

The HYGIENE CENTRE'S Mission is to develop and apply knowledge to help improve hygiene, sanitation and water world-wide

The **Hygiene Centre** is a group of researchers at the London School of Hygiene & Tropical Medicine. Established in 2002, the Centre is part of the Environmental Health Group and is a leader in research in Sanitation, Water and Hygiene.

See our website! <http://www.hygienecentral.org.uk>

The **London School of Hygiene & Tropical Medicine** is Europe's leading public health institution. With over 450 researchers and staff, it is involved in research in all aspects of public health issues current in the world today. From emerging infections, to AIDS to malaria, to road traffic accidents to cardiovascular disease, staff at the School play a leading role in directing thinking and policy on health world-wide.

2009: a successful year

2009 has been an excellent year for the Hygiene Centre /Environmental Health Group at the London School of Hygiene & Tropical Medicine with major contributions across the board in science, practice and advocacy. The group now has 20 members plus 4 associates and 10 PhD and DrPH students. Over the year we have enhanced our position as global thought leaders in Sanitation, Hygiene and Water treatment, have published at least 50 articles, have been cited more than 50 times in press and other media, have been invited to present at numerous international meetings, often as plenary speakers, have advised WHO, Unicef, the World Bank, Oxfam, WSUP, WaterAid and the governments of the UK, US, Tanzania, Vietnam and others, as well as carrying out a variety of tasks for Unilever and other companies including Vestergaard-Frandzen, Medentech, Colgate-Palmolive and Kimberly-Clarke. Under the leadership of Sandy Cairncross and Val Curtis the HC/EHG has won a number of important grants, including \$5m from the Bill and Melinda Gates Foundation to study processes in pit latrines and a coveted MRC-ESRC Interdisciplinary award to study habit formation.

Other highlights included Gaby Judah organising UK activities for Global Handwash Day, including the hugely successful 'Golden Poo Awards 2009' and Val Curtis winning the BMJ Health Communicator of the Year Award.



HIGHLIGHTS

Some of the year's highlights are set out below. Fuller reports by topic are provided in the sections that follow.

- Prof Sandy Cairncross with Ousmane Touré showed that weaning food hygiene could be successfully improved in Mali.
- Wolf Schmidt showed that the true impact of diarrhoea control programmes such as hygiene promotion may be much greater than we thought because diarrhoea increases the risk of respiratory tract infections^[1].
- Steven Sugden, with Walter Gibson (visiting researcher) won a \$5m grant from the Gates Foundation for a study to understand sludge decomposition processes and consumer needs in relation to on-site sanitation in order to find innovative means of extending the life of latrine pits.
- Belen Torondel joined the Gates pit project team in November and is relishing the challenge of setting up lab studies in remote Ifakara, Tanzania.
- Gaby Judah with Robert Aunger and Wolf Schmidt demonstrated that messages could be screened for their effectiveness in changing handwashing behaviour in public toilets. She found that handwashing improved when visitors read the message: 'is the person next to you washing hands with soap?'^[2]
- Robert Aunger and Wolf Schmidt provided the first quantitative evidence for the habitual nature of handwashing and showed how it belongs in the routines of everyday life^[3].
- Jeroen Ensink's study of West African Cholera control programmes found that hygiene was very poorly handled and persuaded WHO to address this issue.
- Adam Biran with Mimi Jenkins found that communal latrines in urban slums were not well used by women or young children in a study in Bhopal, India, suggesting that the needs of these user groups are not yet fully understood.
- Micheál de Barra showed that the emotion of disgust has a factor structure which corresponds to the transmission routes of the major pathogens. He also found that disgust of interpersonal contact increased during the swine flu epidemic.
- Diana Fleishman has begun the process of transferring the Hygiene Wired work to Bangalore. With the team, she showed that UK handwashing rates followed media coverage on swine flu with an approximately 6 week time lag.
- Results are now coming in from Rick Rheingan and Matt Freeman's three year trial of improved school sanitation and hygiene in Kenya. They found that children do take messages about water treatment home, that latrine maintenance reduces absenteeism, that children face real problems with lack of hygiene materials. They are developing a schools' '3 cleans' kit that can sustainably meet the need for hygiene in schools.

