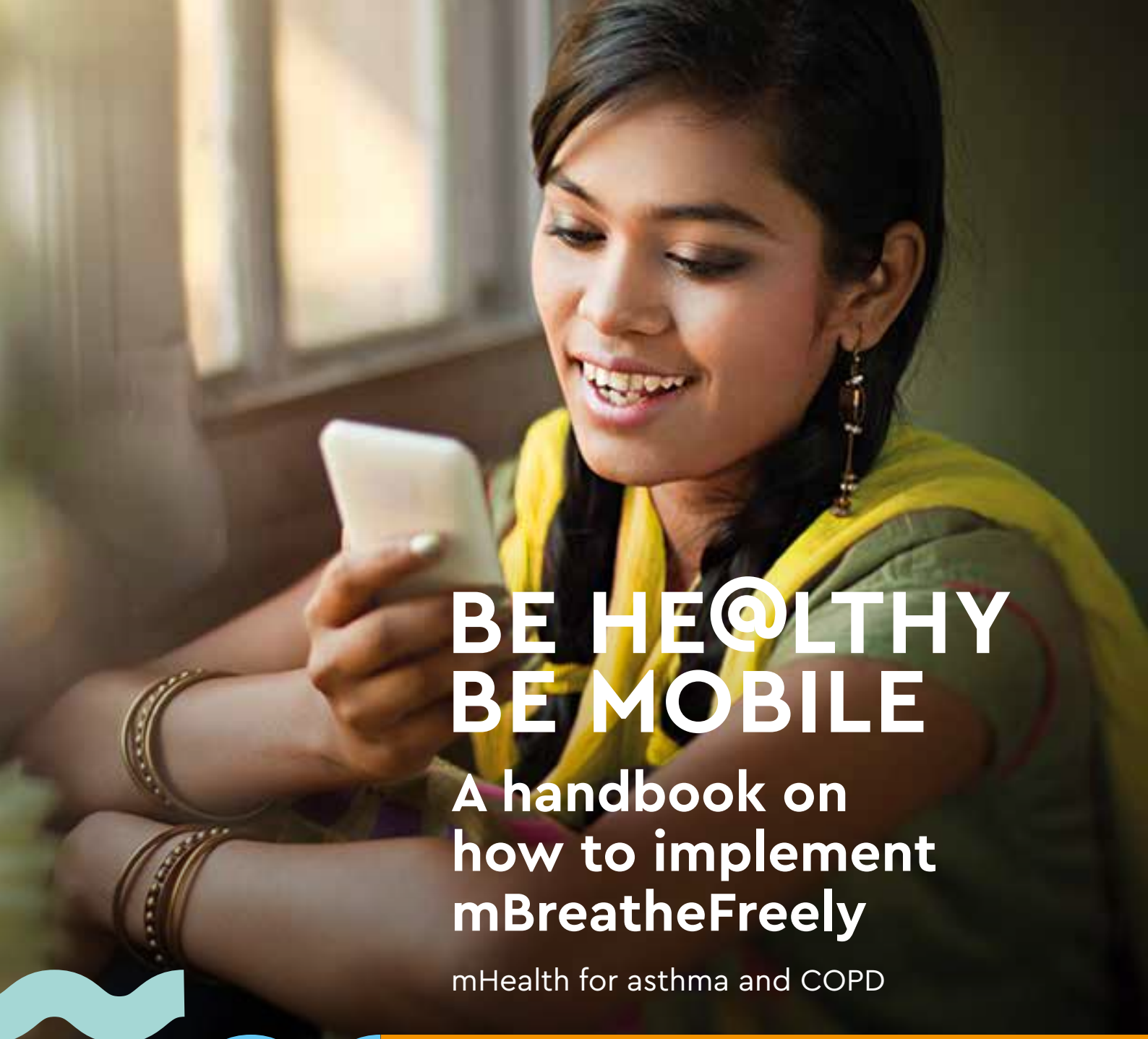

BE HE@LTHY BE MOBILE

A handbook on how to implement mBreatheFreely

mHealth for asthma and COPD

World Health Organization

ITU

A handbook on how to implement mBreatheFreely, mHealth for COPD and asthma

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A handbook on how to implement mBreatheFreely

