0
	Once a week	1
Fruits, vegetables, legumes, dairy, seeds and healthy fats, eggs	2 times a week	2
	3 times a week	3
	4 times a week	4
	5 times a week	5
	6 times a week	6
	7 times a week	7
	< once a week	0
	Once a week	3
Fish and shellfish, chicken and other white meats	2 times a week	2
	3 times a week	1
	4 times a week	0
	5 times a week	0
	6 times a week	0
	7 times a week	0
	0 times a week	7
	Once a week	1
Red and processed meats, Ultra-processed foods, Foods high in sugars, trans and saturated fats	2 times a week	0
	3 times a week	0
	4 times a week	0
	5 times a week	0
	6 times a week	0
	7 times a week	0
	Once a week	1

Table SM1.4. Scores by frequency of consumption

Food group	Consumption quantities	Score
Mexican foods and dishes, fruits, vegetables, legumes, dairy products, seeds and healthy fats, eggs	< recommended portion or > minimum portion	1
	Recommended portion	2
	< recommended maximum or > recommended portion	1
	> the recommended maximum or < the recommended minimum	0
Fish and shellfish, chicken and other white meats, Red and processed meats, Ultra-processed foods, Foods high in sugars, trans and saturated fats	Minimum portion	3
	< Recommended portion > minimum portion	2
	> recommended portion < maximum portion	1
	> Maximum portion	-1

Note: recommend amount of consumption will be determined by the linear optimization programming. An example is shown in Table SM1.5.

Table SM1.5. Examples of recommended amounts of consumption by food groups including the target foods of the intervention

Consumption	Group by objective	Food	Examples of amounts of consumption		
			Average Recommended Serving	Range	Minimum
Daily (at least 1 food from the group)	Mexican food and dishes	Chilaquiles with or without egg and/or chicken	1 cup (160 g)	80 g	240 g
		Mexican style egg (tomato, onion, chili, nopal)	1 plate (220 g)	110 g	330 g
		Quesadilla of corn tortilla (without meat)	1 piece (60 g)	30 g	90 g
		Beans taco	1 piece (60 g)	30 g	90 g
		Panela cheese and beans torta (not meat)	1 piece (197 g)	98.5	295.5 g
		Chicken tamal (no red meat)	1 piece (200 g)	100 g	300 g
		Tamal of ash, chard, or cheese (without red meat)	1 piece (200 g)	100 g	300 g
		Sweet tamal (corn, fruits)	1 piece (172 g)	86 g	258 g
		Mole with chicken	1 plate (334 g)	167 g	501 g
		Chicken or vegetarian (mushroom) pozole	1 plate (300 g)	150 g	450 g
		Chicken or cheese flute (no red meat)	1 piece (75 g)	37.5 g	112.5 g
		Bean or chicken sope (no red meat)	1 piece (75 g)	37.5 g	112.5 g
		Chicken or cheese enchilada (no red meat)	1 piece (75 g)	196.5 g	589.5 g
		Fish or chicken taco (no beef or pork)	1 piece (75 g)	37.5 g	112.5 g
		Bean burrito (no meat)	1 piece (100 g)	50 g	150 g
		Fresh water without sugar	1 cup (240 ml)	120 ml	360 ml
		Toast with beans or chicken	1 big toast (174 g)	87 g	261 g
		Rice pudding	½ cup (178 g)	89 g	267 g
1 time per week		Flan	1 piece (120 ml)	60 ml	180 ml
		Capirotada	1 slice (60 g)	30 g	90 g
		Sweet bread	1 piece (63 g)	31.5 g	94.5 g
		Atole in water	1 cup (240 ml)	120 ml	360 ml
		Atole in milk or champurrado	1 cup (240 ml)	120 ml	360 ml
		Tejuino	2 cups (418 ml)	209 ml	627 ml
		Tuba	1 cup (240 ml)	120 ml	360 ml
		Tepache or honey water	1 cup (240 ml)	120 ml	360 ml

Note: this table will be updated according to the linear optimization programming.

Table SM1.5. Continuation: Examples of recommended amounts of consumption by food groups including the target foods of the intervention

Consumption	Group by objective	Food	Examples of amounts of consumption	
			Average Recommended Serving	Range
Daily (at least 1 food from the group)	Fruits	Papaya	1 cup (140 g)	70 g 210 g
		Tuna	1 piece (70 g)	35 g 105 g
		Pineapple	1 cup (165 g)	82.5 g 247.5 g
		Soursop	½ piece (175 g)	87.5 g 262.5 g
		Guava	2 pieces (83 g)	41.5 g 124.5 g
		Capulín	1 cup (32 g)	16 g 48 g
		Pitaya	1 piece (50 g)	25 g 75 g
		Nance	5 pieces (15 g)	7.5 g 22.5 g
		Creole plum	2 pieces (105 g)	52.5 g 157.5 g
		Zucchini	1 piece (91 g)	45.5 g 136.5 g
Daily (at least 1 food from the group)	Vegetables	Pumpkin	½ cup (110 g)	55 g 165 g
		Onion	½ cup (58 g)	29 g 87 g
		Mushrooms	1 cup (93 g)	46.5 g 139.5 g
		Chayote	½ cup (80 g)	40 g 120 g
		Spicy chili	1 cup (30 g)	15 g 45 g
		Huitlacoche	1/3 cup (66 g)	33 g 99 g
		Tomato	2 pieces (124 g)	62 g 186 g
		Nopales	2 pieces (134 g)	67 g 201 g
		Bell pepper	1 piece (64 g)	32 g 96 g
		Poblano chili	1/2 piece (32 g)	16 g 48 g
Daily (at least 1 food from the group)	Whole grains	Quelites	½ cup (66 g)	33 g 99 g
		Green tomato	5 pieces (86 g)	43 g 129 g
		Purslane	1 cup (115 g)	57.5 g 172.5 g
		Corn tortilla	1 piece (30 g)	15 g 45 g
		Baked corn toast	2 pieces (20 g)	10 g 30 g
		Corn dough	1 ball (45 g)	22.5 g 67.5 g
		Unsweetened amaranth	¼ cup (16 g)	8 g 24 g
		Sweetened amaranth	¼ cup (16 g)	8 g 24 g
		Sweet potato	1/3 cup (69 g)	34.5 g 103.5 g

Note: this table will be updated according to the linear optimization programming.

