EVALUATING THE IMPACT ON HUMAN DEVELOPMENT INDICATORS OF HOUSEHOLD CONNECTION TO THE SEWERAGE SYSTEM IN URUGUAY

Impact Evaluation Concept Note
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1. INTRODUCTION

As part of the Millennium Development Goals (MDGs) declared by the United Nations, sustainable and equitable access to adequate sanitation and hygiene are recognized priorities for development, poverty reduction, and health promotion. Inadequate sanitation services affect billions of poor people in the developing world. In 2000, five out of every ten people suffer inadequate access to sanitation, and nine out of ten do not have their wastewater treated at any level (World Bank, 2000). Inadequate sanitation affects several human development outcomes. Children are particularly affected by the use of unsafe sanitation, mainly through gastrointestinal diseases. In rural areas, inadequate sanitation and wastewater disposal systems contribute to the degradation of groundwater, rivers, and coastal resources, affecting rural incomes. In urban areas, poor sanitation results in increased prevalence of water-related infections and parasitic diseases.

According to a recent publication on guidelines to impact evaluations for water and sanitation interventions, to date few rigorous scientific impact evaluations show how water supply and sanitation sector (WSS) interventions are contributing to welfare, economic growth and poverty alleviation. The same publication argues that it is important to evaluate WSS programs and policies for four reasons: to 'demonstrate' support program expansion, to identify under which conditions certain interventions work or don't work, to identify what are the aspects of program design that lead to greater success, and to disseminate to governments and the development community the tools necessary to maximize the impact of WSS interventions and understand these impacts on health outcomes.

Uruguay is an upper-middle income country characterized by a high coverage and quality of public services and infrastructure relative to other Latin American or middle income countries. The provision of potable water is practically universal in the entire country, as is the provision of adequate sanitation services. However, the coverage level falls to 56.5 percent when sanitation coverage is measured as the percentage of the population with household connections, and to 27.4 percent when measurement is restricted to the population in the urban interior served by the *Administracion de las Obras Sanitarias del Estado* (OSE), the national water and sewage utility. OSE provides water and sanitation services for the entire country, except for Montevideo, where sanitation services are provided by the municipality to 83.1 percent of the population living in the capital, through household connections to the network.

OSE resolution number 1385/2006 approves a law proposal to be sent to the Parliament that declares the connection to the sewerage system as mandatory for all households in the country. According to this proposal, "sanitation is a fundamental public service in relation to public health, environmental protection and welfare in general". Unfortunately, to date, there are no rigorous studies that measure these supposed benefits in terms of health and welfare. Both The World Bank and OSE recognize the need for an accurate evaluation to help maximize household

coverage and understand the impact of sewerage connectivity on Human Development outcomes, ultimately leading to more effective implementations in the future.

The results of the impact evaluation, notably in terms of public health and environmental outcomes, will directly feed into OSE and the Government of Uruguay's (GoU) review of appropriate sanitation standards. Understanding the causal relationship between sewerage connectivity and Human Development outcomes will have significant policy implications and improve World Bank WSS operations in the region. Moreover, it will greatly contribute to the literature on formal evaluation of WSS policies.

2. BACKGROUND

In Uruguay, while access to adequate sanitation[1] is almost universal, only 42 percent of households are connected to the sewerage network. A former Bank project (the OSE Modernization and Systems Rehabilitation APL1 project) financed the expansion of sewerage networks in several Uruguayan cities. Although the works now provide the capacity to connect an additional 16,224 households to the network, to date (a year after the close of the project) only 41.3 percent of the households have connected themselves, leaving 9,511 households without sewerage connections.

Despite past investments of Latin American governments in sewerage infrastructure and various accompanying cost-sharing schemes, the connectivity rate has remained low throughout the region. Why households are choosing not to connect even when they have access to a sewerage network continues to puzzle water utilities and governments in Uruguay and the region. Several hypothesis surmise that it has to do with i) households' lack of funds to invest in the connection, ii) households' credit constraints, or iii) households' lack of knowledge regarding the potential benefits of connecting to the sewerage system. The sewerage connectivity challenge just described and the governmental efforts to address these issues present an opportunity to conduct an impact evaluation to fill in the knowledge gap regarding the budget constraints and other factors inhibiting households from connecting. More so, this situation provides an opportunity to evaluate the impacts of household connectivity on health, education, and welfare outcomes.

OSE, with the support of World Bank's funding, has made strong efforts to increase household connection to the sewerage system. To this end, in 2005 OSE started the CREDIMAT program that created a line of credit for household's connections to the sewerage system. This program offered a credit line to: i) households that asked for a line of credit directly to OSE (a credit up to 250 URs[2]); ii) households with an income between 25 and 60 URs. In this last case, the program was implemented jointly with the municipality involved. Finally, for households under 25 URs in monthly income, OSE signed a partnership with the Social Development Ministry (MIDES) in which they agree to subsidize the connection of these households. In addition to these efforts,

[1] The collective sanitation networks, pumping systems, and the effluent and disposal treatment plants have achieved coverage over 80 percent in Uruguay. However, the household connection to the sewage systems still constitutes a challenge. About 58 percent of households in the Uruguayan territory would be able to get connected to the sewerage system that is already serving their area. To do so they should pay for adapting their home and for building the connection to the sewerage system already passing in front of their door. Later, they should engage to pay the service on a regular basis.

[2] A UR (unidad reajustable) is a monetary unit adjusted by the average wage's index called IMS. By December 4, 2008 it is equivalent to US$15.68.-

municipalities have used their own funding and other institutions' funding to increase household connection. For the households included in this study, stronger mechanisms will be put in place to ensure the connection of all households participating. The mechanisms are detailed in the compromise signed by OSE's authorities and included herein in Appendix 5.

3. THE INTERVENTION

The first municipality selected for the intervention is Treinta y Tres, which according to the 2004 Census has a total population of 49.318 people, from which 25.711 live in the capital, i.e. Treinta y Tres city. Nowadays, this city accounts for 12.450 water connections and only 7.375 sanitation connections, which constitute coverage of 59 percent with respect to the water connections. In this city three neighborhoods with similar socioeconomic characteristics have been identified as possible candidates for the study. These neighborhoods can be divided into 14 blocks that can be intervened independently, without risk of cross contamination since each of them represents a geographic basin[3]. These 14 blocks belonging to the city of Treinta y Tres host 912 households with mean incomes inside the pre-established limits, two schools and a local clinic.

The intervention will be implemented as follows. Firstly, neighboring blocks will be grouped in seven pairs. Secondly, a lottery will be organized to randomly choose which block of each pair is intervened first. The connection to the sewage system of all the households belonging to the selected block will be subsidized[4]. Those blocks that were not selected for this first phase will be intervened in the second phase of the program.

Once the intervention is implemented, it is expected that at least 95 percent of the eligible households will be connected to the sewage system. To reach this goal, the government will subsidize all the household connections to the sewerage system. In addition, a formal agreement was signed by the local authorities committing themselves to ensure household connections (see annex 5)[5].

Soil and feces samples from children under 12 years old will be taken, and questionnaires will be prepared to measure characteristics, the chosen[6] biomarkers, and perception indicators before the intervention is conducted in connected and unconnected households. These same markers will be measured 12 months after the intervention.

[3] OSE's engineers have assessed the independence of the clusters by considering soil characteristics of the referred region, the inclination of each region and the characteristics of the sewerage system itself.

[4] See formal agreement signed by the local authorities committing themselves to ensure households connections in Annex 5.

[5] The municipality chosen has moreover a long story of participation in social responsibility activities promoting the development of the region, which suggests their collaboration will increase the willingness to participate of households in the region.

[6] So far, we have identified as a relevant biomarker the prevalence of parasites in children younger than 12 years old. Before the intervention, we should find an incidence of 4 to 8 percent and we can expect a reduction of 30 percent in the connected blocks. The incidence could be higher if the soil was significantly polluted. In particular, the Uruguayan epidemiologist belonging to our group of local experts has assessed this issue and found that three soil samples should be taken every six months as well as children sample feces.

4. RESEARCH QUESTIONS

This study proposes to provide unambiguous evidence to support or disapprove the following questions:

- Does connecting households to the sewerage system result in better health development outcomes?
- Are there any health externalities in terms of sewerage coverage in health outcomes?

In particular, this study seeks to identify and measure the causal relationship between the sewerage connection of households in a selected area of the country and welfare. In this case, the intervention impact on welfare will be measured according to the following main indicators of soil and feces parasite presence. Parasites normally inhabit the digestive system and/or liver. Some parasites seek out the lungs, or may wander to the heart, brain, or skin. In the digestive system or liver, they disrupt digestion and nutrient absorption. Symptoms include chronic diarrhea and abdominal pain. Other symptoms occur from long-standing infections, among them ulcers, hemorrhage, abscesses of the intestinal wall, and liver damage. Sometimes severe toxemia results when the host's body absorbs the worm's metabolites. This type of worm is highly related to poor sanitation particularly in South America. The long-term consequences of the prevalence of this worm in a host's body are worthy of research, given the fact that these worms can induce severe toxemia in women that have the worm at a fertile age. Toxemia may complicate pregnancy and as a consequence cause pre-eclampsia, a serious condition in pregnancy. One symptom is abnormal protein metabolism. Pre-eclampsia can substantially increase maternal mortality and have severe consequences to a newborn. These consequences range from premature birth to abnormalities of a newborn.

