A novel lung health programme addressing awareness and behaviour-change aiming to prevent chronic lung diseases in rural Uganda

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Abstract

Chronic lung disease is a huge, growing, but under-reported problem in Africa. Following a survey in rural Uganda, which found 16% of the adult population had COPD, we developed a lung health programme aiming to raise awareness in the community of the risk factors for developing chronic lung disease and how to reduce the risks.

A two-year train-the-trainer programme was conducted by healthcare workers (HCWs) in Masindi District, Uganda. Strategy and preliminary education materials were co-developed in a series of meetings with stakeholders including clinicians and community members. An initial group of HCWs were trained and further refined the education programme; they then taught other HCWs. Educational materials covered: "What is lung health?", "How lungs get damaged", "Smoking cessation" and "Preventing harm by reducing exposure to biomass smoke". These materials were approved by the Ministry of Health. Local radio messages were designed and broadcasted. We administered knowledge questionnaires before and after training for both HCWs and the community health workers (CHWs).

We trained 12 HCWs who then trained 47 other HCWs, and over 100 community health workers (CHWs). After the programme, knowledge questionnaire scores improved: for HCWs, the percentage of correct answers were 74% before and 89% after training, and for CHWs from 74% to 91%. Over 15,000 people have been educated directly and thousands more through mass media messages. Knowledge questionnaires administered to 1261 people in the community confirmed awareness of lung health.

This novel lung health programme illustrates how communities may be empowered to reduce their risks of developing chronic lung disease and is a model for addressing the rising tide of non-communicable diseases.

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Throughout the world, people of all ages are affected by chronic lung diseases (CLDs); 235 million have asthma and 251 million have chronic obstructive pulmonary disease (COPD).[1,2] The World Health Organization reports that COPD is now the third leading cause of death in the world, followed by respiratory tract infections and lung cancer.[2,3] The prevalence of CLDs is disproportionately higher in low- and middle-income countries (LMICs) and deprived populations; more than 90% of COPD deaths occur in LMICs.[4] COPD prevalence has increased by 35% in a decade in Africa.[5] While tobacco smoking is seen as the main risk factor for CLDs, in many LMICs biomass fuel use for cooking and heating is emerging as an important risk factor,[6] and perhaps even the greatest risk factor for the development of COPD.[7] Unfortunately, the poorest people in the rural areas are most exposed to biomass smoke as they cannot afford clean cooking fuels or stoves.[8] Data on CLDs and related risk factors, such as tobacco smoking and biomass fuel use, are scarce in most countries in sub-Saharan Africa and are not seen as a major health problem.[9] The knowledge of asthma and COPD among most healthcare workers is poor. In rural Uganda, most people are unaware of the damaging effect of tobacco smoking and biomass smoke, as well as other risk factors such as occupational exposures, severe childhood respiratory infections, tuberculosis (TB), and human immunodeficiency virus (HIV).[10]

The FRESH AIR Uganda survey undertaken in the rural district of Masindi in Uganda found a spirometry-based COPD prevalence of 16% among a representative sample of adults over 30 years of age.[11] The prevalence of COPD among adults between 30-39 years was almost 40%. The smoking prevalence in men was 34%; young women hardly smoked. Almost everybody was exposed to biomass smoke (91% of men and 95% of women), mainly caused by firewood for cooking in poorly ventilated houses. For most participants, the exposure started at conception and continued throughout their lives. Women averaged seven hours' exposure per day.

Following this survey, the healthcare workers (HCWs) met with the project team and discussed next steps. The HCWs identified the importance of raising awareness of lung disease and how to prevent or ameliorate these diseases by reducing exposures. They wanted this to be part of a comprehensive lung health programme using the unpaid community health workers (CHWs), also known as the village health team. A project of the development and implementation of an awareness-raising programme was undertaken with the following objectives:

1. To co-develop a cascading and sustainable 'train-the-trainers' module to train Masindi District CHWs and HCWs in improving lung health, including facilitating stopping tobacco use and reducing exposure to indoor

biomass smoke.
2. To co-create educational materials with CHWs which they can use with their local communities to support people to stop using tobacco and reduce their other risks to lung health problems.
3. To train HCWs to provide support for people to stop smoking tobacco through evidence-based interventions that are adapted to the local cultural and economic conditions and are feasible to implement in the context of rural Uganda.
4. To raise awareness in the community through direct training by CHWs and mass media such as local radio.

