



Implementation and Evaluation of Sustainable Interventions for Reducing Illness in Vulnerable Guatemalan Mayan Villages: Water Filtration and Composting Toilets

Jennifer Hoock, MD, MPH
 Rachelle Meenach-Ligrano, RN, DNP
 Carolyn Bain, MPH
 Alejandra Zarazua, Medico/Young Doctor

AGENDA

BACKGROUND (5 min)

CASE PRESENTATION (20 min)

- Project Implementation & Evaluation Methods
- Evaluation Results & Challenges

DISCUSSION (20 min)

- Discussion of Challenges & Feedback on Methodology
- Summary & Plans for Sharing Tools

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Abstract

Contaminated water and lack of sanitation lead to disease and malnutrition with poor health outcomes in developing countries. Rural communities around the world struggle with development and implementation of water purification and sanitation systems due to lack of funds, expertise and education about their importance. Addressing these issues through household water filtration and composting toilets should decrease the burden of disease and improve nutrition.

Effective evaluation is imperative to assure outcomes and maintain funding. Our project in rural Mayan villages of Guatemala started with Ecofiltros (locally developed) and owner constructed composting toilets. We will present our implementation, collaboration with communities, evaluation data methodology (including community meetings, project tracking, pre/post surveys, education and focus group feedback), data gathering by in-country staff and results. After reporting lessons learned, we will lead a discussion about how to improve project implementation with integrated evaluation systems that effectively document impact and identify challenges.

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Guatemala – Departamento de Izabal



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Learning Objectives

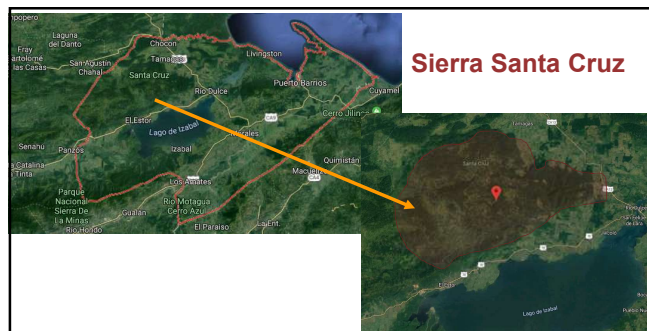
As a result of this session the learner will...

- Understand a collaborative model for implementation and evaluation of health projects in remote villages of developing countries working with local staff
- Assess 2 methods used for evaluating water filter and composting toilet interventions with their respective strengths and limitations
- Describe the challenges of evaluation of interventions in remote settings in developing countries and some possible ways of addressing them

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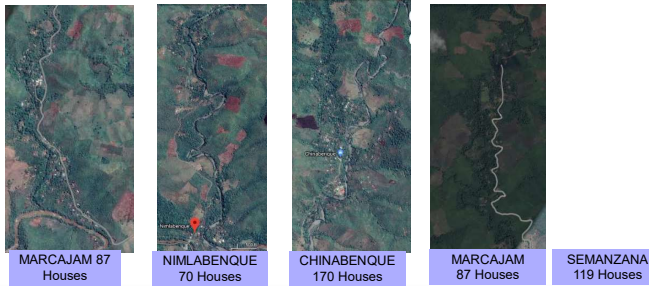
Sierra Santa Cruz



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Our Villages



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Malnutrition in Guatemala

- Largest country in Central America with one of the highest levels of disparity between rich and poor as well as one of the highest poverty levels worldwide

- 54% of the population living **below the poverty line** in 2011
- Two-thirds of the population live on less than \$2 USD a day (World Bank 2017)
- Indigenous populations (>40% of the total population) have much worse rates of poverty, malnutrition, mortality and reduced access to education and health services (MSPAS et al. 2017)



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Las Sierras de Santa Cruz - Izabal



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Malnutrition in Guatemala

Guatemala has **the third-highest rate of chronic malnutrition** in the world and the highest in Latin America and the Caribbean.