mHealth for asthma and COPD

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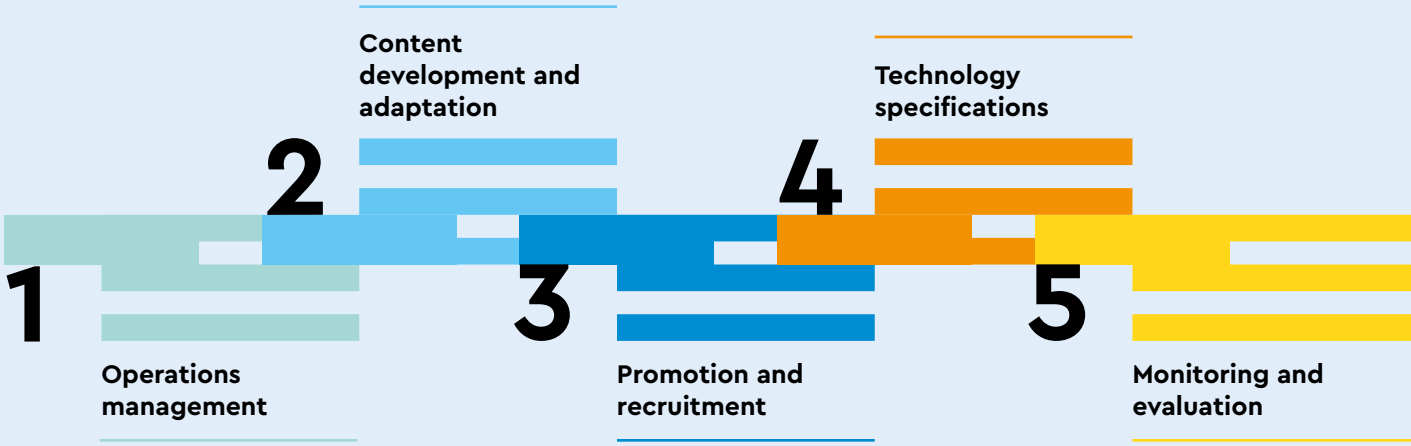
Contents

Executive Summary

The Be He@lthy Be Mobile initiative is a global partnership led by the World Health Organization (WHO) and the International Telecommunication Union (ITU), representing the United Nations agencies for health and information communications technologies (ICTs). The initiative supports the scale up of mobile health technology (mHealth) within national health systems to help combat noncommunicable diseases (NCDs). These include diabetes, cancers, cardiovascular diseases and chronic respiratory diseases, such as asthma and chronic obstructive pulmonary disease (COPD). These are long-term conditions that can significantly affect both the quality and length of patients' lives, especially in settings where resources for diagnosis and treatment are limited.

To help address these issues, Be He@lthy Be Mobile has developed the mBreatheFreely programme, which uses mHealth to provide health information and support to people living with asthma and COPD. mHealth is defined as "medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices" (1).

The mBreatheFreely handbook was prepared by an international group of experts in mHealth for asthma and COPD, in collaboration with WHO and ITU, to **provide guidance for country governments and policymakers to develop, implement, and evaluate an mBreatheFreely programme for the prevention and control of asthma and COPD**. The health messaging provided in the handbook uses evidence-based behaviour change techniques to help persons at risk of, with, or caring for those with asthma and COPD, prevent and manage these conditions. This handbook describes the considerations and decisions to be made in planning a national mBreatheFreely programme in five key areas:



For each area, evidence-based operational guidance and resources are given, which can assist governments in drawing up a detailed workplan for a national mBreatheFreely programme. Subsequent annexes provide information on existing programmes, example programme algorithms and message content, timelines and costing templates.

THE BURDEN OF ASTHMA AND COPD

Chronic respiratory diseases are long-term conditions affecting the respiratory tract. The two most common conditions are COPD and asthma. COPD affects more than 200 million people worldwide (2). An under-diagnosis rate of 72–93% has been reported (3). About 300 million people suffer from asthma and its incidence has been increasing over recent decades (4,5). The greatest burden of lung disease occurs in low- and middle-income countries, where almost 90% of COPD deaths and 80% of asthma deaths occur (6,7). Diagnosis and treatment of chronic respiratory diseases in low- and middle-income countries are hampered by barriers including access to medical care, as well as poor public awareness of the diseases and their risk factors. Access to assessment, diagnosis, management and preventive measures must be improved in order to reverse this trend. Awareness of key risk factors, such as the use of tobacco and indoor and outdoor air pollution, and their reduction could also help to reduce the burden and mortality trends.

