Behavior Change Interventions in Water and Sanitation: Past, Present and Future

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Disciplines at this meeting

- I was struck yesterday by the wide range of disciplines represented here
- Such diversity is an opportunity and a challenge
- The challenge is to move from multidisciplinarity to transdisciplinarity
My own challenge

- “I hope you will talk to us about how to change behavior”
This talk

- **Part 1: Where we are now**
  - Behavior change for water and sanitation in low-income countries
  - Centrality of habit formation
  - Thoughts on the process for making it happen: Formative research

- **Part 2: Where we need to be**
  - Creating a science of behavior change in Global Health
Part 1: Behavior change for water and sanitation in low-income countries
Behavior change in water and sanitation

- A long-standing concern with a rich history
- The emphasis has been on low-income countries with significant morbidity and mortality related to:
  - Diarrheal diseases, cholera, dysentery
  - Parasitic diseases: Amebiasis, giardiasis, schistosomiasis, Guinea worm etc.
  - Arsenic, fluoride
  - Other toxins and contaminants
Behavior change in water and sanitation: **Typical situation**

- Project in a low-income country with high burden of diarrheal disease
- Hardware installed at considerable expense: Pipes, pumps, taps etc.
- Limited public health impact:
  - People don’t adopt new behaviors such as hand-washing with soap
- Limited sustainability:
  - Hardware not maintained
Behavior change in water and sanitation: Typical response

- Qualitative research to better understand factors that affect adoption
- Focus on few key behavioral determinants
- Activities to promote behavior change:
  - Face-to-face promotion
  - Community mobilization
  - Education in primary schools
  - Social marketing of products (soap) and behaviors (handwashing)
Is once enough?

Once is enough
- **Family planning**
  - Vasectomy
  - Tubal ligation
- **Newborn health (home deliveries)**
  - Cutting of umbilical cord with clean instrument
  - Immediate drying and wrapping
  - Immediate breastfeeding
  - Delayed bathing

Once is not enough
- **HIV prevention**
  - Partner reduction
  - Condom use
- **Water and sanitation**
  - Handwashing with soap
  - Point-of-use water treatment
  - Maintain and use latrine
Behavior change when once is enough

- Behavior is conscious and deliberate
- Focus in intervention design on:
  - Decision-making
  - Planning
  - Putting plan into action
- Incentives sometimes given
Example: Newborn care intervention in Sylhet, Bangladesh

- >90% of deliveries occur at home
- Many household members involved in provision of newborn care
- Antenatal home visits by community health worker
  - Negotiate roles of different household members for newborn care
  - Put together “newborn care plan”
  - Practice/role play with doll & materials
Sylhet, Bangladesh: CHW demonstrating drying and wrapping a newborn to pregnant women and other family members
W&S: Once is not enough

- A key challenge for water and sanitation behaviors is that once is not enough
- Habit-formation is critical
- Much of the expertise on habits and how to promote habit formation is found in marketing
Behavior change when once is not enough

- Behavior is habitual
- Behavior not be totally under conscious control
- Focus in intervention design on:
  - Closely matching behavior and technology to local needs
  - Promotion of habit formation
How to inculcate habits?

- **In children:**
  - Instruction, modeling, feedback from adults

- **In adults:**
  - A challenge, as habits have largely been set in place
Key determinants of habit formation (e.g. Verplanken and Wood 2006)

- **Repetition**
  - Increase frequency of practice

- **Stable environment**
  - Favorable to practicing the behavior

- **New context**
  - Inflection point when change seems natural, person is receptive to change
Habit formation: Repetition

- Aim to increase frequency of handwashing, rather than focus on handwashing at specific times
- Self-efficacy is belief that one is capable of performing {handwashing} correctly to attain {reduction in diarrhea}
- According to Social Cognitive Theory, there is “virtuous circle”
  - Practicing behavior increases self-efficacy, and self-efficacy increases practice
Habit formation: Stable environment