- In contrast to the results in Kenya, Tom Clasen and Matt Freeman found that promoting Pureit filters in schools in Tamil Nadu did not significantly enhance household uptake of this technology. A study in Andhra Pradesh is examining the determinants of Pureit adoption.
- Tom Clasen and his team are exploring the potential role of microfinance institutions and self-help groups to drive the adoption of improved water management, including Pureit filters, among low-income populations.
- Ghislaine Rosa with Tom Clasen reviewed the global evidence and found that household water treatment is widespread in the Western Pacific and South East Asia, but less common in the Eastern Mediterranean and Africa – where it is most needed.
- Miri Jenkins tested a new consumer research tool, the repertory grid interview, for eliciting perceptions and mental constructs of low income consumers concerning drinking water quality and treatment method.
- Daniele Lantagne found that point-of-use water treatment was an effective, appropriate, and well-used intervention in cholera response in rural Nepal, but was not effective or utilized in response to an earthquake in Indonesia.
- Sophie Boisson and Tom Clasen completed a one year randomised placebo-controlled trial of the 'Lifestraw' water treatment technology in the Democratic Republic of Congo. It was the first placebo-controlled trial of household-based water filters conducted in a low income setting.
- Val Curtis has been advising the UK Government on behavioural measures for preventing swine 'flu.
- Eileen Chappel's admin team has expanded with the arrival of Tina Rouse to manage the Gates project and other new staff.
- In 2009, Matt Freeman, Rachel Peletz, Mícheál de Barra, Daniele Lantagne and Ghislaine Rosa successfully upgraded to PhD candidates and Wolf-Peter Schmidt and Ousmane Touré successfully defended their PhD theses.

SECTION 1. Hygiene and behaviour

Robert Aunger, Gaby Judah, Adam Biran, Mícheál de Barra, Wolf Schmidt, Diana Fleischman and Val Curtis continued work on a variety of hygiene and behaviour change projects theoretical, practical and experimental around the world and in the UK. In Kenya we showed that water access, level of education, media exposure and media ownership were associated with handwashing with soap, supporting the view that mass media can play a role in hygiene promotion^[4]. We also showed that there were three kinds of determinant of handwashing behaviour^[5], supporting our previous review of handwashing behaviour in 11 countries^[6]. These correspond to the three ways in which brains control behaviour – through cognitive planning, motivation or habit. Though much health-relevant behaviour is part of everyday routine, habit and routine formation have been little studied. This forms a major new research direction for the group and Gaby and Robert have obtained a prestigious MRC-ESRC interdisciplinary award to study this issue. Methodologically, the plan is to attach 'smart' accelerometers to the objects used for a variety of healthy behaviours (e.g., soap dispenser for handwashing with soap, toothbrush or floss-box for dental care, bicycle helmet for safe bike riding, etc), and to track habit formation with a variety of interventions.

Our motorway service station work – Hygiene Wired – was successful in demonstrating the use of smart technologies for behaviour change work, and also in showing how message screening can help develop and test health promotion messages. The results, published in the *American Journal of Public Health*^[7] generated major press attention including the *Times*, the *Guardian*, the *Times of India*, *Der Spiegel*, etc and Val was even interviewed on the prestigious *Science Friday* program

on National Public Radio in the USA. The next step is to take this work to India. The Hygiene Wired set up has also allowed us to document an increase in handwashing behaviour in response to, but lagging 6 weeks behind, media coverage of the swine flu epidemic. This may be due to social networking effects.

Theoretical work on the control of behaviour continues with a major review consolidating theories of behaviour change by Robert and Val and a paper using the logic of behavioural evolution to set out the 14 distinct human motivations. Mícheál has made the exciting finding that the psychological subdomains of disgust do indeed correspond largely to the routes of transmission of infectious disease, helping to confirm our thesis that disgust is a brain system which evolved to help prevent infections through behaviour. Consistent with this thesis, he also showed that disgust in the domain of interpersonal transmission, but not in other domains, increased during the swine flu epidemic^[8].