Annex 1 summarizes that previous specialized literature has shown the correlation between soil parasite presence and human development indicators. Additionally, Annex 2 provides a discussion on the incidence of these biomarkers in the context of Uruguay.

Other outcomes will be also considered such as children's morbidity and mortality, nutrition, and anemia. The design will also measure indicators such as welfare perception, quality of surface water, school attendance, and work attendance.

5. EVALUATION DESIGN

The main purpose of an impact evaluation is to correctly identify and measure the causal effects of an intervention and its outcomes. In order to isolate and assess these effects, it is necessary to determine what would have happened in the absence of the program or what we could call the program's counterfactual.

As a true counterfactual is naturally unobservable, a common procedure it to construct a proxy for it by dividing the sample in two comparable groups:

Treatment Group – a representative sub-sample of the target population that will receive the intervention.

Control Group – a representative sub-sample of the population that will not be intervened (at least initially).

Ideally, groups should be identical (ex-ante). They should be equally affected by observable and, especially, unobservable factors, such that on average, the single difference between the two groups is the result of the implementation of the program.

Assigning households to each group randomly would ideally ensure comparability between the control group and the treatment group. Randomization at the household level presents some problems for the implementation of the connection subsidies. Therefore, we propose a robust identification strategy randomizing at a block level.

The procedure is the following:

a) Select a region with a critical mass of households so that it is possible to implement the intervention in phases for the following year and count with the following characteristics:
   - they are not connected to the sewage system;
   - they have similar socioeconomic characteristics[7]; and
   - that households are as representative as possible of households with an income between 25 and 60 UR so that extrapolation of the results are possible at least to households with this level of average income.

b) Identify observation-independent blocks inside the previously selected region. Each one of those blocks is contiguous, at least, to another block in the evaluation areas.

c) Group the blocks in contiguous pairs.

d) Randomly select from each pair a blocks to connect in phases 1 (the other one will be connected in phase 2). The randomization will be implemented together between the evaluation team and staff from OSE.

e) Once this randomization is completed, a representative sample of the beneficiaries in the first intervention phase will be defined as the treatment group while a representative sample of the households belonging to the last intervention phase will be defined as the control group. To this end, OSE will ensure that almost all the households intervened are connected to the sewerage system according to a formal agreement signed by the corresponding authorities.

f) Finally, data collection will be done at the beginning of the first phase (baseline) and before the beginning of the last phase.

To evaluate the intervention externalities and be able to answer the second research question we need alternative adoption densities. To this end, we will artificially create different densities, and compare the observation results across them. The procedure is the following: after the intervention, in each frontier between two blocks belonging to the same pair, there will be households connected (the ones belonging to the treated group) and households that are not connected (those belonging to the control group). The density in such a frontier is 50 percent of households connected. The results for the chosen biomarkers in that point will be compared with the results of the closer point in which density is 100 percent, namely in the middle of a cluster belonging to the treated group, and with the closer point in which density is 0 percent, namely in

[7] The Annex 5 provides more details about the socioeconomic characteristics of the households belonging to the selected blocks.

the middle of a cluster in the control group. Intermediary densities can also be compared to understand for which density do benefits in human development indicators start to be as high as in the case of maximal density of 100 percent.

6. SAMPLE DESIGN AND POWER CALCULATIONS

Consider the simple framework

$$Y_{ij} = \alpha + \beta T_i + v_j + w_{ij}$$

where Y_{ij} is the outcome for household i in community j, T_j the treatment for community j, β is the treatment effect, and the error term is decomposed into a common group element, v_j with variance τ^2, and a household specific component, w_{ij} with variance σ^2. Under group randomization the OLS estimator for β is consistent but inefficient. The standard error must account for intra-group correlation since the randomization is across groups. Once we correct for that, we can easily test one and two-sided hypothesis about β and by inverting these test to obtain an explicit formula to do the power calculations.

The formula underlying the power calculations will be the Minimum Detectable Effect (MDE) under grouped randomization, as given by Bloom (2005):

$$MDE_T = \frac{(t_{\alpha/2} + t_{1-\kappa})}{\sqrt{P(1-P)J}} \sqrt{\rho + \frac{(1-\rho)}{n}\sigma}$$

where n is the number of households per group or cluster, J denotes the number of groups in the sample, P is the proportion of the sample treated, α is the desired significance level, κ is the power of the proposed test, and $\rho^2=\tau^2/(\tau^2+\sigma^2)$ is the intra-cluster or intra-group correlation.[8] Solving for n gives us the sample size for each cluster

$$n = (1-\rho)\left(\frac{MDE^2 P(1-P)J}{\sigma^2 (t_\alpha + t_{1-\kappa})^2} - \rho\right)^{-1}$$

Note that this formula makes the researcher set the power and significance level, decide the MDE, and make assumptions about the intra-cluster correlation and the standard deviation. The power and significance level are commonly set at 80 and 5 percent respectively. However, deciding the MDE is a little more troublesome. As pointed out by Duflo et. al (2007), when the mean and standard deviation of the outcome are not available, one can express the MDE in multiples of standard deviation of the outcome. Indeed, Cohen (1988) proposes that an effect of 0.2 standard deviations is "small", 0.5 is "medium" and 0.8 is "large." Regardless, knowing the standard deviation is desirable for interpretation purposes.

[8] In the context of this study, the power will be the probability of correctly identifying an effect when there is one. On the other hand, the significance level in our context will be the probability of identifying an effect when there is none.

For this case in Uruguay we use the information from Moraes et.al (2003). The following table presents our results. We assume three different values of the MDE: 10, 20, and 30 percent of the outcome's standard deviations. Finally, we assume a 50 percent probability of treatment (as the treatment will be defined by a lottery).

Table 1: Sample Sizes for cluster and groups during first Year of Intervention

Assumptions	Case 1	Case 2	Case 3
MDE (as % of SD)	10%	20%	30%
Total Sample Size	2880	720	320

Given the nature of the intervention in the case of Uruguay, we consider that the effect of the intervention will be closer to cases 2 and 3 than to case 1[9]. In Uruguay's context, we suggest collecting information of all the participating households (912 households), since even under the assumption of up to 15 percent of attrition, the sample will be in the range proposed.

7. METHODOLOGY OF ANALYSIS

In addition to the identification of the research questions, the sample structure, treatment and control groups, a systematic impact evaluation requires the definition of a framework of analysis. The study will implement a Difference-in-difference (DiD) approach.

DiD methodology consists of measuring the average changes in a given indicator between the periods before and after the intervention for both treatment and control groups, and then comparing the changes for the two groups. The differences between two groups reflect the isolated effect of the program.

This approach requires the existence of base-line and post-intervention information for both groups. For this reason, this project will start with the implementation of a base-line survey collecting information about individual, household and community characteristics of the beneficiaries as well as some indicators. The data collection will include the entire population in the zone selected for this study. The survey will be re-applied to the same sample just before the beginning of the last round of the program.

A DiD econometric analysis will allow verification of the effectiveness of the randomization strategy creating comparable groups and to correct some potential "contamination" of the data. The before- and after-difference for each group corrects for any remaining fixed difference between treatment and control, while the between groups deal with external factors that affect the target population during the interval of analysis. Assuming that those factors reach treatment and control equally, the second difference successfully isolates the true causal effect of the intervention.

[9] According to local experts, we may find an impact (i.e. reduction of the presence of geohelminth in soil and feces) already from the 9th month after the intervention. The power calculations in Table 1 explains that, for such biomarker, if the measurement is done after the 9th month and for our sample size of 912 households, the standard deviation will be closer to that of Case 2.

8. IMPLEMENTATION TEAM

In order to assure that the team will successfully complete the evaluation with the proposed design, the team member composition will include: Word Bank teams, the social team and other experts in the local utility OSE coordinated by Natan Wajner, Academics, local partners and capacity, local supervision, and consultants if necessary. The IE team will be led by Luis Andres. The team already identified a strategic local partner in Uruguay, UNICEM, an institute that has local capacity for designing and implementing health related surveys as well as strong analytical skills. The team will count on the full collaboration of the World Bank project team consisting of Carlos Velez, Carmen Yee-Batista, and Maria Eugenia Sanin. In addition to the partner mentioned above the Department of Social Sciences from the *Universidad de la República*, as well as staff from the Public Health Ministry will provide quality control in the implementation of this evaluation. As part of UNICEM, the epidemiologist Alicia Aleman will be responsible for conducting a survey about the impact evaluation already done in Uruguay and in the region, as well as providing theoretical literature on the subject (TBC). Additionally, members of the GoU participated in the Impact Evaluation Workshop in Buenos Aires 2006, are already familiar with the methodologies, and have committed their support for this initiative.

Annex 3 presents the (draft) work program discussed with the counterparts.

9. TIMELINE (TO BE CONFIRMED)

- Nov 2008 to Nov 2009: Technical definition of the evaluation design, institutional arrangements, identification of technical teams, survey methodology, supervision methodology, and contracts needed.
- Mar to Jun 2010: Formal definition of the evaluation design, questionnaire design (Annex 4 present a draft Questionnaire), sample design, implementation pilot and questionnaire test.
- June 2010: Preparation of field activities and training of the fieldwork team.
- July 2010: Baseline survey fieldwork.
- July 2012: Follow up survey fieldwork.
- Aug to Dec 2012: Evaluation survey fieldwork and dissemination.

