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Study Design of the Maycoba Project: Obesity and Diabetes in Mexican Pimas

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Abstract

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Conflict of Interest Statement

The author(s) declare that they have no conflict interests.

Objective—To focus on the rationale and methods of the Maycoba Project.

Methods—Study population included Mexican Pima Indians (MPI) and Blancos aged 20-years, living in the village of Maycoba and surrounding area. Surveys in 1995 and 2010 included a medical history, biochemical and anthropometric measurements. Additionally, socioeconomic, physical activity, and dietary interviews were conducted. The 2010 study incorporated investigations on type 2 diabetes (T2D) and obesity-associated genetic alleles and human-environment changes.

Results—The study results are limited to demographic data and description of the eligible and examined sample.

Conclusions—This study may yield important information on T2D and obesity etiology in a traditional population exposed to environmental changes.

Keywords

type 2 diabetes; prevalence; environmental changes; Pima Indians

Diabetes and obesity are major public health concerns of the 21st century.^{1,2} Both type 2 diabetes (T2D) and obesity are generally believed to result from the interaction between genetic predisposition and environmentally associated lifestyle factors.^{3,4}

The Pima Indians in the US have the highest known prevalence and incidence of T2D in the world.⁵ In 1991, scientists from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), of the US National Institutes of Health who had investigated diabetes and obesity in the Arizona Pima Indians since 1965 approached investigators from the Centro de Investigación en Alimentación y Desarrollo, A.C. in Sonora, Mexico. The Mexican scientists had been involved in nutrition studies in the Sierra Madre Mountains, in Yécora, Sonora, since 1979, close to a group of Mexican Pimas dwelling in the villages of Maycoba, Sonora, and Yepachic (40 km from Maycoba) in the state of Chihuahua. In the village of Maycoba and surrounding areas live a similar number of individuals with no self-reported Indian heritage who call themselves “Blancos.” The investigators jointly decided to study the relative contributions of environmental and genetic factors in the etiology of obesity and diabetes among the Mexican Pima Indians and Blancos from Maycoba who share the same environment, and to compare their characteristics with those of the Arizona Pima.

It is uncertain how closely related the Mexican Pimas are to the Arizona Pimas; however, in 2004, based on DNA haplotypes, geneticists collaborating in our studies reported that the 2 Pima groups are not identical but cluster together and share common ancestry distinct from that of other Native Americans with a supporting bootstrap value of 95%. Such a high value indicates that the Arizona Pima and Mexican Pima Indians are relatively closely related to each other and probably share a similar gene pool.⁶

Before the 1990s the Mexican Pimas had not experienced great changes from their traditional lifestyle and nothing was known about prevalence rates of T2D and obesity. In October 1991, while the first paved road to reach the Maycoba community was being built,

we reported preliminary findings in 35 Mexican Pimas >18 years (16 male and 19 females), who had a mean BMI of 25 kg/ m² (range 17–36 kg/m²), a simple and monotonous diet low in fat and high in fiber, and a high physical activity level.⁷

In 1995 we conducted a cross-sectional epidemiological study to identify the effects of traditional and western environments on the prevalence of T2D and obesity in Mexican Pima Indians and Blancos from Maycoba, Sonora in Mexico and Pimas from Arizona in the US.^{8–15} Results from this study indicated that the age- and sex-adjusted prevalence of T2D in the Mexican Pima Indians (6.9%) was only one-fifth that in the Arizona Pima Indians (38%), but not statistically significantly different from that of Blancos (2.6%). Body mass index (BMI), waist and hip circumference, and percent body fat were similar in the Mexican Pima and Blanco men and women, respectively, but were markedly greater in the Arizona Pimas. Because the Arizona and Mexican Pimas share a similar gene pool, we concluded that the differences in prevalence of T2D and obesity were mainly due to differences in environmental factors.¹⁴

The Maycoba Project explores the relative importance of gene and environmental factors on obesity and DT2 development in Mexican Pima Indians and Blancos from Maycoba. A basic premise of this study is that in a transition from traditional to a more modernized lifestyle, Mexican Pimas, due to their genetic susceptibility, would exhibit a higher prevalence of diabetes and obesity than the Blancos of Maycoba after 15 years.

