

# GENERAL URBAN METHODOLOGY NOTE

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Introduction  
Evaluation design  
Sampling method  
Comparison groups  
Data collection  
Encelurb 2002 (Baseline)  
Encelurb 2003 (First panel)  
Encelurb 2004 (Second panel)  
Data entry  
Organizing the databases included in the website  
Key variables  
Proposal for the analysis strategies  
References

## 1. Introduction

The Oportunidades Human Development program, a Program of the Executive branch of the Federal Government, has the main purpose of promoting and reinforcing the capacities and potential of families living in high social deprivation conditions, and empowering these families to improve their standards of living and partake in national development. Oportunidades addresses three fundamental factors – nutrition, health, and education- to attain its objectives. Oportunidades was launched in 1997 under the name PROGRESA (for the Spanish abbreviation of Education, Health and Nutrition Program) in highly deprived rural areas. Since then, it has gradually extended its coverage. In 2002 Oportunidades coverage extended to cover extremely deprived households in urban localities with populations of 50,000 to 1 million inhabitants, covering to date more than five million households nationwide.

From inception of the Program's operations it was deemed necessary to assess its performance as well as its impact on the living conditions of participating families. The extension of the Oportunidades Program's coverage to urban areas implied the necessity of periodically evaluating its impacts. To this end, the Ministry of Social Development, through the Coordination of the Oportunidades National Human Development Program, has signed several agreements with the National Institute of Public Health to collaborate in the evaluation of the Oportunidades Program's impact in urban areas, with the objective of combining efforts for data collection of the Urban Household Evaluation (Encelurb, for the abbreviation in Spanish) 2002, 2003, and 2004 Surveys, data entry, and coordination of the various tasks of the evaluation group. In addition, an Evaluation Advisory Group of internationally renowned researchers was assembled, to establish the evaluation technical and methodological guidelines.

The importance of the evaluation of Oportunidades in urban areas lies in that it will determine whether the intervention is producing the expected benefits in these areas<sup>1,2</sup> and whether the benefits are similar to those already documented in rural areas<sup>3</sup>. Furthermore, since the ultimate purpose of Oportunidades is to “boost the capacities of households living in deprivation conditions so that they may attain a higher quality of life on their own effort and initiative”, the impact evaluation is expected to provide an answer to the following questions: 1) Has the program had an impact on some indicators related to the wellbeing of the beneficiary population?; 2) Are the impacts on the beneficiaries indeed attributable to the intervention of the Program?.

While measuring the effect of Oportunidades on poverty reduction is supposed to be a long-term task, it is also a continuous process in which short-term measurements will only reflect the impact on a few selected indicators. These indicators reflect education, health, and nutrition conditions that are part of the causal pathway underlying poverty. The present methodological note describes the general evaluation design in urban areas, as well as the sampling methods, the data collection and entry procedures, and the structure and management of the databases generated for this evaluation. In addition, some strategies are suggested for data analysis according to the general structure of data collection. This document provides a general framework to facilitate the analysis of the databases from the evaluation of Oportunidades in urban areas.

## 2. Evaluation design

The greatest challenge faced by Oportunidades evaluation was to generate data indicative of whether the observed changes were attributable to the Program, as well as to separate these changes from those that could be produced by other social factors that also have an effect on poverty. To meet this challenge, two scenarios may be ideally constructed: one showing the changes brought about by Oportunidades, and another for counter-factual comparison,<sup>4,5,6,7,8</sup> to show what would have happened to the same population of beneficiaries, in an identical setting, but without the Program. By analyzing these two scenarios it would be possible to estimate the impact of Oportunidades by direct comparison. However, this comparison is not feasible because it is not possible to simultaneously observe the same participants with and without the benefits of the Program.

The fact that it is impossible to observe the counter-factual setting has been addressed in different ways, all involving hypothetical situations to allow estimating what would have happened in identical conditions, but without the Program. Evaluators often estimate the impact of programs by comparing the changes observed in the Program beneficiaries group with the changes observed in another group. The group of non-beneficiaries is thought to yield empirical information on what would have happened in the absence of the Program. Therefore it is a simulation of the counter-factual setting, which can be valid if it fulfills the principle of exchangeability.<sup>4,7</sup> In other words, if the condition of intervention or non-intervention were to be exchanged between the groups to be evaluated, they should show exactly the same expected result. That is to say that the populations are similar and that the observed differences can only be a product of the effect of the Program. This principle makes it necessary to assess the counter-factual scenario in a group that is as similar as possible to the group that receives the benefits from the Program; thus the definition of this control or counter-factual group is essential to obtain valid results.

Experimental evaluation designs randomly assign individuals or other sampling units to either an intervention or a control group. Therefore all participants have the same known probability of being allocated either to the intervention group or the control group<sup>9</sup>. Using random allocation it is possible to suppose that there will be no differences between groups. Should there be any difference, it will be due to random chance, not to bias. This is why experimental designs are considered to best meet the principle of exchangeability and the most reliable and powerful study designs, from the statistical point of view, for the evaluation of social programs.

When random allocation is not possible due to ethics, financial, or practical reasons, the alternative is to assemble a comparison group as similar as possible to the group that is benefiting from the Program in terms of the observable characteristics, and thus maximize the exchangeability principle. This can be done using matching or equalization of characteristics methods,<sup>10,11</sup> with the purpose of assembling very similar groups. These groups should be similar to those obtained by random allocation. One drawback is that the degree of similarity can only be assessed with relation to the observed variables or the measurable variables. With random allocation, on the other hand, it is possible to assume comparability even with relation to unobserved variables.

Unlike the evaluation design for Oportunidades used in rural areas<sup>12</sup>, and guided by ethical, practical, and operational considerations, a non-randomized, observational or quasi-experimental design was opted for in urban areas, based on the incorporation plan defined by the Program leaders.

To define the incorporation plan of the Program in urban areas, Program executors had to identify the level of social deprivation in each urban area with populations of fifty thousand to one million inhabitants. In this task the information used was mainly from the National Income and Expenditure of Households Survey 2000 (ENIGH 2000, for its initials in Spanish) to carry out a discriminant analysis model with demographic and socioeconomic data from households. This exercise sought to estimate a poverty index or score with weighting associated with the variables included in the model. The weighting of the discriminant model, as well as the cutoff value for categorizing households as eligible (poor) and non-eligible (not poor) to become Program beneficiaries were handed over to the National Institute for Statistics, Geography and Informatics (INEGI, for its initials in Spanish). This institution applied these values to the entire national population using the data from the 2000 Census. After INEGI classified all households from the census as either eligible or non-eligible, the data were aggregated to the street block level (block of households) and these data were returned to the Program executors to plan the incorporation phases. It should be noted that cities such as Mexico City, Puebla, Guadalajara, and Monterrey, that have a population greater

than one million households, were excluded from the Program coverage expansion, as well as rural and semi-urban localities that were already included in the Program.