10. BUDGET

The main source of these funds will be the SIEF (Spanish Impact Evaluation Trust Fund) that allocated $151,000 for this evaluation.

The project has already received funding for the implementation of this evaluation from the Bank Netherlands Water Partnership Program in Water Supply and Sanitation (BNWP 2 - WSS) ($36,000). Finally, the World Bank project will commit a budget to cost sharing this evaluation.

ANNEX 1: BIOMARKERS UTILIZED TO MEASURE THE IMPACT OF THE CONNECTION TO THE SANITATION NETWORK ON HEALTH

In order to identify which health impact biomarkers have been used in previous studies, a bibliographic search was conducted in Medline and Cochrane employing the following strategies: i) Sanitation & health & impact & evaluation filtered by publication date (10 years) and by Humans (Mesh term); and ii) Sewage (Mesh) AND health filtered by human and evaluation studies (Mesh). By means of this search we intend to identify international studies.

For the identification of regional studies, a similar search was conducted in Lilacs. For the identification of these studies in Uruguay four qualified sources were consulted: OSE (a water utility serving a great part of the population), the Montevideo municipal government (that works in the development of the sanitation plan in the country's capital city), the Environment department of the Facultad de Ciencias, and the health and environment department of the Facultad de Medicina.

The studies found are not true impact studies, since the majority of them lack control groups, and consequently, it is not possible to measure the impact. By using different types of markers, these studies intend to measure the effects produced by the use of different types of sanitation (wastewater treatment, septic tanks, sewages, etc.) on the environmental fecal pollution, and the potential effect on humans. Markers are mostly either human pathogens (measured as a whole or in part), or normal inhabitants of the fecal flora, or diseases that affect individuals. From the evaluation of the studies found, two main health marker groups were identified.

A) Environmental health markers (biomarkers of environmental fecal pollution that would indirectly identify a potential health hazard).

   This group is made up of full detection techniques, partial detection and/or full detection of bacteria, virus or parasites in soils, surface waters, sewage water with human waste, wastewater treatment plant outlets.

   Examples of these markers are:
   - Bacterioid markers (Bacterioides fecal anaerobic 16S rRNA) (Bernhard 2000, 2003).
   - Molecular techniques for the detection of the enterococcal surface protein gene in humans different than that of animals (Jenkins 2005)
   - Human Polyomaviruses (HPyVs) (Bofil 2000, McQuaig 2006).
   - Noroviruses, common gastroenteritis agents. Detected by means of the Broadly Reactive Nucleic Acid Sequence-Based Amplification Assay (Rutjes 2006).
   - Human astroviruses constitute a significant cause of diarrhea in children, and are detected by means of PCR techniques. (Le Cann 2004)
   - Detection of RNA Polio and Hepatitis A viruses, and rotavirus chalcogens was determined by means of cultures, polymerase chain reaction, and ELISA techniques (enzyme-linked immunosorbent assay). (Kittigul 2000)
   - Furtherore, there are studies that assess the presence of geohelminth eggs in soils as markers, as well as bacterial cultures of environment samples (Mahvi AH 2006, Zanetti 2003).

B) Direct Impact Markers in Health consist of the determination of a clinically apparent disease, searching microorganisms (partial or total), or immunologic tests on human beings that reveal a recent infection by a microorganism transmitted by fecal contamination.

Below there is a list of potentially helpful impact markers for sanitation evaluation. As shown in the first section, most of them have not been used in the studies found.

- **Infant Diarrhea:** The most commonly used marker in the studies is the presence of diarrhea (Moll 2007). It is the symptom most frequently associated with bacterial, virus and parasite intestinal infection; however, it is not specific to this type of pathology, since it can be provoked by other causes such as chemical irritation and non-infectious inflammation. The WHO defines diarrhea as the passage of 2 or more loose or liquid stools per day within 24 hours, or one stool with blood or pus. It is an acute and self-limited symptom in most cases, so the use of biomarkers in non-acute periods is very difficult, since it does not provoke permanent immunization. Diarrhea caused by different factors has an important mortality (4% of world deaths) mainly in developing countries (WHO, 2000). It also causes great morbidity: malnutrition, anemia, growth deficit, and school absence.

- **Hepatitis:** Hepatitis A and E are viral diseases caused by a virus transmitted by the fecal-oral route and by intake of food in contact with fecally contaminated earth. The infection can be asymptomatic or present jaundice and abdominal pain and can even lead to death. The virus can be detected by identifying blood antibodies produced after contact with the microorganism (WHO 2001).

- **Cholera:** Cholera is a disease caused by Vibrio Cholerae. It is caused by water or food contamination with feces of infected individuals. In its acute stage, it is diagnosed clinically or by germ detection (WHO 2001).

- **Typhoid and paratyphoid fever:** Both diseases are caused by Salmonella Typhi through fecal contamination of water and food. It is diagnosed by identifying microorganisms in feces in the acute stage and in some cases there may be asymptomatic carriers. (WHO 2001).

- **Geo-parasites:** It is calculated that approximately 10 to 25 per cent of the world´s population is affected by geohelminth infection. This pathology can be caused by a group of helminths entering the body by the intake of eggs found in fecally contaminated soils. These eggs can enter via water, food or contaminated hands (especially in children) (Botero 1998; WHO 1995, 1996). Helminthiasis can cause severe diarrhea, malnutrition, anemia, and thus growth deficit, especially in young children. Diagnosis is made by a stool test and egg identification in soil samples.

Some other markers are consequences of the above, such as child mortality associated with specific causes (diarrhea), malnutrition and anemia but, in all cases, they are secondary to some of the above mentioned and thus non-specific. (WHO 1996; Rodríguez 2006)

ANNEX 2: FEASIBILITY AND ADEQUACY OF THE USE OF BIOMARKERS IN URUGUAY

Uruguay is a Latin American country finishing epidemiological transition. Its morbidity and mortality patterns resemble more those of developed countries than those of developing countries since they show a high mortality associated with non-infectious diseases (heart conditions, cancer and accidents), and a high morbidity associated with osteoarticular diseases, hypertension, diabetes and acute infectious diseases (especially in children).

Infant mortality rate is 12 per 1,000 live newborns and it is mainly associated with neonatal mortality, being the main causes prematurity and congenital and genetic conditions. Diarrhea has not been included within the first five causes of child mortality for more than 10 years.

On the basis of this epidemiological profile, the most adequate outcome measures to be applied in a potential impact study of sewerage network connection are discussed.

A) DIARRHEA IN CHILDREN

A.1) Impact on health and prevalence of pathology It is an endemic disease in Uruguay, which is potentially severe but does not lead to child mortality as is the case in several Third World countries. It is a high estimated prevalence disease even if there are no population studies available and it has ceased to be compulsorily reported. Its prevalence is now estimated through observation points in hospitals with a higher number of consultations.

A.2) Diagnosis methods: Except in severe cases that require interaction, the diagnosis is clinical. Most of the cases do not cause permanent immunity and, therefore, it is difficult to make the diagnosis by means of immune markers.

A.3) Feasible to be measured in individuals and environment: Measurement in individuals is by means of a direct survey or identification of consultations for this disease in the regional health centers.

A.4) Advantages: It can be measured by direct report. Theoretical prevalence is high enough to enable change identification.

A.5) Disadvantages: Survey data may not be reliable for various reasons: i) Lack of homogeneity in the people's definition; ii) Memory bias regarding onset of disease; iii) Seasonal variation; and iv) Potential confusion variables (lack of drinking water, lack of cooling systems to preserve food, etc.)

B) HEPATITIS

B.1) Impact on health and prevalence of pathology It is a potentially serious disease and it is compulsory to report it to the Ministry of Public Health (MPH) in Uruguay. Its behavior is endemo-epidemic. Its incidence in 2005 was 2,877 cases, which represents an incidence rate of 88.7 per 100,000 inhabitants (MPH 2008).

B.2) Diagnosis Method: Anti-hepatitis A antibodies dosage in blood.

B.3) Disadvantage of using it as a potential marker in Uruguay: Anti-hepatitis A vaccine has been included in the MPH Certified Vaccination Scheme, which is widely popular throughout the country and, hence, this indicator is not apt to be used in Uruguay.

C) CHOLERA AND TYPHOID FEVER

There is no cholera in Uruguay and the prevalence of typhoid fever is very low, making this indicators unfit for this kind of study.

D) MALNUTRITION AND ANEMIA.

D.1) Impact on health and prevalence of pathology: Mostly, these are non-specific secondary markers to diarrhea or other type of infections (respiratory, urinary, etc.) as well as specific and non-specific nutritional deficits associated with poverty. There are no population data on acute malnutrition. There are, though, data associated with chronic malnutrition causing growth deficit in children after sustained exposure to nutritional restriction in terms of adequate quantity and quality. Some studies on anemia in children and pregnant women show a high prevalence of this pathology.

D.2) Diagnosis methods: Anemia, blood hemoglobin. Malnutrition, weight and size

D.3) Advantages: Malnutrition can be measured in a simple and non-invasive way.

D.4) Disadvantages: It is a non-specific measurement.

E) SOIL TRANSMITTED HELMINTHIASIS

E.1) Impact on health and prevalence of pathology: Soil transmitted helminthiasis (STH) or intestinal worm infection comprises a group of parasitic infections affecting the human being, whose common factor is the way of transmission. A stage in their vital cycles has to take place in the soil, either for egg maturity or larvae or adult development. Therefore, it is necessary that the levels of human fecal contamination in the environment be high for their cycles to complete.