Materials and methods

We used a participatory approach to design and deliver a lung health awareness programme in rural communities of a resource-limited setting. First, we conducted a needs assessment through stakeholder interviews. We designed a programme that trained HCWs on lung health, who in turn trained CHWs, who in turn trained the communities. The trained HCWs delivered lung health awareness in their clinical settings to patients who sought care, while the CHWs delivered messages to the communities. To supplement this person-to-person delivery of messages, we undertook poster production and mass media message delivery through radio adverts and radio talk shows (details of the stakeholder interviews are available at www.plymouth.ac.uk/research/primarycare/fresh-air/global-bridges).

Needs assessment

To understand HCWs and community needs for lung health information, we conducted a needs assessment. We conducted a series of interviews and meetings in the district with stakeholders of varying seniority and roles from the politicians, administrators, and HCWs of all grades. We also interviewed senior clinicians from the National Referral Hospital. The meetings consisted of (i) explanation of the project, (ii) feasibility and acceptability of the project strategy and how it could be improved, (iii) review of educational topics and type of materials. While plans to audio-record the interviews proved unacceptable to several participants, details of every meeting were written up in contemporaneous notes. At the end of every day, the strategy and materials were adapted in line with feedback. Thus, in an iterative process, we absorbed the views of a range of stakeholders.

Development of preliminary educational materials

The project team reviewed available lung health education materials and received input from expert advisors to develop the curriculum and the contents as PowerPoint slides. Each person developed a set of slides independently which were then peer reviewed. Once agreed, they were used to educate the HCWs. The materials addressed tobacco and other forms of smoking, biomass and other forms of air pollution, and the impact of exposure at different times in peoples' lives.

Development of community education materials

For sensitising the community, the HCWs wanted to use flip-over charts which had pictorial messages on one side for the community and text on the reverse with main messages to be addressed. Posters were also needed for clinics. The group worked to produce draft materials in a two-day workshop comprising the project team and six health promotion and education experts from the Ministry of Health. The final materials were submitted to the Ministry of Health education department for further adaptation, professional illustration, and approval for national use.

Training of HCWs and CHWs

The train-the-trainers process is outlined in Figure 1.

Round 1: To develop a train-the-trainers programme, the course needs to produce (i) materials to educate trainers with sufficient knowledge to teach HCWs, and (ii) materials to teach the CHWs and villagers. The initial training package for HCWs was designed by the project team. The HCWs were selected from all levels of seniority and the programme was delivered in a three-day interactive meeting during which all aspects of lung health and smoking cessation were addressed (programme of training in supplementary material). The contents and key message and the format of educational materials were developed in these meetings (Figure 2). The HCWs were also taught principle of education theory by the district educator and how to deliver simple messages to the community. Successful candidates were awarded certificates of completion.

Round 2: The trained trainers trained a new cohort of HCWs, tested the materials and teaching methods, and again, feedback led to changes. The ratio of trainers to trainees varied according to local facilities but was up to two trainers to 10 trainees. The sessions were conducted in a workshop format using a combination of didactic teaching with the materials developed in the project, such as PowerPoint slides and flipcharts, and interactive