The data obtained on the street block level were used to form coverage areas or clusters composed of locality and coverage or influence area. Areas with 500 or more eligible households were considered for inclusion in the Program in 2002. The remaining areas would be considered afterwards in an inclusion plan according to availability of financial resources.

A promotion campaign through different media<sup>i</sup> was implemented in zones where inclusion was projected in 2002. The population received information about the Program, eligibility rules, and how to apply for becoming a Program beneficiary. Applications were received through service modules strategically located within the service zone during July and August 2002. Households that applied for inclusion had to undergo several evaluation stages before enrollment. Potential eligibility was assessed on the first visit to the module. Data provided by the applicants regarding some socioeconomic characteristics were used to construct (by computer) an instant social deprivation score. Households that passed this stage were scheduled for a home visit to verify the truthfulness of the information provided. During this visit they answered another questionnaire on the same socioeconomic characteristics. This questionnaire was processed at the service module to reassess their eligibility status. The final verdict was announced at the registration module. Eligible households were considered for inclusion in Oportunidades. When persons from eligible households did not return to the module to find out the verdict, or if they returned at a later date, they were not included. The service modules ended their operations in late August 2002. It should be mentioned that households received their first cash payment after going to the health clinic and enrolling the children in a school.

As mentioned above, for evaluation purposes the described inclusion plan was used to identify intervention (programmed to be included in 2002) and non-intervention zones (programmed for inclusion in 2004). The study population was finally made up of a sample of resident households.

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<sup>i</sup> The media used for promotion varied from locality to locality. The decision about the promotion strategy was made by the State Directorates of the Program, in collaboration with the local authorities.

## 2.1. Sampling method

The Evaluation Advisory Group was concerned about accruing a sample size to test the main hypotheses of the study. In this sense, and based on a previous analysis of statistical power, it was found that statistically significant differences (of less than 0.2 standard deviations for some result variables) could be found if the sample consisted of more than 100 street blocks with at least 3 eligible households each.

These calculations yielded a sample size in intervention zones of 6000 eligible households enrolled in the Program, 2000 eligible but not incorporated households, 4000 almost eligible households (households with a deprivation score slightly lower than the cutoff point determining eligibility) and 2000 non-eligible households.

The point of classifying households by their eligibility condition was to identify different comparison groups to enrich the analysis. Since included households are, by definition, eligible households (defined by a poverty score), the comparison groups necessary to estimate the effect of the intervention were eligible resident households in intervention areas and eligible resident households in non-intervention areas. The purpose of including almost eligible households was to extract the maximum potential of the study. The cutoff point defining eligibility or non-eligibility to the program would make it possible to test an alternative evaluation design through discontinuous regression analysis assuming the non-comparability of the groups. The group of non-eligible households was formed to assess the efficacy of focalization of the Program in urban areas.

### Intervention Zones

After the sample size was defined, and using information from the 2000 Census, 149 street blocks were selected by a probabilistic method through single-stage, stratified and cluster sampling (Table I). To obtain the necessary sample sizes of eligible, almost eligible, and non-eligible households, street blocks were selected with a probability proportional to the number of eligible resident households in them. To this end, 6 strata of street blocks were formed using the Tore Dalenius<sup>13</sup> procedure as a function of the number of eligible households to be included in Oportunidades. In this way dispersion and sample size control were attained. Street blocks with 50 or more eligible households were included with certainty (all were included) in the sample (see Figure 1). Street blocks with no eligible households were excluded from the sample frame. In this way selected households in intervention zones were distributed among 17 states (Campeche, Colima, Chiapas, Guanajuato, Guerrero, Hidalgo, Mexico State,

Michoacán, Morelos, Puebla, San Luís Potosí, Sinaloa, Sonora, Tabasco, Tamaulipas, Tlaxcala, and Veracruz), in 62 municipalities and 71 localities.

Table I. Sample size of street blocks by stratum

Stratum	Number of eligible households per street block	Number of eligible households in the stratum	Street blocks sample in the stratum
1	Street blocks with 1 and 2 households	122,885	5
2	Street blocks with 3 to 5 households	156,025	5
3	Street blocks with 6 to 12 households	159,256	5
4	Street blocks with 13 to 28 households	72,872	7
5	Street blocks with 29 to 49 households	16,595	28
6	Street blocks with 50 or more households	6,761	99

Source: 2000 Census

## Non-intervention zones

To define the evaluation control group and considering some ethical and financial aspects, the Advisory Group proposed to define the control sample by means of a matching or equalization of characteristics techniques scheme. To this end, logistic regression models were estimated using a series of socioeconomic characteristics at the street block level. The nearest neighbor matching method was applied using the estimated values. This is based on the proximity of the estimated values using the absolute value of the difference between them. This procedure guaranteed the comparability between street blocks in at least one series of observable variables. This procedure works in such a way that for each selected street block in intervention zones one or more non-intervention street blocks are identified with the same characteristics according to certain variables defined beforehand<sup>ii</sup>.

Considering that the number of eligible households tends to be greater in street blocks in intervention zones than in street blocks in non-intervention zones, the matching of street blocks was done with replacement. This means that a control street block may be grouped with several intervention street blocks. For each intervention street block with 12 or more eligible households, 10 control street blocks were selected, ordered in terms of their proximity. For street blocks with less than 12 eligible households, 3 control street blocks were selected. In addition, due to cost considerations, street blocks having less than 10% eligible households were excluded. Finally, 387 street blocks in non-intervention zones distributed in 14 states (Colima, Chiapas, Guanajuato, Guerrero, Hidalgo, Mexico State,

<sup>ii</sup> It is possible to suppose that street blocks in the comparison group also constitute a random sample of the comparison population, given that by matching they refer to street blocks in the probabilistic sample of the intervention zones. This should be taken into account in the analysis using as clusters the intervention street blocks and their matched pairs, to consider the hierarchical structure of the data.



Michoacán, Puebla, Sinaloa, Sonora, Tabasco, Tamaulipas, Tlaxcala, y Veracruz), 76 municipalities, and 108 localities were selected.

