TESTING BEHAVIOURS TO REDUCE CHILD EXPOSURE TO INDOOR AIR POLLUTION IN RURAL SOUTH AFRICA

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ACRONYMS

ALRI	Acute lower respiratory infections
CO	Carbon monoxide
COLD	Chronic obstructive lung disease
EHP	Environmental Health Project
LPG	Liquid petroleum gas
MRC	Medical Research Council of South Africa
NO_2	Nitrogen dioxide
$PM_{2.5}$	Particulate matter of 2.5 μm or less
RSP	Respirable suspended particulates
SO_2	Sulphur dioxide
SPSS	Statistical Package for the Social Sciences
TIPs	Trials of Improved Practices
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

Background: Indoor air pollution has been causally linked to Acute Lower Respiratory Infections in children less than five years old and accounts for a significant proportion of death and illness in developing countries. At the level of prevention, behaviour change has been identified as a possible intervention strategy to reduce the impact of indoor air pollution on child respiratory health. Yet published studies have yet to systematically focus on the effectiveness of behaviour change strategies in reducing child exposure to indoor air pollution.

The aim of this study, therefore, was to test the acceptability and feasibility of four clusters of behaviours: 1) improve stove maintenance practices, 2) improve ventilation practices, 3) improve child location practices & 4) reduce the duration of solid fuel burning. These behaviours were identified based on a previous phase of research, which aimed to identify indoor air pollution related behaviours that were protective of child respiratory health.

Methods: The study utilised a Trials of Improved Practices methodology, which is a formative research method that involves families actually trying out and possibly modifying selected behaviours over a selected period of time. Thirty families were selected to participate, all of who agreed to try one or more of the above-mentioned behaviours over a four-week trial period. Using participatory observation techniques, the behaviours were assessed before and after home visits by researchers during winter (July-August) 2002. The final visit also involved in-depth interviews to gain an understanding of the barriers, motivations and sustainability of the behaviours.

Results: Of the 30 families that participated in the study, fixing of stoves was recommended to 15. Eleven of the 15 families agreed to attempt the behaviour(s). However, fixing wood stoves proved to be difficult for the majority of these households. Only three out of the 11 families managed to fix their stoves over the trial period. Motivations for fixing stoves included improvements in the levels of air quality, reductions in the amount of dust and soot in the house and generally a cleaner house. In addition, mothers reported that their houses smelled better. The cost of buying materials and hiring someone to fix them was cited as the main barrier to fixing up stoves.

Opening at least two sources of ventilation for longer periods of time while a fire was burning was recommended to 29 families. All 29 families agreed to attempt the behaviour(s) over the trial period. Twenty of the 29 families managed to improve their ventilation practices. The percentage of time that two sources of ventilation were opened while a fire was burning was used as an indicator for ventilation practices. For morning burnings, ventilation practices improved from 7% to 19% amongst families that improved their practices. For evening burnings, ventilation practices improved from 10% to 23%.

Motivations for opening ventilation included improvements in the levels of air quality, reductions in the amount of dust and soot in the house and a cleaner smelling house. Non-functioning windows and the cold weather were identified as barriers to improving ventilation practices.

Reducing the amount of time that their children spend close to a burning fire was recommended to 28 families. All 28 families agreed to try this. At the end of the trial, 16 of the 28 households successfully managed to do this. The percentage of time that children were in close proximity to the stove while a fire was burning was used as an indicator for child location practices. The average proportion of time that children were close to the stoves while a fire was burning was reduced from 43% to 29% amongst the families that improved this behaviour. During evening burnings, the average figure was reduced from 41% to 27%. The 16 mothers who successfully improved their child location practices cited the fact that their children's lungs were protected from smoke as the main motivation for moving them away from the fire. Moreover, four of the 16 mothers reported that it was easier to do chores in the kitchen while someone else was looking after their children. Barriers to keeping children away from fires include the fact that many children did not like being away from their mothers and that mothers felt their children would be cold by being away from the fire. Mothers who did not have someone else to assist them with looking after their children allowed their children to play in another room with other children.

Reducing the length of solid fuel burning was recommended to 27 families. Twenty-six families agreed to attempt this. Only 13 managed to reduce the length of solid fuel burning over the trial period. During morning burnings, the average length of solid fuel burning was reduced from 250 minutes to 219 minutes amongst families who reduced the duration of solid fuel burning. Slightly greater reductions were achieved for evening burnings, where the duration of burning was reduced from 242 to 198 minutes. Of the 13 families that managed to reduce the duration of solid fuel burning, five indicated that they saved fuel by doing so. Burning for shorter periods of time resulted in monetary savings from buying less wood. In addition, this reduced the time & effort required to collect cow dung (which is freely available). Eight families indicated that their motivation for reducing the duration of solid fuel burning was that their children were less exposed to smoke over a prolonged period of time. The need for a fire to be burning for prolonged periods to be able to perform domestic chores, as well as the cold weather, was cited as the main barriers to reducing the duration of solid fuel burning.

Half of all mothers (n=15) reported improvements in their children's respiratory health as a result of behaviour change. Eleven families (36%) reported that they benefited by having a cleaner and less smelly house. Fixing up their stoves, opening windows and doors as well as reducing the amount of time that stoves were burning resulted in a reduction of the amount of dust and soot accumulating on hard surfaces and curtains in the kitchen. This, it was reported, made cleaning the house, particularly the kitchen a little

easier to do. The house also did not smell as much of smoke. Five families (17%) reported that they saved fuels (and consequently money to buy fuels) by reducing the duration that solid fires were left to burn. Of the 30 households that participated in the study, 25 (83%) indicated that they will continue and 5 (17%) reported that they would not continue with the behaviours as they were too difficult to perform.

1. BACKGROUND

Estimates indicate that indoor air pollution is responsible for between 2.7 and 2.8 million deaths annually (Bruce, Perez-Padilla & Albalak, 2000). In many developing countries, indoor air pollution accounts for as much as 4-6 percent of the burden of disease, placing it above environmental tobacco smoking, sexually transmitted diseases, alcohol and homicides as a leading cause of ill health and death (Smith, 1999). Two recent reviews of published epidemiological studies have identified Acute Lower Respiratory Infections (ALRI), such as pneumonia, amongst children under 5 years of age in developing countries, as one of the key health outcomes of exposure to indoor air pollution [i] (Smith, Samet, Romieu & Bruce, 2000, Bruce *et al.*, 2000).

Indoor air pollution in developing countries mostly arises from the indoor burning of solid fuels such as wood, animal dung, coal and crop residues in open fires or poorly functioning stoves. The incomplete combustion of these fuels releases pollutants such as particulate matter (PM), carbon monoxide (CO), sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and other organic compounds into the living environment (Smith, 1987). It is estimated that at least two-thirds of all households in developing countries are still primarily dependent on biomass fuels and coal, affecting approximately 2 to 3.5 billion people worldwide (The World Resources Institute, 1998).