Figure 1: Outline of the train-the-trainers process

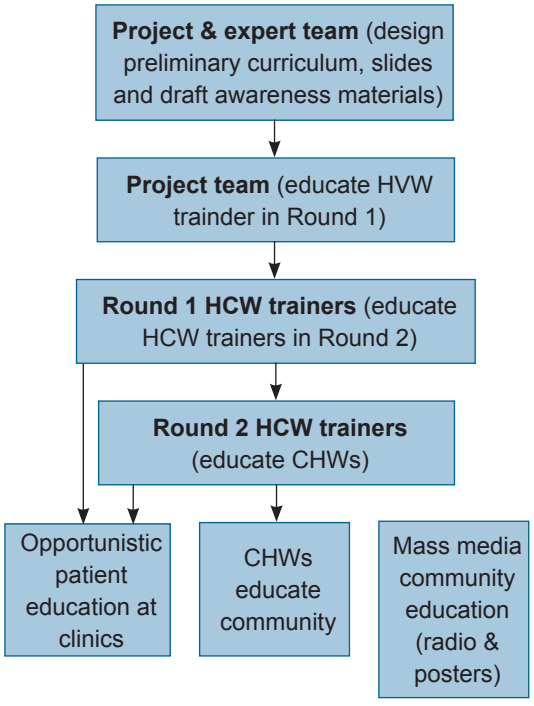
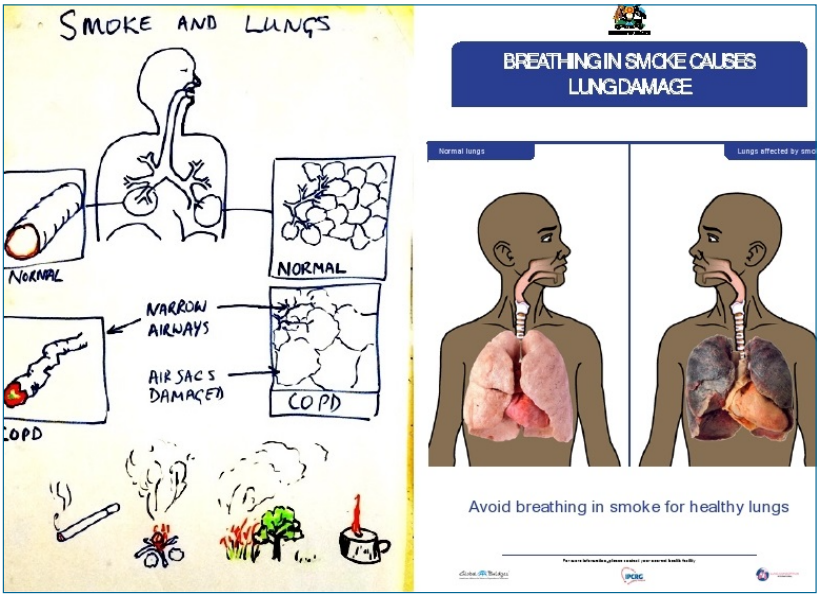


Figure 2: Draft poster from the project workshop and final (simple) version adapted by the Ministry of Health



discussion. The training was supervised by the project team and a senior health educator from the Ministry of Health. This new cohort of trained HCWs went in pairs to the community to train the CHWs.

Round 3: Each trained HCW was responsible for training CHWs in villages closest to their health facilities. The CHWs then trained people in their villages using flip-over charts (Figure 3). At each stage of training, the HCWs completed a knowledge questionnaire before and after the training.

Ongoing support of the HCWs

To provide ongoing support in an affordable way, we adopted the use of mobile telephone technology (SMS) to provide HCWs with updates, but also to collect data about their activity. Although we planned a toll-free mass messaging system to HCWs and CHWs, we discovered that most available systems did not have a modality for receiving feedback. Therefore, we used a mobile phones to send messages and to receive feedback.

Mass media messages

To promote community awareness, the team explored methods for reaching the wider community, including local radio through adverts and talk shows. A local radio station with a large audience and wide coverage was selected.

Evaluation of the awareness programme in the community

CHWs were provided with a form to record numbers of people they had provided lung health education to, using the materials provided in face-to-face consultations.

After the project, a survey of the knowledge of lung health dangers and key lung diseases was run to assess penetration of messages on CHDs. The CHWs submitted a list of all households in their villages from which a random sample of ten households in each village was selected. Using a questionnaire designed by the project, each CHW conducted the survey in ten households in their respective village.

Results

Stakeholder interviews

The team undertook 14 interviews involving 51 stakeholders in January 2014. They spoke to senior clinicians at Mulago National Referral Hospital in Kampala and in the Masindi district, and spoke to local government officers including the Chairman of the District and the Secretary for Health, the District Health Officer for Masindi, and HCWs, CHWs, and community members/villagers: in all, 3 politicians, 8 doctors, 17 nurses, 7 HCWs, and 3 administrators.

The interview themes were that the Lung Health project was both feasible and encouraged; the slides needed a variety of changes in content, scope, and presentation.

Train-the-trainer programme

Using a cascading model in three rounds, we trained 12 HCWs in round one, 47 in round two and 100 CHWs in round 3, a total of 159. These figures were in excess of our planned numbers to be trained. We modified the training by shortening the didactic training from five to three days, reserving the last two days for the trainees to work in groups to adjust the materials. No important problems arose during training and the confidence of the trainers improved with experience of delivering a well-received programme.