Table SM1.5. Continuation: Examples of recommended amounts of consumption by food groups including the target foods of the intervention

Consumption	Group by objective	Food	Examples of amounts of consumption		
			Average Recommended Serving	Range	
Daily (at least 1 food from the group)	Legumes	Pot beans	½ cup (86 g)	43 g	129 g
		Fried beans	1/3 cup (75 g)	37.5 g	112.5 g
		Cooked lentils	½ cup (99 g)	49.5 g	148.5 g
		Cooked chickpeas	½ cup (82 g)	41 g	123 g
		Baked beans	½ cup (85 g)	42.5 g	127.5 g
Daily (at least 1 food from the group)	Dairy products	Curd	3 tablespoons (36 g)	18 g	54 g
		Fresh cheese	1 slice (40 g)	20 g	60 g
		Panela cheese	1 slice (40 g)	20 g	60 g
		Natural yogurt	1 cup (227 g)	113.5 g	340.5
		Whole milk	1 cup (240 ml)	120 ml	360 ml
		Semi-skimmed milk	1 cup (240 ml)	120 ml	360 ml
Daily (at least 1 food from the group)	Seeds and healthy fats	Skim milk (light)	1 cup (240 ml)	120 ml	360 ml
		Avocado	1/3 piece (31 g)	15.5 g	46.5 g
		Dried beans	¼ cup (38 g)	19 g	57 g
		Pumpkin seeds	2 tablespoons (15 g)	7.5 g	22.5 g
		Chia seeds	5 teaspoons (12 g)	6 g	18 g
		Peanuts	14 pieces (12 g)	6 g	18 g
Daily (at least 1 food from the group)	Eggs	Canola oil	1 teaspoon (5 g)	5 ml	15 ml
		Complete chicken egg	1 piece (44 g)	22 g	66 g
		Egg white	2 pieces (66 g)	33 g	99 g
0 to 3 times a week	Fish and shellfish	White fish	1 portion (40 g)	0 g	60 g
		Octopus	1 portion (25 g)	0 g	37.5 g
		River prawn	4 pieces (110 g)	0 g	165 g
0 to 3 times a week	Chicken and other white meat	Grilled chicken	1 portion (29 g)	0 g	58 g
		Chicken in piece	1/3 piece (29 g)	0 g	58 g
		Insects (maguey worms, crickets)	1 portion (35 g)	0 g	52.5 g

Note: this table will be updated according to the linear optimization programming.

Table SM1.5. Continuation: Examples of recommended amounts of consumption by food groups including the target foods of the intervention

Consumption	Group by objective	Food	Examples of amounts of consumption	
			Average Recommended Serving	Range
0 to 1 time a week	Red and processed meats	Beef	1 portion (14 g)	0 g 60 g
		Pork Meat	1 portion (14 g)	0 g 60 g
		Rabbit	1 portion (29 g)	0 g 58 g
		Pork or turkey ham	1 slice (10.5 g)	0 g 21 g
		Pork or turkey sausage	1 slice (14 g)	0 g 60 g
		Longaniza, chorizo, pepperoni or salami	1 portion (14 g)	0 g 30 g
		Beef or pork tacos	1 piece (75 g)	0 g 112.5 g
		Quesadilla with meat, gringa or synchronized (with sausages or meats)	1 piece (60 g)	0 g 90 g
		Enchilada with beef or pork	1 piece (75 g)	0 g 112.5 g
		Flute with beef or pork	1 piece (75 g)	0 g 112.5 g
		Sope with beef or pork	1 piece (75 g)	0 g 112.5 g
		Pork pozole	1 plate (300 g)	0 g 450 g
		Offal	1 plate (300 g)	0 g 450 g
		Birria	1 plate (200 g)	
0 to 1 time a week	Ultra-processed foods	Meat tamal	1 piece (200 g)	0 g 300 g
		Torta (marinated, meat, drowned)	1 piece (197 g)	0 g 295.5 g
		Beef burrito	1 piece (100 g)	0 g 150 g
		Toast with beef or pork	1 large piece of toast (174 g)	0 g 261 g
		Soft drink with sugar	1/4 can (92 ml)	0 ml 138 ml
		Sugar free soft drink	1/4 can (92 ml)	0 ml 138 ml
		Packaged juice	1/3 cup (80 ml)	0 ml 120 ml
		Packaged cookies	1 piece (10.5 g)	0 g 15.75 g

Note: this table will be updated according to the linear optimization programming.