Within this parasitosis we can find: Ascariasis caused by Ascaris lumbricoides, Trichuris trichiura, strongyloidasis caused by Strongyloides stercoralis and, some authors also include Hymenolepis nana (Botero, 2006).

STH caused by human nematodes are acknowledged to be a sanitary problem worldwide and at present a real scourge for developing countries. It is calculated that more than a quarter of the world's population is affected by it (WHO, 1995). The disease presents in endemic and hyperendemic foci (Chiarpenello, 2004).

It is difficult to measure the impact these parasitic diseases have in Latin America: albeit fragmented, there are reports of population studies showing high rates of parasitism (17 to 44 percent) (Beltrame 2002, Gomes 2002, Richer 2005, Brazil Dos Santos 2005).

Although these helminths can affect all population, children in pre-school age (2 to 5 years old), children in school-age (6 to 12 years old), teenagers and women in gestational age are considered to be the risk groups (Awasthi 2003, UNICEF 1997).

It is well-known that these age groups share not only physical but also intellectual intense growth and development, which can be affected by these helminth infections. The negative effect in cognitive development is a proven fact in school-age children, creating a significant learning gap with parasite free individuals (Nokes 1994, Hadidjaja 1998). Additionally, these helminthiases are often associated with other nutritional problems,

especially low iron and vitamin A intakes, which can worsen any underlying condition, particularly anemia (Gabrielli 2005, Steketee 2003).

In severe cases of A. lumbricoides infection, the incidence of xerophthalmiacaused by vitamin A deficit has been suggested, with its potential consequences, namely blindness, morbidity and mortality in the affected communities (Curtale 1995).

In Uruguay, these diseases have shown a significant decrease throughout the 20th century, limiting to just isolated foci. All this promoted by a greater sanitation and potable water coverage and adequate general living conditions. This has contributed to Uruguay focusing efforts to fight chronic conditions, which have become relevant in the light of a complete epidemiological transition. Nonetheless, certain sectors of the population have started to gradually impoverish, thus showing deterioration in living conditions, with scarce or no access to sanitation, potable water, overcrowding, unhealthy housing and flood-prone land, increase in poverty mainly among the youngest sectors (infantilization of poverty). From very low morbidity rates often lower than 4 per cent, with occasional fatal cases, nowadays we have reached high morbidity rates (36 per cent) in a significant sector of our population not only urban but also suburban, showing life-threatening and even fatal cases in very young children. (Sanabria 1999, Acuña 1999, Acuña 2001)

According to a study consulted (Da Rosa 2008), 6,203 stool tests performed in day care centers in Montevideo between 1999 and 2006 showed a 7.2 per cent incidence of STH in a population of low socio-economic background children living in homes with a very low sanitation network connection rate.

E.2) Diagnosis Method: Stool tests performed to stool specimens. The stool test is processed according to Ritchie's technique, direct fresh examination in the case of liquid stools, modified Ziehl-Neelsen dying technique to search Cryptosporidium sp. in the cases in which this agent were suspected on the basis of previous procedures, and macroscopic examination of stools. It implies low cost and moderate complexity. Stools are required to be stored in a regular refrigerator and the processing can take place up to 5 days later given the adequate conservation conditions.

E.3) Advantages: i) Low cost; ii) Specificity, the diagnosis of parasitosis in human beings is an unequivocal consequence of water, food or hand contamination with feces; and iii) Possibility to collect environmental samples (intermediate outcome marker) and human specimens (final outcome marker).

E.4) Disadvantages: Kobayashi A. (1976) has studied and suggested seasonal fluctuation, i.e. an increase of infection cases in certain months of the year showing significant variation. This researcher observed that in Japan the higher peaks of infection occurred during spring and fall whereas in Corea, Seo B.S. (1978) associated them with summer and winter.

However, seasonal fluctuation may not be very strict or even occur since it is influenced by different factors such as temperature, pluviometric indices (humidity), different eating habits, sanitary conditions either personal or environmental. All these elements may result in a more heterogeneous case distribution, without a close association to seasonal variations (Da Rosa 2008).

Reinfection possibility after treatment due to survival of helminth infecting elements in the environment, either larvae or eggs. For this reason, adequate collection methods should evidence these infection stages and their viability and thus determine distribution and intensity patterns.

ANNEX 3: WORKING PLAN FOR THE IMPACT ON HD INDICATORS OF HOUSEHOLD CONNECTION TO THE SEWERAGE SYSTEM IN URUGUAY

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a) Design and preparation stage:	**To be done by:**
1. **Technical design definition**: this stage has been completed (see Aide Memoire from 28th of October 2009 where the methodology is detailed).	Agreed by the LCSSD Economist Unit of The World Bank and OSE in October 2009.
2. **Institutional agreements:** taking into account that the connection to the sewage system must be subsidized, several regions in which the Impact Evaluation studies could be undertaken have been identified. The conditions for ensuring this subsidy must be previously established.	OSE has already presented candidate regions for the study. OSE must sign institutional agreements with each of the chosen municipalities before moving further to the next stage. **In particular, OSE must ensure the implementation of the subsidy to the connection in each municipality.**
3. **Methodology** for the field work: a. Selection of biomarkers to measure impact: so far the presence of parasite has been chosen[10]. b. Division of the selected region in TG and CG. To this end, the following should be considered: (i) engineering restrictions, particularly in terms of the possible speed of capacity building and therefore on the possible speed connection of households in the TG; (ii) economic possibilities of the counterpart financing the connection subsidy; (iii) technical need in relation to the way the biomarkers can be	This stage starts once the municipalities, OSE and The World Bank are in the same page regarding the conditions and requirements for this Impact Evaluation. Participate in this stage OSE, the epidemiologist, Facultad de Ciencias Sociales (CS) from UDELAR and MSP: a. Defined by the epidemiologist under the approbation of OSE and the municipality involved. b. Must be defined jointly by OSE that will determine the real possibilities (Keeping in mind the restrictions imposed by the municipality, in particular related to the subsidy and the lottery) and the epidemiologist who will establish the observation methodology in relation to the prevalence of the biomarker chosen, with the help or The World Bank team. The opinion of other experts,

[10] A starting point could be to consider the prevalence of parasite in children younger than 12 year old between 4 and 8 percent. We expect a reduction of 30 percent one year after the connection. The reduction could be higher if soil in the region is very polluted.

observed; y (iv) the way the lottery could be organized. c. Preparation the IE Protocol including a summary of the questionnaire and the quantity (both in terms of territorial extension and in number) and periodicity of the observations related to biomarkers.[11]. d. Presentation to the IE Protocol to the Ethics committee of the Public Health Ministry (MSP).	namely Alvaro Riela from the Facultad de Ciencias Sociales so that, from this stage the way to build the database is convenient for its further analysis. c. Done by the epidemiologist with the approval of OSE and The World Bank team. We ask OSE to suggest the inclusion in the questionnaire of all data they would like to get out of this study. d. Presented by the epidemiologist. In this stage the Group of Carmen Ciganda from the Health Ministry will be invited to participate as peer reviewer according to the meeting the mission held with them in October 2008.
4. **Preparation of field work**: a. Final definition of regions to be intervened. b. Final definition of the questionnaire. c. Definition of the sample size and sampling. d. Selection and training of a team to do the field work both for the questionnaire and from taking soil and faces samples. e. Trial and testing of the questionnaire. f. Peer reviewing.	All actors must active in this stage: a. OSE must provide the agreements with the municipalities. b. The epidemiologist as well as another specialist in field research will provide the final questionnaire to OSE and to The World Bank team for revision and approval. c. To be done by a specialist d. UNICEM proceeds to the training and asks for the required contracts to The World Bank including the materials needed for soil extraction and analysis. e. UNICEM y CS. f. CS and MSP.

b) Field Work:

1. Lottery.	Municipality and/or OSE with the help of The World Bank team.
2. Baseline observation: we take information	UNICEM.

[11] In relation to parasite presence, 3 soil samples should be taken each 6 months and sample feces of children aged less than 12 years old.

regarding actual prevalence of parasites both in soil and in feces as well as the characteristics of the beneficiaries. This is done both in the TG and in the TC before actually intervening the TG. Database will be organized for future analysis.	
3. Data will be validated. Both groups should have identical ex-ante markers and characteristics.	UNICEM.

c) Data collection and follow up:

1. After implementing the intervention (and the time required to observe changes in biomarkers[12]), a follow-up observation will be undertaken in the same households observed in the baseline. The database will be organized for future analysis.	UNICEM.

d) Analysis:

1. Using different econometric methods we will evaluate the differences observed between the baseline observation and the follow-up observation in the TG and the difference of the previous difference with the difference observed in the TC.	LCSSD Economist Unit of The World Bank together with Alvaro Riela and the Facultad de Ciencias Sociales.

e) Result dissemination:

[To be defined]
Is important to underline that step 2 has already been completed and that we are at the moment at the end of step 3 and moving to the preparation of the field work in 3.

[12] In the case of parasite prevalence the periodicity can be of 6 months or more.

