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Development and validation of an intervention package to improve lifejacket wear for drowning prevention among occupational boaters on Lake Albert, Uganda

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ABSTRACT

Background Occupational drowning is a growing public health concern globally. The human cost of fishing is highest in sub-Saharan Africa. Although lifejackets prevent drowning, the majority of boaters in Uganda do not wear them. We developed and validated a peer-to-peer training manual to improve lifejacket wear among occupational boaters on Lake Albert, Uganda.

Methods The intervention was developed in three stages. In stage one, we conducted baseline studies to explore and identify aspects of practices that need to change. In stage two, we held a stakeholder workshop to identify relevant interventions following the intervention functions of the behaviour change wheel (BCW). In stage three, we developed the content and identified its implementation strategies. We validated the intervention package using the Content Validity Index for each item (I-CVI) and scale (S-CVII/Ave).

Results Seven interventions were identified and proposed by stakeholders. Training and sensitisation by peers were unanimously preferred. The lowest I-CVI for the content was 86%, with an S-CVII/Ave of 98%. This indicates that the intervention package was highly relevant to the target community.

Conclusion The stakeholder workshop enabled a participatory approach to identify the most appropriate intervention. All the proposed interventions fell under one of the intervention functions of the BCW. The intervention should be evaluated for its effectiveness in improving lifejacket wear among occupational boaters.

BACKGROUND

Water-related activities of fishing and water transport are among the oldest occupations in the history of humanity. These occupations come with many risks of drowning.¹ Drowning is the third-leading cause of unintentional injury deaths globally.² Over 90% of the burden occurs in low-income and middle-income countries (LMICs).³ Moreover, these global estimates exclude drownings from transportation and flood disaster-related disasters which are important in the context of many LMICs. The human cost of fishing is astronomical, with over 100 000 annual deaths among fishers.⁴ Lakeside fishing communities suffer the heaviest toll.^{3 5 6} In sub-Saharan Africa, frequent access to water is higher among the people involved

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Some interventions on lifejacket wear among parents and leisure/recreational boaters have been conducted in high-income countries, many of which have been found effective.
- ⇒ These interventions resulted in significant reductions in the burden of fatal drownings in these settings.

WHAT THIS STUDY ADDS

- ⇒ We developed and validated the first-ever peer-led training package aimed at improving lifejacket wear for drowning prevention among boaters involved in occupational boating activities in a rural low-income setting. The package provides an opportunity for uniform messaging among occupational boaters, which will debunk many of the myths surrounding lifejacket wear.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ This study does not have a direct influence on research, practice and policy in Uganda. However, it provides a detailed description of the process of developing and validating a contextualised training manual for use by peers to improve lifejacket to prevent drowning. This manual is an opportunity to scale up to other similar communities and encourage uniform messaging. It hence reduces the chances of false messages and myths surrounding lifejacket wear among communities around other water bodies. When implemented and found effective, the manual can be adopted for use by the relevant government ministries to prevent drowning in Uganda.

in occupational activities compared with those in leisure/recreational activities (high-income countries, HICs).⁷ Despite limited surveillance systems, the WHO African region is estimated to have one of the world's highest drowning death rates of 8 per 100 000 population.² Uganda contributes the highest rate recorded in lakeside fishing communities globally, estimated at 502 per 100 000 population.^{5 8}

Lifejackets are above 80% effective in preventing drowning deaths.^{9–12} Despite this high efficacy, between 81% and 95% of the people who drown from boating-related activities in both HICs and LMICs do not wear them.^{13–16} Observed lifejacket wear among lakeside fishing communities on Lake Victoria, Africa's largest freshwater body, ranges from just 2% in Tanzania¹⁷ to 26% in Uganda.⁸ On Lake Albert, Uganda, this is even much lower; a baseline survey that preceded this study revealed that observed lifejacket wear among occupational boaters was less than 1%.¹⁸ In general, low lifejacket wear among boaters in Uganda has been attributed to many factors. Earlier studies in these communities showed that insufficient knowledge about the benefits of lifejackets, and incorrect lifejacket wear practices were among the factors for low lifejacket use.^{8 19}