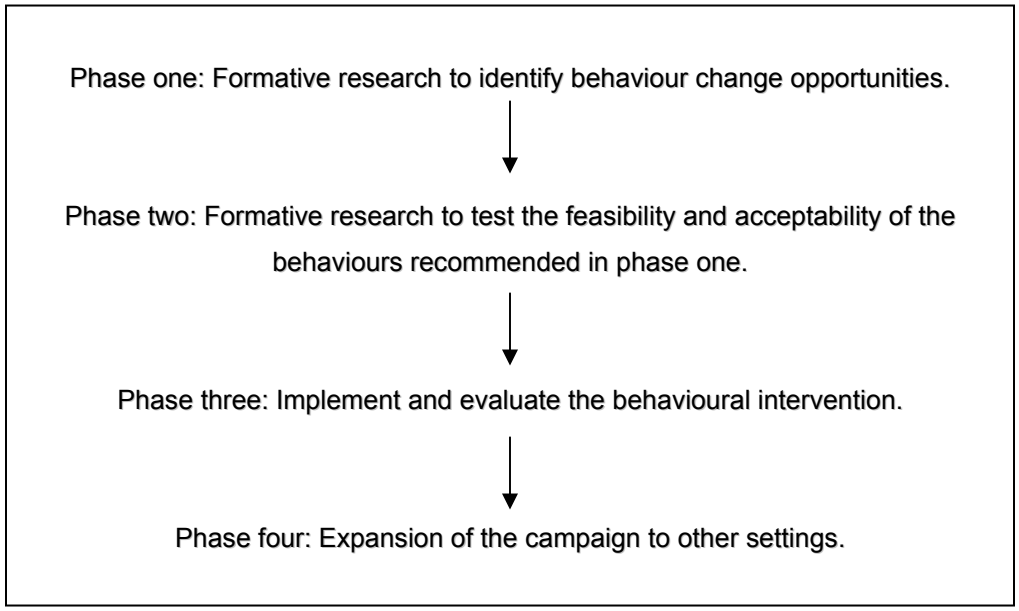
Other determinants of poor indoor air quality include the stoves that people use (or lack thereof) (Ezzati & Kammen, 2002a, Albalak *et al.*, 2001 & Wafula *et al.*, 2000) and ventilation (Nystrom, 1994 in Ballard-Tremeer & Mathee, 2000, Gitonga, 2001). While air quality is important, the health effects of indoor air pollution are also determined by the amount of time a person spends breathing the polluted air. Studies have shown that people in developing countries spend between three and seven hours a day in the burning environment (Bruce *et al.*, 2000). Because of their domestic responsibilities in and around the burning room, women are typically exposed to indoor air pollution far more than their male counterparts (Engel, Hurtado & Ruel, 1998). In addition, women usually have the added responsibility of caring for children. As a result children tend to be close to their mothers - either carried on their mothers' backs or within eyesight – thus also exposing them to high levels of indoor air pollution on a daily basis.

At the level of prevention, behaviour change has been identified (amongst others) as a possible intervention strategy to reduce the impact of indoor air pollution on child health. Behaviours such as moving children out of the room while a fire is burning, using pot lids while cooking and improving the quality of ventilation practices have all been identified for their potential to reduce the impact of indoor air pollution on human health (cf. von Schirnding, Bruce, Ballard-Tremmer, Ezzati & Lvovsky, 2002). Yet published research studies have yet to systematically focus on these and other behavioural determinants of exposure to indoor air pollution or the effect of behaviour change strategies in reducing the impact of

indoor air pollution (Ezzati & Kammen, 2002a, Barnes & Mathee, 2002a & Favin, Yacoob & Bendahmane, 1999).

In response to this, a programme of work is underway in rural South Africa to evaluate the effectiveness of such an intervention. Overall, the project is divided into four phases.

Figure 1 Phases of the project



Phase one identified and recommended four behavioural clusters that may serve to reduce child exposure to indoor air pollution: 1) stove maintenance, 2) increase the duration that two sources of ventilation are opened during burning, 3) reduce the duration of burning and 4) reduce the amount of time that children spend in close proximity to the stove. To identify these behaviours, the behavioural patterns of 20 families that cared for a child with a history of severe ALRI were observed and compared with the behavioural patterns of 20 families that cared for a child with normal respiratory function. In addition, mothers were interviewed after the observations and a further 27 mothers participated in focus group discussions to identify recommendations to reduce children's exposure to indoor air pollution. The four behavioural clusters were selected based on their association with the risk of respiratory ill health, suggestions from mothers, likely cost, required effort and probable reductions in exposure to indoor air pollution (cf. Barnes & Mathee, 2002b).

This report highlights the findings of phase two, the goal of which was to test the feasibility and acceptability of the four behavioural clusters mentioned above. To do this, research attempted to answer the following questions:

- To what extent were mothers willing and able to perform the behaviours?
- How did they perform the behaviours?
- What were the barriers to the performance of the behaviours?
- What were the motivating factors for implementing the behaviours?
- Did mothers perceive any impact of behaviour change?
- Will families continue to perform the behaviours after the trial period?

2. STUDY SETTING

Research participants were residents of Goedgevonden and Uitkyk – two poor, rural villages in the North West Province of South Africa. The villages are situated within 20 kilometres of the villages used in phase one. Dwellings consist of two to four rooms, one of which normally serves as the kitchen (which is also the room in which burning takes place). Ventilation, in the form of windows and a door leading to the outside, are available in all households. However, in many instances, these are in poor condition and are not functioning properly (see barriers to ventilation practices below).

People living in these communities are extremely poor and have high unemployment rates. Households are dependant on wood, cow dung, crop residues and kerosene for their energy requirements. During winter, solid fuels are typically burned in poorly maintained wood stoves, which are normally situated in the kitchen. Kerosene is burned in kerosene stoves. For example, indoor air quality measurements taken during July 2001 (winter) showed very high concentrations of particulate matter ($PM_{2.5}$ and RSP) (Barnes & Mathee, 2002b).

The area becomes extremely cold during winter (average winter minimum temperature is 5°C but temperatures often fall below 0°C) and because of the need for space heating, this is the time of the year when most indoor burning takes place. Fires are typically ignited early in the morning and left to burn out after cooking and water heating is completed. Fires are re-ignited in the late afternoon to cook the evening meal and left to burn out for space heating. Summer cooking practices typically involve cooking outside on an open fire (or a brazier) or using kerosene stoves (Mathee *et al.*, 2000).

Ventilation practices typically involve opening a source of ventilation such as a window or a door for 15 minutes during ignition or until visible smoke disappears. Ventilation is then closed for the rest of burning. The opening of at least two sources of ventilation was found to be significantly associated with improved child respiratory health in phase one. Importantly, young children often follow their mothers around and can spend up to 6 hours close to a burning fire during winter. Older children are normally left to sit close to the fire while younger children are carried on their mothers' backs. Having the child away from the

burning fire was found to be associated with lower risk of child respiratory illness in phase one (Barnes & Mathee, 2002b).

3. PHASE TWO METHODOLOGY

3.1 Study design

Phase two utilised a Trials of Improved Practices (TIPs) (Dickin & Griffiths, 1997), which is a formative research method that involves families actually trying out and possibly modifying selected behaviours over a selected period of time. Thirty households were selected to participate in the study. Behaviours were assessed before and after home visits by researchers during winter (July – August) 2002. This technique allowed an analysis of the acceptability (willingness to try) as well as the feasibility (ability to perform) of the behaviours.

3.2 Research participants

Research participants were 30 mother-child combinations divided into groups based on pre-selected criteria that were found in phase one to have an impact on the behaviours being tested - for example, the availability of an adult to assist the mother by looking after the child in a location away from the burning fire, the age of the study child and the type of appliance used (Barnes & Mathee, 2002b).

Table 1 Breakdown of research participants

	Have used wood stove in the last two weeks				**Have not used wood stove in the last two weeks.**
	Children 1-5 years		Children <1 year old		
	Adult present to watch child in home during burning	No adult to watch child in home during burning	Adult present to watch child in home during burning	No adult to watch child in home other than mother	
Goedgevonden:	3	3	4	4	1
Uitkyk:	3	3	4	4	1
Sub-Totals	**6**	**6**	**8**	**8**	**2**
Total			**30**		

3.3 Procedure

Research participants were identified based on door-to-door visits to approximately 150 households by researchers. During these visits, researchers administered a screening questionnaire that included

questions on the availability of an additional adult to look after the children while a fire was burning, the age(s) of children in the home and whether or not a wood stove was used in the previous two weeks. Once selected, households were informed about the study and then asked to participate and to give informed consent. All households who were selected, agreed to participate in the study. Dates and times were agreed upon for researchers to assess behaviours.

Behaviours were assessed during the week of 3-11 July 2002 when minimum temperatures first dropped below 5°C (assessment visit). Typically, researchers would arrive at a household at approximately 06h30 (or in time for the first burning) and observe household behaviours for a 12-hour period while filling in a semi-structured observation sheet. Where necessary, they would ask and respond to mothers' questions and participate in household activities. After each day, a team meeting was held to formulate recommendations for each household. Recommendations were based on observed behaviours and tailored to each family's need(s). In some cases only one behaviour was recommended while in others all four behaviours were recommended.