ANNEX 4: QUESTIONNAIRE (DRAFT)

ENCUESTA LONGITUDINAL DE USO DE AGUA Y SERVICIOS SANITARIOS: CUESTIONARIO

Proyecto Financiado por el Banco Mundial

Dirección de la Vivienda:
Región:
Provincia:
Comuna:

MODULO RESIDENTES: COMPOSICION DEL HOGAR

	A Todas Las Personas							
	Incluye a todos los miembros del hogar Escribal el nombre de pila de todos los integrantes del hogar e indique quien esta presente en la entrevista 1. Contesta 2. Presente pero no contesta 3. No esta presente	1. Parentesco con el Jefe o Jefa del Hogar 01. Jefe(a) 02. Conyuge 03. Hijo(a)-Hijastro(a) 04. Padre o madre 05. Suegro(a) 06. Yerno o nuera 07. Nieto(a) 08. Hermano(a) 09. Cuñado(a) 10. Otro Familiar 11. No Familiar	2. Sexo 1. Hombre 2. Mujer	3. Edad (años cumplidos)	4. Núcleo Familiar 01. Principal 02. Segundo 03. Tercero . . n. Enésimo	5. ¿Cuál es su relación de parentesco con el jefe(a) del núcleo 01. Jefe(a) 02. Conyuge 03. Hijo(a) 10. Otro Familiar 11. No familiar	6. Estado Civil 01. Casado 02. Conviviente 03. Separado 04. Viudo 05. Soltero	7. ¿Pertence a alguna etnia?
1	P	P1	P2	P3	P4	P5	P6	P7
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								

MODULO RESIDENTES: PATRIMONIO MODULO PARTICIPACION

Jefes de Núcleo							12 Años y más		
8. ¿Tiene Ud. Actualmente en funcionamiento y uso? a. Lavadora Automatica b. Refrigerador c. Teléfono fijo d. Videograbador e. Microondas f. Computador g. Conexión a Internet h. Vehículo							9. ¿Participa Ud. En alguna de las siguientes organizaciones? 1. Juntas de Vecinos-Unión Comunal 2. Centro de Madres, Talleres de mujeres 3. Organizaciones Juveniles 4. Club deportivo y recreativo 5. Organización Artística y Cultural 6. Política 7. Religiosa 8. Asociaciones gremiales, colegios profesionales, Agrupaciones de empresarios 9. Organizaciones de Adulto Mayor 10. Comité agua potables 11. Sindicatos 12. No participa en ninguna PASE A P11	10. En la organización que Ud. Señaló: 1. Participa habitualmente y es dirigente 2. Participa habitual y activamente 3. Participa Ocacionalmente 4. Nunca, sólo está inscrito	11. ¿Por qué no participó en alguna organización? 1. No le interesa 2. No tiene tiempo 3. No sirven para nada 4. No existen organizaciones 5. Están politizadas 7. Otra razón. Especifique
P8a	P8b	P8c	P8d	P8f	P8g	P8h	P9	P10	P11

MODULO VIVIENDA

1. ¿Bajo que situación ocupa el sitio?

1. Propio Pagado
2. Propio Pagandose
3. Propiedad compartida (pagada) con otras viviendas del sitio
4. Propiedad compartida (pagándose) con otras viviendas del sitio
5. Arrendado con contrato
6. Arrendado sin contrato
7. Cedido por servicios
8. Cedido por familiar u otro
9. Ocupación irregular
10. Otro. Especifique.

2a. ¿Cuántas vivienas hay en el sitio?

(Anote 0 en el caso de departamento, condominio o propiedad compartida)

2b. Su vivienda, ¿es la principal del sitio?

1. Si
2. No

3. ¿Cuántas Piezas de Cada tipo posee la vivenda que ocupa?

a. Dormitorio	
b. Estar-Comedor (uso exclusivo)	
c. Estar-comedor y dormitorio (uso múltiple)	
d. Estar-comedor y cocina (uso múltiple)	
e. Cocina (uso exclusvo)	
f. Baño	
g. Otras piezas	

4. ¿De donde proviene el aqua de su viviena?

1. Red pública con medidor propio
2. Red pública con medidor compartido
3. Red pública sin medidor
4. Pozo o noria
5. Río, vertienen o estero
6. Otra fuente. Especifique.

5. Su vivienda tiene agua caliente por medio de:

1. Calefón o gas
2. Termo eléctrico
3. Otro sistema. Especifique
4. No tiene

6. La vivenda donde Ud. Vive, ¿dispone de energía electrica?

1. Sí, de la red pública con medidor propio
2. Sí, de la red pública con medidor compartido
3. Sí, de la red púbillica sin medidor
4. Sí, de un generador propio o comunitario
5. Sí, de otra fuente. Explique.
6. No dispone de energía eléctrica

7.a Material predominante en muros exteriores de la vivienda

1. Ladrillo o concreto (hormigón) o bloque (de hormigón armado)
2. Albañilería de piedra
3. Tabique forrado por ambas caras (madera u otro)
4. Adobe
5. Barro, quincha o pirca
6. Tabique sin forro interior (madera u otro)
7. Desecho (carton, lata, sacos, etc)
8. Otro. Especifique

7.b Estado de conservacion de los muros

1. Bueno
2. Aceptable
3. Malo

9.a Material predominante en el techo de la vivienda

1. Teja, tejuela, losa de hormigon con cielo interior
2. Zinc o pizarreño con cielo interior
3. Zinc, pizarreño, teja, tejuela o madera sin cielo interior
4. Fonolita
5. Paja, coirón, totora o cana
6. Desecho (plásticos, latas, etc)

9.b Estado de conservacion del techo

1. Bueno
2. Aceptable
3. Malo

11. ¿Bajo que situación ocupa la vivienda?

1. Propia pagada
2. Propia pagándose
3. Propiedad compartida (pagada) con otros hogares de la vivienda
4. Propiedad compartida (pagándose) con otros hogares de la vivienda
5. Arrendada con contrato
6. Arrendada sin contrato
7. Cedida por servicios
8. Cedida por un familiar u otro
9. Usufructo
10. Ocupación irregular (de hecho)

10. Tipo de vivienda

1. Casa o Casa en cite
2. Casa en condominio
3. Departamento en edificio
4. Pieza en casa o departamento
5. Pieza en casa antigua o conventillo
6. Mediagua o mejora
7. Rancho, ruca o choza
8. Otro tipo (móvil, carpa, etc) Especifique

8.a Material predominante en el piso de la vivienda

1. Radier revestido (parquet, ceramica, tabla, linoleo, flexit, baldosa, alfombra, Etc)
2. Radier no revestido
3. Tabla o parquet sobre soleras o vigas
4. Madera, plástico o pastelones directamente sobre tierra
5. Piso de tierra

8.b Estado de conservación del piso

1. bueno
2. aceptable
3. Malo

12. Cuánto paga de arriendo?, o si Ud. tuviera que pagar arriendo por esta vivienda, cuanto le costaría el arriendo mensual? _____

13. Cuántos hogares hay en la vivienda? _____

Si existe un solo hogar en la vivienda pasar a la pregunta 17

14. Su hogar, ¿es el principal en la vivienda?

1. Si
2. No

16. ¿Algún miembro de este hogar es propietario de esta vivienda?

1. Jefe de hogar
2. Conyuge
3. Hijo(a)
4. Otro pariente
5. Otro no pariente
6. Jefe y Conyuge
7. Jefe y otro pariente
8. No es propietario (pasar a módulo de uso de aguas)

15. ¿Cuántas piezas de cada tipo ocupa su hogar?

a. Dormitorios (uso exclusivo para dormir)	
b. Estar-Comer (uso exclusivo)	
c. Estar-comer y dormir (uso multiple)	
d. Estar-comer y cocinar (uso multiple)	
e. Cocina (uso exclusivo)	
f. Bano	
g. Otras piezas no habitables	

17. ¿Algún miembro de este hogar es propietario de otra vivienda?

1. Sí, jefe de hogar
2. Sí, conyuge
3. Sí, hijo(a)
4. Sí, otro pariente
5. Sí, otro no pariente
6. Jefe y conyuge
7. Jefe y otro pariente
8. No es propietario

MODULO: USO DE AGUAS

1. ¿Puede indicar cuál de las siguientes fuentes de agua estan disponibles para hogares en este vecindario?

1. Conección domiciliaria privada	
2. Pozo privado en casa	
5. Agua de lluvia acumulada en su vivienda	
6. Agua de lluvia acumulada dentro del vecindario.	
7. Fuente publica	
8. Pozo público	
9. Pozo privado en el vecindario	
10. Rio	
11. Otro. Especifique	

2. ¿Puede decirme Ud. cuál de las siguientes fuentes de agua son utilizadas dentro en su vivienda?

1. Conección domiciliaria privada, con llave dentro de vivienda (PASE A P3)	
2. Conección domiciliaria privada, con llave dentro del sitio pero fuera de vivienda (PASE P3)	
3. Pozo privado en casa (PASE A P3)	
4. Agua de lluvia acumulada en su vivienda (PASE A P18)	
5. Agua de lluvia acumulada dentro del vecindario (PASE A P17)	
6. Fuente pública (PASE A P17)	
7. Pozo público (PASE A P17)	
8. Pozo privado en el vecindario (PASE A P17)	
9. Rio (PASE A P17)	
10. Otro. Especifique (PASE A P17)	

3. ¿En que año la vivienda obtuvo la conección privada?

4. ¿Cuánto tuvo que pagar por la conección? (Induya todos los costos de coneccion)

5. El pago se realizo

1. De una vez	
2. Durante varios meses	
Indique el número de meses	

6. ¿Recibió algún tipo de subsidio para obtener la conección?