Uganda is located in the Great Lakes region of Africa, with nearly 20% of her surface area being covered by water.²⁰ It is a land locked country with over 38 districts, occupied by more than 14 million people²¹ who are either next to or totally surrounded by a water body.²² Frequent access to water, therefore, remains inevitable for millions of people who depend on these water bodies for their livelihoods. However, safety practices are left to individual decisions. While some drowning prevention interventions have been developed in HICs, it is difficult to generalise them to low-income settings like the rural settings of Uganda due to the differences in contexts,^{9 13 23 24} and a few studies that involved commercial fishers.^{1 25 26} In some communities in Uganda, men who wear lifejackets are viewed as cowards, inexperienced on the job, weak and 'feminine'.¹⁹ A contextualised intervention is crucial in debunking these widespread myths and beliefs. We aimed to develop and validate a contextually appropriate intervention training manual to improve lifejacket wear

practices to prevent drowning among occupational boaters on Lake Albert in western Uganda.

METHODOLOGY

Study setting

The development of this intervention training package was preceded by multiple preliminary studies on drowning and life-jacket use in Uganda and along the shorelines (landing sites) of Lake Albert in western Uganda (figure 1).^{16 18 19 27} Lake Albert is Africa's seventh largest freshwater body found along the Uganda-Democratic Republic of Congo border, covering about 5600 km² with a maximum depth of 48 m.²⁸ The lake is one of the five major ones in Uganda, supporting the local livelihoods of about four million people who mainly depend on fishing and water transportation as lifeline economic activities.²¹ According to the National Fisheries Resources Research Institute and Uganda Police Marines, there are over 70 landing sites on the Ugandan side but only about half are gazetted. However, due to the rising lake water levels, many had been flooded; leaving only 22 accessible and occupied at the time of this study. The number of boaters on the landing sites ranges from 150 in a 'small' landing site to over 470 in a 'big' landing site, with the total number of fishers estimated to be over 15 000.²⁹

Selection of intervention

The selection of the intervention was through a participatory approach involving key stakeholders. We followed the eight steps of intervention development collapsed into three stages described by Michie *et al* (figure 2).³⁰ At stage one, the behavioural term was defined by identifying the target group of people (boaters) and the required behaviour (lifejacket wear).