Adam Biran and Val Curtis are consolidating what we know about what works in hygiene promotion as a practical manual for the field. With Wolf Schmidt we are planning a trial of the effectiveness of the approach in Rural India—we created a prototype for the intervention in 2009 and pilot tested it. Adam is advising WSUP (Madagascar, Mozambique and Bangladesh), World Bank (China) and IRC (Ethiopia) on hygiene promotion, and doing a study for WSP on the technologies used for handwashing. We published the results of the trial of the Lifebuoy Swasthya Chetna approach which increased germ awareness and overall soap use but not handwashing^[9]. It was the first published trial involving the use of soap loggers as well as structured observation of behaviour. Val is involved in a pre-start up company called 'Clean Hands Inc' which is seeking to identify and commercialise new products for handwashing post-defecation for the low income consumer. Food hygiene in developing countries is a sorely neglected area. Sandy Cairncross and his PhD student, Ousmane Touré, showed that weaning food hygiene could be improved by mothers using a risk reduction process used by food handlers. We plan to build on this work with a trial in Bangladesh in the first instance. Another neglected area is cholera control. Jeroen Ensink's work in Guinea Bissau and Guinea Conakry, West Africa showed that hygiene promotion had been neglected in cholera control programmes. WHO have now taken up this issue. For the future we will be capitalising on the increasing interest in cholera, diarrhoea and a condition due to poor hygiene and sanitation known as 'tropical enteropathy', which causes chronic malnutrition, with new collaborative research.

2010 plans

1. Have the new generation of Hygiene Wired projects up and working in India; test messages and move towards next generation of 'smart' houses for monitoring behaviour.
2. Determine how to change everyday health habits (MRC/ESRC project).
3. Consolidate the new 'Triple setting' behaviour change model – the first new type of approach to understanding behaviour change in 50 years. Disseminate to academic community and Unilever Marketers.
4. Publish the 14 human motivations paper & test the validity of the model using psychometry.
5. Understand hygiene routines in Brazil and compare with India results (for Lifebuoy).
6. Develop and validate the new disgust scale and the disease related factor structure for disgust in India/Bangladesh.
7. Provide a taxonomy of moral disgust (with implications for Social Mission)
8. Conduct microbiological studies of soap/alternatives/bowls for washing/thoroughness of washing (Summer project students in Bangalore).
9. Carry out an RCT on new approaches to hygiene promotion at low cost (India or Bangladesh).
10. Create a hygiene inspiration manual.

SECTION 2. Schools work

Rick Rheingans, Matt Freeman and Adam Biran's work on the Gates funded schools project in Kenya is now coming to fruition with some important practical findings and new spin-off projects. The big idea is now to develop a coherent approach to sanitation, hygiene and water in schools, based on the best principles of behaviour change, using formative research to understand the situation and matching tools for monitoring and evaluation. Preliminary findings reveal that improvements in sanitation and hygiene in schools reduce the worm burden of *Ascaris* 10 months following deworming. Schools in Kenya were successful in getting messages about water treatment home, latrine cleanliness was found to be protective against absenteeism—which suggests that latrine cleaning may be a cost-effective way of reducing absenteeism and illness as well as reducing open defecation. The Gates Foundation has now agreed to fund a randomised trial of the impact of latrine cleanliness on absenteeism and health. Soap availability was also protective against absenteeism. Children suffer badly from the lack of cleansing, menstrual and handwashing materials in schools.

The findings of this body of work underscore the need for institutional and physical support to create a sustainable and healthy environment for children. An approach called '3 cleans' is being developed. This involves creating kits for schools to provide both for children's personal needs, for maintenance and cleansing and for hygiene promotion to be provided through the Ministry of Education. The approach is well suited to collaboration with industry.



Members of the Hygiene Centre conducted an independent assessment of a Unicef-Unilever project designed to encourage adoption of improved water management practices at home by providing a Pureit (tm) filter and instructions on household water treatment and safe storage in schools.

2010 plans

1. Randomised controlled trial to assess the impact of improved latrine maintenance on behaviours and absenteeism.
2. RCT to assess the effect of improved school-based diffusion efforts on the uptake of hygiene behaviours.
3. RCT to assess the sustainability of 'soapy water' for hand washing in schools.
4. Collaboration with the Kenya Ministry of Education to strengthen the effectiveness of government programs through monitoring, evaluation and joint applied research.