Quantitative evaluation was conducted with pre- and post-knowledge questionnaires developed during the project. After the first groups were run, we modified the questionnaires for better clarity and to remove non-discriminatory items. The results of the subsequent HCWs undergoing training showed general improvements where initial knowledge was suboptimal (Table 1). Their mean scores before training were 74% correct, and after, 89% were correct. As expected, some facts were already well-known, such as particulate matter and carbon monoxide are toxic products in biomass smoke. Other facts, such as that vaccinations are a component of lung health, were less well-known. Only two out of 36 questions showed no improvement

Figure 3: Village healthcare team using the flipchart to educate villagers

Table 1: Results of the survey of the knowledge of HCWs trained by peer HCW trainers before and after training: number correct/total respondents (%)

Item	Correct before	Correct after
1) In a room with 1 window		
a. Enlarging the window has substantial impact on ventilation	13/25 (52)	13/25 (52)
b. Creating a second window has substantial impact on ventilation	22/14 (92)	22/22 (100)
2) The use of energy-saving stoves uses only a third of the wood compared to the traditional stone fire and takes smoke away from the house	20/25 (80)	24/25 (96)
3) Health status (quality of life) and airway obstruction (FEV1) in COPD are strongly correlated with each other	4/25 (16)	22/25 (87)
4) Severe COPD patients often have thin thighs	10/24 (42)	25/25 (100)
5) All the following are toxic products in biomass smoke:		
a. Particulate matter with small particles that can be inhaled deep in the lungs (PM10/PM2.5)	21/26 (81)	24/25 (96)
b. Sulphur dioxide	22/25 (88)	25/25 (100)
c. Oxygen	24/25 (96)	23/25 (92)
d. Carbon monoxide	22/26 (85)	25/25 (100)
6) Exposure to biomass smoke worsens		
a. infectious diseases like TB	25/25 (100)	25/25 (100)
b. children infection	19/26 (73)	25/25 (100)
c. but does not affect children growth	6/15 (40)	25/25 (100)
d. their chronic diseases like asthma	25/26 (96)	25/25 (100)
7) Risk factors of chronic lung diseases are		
a. Tobacco smoke	26/26 (100)	25/25 (100)
b. Biomass smoke	26/26 (100)	25/25 (100)
c. Outdoor air pollutants	17/24 (71)	24/25 (96)
d. Exposure to cockroaches	2/24 (8)	1/24 (4)
e. Grain milling	25/26 (96)	25/25 (100)
f. Tuberculosis	24/26 (92))	25/25 (100)
8) Second-hand smoke exposure can cause preterm delivery	20/26 (77)	23/25 (92)
9) What percentage of Ugandan adults smoke? 1) 7.9% 2) 50% 3) 2% 4) 90%	11/23 (47)	14/19 (61)
10) What causes dependence on tobacco? 1) Nicotine 2) Nitrogen 3) Smoke 4) Tar	20/25 (80)	25/25 (100)
11) Asthma occurs in (mark true and false)		
a. small children	20/26 (77)	21/25 (81)
b. adults	23/26 (88)	22/25 (85)
c. old people	23/26 (88)	23/25 (88)
12) Asthma treatment aims to (mark true and false)		
a. control symptoms	19/25 (76)	22/25 (85)
b. prevent attacks	20/25 (80)	21/24 (87)
c. return lung function to normal	19/25 (76)	19/24 (79)
13) In asthma, inflammation causes (mark true and false)		
a. wheeze	26/26 (100)	25/25 (100)
b. cough	23/26 (88)	24/25 (96)
c. coughing blood	21/26 (81)	22/25 (88)
14) Lung Health involves (mark true and false)		
a. preventing infections	26/26 (100)	25/25 (100)
b. early recognition of acute infections	25/25 (100)	25/25 (100)
c. vaccinations	11/25 (44)	21/25 (81)
15) The following conditions always need treatment with antibiotics:		
a. Acute viral upper respiratory tract infections	13/13 (50)	7/25 (28)
b. Asthma attacks	18/25 (72)	14/25 (56)
c. Pneumonia	26/26 (100)	25/25 (100)

after training. Similarly, the CHWs also showed improvements in their knowledge questionnaires (Table 2), with their mean scores rising from 76% correct to 91%.