1. Si (PASE A P7)	
2. No (PASE A P8)	

7. ¿Por qué recibió un subsidio? (PASE A P9)

1. Postulé a un subsidio entregado por una institución del gobierno	
2. Un empleado público vino a nuestro hogar para ofrecernos el subsidio	
3. Miembro del hogar tenía contactos	

8. ¿Postuló a subsidios para obtener la coneccion? (PASE A P11)

1. Sí, pero no se me otorgó	
2. No	

9. ¿Quién entregó el subsidio? (En caso de múltiples organizaciones, reporte la entidad que proveyó el mayor monto de subsidio)

1. Gobierno vecinal	
2. Gobierno comunal	
3. Gobierno provincial	
4. Gobierno nacional	
5. Empresa de agua	
6. Institución de caridad	
7. Comité de agua	
8. Otro. Especifique.	

10. ¿Cuánto fue el monto del subsidio?

11. ¿Quién provee el agua?

1. Municipalidad	
2. Entidad privada	
3. Otro. Especifique.	
4. No sabe	

12. En el pasado año, ¿cuántos problemas mecanicos/técnicos ha tenido su conección?

13. ¿Está satisfecho con su conección? [PASE A P18]

1. Si	
2. No	

14. ¿Ha intentado obtener acceso a una fuente de agua privada?

1. Si (Pase a P15)	
2. No (Pase a P16)	

15. ¿Cuándo trató de obtener acceso a una fuente de agua privada, experimento alguno de los siguientes problemas? (Marque las alternativas reportadas) [PASE A P18]

1. Mi vecindario no posee servicios de agua privado	
2. Los gastos de conección eran muy altos	
3. Era necesario pagar un soborno, y no estuvimos dispuesto a hacerlo	
4. Era necesario presentar un título de propiedad de la vivienda y no lo tenemos	
5. No pudimos conseguir permiso del dueño de la vivienda	

16. ¿Por qué no ha tratado de conseguir acceso a una fuente de agua privada? (Marque las alternativas reportadas)

1. Mi vecindario no posee servicios de agua privado	
2. El proceso es complejo y toma mucho tiempo	
3. Los gastos de conección eran muy altos	
4. La vivienda no es nuestra, y no queremos invertir en ella.	

17. ¿Para cada una de las fuentes de aguas públicas que su hogar utiliza, indique:

	F1	F2	F3	F4
a. Medio de tranporte desde su vivienda hasta la fuente de agua				
i. Camina				
ii. Vehículo Motorizado Propio				
iii. Vehículo Motorizado - Transporte Público				
iv. Vehículo No Motorizado Propio				
b. ¿Cuánto tiempo demora el trayecto desde su vivienda hasta la fuente de agua?				
c. ¿Quién usualmente está a cargo de trasladar el agua?				
i. Jefe de Hogar				
ii. Conyuge				
iii. Hijos				
iv. Hijas				
v. Otro Familiar				
vi. Otra Persona				
d. ¿Paga diariamente por el tralado del agua desde esta fuente?				
i. No				
ii. Si				
iii. ¿Cuánto?				

18. Para cada una de las fuentes de aguas que su hogar utiliza, indique:

	F1	F2	F3	F4
a. En promedio, cuántos dias por semana miembros de su hogar utilizan la fuente ? ([1]-[7], no sabe=[99])				
b. En una escala del 1 al 10, como calificaría la calidad del agua de cada fuente? ([1]=Completamente insatisfecho, [10]=Completamente satisfecho)				
c. ¿Es el agua de esta fuente bebida?				
d. ¿Es el agua de esta fuente utilizada para el riego?				
e. ¿Cuánto cancela por utilizar esta fuente de agua				
Monto				
Unidad				
i. Mes				
ii. Semana				
iii. Hora				
iv. Metro cúbico				
v. Otro. Especifique				
f. ¿Cuántos metros cúbicos de agua su hogar utiliza mensualmente? ([No sabe=99])				
g. ¿Qué tipo de envase se utiliza en su hogar para acumular el agua? ([1]=Contenedores de 1 litro, [2]=10 litros, [3]=20 litros, [4]=Otro - Especifique)				
h. ¿Cuántos de estos envases se utilizan/terminan diariamente?				

19. ¿Algún miembro del hogar vende agua a sus vecinos?	
1. Si (PASE A P20)	
2. NO (PASE A P21)	

20. Para cada una de las fuentes de aguas que su hogar utiliza, y respecto a la venta de agua, indique:	F1	F2	F3	F4
a. El cargo se realiza por				
i. Diariamente				
ii. Semanalmente				
iii. Mensualmente				
iv. Anualmente				
vi. Por metro cuadrado				
vii. Por envase de 20 litros				
viii. Por envase de 200 litros				
ix. Otro. Especifique.				
b. ¿Cuánto es el monto que cobra?				

21. Para cada una de las fuentes de agua que su hogar utiliza, indique:	F1	F2	F3	F4
a. ¿Trata el agua antes de ser utilizada? i. NO				
ii. Sí, con fluor				
iii. Sí, con cloro				
iv. Sí, con filtro				
v. Sí, otro. Especifique.				
b. ¿Utiliza el agua para algún uso productivo?				
1. No [PASE A P21]				
2. Sí				
Negocio o Almacén				
Riego de productos agricolas				
Servicios (lavado de ropa)				
Otro. Especifique.				

MODULO: Sistemas de Eliminación de Excretas

1. La vivenda donde Ud. Vive, dispone de sistema de eliminación de excretas?
1. Sí, con WC conectado a alcantarillado [PASE A P5]
2. Sí ,con WC conectado a fosa septical
3. Sí, con letrina sanitaria conectada a pozo negro
4. Sí, con cajón sobre pozo negro
5. Sí, con cajón sobre acequia o canal
6. Sí, con cajón conectado a otro sistema
7. No dispone de sistema

2. ¿Ha algún miembro de su hogar intentado contactar a la entidad a cargo del sistema de alcantarillado para conseguir acceso?	
1. Si	
2. No [PASE A P4]	

3. Cuando se llevó a cabo el contacto, ¿experimentó su familia alguno de los siguientes problemas? [PASE A P5]	
1. Mi vecindario no posee servicios de agua privado	
2. Los gastos de conección eran muy altos	
3. Era necesario pagar un soborno, y no estuvimos dispuesto a hacerlos	
4. Era necesario presentar un título de propiedad de la vivienda y no lo tenemos	
5. No pudimos conseguir permiso del dueño de la vivienda	

4. ¿Por qué ningún miembro de su hogar nunca ha contactado la entidad a cargo del sistema de alcantarillado?	
1. Mi vecindario no posee servicios de agua privado	
2. Los gastos de conección eran muy altos	
3. Los gastos de mensuales eran muy altos y no podemos cancelarlos	
4. Era necesario pagar un soborno, y no estuvimos dispuesto a hacerlo	
5. Era necesario presentar un título de propiedad de la vivienda y no lo tenemos	
6. No pudimos conseguir permiso del dueño de la vivienda	

5. ¿El sistema de eliminación de excretas está dentro de su vivienda?	
1. Si	
2. No	

6. ¿Qué distancia recorre para llegar? (Reporte metros)

7. Aparte de los miembros de su hogar, ¿cuántas personas utilizan el sistema?

8. ¿Debe esperar regularmente para utilizar el sistema?	
1. No	
2. Si	
Cuántos Minutos?	

9. ¿Debe pagar por el uso del sistema?	
1.No	
2. Si	
¿Cuánto paga mensualmente?	

10. ¿Cuánto paga anualmente por el mantenimiento del sistema de excretas en su hogar?

11. ¿Tiene inconvenientes con su sistema de excretas durante períodos de lluvias e inundaciones?	
1. Si	
2. No	

MODULO: EDUCACION

	15 ó más		11 años o menos		Todos		
	1. ¿Sabe leer y escribir?		2. ¿Quién está a cargo del cuidado del niño durante el día		3. ¿Asiste actualmente a algún establecimiento educacional, jardín infantil, sala cuna u otro programa especial?		4. ¿Cuándo fue la última vez que asistió formalmente a un jardín infantil, sala cuna, programa especial infantil o algún establecimiento educacional?
	1. Si 2. No		1. La madre 2. El padre 3. Un hermano/a mayor 4. Un abuelo/a 5. Otro familiar 6. Servicio Domestico 7. Una vecina o vecino 8. Un familiar o no familiar que recibe pago 9. Permanece en el jardín o establecimiento e 10. Se queda solo en el hogar 11. Otra. Especifique		1. Si	Pase a P.7	1. Este año (antes de noviembre) 2. El año pasado 3. Hace dos años 4. Hace tres años o más 5. Nunca ha asistido
					2. No	Si tiene 24 ó menos años, pase a P.4 Si tiene 25 ó más años, pase a P.8	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							

