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A neglected source of household air pollution? A preliminary, mixed methods study of purposely produced household smoke in Wollo, Ethiopia.

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Abstract

Background

Ill health associated with Household Air Pollution (HAP) is increasingly recognised as a public health problem in sub-Saharan Africa. To date, attempts to reduce HAP have focussed on smoke from cooking fires and have ignored traditional cultural practices which generate Purposely Produced Smoke (PPS). This study aimed to investigate prevalence of PPS use, reasons for use and perceptions of PPS safety.

Methods

The study was conducted in Wollo, Ethiopia, and used a mixed methods approach of quantitative surveys (analysed descriptively) and qualitative interviews with householders and healthcare workers (analysed thematically).

Results

PPS use was reported by 99% of survey respondents and it was considered a fundamental part of life; reasons for use included housekeeping, culture/religion and wellbeing. Both householders and healthcare workers appeared to assume PPS is safe except for people with certain underlying conditions. Healthcare workers felt the lack of evidence of harm from PPS meant there was no justification for intervention.

Conclusion

This study, the first in-depth study of PPS, has shown its use to be widespread, with many perceived benefits and thus a very important part of local culture in this sample Ethiopian community. Consequently, any public health interventions aimed at reducing HAP in this setting need to consider PPS.

Background

Household Air Pollution (HAP) is harmful to health¹. It is associated with increased morbidity and mortality from many causes, including pneumonia, heart disease and lung cancer, and results in an estimated four million premature deaths per year².

The major contributor to HAP, smoke, is made up of a mixture of gases, water vapour and particulate matter (PM). Guidance from the World Health Organisation (WHO) is that there is no safe threshold of airborne PM³. Such is the significance of HAP to health, particularly in vulnerable populations, that it is related to several of the United Nations' Sustainable Development Goal targets⁴.

Sub-Saharan Africa, where reliance on biomass fuels is over 80%, has a high burden of illness and death from HAP⁵. Globally, fifty percent of deaths from pneumonia amongst children under five are estimated to be due to HAP¹. In Ethiopia, air pollution is the third biggest risk factor for mortality and respiratory infections are the third leading cause of death⁶.

To date public health concern with HAP has focussed on smoke produced as a by-product from cooking, heating and lighting. This has resulted in international efforts to improve the design of affordable cookstoves and their use⁷. In Ethiopia the federal government has proposed distributing improved cookstoves to 30 million households by 2030⁸. However, cookstove trials have shown limited clinical benefit^{9,10} with explanations for the lack of positive results ranging from patterns of use^{11,12} to householders' perceptions that the smoke itself has benefits¹³.

Ethnobotanical texts suggest that traditional practices of burning various barks, roots and leaves to make purposely produced smoke (PPS) are relatively widespread in Ethiopia and sub-Saharan Africa,^{14,15} yet their potential contribution to HAP has been largely neglected in mainstream biomedical literature and by the public health community¹⁶. Clearly, understanding more about PPS is necessary in order to inform public health interventions designed to reduce the overall health burden of HAP.

A very limited number of studies have been done on the link between PPS and health; these have largely originated in southeast Asia and have focussed on the burning of incense sticks. These include studies revealing incense burning as a source of PM and a range of other

pollutants, including volatile organic compounds^{17–19}. There is also some, but not conclusive, evidence of a link between incense use and adverse health outcomes^{20–23}. In Ethiopia most households roast coffee beans over an open biomass fuelled fire (distinct from their cooking stove) inside the home two or three times a day, often with associated burning of incense or other PPS. These coffee ceremonies have been found to increase PM and carbon monoxide exposures²⁴.

For public health interventions to be successful in reducing harm from HAP it is vital to understand all sources of indoor smoke and their cultural context²⁵. We have, therefore, carried out a preliminary study of PPS in a sample community in Wollo, Ethiopia, with the aim of indicating:

1. The prevalence of PPS use in the study population
2. Why the local community uses PPS
3. Whether the local community perceive PPS to be safe

Method

Field work was carried out during two visits to Wollo, Ethiopia, in September (Survey 1) and October 2019 (Survey 2).

