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## The Hawthorne Effect in community trials in developing countries

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The Hawthorne Effect is relatively common in community intervention trials. Yet, very little is known about it in developing countries where poverty may play an important role in how and why people participate in studies. A quasi-experimental trial with a comparison group designed to evaluate the effectiveness of an indoor air pollution intervention showed evidence of reactivity in rural South Africa. By drawing on post-trial focus group discussions with members of the comparison group ( $n = 30$ ), this paper explores the reasons why participants improved their behaviours despite not having received the intervention. Results suggest that participants changed their behaviours for three reasons: expectations of gain, misunderstandings of the data collection equipment and a learning effect. In addition to highlighting the role of poverty and miscommunication in influencing reactivity, this paper also offers recommendations to reduce the Hawthorne Effect in impoverished contexts.

**Keywords:** Hawthorne Effect; Reactivity; Poverty; Community Trials; Research Design

### Introduction

In any study there are potentially two experiments: the study planned by the investigator and the study perceived and participated in by the subjects. Adair (1984, p. 342).

The Hawthorne Effect refers to the manner in which ‘variables can be unwittingly confounded in the experiment because of some aspect of the experiment itself’ (Parsons, 1974, p. 922). The term is derived from a series of experiments conducted between 1924 and 1932 at the Hawthorne plant of Western Electric Company that sought to determine the influence of changing working conditions (e.g. levels of lighting) on employee productivity (Mayo, 1933). In short, findings showed that productivity increased despite changes in working conditions. For example, in the illumination studies when lighting was increased, employee productivity improved. However, when lighting was severely diminished, productivity continued to improve. The original explanation suggested that the increased attention by management motivated employees to increase their productivity rather than the changes in working conditions (Roethlisberger & Dickson, 1939). In other words, employees put their ‘best foot forward’ to impress management.

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It is important to note, however, that the accuracy of the ‘increased management attention’ explanation has been subsequently critiqued, particularly in the organisational and education literature. The critiques are based on secondary analyses of the original studies that failed to show the degree of evidence claimed by the authors, studies that have failed to replicate a Hawthorne Effect (Adair, Sharpe, & Huynh, 1989) as well as evidence that workers may have increased their productivity for reasons other than increased attention by management (Diaper, 1990). This has led some authors (Brannigan & Swerman, 2001; Jones, 1992; Rice, 2006) to position the *origins* of the Hawthorne Effect as a historical myth. However, the term is still commonly used in the research methodology literature to depict improvements in comparison groups (usually in quasi-experimental or experimental designs) that have not received the intervention (see Campbell, Maxey, & Watson, 1995; Gauffman, 1999).

Improvements in comparison groups are usually attributed to the increased attention given, or information inadvertently communicated to, participants during data collection activities. For example, participants may feel the need to disguise potentially negative behaviours or inversely portray themselves in a positive light (sometimes referred to as a *halo effect* or *social desirability*); learn of the intervention from the intervention group or the research team and indirectly be exposed to the intervention (*message contamination*); give more thought to the subject based on the questions being asked and provide what they think are correct answers or behaviours (*learning effect*); may learn that they are not receiving the intervention and compensate for receiving less by improving their behaviours (*John Henry effect* or *compensatory rivalry*); investigators may expect certain participants to perform better, reinforce these expectations, which in turn leads those participants to perform better (*experimenter* or *Pygmalion effect*) (see classic texts such as Rosenthal, 1976; Cook & Campbell, 1979 as well as Bowling (2002) for examples of these effects). The Hawthorne Effect is also sometimes used interchangeably with the term *reactivity* (Cousens, Kanki, Toure, Diallo, & Curtis, 1996; Gittelsohn, Shankar, West, Ram, Gnywali, 1997). While the terms used to refer to the above effects (individually or collectively) differ, participants often do improve their behaviour when participating in trials.