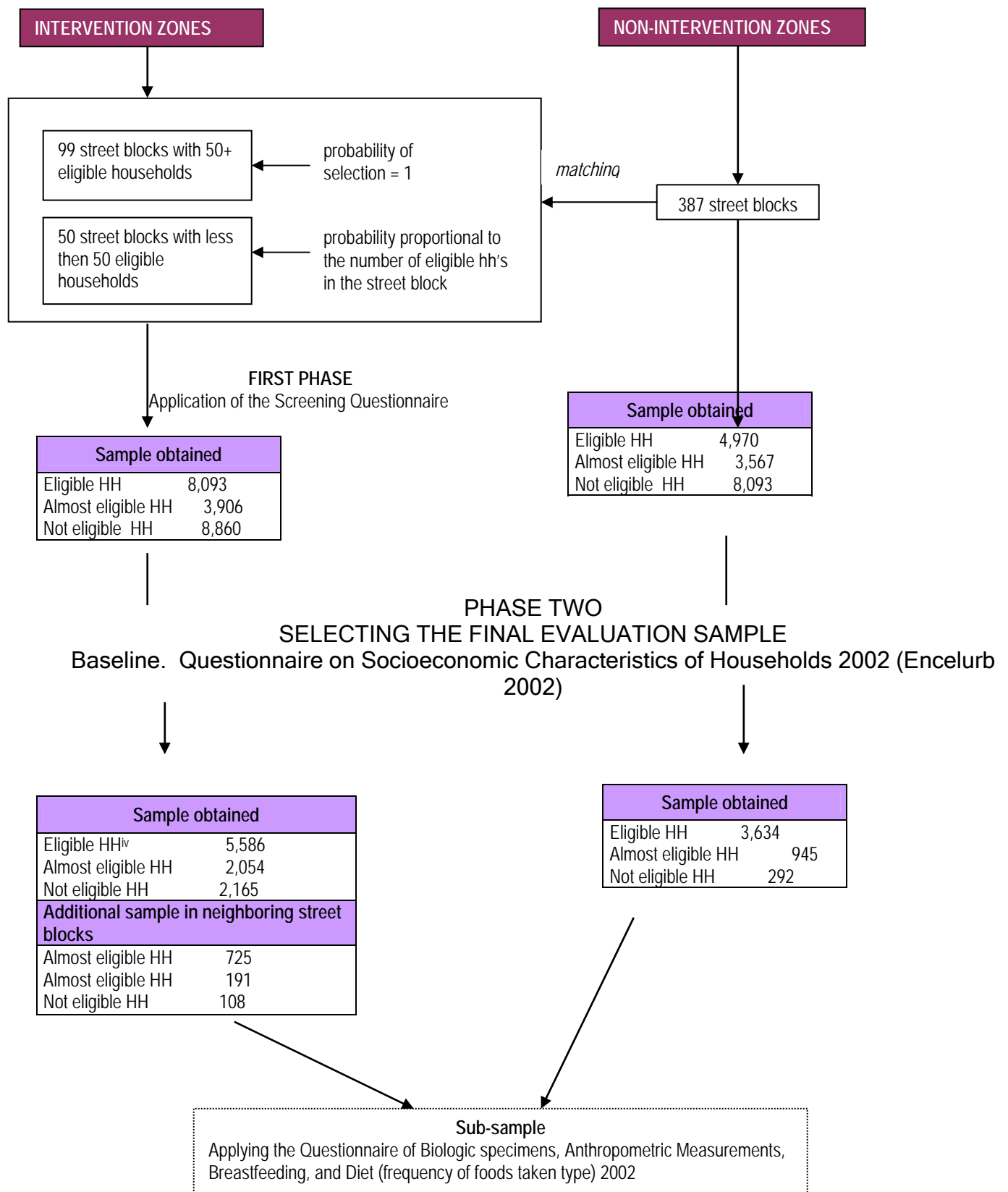
### Identifying Households (Phase One)

To update the household sample data, the first phase involved taking a census of all resident households in selected street blocks in intervention and non-intervention zones. This involved applying the Screening questionnaire (Household questionnaire in Encelurb 2002). Its purpose was to collect the necessary sociodemographic data for re-classifying the households according to their status of eligibility for the Program<sup>iii</sup> (eligible, almost eligible, and not eligible). It should be noted that this classification was used only for evaluation purposes and had no influence whatsoever on the inclusion process of beneficiary households. Moreover, this questionnaire considered whether households had already been selected to participate in Oportunidades. This piece of information was considered as the incorporation self-report and served as the basis for the final selection of the evaluation sample (construction of the panel).

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<sup>iii</sup> The classification criterion was the same used by Oportunidades to identify beneficiary families.

Figure 1. GENERAL SCHEME OF THE SAMPLE MAKEUP



<sup>iv</sup> Classification by eligibility in this stage was estimated based on the data from the Socioeconomic Characteristics of Households Questionnaire 2002.

HH: Households

### **Constructing the panel (phase two of the selection process)**

The data from the first phase were used to select the households in intervention zones claiming that they were included in the Program. These households were included with certainty (all of them were included). However, only 3645 households declared that they were included in the Program when asked through Screening. Yet a sample size of approximately 6000 included eligible households was expected. With the help of the Program's administrative records 656 households were identified that had claimed they were not included in the program when they were indeed included. Thus a sample size of 4301 included households was attained. To reach the desired sample size in these zones it became necessary to expand sample selection. The strategy was to add households included in the Oportunidades program in the street blocks neighboring those street blocks that were already selected. This procedure gathered an additional 1178 included households. In this way the final sample size was around 5479 households included in Oportunidades. As a consequence of this arbitrary expansion, neighboring street blocks were not in our original probabilistic sample. Also, since they were selected in the second phase, resident households in these street blocks have no data collected in the first phase. Thus, they could not be classified according to their eligibility status for inclusion to the Program with the information from Screening. The rest of the eligible and almost eligible households in these zones were selected with equal assigned probability and by systematic sampling. Moreover, a sample of 2000 non-eligible households was selected through simple random sampling.

In non-intervention zones, the sample of households consisted of all households potentially eligible to the Program, in addition to some quasi-eligible households. These households were selected through systematic sampling. All household members were included in the sample.

After the final evaluation sample was formed, phase two went on to include the application of the Questionnaire on Socioeconomic Characteristics of Households 2000 and the Biologic Specimens, Anthropometric Measurements, Breastfeeding, and Diet Questionnaire (frequency of intake of foodstuffs) for the baseline measurement of the follow-up study. In order to use the data from the sample of neighboring street blocks, all households from the original final evaluation sample were again classified as eligible, almost eligible, and not eligible, using the data from the Questionnaire on Socioeconomic Characteristics of Households 2000. Table II shows the final composition of the sample.

Table II. Distribution of households by Program eligibility status\*

Zone	eligible	Almost eligible	Not eligible	Missing Classification**	Total
Intervention	6,311	2,245	2,273	734	11,563
Non-intervention	3,634	945	292	767	5,638
Total households	9,945	3,190	2,565	150	17,201
Total persons	76,002				

\* The classification by eligibility was based on the data from the Questionnaire on Socioeconomic Characteristics of Households 2000.

\*\* Households left unclassified due to a lack of data in some key variables included in the classification algorithm. All reported an incomplete field interview.

It is of note that in addition to this general evaluation sample, several sub-samples were selected throughout the follow-up study to carry out additional studies on specific topics. The method used to select these sub-samples will be described in more detail below, when each data collection process is addressed.

The sampling frame construction method should be clearly established: considering the decisions for sample selection in intervention zones, the final evaluation samples and the sub-samples have no national or regional representativeness. Therefore the Survey has no sampling weights that allow for population inferences.