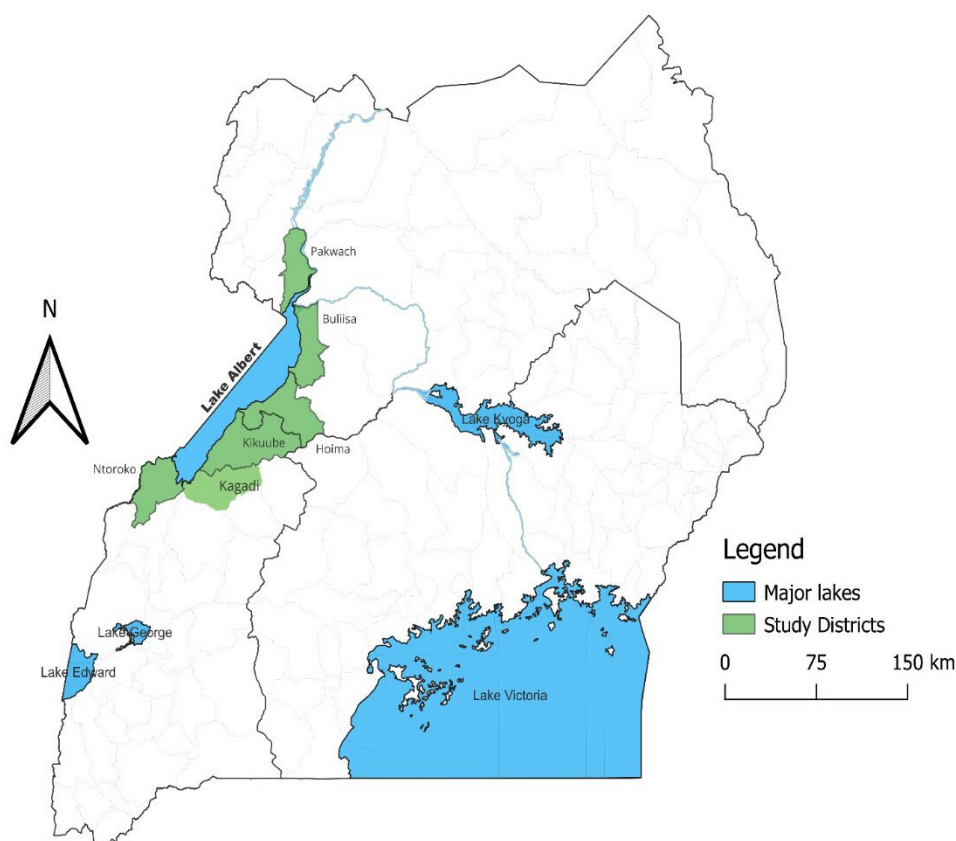


Figure 1 Map of Uganda showing Lake Albert and the surrounding districts.

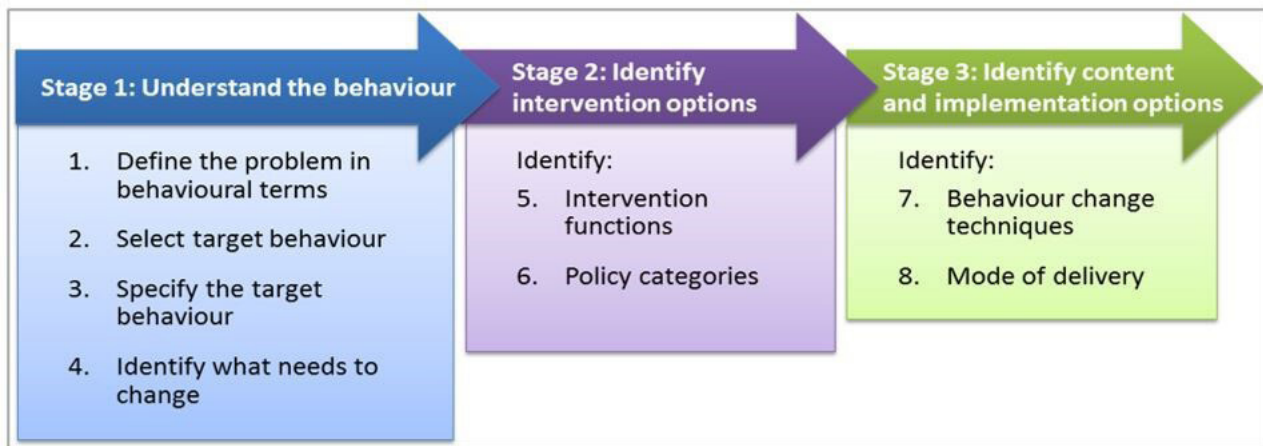


Figure 2 Steps in identifying behaviour change interventions.

The required change was identified based on the results and findings from the baseline survey^{18 19} and the stakeholder insight workshop. At stage two, intervention options were identified from the intervention functions of the capability, opportunity and motivation for behaviour change (COM-B) model of the behaviour change wheel (BCW)³¹ grounded in the theoretical domains framework (TDF).³² To ensure the heterogeneity of the workshop participants, different cadres of stakeholders were invited, including fishermen, transport boat operators, boat owners, Police Marines, lifejacket sellers and the local leaders in the respective study sites.

Eighteen participants from 14 landing sites attended the workshop. The participants were divided into three groups (six people per group) and were asked to suggest and rank interventions from the most preferred and feasible to the least. Output from the group discussions was presented in plenary, after which the proposed interventions were put to vote. The intervention option with the most votes was considered as the most preferred. At stage three, content and implementation options

were identified in consultation with experts in drowning prevention and behaviour change communication experts.