From a perspective that seeks to isolate *how much* change is attributable to an intervention, researchers understandably try to prevent the Hawthorne Effect from occurring. Research design texts have readily available advice on how to prevent it – most of which involves keeping participants and/or the researchers who interact with those participants as unaware (e.g. through blinding and minimising contact between the intervention and comparison groups) about the real nature of the experiment as is ethically permissible. When the Hawthorne Effect does occur, it is usually statistically adjusted for to provide a cleaner picture of the ‘net’ effect of the intervention.

However, despite notable efforts to prevent it, evidence of the Hawthorne Effect is relatively common in published community trials, particularly in developing countries. For example, three recent indoor air pollution trials (Bruce et al., 2007; Tun et al., 2005; Zhou et al., 2006), each reported significant behavioural improvements amongst the comparison groups. Yet, the question of why participants change their behaviours when participating in trials and more importantly, the meaning thereof, is one of the most under-researched topics of modern social research (Adair, 1984). This is because very few studies have actually asked *why* participants changed their behaviours following a trial and, those studies that have, were conducted some time ago in developed countries (Adair, 1984; Adair et al., 1989; Orne, 1973).

This is the first paper to locate a discussion of the Hawthorne Effect in developing countries against the backdrop of poverty by asking participants in a comparison group that showed evidence of a Hawthorne Effect why they changed their behaviours. It argues that while evidence of a Hawthorne Effect may weaken confidence in attributing *how much* change is due to the intervention, exploring why comparison group participants improved their behaviour provides an opportunity to interrogate some of the key methodological assumptions underlying the study. Admittedly, the Hawthorne Effect was not an initial focus of this work. However, the magnitude of behavioural improvement amongst the comparison group (almost as much as the intervention group) as well as evidence of the effect in many other published trials influenced the decision to explore it further. Before proceeding, however, it is important to briefly summarise the indoor air pollution trial that experienced the Hawthorne Effect.

### **The indoor air pollution trial**

Indoor air pollution caused by the indoor burning of biomass fuels, such as wood and animal dung, has been associated with acute lower respiratory infections (ALRIs) such as pneumonia amongst children younger than five years old in developing countries. Over half the global population (three billion people) are reliant on solid biomass fuels such as wood, coal, crop residues and animal dung for their domestic energy requirements (Ezzati et al., 2004; The World Resources Institute, 1998). ALRIs are the single leading cause of death amongst children less than five years old worldwide (Murray & Lopez, 1997) and one of the top killers of South African children (Bradshaw, Bourne, & Nannan, 2003; von Schirnding, Yach, & Klein, 1991).

By the late 1990s, enough epidemiological evidence of the probable link between indoor air pollution and child ALRI existed to call for evaluation studies of the health benefits of indoor air pollution interventions (von Schirnding et al., 2002). Behavioural change (e.g. improving ventilation practices and keeping children away from fires) has been identified as a potential short-to-medium solution until poor households can afford cleaner burning technologies. Yet, until the current study, no studies had explored the effectiveness of behavioural change to reduce child indoor air pollution exposure (the studies mentioned above focused on technological interventions). In response to this, the study sought to evaluate the impact of a behavioural intervention to reduce children's exposure to indoor air pollution in rural South Africa.

Based on extensive qualitative formative research to inform the design of the intervention (Barnes et al., 2004a; Barnes, Mathee, Shafritz, Krieger, & Zimicki, 2004b), the study drew on a mixed methods design (Greene, Caracelli, & Graham, 1989) and was divided into two parts: a quantitative quasi-experimental study and a qualitative study to answer questions that arose from the quantitative study. For the quantitative study, two similar villages were selected in the North West province of South Africa. The villages represented a 'worst case' indoor air pollution scenario in that households were extremely poor; households relied exclusively on wood and cow dung with no access to modern fuels such as electricity, and winter temperatures were low enough for households to bring fires indoors. The two villages were also far enough apart (40 kilometres) to minimise message contamination. One village was selected as the intervention village and one village as the comparison village.