## 2.2 Comparison groups

The impact assessment requires study of at least two groups to estimate the treatment effect; that is, the intervention or treatment group vs. the counter-factual or control group.<sup>4-7</sup> To fulfill the purposes of the impact evaluation of Oportunidades in urban areas the following comparison groups are suggested:

### **Intervention or treatment group**

This group was made up of a sample of eligible resident homes in the intervention zones that were included in Oportunidades in 2002. The status of inclusion in the Program can be identified by means of the households' self-report – as per their answer to question 8 in section 4 of the Socioeconomic Questionnaire of Encelurb 2002, or through the administrative records of the Program located in the database `bd_urb_2002_transf_urbanas` available in this website.

### **Control. Group of eligible households no treatment, in intervention zones**

Also called “internal control”, this group was composed of the sample of resident households in intervention areas that were eligible to be included in the 2002 Program, but that for some reason were not included.

### **Control. Group of eligible households in non-intervention zones**

This group constitutes an “external control” and is made up of households potentially eligible to benefit from the Program depending on their eligibility classification, but which are located in non-intervention zones. As will be explained later, matching techniques will have to be applied in order to achieve the best classification of this control group.<sup>14</sup>

### **Control. Group of almost eligible households in intervention zones**

This group included the sample of resident households in intervention zones. They were classified as almost eligible due to having a deprivation score slightly lower than the cutoff point defining eligibility to the program. Considering this control group as a comparison group could be helpful in estimating the pre-post effect of the program without the requirement of fulfilling the comparability assumption among groups.

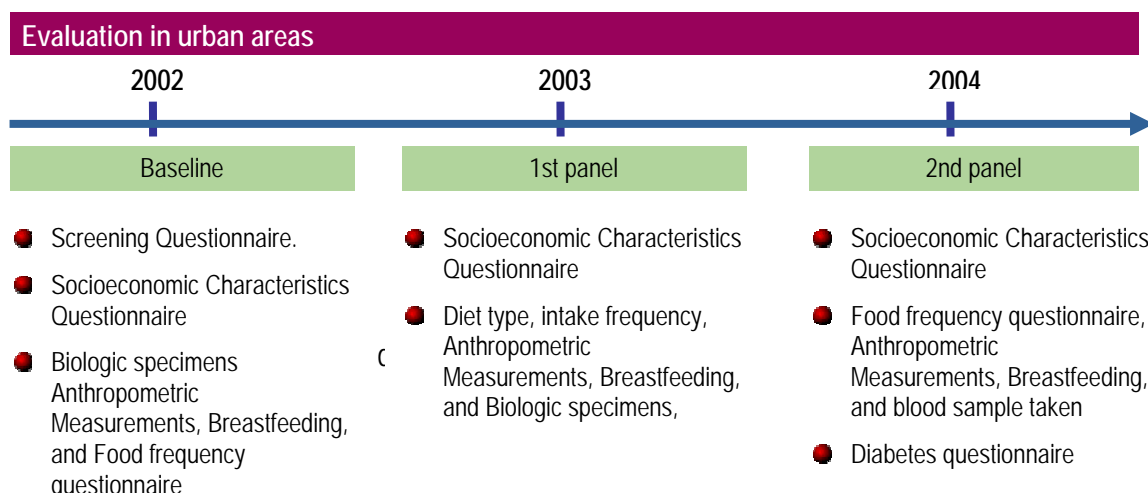
Comparative analysis of these groups should, throughout time, facilitate estimation of the Program's effects. Table III summarizes how the final groups would be conformed.

Table III. Suggested comparison groups

Intervention group	Comparison groups
<ul style="list-style-type: none"><li>➤ Eligible resident households in intervention zones. These households applied to Oportunidades at the module and were included in the Program.</li></ul>	<ul style="list-style-type: none"><li>➤ Eligible resident households in intervention zones but not enrolled</li><li>➤ Eligible households located in non-intervention zones</li><li>➤ Almost eligible households in intervention zones.</li><li>➤ Non eligible households in intervention zones (for focalization study)</li></ul>

## **3. Data collection**

The impact evaluation study of the Oportunidades Program in urban areas comprises the collection of a baseline (Urban Homes Evaluation Survey, Encelurb 2002) as well as two follow-up surveys carried out in 2003 and 2004 (Encelurb 2003 and 2004, respectively). The following diagram shows the specific studies carried out with each data collection.



### 3.1 Encelurb 2002 (Baseline)

Three data collection instruments were created for Encelurb 2002. These were approved in content and format by the Evaluation Advisory Group along with a group of experts.

- **Screening Questionnaire (Household).** This questionnaire was used to collect basic data on the socioeconomic characteristics of households to determine the status of eligibility to the Program and thus perform the selection of the final sample of households. It was applied to all resident households except for households in “neighboring street blocks”.
- **Socioeconomic Characteristics Questionnaire.** This is a multi-topic questionnaire that collected information on the household and the household members regarding sociodemographic, health, education, occupation, consumption, expenditure, incomes, gender, addictions, and reproductive health aspects, among others. It was applied to the final evaluation sample that was selected based on the results from the Screening Questionnaire. Adequate informants to whom this questionnaire was applied were older than 15 years of age and knowledgeable of the household and household members’ data. In addition, youngsters 10 to 21 years of age were directly surveyed to answer the section on tobacco and alcohol use. Women 15 to 49 years of age were also directly surveyed on the questions specific to reproductive health.
- **Biologic Specimens, Anthropometric Measurements, Breastfeeding, and food frequency questionnaire.** This questionnaire was applied to children less than 4 years of age and their mothers, as well as to pregnant women. Specifically, biologic information (mean hemoglobin concentrations by

Hemocue<sup>v</sup>) was collected from subjects younger than 24 to 47 months of age, mothers of children aged 0 to 47 months, and pregnant women. Anthropometric data (height and weight) were collected from 4-year-olds and their mothers. The data on breastfeeding and complementary diet were collected in children less than 35 months of age. Frequency of intake diet was collected from children 6 to 35 months of age and mothers of children aged 0 to 35 months. Children's weight was determined using a Tanita<sup>®</sup> electronic pediatric weighting scale with accuracy to  $\pm 20$  grams. To measure adults' weight a portable Solares<sup>®</sup> weighting scale was used. The length of the children was measured using a PVC infantometer and a stadiometer, made of a 2-meter long flexible metallic measuring tape and a movable right angle structure. Table IV summarizes the total participating sample in this study.

Table IV. Participant population for the application of biological samples, anthropometric measurements, breastfeeding, and frequency of intake diet in Encelurb 2002

Variable	Population
Households	4,770
Hemoglobin and/or anthropometry	5,762 aged less than 24-47 years 4,787 mothers of children less than 47 months of age*
Breastfeeding and complementary diet	3,704 children 0-35 months of age
Frequency of food intake	3,351 children 6-35 months of age 3,113 mothers of children less than 36 months of age *

\* Pregnant women.