Development of educational materials

The content and presentation of the education materials evolved through the life of the project. At a workshop with HCWs, the project team and health promotion experts from the Ministry of Health reviewed the materials and made changes. The themes included: normal lungs and how they develop; lung health and CLD; what causes CLD; preventing lung damage by smoking cessation; reducing exposure to biomass smoke; and early detection and treatment of infections.

While our materials were co-developed with both HCWs and expert opinion, they were improved and simplified by ministry educational experts (Figure 2). These materials were then sent to a professional health illustrator and printed. These materials were tested in three different major cultural communities of Masindi (Alur, Lunyoro and Lugbara). They were also endorsed by the National Tuberculosis Control Program and the Uganda Non-Communicable Diseases Control Program, and thereafter approved by Uganda's Ministry of Health for national use.

The final flip-over chart and posters are available at theipcrg.org/tobacco-dependence-uganda.

Use of mobile telephone technology

In March 2016, we attempted to develop SMS messages for mobile phones for the HCWs in the project as specified in the protocol. Initially, the team opted for a toll-free line; however, the long bureaucratic processes, as well as costs, were beyond the allocated activity budget line. Ultimately, the project manager sent messages directly from her phone to the project staff and this was a success with some, but not all, HCWs. However, block sending of SMS to obtain large-scale responses to queries and for data collection was not successful.

People educated by CHWs on lung health

CHWs were asked to report how many people they had taught in face-to-face encounters. Although they were asked to record this number, the completion of logs was inconsistent. However, each was asked to estimate the number of people they had taught and the figure was in excess of 15,000. CHWs reported that many other education projects are funded to provide enticements for the community members to attend education meetings (such as paid venues, food and drinks); such funding was not available in this project, so the HCWs took opportunities when people were already gathered, e.g. after church services or other meetings and in that way, were able to reach their communities.

Evaluation of the awareness programme

A survey collected 1244 questionnaires in randomly chosen households after the awareness campaign to assess penetration of information delivered. The mean age was 37 years (SD 15.7), 586 (50%) were female, 119 (18%) were current tobacco smokers. There were high degrees of knowledge of the dangers of tobacco smoke but, even after the campaign, less than half the population had awareness of biomass smoke exposure, with only 30% giving correct answers to questions about biomass smoke and the damage to unborn children (Table 3).

Table 2: Results of the knowledge questionnaires of 95 CHWs before and after training: number (%)

Item	Correct before	Correct after
1. Our lungs can be damaged by breathing in harmful things like tobacco smoke, smoke from cooking or infections like Tu-berculosis	95 (100)	95 (100)
2. Smoke from tadooba or kerosene lantern can damage our lungs when we breathe in	89 (94)	95 (100)
3. Tobacco smoking can result into diseases like Tuberculosis	90 (95)	89 (94)
4. Chronic Obstructive Pulmonary Disease (COPD) is also a lung disease which can result from tobacco/cooking smoke	75 (79)	94 (99)
5. Tobacco smoke is only dangerous to smokers but not to other members of the family who stay with smokers	24 (25)	24 (25)
6. Pipe smoking is more dangerous than cigarette smoking	52 (55)	43 (45)
7. When a pregnant woman smokes, the tobacco smoke can make her have		
(i) Miscarriage	70 (74)	91 (96)
(ii) Death of her baby	48 (51)	91 (96)
(iii) Small babies	51 (54)	85 (89)
8. To stop smoking, a smoker needs help	93 (98)	95 (100)
9. Biomass smoke is smoke generated from burning plants, grass, crop residue or cow dung	66 (69)	92 (97)
10. Tobacco smoke or smoke from cooking fires can increase chances of getting cancer	86 (91)	90 (95)

Table 3: Post-project knowledge on lung diseases, effects of tobacco and biomass smoke exposure in randomly selected households in Masindi District

Item	n	%
Knowledge about lung diseases		
Have you ever heard about Asthma?	1116	96
Have you ever heard about Chronic Obstructive Pulmonary Disease?	847	77
Tobacco smoking and knowledge of its dangers		
Tobacco smoke causes disease of the lungs and heart	1085	95
Tobacco smoke can cause cancer	1035	91
Tobacco smoke can damage blood ves-sels	919	85
Knowledge of adverse health effects of biomass smoke		
Sore eyes	545	43
Upper respiratory tract infections	507	40
Respiratory problems like cough, chest pain	730	58
Heart problems	470	37
Damage to unborn baby	373	30
Asthma	587	47
COPD	381	30
Other diseases	61	4.9
Source of knowledge		
From Hospital Health worker	373	35
From our CHW meetings	419	39
Over the radio	268	25
From the newspapers	18	1.7