It is important to note the study villages, through a history of colonisation and administrative changes, were desperately underserved from an environmental health

perspective. Historically, between 1978 and 1994, the Mafikeng local municipality was part of Bophuthatswana, a so-called 'independent' country that, amongst others, served as a cheap labour source for the apartheid system. Prior to this period and before Botswana's independence in 1966, Mafikeng was the governing centre of Bechuanaland, a British protectorate that extended into present-day Botswana. In 1994, the area was officially incorporated into South Africa. Despite valiant efforts at service delivery after 1994, over 56% and 66% of households in the province had no access to piped water in the home and flush sanitation, respectively (Statistics South Africa, 2003). Importantly, at the time of the study these communities had waited for over a decade for electricity supply.

The study recruited a sample of 324 households in the intervention ( $n = 149$ ) and comparison groups ( $n = 175$ ). Eligibility was defined as a household in which one or more children, four years old or less, lived. The unit of analysis was defined as the household. The index child was defined as the youngest child living within a household. The study was approved by the University of the Witwatersrand Ethics Committee for Research on Human Subjects (Clearance Number: M03-05-43). If the caregivers agreed to participate, the primary caregiver completed an informed consent form and was assigned a unique study identification number. The study achieved a participation rate of 98% and 99% in the intervention and comparison groups, respectively.

Household energy practices, stationary levels of indoor air pollution (particulate matter of 10 microns or less ( $PM_{10}$ ) and carbon monoxide (CO)) measured in the kitchen, child exposure to indoor air pollution (CO) measured on the index child in each family as well as confounding factors were measured by a separate blinded data collection team at baseline (i.e. before the intervention was implemented). Data were captured using a one-hour long interview questionnaire administered by trained interviewers. Indoor air pollution indicators were measured in a randomly selected sub-sample of households ( $n = 100$ ) using small monitoring devices. The devices were left overnight in households and collected the following day.

The intervention was implemented immediately after the baseline assessment in the intervention group and not the comparison group by a separate (blinded) health communication team. The objectives of the intervention were (a) to improve caregiver perceptions of the danger of their children's exposure to indoor air pollution and (b) to negotiate modifications to existing behaviours that could reduce child exposure.

Households typically had an indoor and an outdoor kitchen. Fires would be burned in the outdoor kitchen during the warmer daytime and brought indoors during cold winter nights. Caregivers were encouraged, through the intervention, to burn outdoors for as long as they could but if fires were to be brought indoors, they were encouraged to open windows and keep children further away from indoor fires. The intervention was implemented through door-to-door visits to each household in the intervention group after the baseline assessment. Two once-a-week visits were conducted with each caregiver and other family members present in the selected households by the communicators.

The same quantitative measurements at baseline were measured again 12 months later (follow-up) using the same research protocol and by the same data collection team. A qualitative evaluation, using three focus group discussions in each group, was used to answer questions that emerged from the quantitative study. The study design is summarised in Figure 1.

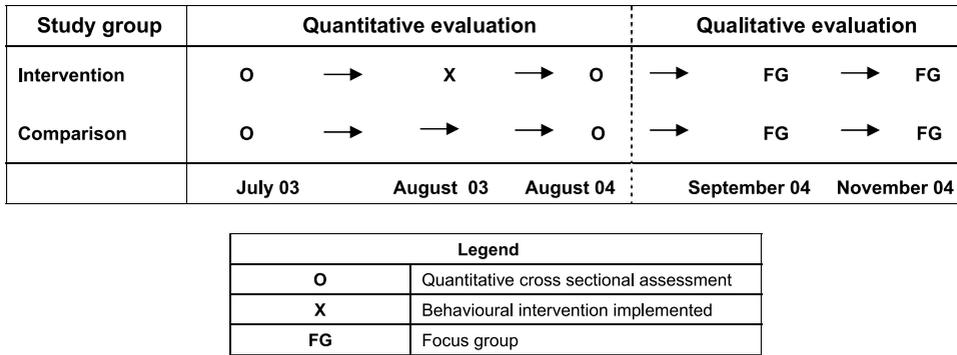


Figure 1. Study design.

