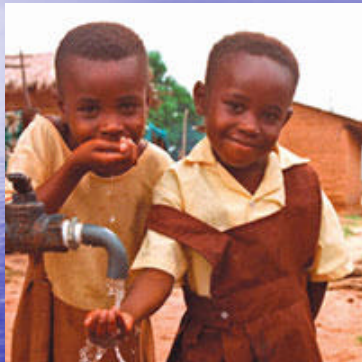


Pure Home Water Project for the Northern Region of Ghana

Claire Mattelet
Rachel Peletz
Jenny VanCalcar
December 9th, 2005

The Global Issue



- Globally, **1.1 billion people** lack access to an “improved” drinking water source
- **1.7 million deaths** annually are from unsafe water, sanitation, & hygiene
 - 90% of these deaths in children
 - Virtually all in developing countries
- **Millenium Development Goals:** To halve by 2015 the proportion of people without sustainable access to safe drinking water

Ghana



- ✓ Population: 21 million
- ✓ Approximately the size of Oregon
- ✓ Northern Region
 - One of the poorest areas
 - Study area: 6 of 13 districts, 750,000 people

Pure Home Water (2005) - Ghana

Project:

- ✓ 2 social entrepreneurs selling household water treatment technologies
- ✓ Person-to-person social marketing and microfinance
- ✓ 4 Sloan MIT students focusing on business aspects



Household Drinking Water Treatment and Safe Storage (HWTS)

- ✓ Treats water at the point of use
- ✓ Made out of local materials
- ✓ Relatively cheap
- ✓ Hard to implement



Retail Prices of HWTS in Ghana

HWTS Systems	US\$
1. Modified "Safe Storage" Clay Pot w/ 1/2 " brass tap (40L)	\$8
2. Plastic "Safe Storage" vessel (50 L)	\$8
3. Tamalkoe Ceramic <i>Filtron</i> (PFP style)	\$18
4. Commeh <i>Nnsupa</i> Candle Filter	\$25
5. Biosand Filter w/ Kanchan™ style plastic bucket (50 L)	\$14
6. SODIS	~ \$1/year
7. Household Chlorination	~ \$4/year
8. PUR	5¢/sachet

Candle Filter - Nnsupa



Tamakloe Ceramica

Modified clay Pot

Household Cross-Sectional Survey

For the Northern Region of Ghana

Rachel Peletz



Water Safety Plan Objectives

As defined by the World Health Organization

Ensure quality drinking water through:

- Water source protection
- Treatment processes to remove contamination
- Recontamination prevention during delivery and storage

Research Objective



- Obtain baseline data on household drinking water and sanitation practices
 - Data for future MEng teams and Pure Water Home: Ghana
- Comparison of households with and without HWTS
- Methods
 - Epidemiological cross-sectional survey
 - Risk assessment

Household Questionnaire

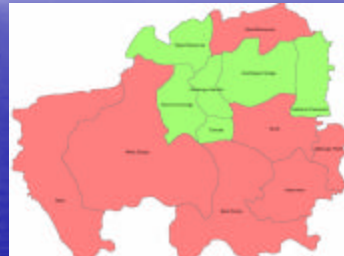
Compilation and Feedback

- Household Background
- Diarrheal Illness
 - Prevalence and knowledge of causes and preventions
- Household Sanitation and Hygiene
 - Hand-washing and toilet facility
- Water Use Practices
 - Source collection
 - Water storage
 - Water quality perception
- HWTS Acceptability
- Observations



Survey Conduction Plan

- Choosing households
 - Location: 6 communities within 3 districts (transportation uncertain)
 - Matching 30 households with and 30 without HWTS
 - Households that ordered but not yet received HWTS
 - Woman of household with children under 5
- Smilie Diaries
 - Self-recorded prevalence of diarrheal disease



Smilie Diaries

AQUAPOL research project

	Normal stools	Diarrhoea					With blood and/or mucus
Monday	☺	☹	☹	☹	☹	☹	<input type="checkbox"/>
Tuesday	☺	☹	☹	☹	☹	☹	<input type="checkbox"/>
Wednesday	☺	☹	☹	☹	☹	☹	<input type="checkbox"/>
Thursday	☺	☹	☹	☹	☹	☹	<input type="checkbox"/>
Friday	☺	☹	☹	☹	☹	☹	<input type="checkbox"/>
Saturday	☺	☹	☹	☹	☹	☹	<input type="checkbox"/>
Sunday	☺	☹	☹	☹	☹	☹	<input type="checkbox"/>