Researchers visited each home to offer the recommendations to mothers and family members. All available family members were invited to join the discussion. During this counselling visit researchers firstly explained (in the seTswana language) how the fuels that people burn produces smoke that contains dangerous chemicals and that breathing in this smoke affects their family's health. Although researchers offered selected behaviours, no recommendations were forced upon families. Instead, researchers assisted each family, through a process of negotiation, with finding practices that it felt would be most feasible. In many instances families felt that, from the outset, certain behaviours would be too difficult to perform.

Once family members decided which behaviours they would try, researchers then facilitated a discussion of *how* they would perform those behaviours. Families were asked questions such as: who is going to take responsibility for looking after the child while the mother was cooking? Do you have enough clothes to keep the child warm while away from the fire? If the mother can look after the child away from the fire, can someone else do her chores? Who is going to fix the stove? How are you going to fix it? How much money do you need for this? If you reduce the length of time that a fire is burning, how will you do all of your household chores in such a short period of time? I see that your windows cannot open, are you able fix them? Who will do this? How much money do you need for this?

Box 1 Negotiating behaviours with families

Mpho is the mother of a 5-month old daughter and lives with her sister Katlego. Typically Mpho starts a fire using wood and cow dung in her wood stove at 06h00, opens one window for 10 minutes during ignition and then closes it for the rest of burning which ends at about 09h00. When her daughter wakes up at about 07h00, she is left in a cot next to the stove while Mpho performs her domestic chores.

During the counselling visit, the researcher discussed the dangers of indoor air pollution with Mpho and Katlego and recommended that they attempt to open the main kitchen window for 35 minutes and also open an additional window/door for the same length of time. Mpho believed that they would not be able to open two windows for 35 minutes because of the cold. They negotiated a time that would be suitable for them. At the end of this process, it was agreed that they would open at least one window for 25 minutes and the other for 10 minutes (or at least until the smoke from ignition process had cleared).

The researcher also recommended that the child be moved away from the stove to a room that has a door that could be closed for the entire duration of burning. Katlego agreed to look after the child in that room while a fire was burning but indicated that she could not do this for the entire time that the fire was burning because she also has to care for herself e.g. bathe and perform domestic chores like washing dishes. A suitable time was negotiated with Katlego when she could bring the child into the kitchen – particularly during periods of low emissions. She also agreed that, when in the kitchen, the child should be left in the cot as far away from the stove as possible. In this way, behaviours were negotiated with family members and solutions were tailored, not only to their needs, but also to what they were realistically able to achieve.

After two weeks researchers visited each family to encourage them to continue with the behaviours for the rest of the trial period (reminder visit). After another two weeks, researchers visited each household to assess the behaviours as well as conduct a semi-structured interview with mothers. During this interview, mothers were asked questions such as: Were you able to perform the behaviour(s)? If no, what were the reasons? If yes, how easy was it? What made it enjoyable? Was there anything you did not like? Will you continue to do this? Will you need to change anything to be able to continue? If you were to stop, what would make you stop? In this way, the study could identify the feasibility of each behaviour specific to each household, the barriers as well as the motivations of the behaviours.

Table 2 Dates of phase two activities

Activity	Dates (2002)
Assessment visits	07/03– 07/11
Counselling visits	07/14 – 07/18
Reminder visits	08/04 – 08/06
Final visit	08/18 – 08/23

3.4 Personnel

The project involved four researchers (Kebitsamang Moiloa, Charity Masilo, Brenda Mogokonyane and Valencia Bonnyane), a project co-ordinator (Brendon Barnes) and a project manager (Angie Mathee). Researchers participated in a five-day training course (07/24-28), co-ordinated by Brendon Barnes, in Mafikeng before the study commenced. The course involved training in: 1) principles of TIPs, 2) indoor air pollution and health, 3) qualitative interviewing, 4) observation techniques, 5) note taking and 6) counselling skills. In addition, the research instruments and researchers' skills were tested and refined during a two-day pilot phase in Bethel, a village situated 20 kilometres south of the study villages.

3.5 Analysis

Data from the observations of household behavioural patterns were captured and analysed using the Statistics Package for the Social Sciences (SPSS) software package. To observe overall trends in the data, frequency distributions and measures of central tendency were used. Qualitative data were analysed using a thematic analysis (Miles & Huberman, 1994).

4. RESULTS

4.1 Impact on behaviours

<u>Stove maintenance practices</u>

Depending on the stove problem, researchers negotiated with families to either seal their stoves and chimneys with a product such as putty (readily available at the local store) or replace missing parts. If cheaper alternatives that would suit families' circumstances and budgets were available, researchers assisted families to identify them.

Of the 30 families who participated in the study, it was recommended that 15 fix their wood stoves. Eleven families agreed to do this. The four families that did not agree to fix their stoves cited the cost of fixing stoves as the primary reason for not attempting the behaviour(s). Fixing wood stoves proved to be very difficult for the majority of households: only 3 out of the 11 families managed to fix their stoves.

The three households that fixed their stoves and chimneys used a variety of low cost methods to do so. These included mixing a paste of cow dung, soil, wool (as a binding agent) and water to seal leaking parts of stoves (see figure 2). One household used a mixture of cement, coarse salt and water as a sealant. To fix chimneys, families either tied an old cloth or fixed an old tin sheet over the broken part of the chimney (see figure 3). Although these methods are relatively temporary, they are however relatively easy to do, cheap and can be done quickly. More importantly, observations and reports from mothers show that they are effective in reducing the emissions from stoves. According to one mother, *"At first I*

was not going to fix my stove because I did not have enough money for it. I did not know about mixing cow dung and water until a friend's mother told me about it. It seems to work so I'll keep on doing it."

Figure 2 Mixing a paste and sealing a leaking stove

Figure 3 Methods of sealing chimneys

Motivations for fixing stoves reported by the three families that fixed their stoves included improvements in the levels of air quality, reductions in the amount of dust and soot in the house and generally a cleaner house. This made cleaning of hard surfaces and curtains easier to do. In addition, after fixing their stoves, mothers reported that their homes smelled better.

For the eight families that did not fix their stoves, the monetary cost, not only of purchasing materials such as putty or tin, but also of hiring someone to do it was thought to be prohibitive. Many families did not have a person who had the skills to fix stoves and therefore had to pay a member of the community to do it. Households that did not have someone living in the house to fix up the stove and did not have the money to pay someone, usually had to rely on the goodwill of friends and neighbours. Very often, this meant that they would have to wait until that person was available. For example, in one household, the person who was meant to fix their stove was ill, while in another the person was too busy and as such, no improvements were made to the stove over the trial period.

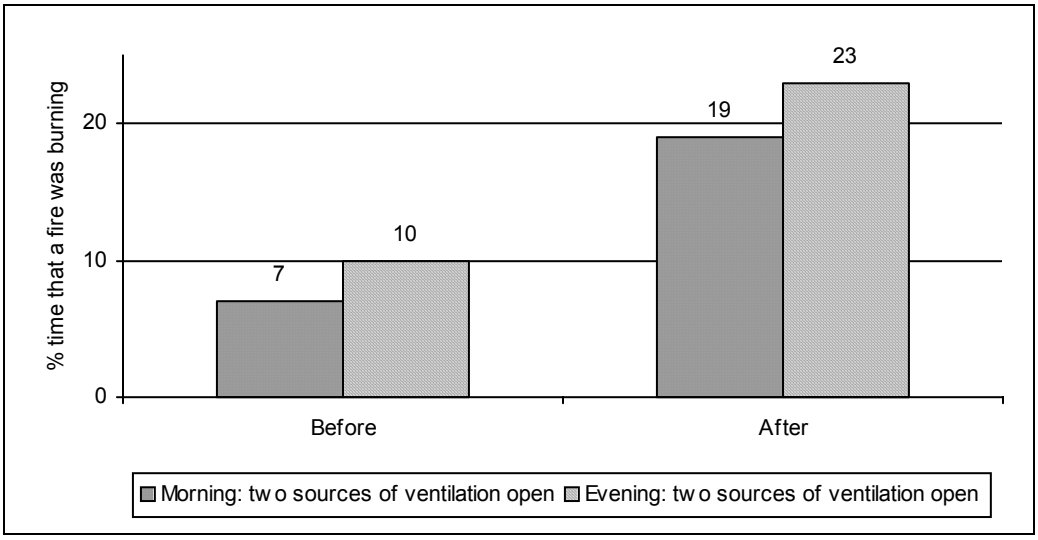
It should be noted however, that even though the compliance rate was low for fixing stoves, mothers who could not fix their stoves nevertheless attempted various behaviours on their own that revolved around the stove but did not necessarily relate to what they agreed to do. These included cleaning the chimney, replacing missing stove lids with a pot and drying wood and cow dung before burning it. As one mother put it, *"Even though I didn't have money to fix the stove, your visit reminded me to at least clean my chimney with an orange sack and a stick. This was easier to do because I do this all the time."*

Ventilation practices

Household members, with the assistance of researchers, agreed to and set themselves goals for opening two sources of ventilation during burning. Overall, improving the quality of double ventilation practices was recommended to 29 families, all of whom agreed to do so. Four of the 29 families also agreed to fix broken windows in the room used for burning. Twenty of the 29 families managed to improve their ventilation practices over the trial period.