Mass media messages

To reinforce awareness, draft radio messages (radio talk show guide script and radio adverts) were also developed by the project team. Experts from divisions of Health Promotion and Education at the Ministry of Health recommended changes that were incorporated. After finalising the radio messages, the team contacted two radio stations in the target area (Masindi) and selected one (Radio Kitara) with the widest coverage in that area. The radio station, together with the project team, produced the radio spot message in English and translated it into two prominent local languages (Lunyoro and Swahili) to cater for the illiterate communities. In March 2016, the project community liaison officer presented the first project radio talk show about lung health on Radio Kitara with three further chat shows. Subsequent radio talk show sessions were presented at three times in April 2016. The adverts on Radio Kitara ran for two consecutive months and for one month at the completion of all the project activities.

Discussion

We aimed to develop a novel comprehensive lung health programme to raise awareness of the scale, nature, and risk factors for CLDs in rural Uganda and how they can be prevented or reduced. In a two-year project, we designed educational materials within a train-the-trainer programme and implemented it within the existing district care health system and delivered a train the trainer programme to 150 HCWs and directly educated over 15,000 people.

In the last ten years, there has been an exponential rise in the number of publications addressing the health effects of biomass smoke exposure and ambient air pollution. The overwhelming evidence that air pollution causes respiratory and other long-term conditions is now widely accepted.[12,13] However, while most of the research addresses the problems, little research has been undertaken to find practical solutions that may be implemented in LMICs. Intervention studies have had mixed results, for example in the CAPS study[14] have tested a simple solution, one type of improved cookstove, to a complex problem. Our intervention was developed in the community by the people who were responsible for delivering it and involved a complex menu of possi-solutions for the community to employ as they saw fit.

The challenge in this project was to distill research evidence into a simple train-the-trainer programme to make people aware of how to avoid damaging their lungs, by primary prevention or improving outcomes with people with existing CLD. Several factors made the community in Masindi district receptive to our messages, in particular, the lifelong impact exposure to biomass smoke, and how children and pregnant women were at risk. Biomass smoke exposure is associated with adverse events in children, including neonatal deaths, early life pneumonia, and asthma.[15-17]

Amongst community members, there was some awareness of the importance of developing symptoms such as cough and breathlessness, but they had little understanding of the diseases which might be causing the symptoms and what should be done about them.[10] The term COPD was virtually unknown, despite its prevalence. Learning that stopping smoking and reducing biomass smoke exposure also lowered the risk of heart disease and any cancers added impetus to our messages.

Tobacco smoking is relatively uncommon in Uganda generally (around 7% in the National Tobacco survey)[18] but in tobacco-growing areas, the prevalence is much higher. While smoking tobacco was recognised as a risk for adult lung disease, there was less awareness of the importance of second-hand smoke, which has been shown to cause increased mortality and morbidity from asthma and respiratory infections in both adults and children.[19] Masindi is a tobacco-growing area; tobacco is cheaply available and is important to create wealth for growers. Tobacco is cured in huts using wood fires; the children attending the fires receive high levels of smoke exposure. Tobacco-curing contributes to outdoor air pollution and to deforestation.[20] In turn, wood shortages often mean people burn green leaves and twigs which produce more toxic smoke than dry wood.

The programme sought to raise awareness and suggest possible solutions, e.g. clean cookstoves, improved ventilation, or keeping away from cooking smoke. The lung health programme helped to address the complex range of issues including environmental problems, fuel poverty, and ways to reduce exposures and demonstrate additional gains. For example, benefits of improved cookstoves were reducing fuel needs, meaning less time collecting wood and more time to grow food, but new cookstoves may also reduce house fires and burns. In each village, there

were different ways the community became engaged; for some protecting childrens' health, for some reducing effort to collect wood. For the community to engage in positive action, it was critical that they owned the solutions and had long-term support from HCWs and the local administration.