For logistics reasons, baseline data collection in the panel in all its components was carried out in three stages. The first consisted of the data collection in intervention zones (zones where the Program began to operate in 2002). This phase was carried out from September 2 to November 27, 2002. The second stage covered non-intervention zones (where the program began to operate in 2004) and took place between October 17 and December of the same year. Each of these stages comprised three data collection phases: 1) Geographic updating of the sampling frame on the household level for accurate location of the same, and application of the Screening Questionnaire; 2) Applying the Socioeconomic Characteristics Questionnaire; 3) Applying the Questionnaire on Biologic specimens, Anthropometric Measures, Breastfeeding, and Frequency of intake diet.

<sup>v</sup> The system used to determine hemoglobin concentrations through Hemo-Cue consists of a micro-cuvette and a photometer. The microcuvette is used to measure the sample. No dilution is needed. The hemoglobin reading takes place in the photometer. The reading follows the reaction and gives the result only when the reaction has stopped. This method gives immediate results, of which household members were immediately informed. In cases of severe anemia, an iron supplement was immediately provided to the household.

It should be noted that a pre-pilot and a pilot test were carried out to verify the format, flow, and time of application of the questionnaires, as well as to foresee possible errors in the questions or the viability in its sequence. Considering its size, experienced personnel living in the areas that were to be surveyed were hired. Thus the application was made more efficient. In addition, the biologic data collection was carried out by well-trained personnel experienced in this sort of data collection, which was coordinated by INSP directly. All data were collected directly in selected households. Informed consent was obtained from the participants. Research protocols were developed and they were approved by the research, ethics, and biosafety committees of INSP. All field work was supervised and validated by the relevant personnel, who ensured that the data collection was performed within the established time period and with high quality.

### **3.2 Encelurb 2003 (First panel)**

Encelurb 2003 constituted the first follow-up or first data panel of the evaluation sample selected in Encelurb 2002. Encelurb 2003 applied the Questionnaires on 1) Socioeconomic Characteristics, and 2) Frequency of intake diet, breastfeeding, and biologic specimens (with a specific module for diabetes).

Since Encelurb 2003 was a follow-up survey, the collection of socioeconomic data from households was based on the methodology and instruments applied in Encelurb 2002. Both the Socioeconomic Characteristics Questionnaire and the Questionnaire on Frequency of Intake Diet, Breastfeeding, and Biologic Tests were reviewed and modified to cover the needs detected by the Evaluation Advisory Group focused on the short-term hypotheses. Specifically, in the diet questionnaire the sections on anthropometric measurements and biologic specimens were excluded and a special module on diabetes was added to collect detailed information regarding glycemic control in adults older than 40 years who had been diagnosed with diabetes in Encelurb 2002.

The collection of socioeconomic data and biologic specimens was done according to design and to the operating strategy previously tried in Encelurb 2002. In order to maintain a universe that would prevent excessive loss of households (due to inability to collect data from them for any reason) and the concomitant loss of power of statistical analyses, approximately 1500 eligible and almost eligible households from intervention as well as non-intervention zones were added to the sample. These new households were systematically selected and are part of the sample that resulted from the Screening phase of Encelurb 2002. The final sample with socioeconomic data of Encelurb 2003 was made up of 18041 households and 77764 persons.



To test the hypotheses regarding the effect of Oportunidades on nutrition indicators using the longitudinal data, the study sample was conformed as shown in Table V for applying the Questionnaire on Frequency of Intake Diet and Biologic Tests of Encelurb 2003. Due to technical and ethical reasons it became necessary to redefine the study sample. Thus not all children and their mothers were part of the biological component of Encelurb 2002. The sample for blood hemoglobin determination was made up of children 12 to 35 months of age, who in Encelurb 2002 had been 0 to 23 months of age. It was done in this way to conform a sample of children who would be the same age (24-47 months) in Encelurb 2004 which would be compared to the sample of children with biologic data in Encelurb 2002<sup>vi</sup>. On the other hand, it is recommended to collect the data on breastfeeding practices and complementary diet practices from children less than 3 years of age.

Table V. Target population for the application of the Questionnaire on Frequency of Intake Diet, Breastfeeding, and Biologic testing. Encelurb 2003

Variable	Target Population
Hemoglobin	3,862 children 12 to 35 months of age who were 0 to 23 months of age in Encelurb 2002
Breastfeeding and complementary diet	2,817 children 12 to 35 months of age who were 0 to 23 months of age in Encelurb 2002 Children of surveyed women who were pregnant in Encelurb 2002 were included.
Frequency of Intake Diet	3,857 children 18 to 47 months of age who were 6 to 35 months of age in Encelurb 2002, children 12 to 18 months of age who were 0 to 6 months of age in Encelurb 2002. Children more than 6 months of age borne of women who were pregnant in Encelurb 2002.
Frequency of Intake Diet	2,975 mothers of children 0 to 47 months of age in 2003.
A total of 4,533 households was visited	

For the glycemic control study in adults older than 40 years of age a sample of 500 diabetic adults was conformed to determine their glycosylated hemoglobin levels. This sample was defined with reference to the minimum sample size necessary to detect significant differences among comparison groups. Using data from Encelurb 2002, households where at least one person diagnosed with diabetes mellitus was residing were identified, and, to take into consideration the no-response rate, 919 households were visited, with 677 subjects completing the questionnaire and 502 (74%) having a valid glycosylated hemoglobin reading. The remaining 26% (n=175) had no biochemical readings because they declined to participate or could not be found.

<sup>vi</sup> This is not a children panel because, had they been found to be anemic in Encelurb 2002 (whether in intervention or non-intervention zones), they would have been subjected to nutritional therapy by INSP, in compliance with ethical guidelines.

The collection of socioeconomic data and biologic specimens for Encelurb 2003 was done from September 14 to November 2003. Unlike Encelurb 2002, intervention and non-intervention zones were covered in a single stage.

### 3.3 Encelurb 2004 (Second panel)

Encelurb 2004 constitutes the second panel of the urban evaluation survey as well as the follow-up for households included in the Encelurb 2002 and 2003 sample. The data herein compiled should serve to evaluate the short- and medium-term impacts of the Program regarding some of the indicators of interest. Encelurb 2004 applied the following: 1) Questionnaire on Socioeconomic Characteristics; 2) Questionnaire on Diet, Biologic Tests, Anthropometric Measurements (height and weight), and taking children's venous blood specimens; 3) Questionnaire on Diabetes and taking capillary blood specimens to determine glycosylated hemoglobin.