- 50% of Guatemalan <5yo of age are stunted due to chronic food insecurity
- Indigenous areas, nearly 70% of the population is chronically malnourished



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Diarrhea

- Second leading cause of death, leading cause of malnutrition in children < 5 yrs old
- Contaminated water can transmit diseases including diarrhea (rotavirus, cryptosporidium, EColi, Shigella), cholera, dysentery, typhoid, and polio.
- Estimated to cause 829,000 deaths each year (unsafe water & poor hand hygiene)
- UN General Assembly recognized the human right to water and sanitation (2010) and WHO incorporates this into Sustainable Development Goal 6.1

WHO Fact Sheets – Water June 2019, Diarrhoeal Disease May 2017

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Baseline Situation

SETTING

- Remote rural Mayan villages in Guatemala
- International NGO working with local staff for over 10 years to improve health through clinical care, health education & public health improvement projects
- Villages visits every 6 weeks – local team
- Clinical Jornadas 6months – local with US team

PROBLEM

- Contaminated water
- High Burden of GI illness
- High levels of Chronic Malnutrition

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Guatemala Village Health

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Composting Toilets

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Public Health Intervention Project

SOLUTION

- Water Filters
- Composting Toilets
- Handwashing

PLANNED INTERVENTION

- 200 Ecofiltros – villagers pay 20% of cost
- 200 Composting Toilets – villagers transport materials & build them
- Education on use & maintenance of filters and composting toilets
- Hygiene education

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Project Implementation

Resources We Had

- **Organization**
 - Small US based NGO (\$150K budget annually)
 - In-Country operation with 10+ years experience
- **Finances**
 - Funding* (\$35K materials/\$10K administration)
- **Staff**
 - Trained health workers – health promoters, local nurse & lead promoter, in-country nurse
 - In-Country Director with 20+ yrs experience in villages in the area
 - Construction Project Manager – construction project management experience
 - Researcher (DNP candidate) – US based
 - Public Health & Project Management expertise – US based

*Funding: Rotary International - Mill Creek & Guatemala Estes Clubs

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Ecofiltro

Proceso de filtración
Los componentes del Ecofiltro

Udidad filtrada – agua limpia y segura para consumo

Capa de grava – elimina las partículas grandes

Capa de arena – elimina las partículas pequeñas

Capa de carbón – elimina los olores y sabores

Capa de fibra – elimina los microbios

Capa de plástico – evita la contaminación

Recipiente

Agua sucia

Tapadera

Udidad filtrada

Filtro tipo cubeta de plástico

Microbiological Effectiveness:

Parameter	Effectiveness
Bacteria	Effective (>90%)
Viruses	Somewhat Effective (>80%)
Protozoa	Very Effective (>99%)
Helminths	Very Effective*

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Project Implementation

Timeline from Start Up to Finish

- **Grant** - Writing 1/2017-9/2017 submission; Funding 2/2018
- **Project**
 - **Ecofiltros (2/2018-1/2019)**
 - Collection of funds from villagers (20% of cost)
 - Training & Distribution
 - 6 week check-in
 - Home Visits & Evaluation – every 3 months
 - **Banos (7/2018-now)**
 - Purchasing & Transport of materials
 - Construction of Banos
 - Compost processing

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Implementation Methods

•Community Meetings

- Every 6 months during North American team trips ongoing
- Focused discussion of this project starting 1 year before application for funds,
- Every 6 week visits by in-country team for project implementation and evaluation

•Project Tracking

- Conducted by In-country Director and Village Project Manager/Lead Health Promotor from the villages
- Used Excel spreadsheet
- Village Health Promotor Pair – monitoring progress and adoption
- Bano/Ecofiltro - entered into EMR "Problem List" of adult head of household
- Composting Toilets numbered with village initial and number by order of completion