- The environment for practicing the behavior is favorable
- No need for on-going problem solving every time person seeks to practice the behavior
- In WASH, a handwashing place and station offers a stable environment with:
  - Stable water supply
  - Appropriate products at hand’s reach
  - Minimization of water wastage
  - Convenience
  - Affordability/cost
Need to be changed only: new drum pic.
Habit formation: New context

- Inflection point when change seems natural, person is receptive to change
- Break in the routine
- New contexts or beginnings can be
  - Naturally occurring
  - Organized by program/project
“New beginnings” for driving

- Driving lessons
- Purchase of new car
- Car accident and/or injury
“New beginnings” for handwashing

- Naturally occurring
  - Move to a new home
  - First pregnancy, birth of first child
  - Return to home after period of working elsewhere, end of the harvest
  - Celebration of new year or religious holiday
  - Natural disaster

- Organized by program or project
  - Community mobilization event e.g. CLTS
  - Extreme stimulus: Shaming, disgust
  - National event: vaccination day, child health day, handwashing day
Formative research to develop intervention that promotes new habits
Formative research

- A systematic inquiry focused on the local context, with the goal to inform the many components of a program or intervention.
- Exclusively qualitative for some and both qualitative and quantitative for others.
- Draws on and integrates multiple disciplines.
Formative and Summative

- **Formative research**
  - Research to select the type of intervention most appropriate for local conditions
  - Research to adapt the method of intervention implementation to local conditions

- **Summative research**
  - Research to measure the results of the intervention, i.e. evaluation
Planning for habit formation

- Ideally there is a multi-phase process of Formative Research
  - Understanding the context, identifying candidate behaviors/practices
  - Household trials of improved practices (TIPS)
  - Pre-test of intervention components
  - Pilot-test of entire intervention package
Example: TIPs for point-of-use water treatment in Bangladesh
Chlorine dispenser

Double chamber water filter

Aqua tab

20 liter plastic drum with attached tap

10 liter aluminum kolshi and lid
TI Ps design

- Field site: rural
- Extended families living in compounds/ baris
- 2 baris trying chlorine dispenser by the water source, w/ or w/o plastic 20l vessel
- 5 HHs in different baris trying the filter
- 5 HHs in different baris trying aquatabs w/ or w/o aluminum kolshi
- No health education, in order to elicit perceived benefits and problems
Selection of options

- All options displayed and introduced at first *bari* meeting
- People’s first choice was the filter
- Second choice was dispenser with vessel
- Third and worst choice was aquatabs
Sample results: Chlorine dispenser

**Benefits**
- Easy to use
- Need not worry about the dosage for collecting water
- “Machine” looks good
- It is prestigious to have such a machine
- Placement of the “machine” near tube-well reminds them to treat water
- Make water clearer than before

**Barriers**
- Leakage
- Those who did not receive a vessel can’t measure water correctly to treat with chlorine
- Women were afraid to turn the valve of the dispenser
- Bad smell
- Did not like temperature
- Problem with having to wait for 30 min- makes water stale/hot/cold
Sample results: Filter

- Filters are “such nice looking technology”. “Good for us to have such technology in a rural area”.
- Filter was most appreciated. Increased family honor. Neighbors came over to have a glass of water. Water clear without taste of iron. More convenient for all to use.
- Cleaning is difficult
Formative research planning workshop

First phase of data collection + TIPS

Initial intervention design workshop

2nd phase: Development and pre-testing of individual intervention components

Intervention refining workshop

3rd phase: Pilot test of intervention

Pre-intervention dissemination of formative results and presentation of plan for intervention (another workshop)

Implementation starts
Part 2: Creating a science of behavior change in Global Health
My argument in Part 2

- Development and implementation of behavior change interventions in low-income, high-burden countries is necessary but not sufficient.
- The field of behavior change in water and sanitation needs to evolve as part of the broader transition to Global Health.
The transition to Global Health
The transition to Global Health

“Old”
- Tropical public health
- World health
- International health

“New”
- Global health
The World Health Organization and the Transition From “International” to “Global” Public Health

The term “global health” is rapidly replacing the older terminology of “international health.” We describe the role of the World Health Organization (WHO) in both international and global health and in the transition from one to the other.