Table SM1.5. Continuation: Examples of recommended amounts of consumption by food groups including the target foods of the intervention

Consumption	Group by objective	Food	Examples of amounts of consumption	
			Average Recommended Serving	Range
0 to 1 time a week	Foods high in added and free sugars, trans and saturated fats	Table sugar to sweeten	1 teaspoon (4 g)	0 g 6 g
		Fresh water with sugar	1 cup (240 ml)	0 g 360 ml
		Industrialized jams	1 tablespoon (17 g)	0 g 25.5 g
		Industrialized syrups and honeys	1 teaspoon (7 g)	0 g 10.5 g
		Cake or pie (thin slice)	1 slice (28 g)	0 g 32 g
		Vegetable oil (not olive or canola)	1 teaspoon (5 ml)	0 g 7.5 ml
		Salt added to already prepared foods	1 pinch (2 g)	0 g 3 g
		Vegetable shortening	1 teaspoon (5 g)	0 g 7.5 g
		Margarine	1 teaspoon (5 g)	0 g 7.5 g
		Lard	1 teaspoon (5 g)	0 g 7.5 g
		Butter	1 teaspoon (5 g)	0 g 7.5 g

Note: this table will be updated according to the linear optimization programming.

Supplementary Material 2. Inclusion, exclusion, and elimination criteria

Table SM2.1. Inclusion, exclusion, and elimination criteria

Study Criteria		
Inclusion	Exclusion	Elimination
Being between 18 and 35 years old	Not signing the informed consent	Not completing the questionnaires
Being Mexican	Not accepting to donate blood and/or stool samples	Do not allow the extraction of blood and / or delivery of stool sample
Reside in the South of Jalisco for at least 1 year	Not being able to stand up to take anthropometric data	Failure to complete the 7-week intervention or 7-week follow-up
Levels of physical activity below what is recommended and what is established as a criterion for inclusion in the study (Table SM2)	Perform levels of physical activity above the minimum established as criteria for inclusion in the study (Table SM2)	
Consuming amounts of food below or above that established as criteria for inclusion in the study or in a lesser or greater frequency than recommended, according to the type of food (Table SM2)	Consume adequate levels of the foods to be promoted in the intervention program (Table SM2)	
Have a Smartphone	Being pregnant or lactating	
Not having consumed antibiotics at least 3 months before the intervention	Suffer from a chronic disease such as type 2 diabetes mellitus, arterial hypertension, dyslipidemia, under medication	
Have a BMI between 18.5 and 40	Suffering from an autoimmune disease such as type 1 diabetes, hypo or hyperthyroidism	
Not having a medical diagnosis of chronic disease under pharmacological treatment	Having a gastrointestinal disease such as Crohn's disease, ulcerative colitis, etc.	
Not having a medical diagnosis of gastrointestinal disease	Having used antibiotics less than 3 months ago	
	Taking antidepressant medications or corticosteroids	
	Consume probiotics or nutritional supplements, except protein powder	

Table SM2.2 Cut-off points to establish inadequate consumption and physical activity, to be included in the research

Physical activity	Inclusion criteria	
	Light	
	< 3 times per week	< 30 minutes per day
Type of physical activity		
Weekly frequency		
Minutes per day		
Food group	Consumption to be included in the study	Frequency of consumption to be included in the study
Mexican food and dishes	< 100 g p ⁻¹ d ⁻¹	< 7 times a week
Fruits	< 400 g p ⁻¹ d ⁻¹	< 7 times a week
Vegetables	< 400 g p ⁻¹ d ⁻¹	< 7 times a week
Whole cereals	< 200 g p ⁻¹ d ⁻¹	< 7 times a week
Legumes	< 60 g p ⁻¹ d ⁻¹	< 7 times a week
Seeds and healthy fats	< 80 g p ⁻¹ d ⁻¹	< 7 times a week
Dairy products	> 250 ml p ⁻¹ d ⁻¹	> 5 times a week
Eggs	> 25 g p ⁻¹ d ⁻¹	> 5 times a week
Fish and shellfish	> 28 g p ⁻¹ d ⁻¹	> 3 times a week
Chicken	> 29 g p ⁻¹ d ⁻¹	> 3 times a week
Red and processed meats	> 7 g p ⁻¹ d ⁻¹	> once a week
Ultra-processed foods	> 10 g p ⁻¹ d ⁻¹	> once a week
Added and free sugars and foods high in trans and saturated fats	> 31 g p ⁻¹ d ⁻¹	> once a week

Supplementary Material 3. Clinical history which will be uploaded to the mobile application

Table SM3.1 Initial Assessment Questionnaire

Clinic history				
General and sociodemographic data				
Last name:	Middle name:	Name:		
Cell phone:	Email:			
Age:	Date of Birth:			
Sex:	Country of birth:			
City of residence:	State of birth:			
Time living there:	Occupation			
Less than 1 month	Officer, director or boss			
1 to 6 months	Professional or technician			
6 to 12 months	Auxiliary worker in administrative activities			
1 to 3 years	Merchant, sales clerk, or sales agent			
3 to 6 years	Workers in personal and surveillance services			
6 to 9 years	Worker in agricultural, livestock, forestry, hunting or fishing activities			
10 years or more	Craft worker			
Lifetime	Industrial machinery operator, assemblers, chauffeur or transport driver			
	Workers in elementary and support activities			
Education				
Did not study	Student			
Unfinished primary	Unemployed			
Finished elementary school	Retired			
Unfinished high school	Other (specify):			
High school finished	Days a week that work			
Unfinished high school	1			
School completed	2			
Unfinished technical career	3			
Technical career finished	4			
Undergraduate student	5			
Unfinished degree	6			
Completed bachelor's degree	7			
Master's degree	Modality			
Doctorate	Face-to-face			
Specialty	Online			
Other:	Mixed			
Individual and family monthly income (pesos per month MXN)	Individual expenditure on food per month (MXN pesos)	Household expenditure on food per month (MXN pesos)	Feeding	
-0 - 2,699		0 - 500	Favorite foods	
2,7 - 0 - 6,799	-0 - 200	500 - 1,000		
6,8 - 0 - 11,599	2-0 - 500	1,000 - 3,000	Foods you don't like	
11,6 - 0 - 34,999	500 - 800	3,000 - 6,000		
35,000 - 84,999	800 - 1,000	6,000 - 9,000	Food allergies and intolerances	
+ 85,000	1,500- 2,000	10,0-0 - 13,000	Lactose	
	2,500 - 3,000	13,000 - 16,000	Seafood	
	3,000 - 3,500	16,000 - 20,000	Gluten	
	+ 4,000	+ 20,000	Fresas	
Diet and physical activity				
Main place of food purchase	Who cooks the food you eat?	Are you currently following a specific diet?		
Tianguis	Me		Nuts	
Market	Mother	Yes	Peanuts	
Retail supermarket (Soriana, Walmart)	Father	To lose weight		
Wholesale supermarket (Sam's, Costco)	Economic Kitchen	To gain weight		
Butcher shop	Restaurants	Ketogenic		
Creamery	I get it as a gift	Vegetarian (ovo-lacto, ovo or lacto)		
Fruit store	Others (specify):	Intermittent fasting		
Others (specify):		Vegan		
		Mediterranean		
		DASH or diet to stop hypertension		
		Others (specify):		