There were significant behavioural improvements and reductions in indoor air pollution amongst the intervention group following the intervention. However, the comparison group that did not receive the intervention improved their behaviours and reduced their children's exposure by almost as much the intervention group. For example, amongst the intervention group, the proportion of households engaging in high risk indoor air pollution practices (e.g. burning indoors with no ventilation) was reduced from 75.5% at baseline to 54.1% at follow-up. Amongst the control group, the proportion of households in the high risk category was reduced from 74.4% at baseline to 57.9% at follow-up. The fact that the comparison group also significantly improved their behaviours meant that the study could not attribute improvements in the intervention group to having received the intervention alone (Barnes, Mathee, Bruce, & Thomas, 2006).

There were no obvious reasons why the comparison group improved their behaviours. The two villages were well balanced at baseline, situated far enough from each other to minimise message contamination, both the data collection teams and health communication teams were blinded, the participant information sheet appeared to be carefully worded so as not to give too much information away and there were no effects of confounding factors (e.g. ambient temperature) after adjustment and stratification. The sample sizes in both groups were also large enough to allow for sufficient variability in responses. One possibility was that change occurred because of the process of participating in the trial itself – in other words, a Hawthorne Effect. In order to establish this, one part of the qualitative study asked comparison group participants about why they changed their behaviours.

### Post-trial interviews with comparison group participants

The qualitative evaluation employed three rounds of focus group discussions with a random selection of study participants in both the intervention and comparison groups using a random purposeful sampling strategy (Patton, 1991). This section describes the focus group discussions conducted with the *comparison group* and not the intervention group. Participants were stratified by suburb to minimise travel inconvenience and randomly allocated to a focus group discussion. The three focus groups included 10 participants each and were conducted in seTswana (the participant's first language) ( $n = 30$ ). The focus group discussions were conducted in a community church in each

suburb. The interviewer used a semi-structured interviewer schedule to guide the interview. Typically, research participants sat in a circle while the interview was conducted while a research assistant would quietly translate to the first author. The author, with the assistance of the research assistant and the interviewer, would occasionally ask questions when necessary.

The focus group discussions were between one and two hours in length. Participants were offered light snacks and beverages during the interviews and a child minder was available to look after young children. Interviews were tape recorded, translated from seTswana to English and transcribed into a word-processing programme using a modified Jefferson method (Potter & Wetherell, 1987).

## Results

### *The need to impress*

A small number of respondents who burned indoors at baseline reported that they burned outdoors at follow-up to impress the research team. In the following extract, the interviewer notices that one of the respondents said she always burned *outdoors* but has evidence from her questionnaire that she, in fact, burned indoors at baseline. In questioning *why* this was the case, and encouraging the participants to be honest about why they burned in various locations, the respondent finally admits that she only burned outdoors while the researchers were in the study villages and then burned indoors when they were not.

#### *Extract 1*

- Interviewer: So where did you burn this winter?  
 P1: Outdoors in the segotlo (outdoor kitchen).  
 Interviewer: Do you always burn there?  
 P1: Yes I always burn there.  
 Interviewer: Honestly? Because last year you said that you burned indoors. I have it here on paper (questionnaire).  
 P1: No, no I burned outdoors.  
 Interviewer: We are not here to judge anyone. We just need to know why people burn indoors or outdoors. It is really important so that we can design future ways to help people cope with smoke.  
 P2: Okay, I burned indoors last year but outdoors this year. *I saw your car and remembered that you were coming back this year.*  
 Interviewer: Help me understand why some people would burn outdoors when we were here but indoors when we were not. What did those people think the study was about? (4) Okay, let me rephrase that, where do you think we are from?  
 P3: Wilhelminah told us that you were from ESKOM coming to check where we burn before we get electricity.  
 Interviewer: Mmm, still, why did you burn outdoors?  
 P3: *Maybe some people thought that if they burned indoors, then you will tell ESKOM that they don't deserve electricity.*