Even a quick glance at the titles of books and articles in recent medical and public health literature suggests that an important but neglected aspect of this transition is the meaning, emergence, and significance of the term “global health.”

<table>
<thead>
<tr>
<th>Decade</th>
<th>International Health(^a)</th>
<th>Global Health(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950s</td>
<td>1 007</td>
<td>54</td>
</tr>
<tr>
<td>1960s</td>
<td>3 303</td>
<td>155</td>
</tr>
<tr>
<td>1970s</td>
<td>8 369</td>
<td>1 137</td>
</tr>
<tr>
<td>1980s</td>
<td>16 924</td>
<td>7 176</td>
</tr>
<tr>
<td>1990s</td>
<td>49 158</td>
<td>27 794</td>
</tr>
<tr>
<td>2000–July 2005</td>
<td>52 169(^b)</td>
<td>39 759(^b)</td>
</tr>
</tbody>
</table>

\(^a\)Picks up variant term endings (e.g., "international" also picks up "internationalize" and "internationalization"; "global" also picks up "globalize" and "globalization").

\(^b\)Number for 55 months only.
What is this transition?

- Is it a change in terminology and rhetoric only?
- Are there substantive and specific changes associated with the new term?

- The transition will assume different forms across different global health problem areas e.g. HIV/AIDS, malaria, maternal health, nutrition, tobacco control etc.
Elements of the new approach: 
Behavior change for water and sanitation in global health
“Global”: Three dimensions or interpretations

1. World + Earth
2. Entire planet
3. Comprehensive
Elements of the new approach: Behavior change for water and sanitation in global health

1. Behavior change must relate to both “World Health” and “Earth Health”

2. The scope of behavior change interventions must be global

3. Intervention design guided by a comprehensive model of behavioral determinants
Element #1: Behavior change must relate to both “World Health” and “Earth Health”
World Health & Earth Health

**World Health**
- World Health is the health of the entire human population of the planet
- Traditional focus of the World Health Organization
- Most “Global Health” is World Health only
- {World is from Old English *Wēreald* meaning a generation or age of men}

**Earth Health**
- Health of the biosphere that sustains life on this planet
- Not clear which international organization has overall responsibility for Earth Health
Three threats to Earth Health affecting water and sanitation

1. Ecosystem degradation
2. Climate change
3. Changes in energy sources
#1: Ecosystem degradation

- 2005 Millennium Ecosystem Assessment found that 60% of the ecosystem services were degraded or used in unsustainable ways.
- Ecosystem degradation has direct effects on availability and quality of water:
  - Filtration of wastes and pollutants
  - Regeneration of clean air, water, and soil
#2: Climate change

- **Temperature**
  - Global rise in surface temperatures
  - Warming of oceans

- **Precipitation**
  - Amount, intensity, frequency and type of precipitation

- **Extreme weather events**
  - Floods, droughts, heat waves, storms
Annual global mean temperatures

Source: www.ipcc.ch/publications_and_data/ar4/wg1/en/faq-3-1-figure-1.html
#3: Changes in energy sources

- Decreases in production/peaking for conventional sources of fossil fuels
- Increases in production of non-conventional sources of fossil fuels
  - Oil sands
  - Oil shale
  - Fracking for natural gas
  - Mountain-top removal for coal
Two effects of changes in energy sources on water & sanitation

- Contamination of water through energy production from non-conventional sources
- Increased cost of energy, affecting availability and access to clean water
Energy and water supply

- Energy is crucial for
  - Pumping and transporting water
  - Desalinating sea water, brackish water
  - Purifying water
  - Treating, transporting, and discharging sewage

- As fossil fuels increase in price, availability of clean water could decline
Peak Oil and Health in Low- and Middle-Income Countries: Impacts and Potential Responses

Peak oil refers to the predicted peak and subsequent decline in global production of petroleum products over the coming decades. We describe how peak oil will affect health, nutrition, and health systems in low- and middle-income countries along 5 pathways.