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Tools Developed for Project

EVALUATION

- Pictorial Survey
- Home Visit Surveys

•EMR

EDUCATION

- Charlas for Education

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Project Tracking

Eco filtros control/control de eco filtros									
Com - oosting toilets control/control de baños abono									
Village number	Date of survey #1	Date of water filter	Village	Household name	EMR ID	Date of survey #2 (1 month after survey #1)	1 week check	What about survey questions	Village number
No. Años	Fecha de encuesta	Fecha de entrega de filtro	Aldas	Nombre de Familia	Numero de EMR	Fecha de la encuesta (1 mes después de la encuesta #1)	Checkeo de 1 semana	Recordar las preguntas ENC. 1 ENC.2 ENC. 3	No. Per años
1	12/1/12	12/1/12	Chinababababab	Cardinal	7449	4/2/13		Julio Chen	1
2	12/1/12	12/1/12	Chinababababab	Cardinal	7450	4/2/13	1/25/13	Julio Chen	2
3	12/1/12	12/1/12	Chinababababab	Cardinal	7451	4/2/13	1/25/13	Julio Chen	3
4	12/1/12	12/1/12	Chinababababab	Cardinal	7452	4/2/13	1/25/13	Julio Chen	4
5	12/1/12	12/1/12	Chinababababab	Cardinal	7453	4/2/13	1/25/13	Julio Chen	5
6	12/1/12	12/1/12	Chinababababab	Cardinal	7454	4/2/13	1/25/13	Julio Chen	6
7	12/1/12	12/1/12	Chinababababab	Cardinal	7455	4/2/13	1/25/13	Julio Chen	7
8	12/1/12	12/1/12	Chinababababab	Cardinal	7456	4/2/13	1/25/13	Julio Chen	8
9	12/1/12	12/1/12	Chinababababab	Cardinal	7457	4/2/13	1/25/13	Julio Chen	9
10	12/1/12	12/1/12	Chinababababab	Cardinal	7458	4/2/13	1/25/13	Julio Chen	10
11	12/1/12	12/1/12	Chinababababab	Cardinal	7459	4/2/13	1/25/13	Julio Chen	11
12	12/1/12	12/1/12	Chinababababab	Cardinal	7460	4/2/13	1/25/13	Julio Chen	12
13	12/1/12	12/1/12	Chinababababab	Cardinal	7461	4/2/13	1/25/13	Julio Chen	13
14	12/1/12	12/1/12	Chinababababab	Cardinal	7462	4/2/13	1/25/13	Julio Chen	14

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GW Ecofiltro-Filter Project Implementation

Village: Chinababababab Semences Marajon Chinababababab

Relaciones: LaBabababab Semences Bababababab Bababababab

Site: Bababababab Home: Bababababab

What is the source of water?

What methods do you use to treat your water?

How to ask Questions:

1. Name who is answering questions

Questions with "¿cómo?"

2. Source of water: "¿cómo?" do they collect rain water or get water from neighbor?

3. Treat water: "¿cómo?" do they filter dirt and leaves? Do they use other chemicals like iodine?

4. In the past 2 weeks, has anyone in the home suffered from the following? -

5. How many under 5 years old? Identify number of children with each illness in the past 2 weeks

What kind of diarrhea do you use?

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Implementation Methods

•Education & Training

- "Charlas" - group talks/demonstrations on need for clean water/sanitation/hygiene
- Training for health promoters and for villagers with health promoters
 - Use & maintenance of Ecofiltros & construction,
 - Construction, use & maintenances of composting toilets

•Focus Group Feedback

- Conducted by In-country team at 6 weeks after installation for problem identification
- => very informal

•Home Visits with Evaluation Surveys

- Ecofiltros - to teach reinforce use and demonstrate cleaning process
- Composting Toilets - to check on use and composting

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Apéndice A: Evaluación de la Saneabilidad de Ecofiltros en Comunidades PRESENTAS DE ASEA

Aldea: Chinababababab (00-100) Semences (0-100) Marajon (0-100) Chinababababab (00-400)

Nombre de Casa: _____

Encuestador: _____

Fecha: _____

Forma: _____

Encuesta de Casas

Problemas

Información General de las Casas

Resumen

1. Nombre de la familia

2. Nombre del entrevistado

3. Género

4. Edad

5. Número de miembros en la familia

6. ¿Hay otros miembros de 5 años?

7. ¿Cuál es la principal fuente de agua para su familia?

8. Si usted vive en un pueblo, ¿cómo se llama?

9. ¿Cómo se llama el pueblo?

10. ¿Cómo se llama el pueblo?

11. ¿Cómo se llama el pueblo?

