



AAFP GLOBAL HEALTH SUMMIT
Primary Health Care and Family Medicine: Health Equity for All

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

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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

MARCAJAM 87 Houses	NIMLABENQUE 70 Houses	CHINABENQUE 170 Houses	MARCAJAM 87 Houses	SEMANZANA 119 Houses
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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 Ecofilters – 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:

- Unidad filtrante: hecho de arena y carbón, que se cubren de microorganismos.
- Caja de plástico: estanca. Una cubierta que hace dar, agua y evita enfermedades.
- Recipientes: Agua filtrada.
- Llave: plástica.

Filtro tipo cubeta de plástico

Microbiological Effectiveness:	
Parameter	Effectiveness
Bacteria	Effective (>90%)
VF virus	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**
 - **Ecofilters (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

Tools Developed for Project

EVALUATION

- Pictorial Survey
- Home Visit Surveys

EMR

EDUCATION

- Charlas for Education

Project Tracking

Eco filtros control/control de eco filtros										Com - oosting toilets control/control de baños abonos			
Village number	Date of survey #1	Date of water filter	Village	Household name	EMR ID	Fecha de instalación de filtro de agua (Mes y año)	Fecha de instalación de baño abono	Encuestador	Encuestador	Village number	No. Per aldea	Nombre del padre	Nombre de madre
1	12/13/17	12/13/17	Chinabababach	Josef Cruz	7449	4/23/18	1/25/18	Julio Ches	Julio Ches	1	Oneir Pita Gal	Sandra Pita	
2	12/13/17	12/13/17	Chinabababach	Josef Cruz	8139	4/23/18	1/25/18	Julio Ches	Julio Ches	2	Oneir Pita Gal	Sandra Pita	
3	12/13/17	12/13/17	Chinabababach	Josef Cruz	8139	4/23/18	1/25/18	Julio Ches	Julio Ches	3	Oneir Pita Gal	Sandra Pita	
4	12/13/17	12/13/17	Chinabababach	Josef Cruz	8139	4/23/18	1/25/18	Julio Ches	Julio Ches	4	Oneir Pita Gal	Sandra Pita	
5	12/13/17	12/13/17	Chinabababach	Josef Cruz	7872 y 8139	4/23/18	1/25/18	Julio Ches	Julio Ches	5	Oneir Pita Gal	Sandra Pita	
6	12/13/17	12/13/17	Chinabababach	Josef Cruz	8139	4/23/18	1/25/18	Julio Ches	Julio Ches	6	Oneir Pita Gal	Sandra Pita	
7	12/13/17	12/13/17	Chinabababach	Josef Cruz	8139	4/23/18	1/25/18	Julio Ches	Julio Ches	7	Oneir Pita Gal	Sandra Pita	
8	12/13/17	12/13/17	Chinabababach	Josef Cruz	8139	4/23/18	1/25/18	Julio Ches	Julio Ches	8	Oneir Pita Gal	Sandra Pita	
9	4/23/18	4/23/18	Chinabababach	Josef Cruz	7919	7/12/18	1/27/18	Julio Ches	Julio Ches	9	Oneir Pita Gal	Sandra Pita	
10	4/23/18	4/23/18	Chinabababach	Josef Cruz	7919	7/12/18	1/27/18	Julio Ches	Julio Ches	10	Oneir Pita Gal	Sandra Pita	
11	4/23/18	4/23/18	Chinabababach	Josef Cruz	7919	7/12/18	1/27/18	Julio Ches	Julio Ches	11	Oneir Pita Gal	Sandra Pita	
12	4/23/18	4/23/18	Chinabababach	Josef Cruz	7919	7/12/18	1/27/18	Julio Ches	Julio Ches	12	Oneir Pita Gal	Sandra Pita	
13	12/13/17	12/13/17	Chinabababach	Josef Cruz	8139	4/23/18	1/25/18	Julio Ches	Julio Ches	13	Oneir Pita Gal	Sandra Pita	
14	12/13/17	12/13/17	Chinabababach	Josef Cruz	8139	4/23/18	1/25/18	Julio Ches	Julio Ches	14	Oneir Pita Gal	Sandra Pita	

CWAF - Ecofiltro-Filter-Project-Implementation

Village: Chinabababach, Semecano, Maricao, Chinabuega, Nabajuega, Jinca (village)

Sub-town: La Balsa, Maricao, Balsa, Pajarales, La Balsa (village)

Site: Balsa Program, Home, School, (village site) ID#

EWAF Visual Monitoring Form

Name of Community Health Promoter: _____
 Date of visit: _____
 Name: _____

How many people in household? _____
 How many children under 5 years old: _____

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 children under age 5 are sick? Identify number of children with each illness in the past 2 weeks?

What is the source of water?
 (circle) River or Stream, Open Well, Spring, Borehole, Other

What methods do you use to treat your water?
 (circle) No Treatment, Boiling, Chlorine, Other

In the past 2 weeks, has anyone in the home suffered from the following?
 (circle) Diarrhea, Stomach Ache, Skin Infection, Eye Infection, Other

Implementation Methods

- Education & Training
 - "Charlas" - group talks/demonstrations on need for clean water/sanitation/higiene
 - 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

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

Aldea: Chinabababach (CC-198) Semecano (B-200) Maricao (B-300) Chinabuega (CB-400)

Nombre de Casa: _____
 Encuestador: _____
 Fecha: _____
 Hora: _____

Programa: Encuesta de Casas

Información General de las Casas

1. Nombre de la familia: _____
 2. Nombre del entrevistado: _____
 3. Género: _____
 4. Edad: _____
 5. Número de miembros en la familia: _____
 6. ¿Hay niños menores de 5 años? _____