The negative effects of peak oil on health and nutrition will be felt most acutely in the 58 low-income countries experiencing minimal or negative economic growth because of their patterns of sociopolitical, geographic, and economic vulnerability.

The global health community needs to take additional steps to build resilience among the residents of low- and middle-income countries and maintain access to human growth and consumption: (1) global climate change, (2) ecosystem degradation, and (3) peak oil production. Of the 3, climate change has likely received the most attention, with continuing investigation and concern expressed not only about how climate change will affect health but also about how continued population growth and economic development may affect production of greenhouse gases.

The second threat, ecosystem degradation, was recently characterized in detail by the Millennium Ecosystem Assessment. This assessment examined 24 “ecosystem services” and concluded that 15 were in serious decline and 5 were in a precarious condition. Ecosystems provide critical services that underpin health and well-being.”

Behaviors related to water and sanitation: World Health & Earth Health

**World Health Behaviors**
- Hand-washing with soap before meals, before food preparation, after defecation
- Point-of-use water treatment: chlorination, filtration
- Use of sanitary latrines
- Avoid contact with water bodies infected with schistosomes and other parasites

**Earth Health Behaviors**
- Preservation of mangrove forests, swamps, deltas, forests
- Prevention of contamination of aquifers
- Decreased consumption of water & fossil fuels
- Decreased production of greenhouse gases
- Preservation of biodiversity
Elements of the new approach: Behavior change for water and sanitation in global health

1. Behavior change must relate to both “World Health” and “Earth Health”
2. The scope of behavior change interventions must be global
3. Intervention design guided by a comprehensive model of behavioral determinants
Element #2:
The scope of behavior change interventions must be global
Current scope of behavior change intervention in water and sanitation

- Focus is almost exclusively on low-income countries
- Good reasons for this:
  - High burden of diarrhea-related mortality in children <5 years
  - Concerns for equity and fairness: Effort should be where problem is greatest
### Scope of behavior change: High and low-income countries

<table>
<thead>
<tr>
<th>Individual behaviors: Water &amp; sanitation</th>
<th>High-income countries</th>
<th>Low-income countries</th>
</tr>
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<tbody>
<tr>
<td>Hand-washing with soap</td>
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<tr>
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<td></td>
</tr>
<tr>
<td>Sanitary disposal of feces</td>
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- This is the conventional analysis
- This analysis results in an exclusive focus on low-income countries
## Scope of behavior change: High and low-income countries

<table>
<thead>
<tr>
<th>Collective behaviors: Environment</th>
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<th>Low-income countries</th>
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</thead>
<tbody>
<tr>
<td>• Preservation of forests, mangroves</td>
<td>++++</td>
<td>++++</td>
</tr>
<tr>
<td>• Protection of aquifers</td>
<td></td>
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<th>Low-income countries</th>
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</thead>
<tbody>
<tr>
<td>• Construction and maintenance of potable water and sewage systems/latrines</td>
<td>++++</td>
<td>++++</td>
</tr>
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<th>Individual behaviors: Environment</th>
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<th>Low-income countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Decreased production of greenhouse gases</td>
<td>++++</td>
<td>+/- -</td>
</tr>
<tr>
<td>• Decreased consumption of water</td>
<td></td>
<td></td>
</tr>
</tbody>
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</tr>
</tbody>
</table>
Is this broader scope really necessary?