The percentage of time that two sources of ventilation were opened while a fire was burning was used an indicator of ventilation practices. Amongst the 20 families that improved this practice, the proportion of time that two sources of ventilation were opened while a fire was burning increased from 7% to 19% during morning burnings. For evening burnings, this figure improved from 10% to 23%.

Figure 4 Improvements in ventilation practices (n=20)



The eleven families that improved their double ventilation behaviours cited a number of motivations for doing so. These included the presence of less smoke in the house while a fire was burning, hard surfaces

were easier to clean because less soot was deposited in the living environment and their homes generally smelled better. A number of barriers to improving ventilation practices were identified, most notably, non-functioning windows in the room used for burning. Usually both the windowpane and the opening mechanisms were broken. To keep out the cold as well as to secure privacy, people normally covered windows with water-resistant plastic bags, cardboard or a sheet of metal. Figure 5 shows two of the study dwellings with non-functioning windows that have been covered with plastic and metal sheeting. The cost of fixing windows was thought to be too high, and as a result, none of the four families that agreed to fix broken windows did so.

Figure 5 Non functioning windows that have been covered

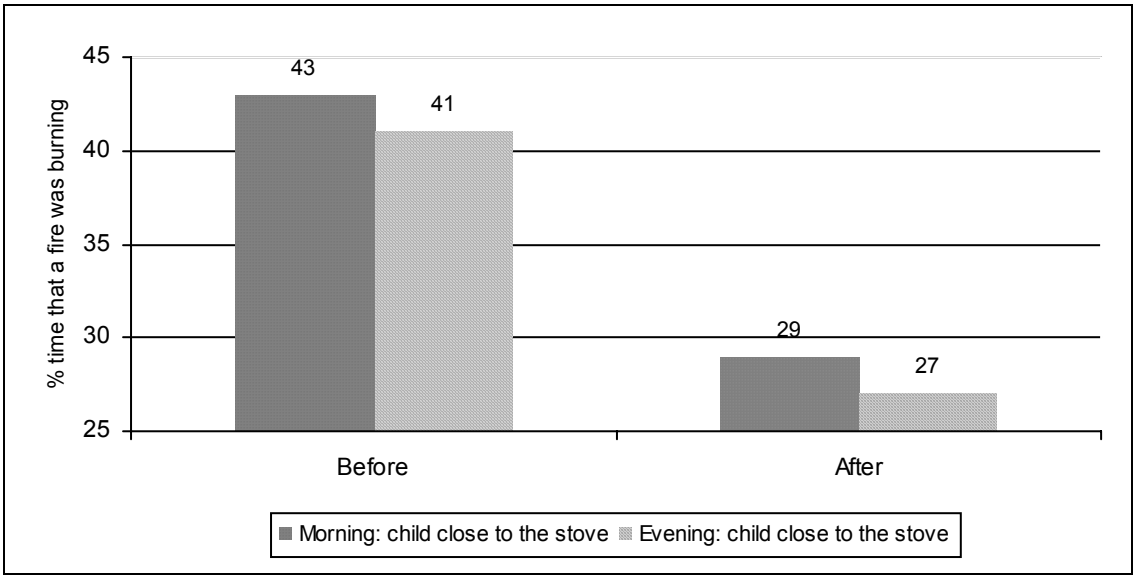
Another barrier to opening ventilation was the cold winter temperatures. At least 4 out of the 9 households who agreed to but did not improve their ventilation practices cited cold weather as the primary reason for doing so. In these cases the door leading to the outside was usually opened only for a short period during ignition and then closed again for the rest of the burning. As one mother put it, "*No, I did not open my windows because it was too cold, I only opened the outside door for a short time thinking that it is enough for the smoke to go through.*"

Reducing the amount of time that children spend close to the fire

Mothers were asked to reduce the amount of time that their children spend in close proximity to the stove during burning. Overall, it was recommended that 28 families reduce the length(s) of time that their children were close to fires. All 28 families agreed to try this for the trial period. Sixteen of the 28 families successfully managed to reduce the length (s) of time that their children were in close proximity to the stove. The percentage of time that children were in close proximity (within 1.5 metres) to the stove while a fire was burning was used as an indicator for child location practices. The proportion of time that children were close to the stove while a fire was burning was reduced from 43% to 29% during morning burnings

amongst the 16 families that improved this behaviour. During evening burnings, the figure was reduced from 41% to 27%.

Figure 6 Improvements in child location practices (n=16)



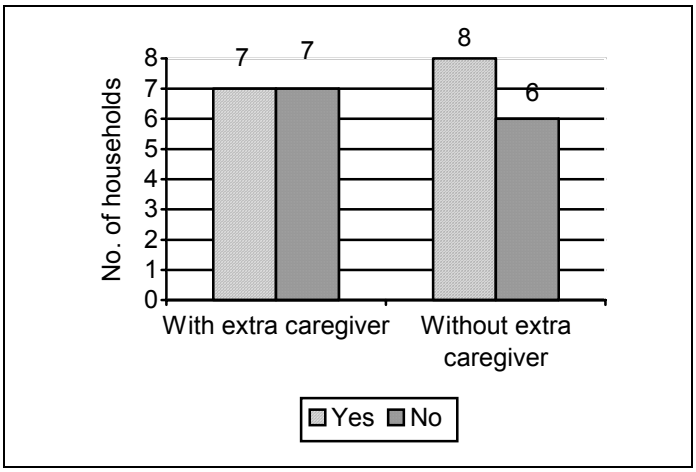
Even though keeping children away from the burning fire was reportedly difficult, the 16 mothers who were able to do so cited the fact that their children were not exposed to indoor air pollution as the main motivation for doing so. The reassurance that they were protecting their children's respiratory health was a significant motivating factor for persisting with the behaviour. Moreover, four of the 16 mothers reported that it was easier to do chores in the kitchen while someone else was looking after their children.

Mothers reported a number of barriers to moving their children out of the burning room. Many children were reportedly not used to being looked after by someone else and were often unhappy to be away from their mother and resorted to crying and misbehaving. After a while, mothers allowed their children to be close to them and to the burning fire. This is highlighted in the following extract taken from an interview with a mother, *" I felt very bad because my child would cry. I did not want to see him cry because he would only want to be with his mummy and not with other people in the house. He only wanted to be with me."* It was also cold being away from the fire, so many mothers felt that it was cruel and un-nurturing to allow their children to be cold while a fire was burning.

As an important behaviour in terms of exposure to indoor air pollution, and in light of the finding in phase one that the availability of someone to look after the child in a location away from the stove was found to be a significant determinant of child location practices, it was decided to classify families based on the presence or absence of an additional adult to look after the child. No differences were evident between

households with and without extra adults and whether or not they managed to improve child location practices. Both groups managed to reduce the amount of time that their children spent close to the burning fire by 14% during morning burnings and by 13% during evening burnings. Interestingly, those households without extra caregivers were slightly over represented in the group that reduced the amount of time that their children spent in close proximity to the burning fire.