5. Work with a group of consortium of partners in Mali to develop monitoring, evaluation and learning program with support from Dubai Cares.
6. Collaboration with UNICEF to strengthen capacity for effective school WASH programs through their training network.

SECTION 3. Point-of-use water treatment

Though the Kenya study showed that point-of-use Water Treatment could be promoted through schools, a study of 61 schools in Tamil Nadu managed by Matt Freeman with Tom Clasen showed no enhanced uptake of Unilever's 'Pureit' system in intervention communities. This may have been because of a parallel programme successfully introducing Pureit through self-help groups. A new project in Andhra Pradesh will assess the determinants of Pureit adoption by self-help group members, its sustained use and the pathogen reductions thus achieved. A further study on converting people who boil water to alternative household water treatment options is also planned as well as an exploration of the needs of those living with HIV/AIDS, especially mothers who are bottle-feeding their infants.

Mimi Jenkins showed that slow sand filtration in Kenya was equally effective at reducing fecal coliforms and diarrhoea rates as commercially available technologies and so adds to the range of effective options for poor populations^[10]. She investigated the determinants of consumers' perceptions and preferences with regard to the quality of household drinking water and treatment options, collaborating with researchers from the Asian Institute of Technology and Beth Scott. Using the repertory grid method gave in depth pictures of consumer views in Bangladesh, Kenya and Vietnam and found 26 distinct psychological constructs concerning drinking water choice which varied by gender, local water access, prevailing social norms, lifestyle, past experiences, and information exposure.

Sophie Boisson and Tom Clasen completed a one year randomised placebo-controlled trial of the 'Lifestraw' water treatment technology in the Democratic Republic of Congo, the first placebo-controlled trial of household-based water filters conducted in a low income setting. The study highlighted the challenges of blinding HWT interventions in low income settings and the need for further work to obtain valid effect estimates^[11].

The study highlighted the challenges of blinding HWT interventions in low income settings and the need for further work to obtain valid effect estimates. It is widely believed that the impact of household water treatment and other water, sanitation and hygiene interventions that rely on self-reported outcomes in open trial designs exaggerate the impact of the intervention on diarrhoeal diseases.^[26] Tom Clasen and other members of the EHG/HC water group are working with USAID, PSI and Medentech to design and undertake a double-blinded, randomized, controlled field trial in India of a chlorine tablet in an effort to determine whether and to what extent these interventions are actually effective.

Ghislaine Rosa modelled the self-reported use of household water treatment for 67 low- and medium-income countries. An estimated 33% of the households (an estimated 1.1 billion people) in these countries report treating their drinking water at home. The practice is widespread in the Western Pacific (67%) and Southeast Asia (45%) regions, and less common in the Eastern Mediterranean (14%) and Africa (18%). Urban dwellers are more likely to treat their water and to use microbiologically adequate methods than rural populations. Boiling is the most dominant method, with 21% of the study households (598 million people) using the method, followed by filtering (265 million), straining (229 million), settling (118 million) and

chlorinating (67 million). Despite being more likely to be at higher risk of waterborne disease due to lower coverage of improved water sources, African and rural households are less likely to treat their water at home or use microbiologically adequate methods. This is now continuing this work to look at determinants of use of HWT and whether the data show any reduction in diarrhoea risk that can be attributed to HHWT.

Providing safe water in emergencies such as floods and earthquakes is clearly important, but what is the role of POUwater treatment in such cases? This is the question Daniele Lantagne has been focusing on this year in projects supported by USAID/CDC as well as Oxfam/Unicef. With partners, Daniele found that the answer was different in different places. PoUWT was an effective, appropriate, and well-used intervention in cholera response in rural Nepal, and was not effective or utilized in response to an earthquake in Indonesia.