24 años o menos	De 6 a 24 años	Estudiantes	Todos
5. ¿Cuál es la principal razón por la cual no asiste actualmente a un jardín infantil, sala cuna, programa especial infantil o algún establecimiento educacional?	6. ¿Qué piensa hacer el próximo año?	7. ¿A qué jornada asiste regularmente?	8. Indique los años de escolaridad completados
1. No tiene edad suficiente 2. No existe establecimiento cercaño 3. No existe cupo en establecimiento 4. Dificultad de acceso o movilización 5. Horario inconveniente 6. Dificultad económica 7. Está trabajando o buscando trabajo 8. Ayuda en la casa o quehacer del hogar 9. Requiere establecimiento especial 10. Maternidad o Embarazo 11. No le interesa 12. Pasó edad de estudiar 13. Enferdad que lo inhabilita 14. Problemas Familiares 15. Problemas de Conducta 16. Problemas de Rendimiento 17. No es necesario porque lo(a) cuidan en la casa 18. Otra Razón. Especifique.	1. Estudiar 2. Trabajar 3. Quehaceres del Hogar 4. Cuidar a los niños 5. Estudiar y trabajar 6. Otras actividades 7. No sabe **Pase a P.8**	1. Mañana 2. Tarde 3. Jornada Completa (mañana - tarde) 4. Vespertina 5. Otra (Horario variable o esporádico)	

A todos los estudiantes			Estudiantes de Educación Prebásica, Básica y Media
9. En el presente año escolar, ¿recibe alimentación en el establecimiento educacional? 1. Desayuno u Once 2. Almuerzo 3. Desayuno y Almuerzo o Almuerzo y Once 4. Desayuno, Almuerzo y Once (Alimentación completa) 5. Alimentación completa más colación 6. No recibe **Pase a P.11**	10. ¿Paga por la alimentación que recibe en el establecimiento educacional? 1. Si 2. No	11. El establecimiento educacional es: 1. Privado 2. Público	12. En el presente año escolar 2009, ¿ha recibido alguno de los siguientes beneficios en el establecimiento educacional o a través de él? Útiles Escolares Textos Escolares Atención Dental Escolar Atención Médica Escolar 1. Si 2. No

MODULO EMPLEO E INGRESOS DEL TRABAJO

Situación Ocupacional (personas de 12 años y más)				
1. ¿Trabajó usted la semana pasada? 1. Si **P.8** 2. No ¿Ni siquiera una hora? ¿Ni ayudando a un familiar? ¿Ni como aprendiz sin paga? ¿Ni vendiendo algún producto? 1. SI **P.8** 2. No **P.2**	2. Aunque no trabajo la semana pasada ¿tenía algún empleo del cual estuvo ausente temporalmente por licencia, huelga, enfermedad, vacaciones u otra razón? 1. Si **P.8** 2. No **P.3**	3. ¿Buscó trabajo remunerado en los últimos dos meses? 1. Si **P.4** 2. No **P.7**	4. ¿Cuántas semanas ha estado buscando trabajo? (Señale el número de semanas cumplidad)	5. ¿Ha trabajado alguna vez? 1. Si 2. No

		Ocupados (Responden Alt. 1 en P1 ó en P2)
6. ¿Cuál es su oficio o que hacía en su último trabajo?	7. ¿Por qué no buscó trabajo en los últimos dos meses?	8. ¿Cuál es su ocupación u oficio actual o qué hace usted en su trabajo principal?
Pase a P.24		
	1. Quehaceres del hogar 2. No tiene con quién dejar a los niños 3. Enfermedad crónica o invalidez 4. Estudiante 5. Jubilado(a), pensionado(a) 6. Rentista 7. Tiene trabajo esporádico 8 Se aburrió de buscar 9. No tiene interés 10. Otra razón. Especifique	
	Pase a P.24	

9. ¿Qué clase de actividad realiza la empresa, industria o servicio donde desempeña su trabajo principal actual?	10. En su ocupación principal, usted trabaja como:	11. En su trabajo actual principal, ¿ha firmado contrato de trabajo?	12. Según su contrato de trabajo o el trato con su empleador, su jornada de trabajo normal es de:
	1. Patrón o empleador 2. Trabajador por cuenta propia 3. Empleado u obrero del sector público 4. Empleado u obrero de empresas públicas 5. Empleado u obrero del sector privado 6. Servicio doméstico puertas adentro 7. Servicio doméstico puertas afuera 8. Familiar no remunerado 9. FF.AA. Y del orden **Si contesta alternativas 3, 4, 5, 6 ó 7, pase a P.11** **Si contesta alternativas 1,2,8 ó 9 pase a P.13**	1. Sí, contrato indefinido 2. Sí, contrato no indefinido 3. Sí, no sabe si es indefinido 4. No ha firmado contrato 5. No se acuerda o no sabe si firmó contrato	**(Señale horas semanales)**

13. ¿Cuántas personas trabajan en total en esa empresa? (En su país)	14. ¿Cuántas horas trabaja efectivamente en su empleo principal?	15. Su actual empleo principal es de tipo:	16. ¿Desde cuándo tiene su actual empleo?
A. Una persona B. 2 a 5 personas C. 6 a 9 personas D. 10 a 49 personas E. 50 a 199 personas F. 200 ó más personas X. No sabe **Incluya al entrevistado**	(Señale horas semanales)	1. Permanente 2. Temporal 3. A plazo fijo 4. Por tarea o servicio 5. Otra. Especifique	Indique mes y año

Ocupados

17. En el mes pasado, ¿cuál fue su ingreso o remuneración líquida en su ocupación principal? Anote el monto mensual declarado en [Unidad monetaria] **Incluya:** Los descuentos por préstamos y consumos en casas comerciales **Excluya:** Las asignaciones familiares, bonificaciones, gratificaciones, descuentos previsionales y de salud. **(Si no tuvo remuneración o ingresos, anote cero y pase a P.19)**	18. ¿A qué jornada de trabajo correspondió ese ingreso o remuneración del mes anterior? **Indique total de horas y días mensuales**	19. Además del ingreso declarado anterior (en pregunta 17) ¿recibió el mes pasado otros ingresos provenientes del trabajo principal? **(Anote como máximo dos situaciones, lea alternativas)** 0. No recibió otros ingresos 1. Bonificación o gratificación 2. Remuneración en especies o regalías 3. Retiro de productos de su negocio (no agrícolas) para consumo propio 4. Valor de la casa cedida por servicios este ingreso? 0. No recibió otros ingresos Cual es la periodicidad de este ingreso? 1. Diarios 2. Semanal 3. Quincenal 4. Mensual 5. Bimestral 6. Trimestral 7. Cuatrimestral 8. Semestral 9. Anual

20. Durante el último año (2009), ¿ha recibido usted alguno de los siguientes tipos de ingresos derivados de su trabajo principal?	21. ¿Tiene otra u otras ocupaciones además del trabajo principal?	22. El mes pasado, ¿cuál fue el ingreso líquido total por esa o esas ocupaciones?	23. Actualmente, ¿participa Ud. en algún Programa de Empleo de Emergencia del Estado? (Municipalidad u otro organismo estatal)
0. No ha recibido los ingresos anteriores 1. Bonificaciones, gratificaciones u otros similares (trabajadores independientes) 2. Ganancias derivadas de la venta de productos agropecuarios y mineros (Trabajadores independientes del sector silvoagropecuario y mineros)	1. Si **P.22** 2. No **P.23**	**Incluya el total de ingresos percibidos por trabajos secundarios durante el mes anterior**	1. Si 2. No
Anote el tipo de ingreso y monto anual correspondiente			

	Personas de 15 a 60 años	
24. ¿Ha recibido algún tipo de capacitación laboral durante los últimos 12 meses? 1. Sí, sólo una vez 2. Sí, más de una vez **Pase a P.26** 3. No **Pase a Módulo otros ingresos**	25. ¿Cuál fue la duración y la intensidad de la capacitación recibida? **capacitación recibida)** **Duración** A. Menos de un mes B. De 1 a 3 meses C. De 4 a 6 meses D. Más de 6 meses **Intensidad semanal** 1. Una vez 2. Dos veces 3. Tres veces 4. Cuatro veces 5. Cinco o más veces	26. La capacitación recibida o la que actualmente recibe tenía o tiene por finalidad... 1. Capacitarse en un edificio para encontrar un empleo 2. Aprender un nuevo oficio para cambiar de empleo o actividad 3. Mejorar su desempeño en su actual actividad 4. Mejorar sus conocimientos en general, sin que ello se relacione necesariamente a su puesto de trabajo 5. Otro. Especifique.

MODULO OTROS INGRESOS

	A TODAS las personas				
	1. El mes pasado ¿recibió ingresos por...?		2. En los últimos 12 meses, ¿recibió ingresos por...?		3. El mes pasado, ¿recibió ingresos por...?
	Registre como máximo dos tipos de ingresos		1. Intereses por depósitos 2. Dividendo por acciones		**Tipo**
	1. Arriendo de propiedades urbanas 2. Pensión de alimentos 3. Dinero aportado por familiares ajenos al hogar 4. Remuneración por trabajos ocacionales (no ocupados) 5. Arriendo de maquinarias, animales o implementos 6. Trabajos realizados antes del mes anterior correspondientes a sueldos, finiquitos, indemnizaciones de trabajadores 7. No recibió estos tipos de ingresos		3. Donaciones de instituciones o personas ajenas al hogar 4. Valor del consumo de productos agrícolas producidos o recolectados por el hogar (huertos, gallineros, productos del mar, etc) Especifique 5. Retiro de Utilidades 6. Arriendo de propiedades agrícolas (tierras e instalaciones) 7. Arriendo de propiedades por temporadas 8 Otros ingresos. Especifique 9. No recibió este tipo de ingresos		1 Jubilación 2. Pensión de Invalidez 3. Pensión de Viudez 4. Pensión de Orfandad 5. Otro. Especifique 6. No recibió este tipo de ingresos
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					