Figure 7 Number of households that improved child location practices by presence of an extra caregiver



How did mothers without the assistance of other adults manage to keep their children out of the room while a fire was burning? Of the eight mothers who managed to do this, six left their children to play with other siblings (usually younger than five years old) in another room of the house while a fire was burning. Typically, mothers in this group would give them toys to play with and dress them warmly so that they would not feel cold. They would also instruct the oldest sibling to take care of the younger children. These children were typically left unsupervised for this duration.

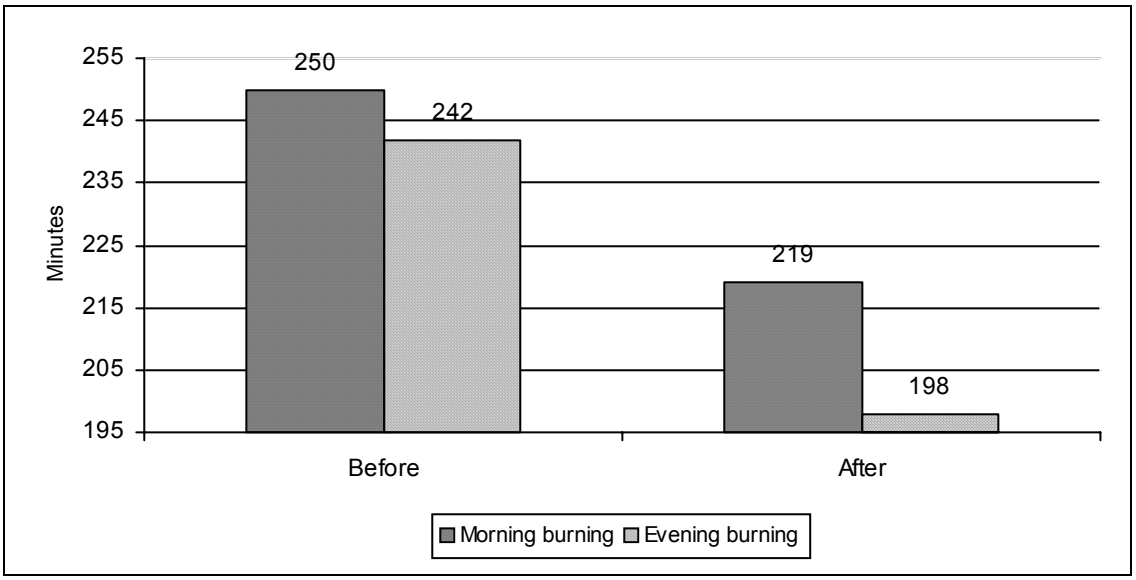
One mother (of a two year old son) without additional assistance, and without any other children, attempted herself to spend less time in proximity to the fire. *"In order to keep him away, I avoided staying in the burning room because every time I am in there, he would be holding my dress. When we were talking before it sounded simple, but it was difficult because this delayed my daily duties because the child follows me wherever I go. I could cook freely only when he was sleeping so I had to wait for him to sleep. At the same time my pots would be burning because there is nobody to look after him."* While a fire was burning, one mother (without additional assistance) took her child to her mother who lived two dwellings from her.

Duration of burning

Results from phase one showed that many households did not extinguish fires once cooking and water heating was completed and the house was sufficiently warm. Instead, fires were left to extinguish on their own, which could take up to two hours after cooking and water heating were completed. Families were asked to reduce the amount of time that solid fuels were burned, particularly after cooking and water and space heating were completed.

Overall, it was recommended that 27 families reduce the duration of solid fuel burning of which 26 families agreed to try for the trial period. Only 13 of the 26 families managed to successfully reduce the length of solid fuel burning over the trial period. During morning burnings, the average length of solid fuel burning was reduced from 250 minutes to 219 minutes amongst the 13 families that improved this behaviour. Slightly greater reductions were achieved for evening burnings: the duration of solid burning was reduced from 242 to 198 minutes. Extinguishing a fire normally entailed pouring water or leftover maize porridge over the embers to extinguish them or using just enough fuel as is necessary to complete the cooking, water and space heating.

Figure 8 Reductions in the duration of solid fuel burning (n=13)



Of the 13 families that managed to reduce the duration of solid fuel burning, five indicated that they saved fuel by doing so. Burning for shorter periods of time resulted in monetary savings from buying wood. In addition, using less fuel reduced the time & effort required to collect cow dung, which is freely available.

Eight families indicated that their motivation for reducing the duration of solid fuel burning was that their children were less exposed to smoke over a prolonged period of time.

A number of barriers to reducing the duration of solid fuel burning were evident, most notably the need for warmth during the cold winter months. Many mothers reported that when they extinguished their fires, their homes would become extremely cold – particularly during mornings and evenings. In addition, reducing the length of time that a fire was burning often meant that the mother had to do all the chores that rely on the fire during a shorter period of time. These chores include heating water for tea, heating babies' bottles, bathing and reheating leftover food. This was often very difficult to do because the fire would be needed for different purposes at different times.

Box 2 The burden of reducing the duration of burning

Wilhelminah, a mother of three, lives in a three-roomed dwelling. She lives with her mother-in-law and children except when her husband, who works in Mafikeng, comes home every second weekend. Her three children are aged 9 years, 7 years and 7 months. The two eldest children are at school, while the youngest stays at home with her during the day. Wilhelminah typically gets up at about 05h45 and starts a wood fire at 06h00. She uses the fire to heat leftover food for breakfast and begins to heat water on her wood stove.

She wakes her two older children up at 06h10. After getting out of bed, they stand next to the fire to heat themselves, use the warm water to bathe with, eat and then leave for school at about 07h00. At 08h00, she heats more water to wash dishes with and then starts cooking. Her youngest child wakes up a little after 08h00, after which she heats more water to warm her baby's feeding bottle. She changes her baby's napkin and then heats more water to bathe her child with at about 08h35. She also uses this hot water to wash her child's napkins with at about 09h00. She continues to cook until 10h00. She uses the fire to heat her iron with and then irons her family's clothing with until about 10h30. After four-and-a-half hours, the fire is left to extinguish on it's own. By this time, she has also already fetched wood from outside a few times, collected dried cow dung (as her wood supplies are running low), collected fresh water from the village well, and has begun to wash her family's clothing. While being used continuously from 06h30 until 10h30 for domestic tasks, the fire simultaneously provides comforting heat during cold winter mornings.

In short, having a fire burning for prolonged periods of time allows mothers to do the chores that rely on heat when they need to be done while simultaneously providing much needed warmth for the household. Reducing the length of burning would entail having to do all of those chores during a shorter time period, or alternatively igniting a fire each time a chore needs to be done.

Table 3 summarizes the impact of the home visits on the four clusters of behaviours.