Intervention development

Drafting phase: content development

Drafting the content included writing the text, choosing the relevant illustration images/pictorials, formatting, layout and packaging into a training manual. The drafting was guided by literature and consultation with experts on drowning prevention. The draft was structured under subtitles of background, purpose, objectives of the training, training outcomes, target audience and duration of the training. The content was packaged in three modules (table 1). Relevant pictorial illustrations were to be used during the training, where necessary. A mix of training and instruction methods was proposed for use, including lectures, role plays, demonstrations and storytelling. The content of the modules was then taken to validation through expert scrutiny.

Table 1 Modules for training peers on lifejacket wear

Course details	Mode of delivery	Duration
Module 1		
What is drowning	Lectures, storytelling, role play	5 hours
Case scenarios on drowning		
Definition of a lifejacket and other personal floatation devices (PFDs)		
Roles of peers in promoting lifejacket wear		
Why use a lifejacket		
How a lifejacket works		
Module 2		
Different types of lifejackets?	Lecture, demonstrations	3 hours
Selection of right type of lifejacket		
Characteristics of a good lifejacket		
Who should use a lifejacket		
Module 3		
Correct donning procedures for lifejacket	Demonstrations, role play, lectures	3 hours
When should you wear a lifejacket?		
Care for your lifejacket		
What you should do		
Convincing a person to wear a lifejacket		
PFD, Personal Floatation Device .		

Validation phase

We adapted the approach used by Farizan *et al.*³³ Apart from the expertise of FO, seven experts (four researchers with extensive knowledge and experience in drowning prevention, one behaviour change communication expert, one instructional material designer and one educationist/professional teacher) were asked to evaluate the content. One of the four researchers was an international expert in drowning prevention in similar settings while all the others were local experts who were familiar with the context. The experts reviewed and rated the content of the manual independently in relation to the objectives. The communication expert was requested to critically review the suitability and applicability of the modes of delivery in relation to the target audience as well as the simplicity of the messages to a non-technical person. All the comments raised by the communication expert were addressed accordingly.

We included a 33-item list of parameters that the experts were asked to evaluate using a 4-point Likert scale. The experts were asked to pay attention to the objectives, structure and presentation, relevance and writing style, and the pictorials used. This aimed at assessing the degree to which the content was relevant in addressing the behaviour of interest (lifejacket wear), that is, 1—strongly disagree, 2—disagree, 3—agree and 4—strongly agree. We obtained the rating by each expert by assigning ‘1’ if the rating was 3 or 4, and ‘0’ if the rating was 1 or 2. To ensure the validity of the intervention training manual, we computed the content validity index for each item (I-CVI). In addition, we computed the scale-level CVI (S-CVI/Ave). To obtain the number of raters in agreement, we summed up the ratings provided by the different raters for each item for which the raters agreed. To calculate the universal agreement (UA), we assigned ‘1’ if all the raters agreed 100% on a particular item, and ‘0’ if not all the raters agreed on a given item.

Assessment of face validity

After translating the content into Alur and Runyooro, the local languages that are widely spoken in the study area, face validity

was assessed. Fourteen boaters from the target community were selected to give their opinion about the messages, specifically focusing on how readable, how understandable and how relevant they were. This was assessed using a list of 16 items. The assessment was based on a 5-point Likert scale: 1—strongly disagree, 2—disagree, 3—neither agree nor disagree, 4—agree, 5—strongly agree. None of the respondents selected option three. The author calculated the extent to which these respondents agreed based on the assessment parameters using I-CVI and S-CVI/Ave. The comments and concerns raised by the technical experts and the community members were addressed to arrive at the final document. Figure 3 shows the process of development.

Who are the peers in this study?

From the insight workshop, we defined a peer as a boater who is a drowning survivor who was wearing a lifejacket at the time of the incident, and this should have occurred in the last 2 years. The 2 years were preferred to minimise recall bias as they shared their experiences with their peers during the training sessions. In situations where a drowning survivor was not available, the replacement was a person who was a consistent user of a lifejacket. We defined a consistent user as a person who reports having worn a lifejacket for all the last seven trips in a boat on the lake and with proof of lifejacket ownership. The peers were to be identified through the boat owners and privately screened by the study team to meet the operational definition. In addition, the peers had to be known members of the landing site, with a reasonable command of respect in the opinion of the landing site leaders.