This paper describes the rationale, methods and response rates of the “Maycoba Project,” which allows us to examine changes occurring between 1995 and 2010 in the prevalence of obesity, T2D, and their risk factors including sociodemographic, diet, physical activity, anthropometric and body composition, blood pressure and biochemical characteristics, and to calculate the 15-year cumulative incidence of T2D and mortality. The 2010 study also incorporated additional genetic research to assess the frequencies of T2D and obesity-associated alleles, and ecological changes that have taken place in the region over the past 15 years.

METHODS

Aims and Objectives

The specific objectives of the Maycoba Project were to: (1) compare the current prevalence of T2D and obesity in Mexican Pima Indians and Blancos to that in 1995 as measured by weight, height, waist and hip circumference, body composition, oral glucose tolerance and HbA1c; (2) compare current diet and physical activity in both Mexican Pimas and Blancos to that in 1995; (3) assess changes in total energy expenditure in Mexican Pimas between 1995 and 2010; (4) document the frequencies of T2D and obesity-associated genetic variants in Mexican Pimas and Arizona Pimas, (5) document environmental changes that have taken place during the 15-year time span using ethnographic and geographic information system methodologies, and (6) assess total and cause specific mortality over the 15-year period since 1995 among the Mexican Pima Indians and Blancos eligible to participate in the 1995 survey.

Census and Participants Eligibility

The village of Maycoba is located in the mountains of northwest Mexico, in the eastern region of the state of Sonora, 340 km southeast of Hermosillo. It is located approximately 1530 meters above sea level with the coordinates N28 23.531 and W108 39.447.

The Maycoba census conducted in 1995, and updated in 2010, was used to establish ethnicity and identify the eligible survey population. Participants were considered full Pima if they reported that both their parents were full Pima and part Pima if only one parent was Pima.^{14,16} The Maycoba area residents who reported no parental Amerindian heritage were considered to be Blancos.

All people aged ≥ 20 years, currently living in Maycoba and the surrounding ranches (Maycobita, Agua Fría, El Encinal 1, El Encinal 2, Los Alisos, La mesa, La minita, Puerto la Cruz, Santa Rosa, El Kipor, Cieneguita, Tierra Panda, La Dura, Hacienda de Camilo, Arroyo Hondo, El Llano, El Tabaco, El Carrizo, and Los Pilares) were invited to participate in the 2010 survey.

Survey Examinations

Field staff members of the “Maycoba Project” were trained based on a manual of operations developed for the 1995 study and updated in 2010. The day before the health examinations, participants were instructed about the conditions required prior to the collection of biological samples and measurements. Participants arrived at the clinic, at 7:00 a.m. in the morning after a 10–12 hour fast including coffee, alcohol or any other beverage. Examinations were done at our research clinic located in the village of El Kipor, 10 km east of Maycoba (Figure 1). They included a medical history and socioeconomic questionnaires, anthropometric measurements, dietary and physical activity questionnaires, biochemical and gene analysis, as well as ethnographic and geographic information.

Medical history and socioeconomic questionnaires—Basic health status, current use of medications, smoking habits, pregnancy status, and dental information were recorded in the medical history questionnaire. A socioeconomic questionnaire was designed to investigate the importance of new conditions and programs, such as governmental aid (Oportunidades, Seguro Popular, Setenta y Más, Procampo, Proarbol, and others), speaking Pima language, Spanish writing/reading and level of education. Also access to vehicles, electric power, electric appliances, other sources of income, education, marital status, source of drinking water, land possession, new sources of employment, type of housing were determined.

