

# Theme

## Monitoring and evaluation of health and socio-economic impacts: Key lessons learnt from a Household Energy & Health Project

### Authors

**Kirstie Jagoe, Helen Bromley, Nigel Bruce**

Division of Public Health, The University of Liverpool, UK, L69 3GB

E-mail for correspondence: [kjagoe@liverpool.ac.uk](mailto:kjagoe@liverpool.ac.uk)

*The evaluation of household energy programmes is a complex and demanding task, but also very important and worthwhile. In this article, a team from the University of Liverpool presents a range of issues that arose from a series of evaluation studies, together with an introduction to recently developed guidelines designed to address these issues and allow organizations to obtain the skills, knowledge and tools to evaluate the impacts of household energy programmes.*



In 2003, the Shell Foundation supported four projects which aimed to develop and disseminate improved stoves to poor biomass dependant rural populations using an economically sustainable approach. The evaluation of these projects was made a pre-requisite for funding. Teams from the University of Liverpool and University of California Berkeley (UCB) were commissioned to support the development organisations during the evaluation process. By 'development organisation', we mean NGOs, and other organisations/agencies that are leading the development and implementation of household energy interventions in low income countries.

**Figure 1** Focus group discussion facilitated by a member of Development Alternatives field staff (Photo: Helen Bromley)

The Liverpool team were responsible for the health, social and time-activity impacts evaluation using quantitative and qualitative methods, while the UCB team focused on the effects on indoor air quality and stove performance. The ultimate aim was for the Liverpool and UCB teams to use the experience gained from this work to develop and make widely available, standardised guidelines and protocols for the monitoring and evaluation of household energy programmes.

The findings from the evaluation studies have been reported to the Shell Foundation, and are currently being prepared for publication. In this article, the team from the University of Liverpool discusses the key lessons learnt and issues raised during this project (See Box 1). This is followed by a brief introduction to recently developed guidelines designed to address these issues and to assist organisations in planning evaluation studies, their role in the work, and in acquiring the skills, knowledge and tools to evaluate the impacts of household energy programmes.

### What is the place of 'off the shelf' evaluation packages?

For the health and socio economic components of the evaluation of household energy interventions, the goal of developing a standard 'off the shelf' impact evaluation package seems to be neither appropriate nor realistic - for two main reasons.

Firstly, examining the impacts of a household energy intervention on health, women's lives, environment and income generation, etc., is a complex task that requires an in-depth knowledge of the community involved, including features such as culture, climate and environment. This creates a situation where, for example, a questionnaire that has been developed for use in rural

### Box 1: Key lessons learnt

- A standardised 'off the shelf' package is not an appropriate or realistic method for evaluating the health and socio economic impacts of household energy interventions.
- With realistic aims, appropriate skills as well as support with monitoring and evaluation, the majority of development organisations can carry out useful evaluation studies
- Detailed evaluation studies should not be carried out until there is good evidence to show that the intervention meets the needs of a majority of prospective purchasers, and that they will be able to use it in the manner intended.
- Matching evaluation research to programme development is a challenge which needs to be recognised and allowed for at the planning stage.
- Different scientific perspectives are useful in understanding and validating the many complex ways household energy can impact on health and wellbeing.

India is unlikely to be useful in that form in an African or Latin American country until it has undergone considerable adaptation to the local setting. In this project, adaptations had to be made to questionnaires and focus group discussion (FGD) topic guides when they were used at different sites even within rural India to allow for differences in, for example, fuel types and the nature of food cooked each day.

Secondly, the aims of the organisation carrying out the monitoring and evaluation are typically diverse and require very different individual projects in order to achieve them (See Box 2). A standardised package would not provide the flexibility to allow for this range of aims.

However, it is also very important to use tried and tested methods where possible, and that there is also merit in retaining common features across studies where relevant to help with comparing the results of work in different countries. Therefore the study design should seek a balance between local relevance and the collection of data that is reliable and comparable with work carried out elsewhere.

### What role should the development organisation have in the evaluation?

Development organisations involved in household energy work vary greatly in their aspirations and monitoring and evaluation expertise. However with realistic aims, appropriate skills as well as support with monitoring and evaluation, the majority can make an important contribution to the implementation of useful evaluation studies.