Tobacco is taken in many forms including shisha, and anecdotal evidence suggests that this is becoming more socially acceptable, especially in more affluent young women who previously seldom smoked tobacco.[21] Shisha is perceived to be safer than cigarettes but is in fact just as toxic. Thus, the social and cultural roots of tobacco use needed to be addressed before smoking cessation could be implemented.

Many public health projects which are organised with external funding are viewed with suspicion by the Ugandan health community as they provide a short-term input and then disappear, leaving a vacuum. To avoid this, the lung health programme was embedded in the local community health system using HCWs and CHWs to deliver it, with involvement of senior administrators including the District Health Officer an author on this paper. Preliminary ground work was critical, with stakeholder interviews involving input from all levels of the community, and their input into the design and content of the materials gave them ownership.

The role of community HCWs is crucial if the problems of non-communicable diseases (NCDs) such as CLD are to be addressed.[22] The scale of NCDs requires that management needs to move from hospitals to the community, where the CHWs are well-placed to raise awareness of the causes and prevention of NCDs. Dynamic partnerships between experts and HCWs may promote best practice.[23] In this project, the HCWs were involved in the design and contents of the educational materials and then in teaching and delivering the education. The lessons about biomass smoke and tobacco are not exclusive to lung disease, so there is cross-fertilisation and reinforcement of health promotion messages for other NCDs, which made the job of the CHWs easier. Expertise from the national experts in public health, health education, and international experts on health also provided valuable input into the design and contents of the programme.

To maintain, support, and monitor the awareness-raising activities by health care workers, we used mobile phone support. Despite optimism, in reality, logistical issues and cost supervened and using text messaging en masse proved expensive and impractical. Radio adverts and chat shows were more successful and reached a large audience.

One unusual aspect of this programme is the comprehensive health approach including tobacco and biomass smoke exposure, but also the importance of vaccination and how to recognise lung diseases at an early stage before they became advanced. In particular, for both COPD and TB, detection at an early stage, before extensive irreversible lung damage has been caused, is critical to outcomes. Therefore, our key messages further overlapped with other public health campaigns, such as for childhood vaccinations, TB diagnostic programmes, and HIV awareness. Synergy with other public health initiatives provided opportunities for the healthcare workers to introduce lung health when talking about TB programmes, and conversely, talking about immunisations in the lung health programme.

Impact of CLD is greatly affected by social and psychological factors. For the affected, ignorance of the cause and how to address it leads to a feeling of powerlessness and maladaptive behaviours such as resting, which worsen the prognosis. Simple steps to take, such as keeping active, eating well, and avoiding noxious exposures were not known even amongst HCWs. Many people believed that their symptoms were caused by witchcraft, again leading to fear and helplessness. Chronic cough was widely considered to be a danger to others and stigmatisation is common; even with negative TB tests, isolation is common and some became outcasts.[10] In the community, improving knowledge of the CLDs and dispelling myths helped to reduce the stigma associated with the symptoms. In the close-knit communities, particularly amongst women, stigma can have a powerful effect on their health, social welfare, and prospects. Fear of TB paradoxically caused people to delay seeking medical attention.

The lung health programme was well-received and has potential to prevent CLD, to ameliorate suffering by education on the causes and positive steps to take to improve health. In particular, the dispelling of myths has the potential to improve unnecessary suffering from myths, ignorance, and social rejection. Further research is needed in targeted education programmes for people with COPD and asthma and high-risk populations such as pregnant women and small children.

The limitations of this study include that the effects have only been measured in the short-term; evaluation in the long-term will be necessary to demonstrate sustained impact. The true benefits of this intervention will be in improved health outcomes but it is not possible in the timeframe to evaluate these. A control group where no intervention took place would reduce the chance that confounding factors were responsible for improvement, as opposed to the intended aspects of the intervention. When working in a low-resource setting, the free provision of a new service may be gratefully received, irrespective of its true worth. Furthermore, HCWs may find it difficult to provide negative feedback about the programme as that might be perceived to be disrespectful and impolite, thus the reported benefits maybe inflated and the shortcomings diminished.

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Ethical approval

We obtained administrative clearance from the Masindi District Health Officer and village leaders for conduct of the training and awareness campaigns. As this study involved no patients, only healthcare workers and surveys of the general population, research ethics approval was not required. No individual trainee or information beneficiary consent was required.

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