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96. ¿Cómo se llama el pueblo?

97. ¿Cómo se llama el pueblo?

98. ¿Cómo se llama el pueblo?

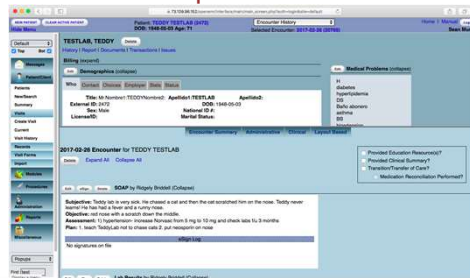
99. ¿Cómo se llama el pueblo?

100. ¿Cómo se llama el pueblo?

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Open EMR



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Evaluation Methods – Project Tracking

Composting Toilets

Community	Pilot	7-8/2018	9/2018	Not Done	Total Banos	Total when done	Total Casas
Chinabachilchoch	1	39 (2 pend)		1	39	40	
Chinabenneque	4		11	17	11	28	
Semanzana	2	67	9 (2 pend)	2	76	78	
Marcajam	3	17		14	17	31	
Nimlabenneque		24			24	24	
Quetzal					0	0	
Esperanza Tunico	1				0	0	
Total	11			34	167	201	

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EVALUATION METHODS

•Project Tracking

–Ecofiltros

- Funds collected from villagers
- Distribution of filters
- Dates of home visits for surveys

–Composting Toilets

- Materials distributed
- Toilets completed
- Dates of home visits for surveys

•EMR Records

- Individual patient care
- Project in problem list
- Clinic patient - Hematocrits, Dx of – Diarrhea, Worms

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Evaluation Results EMR - Hematocrits

Average Hematocrit values by village									
Average of result	Column La	2012	2013	2014	2015	2016	2017	2018	2019
Chinabenneque		38.6	38.6	39.2	38.8	40.0	34.5	35.5	
Chinabachilchoch		34.7	37.4		38.6	41.7	39.9	36.8	
Esperanza Tunico		35.5	32.0	39.6	36.0	38.1	35.8	36.9	
Marcajam		38.1	37.7	38.7	37.9	41.0	37.9	35.4	
Nimlabenneque		33.0	38.0	38.9				37.9	37.5
Semanzana		33.0	38.0	32.0		39.6	39.8	40.3	39.3
Average		33.0	38.0	37.7	39.3	37.6	39.7	38.3	37.3

Number of hematocrit samples									
Count of result	Column La	2012	2013	2014	2015	2016	2017	2018	2019
Chinabenneque		43	176	34	18	2	2	66	341
Chinabachilchoch		6	42		79	27	43	56	253
Esperanza Tunico		2	29	53	152	56	21	61	374
Marcajam		78	82	15	68	20	73	48	384
Nimlabenneque		4.0	28	22				30	52
Semanzana			1		58	70	19	128	276
Grand Total		4.0	157	352	102	375	175	188	1764

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Evaluation Methods – Project Tracking

Ecofiltros

Community	Phase 12/2017	4-5/2018	6/2018	8-9/2018	10/2018	1/2019	Total Ecofiltros	Total Casas
Chinabachilchoch	8	2		2		6	18	61
Chinabenneque	8	6		16			30	170
Semanzana		64		22			86	119
Marcajam		5		4	1	1	11	87
Nimlabenneque				18		1	19	70
Quetzal					22		22	28
Esperanza Tunico		2	28				30	110
Total	16	79	28	76	23	15	216	645

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Evaluation Results EMR – Hematocrits <2 yo

Average Hematocrit values by village						
Average of result	Column La	2013	2016	2017	2018	2019
Chinabenneque		31.0				33.6
Chinabachilchoch			35.9	34.0	34.7	32.1
Esperanza Tunico			34.4	34.4	34.8	34.6
Marcajam		30.1	32.2			32.5
Nimlabenneque					31.3	34.2
Semanzana			39.0	36.0		34.8
Average		30.4	34.2	34.5	33.2	33.6