Setting

The setting for this study were accessible small towns and villages around Desse, Ethiopia (see map in Figure 1) chosen to represent a range of urban/rural and highland/lowland communities. All in the North Wollo or South Wollo Zones of the Amhara Region, an area typical of highland Ethiopia, where most of the country's population live, and where the lifestyle is traditional and dependent on agriculture and herding. The estimated combined population of North and South Wollo is 4.75 million; the majority of whom are Muslim, live in rural areas and speak Amharic.²⁶

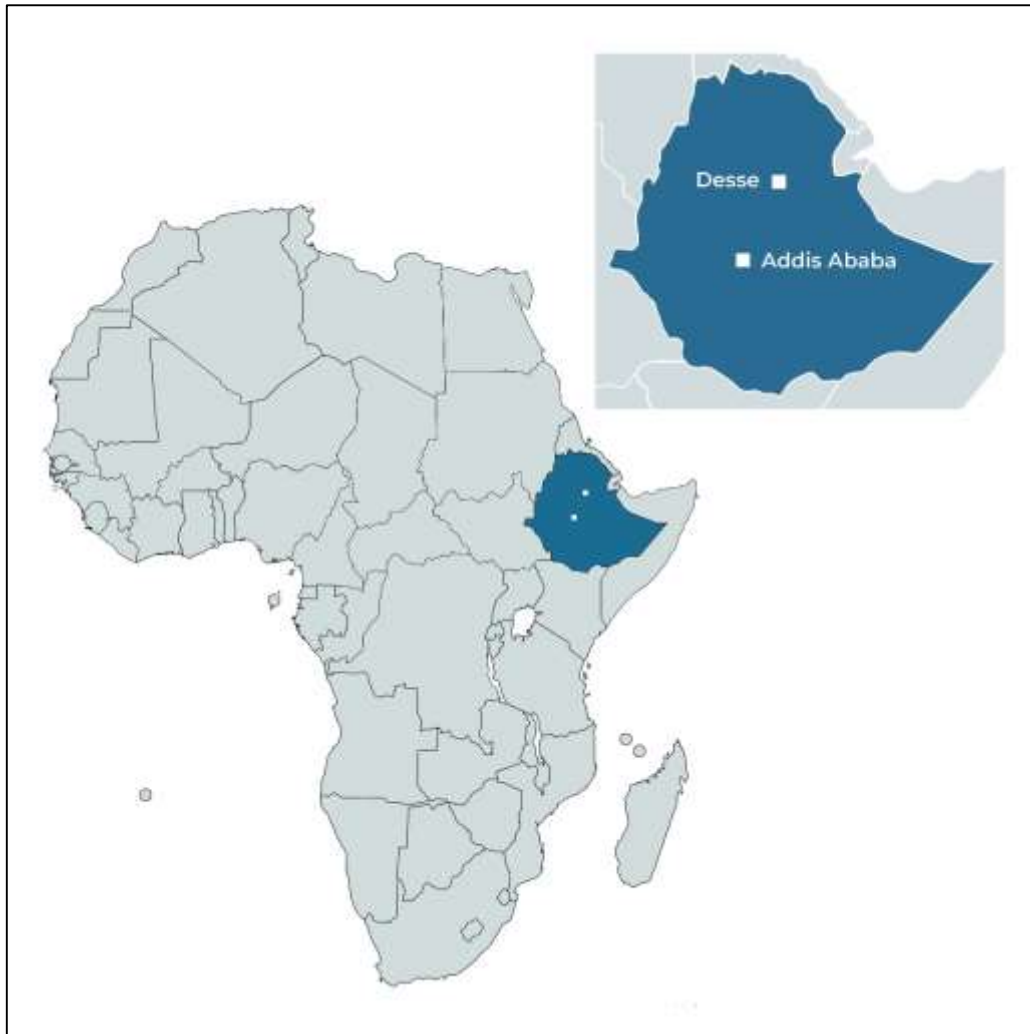


Figure 1: Map of Africa showing Desse in South Wollo, Ethiopia

Study design

This study used a mixed-methods approach. The quantitative aspect of the study involved two short surveys of householders and was designed to indicate prevalence of PPS use amongst the local community. Survey 1 also collected information on frequency of PPS use whilst Survey 2 asked respondents about reasons for use.

Systematic sampling was used for the surveys with a quota of 25 households being surveyed in each of the 12 villages visited. Surveys were conducted face-to-face in Amharic and then translated into English.