WHAT IS MHEALTH FOR ASTHMA AND COPD?

The use of mobile technology including short message service (SMS), mobile phone applications (apps), and telemedicine is increasingly considered as a way to improve access to prevention, diagnosis and management of COPD and asthma (8). Studies on the use of text messaging in disease management and disease prevention indicate that text messaging can be an effective tool in certain aspects of health behaviour change and disease management. High-income countries, such as Denmark, Norway and the United States of America, are implementing mHealth programmes for COPD, and many small-scale studies have either been completed or are underway focusing on mHealth for asthma (9–12). SMS and app programmes are the most common forms of mHealth (13). Low- and middle-income countries mostly use SMS solutions.

mHealth is promoted as a strategy to support self-management of both asthma and COPD. While mHealth mediated self-management is not consistently superior to usual care, it is a safe option for delivery and support of self-care. An overview of literature on mHealth in asthma and COPD can be found in Annex 1, and five examples of mHealth programmes are described in Annex 2.

WHY USE MHEALTH FOR ASTHMA AND COPD?

Most mHealth applications for asthma and COPD currently focus only on management for severe cases of either disease. In addition to management, however, there is also a need to focus on improving self-management education to prevent symptoms (by being proactive, intervening early, using a stepped care model, among others) and disease progression (such as targeting persons with mild cases), thus providing practical help to patients so that they can manage both their treatment and their daily lives with minimal support from the health system. To address the imbalance in research focus, there is also a clear need to translate effective models of care from high-income countries and adapt them to low- and middle-income country settings.

WHAT IS AN MBREATHEFREELY PROGRAMME?

The mBreatheFreely programme is designed as a population-based programme targeting asthma and COPD. It should take into account a wide diversity of individuals and their motiva-

tions for changing their approach to self-management and managing their condition. Even if the majority of a population does not have asthma or COPD, some people may still be interested in the programme because they know someone with asthma or COPD, while others may be at high risk or have undiagnosed asthma or COPD. Although an assessment of needs and capabilities will be performed prior to implementing the programme in any particular location, the programme will aim to provide information to enhance prevention, motivate testing in people at risk, and provide appropriate, culturally relevant guidance both for people with chronic respiratory disease and for the general population.

When implementing the programme, it is important to keep in mind that factors that contribute to asthma or COPD may differ geographically, even within a country, particularly as a result of income disparity. The significance of dietary habits, physical activity and access to health care must also be considered.

A comprehensive mBreatheFreely programme in a wide geographical area should aim to address the spectrum of disease of asthma and COPD, the use of appropriate technologies, and the needs and cultural norms of the population. mBreatheFreely interventions should be embedded in the continuum of prevention and care, as mHealth can support services at all levels (Box 1).

MAIN TARGET POPULATIONS

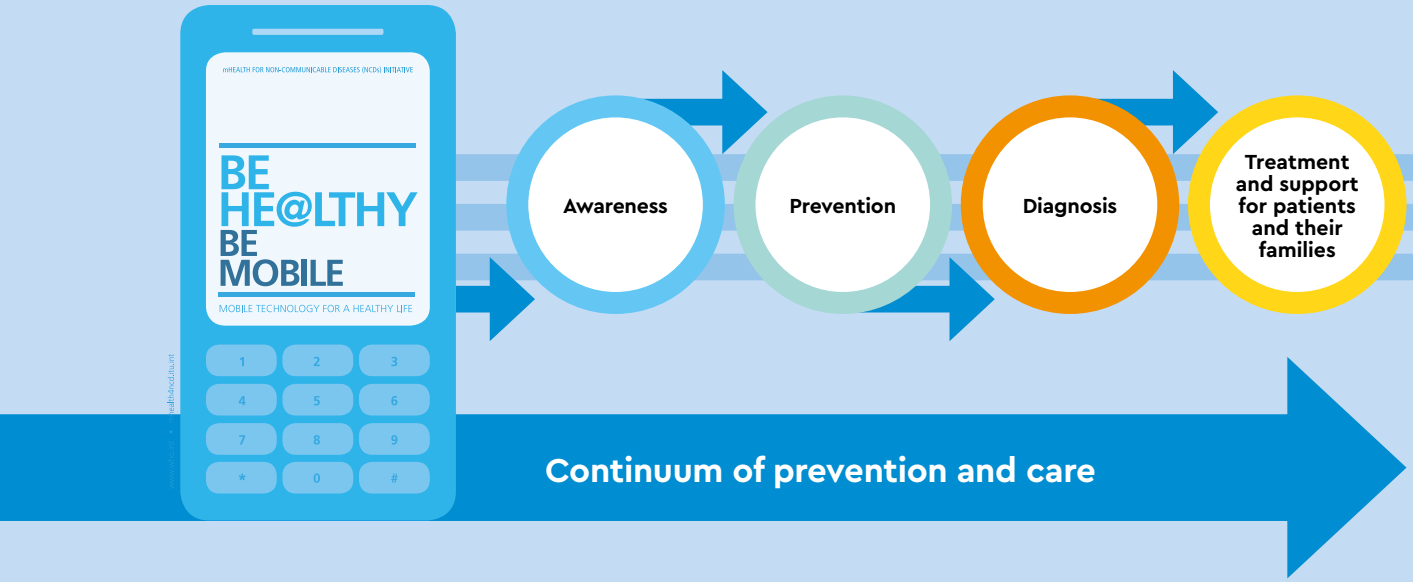
Persons with asthma or COPD
diagnosed and undiagnosed