Number of hematocrit samples						
Count of result	Column La	2013	2016	2017	2018	2019
Chinabenneque		3				15
Chinabachilchoch			7	1	3	14
Esperanza Tunico			34	10	4	22
Marcajam		7	11		15	11
Nimlabenneque					3	9
Semanzana			1	1		4
Grand Total		10	53	12	25	75

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Evaluation Results EMR – Hematocrits 2-5 yo

Average Hematocrit values by village									
Average of result									
Row Labels	2013	2014	2016	2017	2018	2019	Average		
Chinabuenque		32.0				34.3	33.9		
Chinachablichoch			35.7		35.3	32.0	35.3		
Esperanza Tunico				34.9	33.7	34.3	35.3		
Marcajam	36.0		36.0		34.3	35.3	35.4		
Nimlabenque					38.5	34.8	36.0		
Semanzana				35.6	35.3	35.6	35.6		
Average	36.0	32.0	35.7	35.2	35.1	34.9	35.3		

Number of hematocrit samples									
Count of result									
Row Labels	2013	2014	2016	2017	2018	2019	Grand Total		
Chinabuenque		2				9	11		
Chinachablichoch			9		4	1	14		
Esperanza Tunico			44	11	3	3	61		
Marcajam	4		7		6	3	20		
Nimlabenque					2	4	6		
Semanzana				10	3	15	28		
Grand Total	4	2	60	21	18	35	140		

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Evaluation METHODS

•Pictorial Survey

- During grant application to gather data to demonstrate need and interest of villagers
- To serve as baseline for Composting Toilets evaluation

•Feedback Groups

- Project Director had a set of questions to ask to the group to see how they were doing with the filters
 - Identify issues and problem solve to facilitate proper use
- Prepare report from each meeting

•Interview with Home Visit

- Ecofilters – Interview questionnaires at baseline, 3 mo, 6 mo & 1 year
- Composting Toilets – 3mo, 6mo, & 1 year

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Evaluation Results EMR – Diarrhea

% Patients Seen that had diarrhea									
% of patients with Diarrhea									
Village	2012	2013	2014	2015	2016	2017	2018	2019	
Chinabuenque	0%	6%	3%	1%	4%	1%	2%	11%	
Chinachablichoch	0%	0%	7%		2%	2%	3%	12%	
Esperanza Tunico	0%		5%	4%	11%	4%	7%	21%	
Marcajam		6%	3%	7%	4%	6%	6%	19%	
Semanzana				0%	2%	2%	10%	5%	
Average	0%	5%	4%	4%	6%	3%	5%	13%	

Total Patients Seen									
Village									
2012	2013	2014	2015	2016	2017	2018	2019	Grand Total	
Chinabuenque	4	89	263	78	281	195	209	235	1354
Chinachablichoch	2	7	72		283	355	329	174	1222
Esperanza Tunico	2	2	130	151	514	484	250	164	1697
Marcajam		127	95	46	260	372	339	177	1416
Semanzana		1	2	1	189	359	174	199	925
Grand Total	8	226	562	276	1527	1765	1301	949	6614

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Evaluation Home visits - Survey results ECOFILTERS

# Water filters per village	PERCENTAGE OF ECOFILTERS IN THE VILLAGES						
	Totals	Chinachablichoch	Chinabuenque	Semanzana	Marcajam	Nimlabenque	Quetzal
186 Water filters placed		18/61 (30%)	30/170 (18%)	87/119 (73%)	11/87 (13%)	19/70 (27%)	21/28 (75%)

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Evaluation Results EMR – Worms

% Patients Seen that had worms									
% of patients with worms									
Village	2012	2013	2014	2015	2016	2017	2018	2019	
Chinabuenque	0%	4%	0%	3%	0%	1%	3%	1%	
Chinachablichoch	0%	29%	1%		2%	1%	2%	0%	
Esperanza Tunico	0%	0%	2%	2%	4%	1%	2%	0%	
Marcajam		0%	1%	2%	1%	1%	1%	1%	
Semanzana		0%	0%	0%	2%	1%	1%	1%	
Average	0%	3%	1%	2%	2%	1%	2%	0%	