The study was designed to be exploratory with interviews and Focus Group Discussions (FGDs) amongst householders used to gain a deeper understanding of the reasons for use and

perceptions of PPS safety. FGDs with health care workers (HCWs) were included to add further insight from those most likely to be the vehicle for any future public health intervention relating to PPS.

Most interviews and FGDs were conducted in Amharic with Ethiopian interviewers with the remainder conducted by a UK researcher in English (with translation into Amharic); all interviewers had prior experience of qualitative research. A topic guide for the interviews was developed around reasons for PPS use and perceptions of its safety.

Purposeful sampling was used to recruit participants likely to be rich sources of information²⁷. Potential household interviewees were identified by the survey team and asked if they would consent to participate in an interview. Snowball sampling was also used by asking interviewees if friends, neighbours or family members might be willing to participate.

The household interviews were conducted in or around the participant's home. HCWs were recruited at local health centres and FGDs were held there in private rooms.

All interviews and FGDs were audio recorded and later translated into English and transcribed.

Analysis

Descriptive analysis of the survey data, including Student's t-test, was undertaken in MS Excel.

Thematic analysis²⁸ of interview and FGD data was carried out from a relativist ontological perspective, accepting that reality is subjective and based on personal experience. Three researchers (RW, TA, MW) inductively coded two household and two HCW transcripts, agreeing codes through discussion and consensus. All the transcripts were then coded by the lead researcher (RW) who made some further minor refinements and then developed themes through consultation with the wider team. NVivo²⁹ was used to manage the data for the thematic analysis.

Quality Assurance

Rigour was increased by comparing the research team's field notes at the end of each day in order to contextualise the study and identify emergent themes.

A reflective journal was kept by the lead researcher to aid reflexivity and thus enhance the study's credibility.

Ethics

Ethical approval was obtained from Faculty of Medicine Ethics Committee, University of Southampton and from School of Public Health, Addis Ababa University. After explaining the objectives and importance of the study, all participants were asked to give consent for participation and for audio recording before commencement. Confidentiality and anonymity were kept throughout the study.

Results

Study Population

A total of 304 householders completed the surveys (two refused). The key characteristics of the respondents were similar across Survey 1 (n=152) and 2 (n=152); the majority of the respondents were female (Survey 1=88%, Survey 2=94%), reflecting the fact that women were more commonly at home. The majority of respondents were Muslim (Survey 1=86%, Survey 2=81%). Households had an average of 2.6 rooms and 14% had an open fire for cooking inside their home.

Seven FGDs were held with a total of 29 HCWs (22 male and 7 female); there were between two and six participants in each FGD. FGDs lasted an average of 37:44 minutes (range 22:17 to 50:29).

Eleven individual householder interviews and two FGDs (one with two participants and one with five) were held with three male and 15 female participants. These lasted an average of 14:11 minutes (range 7:26 to 27:37).

Prevalence of PPS use

Use of PPS was found to be almost universal; 300 respondents (99%) reported its use. Three-quarters of respondents to Survey 1 reported using PPS at least once a day; this varied a little according to household characteristics, but these differences were not statistically significant (Table 1).

Table 1: Use of Purposely Produced Smoke (PPS) at least once a day, by characteristic of respondents

	Total	Number using PPS at least once a day	Percentage using PPS at least once a day	t-test p-values
Total	152	114	75.0	
Male	19	12	63.2	
Female	133	102	76.7	0.103
Muslim	130	99	76.2	
Orthodox	21	15	71.4	0.318
No open fire inside house	128	97	75.8	
Open fire inside house	23	16	69.6	0.264

Note: Student's t-test used to compare differences between groups (not adjusted for other householder characteristics)

Why do the local community use PPS?

In Survey 2 the most common reason for use of PPS was to accompany coffee ceremony (44% of responses overall). Coffee in combination with chewing khatⁱ and prayers was mentioned in a further 9% of responses. Health and/or repelling bad spirits was mentioned in 9% of responses, as was housekeeping. Table 2 shows how reasons for use varied according to the type of material being smoked (including Latin names^{15,30-32}).