Table SM3.1 Continuation: Initial Assessment Questionnaire

Clinic history			
Physical activity			
Currently doing physical activity			Type of activity
Less than 3 times a week			Walking
3 or more days of vigorous activity of at least 20 minutes per day			Jogging
5 or more days of moderate to vigorous activity or walking at least 30 minutes per day			Run
3 days a week of very vigorous activity for at least 60 minutes a day			Aerobics, Zumba or dance
7 days a week of moderate to vigorous activity or even walking for at least 60 minutes per day			Cycling
Times a week		Type of activity	Swimming
1			Crossfit
2			Weightlifting
3			Multifunctional
4			Focused exercises (write which ones, e.g. sit-ups, sit-ups, push-ups)
5			Other:
6			
7			
Intensity		120	
Mild		150	
Moderate		180	
Intense		210	
		240 or more	
		Other:	
Anthropometric data			
Estimated weight for you:		Size in centimeters estimated by you:	
Height (centimeters):		Weight (kg):	BMI:
Fat percentage:		Muscle mass:	Body water:
Metabolic age:		Metabolic rate:	Visceral fat:
Waist circumference:		Hip circumference:	Bone mass:
Biochemical indicators		Clinical indicators	
Fasting glucose		Blood pressure	
Glucose 2 hours after eating		Acanthosis nigricans	
Triglycerides		Signs and symptoms of nutritional deficiencies	
Total cholesterol		Overall status	
LDL cholesterol		Very tired	
HDL cholesterol		Dizziness	
Gut microbiota		Very thirsty	
Gastrointestinal signs and symptoms			
Abdominal swelling		Frequent urination	
How often does it happen?		Very hungry	
Diarrhea		Do your feet or hands swell?	
How often does it happen?		What time of day does it occur?	
Constipation		How often does it happen?	
How often does it happen?		How many hours do you spend sitting a day?	
Reflux		How many hours do you spend standing a day?	
How often does it happen?		Nose bleed	
Abdominal swelling		How often does it happen?	
How often does it happen?		Red spots on your skin or bruises for no reason	
Nails		Hair	
Brittle nails		Hair loss	
Have you recently performed any cosmetic treatment on your nails?		Brittle hair Is your hair dyed or undergoing any cosmetic treatment?	

Table SM3.1 Continuation: Initial Assessment Questionnaire

Clinic history		
Signs and symptoms of nutritional deficiencies		
Mouth	Sueño	
Cuts at the corners of your mouth	How many hours do you sleep a day?	
How often does it happen?	Do you rest at night?	
Tongue swelling	Do you wake up during the night?	
How often does it happen?	How often does it happen?	
Gum inflammation	How many hours do you sleep a day?	
How often does it happen?	Do you rest at day?	
Solar exposition		
How many minutes do you expose yourself to the sun per day?	Do you cover your skin with long-sleeved clothing, pants, a cap or a hat?	
Less than 5 minutes	Always	
5 to 10 minutes	Sometimes	
10 to 15 minutes	Never	
15 to 20 minutes	Do you use sunscreen?	
20 to 30 minutes	Yes	
30 minutes to 1 hour	No	
More than 1 hour	How many days do you expose yourself to the sun per week?	
	1	
	2	
	3	
	4	
	5	
	6	
	7	
Lactation	Write for how long	
Exclusive breastfeeding		
Formula feeding (if you received only artificial milk as food)	Observations:	
Mixed breastfeeding (if in addition to breastfeeding you received any artificial milk)		
Supplemented breastfeeding (if non-dairy solid or liquid foods were received in addition to breastfeeding)		
Mixed supplemented breastfeeding (if it was a breastfed infant, who also received some artificial milk and solid or liquid foods)		
Complemented artificial feeding (if when breastfeeding you received artificial milk and solid or liquid foods)		
Festivities		
Please write the main holidays you celebrate and on the right side write the main foods you eat on these holidays		
Festivity	Food eaten on the holiday	
Hygiene habits		
How often do you take a bath?		
How many times do you brush your teeth a day?		
Is the street where you live paved?		
What type of flooring does your house have?		
Do you have pets? What type?		