Table 3 Summary of behaviours

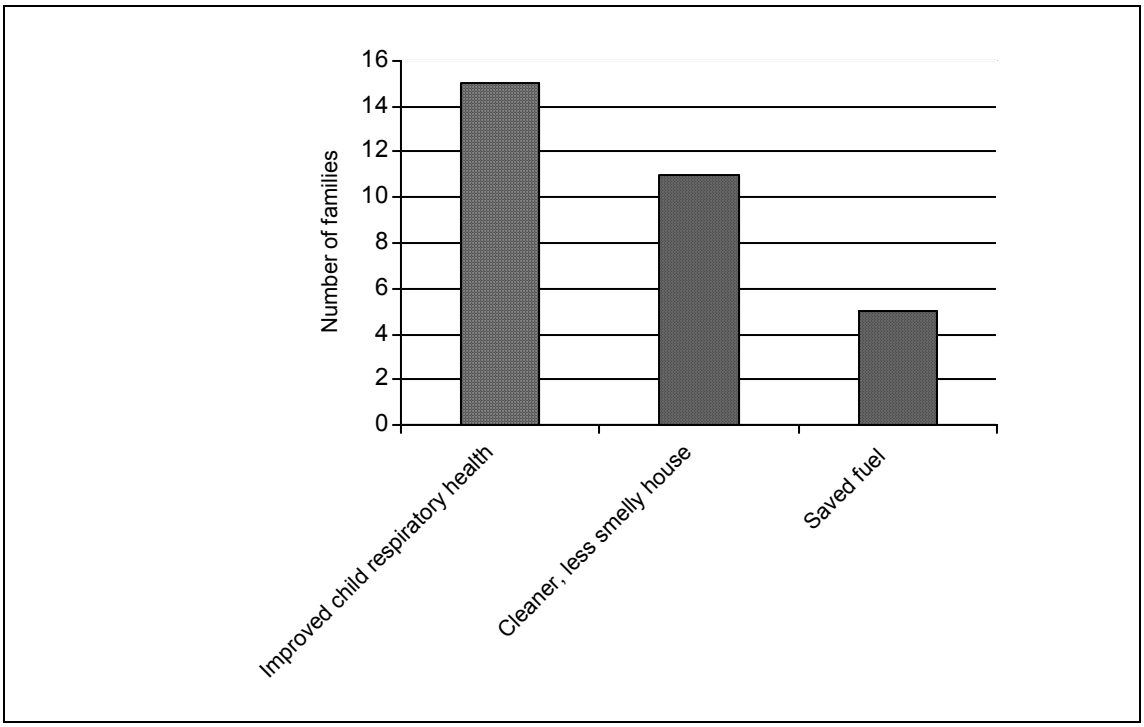
Behavioural cluster	Number of families to which recommended.	Number of families that declined to perform the behaviours.	Number of families that agreed to perform the behaviours.	Number of families that successfully performed the behaviours.	Description of how behaviours were performed.	Barriers	Motivations
Improve stove maintenance practices.	15	4	11	3	Families used a mixture of cow dung, soil and water to seal leaking parts of stoves and used old cloths or old tin sheets to cover broken parts of chimneys.	▪ Cost of purchasing materials. ▪ Cost of hiring person to fix stoves.	▪ Less smoke in he house. ▪ Less dust which makes cleaning easier. ▪ Cleaner smelling house.
Improve double ventilation practices.	29	0	29	20	Families opened doors and windows for longer periods of time while a fire was burning.	▪ Non-functioning windows that cannot be opened. ▪ Cold weather.	▪ Less smoke in the house. ▪ Less dust which makes cleaning easier. ▪ Cleaner smelling house.
Improve child location practices in relation to the fire.	28	0	28	16	Families attempted to keep children out of the kitchen while a fire was burning. To do this, children were looked after by another adult or left to play with other children in another room of the house.	▪ Children often do not like being away from their mothers. ▪ Lack of extra adult supervision for children when they are away from the kitchen. ▪ Children become cold when out of the kitchen	▪ Knowledge that children's respiratory health is protected.
Reduce the duration of solid fuel burning	27	1	26	13	Families reduced the length of solid fuel burning by extinguishing the fire after cooking and water and space heating was complete.	▪ House becomes cold when fire is extinguished. ▪ Increased burden on women to perform chores in shorter time.	▪ Fuel saving. ▪ Less money needed to purchase wood. ▪ Less time & effort required to collect cow dung.

4.2 Perceived benefits and sustainability of behaviour change

In line with the motivations cited above, mothers noted what they perceived to be benefits of behaviour change over the trial period. Half of all mothers (n=15) reported improvements in their children's respiratory health following the trials. The reported improvements ranged from a decrease in specific symptoms, such as coughs, to less frequent visits to the local hospital.

Eleven mothers reported that they benefited by having a cleaner and less smelly house. Fixing up their stoves, opening windows and doors, as well reducing the amount of time that stoves were burning resulted in reductions in the amount of dust and soot that accumulated on hard surfaces and curtains in the kitchen. This, it was reported, made cleaning the house, particularly the kitchen, a little easier to do. The house also did not smell as much of smoke. Only five families reported that they saved fuels and consequently money to buy fuels as well as effort in collecting free fuels such as cow dung by reducing the time that solid fires were left to burn.

Figure 9 Perceived benefits of behaviour change



Of the 30 families that participated in the study, 25 (83%) reported that they intended to continue with the behaviours, mainly due to improvements in their children's health. Five (17%) families reported that they would not continue with the behaviours because they were too difficult to perform.

5. DISCUSSION & RECOMMENDATIONS

Behaviour change is notoriously difficult to achieve and even more difficult to sustain. A recent review of published behaviour change studies found that only a small percentage of studies managed to achieve behaviour change and those that did, were plagued with methodological flaws (Cave & Curtis, 1999). This report showed how, after home visits to discuss indoor air pollution and behaviour change, families changed their behaviours (to varying degrees) to reduce their children's exposure to indoor air pollution. However, it is important to highlight the methodological weaknesses of the approach used in this study.

Firstly, it is possible that people's behaviours were influenced by the presence of a researcher. During the follow-up visits families were already sensitised to the fact that researchers were there to determine whether they had performed the agreed behaviours. Consequently, the behaviour change reported here could be a result of *reactivity* due to the presence of researchers and not true behaviour change. The same weakness holds true for the personal interview conducted during the follow-up visit. The study attempted to circumvent this by stressing to families that the researchers would learn just as much from what they were <u>not</u> able to do as from what they were able to do. They were therefore encouraged to be as open and honest about what they were and were not able to perform.

Secondly, because there were only two data collection visits (one before and one after), it was not possible to capture important daily and weekly variability in behaviour. These two visits represent mere 'snapshots' in the lives of the families that participated in the study. For example, it is not known how a particularly cold spell would affect families' abilities to open windows, keep their children away from the stove and reduce the time that a fire was burning. Moreover, factors such how cold it was on the assessment days and whether someone else was present on that particular day to look after the child would all influence the behaviours that were observed.

Nevertheless, the study yielded valuable information with regard to behaviour change and indoor air pollution. It showed how indoor air pollution behaviours are firmly rooted in poverty, weather and an enabling environment. Importantly, it showed how certain behaviours such as ventilation and child location practices were easier to improve than stove maintenance and reducing the length of burning.

For example, the cost of fixing of wood stoves was found to be prohibitive for most families that participated in the trials. The three families that did fix their stoves and chimneys used relatively low cost methods to do so. The fact that so few families managed to fix their stoves indicates that the promotion of stove fixing may only be feasible for a small number of people in this context. In addition, even though families reported improved levels of air quality, observations indicate that 'fixed' stoves were still emitting

visible smoke albeit to a lesser extent than before. Because of the perception that stoves were not emitting pollutants, it was found that children actually spent more time in close proximity to the stove after it had been fixed than before. In all likelihood 'fixed' stoves still emit dangerous pollutants and spending more time close to it may work against the intention of the intervention. Even though the promotion of stove fixing behaviours has the greatest potential for improving levels of air quality, they may not be feasible because of the cost and the potential risk that children may actually spend more time close to the stove once it is fixed.

Although reducing the duration of burning had a relatively high acceptability rating (26 out of 27 families agreed to try it), it proved to be difficult for most households, not only because of the need for warmth generated by the stove, but also because of the increased burden placed on mothers to perform all of their domestic activities during a shorter period of time. The fact that families need and use the fire for a prolonged period of time makes reducing the duration of solid fuel burning impractical. Even though those families (n=13) that did manage to reduce their burning did so by 13-19%, reducing the duration of burning may have limited feasibility in this context.

It is recommended that the intervention should focus on improving child location and ventilation practices, as they appear to be the most acceptable and feasible in terms of behaviour change. Not only were most families willing to perform the behaviours but they were also able to improve these practices in a measurable way. In terms of moving the child away from the burning fire, the intervention should recommend that someone, preferably an adult or adolescent, watch and care for the child in a location where the smoke from the fire cannot reach. In homes where there is no extra help for mothers children should be kept in the kitchen but as far away from the fire as possible.

The intervention should also focus on encouraging families to open two sources of ventilation during burning, particularly during periods of high smoke emissions such as during ignition or when fuel is added to the fire. The cost of fixing broken windows may serve as a barrier to ventilation practices. Nonetheless, most households have a door leading to the outside as well as a working window so the opening of doors as well as windows can be encouraged.

It is also encouraging to note that 83% of families indicated that they intended to continue with the behaviours after the trials. The most common reason cited for wanting to continue was because of perceived improvements in their children's respiratory health. While these figures may also be exaggerated somewhat by what families thought researchers wanted to hear, it nevertheless highlighted, as in phase one, the importance of mothers' intentions to care for and nurture their children's health as a key motivation for sustained behaviour change. Open-ended interviews showed how other motivations, such as having a cleaner house and saving money through using less fuel, did not feature as strongly as

the concern over their children's health. Researchers observed that many mothers viewed smoke as an irritant associated with symptoms such as coughing and eye irritation but were not aware of the association between smoke and serious illnesses such as pneumonia.