ⁱ Khat refers to the leaves and the young shoots of the plant *Catha edulis Forsk.* In many countries in Africa khat is traditionally consumed by chewing the tender leaves and stems. The khat leaves contain the psychoactive substances cathinone and cathine.³⁶

Table 2: Reasons for purposely producing household smoke given by Survey 2 respondents (n=152), by type of material smoked

Type of material used to purposely produce smoke	Reason for use given (number of responses)					
	Coffee ceremony	Coffee, chewing khat and prayers	Health and/or repelling bad spirits	House-keeping	Prayers	Other reasons or combination
Adis <i>Myrtus communis L.</i>	47	5	0	6	3	17
Adrus <i>Commiphora myrrha</i>	88	17	0	2	1	30
Bukbukka <i>Colchicum sativus</i>	18	2	0	0	1	3
Kebericho <i>Echinops spp.</i>	4	1	35	1	1	7
Tamanay <i>Securidaca longepedunculata Fres.</i> (<i>Polygonaceae</i>)	3	1	0	1	1	8
Wogart <i>Silene macrosolen</i> (<i>Caryophyllaceae</i>)	4	0	12	4	1	6
Woiyra <i>Olea europaea subsp. Africana</i>	29	9	4	33	1	61
Wollo mix [A mixture of various barks and roots]	56	16	0	3	20	0
Total number of responses	249	51	51	50	29	132
Percentage of all responses	43.5	8.9	8.9	8.7	5.1	23.0

N.B One respondent may have given responses for more than one reason and/or more than one type of material

Data collected in the FGDs and interviews confirmed the wide range of reasons for using PPS, these were grouped into the themes of housekeeping, religion/culture and wellbeing, as shown in Table 3.

Within the housekeeping theme, PPS was described by respondents as a fundamental part of a home.

“A house is nothing without smoke” (HH11)

Several specific housekeeping purposes of PPS were mentioned; creating a pleasant smell was the main one but also repelling insects and snakes.

“There are many kinds of smokes and the community tend to use them for their good smell” (HCW7)

Religious/cultural reasons for PPS emerged as the second major theme, with respondents indicating that PPS is central to local culture. Specifically, as seen in the survey results, using PPS to accompany coffee ceremony was considered a fundamental part of life.

“If there is a coffee ceremony, there will always be a smoke with it” (HCW4)

Use of PPS to accompany khat chewing and during prayers was also frequently mentioned.

The final theme was wellbeing which encompassed a range of reasons for PPS use. Certain types of PPS (particularly Kebericho and Wogart) were perceived to cure illness in both humans and animals and, in accordance with local understanding of disease causation, were also believed to repel evil spirits.

Some of the perceived wellbeing benefits related specifically to female fumigation with Woiybaⁱⁱ (*Combretum adenogonium*, also sometimes called Bolokia); these included post-partum healing, cosmetic/beauty purposes, strong bones and relieving back pain.

ⁱⁱ Female fumigation is different from other PPS practices as the Woiyba wood is burnt in a small pot placed in a hole in the floor and the woman sits astride it, naked and wrapped in an animal hide.

Table 3: Themes and sub-themes relating to the reasons for use of purposely produced smoke (with illustrative quotes)

Themes and sub-themes relating to reasons for use of purposely produced smoke		Illustrative quotes
Theme	Sub-theme	
Housekeeping	Fundamental part of home	“It’s very beautiful for the house to be filled with smoke, and you will be happy when you get into your house” (HH5)
	Creating a pleasant smell	“It’s very important for us to use smoke in the house after cleaning it, as we consider it as a perfume.” (HH6) “Smoke is mostly used in our culture to create something that has a pleasant smell” (HCW4)
	Repelling insects	“Woiyra is believed that it will prevent mosquitos.” (HCW3) “Many times we use it [Woiyra] to avoid the insects and prevent it from ticks” (HH13)
	Repelling snakes	“There is Wogart, that is used to prevent a snake from coming” (HCW7) “It is believed that a snake will not come close to the house if there is a Kebericho smoke.” (HCW1)
	Warming the house	“Smoke is believed to create hot environment in the house” (HCW4) “If there is an event in the house, the women will prepare the smoke to make the house warm.” (HCW7)
Religious or cultural	To accompany coffee ceremony	“Adrur and Woiyra is mostly used when there is a coffee prepared, the community considers this as a culture” (HCW3) “It’s part of our culture to have smoke together with coffee ceremony” (HH4)