Since Encelurb 2004 is a follow-up study, data collection in households was based on the instruments and methodology used in Encelurb 2002 and 2003. The basic guide for socioeconomic data collection was the Questionnaire on Socioeconomic Characteristics of Households of Encelurb 2003. Some modifications were made in content according to the needs determined by the Evaluation Advisory Group with relation to the short- and medium-term hypotheses. As a consequence of the two stages of data collection, the education module had to be modified to distinguish between current school attendance and future school attendance of household members. The final sample with socioeconomic data in 2004 included a total of 17023 households and 72421 individuals. The field work was performed from June 21 to August 31 2004 in non-intervention zones and from September 1 to November 12 in intervention zones.

The Socioeconomic Questionnaire was applied along with the Questionnaire on Diabetes and Glycosylated Hemoglobin, with a format similar to that used in Encelurb 2003. Its objective was to collect detailed data regarding glycemic control in adults older than 40 years. The procedures for taking capillary blood specimens followed the technique already tested in 2003. It is important to note that the sample for this diabetes study does not necessarily include the same participants from Encelurb 2003. For different reasons not all of them were able to participate in the study again and therefore the sample had to be completed with persons who reported having diabetes in the socioeconomic characteristics survey of Encelurb 2003 and who resided in eligible households. The final sample was made up of 598 persons with diabetes data and glycosylated hemoglobin levels.

For the Encelurb 2004 biologic data collection the study population was selected from the Encelurb 2002 population: children 24 to 47 months of age and their mothers who had socioeconomic data available. These persons had also been part of the biologic survey in Encelurb 2003. The guide for biologic data collection was the Questionnaire on Biologic Specimens, Anthropometric Measurements, Breastfeeding, and Frequency of Intake Diet of Encelurb 2003. A module for anthropometric measurements (height and weight) similar to that used in Encelurb 2002 was added. Table VI summarizes the final makeup of the sample for data collection.

Table VI. Encelurb 2004. Target population for application of the Questionnaire on Diet, Biologic Specimens and Anthropometric Measurements (height and weight).

Variable	Target population
Total sample	7,976 children 24 to 47 months and their mothers who had baseline measurements in Encelurb 2002 and measurements in the Encelurb 2003 follow-up survey.
Hemoglobin, breastfeeding, and anthropometrics	3,315 children 24 to 47 months of age provided anthropometric and hemoglobin measurements and breastfeeding status data. 1,041 children 0 to 23 months of age with only anthropometric measurements
Frequency of Intake Diet type	3,315 children 24 to 47 months of age
Breastfeeding and complementary feeding practices	1,041 children 0 to 23 months of age
Frequency of Intake Diet type	3,385 mothers of children 24 to 47 months of age
Hemoglobin and anthropometrics	3,385 mothers of children 24 to 47 months of age

Unlike Encelurb 2002, in the 2004 Survey weight was taken using a single electronic weighting scale with a 14 kg capacity, accurate to 20 g for children 0 to 23 months of age, and with a capacity of 135 kg for children older than 2 years. The scale was adjusted daily prior to beginning the field work. Height and weight were measured with a portable wooden infant-meter/stadiometer with a 198 limit and accuracy to 1mm. Standard techniques were used to measure height, weight and length.

In addition, as a part of the biologic data collection of Encelurb 2004, venous blood specimens were obtained from a sub-sample of children 6 to 47 months of age and women who participated in the phase IV of Study on Nutritional Status and Supplement intake in Children and Women (previously mentioned). Collection of venous blood specimens was intended to obtain levels of serum ferritin, soluble transferrin receptor and C-reactive protein. The

serum specimen was taken from a vein in the forearm using vacuum tubes free from trace elements and with no anti-coagulant. The specimen was then centrifuged to separate the serum and empty to cryogenic tubes that were temporarily stored in liquid nitrogen containers. The specimens were analyzed through a nephelometric immunoassay method. The analysis was done at the nutrition laboratory of INSP's Center for Nutrition Research in Cuernavaca, Mexico. The biological data collection was carried out from July 23 to August 31 in non-intervention zones and from September 15 to October in intervention zones.

In all cases the procedures were in line with universal caution measures and biologic waste was handled, stored, and transported observing the Official Mexican Norms of the National Health Institutes and the State Health Department. The photometer was adjusted daily (at the beginning and after every 10 measurements), according to international hemoglobin standards, and the recommendations of the International Committee for Standardization in Hematology. All measurements were taken by highly trained personnel.

#### **4. Data entry**

To ensure that all household members were duly identified and that their information could be linked among all surveys, a master dataset was developed with the data from all the households and their members in the original sample. A system was developed for the Encelurb 2002 data entry using Visual Basic 6.0 with a connection to an SQL-Server 2000 dataset manager, which underwent a number of online validations, ensuring the consistency of the data entered. For reasons of technical convenience the data entry process for Encelurb 2003 and 2004 was done in a specialized programming language called CSPro, available from <http://www.census.gov/ipc/www/cspro/>. This programming language, created and maintained by Macro International, the US Census Bureau, and SEPRO Chile is used especially to develop entry screens for questionnaires from complex surveys like a population census or health survey. To ensure that the entered data had an error lower than 1% on the variable level, online entry of all numeric variables was done in duplicate for all the questionnaires that comprised the evaluation surveys.

#### **5. Organizing the databases included in the website**

All data from for this evaluation survey was organized by survey or data collection (Encelurb 2002, 2003, 2004). Folders were created for each questionnaire in each survey. Every folder contains the SPSS-format files of

the different tables in the given questionnaire, as well as a questionnaire in PDF file with each question labeled exactly as it appears in the database.

Each table-file was created in terms of the analysis unit containing the data (household, household members, women 15 to 49 years of age, children less than 4 years of age, etc.). Mostly, table-files refer to some specific section of the questionnaire or to the respective unit of analysis. For instance the table `tbl_hogares` contains all data taken through the questionnaire at the household level; the table `tbl_personas` contains data at the individual level for all sections of the questionnaire that collected data on all members of the household; table `tbl_ahorro_actual` contains the data at the individual level on household members who had savings, and corresponds to the questionnaire section “Current savings of the household”. Although the name of table-files is the same in all the different surveys, they can be identified as belonging to a specific survey, as will be explained below.

Folders were labeled in such a way that one can easily tell which survey they belong to, which questionnaire or data it contains, and the version date. Here is an example: `bd_urb_2002_socioeconomic_2004-10-01` is a folder containing the database of the socioeconomic data in the urban survey Encelurb 2002vii and corresponds to the October 01 2004 version. Although database cleaning guarantees a consistency error less than 1%, the cleaning process is still underway, meaning that the databases could be updated at any moment. It is advisable to check back regularly for the last version of the databases.

This website contains the databases corresponding to each evaluation survey (Encelurb 2002, 2003, and 2004), as well as other databases closely linked to them, also useful for data analysis.

The databases available for access are those which have fulfilled all cleaning validations and guarantee a high quality of the data. Databases corresponding to the surveys mentioned in this note which are as yet unavailable will be on hand for access as soon as they fulfill the validation criteria.