Total Patients Seen									
Village									
2012	2013	2014	2015	2016	2017	2018	2019	Grand Total	
Chinabuenque	4	89	263	78	281	195	209	235	1354
Chinachablichoch	2	7	72		283	355	329	174	1222
Esperanza Tunico	2	2	130	151	514	484	250	164	1697
Marcajam		127	95	46	260	372	339	177	1416
Semanzana		1	2	1	189	359	174	199	925
Grand Total	8	226	562	276	1527	1765	1301	949	6614

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Evaluation Home visits – Survey results ECOFILTERS USE

Total number of households surveyed	Water treatment in Villages						
	Totals	Chinachablichoch	Chinabuenque	Semanzana	Marcajam	Nimlabenque	Quetzal
186		18	30	87	11	19	21

Frequency of treatment							
Always	179/186	15/18 (83%)	28/30 (93%)	85/87 (98%)	11/11	19/19 (100%)	21/21(100%)
Sometimes	5/186 (3%)	2/18 (11%)	2/30 (7%)	1/87 (1%)	0	0	0
Never	2/186 (1%)	1/18 (6%)	0	1/87 (1%)	0	0	0

Purification method							
Boil	177/186	15/18 (83%)	28/30 (93%)	85/87 (97%)	10/11 (91%)	19/19 (100%)	21/21(100%)
Chlorine	6/186 (3%)	2/18 (11%)	1/30 (3%)	2/87 (2%)	1/11 (9%)	0	0
Sunlight	2/186 (1%)	1/18 (6%)	1/30 (3%)	0	0	0	0
No treatment	1/186 (0.5%)	0	0	1/87 (1%)	0	0	0

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Evaluation Home visits – Survey results ECOFILTER Maintenance

Questions	Response	
Could describe how to replace non- working water filters or who to call?	Yes- 100%	
Could describe when to clean water filters?	When it decreased flow	1 family
	Regularly at 3 months	4 villages 100%
	Every 2-3 days, every week, or every 2-3 weeks	2 villages 75%
How they used their water filter	Handwashing	2 villages 25%
	Wash food and/or cooking	8 families
	varied between	48%- 75% in 3 villages
	"Every day or used for all"	100% for 1 village
	Drinking only	100% 1 village 20%-50% for remaining villages
Could describe cleaning still using water filter	Yes- 100%	
Satisfied	100%	
Liked the taste	100%	

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Evaluation Challenges

• Interview with Home Visit

-Ecofiltros

Successes

- Baseline, 3 mo, 6 mo were done by Lead Health Promoters

Challenges

- Very hard to get done at the specified time despite paying per home visit
- Identifying consistent people in the household and finding them for the survey
- Verbal translation and cultural understanding from Spanish to Keq' Chi
- Recall bias and inaccurate reporting due to "desire to please" bias

-Banos

- 3 mo in progress – now being done by health promoters and very hard to train them

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Evaluation Challenges

• Pictorial Survey

-Needs Assessment

• Very few completed

- investigator didn't speak Spanish so hard to translate instructions
- Pictures were not as universal as expected so answers did not correlate with known information
- Administration required some communication which both researcher and health promoters did poorly for different reasons

-Baseline for Composting Toilets

- Completed by health promotor in 2 villages after construction but before use of composting toilets; instructions not clear to health promotor thus all completed that they had a composting toilet, not what they used previously
- In the process of redoing baseline given the recall is likely to be accurate.

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DISCUSSION of EVALUATION CHALLENGES

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EVALUATION SUCCESSES & CHALLENGES

• Feedback Group at 6 weeks for Ecofiltros

Successes

- Group meetings did occur
- Anecdotal reporting that all were happy with filters and not having any problems

Challenges

- Although we had a written list of questions, the in-country staff didn't really understand how to collect feedback
- Despite instructions, not notes were kept by in-country staff
- Team norm not to say if there is a problem and this is true in the villages as well
- Issues of language since health promoters are not fluent in Spanish and have only 3-5th grade education

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SHARING of TOOLS

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Tools Identified

- Surveys
- Data Systems
- Analysis Support
- Evaluation Systems
- SHARING WHAT WE LEARNED

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Our Work Continues – Smokeless Stoves



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