		<p>“We use the smokes during coffee ceremony, we can’t drink the coffee if there is no smoke” (HH3)</p> <p>“Before you start drinking the coffee, it’s a must for the smoke to be there.” (HCW7)</p>
	To accompany khat chewing	<p>“People that chew khat usually likes the smoke and even they are not happy if there is no smoke in the house, and might even leave” (HH8)</p> <p>“Whenever there is khat chewing or there is coffee making there will always be a smoke.” (HCW3)</p>
	Cultural importance	<p>“smoke is part of our culture” (HCW4)</p>
	At festivals or special occasions	<p>“It is said that if there is no smoke the festival is not that attractive” (HCW4)</p> <p>“In Wollo it is common to have different kinds of holy days like prayer times when the whole house is full of smoke.” (HCW1)</p>
	To accompany prayers	<p>“During prayer time, a good sprit will not approach if there is no smoke.” (HCW4)</p> <p>“The main thing is Wollo is known for Dewa (prayer) and smoke, these two things cannot be seen separated.” (HH6)</p>
Wellbeing	Care of infant	<p>“For children Tunjit is used, not for the newborn itself but for the diapers and cloths so that it will not have a bad smell.” (HH7)</p> <p>“Wogart is used after giving birth to clean the nappies of the baby, and since the smell is really good people tend to use Wogart in the post delivery time.” (HH4)</p>
	Happiness or good feeling	<p>“Wollo smoke - one of the reasons is it will relieve depression. Most of the population use this smoke to feel happy when they are sad.” (HCW6)</p>

		<p>“We get very happy, it gives us a happy feeling” (HH3)</p>
	<p>Medication or healing (humans)</p>	<p>“The smokes are used as medication, for example, when there is a bad spirit we use Kebericho to push the evil, and also Wogart is used for medication.” (HH1)</p> <p>“Woiyba smoke is used for back pain, for skin, and if there is tear during giving birth, they would not even let us treat them saying the Woiyba will be helpful for the tear and they don’t need any intervention.” (HCW5)</p> <p>“It is known informally, people when they even have typhoid and typhus, Kebericho is given.” (HH13)</p>
	<p>Medication for animals</p>	<p>“Smokes are very useful; usually they are used for many kinds of illness the smokes are Kebericho, which is used for illness in both human and animals.” (HH10)</p>
	<p>Repelling bad spirits</p>	<p>“Kebericho is used when there is someone who is possessed by bad spirit.” (HCW2)</p> <p>“We use Kebericho, to push bad spirit out from the house.” (HH5)</p> <p>“The other smoke called Wogart is known by our families and ancestors as to be used to push away a bad spirit.” (HH4)</p> <p>“Kebericho is used for children when it is believed that they were exposed to bad spirit.” (HCW7)</p>
<p>Wellbeing from female fumigation with Woiyba/ Bolokia</p>	<p>Cosmetic or beauty</p>	<p>“Even the old ladies tend to look young.” (HCW2)</p> <p>“It will make your skin look good and lighter” (HH5)</p> <p>“Woiyba which is used for beauty and cosmetic fumigation; it’s like a modern steam.” (HH13)</p>
	<p>Back pain</p>	<p>“It is a good medication for back pain” (HCW2)</p>

	Post-natal care	<p>“I want to add something on the Bolokia smoke. If one woman gives birth she will use this smoke. Because when a woman is pregnant and then gives birth her skin will be stretched but the Bolokia will repair it and return it to normal and remove the stretch marks.” (HCW1)</p> <p>“If there is any fluid discharge from the vagina this will make it dry, and it helps in the healing process of the wound that happened because of delivery” (HH1)</p> <p>“If they have time after post-delivery they will use it for 45 days continuously but if she has no help she might due it just for few days.” (HCW7)</p>
	Strong bones	“I know that if a woman is fumigated with Bolokia it is good for the strength of the bones” (HCW1)
	Sexual intimacy	<p>“It will also be a spice for love of men and women.” (HH10)</p> <p>“So when is done with post-natal period she will look so good and when she is with her husband it will be like good old times.” (HH6)</p>

Note: HCW quotes are coded HCW1-HCW7 and householder quotes are coded HH1-HH13 according to which interview/FDG they were made in.

Perceptions of the safety of PPS

Participants' perceptions of the safety PPS were grouped into three themes; perceptions of harm, uncertainty and actions to mitigate harm(see Table 4).

When asked about the harm of PPS, respondents often made a distinction between PPS and cooking smoke, believing that the latter is harmful to health. HCWs indicated that this understanding of the harm of cooking smoke is the result of health education work.