It is recommended that the intervention should focus on consolidating mothers' existing knowledge of indoor air pollution but also expand that knowledge to include the dangers of smoke that mothers are not generally aware of such as the dangers of non-visible smoke. The key motivation should be the protection of their families', particularly their children's, respiratory health.

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[i] Strong evidence shows that exposure to indoor air pollution is also associated with an increased risk of chronic obstructive lung disease (COLD) in adults and moderate to weak evidence exists for Tuberculosis, adverse birth outcomes, eye problems and cardiovascular disease.

Indoor Air Pollution Trials of Improved Practices

Counselling visit guide

[Please invite all adults to join the discussion.]

Thanks again for letting me observe you last week. I learned a lot. I'd like to talk to you today for about 45 minutes about possible ways to improve your child's respiratory health. Is this possible now?

[If no, ask when can you come back. If yes, proceed]

We're designing a programme and we need your input to make it successful. I'll suggest a few things to try based on what I learned from you last week that may make your child healthier. I ask only that you give it an honest try. We will learn as much from what you can't do as from what were able to do. I'll come back in a couple of weeks to find out how it goes.

As you may know, doctors say that diseases of the lungs such as pneumonia can make our children very sick and even die. These diseases happen when the child breathes in the smoke from the fires that you light inside to cook with or heat with. The smoke that you see, as well as the fumes that you can't see, contain dangerous particles and chemicals that enter your child's lungs (and yours) and make them so weak that they can't fight off germs. This is how they become infected and your child gets very ill. Have you also heard of this? *[Discuss and get mothers to ask you questions if they have any*]

EXPLAIN ASSESSMENT RESULTS AND INCLUDE FEEDBACK OF POSITIVE THINGS THEY ARE DOING.

Are you willing to try a few things to prevent respiratory illness and 'brown eyes' in your children? Do you have any ideas to try?

[*Present options below based on assessment. Negotiate with the family so that they agree to try at least one or more new things. Explain that this is just a trial – you will be returning to find out what they liked or didn't like about each to learn what to recommend to other families.]*

A. IF STOVE NEEDS REPAIR:

- We know that broken stoves put out a lot of bad smoke & fumes that you can't see into the house, would you be willing to fix your _____ [*insert broken part*] of stove.

- *[If yes]* How do you think you could do this? *[If they don't have ideas, suggest from table below.]*

Concern	What to do	Ideas to try
▪ Chimney	▪ If chimney is blocked, unblock during trial ▪ If chimney is cracked, seal with fire grout putty?	▪ Put a stone down the chimney on a string (just smaller than diameter of chimney) ▪ Gather friends to buy putty together from store (request store to stock)
▪ Door	▪ Replace hinges ▪ [Buy or find something to replace door – is there anything?]	Buy hinges from stores (request store to stock)
▪ Missing or broken plates	▪ Cover with large pot during burning ▪ Find other object to cover hole.	

[Help the family think through how they are going to do it.]

- Who can do this?
- When?
- Do you think there're going to be any problems with this?
    - What do you think you could do about the problems?
- How are they going to get the materials?
- How do you think you could pay for it?
- Do you think there're going to be any problems with this?
    - What do you think you could do about it?

[If hesitant, encourage them to try by using the motivations below]

- Less smoke in the house.
- A cleaner smelling house.
- Easier housework because there may be less dust in house.
- Use less fuel.

- Stove will work better.
- Better health of children.
- Keep valued stove working longer.

[Please circle the motivations to which people best responded to]

[*If no*] Why not? [*Try to use motivations above*.]

_____

_____

_____

_____

B. IF VENTILATION NEEDS TO BE OPENED MORE:

- We know that by opening windows and doors let smoke and fumes out of the house, children are less likely to breathe them in and less likely to get sick.

- Would you be willing to open _____ for _____ (period of time)?

- *[If yes]* How do you think you could do this? *[If they don't have ideas, suggest from table below.]*

Concern	What to do
If windows & doors closed throughout burning	Try to open at least 2 sources during burning (for cross-ventilation) especially during ignition.
If one source of ventilation is open for short time.	Open another source at the same time and leave them open longer.
If windows & doors open for short duration	Ask to open 2 sources for longer during burning - particularly in the burning room.

[Help the family think through how they are going to do it.]

- Who can do this?

- When?

- Do you think there're going to be any problems with this?

    - What do you think you could do about the problems?

[If hesitant, encourage them by using the motivations below]
- Less smoke in the house.
- A cleaner smelling house.
- Easier housework because there may be less dust (from fires) in house.
- Better health of children.
- Avoid breathing in the 'unseen' fumes.

[Please circle the motivations to which people best responded to]

[If no] Why not? [*Use motivations above again*]

C. CHILD LOCATION

- We know that by keeping young children away from the stove while burning, they are less likely to breathe in smoke and fumes, so less likely to get sick.
- Would you be willing to help your child stay away from the stove during burning?
- *[If yes]* How do you think you could do this? *[If they don't have ideas, suggest from table below.]*

Concern area	What to do	Ideas to try
Child near stove throughout burning	Move child away from stove during burning to outside or in an area of the home where smoke doesn't reach	(*Infant babies)* ▪ Place box or cot in room where smoke doesn't reach & find another person to watch the baby while mother is in burning room ▪ Put extra blankets on the infant ▪ Cover infants' head with a warm hat *(Young children)* ▪ Give the child toys to play with in another room or outside ▪ Cover child's head with hat ▪ Put warm socks on child ▪ Put warm clothes on child ▪ Find another person to watch the child while the fire is burning ▪ Watch the child yourself somewhere else while the fire is burning; Find another person to do chores related to burning ▪ Send the child to another place to play ▪ Organize day care centre for young children.
	[If she cannot agree to try this, continue]	
	Move child away from stove during ignition and/or morning hours (outside or in an area in the home where smoke doesn't reach).	
	Move child to the far side of the burning room during ignition and/or morning.	*Infant babies)* ▪ Place box or cot far away from stove ▪ Put extra blankets on the infant ▪ Cover infants' head with a warm hat *(Young children)* ▪ Take child off back while fire is burning and put in safe place far away from stove ▪ Cover child's head with hat ▪ Put warm socks on child ▪ Put warm clothes on child ▪ Give the child toys to play with

[Help the family think through how they are going to do it.]

- Who can make sure the child stays away from the stove during burning?

- Do you think there're going to be any problems with this?
    - What do you think you could do about the problems?

[If hesitant, encourage them by using the motivations below]

- Avoid burns on the child.
- A healthier child with fewer illnesses.
- This will lower transport and time costs associated with taking children to hospital.
- Avoid the child's eyes from becoming brown.

[Please circle the motivations to which people best responded to]

[If no] Why not? [*Use motivations above again*]

_____

_____

_____

_____

D. BURNING DURATION

- We have noticed that some people don't put out fires when they're finished cooking but let them burn themselves out.
- Since smoke and fumes are dangerous for mothers and children, would you be willing to try to put out the fire as soon as you've finished cooking?
- *[If yes]* How do you think you could do this? *[If they don't have ideas, suggest from table below.]*

Concern	What to do	Ideas to try
Extended burning (burning out naturally)	Put out fire after cooking is finished	▪ Seal stove tightly (starve fire of air) ▪ Extinguish fire by throwing leftover 'pap' on the coals – making sure to clean it afterwards. ▪ Extinguish using the 'can' method.

[Help the family think through how they are going to do it.]

- How do you think you could extinguish the fire after cooking?
    - Do you all agree?

- Who will do this?
- Do you think there will be any problems doing this?
    - How can you overcome these problems?

[If they're hesitant, encourage using the motivations below]

- Use less fuel
- Dangers of unseen smoke
- Better health of children & family

[Please circle the motivations to which people best responded to]

- [*If no]* Why not? [*Try to convince using the family using motivations above.]*

E. AGREEMENTS

Can you remind me what you agree to try for a few weeks? [*Make sure they understand clearly and agree. Write down*:]

_____

_____

_____

_____

Do you have any questions for me? [*Write down.]*

_____

_____

_____

_____

Arrange a date for follow-up in about 2 weeks. Ask when a convenient time of day to meet them when at least the mother will be home.]