Anthropometric and clinical measurements—**Weight** was measured on a battery-operated electronic scale and height by a stadiometer (Holtain LTD, Germany). Body mass index (BMI) was calculated by dividing weight in kilograms by the square of height in meters. Participants were classified as obese if BMI was $\geq 30 \text{ kg/m}^2$ and overweight if $25 < \text{BMI} < 30 \text{ kg/m}^2$.¹⁷ Waist was measured in the supine position at the level of the umbilicus and hip circumference was measured in the standing position at the level of the greater trochanters. Central obesity was assessed by waist circumference (≥ 102 for men and ≥ 88

for women).¹⁸ Percent body fat was estimated from bioelectrical impedance (BIA-103, RJL Systems Detroit, MI) using an equation developed for the Arizona Pima Indians.¹⁹ Blood pressure was measured in resting conditions with a Professional Digital Blood Pressure Monitor (Omron, HEM-907XL IntelliSense, USA) according to the manufacturer's instructions.

Dietary patterns—A single 24-hour dietary recall questionnaire was administered to 489 participants (Mexican Pimas and Blancos) at their homes. To permit analysis of the dietary data, a food database was updated with regional foods and new products found in stores and ambulant vendors. To calculate the amount of nutrients and energy contained in each food, we used the protocol proposed by Ortega et al.²⁰ To determine the reproducibility of the dietary recall, 60 participants were administered a repeated 24-hour recall within a 3-month period, but not in less than 3 weeks of the initial recall.

Physical Activity and Energy Expenditure

Physical activity questionnaire—Physical activity was assessed by a questionnaire designed to evaluate weekly occupational and leisure activities over the past year.²¹ The questionnaire had been previously adapted for the Mexican Pima and Blanco populations.¹² An estimate of the individual's activity level was expressed as hours per week and as metabolic equivalents (METs) per week averaged for occupational and leisure activities over the past year. Reliability testing consisted of administering the questionnaire twice to the same individual, 3 weeks apart (N = 25). The calculations of physical activity were done in the same manner as in the 1995 study.^{12,21}

Total energy expenditure (TEE) measured by the doubly labelled water method (DLW)—A sub-set of 52 male and female full Pima participants, 26 of whom were followed-up from the 1995 TEE study and 26 new participants matched by age and sex to the participants in 1995 TEE study, were selected for measurement of TEE. TEE was measured using doubly labelled water as previously described.²² The ingested dose was a 1:20 mixture of 99.9% ²H₂O and 10% H₂¹⁸O (Cambridge Isotope Laboratories Inc., Andover, MA) and was administered as 1.9 g/kg and 2.1 g/kg of total body weight for females and males, respectively. Complete urine collections were made at ~1.5 (discarded), 3.0 and 4.5 hours after dosing on day 1, and twice during a 4-hour period 7 days later. The disappearance rates of the stable isotopes were determined as previously described.²³ and energy expenditure was calculated from CO₂ production using a food quotient as in the 1995 study.¹²

Resting metabolic rate (RMR) by indirect calorimetry—After resting comfortably on a bed for 10 minutes, a measurement of the resting metabolic rate (RMR) was initiated, using a Deltatrac metabolic cart (Sensor Medics Corp, Yorba Linda, CA) as previously described.⁸ Gas exchange flows were corrected to standard temperature and pressure dry values (STPD). In addition, alcohol combustion burns were performed each day of RMR measurements. During the alcohol burns, the average Deltatrac barometric pressure was 640 ± 1.5mm Hg. According to gas recoveries (expected CO₂ production and O₂ consumption

calculated from the amount of alcohol burned), oxygen and carbon dioxide values were multiplied by 1.113 and 0.942 respectively.