In exploring *why* participants needed to impress the study team, another respondent indicated, after an uncomfortable four-second pause, that she had heard from someone else in the village that the researchers were from the national electricity supplier (ESKOM) and were there to check whether the villages *deserved* electricity

– which, of course, was not the case. Later in the interview it was revealed that there was a strong perception that indoor burning was shameful, neglectful and a sign of lower social standing. Certain respondents could have interpreted the study team as there to judge them and burned outdoors to create a good impression in the hope that they will receive electricity. The question of why ESKOM or the study team for that matter would bother whether they burned indoors or outdoors speaks to a broader issue of how caregivers perceived who was deserving of state-driven service delivery.

Extract 2

... the only thing that can help us is electricity, because if there is electricity then we won't need to make fires and there will be no more smoke affecting our children. *We've suffered for a long time.*

Interviewer: But if you had electricity, how would you be able to afford it especially to cook with?

P2: For me it's like this. We all agree that people should not be in a house that is full of smoke, especially children. *But things are getting better for us. We are getting electricity in a few months, water pipes, even i.d's (identity documents) now. We can't still be cooking indoors. That's in the past, in Mangope's time ((laughs)).*

P3: *((laughs)) we have to improve ourselves, we are not backwards. Even if we can't afford electricity now, one day we will. Then we can cook even heat ourselves when it is cold. You can even bake with electricity. Eh, I can bake and sell cakes. Even if it is out of our hands now, we can still do small things to develop ourselves.*

Interviewer: What do you mean small things?

P3: Like cook outside. It is not right to cook inside. Like all the things we've been talking about. You have to take pride in yourself. No one will lift us out this situation. We have to do it on our own. *Because one day we will have electricity, but until that time, I will cook outdoors. I want a better life. I don't want my children sick and smelling of smoke. I want them to see that there is a better life.*

After the initial question about what can be done to solve the indoor air pollution problem, the interviewer attempts to steer the discussion away from electrification as the solution to indoor air pollution. This is in keeping with the key justification of the project, that is, that electrification is unlikely to be sustainable in contexts such as the study communities because of the high costs associated with it. Thus, even with access to electricity, households will not necessarily be able to afford to use it for domestic activities such as cooking and heating that are likely to have the most significant impact on indoor air quality. The interviewer tried her best to convince the participants (particularly P1 and P2 who were convinced that electricity was the answer) that electricity is not a meaningful discussion from an indoor air pollution perspective.

At a critical point in the discussion, P3 suggests that it is not possible to separate impending electrification and people's desire for a better life from the reasons that people shifted to outdoor burning. She suggests that, like her, it is precisely *because* of development projects that many caregivers chose to burn outdoors. The anticipation of development projects stimulated people to engage in behaviours that were deemed as symbolic of lifting themselves out of poverty. P3 jokingly mentions indoor burning is associated with past ways of thinking such as in Mangope's time (referring to the

previous leader of the independent Bophuthatswana state). She notes that ‘we have to improve ourselves, we are not backwards’ and goes on to mention that even if they cannot afford electricity when they get it, they can ‘do small things to develop themselves’ like cook outdoors.

An important first step in lifting oneself out of poverty, she suggests, is to take responsibility for one’s actions. In contrast to ‘lazy’ people who do things like cook indoors and let their children smell of smoke suggests that they do not take responsibility for lifting themselves out of poverty, people who are interested in developing themselves out of poverty do ‘small things’ like burn outdoors, are motivated to keep their homes clean and keep their family’s healthy and presentable. This is reflected in P3’s comments in Extract 2: ‘You have to take pride in yourself. No one will lift us out this situation. We have to do it on our own. Because one day we will have electricity, but until that time, I will cook outdoors. I want a better life. I don’t want my children sick and smelling of smoke. I want them to see that there is a better life’.