- Is behavior change already complicated enough for water and sanitation at the individual level, why add:
  - Collective behaviors
  - Environmental sustainability behaviors
Why the broader scope is unavoidable

- We have neglected promotion of the collective behaviors for a long time, results are apparent:
  - Degradation of water and sanitation infrastructure
- Clean water is more immediate and tangible benefit for environmental sustainability behaviors than reductions in greenhouse gases, fewer extreme weather events etc.
Why link behavior change in high and low-income countries?

- Despite apparent differences, there are many common challenges
- Linking of research agenda in high and low-income countries has proven beneficial for:
  - HIV/AIDS
  - Tobacco control
  - Tuberculosis
  - Etc.
Elements of the new approach: Behavior change for water and sanitation in global health

1. Behavior change must relate to both “World Health” and “Earth Health”
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Element #3: Intervention design guided by a comprehensive model of behavioral determinants
How do we have an influence on behaviors?

**Directly**

- Tuberculosis treatment through DOTS approach
  - We actively search for cases
  - Once cases are identified, we follow up to ensure they come for treatment
  - We observe TB patients taking the treatment in the clinic

**Indirectly**

- Water and sanitation
  - We identify determinants we think affect the behaviors: availability and cost of technologies, knowledge of diarrhea transmission, self-efficacy, disgust etc.
  - We hope this will lead to people practicing the behavior
What is the state of the science on behavioral determinants?

**HIV/AIDS**
- Hundreds of articles
- Large evidence base for associations between determinants and behavior

**Water and sanitation**
- Weak evidence base
- Little systematic measurement of behavioral determinants
- Many claims for single determinants e.g. disgust, social norms
What is the state of the science on behavioral determinants?

- If we don’t identify the determinants we are trying to influence, and measure them, it is difficult to advance the science of behavior change in water and sanitation.
Advantages of using an explicit model of health behavior

- Develop a behavior change strategy and a communication plan that takes into account all possible mechanisms influencing behavior change and habit formation vs. some only.
- Explore and evaluate each of the mechanisms that lead to behavior change:
  - Identify elements most associated with results.
- Compare experiences across sites & countries.
Some limitations of existing models

- Many well-known models don’t take into account the specific characteristics of water and sanitation-related behaviors
- Some are specific to one behavior or set of behaviors e.g. handwashing
- Tend to be focused exclusively on low-income countries
Development of a comprehensive framework (1)

- I have been working with ICDDR,B (Steve Luby) and group on developing and implementing behavior change interventions in two large randomized trials of packages of water and sanitation interventions in Bangladesh.

- Early on we identified the need to develop a comprehensive framework of determinants to guide intervention development.
Women garments workers of research site comming to home in afternoon for lunch break
Development of a comprehensive framework (2)

- We thought it would be easy, but we were wrong
- There are many models and frameworks out there, but each is partial
- Many are focused on one specific behavior or set of behaviors, none provided sufficient guidance for a comprehensive intervention
Example of existing framework: FOAM

- Developing by Water and Sanitation Program of the World Bank
- Specific for handwashing promotion
FOAM - Focus, Opportunity, Ability, Motivation

A draft behavior change framework
HW programs

March 2009
## FOAM

<table>
<thead>
<tr>
<th>Focus</th>
<th>Opportunity</th>
<th>Ability</th>
<th>Motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target population</td>
<td>Access/availability</td>
<td>Knowledge</td>
<td>Attitudes and beliefs</td>
</tr>
<tr>
<td>Desired behavior</td>
<td>Product attributes</td>
<td>Social support</td>
<td>Expectations</td>
</tr>
<tr>
<td></td>
<td>Social norms</td>
<td></td>
<td>Threat</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Intention</td>
</tr>
</tbody>
</table>
Factors missing in other models

- Characteristics of the water and sanitation hardware being promoted (handwashing station, water treatment technology, latrine etc.), and the cost and complexity of using it;

- Characteristics of the physical environment: Chemical and microbiological composition of different available sources of water, level of the water table, pattern of precipitation, population density; and