Administrative clearance from Uganda Police Marines and the leadership of the landing sites was obtained before the study. Only adults (18 years and above) were recruited as peer trainers. All the peers were volunteers who wished to contribute to saving the lives of their colleagues through ‘citizen watch’. During the training, meals and refreshments were served. In addition, a modest transport refund was given to all the peers (trainees). In the second month of the intervention, each peer was given a new

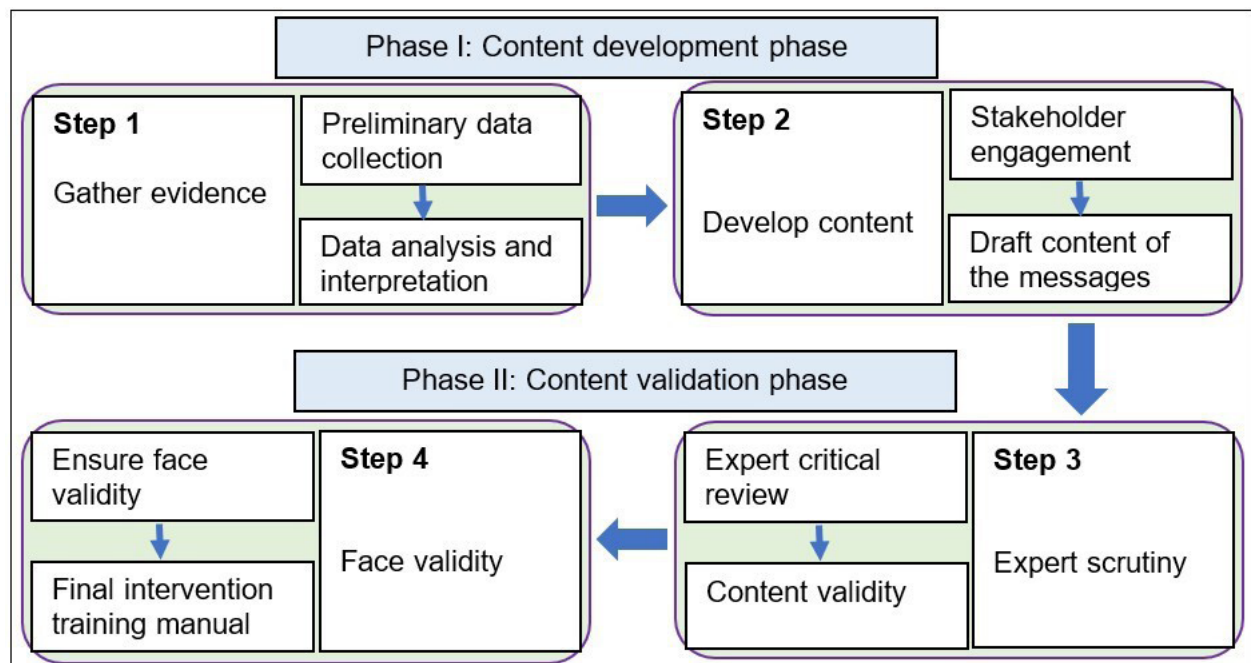


Figure 3 Process of development of the intervention.

Table 2 Identification of interventions to improve lifejacket wear among boaters on Lake Albert, Uganda, substudy 3

Level one: group discussion				
S/N	Suggested intervention	Groups that mentioned		
		Grp 1	Grp 2	Grp 3
1.	Provide free lifejackets	✓	✓	
2.	Create bye-laws	✓		✓
3.	Sensitisations to be done by colleagues and the locals	✓	✓	✓
4.	Train on proper lifejacket wear	✓	✓	✓
5.	Avail of lifejackets at landing sites at subsidised prices	✓	✓	
6.	Teach people how to swim	✓		✓
7.	Improve quality of lifejackets		✓	
Level two: general voting		No of mentions		
1.	Provide free lifejackets	15		
2.	Create bye-laws	12		
3.	Sensitisations to be done by colleagues and the locals	18		
4.	Train on proper lifejacket wear	18		
5.	Avail lifejackets at the landing sites at subsidised prices	15		
6.	Teach people how to swim	10		
7.	Improve quality of lifejackets	05		

seaworthy lifejacket as a means of motivation. We also provided prepaid phone airtime to facilitate communication between the peers and the study team.