In sum, participants viewed indoor burning as shameful and neglectful, while outdoor burning was viewed as a sign of participants’ desire for a better life. Participants also believed that that they had to show outsiders that they were deserving of state services as reflected in P3’s comments (Extract 1) that the research team were ‘coming to check where we burn before we get electricity’ and that ‘maybe some people thought that if they burned indoors, then you will tell Eskom that they don’t deserve electricity’. These factors, together with the misunderstanding that the team represented the electricity supplier, meant that some participants (who would have otherwise burned indoors) burned outdoors in the hope that the researchers would view them as deserving of electricity.

### *Equipment*

In addition to the need to create a good impression, another short-term reaction occurred through misunderstandings of the workings of the indoor air pollution monitoring equipment. In particular, respondents reacted to the Gillair pumps used to monitor PM<sub>10</sub> levels. The Gillair pumps are small machines that were mounted approximately 1.5 metres from fires. They emit a low level noise as they pump air through the pre-separator and filter. Extracts 3 and 4 are taken from two interviews conducted with the comparison group.

#### *Extract 3*

- P1: I did not want the machine to block. I did not bring the fire indoors.  
 Interviewer: Where did you burn?  
 P1: I was burning outdoors.  
 P2: I also burned outdoors because there was a day (last year) when the machine stopped by itself in my house and what came into my mind was the smoke in the house made the machine to stop. I was so heart broken because I just made conclusions that it is the smoke in my house that made the machine to stop ... so this year I burned outdoors. I don’t want to break your machines.  
 Interviewer: So does that mean when we left, you burned indoors again?  
 P1: Yes

- Interviewer: When other members of the community were asking you about the machine what was your response?  
P1: I told them it was the machine to capture the smoke.  
P2: Nobody has ever asked me but I was going to say it reduces the smoke in the kitchen but if it gets too full it stops.

*Extract 4*

- P3: We told the children to be careful because the machine was recording everything they said. They were told so because we wanted to keep them away from the machine. They were afraid of it.  
Interviewer: Were you afraid of it?  
P1: We were afraid that the children even ourselves will get burned by this machine because we understood why it was installed but sometimes we were doubtful.  
P2: We did not want them to touch the machine because one day one girl forgot to switch the iron off and the whole house burned down. So I locked the door of the inkwe (indoor kitchen) and burned outdoors for that day.

One participant highlighted the fact that the pump stopped on its own during the baseline assessment when she burned indoors, and she interpreted this to mean that the smoke from the indoor fire had caused it to 'break'. In fact, the pumps were programmed to stop sampling after 24 hours and this was the more likely explanation for the pump stopping. Responses later in the extract suggest that participants (mis)understood that the machine sucks the smoke into them and do not let the smoke out and this is the reason that the pumps stop when they get to full. To prevent machines from blocking during follow-up, some caregivers reported that they burned outdoors where the smoke would not reach the machines but burned indoors as soon as the pumps were removed. In addition, in one focus group, participants indicated that they believed that the machines may cause fires, burn children and cause property damage. They also attempted to keep children away from the pumps by telling them that machines were recording everything they said.

***Learning effect***

The further type of reaction (a learning effect) occurred as a result of some participants in the comparison group becoming more interested in indoor air pollution and child health and taking steps to reduce their children's exposure. Formative research indicated that most participants knew that indoor air pollution was associated with poor health before the study commenced. Observations of health effects, however, were limited to short-term symptoms such as coughing and dizziness in the vicinity of fires with very little understandings of more serious health consequences such as pneumonia and death. It is possible that participants were made aware that the study focused on biomass fuels, indoor air pollution and (poor) health through the participant information process at the beginning of the study. It is reasonable to expect, therefore, that participants in the comparison group would have concluded that the problem of indoor air pollution must be serious enough to warrant a study. If it was serious to warrant a study, therefore, then steps should be taken to reduce exposure to it. Extract 5 is taken from a comparison group interview in which participants took an interest in the health effects of indoor air pollution.

