

Identifying Acceptable and Feasible Behaviors to Reduce Indoor Air Pollution in Rural South Africa

The CHANGE project provided technical and financial assistance to the Medical Research Council (MRC) of South Africa to identify and test feasible behavioral interventions to reduce children's exposure to Indoor Air Pollution (IAP) in rural South Africa. CHANGE worked with the MRC from 2000 to 2003. Two phases of research were undertaken during the winters (June-August) of 2001 and 2002. The first phase determined the feasibility of potential interventions and during the second phase selected interventions were tried out.

Indoor Air Pollution and Acute Lower Respiratory Infections: A Behavioral Approach

Ninety percent (90%) of rural households in developing countries (a total of 50% of all households worldwide) rely on biomass fuels that occur naturally in the environment. Unfortunately, these polluting fuels contribute to acute lower respiratory infections (ALRIs). ALRIs represent 27% of the world's burden of infectious disease and 80% of ALRIs occur in children under five years of age. In South Africa, children living in homes burning polluting fuels for cooking and heating are four times more likely to develop ALRIs than those living in homes that do not burn these fuels. Fourteen percent (14%) of all deaths of children under age five in South Africa are related to ALRIs. This number is seven times higher than estimates in Western Europe.

Most interventions to reduce exposure to IAP have been technology-based approaches, mostly in the form of stove improvement, and using less polluting fuels, such as electricity and liquid petroleum gas. Little, however, is known about how behavioral interventions can reduce child exposure to IAP.

There are a number of reasons to focus on behavior change interventions as a way to prevent exposure to IAP:

- Behavioral approaches are potentially less expensive and more sustainable than other interventions.
- Technical interventions are costly and require appropriate use – with associated behaviors -- for impact.
- Little is known about how and to what extent behavior change might prevent IAP exposure.

Phase 1 – Determining Feasibility

The research objectives for this phase were to:

- Determine all fuel use practices that might affect child exposure to IAP and how these practices differ between households with high and low ALRIs and,
- Categorize each practice as positive or negative and recommend which negative practices to improve and potential ways to do this.

The field sites were Brooksby and Ensulrust villages, in the rural NW Province, areas with high levels of poverty and unemployment. The area is isolated, flat, and dry with cold winters. The research was conducted in winter to measure the worst case for IAP since more burning occurs in winter when it is cold and less ventilation is used. Factors that led to choosing this area and these sites included: high levels of IAP and ALRIs, no factories producing external air pollution and no electricity in the household.

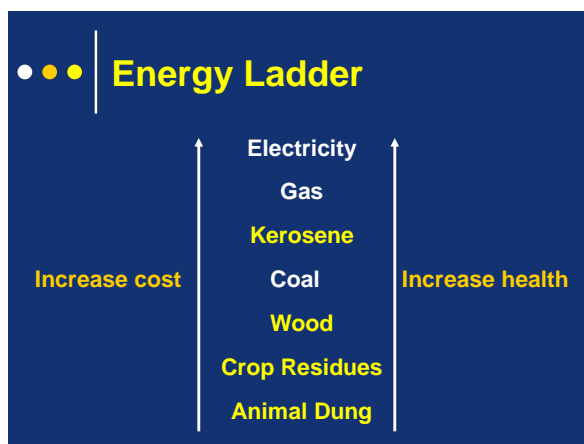
The methodology was sequential. Researchers

- Screened (on a number of indicators) for incidence of ALRIs among all 150 households with children under the age of five years;
- Observed for 14-hour periods (roughly sunrise to sunset) 20 households with high ALRI scores and 20 with low ALRI scores;
- Interviewed the female head of household about her cooking and heating practices immediately following each observation. (The observer-interviewers were not told which households were high and which were low ALRI.)
- Conducted four focus groups with other mothers (two from high ALRI households and two from low ALRI households) to elicit their perceptions about fuel usage in the community.

Limitations of this study included the small sample size (although it represented 30% of total households), observations obtained only during a one-time visit instead of over time and the presence of a researcher which could lead the families to behave differently than they normally do.

All 40 households burned fuel indoors (and four also burned outside, using braziers), although where and for how long varied. Women mainly cooked and heated the house (i.e., burned fuel) with wood or kerosene stoves. No one used gas stoves. The wood stoves were handed down through generations and were fixed in a particular location in each household, unlike kerosene stoves, which were movable. Households had various combinations of stoves: eighteen had both wood and kerosene; ten had kerosene only; six had wood only and another six had other combinations. Wood stoves were often in state of disrepair. For example, some had doors that did not close and others had holes in the chimneys or exhaust pipes. Such problems cause increased usage of fuel and greater IAP.

Women relied on a variety of fuels over the month and often used fuels sequentially, using more expensive fuels when money was more available, and cheaper fuels as funds became tighter. Wood was the most commonly used fuel (68% of households), followed by kerosene (53%), cow dung (30%) and maize cobs (15%). No coal was used. Women preferred wood and kerosene but used other fuels when funds ran low.



Among the fuels used, kerosene was the best (least dangerous to health) fuel available, followed by wood, maize cobs and lastly animal dung. Animal dung is free and children can collect it, so it requires less adult time.