“The Health Extension Workers have taught the community that there should be a separate house that is used for cooking just to minimize the exposure of the family to smoke. So, we can say almost all the community knows about the disadvantage of this smoke.” (HCW1)

Most participants expressed an assumption that PPS is safe.

“So, most of the smokes that are used in the household are safe.” (HCW1)

Indeed, it was quite striking that householders appeared almost surprised to be asked about possible harms of PPS and they suggested that any harms would be insignificant or only relevant for people with an existing condition such as asthma or allergy.

HCWs talked more about possible health harms of PPS but, again, usually in relation to people with pre-existing conditions.

“Those who are asthmatic will definitely not use the smokes because it makes them worse” (HCW7)

The second theme of uncertainty of PPS safety was almost exclusively mentioned by HCWs. They talked about PPS having advantages and disadvantages, that its side effects are not understood and that appropriate dose is unknown.

“When done in excess it might not be good” (HCW1)

In response to this uncertainty, HCWs often spoke about a lack of evidence and they frequently asked the researchers to share the findings of this study with them.

“There is nothing known about the harm of the smokes, so I want to know if there are ways we can know about these smokes? Or what shall we do? Since there is no

evidence to say anything, so is there any study done in this area? Can you give us a manual or something?" (HCW7)

Some participants talked about ways of mitigating harms such as avoiding using PPS if a person in the house has asthma. HCWs often talked about their role, for instance in giving health education, and the challenges they saw in doing this.

"Even if you try to recommend that people stop using smoke, the acceptance rate will be very low since these things have cultural values." (HCW1)

Table 4: Themes and sub-themes relating to the perception of safety of purposely produced smoke (with illustrative quotes)

Themes and sub-themes relating to the safety of purposely produced smoke (PPS)		Illustrative quotes
Theme	Sub-theme	
Perception of harm from PPS	Comparison with smoke from cooking	“There are two types of smokes, a good type of smoke and a bad type too” (HCW4)
	Assumption that PPS is safe	<p>“We don’t see any harm from the smokes” (HH1)</p> <p>“It’s is proven that it has not any harm” (HH6)</p> <p>“Wollo chis [smoke] has no negative impact in my perception” (HCW6)</p> <p>“It doesn’t have a bad effect it is just used to have a very good smell” (HCW7)</p>
	Harms are insignificant or only relevant to people with other conditions	<p>“These smokes we are talking about might give you a bit of difficulty to breathe other than that these smokes are safe.” (HH4)</p> <p>“Allergies are sometimes because of the smokes.” (HCW6)</p> <p>“This smoke even have two sides to it, it has a great smell, but for patients who are asthmatic or have a lung diseases this makes it worse” (HCW2)</p> <p>“So when we see the negative impact, there are people who are asthmatic and they tend to be sick all the time because of this smoke, most of people complain about tonsillitis, but it is usually caused by repeated exposure to these smokes, so for me the negative impact is much more.” (HCW7)</p>

Uncertainty	Dose	<p>“So, what I think is that if it is too much it will still affect the health. But if it is used with appropriate amount then I don’t think it will affect the health.” (HCW1)</p> <p>“I don’t doubt that the smoke is useful, but the amount is very important.” (HCW2)</p>
	Side effects	<p>“They don’t know the side effects of these smokes” (HCW3)</p>
	Lack of evidence	<p>“I will agree on the uncertainty about side effects since they are not studied.” (HCW1)</p> <p>“I don’t have any evidence to even think that they have harm” (HCW7)</p>
Actions to mitigate harms	Actions to reduce harm of smoke generally	<p>“We have a separate house for cooking” (HH3)</p> <p>“Since my daughter is allergic to smokes, we don’t usually smoke in the house” (HCW7)</p> <p>“My husband has asthma so when he is around I don’t use the smokes at all” (HH4)</p>
	Health education	<p>“We don’t have evidence to boldly give health education saying that these smokes are bad for the health.” (HCW6)</p> <p>“To my knowledge there is no health education given regarding this topic or there is no plan” (HCW7)</p>

Note: HCW quotes are coded HCW1-HCW7 and householder quotes are coded HH1-HH13 according to which interview/FDG they were made in.