*Extract 5*

- Interviewer: I'm trying to understand why some people in your community burned indoors last year but outdoors in the segotlo this year.
- P2: I burn outside but in winter I used to bring the embers inside until one day my child started coughing and vomiting. After you visited last year and asked us about where we burn and our children's health. I thought before it was because of the smog. Now I only burned outdoors and my child seems better.
- Interviewer: But why outdoors?
- P2: The smoke is not so strong. I would like to find out more from you about the study and these diseases.

The extract highlights how one participant in the comparison group concluded, through her own experiences of her child's illnesses together with the questions that were asked of her in the study, that indoor air pollution may be dangerous to her child's health. After the initial question about why people who were not exposed to the intervention burned outdoors at follow-up but not at baseline, the participant indicated that she had brought a fire indoors until her child became sick (coughing and vomiting). She mentions that her understanding of the link between air pollution exposure and her child's sickness was confirmed by the study team's visit when they asked her about where she burns and her children's health. She concluded that the air pollution ('smog') from the fire was causing her child's sickness. A few participants in the comparison group took an interest in the study and were keen to understand more about it.

**Discussion**

The Hawthorne Effect has received considerable attention in the published literature with vociferous debate about whether it existed in the original studies or not (see Diaper, 1990; Jones, 1992). From a methodological perspective, the results from this study confirm that comparison group participants *do* improve their behaviours when participating in studies. Indeed, these findings echo certain interpretations of the original Hawthorne studies in that participants improved their performance in an attempt to impress the research team. However, the paper differs from the original Hawthorne studies and subsequent reflections of it in that it identifies how poverty, miscommunication and a learning effect contributed to it.

By acknowledging that poverty may play an important role in influencing the Hawthorne Effect, it is not my intention to suggest that quantitative quasi-experimental designs in poor contexts are necessarily redundant. Given the need for evidence-based practice and the considerable resources dedicated to such studies, it is important to discuss ways to prevent the Hawthorne Effect rather than disregard quasi-experimental trials in their entirety. Comparison groups, in particular, are an essential feature of quasi-experimental trials. They exist to monitor whether extraneous factors, such as the Hawthorne Effect, may explain changes in the intervention group. Indeed, the interpretation of this study would have been very different without a comparison group.

For example, if the study design did not include a comparison group, the work would have concluded that the health education intervention resulted in a significant improvement in behaviours and a decrease in indoor air pollution. However, given the fact that the comparison group also improved their behaviours and indoor air pollution

results; it was not possible to attribute changes in the intervention group to the intervention alone.

Reactivity in this study can be attributed, in part, to miscommunication between the study and participants. Misunderstandings of the study may have been reduced through being clearer about why the study was being conducted. The post-trial interviews showed that the comparison groups were unclear about the justification of the study, who the study team represented (some participants believed that the study was being conducted by the national electricity provider) and the functioning of the air pollution monitoring equipment.

The participant information process may have played a role in creating these misunderstandings. As part of the (necessary) ethical obligations of the study, the objectives of the study as well as the working of the monitoring equipment were explained to participants in an easily understandable fashion. Participants in both the intervention and comparison groups were informed that the study was about fuels, smoke, ventilation and child location practices as well the respiratory health of their children. Further in the participant information sheet, interviewers explained in a simple manner about the operation of the air monitoring pumps. The interviewers explained that the pump and cyclone is 'a small machine that tells us how much smoke your fires are making' and that it 'sucks air into it and captures the amounts of pollution that are made by fires'. These two sentences, while at the simplest level are correct, could have led to the misunderstandings about the air quality equipment mentioned in the qualitative interviews. Based on certain perceptions of the shameful aspect of indoor burning (highlighted above), it is easy to see how, for example, participants could view the machines as operating to give researchers information about indoor burning practices or will break if they became too full.

The participant information process is a necessity in any study. However, if oversimplified, the participant information process could influence reactivity. The initial institutional (ethical) review of this study suggested that the original participant information sheet was too complex, gave too much information to participants and by implication may have influenced behavioural change amongst the comparison group. On the contrary, the over simplification of the process could have had a similar, if not stronger, effect in influencing people to burn outdoors.