Table SM3.1 Continuation: Initial Assessment Questionnaire

Table SM3.1 Continuation: Initial Assessment Questionnaire

24-hour reminder			
Food time	Menu / Preparation	Ingredient / Food	Quantity
Breakfast			
Hour:			
Place:			
Morning snack			
Hour:			
Place:			
Meal			
Hour:			
Place:			
Evening snack			
Hour:			
Place:			
Dinner			
Hour:			
Place:			
Milliliters of water consumed throughout the day:			

Table SM3.1 Continuation: Initial Assessment Questionnaire

Food frequency questionnaire																									
<p>For each food, indicate how many times per month or per week you consume it. Subsequently, indicate how many times a day you consume it, the day you take it. For example, if you drink 2 cups (480 milliliters) of whole milk 3 times a week and those 3 days you drink it in the morning and at night, you drink it 3 times a week and 2 times a day, in a quantity of 2 portions. It is also important to consider the summer/winter variation. For example, if you eat ice cream 4 times a week during the 3 summer months, your average consumption is 1 time a week.</p>																									
Group	Food	Portion	Type, brand, flavor or preparation	Average consumption last year							When you consume it, how many times a day do you do it? (Check 1 option per day)	Number of servings													
				Times a year			Times a month		Times a week			Times a day		(Mark how many servings you consume each time you eat it)											
				Never	1-5	6-11	1	2	3	1		2	3	4	5	6	7	1	2	3	4+	1/4	1/2	1	2
Dairy	1. Whole milk	1 cup (240 ml)																							
	2. Semi-skim milk	1 cup (240 ml)																							
	3. Skim milk	1 cup (240 ml)																							
	4. Almond milk	1 cup (240 ml)																							
	5. Soy milk	1 cup (240 ml)																							
	6. Coconut milk	1 cup (240 ml)																							
	7. Chocolate flavored milk	1 cup (240 ml)																							
	8. Packaged milk shake	1 cup (240 ml)																							
	9. Whole yogurt (sweetened with fruit)	1 cup (227 g)																							
	10. Low-fat yogurt	1 cup (240 g)																							
	11. Fermented milk drink	1 piece (80 g)																							
	12. Bionico cream (evaporated milk with cow cream)	½ cup (120 g)																							
Cheeses	13. Curd	3 tablespoons (42 g)																							
	14. Cottage cheese	3 tablespoons (48 g)																							
	15. Fresh cheese (not in quesadillas)	1 slice (40 g)																							
	15.1 Panela cheese (not in quesadillas)	1 slice (40 g)																							
	16. Cured cheeses consumed alone (manchego, oaxaca, asadero, mozzarella, cheddar, goat, parmesan, chihuahua), (not in quesadillas)	1 slice (30 g)																							
Animal source foods	17. Chicken eggs	1 piece (60 g)																							
	18. Egg white	2 pieces (66 g)																							
	19. Chicken with skin (chicken pieces except wings)	1 piece (200 g)																							
	20. Chicken without skin in pieces	1 piece (200 g)																							
	20.1 Grilled skinless chicken fillet	1 ration (90 g)																							
	21. Turkey	1 ration (108 g)																							
	21.1 Bunny	1 ration (90 g)																							
22. Beef steak or steak (stews, griddle)	1 ration (90 g)																								

Note: foods colored blue corresponds to those that will be included in the intervention program and correspond to those presented in Table A6.5, where the frequency and quantity of consumption to be promoted are specified. FCFQ adapted from: Lares-Michel, M.; Housni, F. E.; Aguilera Cervantes, V. G.; Michel Nava, R. M. Nutrieccology: A Mexican web-based nutritional ecologic software for the assessment of diet, dietary pattern, diet quality, and dietary environmental impact. Nutrients (under revision).

Supplementary Material 4. COM-B questionnaire including nutritional-sustainable knowledge questions

This questionnaire will be modified based on the issues addressed during the development of the program, as well as based on the execution of the pilot test, where multiple options will be established for data analysis. However, the format to be used and the questions determined so far are presented below, which incorporate the elements of the COM-B model, which include capacity, opportunity, and motivation (14). Likewise, questions on sustainable food consumption were integrated, according to the questionnaire by Verain et al. (62).

Table SM4.1. COM-B questionnaire including nutritional-sustainable knowledge questions

COM-B questionnaire						
Participant number:						
Date:						
COM-B dimension	Answer		Mark your answer	Explain your answer		
Capability						
Knowledge of general nutrition and sustainability						
Do you know which food groups exist?	Yes					
	No					
	If you know, write them down please.					
Do you know what foods contain carbohydrates?	Yes					
	No					
	If you know, write them down please.					
Do you know what foods contain fat?	Yes					
	No					
	If you know, write them down please.					
Do you know what foods contain protein?	Yes					
	No					
	If you know, write them down please.					
Did you know that the food you eat requires high amounts of water during its production?	Yes					
	No					
	Explain your answer please					
Did you know that the food you eat generates greenhouse gas emissions during its production, which promote climate change?	Yes					
	No					

	Explain your answer please	
What foods do you think use more water during their production?	Yes	
	No	
	If you know, write them down please.	
What foods do you think generate more greenhouse gas emissions during their production?	Yes	
	No	
	If you know, write them down please.	
Do you consider that the traditional Mexican diet is healthy?	Yes	
	No	
	Explain your answer please	
Do you consider that the tortilla is "fattening"?	Yes	
	No	
	Explain your answer please	
Do you consider that buying food in local markets or markets is frowned upon?	Yes	
	No	
	Explain your answer please	
Do you consider it a better option to buy your food in supermarkets than in local markets?	Yes	
	No	
	Explain your answer please	
If you knew all the environmental impacts of your diet, would you change it?	Yes	
	No	
	Explain your answer please	
Would you be willing to eat less red meat if you knew that it had a high environmental impact?	Yes	
	No	
	Explain your answer please	
Do you know what sustainable diets are?	Yes	
	No	
	Explain your answer please	
Specific nutrition and sustainability knowledge		
Aspect	Write your answer please	
Please mention the benefits of physical activity		
Mention what is the recommended amount of physical activity to perform per day		
Please mention the benefits of consuming a traditional Mexican diet		
Mention what is the recommended amount to consume of portions of Mexican food per day		
Please mention the benefits of consuming fruits and vegetables		
Mention what is the recommended amount to consume of servings of fruits and vegetables per day		
Please mention the benefits of consuming whole grains		
Mention what is the recommended amount to consume of servings of whole grains per day		
Please mention the benefits of consuming legumes		
Mention what is the recommended amount to consume portions of legumes per day		
Please mention the benefits of consuming seeds and healthy fats		
Mention what is the recommended amount to consume of portions of seeds and healthy fats per day		
Please mention the benefits of consuming dairy in adequate amounts		
Mention what is the recommended amount to consume of dairy portions per day		