MODULO SALUD	Todas Las Personas										
	1. ¿Qué miembro de su hogar se sintió enfermo el mes pasado? 01. Jefe(a) 02. Conyuge 03. Hijo(a)-Hijastro(a) 04. Padre o madre 05. Suegro(a) 06. Yerno o nuera 07. Nieto(a) 08. Hermano(a) 09. Cuñado(a) 10. Otro Familiar 11. No Familiar	2. Sexo 1. Hombre 2. Mujer	3. ¿Esto fue provocado por diarrea, colera, gusanos o alguna otra enfermedad? 01. Diarrea 02. Cólera 03. Gusanos 04. Malaria 05. Dengue 06. Otro 99. No sabe	4. ¿Cuáles fueron sus síntomas (marque todas las que apliquen) 4.a Dolores estomacales/ abdominales 01. Si 02. No	4.b Defecación frecuente (más de 3 veces al día) 01. Si 02. No	4.c Excremento aguoso 01. Si 02. No	4.d Excremento con sangre 01. Si 02. No	4.e Vómito 01. Si 02. No	4.f Fiebre 01. Si 02. No	5. ¿Qué cree usted causo la enfermedad? 01. Agua no segura 02. Comida contaminada 03. Malos habitos de higiene 04. Saneamiento inadecuado 05. Otro	6. ¿Qué edad tiene esta persona?
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											

	Todas Las Personas								
	7. Más o menos, ¿Cuántos días esta persona estuvo enferma el mes pasado?	8. ¿Cuántos días de trabajo o colegio perdió esta persona?	9. ¿Alguien cuidó a esta persona cuando el/ella estuvo enfermo(a)? 01. Si 02. No	10. ¿Cuántos días de trabajo o colegio perdió la persona que cuidó al enfermo(a)?	11. ¿A quién consultaron sobre la enfermedad? 1. Nadie ***Público*** 02. Hospital Central 03. Hospital provincial 04. Hospital rural 05. Centro Medico 06. Brigadas móviles	 ***Privado*** 07. Hospital privado 08. Clinica privada 09. Consultorio Privado 10.Enfermero 11. Farmacia ***Otro*** 12. Médico a la casa 13. Iglesia 14. Curandero	12. ¿Cuánto tiempo toma llegar a este lugar desde su hogar (ida solamente)? **Horas**	 **Minutos**	13. ¿Cuánto costó la(s) consulta(s)?
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

14. ¿Cuánto gastó en medicamentos de farmacias y tradicionales?	15. ¿Ha sido su hogar fumigado con químicos para matar mosquitos en los últimos 6 meses? 1. Si 2. No

ANNEX 5: FORMAL AGREEMENT SIGNED BY OSE REGARDING CONNECTION SUBSIDIES

ESTUDIO DEL IMPACTO DEL SANEAMIENTO EN LA SALUD PÚBLICA

Noviembre de 2009

La finalidad del presente estudio es determinar el impacto que tiene la conexión al saneamiento público a través de la red de colectores, en la salud pública.

Para ello se eligió trabajar en la ciudad de Treinta y Tres, capital del Departamento del mismo nombre. Se trata de una localidad con aproximadamente 26.000 habitantes, que consideramos representativa de las ciudades del interior del país que constituyen los potenciales clientes de OSE.

En la actualidad cuenta con 12.450 conexiones de agua y 7.375 de saneamiento, lo que implica una cobertura del 59% de saneamiento respecto a las de agua potable.

La ciudad posee Planta de Tratamiento de Efluentes, consistente en un tratamiento secundario mediante Aireación Extendida, con vertido final al Río Olimar. La capacidad de la misma se estima suficiente a un horizonte de proyecto previsto al 2030.

Actualmente las viviendas cuentan con soluciones individuales (en general "pozos negros"). Si bien en su mayoría se encuentran en los frentes de las casas, en algunos casos se sitúan en el retiro lateral o en los fondos. Tal como sucede en la mayor parte de las localidades, el vaciado de los mismos con camiones barométrica, no se da con la frecuencia que sería deseable, estimándose que en reiterados casos los mismos infiltran al terreno y muchas veces sufren desbordes.

Para el estudio fueron elegidas 14 "cuencas" agrupadas en 3 zonas de la ciudad. Las mismas son de similares características en lo social, cultural y económico, y cumplen la condición de no tener escurrimientos pluviales cruzados que pudieran permitir contaminación entre las mismas por esta vía.

Totalizan unas 1.000 viviendas, además de dos Escuelas Públicas y una Policlínica barrial.

Indicamos en el siguiente cuadro las características y obras necesarias para la red de saneamiento:

Cuenca	Nº viv. Proyecto Red	Long.red (mts)	Densidad (viv./100m)	Nº viv. Estudio	Long.emisario (mts)	Pozo Bombeo	Long. Impulsión (mts)
1	37	540	6.8	37	120	No	
2	85	1470	5.8	78		No	
3	84	1400	6.0	65		No	
4	97	1300	7.5	97		No	
5	97	950	10.2	97		No	
6	31	320	9.7	30		No	
7	62	700	8.8	51	280	No	
8	29	700	3.6	21		No	
9	88	1780	4.9	68		Si	600
10	156	2500	6.4	156			
11	75	1135	6.6	75	300		
12	23	353	6.5	23		Si	600
13	34	744	4.6	34			
14	80	1831	4.4	80	280		
	987 viv.	15.732m	6.3	912 viv.	980m		1.200

De acuerdo al mecanismo de trabajo previsto, el agrupamiento en pares de cuencas será el siguiente: 1 y 2; 4 y 5; 6 y 7; 8 y 3; 9 y 10; 11 y 12; 13 y 14.
Debe tenerse en cuenta que las cuencas 10 (12) y 13 cuentan con una Escuela Pública cada una.

A efectos de asegurar el éxito del trabajo, se estimulará y financiará la conexión al saneamiento a construir, por diversos mecanismos en coordinación con la Intendencia Municipal:

- Exoneración por parte de OSE de la tasa de conexión entre la red intradomiciliaria y la red externa de OSE.

- Programas de financiamiento por parte de OSE para la adecuación de la sanitaria interna. Se trata de un préstamo pagadero en hasta 36 cuotas. Hasta la cancelación del mismo, no se le cobrará al cliente la tarifa correspondiente al cargo variable. Esta financiación se puede otorgar por OSE directamente al vecino o a través del Convenio con la IM de Treinta y Tres.

- Aplicar los criterios del nuevo convenio con IM de Treinta y Tres para financiar junto con OSE, a través del denominado “Plan Conexiones” de la Intendencia, un número limitado de obras intradomiciliarias dirigido a los vecinos de más bajo nivel socio-económico.

- Utilizar el acuerdo entre el MIDES (Ministerio de Desarrollo Social) y OSE para construir conexiones al saneamiento (incluyendo la obra intradomiciliaria) dirigido específicamente a los vecinos que estén inscriptos en el Plan de Equidad del MIDES. Estos vecinos pagan solamente una cuota fija y muy bonificada por los servicios de agua y saneamiento (actualmente $ 61 por tarifa de agua mas $ 37 por tarifa de saneamiento).

- La Intendencia Municipal restringe el envió de servicios de barométrica subsidiados a vecinos de barrios en que cuentan con redes de alcantarillado.

- Trabajo educativo de concientización respecto a la importancia de contar con la conexión al saneamiento. Se prevé realizar el mismo por parte de asistentes sociales de la Intendencia Municipal y de la Oficina de Relaciones Públicas de OSE, en parte a través de los centros de enseñanza del barrio.

Las líneas de acciones estratégicas se apoyan en los siguientes acuerdos institucionales ya firmados:

- Convenio Marco entre la IM de Treinta y Tres y OSE, de Octubre de 2003, para la Ejecución de Obras del Programa de Ampliación de Redes de Alcantarillado. OSE y la IM asumen responsabilidad en la ejecución de Programas de Educación Ambiental.

- Acuerdo Marco de Cooperación Interinstitucional para Obras de Saneamiento entre la IM de Treinta y Tres y OSE, del 3 de Agosto de 2007, para facilitar el acceso al saneamiento mediante una acción coordinada para facilitar la financiación y realización de las obras de conversión de la sanitaria interna para la población de menores recursos. Se exonera de pago del cargo variable de la tarifa de saneamiento a todos los usuarios amparados en el Convenio. En ningún caso se brindará o financiará servicios de barométricas a las partes beneficiadas por el presente Convenio.

- Convenio entre OSE, el Ministerio de Vivienda, Ordenamiento Territorial y Medio Ambiente (MVOTMA) y el Ministerio de de Desarrollo Social (MIDES), destinado a otorgar a los núcleos o grupos amparados por dichos Ministerios, una tarifa subsidiada, disponiendo de un régimen especial, de acuerdo a sus posibilidades socio económicas (tarifa de agua subsidiada $61 y tarifa de alcantarillado subsidiada $36). El convenio comprende además la posibilidad de realizar obras de saneamiento destinadas a hogares en situación de vulnerabilidad socio económicas. En estos casos el MIDES suministrará mano de obra, capacitación y los materiales para la sanitaria interna; OSE suministrará la cámara, el seguimiento y la dirección de obra.

- Resolución de Directorio que exonera del pago de la tasa de 2 UR por conexión a la red de alcantarillado.

Ing. Rosanna Pagano	Ing. Natan Wajner
SubGerente Saneamiento	Gerente Prog. con Financ. Externo

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