Biological Samples and Biochemical Measurements

A fasting blood sample (22 ml) was drawn for serum lipids, creatinine, insulin, plasma glucose and DNA analysis. Hemoglobin HbA1c was measured in a whole blood sample (HbA1c Capillary collection System, BIO-RAD 270-2167). Hematocrit was measured *in situ* using the gold standard method (DIN 58933-1). Oral glucose tolerance tests were performed using a 75-gram glucose load after a 10–12 hour fast according to World Health Organization recommendations.¹⁷ An additional blood sample (12 ml) was collected 2-hours post-load for plasma glucose and serum insulin analyses.

Except for the samples used for hematocrit and HbA1c analysis, all blood samples were separated by spinning at 2400 RPM for 10 minutes in a refrigerated centrifuge. Urine samples were collected both for analysis *in situ* using a Uristick (Spinreact Urine 10) and for albumin and creatinine analysis to determine urinary albumin/creatinine ratio (Kinetic Jaffe reaction). Biochemical analyses were conducted at the Phoenix Epidemiology and Clinical Research Branch (PECRB). Identical methods and measurements were used in the both surveys. Deuterium [^2H] and oxygen-18 (^{18}O) determinations were performed at the Pennington Biomedical Research Center in Baton Rouge, LA.

Plasma glucose concentrations were measured using the glucose hexokinase method (Ciba Corning Express, Norwood, MA). T2D and impaired glucose homeostasis (impaired fasting glucose and impaired glucose tolerance) were defined according to the American Diabetes Association criteria.²⁴ Plasma insulin concentrations were determined using an automated RIA analyzer (Concept 4; INC Biomedicals, Horsham, PA). Triglycerides and total cholesterol were measured by enzymatic methods.^{25,26} HDL cholesterol was determined using the magnesium chloride precipitation method²⁷ and creatinine by Kinetic Jaffe reaction.

Frequencies of T2D and Obesity Associated Genetic Variants

We plan to examine the differences at loci that are likely to play a role in T2D and obesity. To determine the similarities and differences in genetic susceptibility to T2D and obesity between the Arizona and Mexican Pimas and Blancos we will:

1. Among the full heritage Mexican Pimas and Blancos, determine allele frequencies of the specific gene variants [single nucleotide polymorphisms (SNPs)] that have already been established as being associated with diabetes and obesity among Caucasians and other populations, eg, known diabetes-associated variants in the genes TCF7L2, PPARG, KCNJ11, HHEX, SLC30A8, IGF2BP2, CDKAL1, CDKN2A/B, and FTO.
2. Determine among full heritage Mexican Pima Indians and Blancos the allele frequencies of other novel SNPs that are strongly associated with either T2D and/or obesity in the Arizona Pima but which have not yet been established as diabetes and/or obesity susceptibility conferring

variants in other populations.^{28–30} There are a number of SNPs that show strong associations with either T2D or obesity in the Arizona Pimas, many of which have not been reported as associated in other populations: SIM1 (rs3213541),³¹ ACAD10 (rs659964),³² MAP2K3 (rs11652094)³⁰ and TREH (rs558907).³³

3. Determine the extent of non-American Indian admixture in the putatively full blood Mexican Pima Indians by analysis of ancestry informative markers in the Mexican Pimas.
4. Determine the extent of American Indian admixture among the Blancos by analysis of Amerindian ancestry informative markers.

Genotyping will be done using BeadXpress system (Illumina, San Diego, CA). Allele frequencies in each group (Arizona Pimas, Mexican Pimas and Blancos) will be calculated using maximum likelihood methods. If necessary, to account for known familial relationships, the ILLINK program of the LINKAGE package will be used.³⁴ To compare Arizona Pimas and Mexican Pimas, the frequency will be estimated in each group separately and the statistical significance of the difference in allele frequency will be determined.³⁵

Mortality Study

The aim of this sub-study was to assess total and cause specific mortality rates during the 15-year period (1995 to 2010) among the Pima Indian and Blanco participants and non-participants in the 1995 baseline survey from the community of Maycoba.

Information regarding cause-specific mortality was ascertained using a specially designed questionnaire that was administered to the nearest relatives of people who died during the period (verbal autopsy). The questionnaire was adapted from the one used in the GOCADAN study.³⁶ The information was supplemented with a copy of the death certificate.