Please mention the benefits of consuming eggs in adequate amounts	
Mention what is the recommended amount to consume of servings of eggs per day	
Please mention the benefits of consuming fish and shellfish in adequate amounts	
Mention what is the recommended amount to consume of portions of fish and shellfish per day	
Please mention the benefits of consuming chicken in adequate amounts	
Mention what is the recommended amount to consume chicken portions per day	
Please mention the benefits of avoiding red and processed meats	
Mention what is the recommended amount to consume of portions of red and processed meats	
Please mention the benefits of avoiding ultra-processed foods	
Mention what is the recommended amount to consume of portions of ultra-processed foods per day	
Please mention the benefits of avoiding added sugar, foods high in trans and saturated fats	
Mention what is the recommended amount to consume of portions of added sugar, foods high in trans and saturated fats	
Food preparation skills	
Do you know how to cook?	Yes / No
If the answer was yes, what foods do you know how to cook?	
Preparation capacity	
Does it have a kitchen equipped with a stove?	Yes / No
Does it have a kitchen equipped with a refrigerator?	Yes / No
Does it have a kitchen equipped with an oven?	Yes / No
Opportunity	
Time to eat	
How many minutes a day do you have for breakfast?	
How many minutes a day do you have to eat?	
How many minutes a day do you have for dinner?	
How many minutes a day do you have to consume snacks?	
Prepare food	
How many minutes a day do you have to prepare your breakfast?	
How many minutes a day do you have to prepare your food?	
How many minutes a day do you have to prepare your dinner?	
How many minutes a day do you have to prepare your snacks?	
Access to food	
Are there places selling fresh food (fruits, vegetables) near your home?	Yes / No / I do not know
Are there non-perishable food outlets near your home (beans, oatmeal, rice, crackers, etc.)?	Yes / No / I do not know
Food storage	
Do you have a refrigerator at home?	Yes / No
Do you have containers to store food (tupers)?	Yes / No
Motivation	
You want to change your eating habits	
Would you like to improve your eating habits?	Yes / No / I do not know
Would you like to eat healthier?	Yes / No / I do not know
Would you like to be a more physically active person?	Yes / No / I do not know
Emotions involved in your food consumption	

Do you eat more food or less food when you are sad, angry, or happy?	Please specify the emotion and the effect it has on your hunger and satiety					
Habits you are willing to change						
Please write down the eating habits that you would be willing to change, for example, eat more fruits and vegetables, eat less beef, etc.						
Reasons for sustainable food consumption						
Please write how important the following aspects are to you when you are going to consume food 1 is not very important and 5 is very important						
Animal welfare						
Produced without animals suffering	(Not very important)	1	2	3	4	5 (Very important)
Produced in an animal-friendly way	(Not very important)	1	2	3	4	5 (Very important)
It is produced respecting the rights of animals	(Not very important)	1	2	3	4	5 (Very important)
Produced with enough space for animals	(Not very important)	1	2	3	4	5 (Very important)
It is a free range or free range product	(Not very important)	1	2	3	4	5 (Very important)
Ethical concern						
Produced without exploitation	(Not very important)	1	2	3	4	5 (Very important)
Produced without child labor	(Not very important)	1	2	3	4	5 (Very important)
Traded fairly	(Not very important)	1	2	3	4	5 (Very important)
Environmental welfare						
Produced in an environmentally friendly way	(Not very important)	1	2	3	4	5 (Very important)
It is produced without disturbing the balance of nature	(Not very important)	1	2	3	4	5 (Very important)
Produced with minimal CO2 emissions	(Not very important)	1	2	3	4	5 (Very important)
It is packaged in an environmentally friendly way	(Not very important)	1	2	3	4	5 (Very important)
Local and seasonal						
It is a local/regional product	(Not very important)	1	2	3	4	5 (Very important)
It is a seasonal product	(Not very important)	1	2	3	4	5 (Very important)
It comes from nearby (short transport distance).	(Not very important)	1	2	3	4	5 (Very important)

Supplementary Material 5. Primers for bacteria identification in the qPCR analysis