Tables VII-A and VII-B show the data available on this website. The total number of folders is shown by survey – there is one folder for each database and corresponding to each questionnaire applied in that event of data collection. The name of the Questionnaire it refers to is identified, as well as the number of tables it contains.

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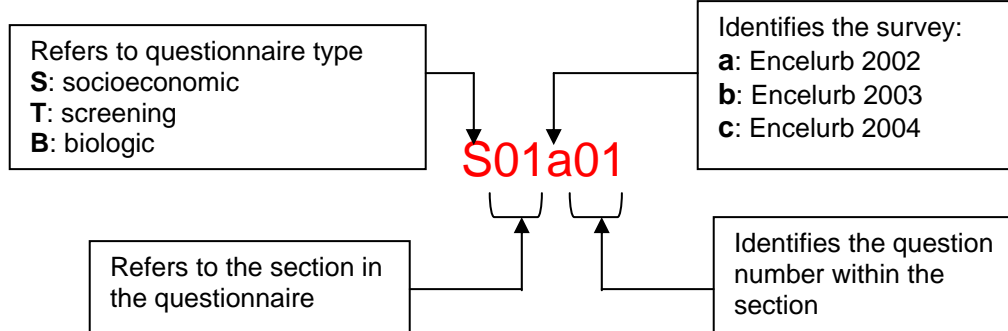
<sup>vii</sup> Corresponding to the Questionnaire on Socioeconomic Characteristics of Households 2002.

Table VII-A. Encelurb 2002 Databases			
File name	Format	Number of tables	Description
bd_urb_2002_tamizaje_2005-05-06	SPSS	2	Screening Questionnaire
bd_urb_2002_socioeconomico_2005-05-31	SPSS	15	Questionnaire on Socioeconomic Characteristics of Households
bd_urb_2002_biologico_2005-07-13	SPSS	6	Questionnaire on Biologic Data
bd_urb_transf_urbanas_2005-07-14	DBF	1	Money transfers made to households included in the Program. Identification of inclusion in the Program was done through administrative records.

Table VII-B. Encelurb 2003 Databases			
File name	Format	Number of tables	Description
bd_urb_2003_socioeconomico_2005-05-31	SPSS	13	Questionnaire on Socioeconomic Characteristics of Households
bd_urb_2003_biologico_2005-07-13	SPSS	7	Questionnaire on Biologic Data
bd_urb_2003_diabetes_2004-07-13	SPSS	1	Diabetes Questionnaire

## 6. Key variables

Each question in the questionnaire was labeled in such a way that the questionnaire it corresponds to could easily be identified, as well as the section and question number. Each folder contains the PDF questionnaire labeled for quick identification of the question and the corresponding variable in the database. Example:



A household identifier called *id\_hogar* and an individual identifier *id\_pers* were generated to uniquely identify each subject in the sample in follow-up surveys. This was done to link the different analysis units. These keys were constructed as follows:

<b>id_hogar</b>	CAM 04 0001	<b>CAM:</b> corresponds to the state, in this instance, Campeche <b>04:</b> INEGI code for the state <b>0001:</b> a consecutive number of households in the state
<b>id_pers</b>	CAM 04 0001 03	<b>Id_hogar</b> + the position of each member in the household

Because in 2003 and 2004 households may have changed their demographic composition and new households branched out within the original (Encelurb 2002), these were identified in Encelurb 2003 and 2004 databases, as follows:

<b>id_hogar</b>	MOR D 1 0324	<b>MOR:</b> corresponds to the state. <b>D:</b> means it expanded from the original household in 2002. <b>1:</b> number of the household expanded in the original 2002 household. <b>0324:</b> a consecutive number of the households in the state, it is related to the original <i>id_hogar</i> .
<b>es_desd</b>	{1, 2}	<b>1:</b> household expanded from the original <b>2:</b> non-expanded household
<b>id_base</b>	MOR170324	The <i>id_hogar</i> in Encelurb

In addition to Key variables, Encelurb 2002 and 2003 databases contain other variables that may be useful in the analysis.

<b>Folioori<sup>viii</sup></b>	04 002 0001 0639 034	<b>04:</b> state code <b>002:</b> municipality code <b>0001:</b> locality code <b>0639:</b> AGEb code <b>034:</b> code of the original street block according to geographic
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<sup>viii</sup> Variable constructed to identify street blocks that are part of another block. This variable records the original street block to which they belonged according to the 2000 Census. When street blocks are not part of another street block, the value of variables FOLIOORI and FOLIO is the same.

		data of the 2000 census.
<b>folio</b>	04 002 0001 0639 992	<b>992:</b> Number of the street block at the time of the data collection. It was part of the original block according to the 2000 Census.
<b>zona</b>	{0, 1}	Only in Encelurb 2002 <b>0:</b> non-intervention zones <b>1:</b> intervention zones
<b>tipo_h</b>	{C, I, B}	<b>C:</b> Households in non-intervention zones <b>I:</b> Households in intervention zones <b>B:</b> Households in neighboring street blocks (Encelurb 2002 only)
<b>cal_tam</b>	index	Poverty score according to Screening data.
<b>cla_tam</b>	{1, 2, 3}	Poverty classification according to Screening data. <b>1:</b> Eligible <b>2:</b> Almost eligible <b>3:</b> Non-eligible
<b>cal_soc</b>	index	Poverty score according to data from the Socioeconomic Questionnaire 2002
<b>cla_soc</b>	{1, 2, 3}	Poverty classification according to data from the Socioeconomic Questionnaire 2002 <b>1:</b> Eligible <b>2:</b> Almost eligible <b>3:</b> Non-eligible

## 7. Proposal for analytical strategies

The databases generated for this evaluation study can be used to evaluate the impact of the Program and for other research purposes as well. This section shows some methodology considerations and proposes some analysis strategies related to the impact evaluation. If the objective is to explore the Program's impact, then one must take advantage of the longitudinal nature of the study in order to obtain double difference<sup>ix</sup> (difference in difference - DID) estimators. Using these indicators the baseline differences in the indicator of interest can be controlled and the net effect of the Program can be isolated from other changing factors in time (those which could also affect the indicator of interest), common to both comparison groups. However, as mentioned before, the fact that inclusion or non-inclusion to Oportunidades in intervention zones depended on the decision taken by households and not to random allocation should be taken into account during the analysis so as to attain the maximum comparability among the study groups.

<sup>ix</sup> It is advisable take advantage of the longitudinal nature of the study. However, the difference in difference analysis cannot be performed on all indicators since the data were collected a one point in time only. In this case strong assumptions of the simple comparability at the baseline allow for a first difference analysis.