Discussion

Main findings of the study

This study, which is the first in-depth study of this source of HAP, demonstrates widespread use of PPS in Wollo. Overall 99% of survey participants reported PPS use, with 75% using it at least once a day. Importantly, the detailed interviews reveal the very fundamental importance of smoke in the home to the local population.

The reasons for using PPS are wide ranging and tend to relate to the particular type of material being used to create smoke. Use of PPS appears to be very closely associated with housekeeping, particularly for creating a pleasant smell, and is considered necessary for a good home. There are also important religious and cultural reasons for using PPS, such as accompanying prayers or coffee ceremonies, and numerous perceived health and wellbeing benefits.

Both householders and HCWs appeared to understand that smoke produced as a by-product of cooking is harmful for health, but most assumed PPS to be safe. Householders found it surprising to be asked about harm from practices so deeply embedded in their culture; although they did concede that there may be problems for people with pre-existing conditions such as allergies and asthma. HCWs tended to express some uncertainty; whilst appearing convinced of the benefits of PPS, they spoke of not knowing the appropriate dose or what its side effects are. As a result, HCWs often mentioned the lack of evidence of harm and, therefore, saw no justification for taking action on PPS.

What is already known on this topic?

There have been very few studies on PPS as opposed to smoke produced as a by-product of cooking¹⁶ and other studies have tended to ignore this source of HAP when they have made measurements of particulate matter³³. The lack of progress on using improved cookstoves to reduce HAP has resulted in a call for a greater understanding of community beliefs and perceptions and further research on the many other sources of air pollution aside from cooking³⁴.

A study in Ethiopia found health benefits were not prioritised over other social and personal needs in relation to reducing smoke from cooking¹³. A pilot study on HAP from Ethiopian coffee ceremonies found that levels of health concern were not high leading the authors to conclude that more research is needed before they could recommend interventions²⁴.

Other studies, such as a qualitative study in Nepal, have found that HAP is understood as 'bad smells'³⁵ so it follows that PPS used for a 'pleasant smell' would not be characterised as a source of pollution.

What this study adds

This study provides evidence of the widespread use of PPS in a sample Ethiopian community and gives important insights into reasons for its use. The findings reveal that PPS is a fundamental part of local culture and is perceived differently from the smoke produced from cooking fires.

The findings of this study on perceptions of safety of PPS will inform any future public health interventions. The local community appeared to assume that PPS is safe but their acknowledgment of potential harm for people with pre-existing conditions, such as asthma, could offer opportunity for future behaviour change intervention.

Our finding that HCWs in Wollo also believe PPS to be safe is an important message for the research community and for international bodies developing guidelines on HAP. HCWs are a key vehicle for delivering health messages to local populations in Ethiopia and this study showed that the lack of evidence that its harms outweigh the benefits is a barrier to them taking action on PPS.

Limitations of this study

This was a preliminary study. Whilst it was not designed to be generalisable, the findings are limited by the small geographical area and population studied. For instance, having only sampled one region of Ethiopia (Amhara), important differences between cultural groups may have been missed. Additionally, the small sample size made it difficult to draw robust

conclusions about differences by householder characteristics. Another possible limitation is reluctance on the part of interviewees to be open as to the nature and reasons for their behaviours especially to outsiders. Nevertheless, the consistency of the results clearly signal the potential importance of PPS to public health approaches for tackling HAP and suggest the importance of further research elsewhere in Ethiopia and sub-Saharan Africa.

The interviews and FGDs were carried out by different interviewers with resultant variation in gender, language and status. This impacted on the researcher-participant dynamics and will have resulted in bias which is acknowledged. The use of field notes, reflective journal and daily field team discussions helped understand the impact of this on the findings, which appears to have been minimal as the same themes were constructed from the data irrespective of interviewer.

Conclusion

The use of PPS in this sample Ethiopian community is widespread; it is a fundamental part of the culture and there are many reasons for its use and many perceived benefits. The local community generally assumes that this is a safe practice for healthy individuals, and they do not equate it to the smoke from cooking, which is understood to be harmful. HCWs appear to feel that a lack of evidence of health harms means intervention is not justified.

PPS presents a dilemma for public health professionals; intervention would be unethical without evidence that its harms outweigh the perceived benefits. Therefore, public health research into HAP in similar settings should include PPS so that any intervention or behaviour change strategy is informed by a better understanding of all sources of HAP and the communities' perceptions of them.

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