Patient and public involvement

The public was involved in the design, conduct, reporting or dissemination plans of this research. The leaders of the boaters participated in the consultative insight workshop and their preferences for the types of intervention were considered. Peer trainers were partly identified by the leaders of the landing sites. The results of the intervention will be disseminated through workshops where the representatives of the boaters will be invited.

RESULTS

Development of the intervention content

Seven interventions were proposed and voted for by the stakeholders. All 18 participants unanimously voted for sensitisation and training on lifejacket wear, while 15/18 voted for the provision of free lifejackets and subsidies on lifejacket prices. Improving the quality of lifejackets had the fewest votes (5/18) (table 2).

Content and face validity of the training manual

The I-CVI calculated for individual items ranged from 0.86 to 1.00, which met the minimum acceptable level for at least six raters.^{34 35} The S-CVI using the I-CVI average for the 33 items

was 0.98 while the S-CVI using the UA, S-CVI/UA was 0.88, all above the minimum acceptable S-CVI of 0.80 (online supplemental table 1).³⁵ For face validity, our results showed that the respondents to the largest extent agreed on most of the items, with the lowest I-CVI being 86% and an S-CVI/Ave of 96% (online supplemental table 2). The ratings shown by both the I-CVI and the S-CVI/Ave indicated that the experts and part of the community members agreed that the intervention package was appropriate and relevant to the target audience.

Mode of delivery

Following the steps for identifying behaviour change interventions,³⁶ the main mode of delivery identified was; physical/face to face, also referred to as peer-to-peer training. This was to be supplemented by the use of posters/stickers (online supplemental figure 1) and text messages. The text read *Dear (name of person), a good lifejacket is one you are wearing. You can drown and die anytime if you don't wear a lifejacket. Wear it. This message is brought to you by Makerere University and Landing Site Management Committee.* All messages were translated into the local languages that can be read by the majority of the target community (Alur and Runyooro).

DISCUSSION

This study aimed to develop and validate an intervention to improve lifejacket wear practices to prevent drowning among occupational boaters on Lake Albert, Uganda. Based on the results from the general voting shown in table 1, the intervention option with the highest number of votes was taken into implementation while considering its feasibility and resources. Therefore, increasing awareness about the benefits of lifejackets and their proper use was the most preferred intervention. In particular, the participants pointed out the need for a peer-to-peer approach to sensitise and train their colleagues. This was justified by the mobile nature of the boaters, but also as an opportunity to share their experiences among themselves with the people they are free or identify with. Sensitisation would aim at creating awareness and improving knowledge about the benefits of lifejackets, while training would entail imparting skills on proper donning practices. These preferences of the workshop participants can be aligned to the constructs of the COM-B TDF model, which indicate that both education and training are contents of the BCW.³¹ Indeed, modelling is an important component of the BCW, in this study considered as peers. Using the BCW was, therefore, helpful in identifying the source of behaviour as well as categorising the kinds of interventions proposed by the participants based on the intervention functions and policy categories.