Persons with risk factors for asthma or COPD
including smoking or biomass smoke exposure

Health care workers, and carers
such as parents of children or other relatives

BOX 1. THE ROLE OF MHEALTH IN THE CONTINUUM OF CARE

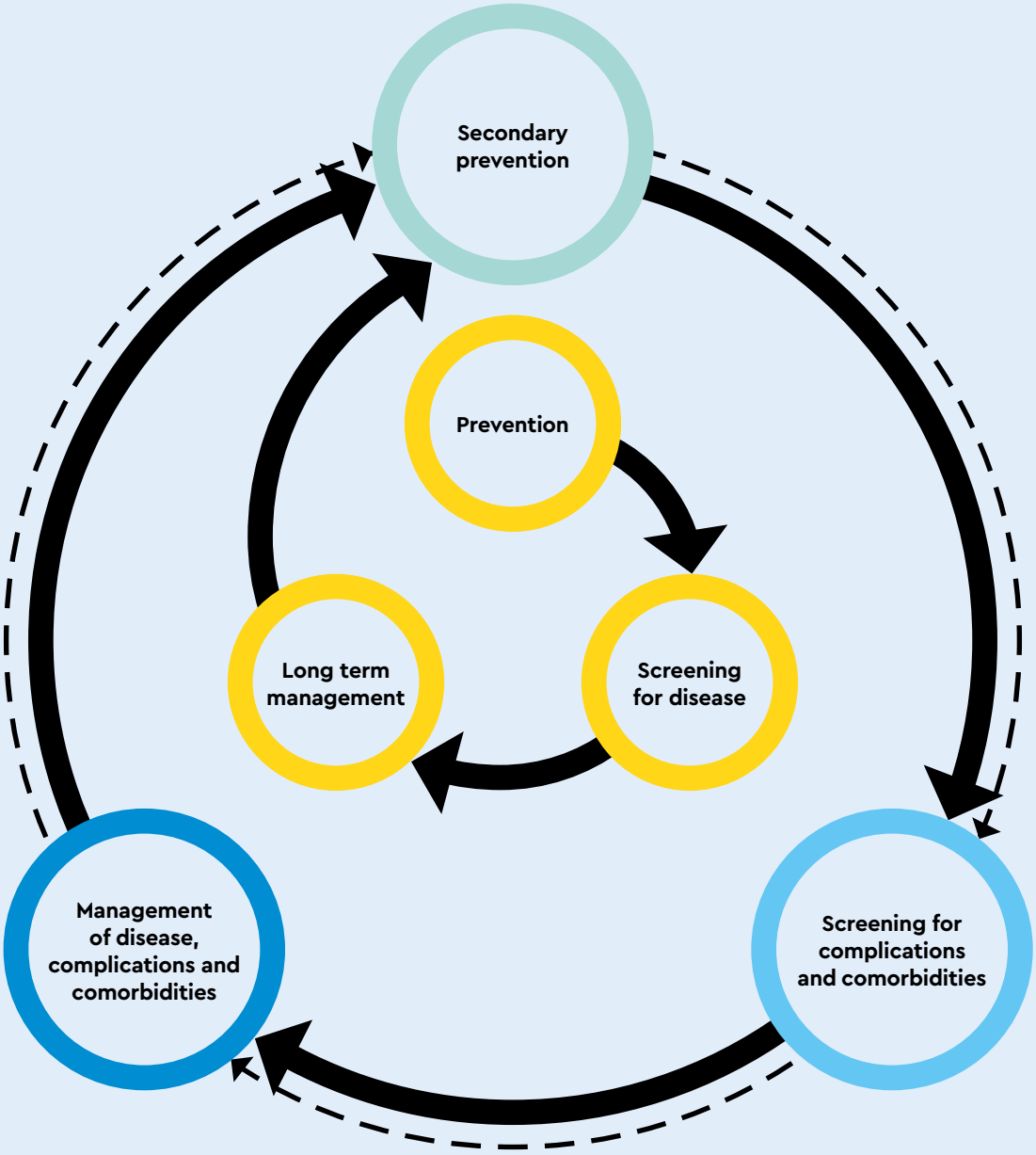
Action to improve chronic respiratory diseases in low- and middle-income countries needs to take place along a continuum that encompasses awareness raising, prevention, diagnosis, treatment and support for patients and their families. Action at each stage across this continuum has implications for the other stages and there are complex interactions. Prevention cannot take place without awareness raising amongst the population. Awareness raising also increases the demand for diagnosis and treatment. Diagnosis cannot be considered in isolation from treatment and support opportunities. Some actions, such as smoking cessation, constitute both prevention and treatment. Focusing on one aspect of this continuum alone would fail to identify implementation issues that arise from the often complex interaction between these stages in real life practice. mHealth can help at all the stages in the continuum of prevention and care.