- Factors affecting habit formation, whether a behavior becomes habitual, process of habit formation
IFHPS
Integrated Framework for Hygiene, Point of use water treatment, and Sanitation
Columns in the framework: Three interacting domains

- Environmental / Socio-Demographic
- Product / Technology “Hardware”
- Psychosocial Determinants “Software”
Rows in the framework:
Levels of influence

- Aspects of each domain are reflected at multiple levels.
- Reciprocal influence across levels – higher levels are influenced by lower levels, lower levels are influenced by higher levels.
Levels

- Societal / Structural
- Communal
- Relational / Interpersonal
- Individual
- Behavioral

Environmental & socio-demographic

- Policy and regulations, climate and geography
- Access to markets, access to resources, built and physical environment
- Roles and responsibilities, household structure, division of labor
- Wealth, age, education, gender, livelihoods/employment
- Favorable environment for habit formation, opportunity for repetition of behavior

Psychosocial “Software”

- Leadership / advocacy, cultural identity
- Shared values, collective efficacy, social integration, stigma
- Injunctive norms, descriptive norms, aspirations, shame
- Self efficacy, knowledge, disgust, perceived threat
- Existing water and sanitation habits, outcome expectations

Product/Technology “Hardware”

- Manufacturing, financing and distribution of the product, current and past national policies and promotion of products
- Location, access, availability, individual vs. collective ownership/access and maintenance of the product
- Sharing of access to product, modeling/demonstration of use of product
- Perceived cost, value, convenience and other strengths and weaknesses of the product
- Ease / Effectiveness of use of product
সাবান দিয়ে দুঃহাত ধুলে
সুস্থ থাকব সবাই মিলে

প্রকাশনায়: আইসিডিডিআর,বি, মহাখালী, ঢাকা
IFHPS: Application to handwashing with soap using handwashing station

Levels

<table>
<thead>
<tr>
<th>Societal / Structural</th>
<th>Environmental &amp; socio-demographic</th>
<th>Psychosocial</th>
<th>Hand-washing station (HWS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Societal / Structural</td>
<td>Policy and regulations, climate and geography</td>
<td>Leadership / advocacy, cultural identity</td>
<td>Manufacturing, financing and distribution of the HWS</td>
</tr>
<tr>
<td>Communal</td>
<td>Access to markets, access to resources, built and physical environment</td>
<td>Shared values, collective efficacy, social integration, stigma</td>
<td>Location of HWS, individual vs. collective ownership/access to the HWS, maintenance of water and soap in HWS</td>
</tr>
<tr>
<td>Relational / Interpersonal</td>
<td>Roles and responsibilities, household structure, division of labor</td>
<td>Injunctive norms, descriptive norms, aspirations, shame</td>
<td>Sharing of access to HWS, modeling/demonstration of use of HWS by family members and neighbors</td>
</tr>
<tr>
<td>Individual</td>
<td>Wealth, age, education, gender, livelihoods/employment</td>
<td>Self efficacy for handwashing, knowledge, disgust related to unclean hands, perceived threat of unclean hands</td>
<td>Perceived cost, value, convenience and other strengths and weaknesses of HWS</td>
</tr>
<tr>
<td>Behavioral</td>
<td>HWS located in a place that facilitates habitual handwashing with soap</td>
<td>Existing handwashing habits, outcome expectations for handwashing</td>
<td>Ease/Effectiveness of using HWS for handwashing</td>
</tr>
</tbody>
</table>
IFHPS: Next steps

- Finalizing two papers
  - Description
  - Application to TIPS
- Have developing codebook for analyzing of qualitative data (interviews and focus groups) incorporating the determinants in the framework
Elements of the new approach:
Behavior change for water and sanitation in global health

1. Behavior change must relate to both “World Health” and “Earth Health”

2. The scope of behavior change interventions must be global

3. Intervention design guided by a comprehensive model of behavioral determinants