Follow-up visit arranged for: _____

Thank you!!

Indoor Air Pollution Trials of Improved Practices

Final Visit Guide

Introduction

[Interviewers please greet the person again and thank her for talking with you before. Indicate that you would like to talk to her again about some of the things she agreed to try in the previous visits. Please indicate to her that the discussion will be the same as before:

- *She can say anything she wants as long as that is truly how she feels.*
- *There are no right or wrong answers, only her opinions.*
- *It does not matter if she has tried what we discussed or not, her answers will be very helpful if she did or did not try the behaviours].*

Questions

- Thank you for speaking with me earlier. Can you remind me what we agreed that you would try?

- Were you able to do what we agreed on?

[*For each new behavior ask*:]

  - *[If no*] why not?

  - *[If yes*] How did it go?

  - Did you do it as we discussed? Did you make any modifications or improvements?

  - Was it easy or difficult?

- Was there anything you liked about doing this? Why?
- Was there anything you did not like? Why?
- Do you find any benefits to doing this? [*If yes*] What benefits?
- Did anyone else say anything about you doing this? [*If yes]* Who? What did they say to you?

- Do you think you will continue doing this? Why or why not?
- Would you recommend this to other people like yourself? Why or why not?
- If you told someone else about what you tried, what would you say?
- Is there anything else we should know?

Thank you!

Indoor Air Pollution Trials of Improved Practices

Household behaviour summary sheet

[Interviewers, please re-introduce yourself to the participant, remind her that you are here as part of a MRC study of child health and that the purpose of your visit is to ask her a few questions about her daily activities. Tell her that it will take approximately 40 minutes to complete. Explain that the research is looking to design a program to improve child health, so her participation will ensure that her input is included in the program.]

Do you still agree to let me ask you a few questions today, and return to talk with you again? *[If no, thank her and end the visit. If yes, continue. If yes, but not today, arrange for another day]*

DATE: _____

START TIME: _____

HOUSEHOLD ID NUMBER: _____

COMMUNITY: _____

INTERVIEWER ID NUMBER: _____

A. STOVES

FOR ALL STOVES				FOR WOOD/COAL STOVES										
TYPES	In use? Y/N	Visible smoke when burning? Y/N	If yes, how severe? [Little (l) Moderate (M) Very smoky (V)]	Does chimney need repair? Y/N	Does door need repair? Y/N	Is the door left open during burning?	If yes, approximately what percentage of the burning time?	Is there a missing plate? Y/N	Is there anything else broken? Y/N	If yes, please specify.	Is the stove cleaned out after each burning? Y/N	If yes, please describe how.	Is the ash used for anything? Y/N	If yes, how is the ash used?
Wood/coal														
Paraffin														
Brazier (Mbawula)														
Gas														

- Is this the stove(s) you normally use? (Y/N) _____
- If no, what other stoves do you use during winter? _____
- If you use a brazier in evening hours, do you take it inside to burn? (Y/N) _____
    - If yes, when do you take it inside? _____
    - For how long does it stay inside? _____
    - Where in the home is the brazier put? _____

B. DURATION OF BURNING

TIME OF DAY	DURATION OF BURNING	
	Paraffin	Solid [wood (W), cow dung (C), mielie cobs (M)]
Morning Burning	Start time: End time: Length:	Start time: Fuels used: End time: Length:
Afternoon Burning	Start time: End time: Length:	Start time: Fuels used: End time: Length:
Evening Burning	Start time: End time: Length:	Start time: Fuels used: End time: Length:

C. FIRE EXTINGUISHING (SOLID FUEL ONLY)

METHOD (Please tick)		IF FIRE WAS USED FOR COOKING, HOW LONG AFTER COOKING IS COMPLETED (IN MINUTES) WAS FIRE EXTINGUISHED		
		Morning	Afternoon	Evening
Let fire burn out				
Extinguish by closing stove doors				
Extinguish by sealing off using a tin can				
Extinguish by putting leftover 'pap' on the fire.				
Extinguish by putting water on the fire.				
Extinguish other: _____				

C. VENTILATION

[Please tick or complete as necessary]

Morning burning/s

	Opened at all during burning	Opened during ignition and then closed for the rest of burning.	Closed during ignition and then opened for the rest of burning.	Opened throughout burning.	Opened and closed at various stages of burning.	Who opens it?	Who closes it?	How much open? full (F), half (H), less than half (LH), more than half (MH), closed (C).
Window closest to stove								
Other window (1) in burning room								
Other window (2) in burning room								
Other window (1) in the house								
Other window (2) in the house								
Inter-leading door 1								
Inter-leading door 2								
Door leading to outside								

Afternoon burning/s

	Opened at all during burning	Opened during ignition and then closed for the rest of burning.	Closed during ignition and then opened for the rest of burning.	Opened throughout burning.	Opened and closed at various stages of burning.	Who opens it?	Who closes it?	How much open? full (F), half (H), less than half (LH), more than half (MH), closed (C).
Window closest to stove								
Other window (1) in burning room								
Other window (2) in burning room								
Other window (1) in the house								
Other window (2) in the								

house								
Inter-leading door 1								
Inter-leading door 2								
Door leading to outside								

Evening burning/s

	Opened at all during burning	Opened during ignition and then closed for the rest of burning.	Closed during ignition and then opened for the rest of burning.	Opened throughout burning.	Opened and closed at various stages of burning.	Who opens it?	Who closes it?	How much open? full (F), half (H), less than half (LH), more than half (MH), closed (C).
Window closest to stove								
Other window (1) in burning room								
Other window (2) in burning room								
Other window (1) in the house								
Other window (2) in the house								
Inter-leading door 1								
Inter-leading door 2								
Door leading to outside								

D. CHILD LOCATION

[In your estimation, what percentage of the time are individuals in various locations].

	MORNING					OTHER BURNINGS				
	<1 metre of the stove	Within burning room but >1 metre of the stove.	In another room	Outside		<1 metre of the stove	Within burning room but >1 metre of the stove.	In another room	Outside	
Location of child at ignition					=100%					=100%
Location of child during burning					=100%					=100%
Location of mother during burning					=100%					=100%
Location of caregiver if not mother					=100%					=100%
Specify who caregiver is:										

E. SUPPORTING CONDITIONS

[Please tick or complete the appropriate boxes]

	Is the child wearing a hat?	Socks?	Jacket?	Long pants?	Other warm clothes?	Covered in blankets?	Is s/he in a playpen/box?	Toys present.	If yes, please specify	Are there extra blankets that you can see?	Are there extra clothes for child?
Morning burning											
Afternoon burning											
Evening burning											

Thanks for letting me into your home and seeing what you do. Can we set a day and time to meet again next week to discuss some health issues? Thank you and good-bye.

Counselling visit arranged for: _____

ASSESSMENT RESULTS:

Indoor Air Pollution Trials of Improved Practices

Screening Guide

Date: _____ Village: _____

Household ID number: _____ Address: _____

Interviewer ID number _____ Closest land mark: _____

Questions

1. Age, sex and location of children under 5 during the day.

Child	Age	Sex (M/F)	At home during the day *[tick for yes, leave blank for no].*
Youngest			
Next oldest			
Next oldest			
Next oldest			

[If no children are at home during the day, thank her, discontinue and move on to the next house]

2. Do you have a wood/coal stove in the house?

Yes	No

3. Have you used this stove during the past month for cooking or heating?

Yes	No

4. Is there anyone, other than yourself, who is available to watch your child during the early morning and evening while you do your household chores?

Yes	No

[Thank you!]

[For each village, complete the form below by ticking the relevant columns to summarize each household you have visited.]

Village:

House number	Address	Child 1 to <5 at home during day	Child <1 at home during day	Used wood-burning stove indoors in last month	Do not have or have not used wood-burning stove last month	Have another person 5+ years old to watch child.	Do not have another person 5+ years old to watch child.
1							
2							
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