mHealth activities are not meant to stand alone, but ideally should be integrated into existing healthcare delivery systems to ensure optimum impact.

This could include activities such as endorsement by, enrolment in, and monitoring of mHealth programmes by health care workers. It could also include integration with broader public health programmes utilizing schools, parents, employers, as well as national awareness campaigns. Five main areas in which mBreatheFreely programmes may be useful as part of a broader, structured national respiratory diseases programme are: prevention, screening, long-term management, secondary prevention of exacerbations and for specific conditions (Figure 1). In settings where national respiratory diseases programmes are not available, however, the mBreatheFreely programme may be added to other established programmes, if deemed appropriate after careful needs assessment, such as tuberculosis programmes, or other Be He@lthy Be Mobile mHealth programmes, such as mTobaccoCessation.

FIGURE 1. CONTINUOUS (SECONDARY) PREVENTION, SCREENING AND MANAGEMENT



An example of an mHealth programme that has been used to address respiratory diseases is described in Box 2.

BOX 2. PROGRAMME EXAMPLE: MHEALTH FOR ALLERGIC RHINITIS AND ASTHMA – THE MASK PROGRAMME

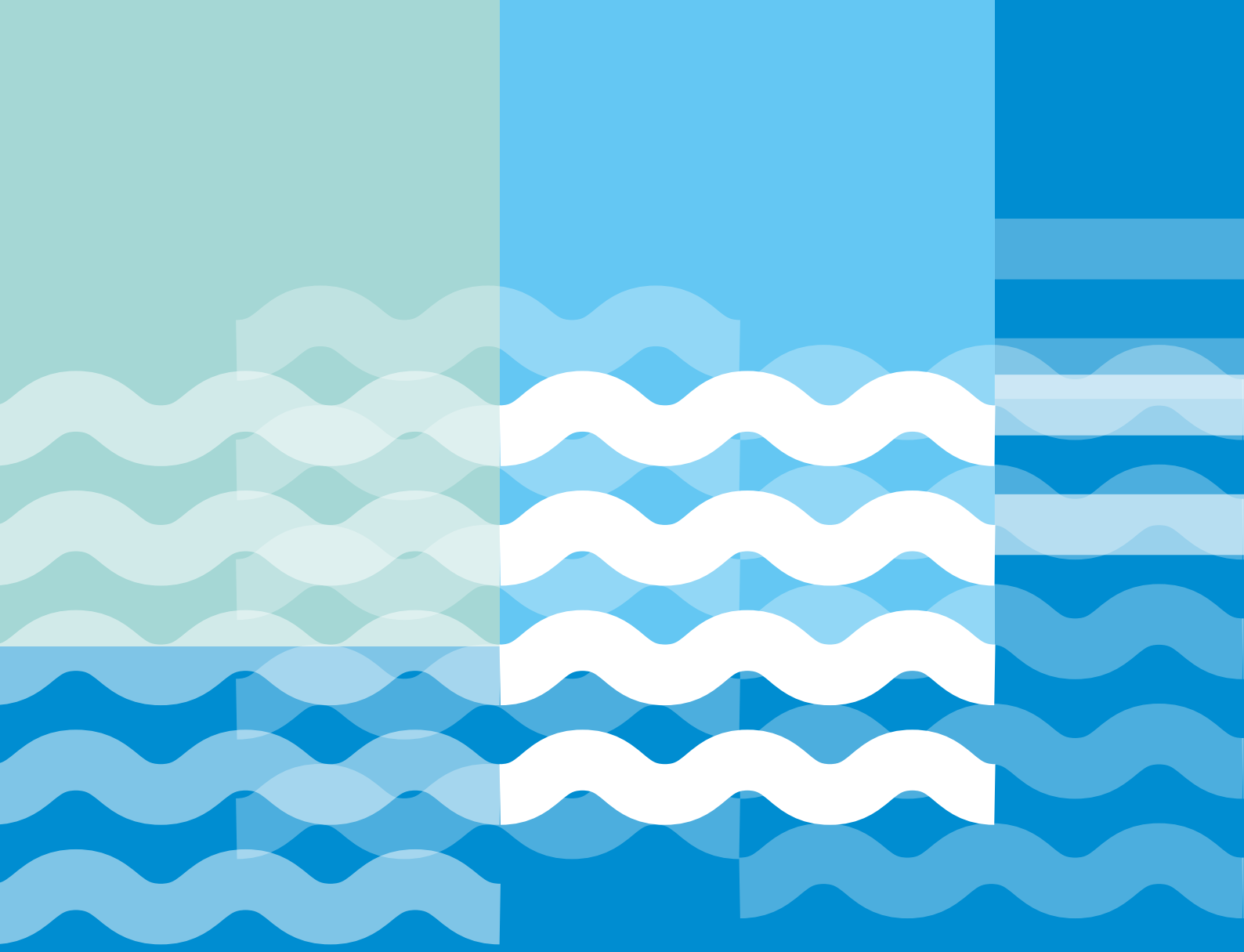
Background: MASK (MACVIA-ARIA Sentinel NetworK for allergic rhinitis and asthma multimorbidity) is patient-centred ICT system (14–16) that enables patients to access a user-friendly app on their smartphone. It is one of the implementation tools of the European Innovation Partnership on Active and Healthy Ageing (17,18), set up by the European Commission.