All the children observed in both low and high ALRI households were exposed to some IAP. Windows were generally opened only when smoke was visible. If the mother did not see or smell smoke, she did not feel that there was any danger. There was also no difference in fuel use, type of stove used or length of burning between low and high ALRI households. However, several behaviors were significantly more likely in low ALRI households. Low ALRI households were more likely to:

- Open at least two ventilation sources,
- Keep children further (>1.5 m) from fire, and
- Burn fuels closer (<1.5 m) to ventilation.

Based on the findings, researchers concluded that two potential interventions were not feasible to promote among a population similar to those studied:

- Improving fuel use or heating appliance (which would require more money than households had available)
- Moving heating appliances closer to ventilation (since the wood stoves are fixed in place and more direct ventilation would cause the kerosene fires to go out).

Four potential interventions were selected to offer a menu of choices for a behavioral trial:

1. More ventilation sources and/or ventilating for longer periods of time,
2. Keeping young children further from burning fuel,
3. Fixing stoves, and
4. Burning fuels for a shorter duration.

The first two (increasing ventilation and keeping children further from burning fuel) were clear choices because comparison of high and low ALRI households showed that they were significantly more common in low ALRI households. Women interviewed in focus groups thought both of these would reduce their children's exposure to IAP. In addition, they suggested two other interventions (fixing stoves and burning for a shorter duration).

Phase 2 – Behavioral Trials

The research objectives for this phase were to:

- Determine which of the four selected behaviors families were willing to try,
- See which behaviors they were able to perform,
- Discover how families carried out the new behaviors,
- Identify factors facilitating practice of the behaviors (motivators) and factors that make the practice more difficult or impossible (barriers), and
- Gain a sense of how sustainable these behaviors might be, what benefits the participants perceived from having practiced the behaviors and which behaviors they planned to continue.

This trials phase was conducted in two similar villages located near those in the first phase. All 150 households were screened to determine if they included children under age five, used solid fuels, and had someone available to help the mother watch the children (to keep them further from the stoves). Thirty households were selected and assessed, then observed (from 12-13 hours) to identify relevant behaviors.

After researchers reviewed the observation data, facilitators held three sequential face-to-face meetings with each household, using the Trials of Improved Practices (TIPs) methodology developed by the Manoff Group:

- Meeting 1: Negotiation visit
- Possible new behaviors recommended
 - Facilitator negotiates behaviors that household members agree to try
- Meeting 2: Two weeks after negotiation visit – reminder counseling visit
- Meeting 3: Two weeks after reminder visit – final interview
- What the household did and how
 - Reasons (barriers and benefits)
 - Any perceived changes due to specific behavior(s)
 - Intentions to continue specific behavior(s)

Behaviors Tried by Households (HH)

BEHAVIOR CLUSTER	Number of households			
	Discussed	Agreed to try	Successfully did	Willing to continue
Ventilation	29	29	20	17
Child location	28	28	16	13
Burning duration	27	26	13	6
Stove maintenance	15	11	3	1

Many households tried multiple behaviors. Fewer than 30% of households that agreed to fix broken stoves did so and only one household was willing to continue this behavior. At least

50% of households who said they would try the other three behaviors actually tried them. Most households that tried two of the behaviors (opening more ventilation sources for longer periods and keeping children further from burning fuel) said they intended to continue. However, fewer than 50% of households that decreased burning duration intended to continue the practice. Overall, 83% of the households found at least one behavior they intended to continue.

Barriers and Benefits of New Behaviors

Behavior	Barriers to Behavior	Benefits of Behavior
Ventilation	Windows wouldn't open Too cold to open	Less dust Less smoke Cleaner-smelling
Child Location	Need for warmth Child stay near mom No one else to help	Children less exposed to smoke
Burning duration	Need for warmth More burden for moms – work faster	Children less exposed Save money on wood Less time getting dung
Stove maintenance	Material and labor costs	Less dust Less smoke Cleaner-smelling

Each behavior had its own limitations and perceived benefits. Behaviors related to indoor air pollution are influenced by multiple factors including: poverty, weather, and enabling factors such as the availability of someone to watch the child, and someone to fix stoves. Some perceived results from performing the different behaviors included: healthier children, less dust and smoke and savings of money and time.

Recommendations For the intervention phase

We recommend this two-phase process of screening and evaluating behaviors both for interventions to reduce exposure to indoor air pollution and for other health topics. Phase one helped eliminate two popular approaches - improving fuel quality and moving stoves - because of financial and physical limitations. The trials (Phase two) helped confirm that two of the four behaviors tested were feasible for more participants -- opening more sources of ventilation for longer periods and keeping children further from stoves.

Trials of behavior by community members provide real and immediate feedback. The program can learn from how community members modify specific actions as they try them. This practical real-life approach can provide information, not only on what behaviors are more feasible and potentially sustainable, but also how best to promote them. This approach also focuses planning on behaviors, rather than on just giving people more information.

References

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- Trials of Improved Practices, located on www.manoffgroup.com.

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