Qualitative Human-environment Assessment

Focus groups, participant observation, surveys of the Maycoba stores, and surveys of different households were used to gain insight about attitudes, beliefs, and behaviors relating to lifestyle activities, the food environment, health, and changes in the community since the 1995 study. Two investigators trained in qualitative methods, conducted 5 focus group discussions with key informants (groups 1 and 2) and community members (groups 3 through 5). In the first 2 focus groups, participants discussed cultivation and acquisition of food, physical activities, health, and changes in the Maycoba region in the past 15 years. The last 3 focus groups discussed diabetes, ethnicity, and ethnomedical constructs. These investigators also visited homes and stores as part of the participant observation method.

The participant observation data consist of ethnographic information that is used to corroborate and to explain some of the findings from the other more objective methods used in the study.

Using census data, households eligible for the survey were randomly selected from separate Pimas and Blancos households with an individual aged of 35 years or over who had lived in the area since 1995. Five local interviewers were trained to conduct the surveys.

GIS-RS Human-environment Assessment

The land-use and land-cover (LULC) in Maycoba and surrounding settlements were assessed using geographic information systems and remote sensing analysis (GIS-RS). GIS-RS was used to determine land-use change and land-cover between 1994 and 2007 in the study region. The analysis focused on whether there have been transitions in agricultural land-use and urbanization that would be consistent with a more sedentary lifestyle.

The analysis used aerial photographs from 1994 and high spatial resolution satellite images from 2007 to produce LULC maps. Land-use changes were assessed by creating land-use categories and maps from the 1994 aerial photographs and 2007 satellite images using ArcGIS 10 (ESRI). Land-cover categories were created and analyzed from the 2007 satellite images. Creating land-cover maps included the following steps: image co-registration, mosaic, supervised classification, and accuracy assessment. These analyses were performed in ERDAS Imagine 2010 (Hexagone-Intergraph).³⁷ Three variables from the land-use change analysis were examined further as proxies for lifestyle change: urban development, dwelling unit density, and variation in the road network. Fieldwork was conducted to validate the LULC analysis findings.

Individual Notification of Results and Health Examination

Some feedback was provided at the time of testing, and some participants, such as those with high blood pressure or abnormal glucose values, were referred immediately to the appropriate local healthcare provider or advised to seek treatment inside or outside the community. Participants received information on height, weight, body mass index, waist circumference, hematocrit, and fasting and 2-hour blood glucose values as well as urine analysis results, along with a description of what the test or measurement indicated the range of normal values and a comment on the scores. Additional results included serum cholesterol, triglycerides, and urine albumin-creatinine ratio (ACR), as well as HbA1c and confirmatory glucose values measured with the glucose hexokinase method analyzed at PECRB laboratories. All participants with T2D, glucose intolerance and severe dyslipidemia were evaluated at the clinic by a physician. In those individuals diagnosed with T2D, a clinical examination that included eyes and feet was conducted. Medical advice was given to participants by the project's physician and dietary and lifestyle recommendations by a nutrition expert.

Data Management and Statistical Methods

Standardized operating procedures for data collection, processing and analysis were adapted from related studies in the Arizona Pima Indians and the 1995 baseline cross-sectional study.¹⁴ Data were entered onto the electronic forms and transmitted to NAU for inclusion in the study data base. A back-up was kept in secure password-protected electronic files with access available to authorized individuals at CIAD, NAU and PECRB. Personally identifying information was not included in the working analysis files.

Statistical analysis will be performed using the Stata software version 11.1 (Stata Corporation, College Station, TX) or SAS software version 9.1 (SAS Institute). Techniques will vary according to the specific analysis, but will include basic statistical descriptions as well as multivariate linear and logistic regression.