2010 plans

1. Investigate the role of micro-finance and women's self-help groups to improve the uptake of Pureit filters among lower and vulnerable socio-economic classes in India.
2. Launch a double-blinded, randomized, placebo-controlled trial to assess the extent to which household water treatment prevents diarrhoeal disease in the absence of reporting bias and placebo effect.
3. Investigate the extent to which children <2 years whose mothers choose replacement feeding as an alternative to breastfeeding in accordance with UN guidelines would benefit from improved household water management practices.
5. Conduct case studies in Uganda and Peru to determine whether international assessments of boiling accurately report actual household water treatment practices.
6. Explore synergies in combining the promotion, sale and delivery of household water filters with other products, including improved stoves to reduce indoor air pollution and insecticide treated bed-nets and condoms as part of integrated HIV/malaria/diarrhoeal disease interventions.
7. Explore the extent to which household water treatment implemented in the immediate aftermath of a natural disaster or outbreak improves sustained adoption of the intervention post-emergency.
8. Take steps to re-position household water treatment not as a water intervention (since it does little to improve water quantity and access) but as a hygiene intervention where it can take advantage of lessons in communication and behaviour change that are central to uptake.

SECTION 4. Sanitation

The New Gates pit project got off to a flying start in 2009 with a startup workshop in Ifakara, Tanzania attended by Walter, Belen, Steven and Jeroen. Latrines will be studied from the perspectives of microbiology, geophysics and chemistry as well as from the perspective of the consumer, with the objective of finding better ways of managing faecal wastes. New techniques are being developed using geophysical prospection to provide quicker and safer ways of collecting data from pit latrines. Vietnam is the second site for this work with a third still to be chosen.

In India, Adam has been exploring the role that public latrines play in improving sanitation for slum dwellers with help from Mimi in a project for WaterAid. The results suggest that facilities do not meet the needs of women or young children very well, with open defecation, and the unsafe disposal of child faeces remaining common. Distance to the communal facilities was also a factor in limiting use. Further work is planned to explore these issues in more detail.

Working with WaterAid, a leader in the promotion of hygiene and sanitation interventions in low-income countries, Tom Clasen and other members of the EHG/HC sanitation team have designed a randomized, controlled trial to assess the effectiveness of basic sanitation on diarrhoeal disease and helminth infection.

Subject to funding, the study will be launched in Orissa, India in early 2010. Among other things, the trial will incorporate novel "smart latrine" technologies being developed by the researchers to remotely monitor actual use of the latrine by each member of the household.



The Gulper

Steven Sugden continues work on commercialising the 'Gulper' – a technology for emptying pits at low cost in urban areas. He is also providing support to WSUP's sanitation activities in Madagascar and Mozambique.

2010 plans

1. Conduct the first randomized, controlled trial to assess the effectiveness of latrine promotion to prevent diarrhoeal disease and helminth infection.
2. Develop and pilot the first technology for monitoring the use of latrines in low-income settings.
3. Organize a workshop that brings together major national and international solid waste disposal companies with researchers in sanitation to explore opportunities for collaboration and research.

SECTION 5. Synthetic, methodological, capacity building, advisory and advocacy

The Hygiene Centre /EHG is active in our sector in a wide range of ways beyond its ground-breaking research. We are actors in global networks such as the Global PPP for Handwashing and the Network on Household Water Treatment. Sandy plays a key role in the CHERG, the international reference group on the health impact of interventions on children. A summary paper of the impact of hygiene, sanitation and water on public health is shortly to appear in the International Journal of Epidemiology. Sandy is also leading an important new series on water, sanitation and hygiene for publication in 'The Lancet'. Sandy remains as Chair of the Advisory Committee of the Global Sanitation Fund, but has stood down after nearly a decade of service on the boards of WaterAid and the International Scientific Forum on Home Hygiene.

The SNOWS Consortium for building African research capacity in environmental health, which the group helped to establish, won a 5-year grant of £1 million from the Wellcome Trust and held its first meeting in Accra in December (see photo). The consortium includes Tshwane and Venda Universities in South Africa, Egerton University in Kenya, Gezira University in Sudan, and the universities of science and technology of Mbarara in Uganda and Kumasi, Ghana. The other northern partners in SNOWS are the University of East Anglia and Copenhagen University. Much of 2010 will be taken up by a needs assessment, but an early item of collaboration is Sandy's co-supervising a PhD student at Tshwane.