7. ¿Cuál es la principal fuente de agua para su familia?
 A. La perforación
 B. La perforación
 C. Una perforación profunda
 D. Fuente comunal
 E. Otro: _____

8. Si su casa es... ¿cómo es? _____

Evaluación de la Infraestructura Desempeño/Estado de la Sistema de Agua

20. ¿El sistema funciona? (el agua viene del chorro)
 A. Sí
 B. No

30. Si está funcionando, ¿cuántas horas por día tiene agua en el chorro?
 A. 18-24 horas
 B. 9-18 horas
 C. menos de 9 horas
 D. No se aplica

31. ¿Cuál es la distribución (tubo para el sistema)?
 A. Sí
 B. No
 C. No se aplica

32. ¿Hay alguien en su comunidad con problemas?
 A. Sí
 B. No
 C. No se aplica

33. ¿El agua llega a todos los chorros?
 A. Sí
 B. No
 C. No se aplica

34. ¿El diseño del sistema es el mismo de la información entregada por el delegado del control de agua?
 A. Sí
 B. No
 C. No se aplica

Open EMR

The screenshot shows a patient record for TEDDY TESTILAS, born 02/08/1998. A note from a 2017-2018 encounter is visible, detailing a visit for a 'Tummy Issue' and a 'Tummy Pain'. The note includes a physical exam, a differential diagnosis, and a plan for further evaluation and treatment.

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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
Chinachablichoch	1	39 (2 pend)		1	39	40	
Chinablenque	4		11	17	11	28	
Semanzana	2	67	9 (2 pend)	2	76	78	
Marcajam	3	17		14	17	31	
Nimlabenque		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 of result	Column La	2012	2013	2014	2015	2016	2017	2018	2019
Chinablenque		38.6	38.6	39.2	38.8	40.0	34.5	35.5	
Chinachablichoch		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	
Nimlabenque		33.0	38.0	38.9			37.9	37.5	
Semanzana				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

Count of result	Column La	2012	2013	2014	2015	2016	2017	2018	2019	Grand Total
Chinablenque		43	176	34	18	2	2	66		341
Chinachablichoch		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
Nimlabenque		4.0	28	22			30	52		136
Semanzana			1		58	70	19	128		276
Grand Total		4.0	157	352	102	375	175	188	411	1764

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Evaluation Methods – Project Tracking

Ecofiltros

Community	Pilot (3/2017)	4-5/2018	6/2018	8-9/2018	10/2018	1/2019	Total Ecofiltros	Total Casas
Chinachablichoch	8	2		2		6	18	61
Chinablenque	8	6		16			30	170
Semanzana		64		22			86	119
Marcajam		5		4	1	1	11	87
Nimlabenque				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 of result	Column La	2013	2016	2017	2018	2019
Chinablenque		31.0				33.6
Chinachablichoch			35.9	34.0	34.7	32.1
Esperanza Tunico			34.4	34.4	34.8	34.6
Marcajam		30.1			32.8	32.5
Nimlabenque					31.3	34.2
Semanzana			39.0	36.0		34.8
Average		30.4	34.2	34.5	33.2	33.6

Count of result	Column La	2013	2016	2017	2018	2019	Grand Total
Chinablenque		3				15	18
Chinachablichoch			7	1	3	14	25
Esperanza Tunico			34	10	4	22	70
Marcajam		7	11		15	11	44
Nimlabenque					3	9	12
Semanzana			1	1		4	6
Grand Total		10	53	12	25	75	175

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Evaluation Results EMR – Hematocrits 2-5 yo

Average Hematocrit values by village								
Average of result	Column La							
Row Labels	2013	2014	2016	2017	2018	2019	Average	
Chinabuenque		32.0				34.3		33.9
Chinachabilchoch			35.7		35.3	32.0		35.3
Esperanza Tunico			35.6	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	Column La							
Row Labels	2013	2014	2016	2017	2018	2019	Grand Total	
Chinabuenque	2					9		11
Chinachabilchoch			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	Column La							
Village	2012	2013	2014	2015	2016	2017	2018	2019
Chinabuenque	0%	6%	3%	1%	4%	1%	2%	11%
Chinachabilchoch	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									
Column La	Column La								
Village	2012	2013	2014	2015	2016	2017	2018	2019	Grand Total
Chinabuenque	4	89	263	78	281	195	209	235	1354
Chinachabilchoch	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	Chinachabilchoch	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	Column La							
Village	2012	2013	2014	2015	2016	2017	2018	2019
Chinabuenque	0%	4%	0%	3%	0%	1%	3%	1%
Chinachabilchoch	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%	1%
Semanzana	0%	0%	0%	2%	1%	1%	1%	1%
Average	0%	3%	1%	2%	2%	1%	2%	0%

Total Patients Seen									
Column La	Column La								
Village	2012	2013	2014	2015	2016	2017	2018	2019	Grand Total
Chinabuenque	4	89	263	78	281	195	209	235	1354
Chinachabilchoch	2	7	72		283	355	329	174	1222
Esperanza Tunico	2	2	130	151	514	484	250	164	1697
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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	Chinachabilchoch	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
	Regularly at 3 months
	Every 2-3 days, every week, or every 2-3 weeks
How they used their water filter	Handwashing
	Wash food and/or cooking
	"Every day or used for all"
	Drinking only
Could describe cleaning still using water filter	Yes- 100%
Satisfied	100%
Liked the taste	100%

- ### 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

- ### 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.

DISCUSSION of EVALUATION CHALLENGES

- ### 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

SHARING of TOOLS

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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