Unless the development organisation has extensive experience carrying out monitoring and evaluation they should seek to establish collaboration with a team, ideally in their own country, who have the appropriate experience and expertise. There are many advantages to collaboration with an organisation from the country where the study is taking place including, having a good understanding of the issues that influence household energy in that area as well as ease of access to the study site thereby keeping costs to a minimum.

The benefits associated with the development organisation taking a lead role in their own evaluation work (with research and planning support), as opposed to an outside research organisation carrying out the whole project, are related to the privileged

## Box 2: Example aims for a programme evaluation study

- Enable informed decisions on development of a technology, service or programme.
- Promote marketing through better understanding of how consumers' views affect uptake and use.
- Provide evidence of intervention impacts, for example on pollution, health, time, income generation, etc.
- Determine the overall effectiveness, and (with cost information) the economic efficiency of the programme.
- Obtain evidence to influence policy at local, national or international levels
- Meet the growing expectations of donors for evaluation, and improve prospects for future funding

## Box 3: Steps prior to a substantive evaluation

- Testing within a laboratory situation (many development organisations have 'laboratory' type facilities that are used to test the stove designs).
- Field-based testing in a few households which are representative of the different cooking practices and fuel options typically encountered in the target population, to obtain feedback from users on acceptability and suggestions for changes. Assessment of the impact on IAP and fuel efficiency should also be established at this stage.
- Evaluation of the usability and community acceptance over a longer time period and across different seasons (especially where seasons has a major influence on stove use), in a larger number of households (in the order of 20-30, at least) typical of the target population.

relationship many development organisations have established with the communities that they work in. This allows them a level of access to homes, people and information that others may not be permitted (Figure 1). This relationship can work either way of course, since the relationship could also be a barrier to hearing people's true feelings or responses may unduly reflect messages that have been a core element of the development organisation's own promotional activity. However, the possible problems associated with this close relationship should not obscure the potential it offers for trust and honesty, nor lead to an assumption that an outside organisation would always achieve greater objectivity and accuracy in data collection.

### Evaluation study planning must reflect progress with intervention development

What the development organisation hopes to achieve from their evaluation should be strongly determined by the current stage of development of the intervention, and the approach to delivery and adoption. There is potential for wasting valuable resources and time, as well as the goodwill of the communities involved, if an extensive evaluation is carried out only to find that the adopters are not using the intervention or have adapted it so radically to suit their needs that the intervention no longer does what it was designed to do. Therefore

detailed evaluation studies should not be carried out until there is good evidence to show that the intervention meets the needs of a majority of prospective purchasers, and that they will be able to use it in the manner intended for reducing indoor air pollution and improving fuel efficiency. As part of the initial planning of evaluation studies, it is important to assess what is known – and not known – about the acceptability and use in practice of the intervention. By way of example, Box 3 sets out the stages of development and evaluation that should have been completed before undertaking a substantive evaluation of health, social and economic impacts of a medium to large scale sustainable stove programme.

### Issues in the design of evaluation studies

Possibly one of the greatest challenges when building an evaluation study around a household energy development programme is to align the design and timing of the evaluation work to the timescale and geographical spread of the intervention adoption process. This requires careful planning at an early stage.

Another critical design issue is the use of comparisons groups. There is no question that the lack of a comparison group does place additional constraints on interpretation of the findings, particularly for health and socio-economic outcomes which are sensitive to many influences.



**Figure 2** Development Alternatives intervention: The two pot Anandi Stove (Photo: Nigel Bruce)

The inclusion of a comparison group, while desirable, will increase the cost and complexity of the study. The feasibility of using comparison homes (whether these are randomised or more simply drawn from nearby, similar communities that do not have the intervention) has raised concerns about ethics and practice. Development organisations may be uncomfortable conducting surveys and other data collection (e.g. air pollution) among communities where they are not actively carrying out development work, particularly if this extends over the 12 months or more needed for a reasonable follow-up period.

The randomised allocation of homes to an intervention such as new stoves (Figure 2) and control (continued use of traditional stoves) is, from a scientific

perspective, the most powerful method for studying the impacts of the new stove, but adds another problematic dimension. The disadvantage is that randomisation typically has to be very actively and closely managed, so that in practice it is very difficult to align this study design with the goal of evaluating a market-based programme, where adoption occurs (over time and geography) in a manner determined by the market and various other factors, such as promotional activity and credit facilities, designed to stimulate that market.