Application: A mobile phone app (called the Allergy Diary) has been developed and launched in 22 countries (19). This app uses visual analogue scales (response scales ranging from 1 to 10) which the patient can use to assess his or her rhinitis, conjunctivitis, asthma control and productivity at work (20). The app also has a scroll list including all the rhinitis and asthma medications available in the patient's country. 0ver 11,000 users have been recorded. A simple questionnaire administered by mobile phone enables the identification of differences between specifically defined rhinitis groups.

Results: The results suggest novel concepts and research questions in allergic rhinitis that may not be identified using classical methods (18). A study using the visual analogue scale has shown that work impairment is strongly associated with the inadequate control of rhinitis, conjunctivitis and asthma (18).

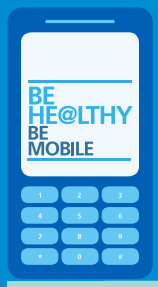
Implications: This study validates work impairment data that is collected from the app. Furthermore, it validates data on the app itself, especially the distribution of responses for the visual analogue scale. A clinical decision support system (providing clinicians, staff, patients or other individuals with knowledge and information to enhance health and health care) is available for patients who use tablets. It is based on algorithms (a list of steps to be followed in order to solve a problem) developed by an expert group (37). Data on treatment for rhinitis or asthma are currently being analysed. The project is being expanded by 22 "reference sites" of European Innovation Partnership on Active and Healthy Ageing (38). Reference Sites are organizations that work with the European Union to improve the lives and health of older people. They are currently working to better understand, assess diagnose and manage the burden of rhinitis and asthma in the elderly, as compared with the adult population.