Quantification of Results

- **Risk Assessment**
 - Daily Exposure = Pathogen Concentration x Volume Consumed
- **WAWI (West Africa Water Initiative) Indicators**
 - Access to safe water = People with access / Total population
 - Access to sanitation = People with access / Total population
- **HTWS acceptability**
 - Rate Of Adoption (ROA) = Fraction using HWTS 1 month after receiptment

Project Status



- **Current Progress**
 - Survey development and revisions
 - IRB (Institutional Review Board)
- **Future Plan**
 - Refine surveys and conduction plan
 - Collaboration with Jenny and Claire with GPS and water testing
 - Ghana!

Assessment and Comparison of Simple and Low-Cost Microbial Indicator Methods

for the Northern Region of Ghana

By Claire Mattelet



Motivations- Simple and Low-Cost Methods for Drinking Water Testing

- Fatal diseases in Ghana mainly linked to poor water & sanitation:
Malaria, Diarrhoea, Typhoid, Cholera, Gastroenteritis
- In Northern Ghana:
Communities are widely dispersed
=> Limited ability to monitor HWTS
=> Need for simple methods
- Poverty in Northern Ghana:
=> Need for cheap methods

RESEARCH OBJECTIVE

- Assessment and Comparison of Simple and Low-Cost Microbial Indicator Methods on the Basis of 6 Screening Criteria:



- Cost
- Ease of use
- Ease of interpretation
- Labor requirements to complete test
- Level of skill required
- User acceptability

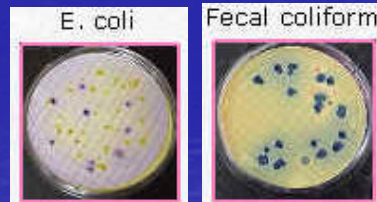


MATERIALS

Simple and Low-Cost Methods

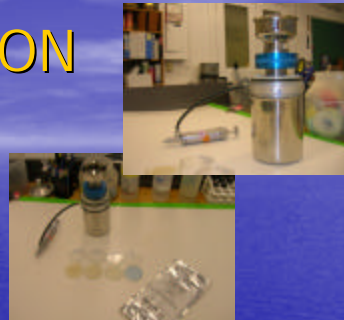
- ✓ Membrane Filtration – Millipore
- ✓ Zip Agua
- ✓ 3M – Petrifilm
- ✓ H₂S – HACH
- ✓ H₂S – Home made
- ✓ Most Probable Number (MPN) – Home made

Microbial Indicators



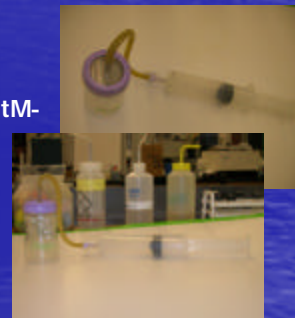
MEMBRANE FILTRATION

- ✓ Millipore Corporation Product
- ✓ Filtration Unit Cost : \$ 1,000
- ✓ Pump \$300



ZIP AGUA

- ✓ MIT 2004 IDEAS Competition team product M-ColiBlue24 test cost : US\$ 2.18/test
- ✓ Baby bottle + syringe: US\$ 13



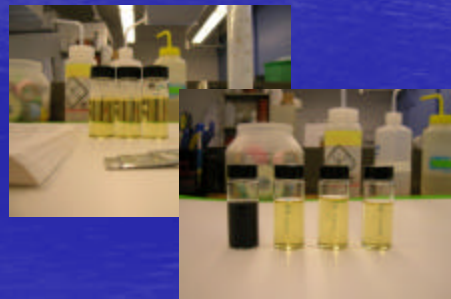
3M-PETRIFILM: *E. coli* / coliform count plate (EC)

- ✓ Enumeration test
- ✓ Cost: \$ 1/plate



H2S - HACH

- ✓ Presence-Absence test
- ✓ Hach Company Product
- ✓ Cost: US\$ 0.60/test



H2S – HOME MADE

- ✓ Labor intensive
- ✓ Similar product to the Hach product but much cheaper = \$0.05/test

MPN – HOME MADE

- ✓ Cost: Cheap => Rice Broth: - 25g Rice
- 4g powdered milk
- ✓ Home Made Broth Media with locally available ingredients: Rice, Potato, Corn, Lactose.