When planning an evaluation study, it is very tempting to 'arrange' the initial adoption for the convenience of the study logistics, and probably to an extent this is inevitable. It is however an issue that needs to be considered carefully at the planning stage, with acknowledgments about the consequences of the resulting decision. Thus, on the one hand, the study needs to be feasible and practical within a reasonable budget and timescale, so it may not be realistic to relinquish completely control over the rate and location of adoption. On the other hand, 'fixing' the delivery, pricing, etc., of the intervention in such a way as to ensure the study is relatively easy to carry out may easily lead to the results having limited relevance to programmes where

the goal is widespread adoption through financially sustainable mechanisms.

## Approaches to the evaluation of impacts on health and wellbeing

The mechanisms and pathways involved in the household energy impacts on health are wide ranging. These include clearly defined issues such as the effects of high levels of incomplete combustion products on the lungs, burns to young children from open fires, but also much less easily defined health consequences. An example of the latter would include the ways in which a cleaner, better lit environment for a family might increase opportunities for income generation and education, and thereby improve health in both the short and longer terms. As a result, different scientific perspectives that encompass epidemiological and qualitative research methods are useful in understanding these links and consequences. It was found useful to approach this apparently complex set of issues by considering the evaluation of health and wellbeing under four headings. These are shown in Table 1, together with a summary of the most appropriate research methods for each, and some of the implications for the expertise, costs and settings required.

The linkages between the varied effects of household energy interventions

**Table 1** Approaches to assessment of health outcomes of household energy interventions, methods and implications for evaluation studies

Approach to health outcome evaluation	Appropriate research methods and implications
1. Health impacts of reduced indoor air pollution exposure on disease outcomes including childhood pneumonia, COPD, TB, birth weight, eye disease, etc.	Epidemiological methods are required, with strong study design (randomised trials if possible, or analytic observational – cohort and case control, and sufficient sample size, which in practice will typically be quite large). Studies require detailed and resource intensive case finding methods, including medical examination and investigations. Some of the disease outcomes develop after many years (COPD, cancer, TB, cataract) adding complexity and resource demands. Suitable intervention research settings may be difficult to align with the development of market driven dissemination, although may be more feasible with observational designs (e.g. case control, cohort) where large scale adoption is taking place.
2. Impacts on safety during the collection and use of fuel	Both survey-based questionnaires and qualitative research methods are appropriate and useful. Questionnaires need careful definitions and wording, but assessment generally does not require clinical (medical) examination or investigations. Qualitative methods are valuable for documenting and understanding how, for example, women are at risk during fuel collection, or how burns to children relate to daily activities. Assessment of the safety of interventions should be considered ethically important, and should not be assumed. Inclusion in evaluation studies in development project settings is feasible with appropriate research support.
3. User perceptions of the health effects of indoor air pollution and intervention impacts	Both survey-based questionnaires and qualitative research methods are appropriate and useful, with the latter being particularly useful for documenting perceptions and understanding of how these might (or might not) impact on householder's motivation to obtain, maintain and promote the intervention. It is important to avoid leading questions in both surveys and qualitative data collection, and to recognise the extent to which development activities by a development organisation may elicit responses to please. Inclusion in evaluation studies in development project settings is feasible with appropriate research support.
4. Indirect impacts on health, including through effects on time (especially of women), income generation, and the knock-on effects of other improvements to the home environment.	This is an important but complex area to study, requiring a mix of research methods ranging from quantitative surveys through to participatory and qualitative methods. These need to be combined with reference to theoretical models to help build up and understand inter-relationships, that is, how the various consequences of the intervention can ultimately affect health and wellbeing. While some aspects of these inter-relationships may be generally applicable (e.g. that increased availability of women's time will usually benefit young children's health and welfare), many aspects will be highly context specific. These issues should be considered, but require support and careful planning to ensure realistic objectives and relevance to the setting.

on health are complex by virtue of the many inter-relationships, variable timescales and influences which work in both directions, and so too are the methodological considerations involved in designing studies to demonstrate such impacts. Although the evaluation of health and wellbeing is demanding, it is important that this topic is discussed thoroughly in the planning stages of the study, so that appropriate and realistic objectives are set, suitable techniques chosen, and sufficient resources identified.