Bacteria	Name	Primer (5'-3')	Number of bases	Sequence	Notes	Reference
Firmicutes	928F-Firm	Forward	21	5'-TGAAACTCAAAGGAATTGACG-3'	Y = C or T → C	
	1040FirmR	Reverse	17	5'-ACCATGCACCACCTGTC-3'		
Bacteroidetes	798cfbF	Forward	20	5'-CAAACAGGATTAGATACCT-3'	R = A or G → A	
	Cfb967R	Reverse	19	5'-GGTAAGGTTCTCGCGTAT-3'		(4,68)
Universal	926F	Forward	20	5'-AAACTCAAAGGAATTGACGG-3'	K = G or T → G	
	1062R	Reverse	18	5'-CTCACAAACACGAGCTGAC-3'	R = A or G → A	
<i>Lactobacillus</i>		Forward	19	5'-AGCAGTAGGGAATCTTCCA-3'		
		Reverse	17	5'-CACCGCTACACATGGAG-3'		
<i>Bifidobacterium</i>		Forward	18	5'-TCGCGTCCGGTGTGAAAG-3'	C	
		Reverse	17	5'-CCACATCCAGCATCCAC-3'	A	
<i>Faecalibacterium prausnitzii</i>	FPR-2F	Forward	19	5'-GGAGGAAGAAGGTCTTCGG-3'	Amplicon 248	
	Fprau645R	Reverse	21	5'-AATTCCGCCTACCTCTGCACT-3'		(73)
<i>Akkermansia muciniphila</i>		Forward	20	5'-CAGCACGTGAAGGTGGGGAC-3'		
		Reverse	20	5'-CCTTGCCTGGCTTCAGAT-3'		(74)
<i>Prevotella copri</i>		Forward	20	5'-CCGGACTCCTGCCCTGCAA-3'		
		Reverse	20	5'-GTTGCGCCAGGCAGTGCAT-3'		(75)
<i>Bilophila wadsworthia</i>		Forward	26	5'-CAACGTCCCCACCATCAAGTTCTTG-3'		
		Reverse	26	5'-TGAATTGCGGAAGGAGCGAGAGGTC-3'		(77)
<i>Clostridium coccoides</i>		Forward	19	5'-CGGTACCTGACTAAGAACG-3'	429 pb	
<i>(Eubacterium rectale</i> group and <i>Lachnospiraceae</i> family)		Reverse	19	5'-AGTTTCATTCTTGCAG-3'	429 pb	(48)
<i>Streptococcus thermophilus</i>	St1	Forward	22	5'-TTATTGAAAGGGCAATTGCT-3'	Posición: 195-216	
	St2	Reverse	21	5'-GTGAACCTTCCACTCTCACAC-3'	Posición: 474-454	(80)

Bases modified according to "Re: What are Y, M, W and D in primer design?", by A. Gund, Nadine, 2014. https://www.researchgate.net/post/What_are_Y_M_W_and_D_in_primer_design/538c1577d11b8ba27a8b45df/citation/download.

Supplementary Material 6. Adherence questionnaire

This questionnaire will be updated based on the food plans to be designed, so the recommendations provided, and the consumption of the population will be contrasted, after the pilot test of this study. However, the format to be used and the questions developed so far are presented below.

Table SM6.1. Questionnaire of adherence to the sustainable-psycho-nutritional program

Questionnaire of adherence to the sustainable-psycho-nutritional program								
Participant number:								
Date:								
Questions about food consumption	Times per week							Times per day
	1	2	3	4	5	6	7	
How many times a week do you eat foods that include corn?								
How many times a week do you eat foods that include amaranth?								
How many times a week do you eat fruit?								
How many times a week do you eat vegetables?								
How many times a week do you eat foods that include beans?								
How many times a week do you eat foods that include lentils?								
How many times a week do you eat foods that include canola, olive, or avocado oil?								
How many times a week do you eat foods that include milk?								
How many times a week do you eat foods that include cheese?								
How many times a week do you eat foods that include yogurt?								
How many times a week do you eat foods that include eggs?								
How many times a week do you eat foods that include fish or shellfish such as shrimp, octopus or crab?								
How many times a week do you eat foods that include chicken?								
How many times a week do you eat foods that include beef or red meat such as pork, lamb, and goat?								
How many times a week do you eat foods that include processed meats like ham and sausage?								
How many times a week do you consume soft drinks?								
How many times a week do you eat packaged (ultra-processed) foods?								
Question about consumption reasons	Answers							
Have you ever preferred to eat a particular food because of its environmental impact?	Yes	No	Explain your answer please:					
Have you ever preferred to eat a particular food because of its impact on health and nutrition?	Yes	No	Explain your answer please:					
From 1 to 10, how much would you say you consumed the meal plan that was provided to you?	Yes	No	Explain your answer please:					
Was there any food that you did not like and therefore did not consume it?	Yes	No	Explain your answer please:					

Informed consent for study participants:

Official title:

Sustainable-psycho-nutritional intervention program and its effects on water and carbon footprint, metabolic biomarkers, and gut microbiota in Mexican population: study protocol of a m-Health randomized clinical trial



Brief Title:

Sustainable-psycho-nutritional intervention program and its effects on health outcomes and the environment



Responsible institution:

Research Institute in Eating Behavior and Nutrition (Instituto de Investigaciones en Comportamiento Alimentario y Nutrición (IICAN), University Center of the South, University of Guadalajara. Address: Av. Enrique Arreola Silva 883, Col. Centro. Zip Code: 49000, Cd. Guzmán, Jalisco, México.

UNIVERSIDAD
DE GRANADA



Collaborating institutions:

Institute of Nutrition and Food Technology "José Mataix Verdú", Biomedical Research Center, University of Granada, Avenida del Conocimiento S/N. Parque Tecnológico de la Salud. Armilla, 18071 Granada, Spain



National Technological Institute of Mexico (Tecnológico Nacional de México, Campus Ciudad Guzmán)
Address: Avenida Tecnológico 100, Col. Centro. Zip Code: 49000. Ciudad Guzmán, México.



Zapotlán el Grande, Jalisco. Date: _____

By means of the present, I _____, I agree to participate in the research project entitled: **"Sustainable-psycho-nutritional intervention program and its effects on water and carbon footprint, metabolic biomarkers, and gut microbiota in Mexican population: study protocol of a m-Health randomized clinical trial"**. I am aware that the objective of this study is to design a sustainable-psycho-nutritional intervention program and evaluate its effect on biological and environmental indicators in the Mexican population. and that the information collected will be analyzed for non-profit research purposes which will lead to publications in scientific journals. In addition, I am aware that at no time will I receive financial remuneration for my participation.