However, while recommendations directed at improving the communication between the study and participants might have *reduced* the Hawthorne Effect, it would have still occurred albeit to a lesser extent. In a context of severe economic deprivation, participants' knowledge that they were participating in a study (Orne, 1973) together with expectations of receiving electricity highlighted in the interviews may have nonetheless led to the reactivity experienced in this study.

Poor participants' desire for a better life, in particular, is a common underlying motivation for improving health-related behaviours in rural contexts in developing countries (see Jenkins & Curtis, 2005). The South African Government's emphasis on a participatory development agenda reflected in policies such as 'Masakhane' (South African Government, 2003) may have played a role in the Hawthorne Effect in the current study. There is a widely held view that government alone cannot take responsibility for infrastructural development in poor communities. Not only are villagers called on to do their part (e.g. help build the infrastructure), but there is also a view that those who show their commitment to development will receive basic services sooner than those who do not – in other words, a 'development contract' between government and poor communities.

Participants in this study were, therefore, keen to show that they were not lazy, neglectful and 'backward'; they were doing their part of the 'development contract' and that they, therefore, deserved electricity. Given that service delivery had been delayed for so long in some rural villages, this may have translated into communities needing to show outsiders (such as the research team) that they *deserved* services such as electricity (as highlighted in Extract 2) by burning outdoors.

Based on these findings, there are two methodological recommendations for reducing the Hawthorne Effect in contexts beyond those typically espoused in methodological texts (e.g. keeping comparison and intervention groups separated, blinding and limiting information that might influence reactivity). Firstly, when designing intervention trials, it is important to consider how participants' experiences of poverty may influence them to put 'their best foot forward' to impress the research team. This is especially true in contexts where communities have been historically deprived of basic services and where there is an emphasis on shared responsibility for development.

Qualitative formative methods may be useful at identifying potential factors (such as poverty) that might influence the Hawthorne Effect prior to a quantitative study. However, they may not necessarily be better at identifying the influence of poverty if they purposefully ignore it. For example, although two phases of qualitative research had been conducted prior to the main intervention study (see Barnes et al., 2004a, 2004b), both had focused on the individual perceptions of health-, energy-related behaviours and, at most, to that of the households in which children lived. In fact, as evidenced in Extract 2, this study had intentionally avoided issues of poverty as it was precisely because of poverty (and people's inability to afford electricity) that the study focused on behavioural change. While qualitative formative studies are encouraged, they do need to be sensitive to the way poverty and people's desire for a better life could influence them to try to impress the researchers.

Secondly, it is important to consider how studies are communicated to participants through, for example, the participant information process. A key lesson learnt in this study was that while the ethical review process is absolutely necessary, it is important not to oversimplify the communication because of potential misunderstandings. This is particularly true in communicating who the study team represent and the functioning of monitoring equipment. Given the invasive nature of some intervention studies, future work should pay careful attention to how participants understand the operation of the equipment.

One possible influence (not addressed in this paper) is the interaction between the research assistants and the participants during the communication process. It is not clear, for example, what was communicated to participants by the research assistants and how this departed from what was in the participant information sheet. Given the pressure on research assistants to recruit and elicit responses from participants, it is possible that some research assistants could have told participants that they would receive electricity if they participated. Future studies of the Hawthorne Effect should consider the communication process between the research team and potential participants.

## **Conclusion**

Over 25 years have passed since Adair's (1984) call for a stronger focus on identifying the reasons why participants' improve their behaviours. Yet, despite widespread

evidence of the Hawthorne Effect, this is the first study of its kind in developing countries to do this. The results from this exercise not only support a mixed methods evaluation design, but importantly highlight the value of not merely assuming that the Hawthorne Effect is a confounding variable that should be statistically eliminated or simply ignored. Useful methodological information can be obtained by understanding participants' perceptions of participating in community trials in contexts of poverty. It is hoped that this paper will stimulate further interest and debate on the Hawthorne Effect in community trials in developing countries.

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