RESULTS

Census

In the 1995 census, 1166 individuals were enumerated in the community of Maycoba and surrounding areas (667 Pimas, 492 Blancos and 7 from other tribes). The proportions of men and women in the overall population were 53% and 47% respectively. After analyzing only Blancos and Pimas (N = 1159), 604 individuals were classified as under 20 years of age (379 Pimas and 225 Blancos) and 555 individuals aged 20 years and older (288 Pimas and 267 Blancos) who were eligible for the survey. Of the 288 eligible Pima, 54% were men and 46% were women. Of the 267 eligible Blancos, 56% were men and 44% were women. Of the eligible Pima population, 50% lived in Maycoba and 50% inhabited the neighboring areas. Conversely, most of the Blancos eligible lived in Maycoba village (92%) and few lived in the surrounding areas (8%).

According to the 2010 census, 1270 individuals reside in the community of Maycoba and surrounding areas (821 Pimas, 442 Blancos and 7 from other tribes). The proportions of men and women in the population were 52% and 48% respectively. After analyzing only Blancos and Pimas (N = 1263), 543 individuals were classified as under 20 years of age (404 Pimas and 139 Blancos) and 720 individuals aged 20 years and older (417 Pimas and 303 Blancos) who were eligible for the survey. Of the 417 eligible Pima, 52% were men and 48% were women. Of the 303 eligible Blancos, 54% were men and 46% were women (Table 1). Similar results were found in men and women.

Compared with Blancos, the proportions of eligible Pima Indians were similar in the 35–44 and 45–54 age groups in both men and women.

Of the eligible Pima population, 48% lived in Maycoba and 52% inhabited the neighboring areas. In the case of Blancos, 96% lived in Maycoba village and 4% in the surrounding areas.

Study Participants

Cross-sectional study—In the 1995 baseline study, 417 of 555 eligible subjects were included in the survey (225 Pimas and 192 Blancos).¹⁴ From August 2010 to April 2011, 604 of 720 eligible subjects were included in the survey. Participation rates in Pima Indians and Blancos were 85% and 83% respectively (Figure 2). Participation rates were 77% vs 93% for men and women in Pima Indians and 78% vs 88% in Blancos. Table 2 shows the distribution of Pima and Blanco study participants by age and sex.

Longitudinal follow-up study—Of 417 Pimas and Blancos included in the 1995 survey, 54 had died during the 15-year interval (1995–2010), 89 had moved out of Maycoba, and 274 remained in the Maycoba region (162 Pimas and 112 Blancos). Of eligible Pimas and

Blancos studied in 1995 and still residing in the area (N = 274), 258 were re-examined in 2010. Participation rates in the longitudinal component of the study, based on 274 subjects still living in Maycoba, were 95% in Pima Indians and 93% in Blancos respectively (Figure 2). Response rates were 95% for both women and men among Pima Indians; for Blancos, 94% of the respondents were women and 92% were men.

Energy Expenditure Sub-study

For the total energy expenditure study we included 52 Pima participants; twenty-six participants who took part in the 1995 TEE study and 26 new participants matched by age and sex to participants in the 1995 TEE study. There was 100% participation in this sub-study.

DISCUSSION

The Maycoba Project is a research study with both cross-sectional and longitudinal components. The 2010 population census, recruitment process, fieldwork, and analyses of the blood and urine samples have been completed. DNA analysis, data management and statistical analysis to examine the main hypotheses are ongoing.

The cross-sectional component of the study will permit the assessment of changes in the age- and age and sex-adjusted prevalence of T2D and obesity among Mexican Pimas and Blancos over the 15-year period between 1995 and 2010. Similarly, comparisons will be made to identify changes in other factors related to T2D such as diet, physical activity, hypertension, lipids, etc.

Frequencies of T2D and obesity-associated genetic variants will be determined and compared among the Mexican Pima and Blancos, and among a random sample of 400 Arizona Pimas. Determining the degree of genetic admixture among the Mexican Pima and the Blancos may allow inferences concerning the extent to which any differences in the prevalence of diabetes and obesity can be attributed to differences in ancestry.