Some of the lessons learned in the field from these programmes, as well as other large-scale international programmes, will be presented in this document. The efficacy of programmes is context-specific and depends on a whole host of factors, including patient preferences, health system structure and service type.



Developing a national mBreatheFreely programme

FIVE AREAS OF THE MBREATHEFREELY PROGRAMME



1 Operations management

2 Content development and adaptation

3 Promotion and recruitment

4 Technology specifications

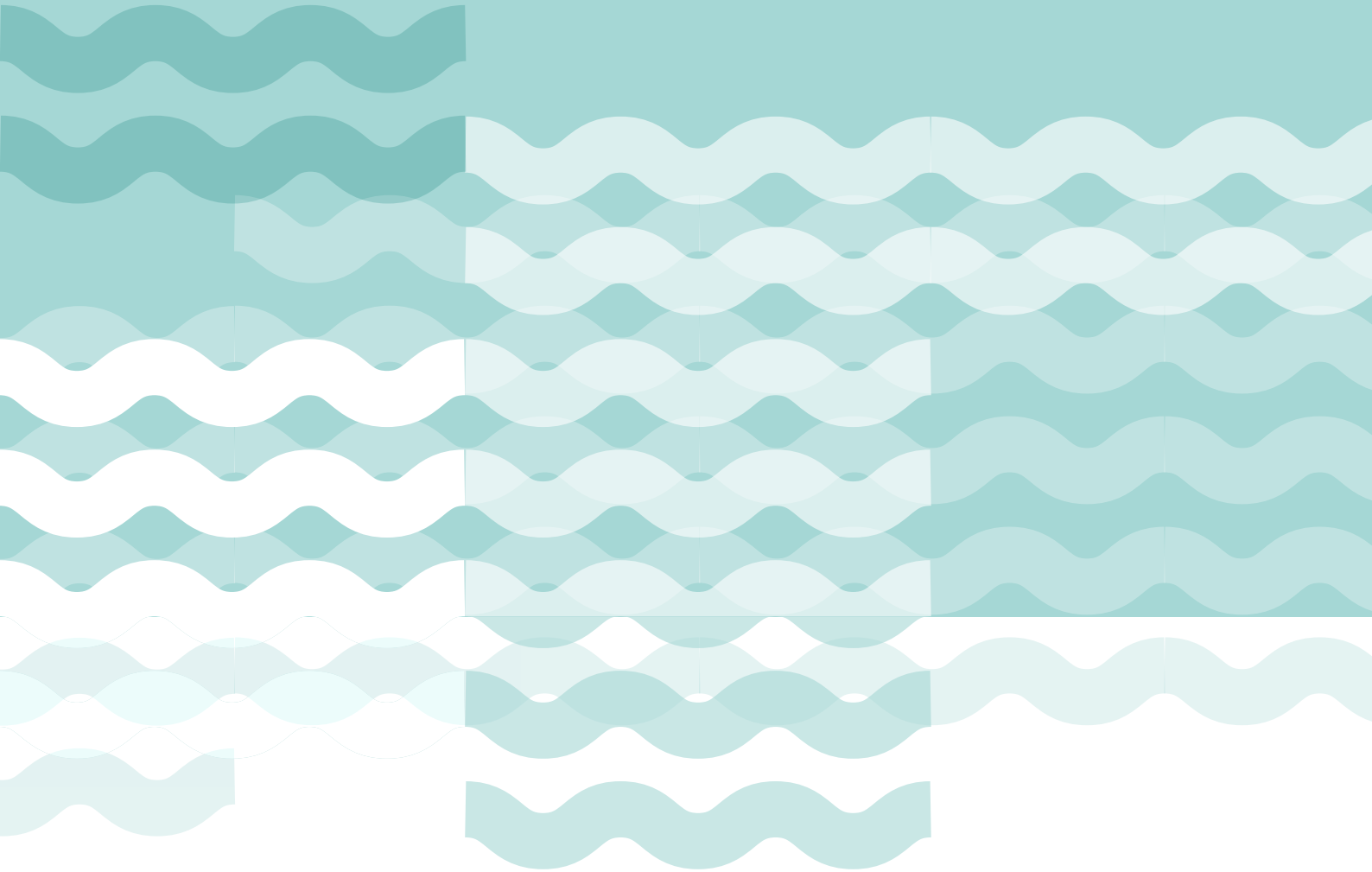
5 Monitoring and evaluation

This handbook also contains annexes that include:

- background literature
- examples of mHealth programmes for asthma and COPD
- an example mBreatheFreely message library and algorithm template
- considerations for project management

SECTION 1

OPERATIONS MANAGEMENT



This section describes several key activities that need to be considered in the planning phase of a national mBreatheFreely programme:

- Needs assessment
- Programme leadership and partnership
- Formative research.