I have been informed that my participation will consist of an evaluation of the following aspects. Anthropometric data: weight, height, waist and hip circumference. To do this I must take off my shoes and uncover my waist for less than 3 minutes. Biochemical data: blood sample and stool. For this, a specialist will take blood from my arm, so I will have to discover it and maintain a 12-hour overnight fast. Likewise, I will be given a sterile container to place a 3 cm³ stool sample that I could be asked to preserve at the fridge if I am not able to deliver it to the researcher as soon as I collected it. Clinical data: blood pressure measurement and superficial examination (e.g., face, neck, feet, hands), so I will uncover my left arm and allow the specialist to check my eyes, nails, hair, neck, and mouth, and, if necessary, the folds of my armpits. Dietary data: completion of dietary records and food frequency questionnaire. So, I will report the amounts of food I consume per day and on average per week, month, or year. I will be asked to write it down in paper, a mobile application, or a computer. Also, I may be asked to send photos of my food intake or uploaded into a mobile application. I am also aware that I will respond to a survey where I will provide sociodemographic and socioeconomic data, such as my educational level, my employment, a range of monthly income in Mexican pesos, among other data. In addition, I have been informed that I will have to use a mobile application that will help me improve my diet, both in relation to my nutrition and the environment. I know that the intervention in which I agree to participate will last 15 weeks, in which I will allow the extraction of blood and measurement of my weight, waist, and hip circumference on three occasions, as well as the visual physical examination and the taking of my blood pressure. I also know that I will deliver stool samples on a weekly basis, during the 15 weeks and that within the mobile application that I will use, I will be asked to record my food consumption on a daily basis, incorporating photographs and specifying the amounts of food consumed.

Additionally, I know that I may not be involved in the study but only evaluated. In addition, I know that the intervention, if it is part of it, will last 7 weeks, and additionally, there will be a 7-week follow-up period where I will be told whether or not I will be able to use the mobile application.

I know that the study will be carried out at the Centro Universitario del Sur, specifically at the Institute for Research in Eating Behavior and Nutrition (IICAN), as well as at the Laboratory of Biomedicine and Biotechnology for Health. In addition, it has been explained to me that my participation in this study is voluntary and I will not receive any financial compensation for it. However, I know that, if I wish, I will be able to obtain a

psycho-nutritional-sustainable diagnosis, and furthermore, with my participation I will benefit from obtaining nutritional counseling at the end of the intervention.

Finally, I confirm that I have been informed that the responsible researchers will maintain the confidentiality of my personal data based on the guidelines established by the Federal Law on Protection of Personal Data Held by Private Parties.

Therefore, I declare that:

1. I have read or had read to me the information provided.
2. I have had the opportunity to ask and all my doubts and questions have been satisfactorily clarified.
3. I voluntarily consent to participate in this research.
4. I understand that I have the right to withdraw at any time I choose without it affecting me in any way.
5. I have been informed that my refusal to participate will not cause me any problems.
6. I have been informed that the researchers undertake to answer any questions I may have during and after the data collection process.

7. I am aware that the main investigator will provide me with a diagnosis of my nutritional status and will provide me with nutritional guidance, if I wish.

8. I am aware that measurements will be taken on my waist and hips, so I will have to uncover my abdomen. In addition, I know that I will have to remove my shoes, socks and metallic accessories, including the belt, earrings, among other artifacts, when the main researcher of the study asked me to do so, before getting on the scale to be weighed and before being measured on the stadiometer.

9. I consent to a blood sample being taken and am aware that I will submit a stool sample on a weekly basis.

10. I agree to allow my blood pressure to be taken, visual examination of my neck, eyes, mouth, hair, nails and, if applicable, armpit folds. I also agree to fill in the questionnaires that the main researcher provides me, always answering as honestly as possible.

11. I agree to use a mobile application where I know that I will provide information, which will be confidential, but will help me improve my diet, both in relation to my nutrition and the environment. Likewise, and if I wish, I will be able to interact with other users within the mobile application and thus provide us with support.

12. I accept that my data will be used in this and future studies, where my identity will always be protected.

If you have doubts or queries regarding participation in this study, you can contact the researcher responsible for this study, Mtra. Mariana Lares Michel, who is a doctoral student at the Institute for Research in Eating Behavior and Nutrition (IICAN). Her contact details are as follows: Av. Enrique Arreola Silva 883, Centro, C.P. 49000, Cd. Guzmán, Jalisco, Mexico, telephone: 3411017629. email: mariana.lmichel@alumnos.udg.mx Also, you can contact Dr. Fatima Ezzahra Housni, who is the responsible researcher for this study at ClinicalTrials.gov. Her contact details are as follows: Av. Enrique Arreola Silva 883, Centro, C.P. 49000, Cd. Guzmán, Jalisco, Mexico, Tel.: (+52) 341 5752222 ext. 46142. email: fatima.housni@cusur.udg.mx

Sincerely
Place and date

Name and signature of the participant

Telephone: _____
Email: _____

Name and signature of the Witness 1: _____
Address and telephone: _____
Type of relationship with the participant: _____

Name and signature of the Witness 2: _____
Address and telephone: _____
Type of relationship with the participant: _____

I have explained to the participant the objective, justification and procedures of this research, as well as the risks and benefits that their participation implies. In turn, I have answered all the questions, doubts and clarifications that he has made me. Finally, I declare that I respect the guidelines and regulations corresponding to research on human beings.

Name and signature of the investigator

Name and signature of the applicator