In Ghana

WEEK 1:

- ✓ Lab Analysis (Tamale)
- ✓ First assessment of the 6 defined criteria

FOLLOWING WEEKS:

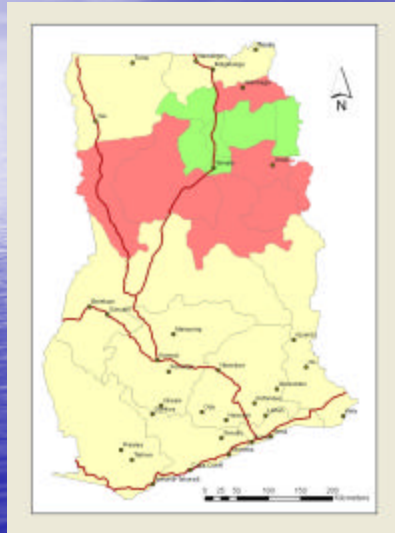
- ✓ Selection of one or two appropriate techniques
- ✓ Transfer methods to « Pure Home Water » Ghana team
- ✓ Field water samples

Creating a Geographical Information System (GIS) Tool



Jenny VanCalcar

What is GIS?



- A way to view and analyze data from a geographic perspective
- Spatial features can be connected to tabular information
- Overlaying of layers shows interrelations

Research Objective

- Create a tool to:
 - Store all relevant HWTS project information in a single database
 - Perform spatial analysis to aid in developing future interventions and business strategies
 - Design maps to represent the work accomplished and areas of future need

Current Data Sources

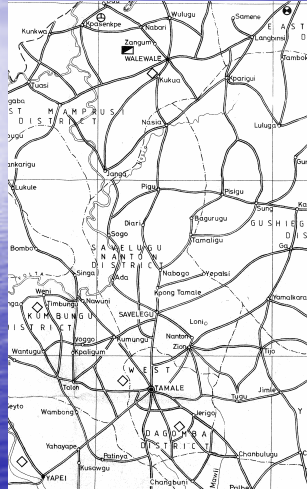
- Digital
 - Gfk Macon – regional boundaries, major rivers, lakes and highways
 - National Geospatial-Intelligence Agency – villages and water sources
- Paper
 - Town & Country Planning Department – district boundaries
 - Ghana Geological Survey – boreholes, villages, local roads
- Tabular
 - Guinea Worm Eradication Program

Digital Data



- Choose WGS 84 as the coordinate system for data projection
- Easy basic map production but little statistical information

Paper Maps - Map Digitization



Tabular Data - Village Naming Issues

Villages in the Tamale District	
Guniea Worm Data	Spatial Data
Adubiyili	Bahalahi
Asawaba	Balahi
Bagli-Dakyemyili	Banvim
Bagliga	Banvum
Baglihi	Biipela
Banvim	Boashe
Batanyili	Buma
Chagnaayili	Bulpiela
Chandu	Choggo
Changnayili	Choggo
Chanshegu	Dakrubongo
Cheshe	Defa
Choggu Yepalsi	Difa
Daboghei	Difaa
Dabokpa	Dila
Daboshei	Dimalla
Dalugyili	Dokrubonga
Datoyili	Dumala
Dohini	Dungu
Dungu	Foshegu
Dungu	Gbase
Fooshegu	Giana
Fuo	Gumani
Gbambaya	Guntingli

- Different data sources spell village names differently
- Cannot place tabular information within the database if there is no spatial reference

Data Production Using a Global Positioning System (GPS) Device



In-Country Research Plan

- Continue gathering relevant data
 - CERSGIS
 - Ghana Statistical Service
- Take GPS points
- Discuss desired outputs
 - Pure Home Water - Ghana
 - World Vision – Ghana Rural Water Project

Schedule

Fieldwork

- January 2, 2006
- January 4-5, 2005
- January 23, 2005
- January 28, 2005



Team arrives in Accra, Ghana
Travel to Northern region of Ghana
Fieldwork complete
Leave Accra, Ghana

Post-fieldwork

- February- April
- April-May

Data Analysis/ Write-up
Submit Final Report



Thanks for your attention



TO GHANA

WE WILL WRITE
YOU A POSTCARD!



3M PETRIFILM