Some of the possibilities to minimize or control the problem of lack of comparability among groups are:

**Multiple conventional statistical methods and simultaneous equations.** Different techniques are available which can be used to isolate the net effect of inclusion or non-inclusion to Oportunidades. If the decision to participate is a choice made by the household, there may be some observable and non-observable characteristics (also influencing the result of interest to be evaluated) associated to the probability of agreeing to participate in the Program. The technical term for this condition is endogeneity. The Program's endogeneity potential would be corrected only by estimating a system of equations and using instrumental variables and must be implemented according to the type of response variable and the type of participation in the Program (e.g., Two-Stage Least Squares – 2SLS method, multivariate probit models, structural equations, etc.).

**Comparability based on propensity score matching.** When the desired comparison is between the treatment group and the group of eligible households in non-intervention zones, the use of the propensity score matching method<sup>14,15</sup> is recommended to identify those eligible households in intervention zones that would agree to become beneficiaries were it offered to them. To this end, a propensity score or a score for probability of inclusion in the Program must be constructed in zones where the Program has been offered, being a function of the observable characteristics that reflect the incentives for the homes to participate. Matching by propensity scores is a way of correcting the estimation of the effects controlling for potential confounding factors and selection bias. This is based on the fact that bias and the possibility of confounding are minimized when beneficiaries are compared with non-beneficiaries, while sharing characteristics to the greatest possible extent. The theoretical assumptions are that the probability of being included in the Program depends to a great extent on the observable characteristics, and that, usually, compared groups differ only in terms of participation in the Program; otherwise they are exactly alike. One condition for constructing the propensity score is that it must be a function of variables that do not become modified by the Program. That is to say that the score depends on characteristics that are prior to participation in the Program. Once the propensity score has been constructed, there are several methods that can be used to do the matching – simple or weighted, among the most popular are the nearest neighbor method, the Kernel method, and Mahalanobis matching.<sup>16</sup>

Moreover, it is possible to do intention-to-treat analysis by considering only the condition of eligibility to the Program among the intervention and non-intervention zones. As was mentioned before, using the group of almost eligible households as the comparison group would estimate the effect of treatment through non-continuous

regression analysis. Table VIII summarizes the main analysis strategies used in recent studies on the impact evaluation of Oportunidades in urban areas.

Table VIII. Analysis strategies used in the 2004 evaluation

Study	Authors	Analysis strategy
Medium-term impact of the Oportunidades Program on education and work of youngsters 9 to 15 years of age in rural areas in 1997. <sup>17</sup>	Parker SW, Behrman JR, Todd PE.	Multiple regression models by differences in differences (interaction), with and without matching by propensity score
Medium-term impact of the Oportunidades package, including the nutritional aspect, on the education of rural children between 0 and 8 years of age in 1997. <sup>18</sup>	Behrman JR, Parker SW, Todd PE.	Multiple regression models by differences in differences (interaction), with and without matching by propensity score
Impact of Oportunidades on the education of children and youngsters from urban areas after one year of participation in the Program. <sup>19</sup>	Todd PE, Gallardo-García J, Behrman JR, Parker SW.	Multiple regression models by differences in differences (interaction), with and without matching by propensity score
Impact of Oportunidades on morbidity and health status in the beneficiary and on use of health services. Short-term results in urban areas and medium-term results in rural areas. <sup>20</sup>	Gutiérrez JP, Bautista S, Gertler P, Hernández-Ávila M, Bertozzi SM.	Multiple regression models by differences in differences (interaction), with matching by propensity score
Impact of Oportunidades on adolescents' risk behaviors and its immediate consequences. Short-term results in urban areas and medium-term results in rural areas. <sup>21</sup>	Gutiérrez JP, Gertler P, Hernández-Ávila M, Bertozzi S.	Multiple regression models by differences in differences (interaction), with matching by propensity score
Impact of Oportunidades on reproductive health of the beneficiary population. <sup>22</sup>	Hernández-Prado B, Urquiza-Salomón JE, Ramírez-Villalobos MD, Figueroa JL.	Multiple regression models by differences in differences, with adjustment by propensity score
Medium-term impact of the Oportunidades Program on obesity and chronic diseases in rural areas. <sup>23</sup>	Fernald LC, Gertler PJ, Olaiz G.	Multiple regression models with matching by propensity score and bootstrap method
Evaluation of the quality of medical care for the diabetic population benefiting from Oportunidades. <sup>24</sup>	Hernández Ávila M, Meneses- González F, Téllez-Rojo MM, Manzano A, López-Ridaura R.	Multiple regression models by differences in differences (interaction).
Impact of Oportunidades on the knowledge and practices of beneficiary mothers and youngsters. An evaluation of the educational sessions on health. <sup>25</sup>	Duarte-Gómez MB, Morales-Miranda S, Idrovo Velandia AJ, Ochoa-Marín SC, van der Wal SB,	Multiple regression with adjustment by propensity score

	Caballero-García M, Hernández Ávila M.	
Impact of Oportunidades on the growth and health status of children in rural areas. <sup>26</sup>	Neufeld L, Sotres-Álvarez D, Gertler P, Tolentino-Mayo L, Jiménez-Ruiz J, Fernald L, Villalpando S, Shamah T, Rivera-Dommarco J.	Generalized estimating equations (GEE) Regression models with adjustment by clusters (localities) and multiple models with matching (nearest neighbor) by propensity score
Medium-term impact of the Oportunidades Program on children's health in rural areas. <sup>27</sup>	Gertler PJ, Fernald LC.	Multiple regression models by differences in differences (interaction), with matching by propensity score
Comparative study on nutritional status and language acquisition between children in urban localities with and without Oportunidades. <sup>28</sup>	Neufeld L, Sotres-Alvarez D, García-Feregrino R, García-Guerra A, Tolentino-Mayo L, Fernald L, Rivera-Dommarco J.	Multiple regression with adjustment by propensity score
Study on the intake of supplements Nutrisano and Nutrivida in women and children in urban areas beneficiaries of Oportunidades. <sup>29</sup>	Neufeld L, Sotres-Alvarez D, Flores-López L, Tolentino-Mayo L, Jiménez-Ruiz J, Rivera-Dommarco J.	Mixed models for repeat measurements
Medium-term effects of the Oportunidades Program on intake in rural areas. <sup>30</sup>	Attanasio OP, Di Maro V.	Multiple linear regression models, matching by propensity scores and linear total interaction matching
Effect of Oportunidades on the level and composition of intake in urban. <sup>31</sup>	Angelucci M, Attanasio OP, Shaw J.	Multiple regression models by differences in differences (interaction), with matching by propensity score and intention to treat
Effect of Oportunidades on intake increase in households based on productive investments in micro-enterprises and agricultural production. <sup>32</sup>	Gertler P, Martínez S, Rubio M.	Two-stage least squares models
Effect of Oportunidades on demographic dynamics of households and migration decisions of household members, in rural localities <sup>33</sup>	Rubalcava LN, Teruel GM.	No-parameters method in differences in differences
Evaluation of the focalization mechanism of Oportunidades in urban zones. <sup>34</sup>	Coady DP, Parker SW.	Multiple regression models with fixed effects at the street block level