## Conclusions

The evaluation of household energy programmes is certainly a complex and demanding task, but also very important and worthwhile. Evaluation requires careful planning in advance, taking account of the stage of development of the technology and approaches to promoting adoption, consideration of the information requirements of prospective audiences, and of other factors including local and national trends in fuel availability and use, and policy on energy and development. Development organisations should be encouraged to consider what role they wish to adopt in the evaluation study - whether to take a lead role, take a facilitative role with a collaborating partner from a research group leading the work, or whether to commission the work to an external agency and manage the contract. For some, there is much that can be gained for taking a lead on the development and coordination of the study, particularly if there is a desire to develop capacity for future evaluation work.

On the other hand, the demands and challenges involved must be recognised. The decision should be an informed one

and arrangements should be in place for whatever level of research support is required, before embarking on the study. Finally, it is critically important that the evaluation work be appropriate to the stage of development of the intervention and only carried out with prior evidence of efficacy and acceptability. Larger-scale evaluation studies should not be planned until these preliminary assessments have been carried out and the technology and means of dissemination shown to be capable of meeting the needs and circumstances of the target population.

## Guidelines

Guidelines written by the University of Liverpool team have been developed to incorporate the lessons learned from this work. They recommend the development of plans for evaluation work in close partnership with a support organisation that has experience of evaluation research in similar settings. The guidelines seek to adapt established research study designs and data collection methods to the particular circumstances and needs of the project to ensure they are appropriate to the experience, culture and expectations of the people concerned.

The guidelines may be downloaded via the @HEDON link below.



## Acknowledgments

We would like to thank all of the managerial, office and field staff at ARTI (Pune, India), Development Alternatives (Jhansi India) and GIRA (Michoacan, Mexico). Our appreciation and thanks also go to the women and their families who participated in these evaluation studies - our understanding of this complex field has increased due to their generosity and patience. This work was funded by the Shell Foundation, London.

## Profile of the authors

Kirstie Jagoe has an MSc in epidemiology from the London School of Hygiene and Tropical Medicine. She has worked in the field of indoor and outdoor air pollution for the last eight years. She worked as the University of Liverpool project co-ordinator for the Shell Foundations' Household Energy and Health Project.

Dr Helen Bromley is a Specialty Registrar in Public Health in the NHS and a Lecturer in Public Health Management at the Liverpool School of Tropical Medicine. She is particularly interested in the contribution of qualitative and participatory research methods in understanding and addressing public health problems, especially in resource poor settings.

Dr Nigel Bruce is a Reader in Public Health at the University of Liverpool, currently involved in research and policy work on environment, health and development. He trained in medicine and public health, and has a masters degree and PhD in Epidemiology. He has contributed to work on the prevention of respiratory illness and other forms of ill-health through the improvement of household environments with research including randomised stove intervention trials in Guatemala, development and evaluation of sustainable household energy interventions in Africa, Central America, India and Nepal, and work on developing research prioritisation methods.

## A request for information: The WHO systematic review of interventions to reduce household indoor air pollution.

The WHO, in collaboration with the University of Liverpool, is currently carrying out a systematic critical overview of activity, approach and impact of projects and programmes developing and disseminating interventions aimed at reducing domestic exposure to indoor air pollution. In order to ensure the search for programmes is inclusive

we are interested in hearing from any organization which has in the past 10 years;

1. Implemented household energy projects and programmes which aim to reduce indoor air pollution and, have carried out monitoring and evaluation that includes some form of IAP measurements and/or personal exposure monitoring.

2. All substantial programmes (dissemination of over 10,000 units) promoting clean fuels such as LPG and

biogas. These programmes do not necessarily require to have evaluated IAP and/or exposure measurement to be eligible for this review, on the understanding that there must have been an assessment of the extent to which the clean fuel is being used for main cooking, heating and other tasks previously carried out with solid fuels.

Please forward your information to Kirstie Jagoe at [kjagoe@liverpool.ac.uk](mailto:kjagoe@liverpool.ac.uk) as soon as possible, and at latest by August 15th 2008. We look forward to learning more about your work.

# Focus