Eileen produced a document identifying the key elements of research management for discussion at the inaugural meeting of the SNOWS Consortium. Research Management has become a key issue for all



Members of the SNOWS Consortium at their inception meeting in Ghana in December 2009. Front row, l. to r.: Sandy Cairncross (LSHTM), Esi Awuah (KNUST Kumasi), Natasha Potgieter (Univ of Venda). Middle row: Edward Muchiri (Egerton Univ), Edgar Mulogo (Mbarara Univ), Abdulai Suglo (KNUST), Prince Antwi Agyei (KNUST), Samira Abd El Rahman (Gezira Univ). Back row: Anders Dalsgaard (Copenhagen Univ), Paul Jagals (Tshwane Univ of Technology), Paul Hunter (Univ of East Anglia), Jeroen Ensink (LSHTM)

newly funded consortia and, together with support from the Association of Commonwealth Universities and the International Network of Research Management Societies, Eileen will run a workshop at the INORMS Conference in Cape Town in April 2010.

One of the most important scientific contributions of the year was Wolf's new approach to measuring diarrhoea outcomes using weight loss as a proxy measure for recent diarrhoea. This may prove a key tool for measuring outcomes rigorously in future trials of interventions. The paper is 'in press' with the Journal of Epidemiology and Community Health^[12].

Val was asked by Unilever Vitality to give a presentation at a meeting between the Director General of Health of the European Union and his team with a range of global brands such as Pepsico, Coca-cola, Nestlé and Unilever. She argued that far more could be done if both sides understood each other better and joined forces for healthier behaviour. Val was honoured to be invited to give a plenary talk at the European Human Behaviour and Evolution Association on disgust, disease and morality. She was also thrilled to be awarded the title of 'BMJ Health Communicator of the Year' at a glamorous ceremony in March. Val, Robert and the team continue to assist Lifebuoy in a variety of projects, learning about hygiene routines in India, presenting at the inaugural Social Mission meeting with 21 Lifebuoy countries, writing a preface for the social mission report and providing an on-tap facts and figures service.



Val Curtis

Mimi Jenkins was invited to prepare and present a background paper on financing for sanitation demand creation and behaviour change at the KfW German Development Bank's first-ever high-level symposium on financing for sanitation in October 2009, attended by European investment banks, bi-lateral and non-governmental development agencies, and sanitation experts^[13].

Outcomes included recommendations to invest in creating a sanitation market that serves low income populations and applying professional marketing to create demand.

Global Handwash Day was a huge event internationally. The UK efforts were coordinated by our own Gaby Judah, and we managed to achieve an international splash with our efforts. We released the Hygiene Wired study to the press which attracted over 50 citations in media in the UK and globally. Val was even interviewed on the prestigious Science Friday on National Public Radio in the USA. The Golden Poo Awards 2009 were the highlight of the day. A glamorous sold-out awards ceremony hosted by Celebrity Dr Phil Hammond had the audience in stitches. Golden Pooos were awarded to the makers of short animated films about handwashing and to Hygiene Champions Mary Swai and Rebecca Budimu of Unicef and the Tanzanian Government as well as Sanitation Champion the Honourable Namuyangu J. Byakatonda of Uganda. A film called 'Seriously Dirty' was made of the event which can be viewed at <http://www.thegoldenpooawards.org/>.

We created some controversy by focusing on poo, as we intended. 'Newsweek' said:

"Without a little edge, campaigns to raise awareness of diarrheal disease just get ignored in the West. So maybe it's OK to offend a few people if that's the only way to get some much-needed attention for your cause. Really, which is more upsetting, the campaign or the million deaths it's trying to prevent?"



The Hygiene Centre was also nominated for the Conrad Hilton Global Humanitarian Award.

Members of the EHG/HC delivered five papers at the International Forum on Household Water Treatment and Safe Storage in Dublin in September 2009. Tom Clasen headed a special session on household water treatment at the Annual Meeting of the American Public Health Association in Philadelphia in November, 2009. During the 2009-10 academic year, Tom Clasen is a Visiting Professor in the Department of Epidemiology, School of Public Health, University of California-Berkeley.

We thank all our funders (Gates, Unilever, WSUP, WaterAid, DFID, Unicef, World Bank, WHO, Vestergaard Frandzen, Colgate, Medentech, IRC, Danida, EU, LSHTM), colleagues and supporters.

STOP PRESS

Just before Christmas we learned from DFID that the consortium led by LSHTM has won the bidding for their £10 million research programme on sanitation and hygiene, subject to clarification of a few points of detail. We look forward to successful completion of the contract negotiations early in the new year.

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