The peers found it convincing to use printed or written material translated into the local language as a reference document while teaching their colleagues. This provides a basis for giving correct information about lifejackets to prevent drowning among at-risk communities. The need for educational interventions among fishermen has been recommended in many studies. For example, an assessment of occupational hazards and the use of safety devices by fishers in Kerala, India and prevention of commercial fisher deaths in Laska recommended that it is important to educate fishers to use safety devices such as lifejackets to prevent drowning.³⁷ In addition, the use of standardised reference documents such as training manuals, booklets and leaflets has been cited as one of the approaches to increasing awareness about drowning prevention.³³ In addition, a safety training programme for commercial fishermen was developed in the USA, to prevent

drowning among the fishers.¹ Not only this, health education pamphlets and leaflets have been used to teach patients in many settings about various public health-related issues.^{38 39}

The intervention package (training manual) developed in this study will improve the accuracy and consistency of information on drowning prevention, specifically on lifejacket use among boaters and fishing communities in general. However, care is needed when translating the manual into other languages and adapting it to respective contexts. This training package is helpful in addressing and correcting some myths to improve drowning prevention practices, especially given the gaps in the legislative framework on drowning prevention in Uganda. The water bodies of Africa's great lakes region pose serious drowning risks that require systematic approaches to prevention. Equipping community members with the right knowledge about prevention methods is one of the ways of ensuring resilience.

Evaluation and validation of the training manual

All the raters of our intervention package generally rated the content highly, as evidenced by the high I-CVI and S-CVI/Ave. This means that the content of the package was relevant in addressing the behaviours of interest in the target community. Validation is important in ensuring the relevance and trustworthiness of any research tools. Moreover, for training manuals, involving experts from different disciplines is crucial for the inclusiveness of various dimensions of behaviour. This training manual is credible because it underwent rigorous reviews by experts in drowning prevention in the region and globally. This improves the credibility, and acceptability of the study outputs for use in the different fields of practice. A similar approach was used in Malaysia to develop and validate a health educational booklet for use by parents to prevent drowning among children.³³

To the best of our knowledge, this is the first manual designed and validated with the aim of improving knowledge and proper use of lifejackets among the boaters involved in occupational boating activities in Uganda. However, a previous unpublished quasi-experimental study on Lake Victoria also used short message service (SMS) and posters as a means of delivery of messages to the general fishing communities. Our approach is different in two ways: (1) the target audience is exclusively boaters involved in occupational boating activities and (2) in addition to posters and SMS reminders, we have introduced peer-to-peer physical teaching/training as the main mode of delivery. However, we do recognise that this manual has some limitations. The face validity was determined using communities living around just one lake out of the many large water bodies in Uganda. Therefore, this manual may not be generalised for use in all fishing communities in Uganda due to the different socio-cultural factors among others. This calls for further contextualisation of the manual to different communities that experience different risks.

CONCLUSION

The stakeholder insight workshop was key in ensuring a participatory approach during the identification of the most appropriate intervention for the target community. The intervention functions of the BCW of the COM-B model grounded in the TDF was instrumental in guiding intervention options. Providing a training package for the proper use of lifejackets is crucial in ensuring uniformity of the messages passed to the fishing and water transport fraternity. This is important in debunking the myths that have surrounded lifejacket wear in fishing

communities for a long time. There is a need to implement and test the effectiveness of this peer-led training intervention to improve lifejacket wear to prevent occupational drowning.

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Contributors FO conceptualised the study, led the writing of the proposal and obtained ethical clearance, supervised the data collection process, oversaw the analysis and led the writing of the manuscript. FN reviewed the protocol to ensure scientific rigor, guided the identification of the intervention and critically appraised the manuscript. OK and JJ played an instrumental role in advising on intervention options based on their experience in drowning prevention research and injury epidemiology and prevention in general. FEM reviewed the protocol and advised on computation of the content and face validity index to ensure relevance of the intervention package. JBI reviewed the manuscript to ensure intellectual content. SPSK participated in the facilitation of the workshop, reviewed the manuscript and provided expert advice on the best approaches to behaviour change communication. However, FO took full responsibility for the conduct of the study and final manuscript as the guarantor; he had full access to the data and controlled the decision to publish. All authors have approved the final manuscript.

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Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Consent obtained directly from patient(s).

Ethics approval This study involves human participants and this study was approved by Makerere University School of Public Health Research and Ethics Committee (SPH-REC), and registered with Uganda National Council for Science and Technology (UNCST), registration #SS992ES. Participants gave informed consent to participate in the study before taking part.

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