Ecological changes that have taken place in the region over the past 15 years, and a community perspective on these changes was also measured in the 2010 study and part of these results are already published.^{37,38} The focus groups organized during the ethnographic study were composed of 6–10 participants. These groups included both sexes and were representative of the community of Maycoba.³⁸

The longitudinal component of the study will allow calculation of the age- and sex-specific standardized cumulative incidence rates of diabetes and obesity and assessment of the extent that baseline factors and exposure to changing environmental factors are related to the development of obesity and T2D. Therefore, the study will provide information on the relative importance of changes in physical activity, changes in diet, changes in body mass and exposure to other environmental factors in determining differences in outcome of diabetes and obesity in the Maycoba population.

Strengths and Limitations

In general, we achieved a good response rates in the 2010 cross-sectional study in both Pimas and Blancos 20 years of age - 85% and 83% respectively. A limitation of the study is that in the longitudinal component, whereas responses rates were high (94%) among those who had remained in the community, a considerable proportion of the 1995 survey respondents had died (13%) or migrated from the area (21%) and were not accessible for re-examination. This may lead to bias in the incidence rates we can estimate.

The high response rates can be related to various factors. Our research group started the work in the Maycoba community during the period of 1991 to 1993. After the 1995 study was completed, we remained in contact with the personnel from the local health clinic in Maycoba. As a service to the community, we visited all participants diagnosed with impaired glucose tolerance and T2D to evaluate the direct and collateral effects of the disease as well as the use of T2D medications. The group also kept in close contact with the community through multiple trips to the community to organize a variety of documentaries. An additional key factor that allowed us to have high participation rates was that for the 2010 survey we incorporated one of the local health providers into the survey team as a recruiter, which increased confidence of the Maycoba population in the purpose and goals of the study.

Human Subjects Statement

The study was approved by the Institutional Review Boards for the Protection of Humans Subjects of the Northern Arizona University (NAU), the Centro de Investigación en Alimentación y Desarrollo in Hermosillo, México, and the National Institute of Diabetes and Digestive and Kidney Diseases.

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Figure 1.
Images of the Clinic in el Kipor at Maycoba Where the Examinations Were Conducted

Figure 2.
Overview of the Maycoba Project

Table 1

Distribution of Eligible Population by Ethnicity, Age-group and Sex According to 2010 Maycoba Census (N = 720)

Age group (years)	Pima (N = 417)		Blancos (N = 303)	
	Women N (%)	Men N (%)	Women N (%)	Men N (%)
20–24.9	36 (17.8)	41 (19.1)	19 (13.7)	17 (10.4)
25–34.9	68 (33.7)	69 (32.1)	34 (24.4)	44 (26.8)
35–4.9	39 (19.3)	46 (21.4)	31 (22.3)	42 (25.6)
45–4.9	30 (14.9)	21 (9.8)	23 (16.6)	23 (14.0)
55	29 (14.3)	38 (17.6)	32 (23.0)	38 (23.2)
Total	202 (100)	215 (100)	139 (100)	164 (100)

Table 2

Distribution of the Examined Sample in 2010 by Ethnicity, Sex and Age-group (N = 604)

Age group (years)	Pima (N = 354)		Blancos (N = 250)	
	Women N (%)	Men N (%)	Women N (%)	Men N (%)
20–24.9	29 (15.4)	30 (18.1)	18 (14.8)	15 (11.7)
25–34.9	65 (34.6)	47 (28.3)	28 (23.0)	26 (20.3)
35–44.9	37 (19.7)	37 (22.3)	28 (23.0)	34 (26.6)
45–54.9	29 (15.4)	20 (12.0)	23 (18.7)	17 (13.3)
55	28 (14.9)	32 (19.3)	25 (20.5)	36 (28.1)
Total	188 (100)	166 (100)	122 (100)	128 (100)