1.1 NEEDS ASSESSMENT

For an mBreatheFreely programme to be effective, it is essential to understand the context in which the intervention will be delivered. A needs assessment provides a vehicle for establishing information for planning, identifying gaps in knowledge and helping with decision-making and will help determine the relevant barriers and facilitators of behaviour change for people with (or at risk for) chronic respiratory diseases or their caregivers in each participating country's context. Conducting a needs assessment will provide an understanding of the setting for the operations management teams. Table 1 lists the considerations for conducting a needs assessment.

The needs assessment should be performed in an iterative manner in which stakeholders are encouraged to identify sources of information and additional stakeholders. The data will inform the development and implementation of a national mBreatheFreely programme, and help establish baseline measurements from which the programme can be monitored and evaluated.

TABLE 1. NEEDS ASSESSMENT

TOPIC	POTENTIAL SOURCES	METHODS	EXAMPLE QUESTIONS
Burden of chronic respiratory disease (CRD) and risk factors for CRD	Public health officials, Published records on prevalence of CRD and CRD risk factors	Qualitative interviews, surveys, literature reviews	What is the burden of asthma? What is the burden of COPD? What is the prevalence of smoking? What is the impact of air pollution?
Perceptions of CRD	Public health officials, healthcare workers, persons with CRD or CRD risk factors, carers for persons with CRD	Qualitative interviews, focus groups, surveys	How does the population perceive respiratory symptoms? To what extent does the population have knowledge about CRD? Would patients and people at risk identified by mBreatheFreely be taken care of by existing programmes? Are there any patient organizations active?
State of prevention and control programmes	Public health officials, public health records, healthcare workers, healthcare facilities, persons with CRD or CRD risk factors	Qualitative interviews and focus groups, surveys, health care facility visits and observation, review of public health records	What programmes are running in your country (asthma, COPD, tobacco cessation or comparable)? What are the aspects of those programmes that are effective? How could the mBreatheFreely programme be integrated into existing programmes? Are there any governmental institutions that could support mBreatheFreely to get free access to messaging?

Health care infrastructure	Public health officials, health care facilities	Health care facility visits and observation, review of existing programmes	Which health care facilities are available in your country? Which respiratory programmes are running in your country? To what extent does the population have access to health care providers?
State of mobile communications	Telecommunication company records, official records and publications, mobile services users	Review of records and publications, qualitative interviews and focus groups, surveys	What percentage of the population has access to mobile communication? Is there access to SMS? Is there access to internet on mobile phones?
Target groups	Public health officials, health care workers, persons with CRDs or CRD risk factors, carers for persons with CRD, public health records	Qualitative interviews, focus groups, surveys Review of records and publications	Which groups should be targeted (most)? Are there specific regions/ communities with higher risk or burden?
Contextual, geographical, cultural and behavioural influences	Public health officials, health care workers, persons with CRDs or CRD risk factors, carers for persons with CRD	Qualitative interviews, focus groups, surveys	Are there any contextual, geographical, cultural or behavioural influences that should be taken into account (e.g. altitude, access to health care, religion)?
Stakeholder views	Public health officials, health care workers, persons with CRDs or CRD risk factors, carers for persons with CRD	Qualitative interviews, focus groups, surveys	Which stakeholders should be involved in the programme? How do these stakeholders see an mBreatheFreely programme? What are the needs/wishes of the stakeholders?

1.2 PROGRAMME LEADERSHIP AND PARTNERSHIPS

PROGRAMME LEADERSHIP

To facilitate planning, implementation and monitoring of interventions in the mBreatheFreely programme, a leadership team should be established with clear responsibilities and accountability for the programme, including (See Figure 3):

- a steering committee for overall direction and agreements;
- an international group of informal experts to advise and support the in-country project team, along with WHO and ITU; and
- a national technical advisory group of in-country leaders to manage operations, technical specifications, content development and adaptation, recruitment and promotion, and monitoring and evaluation.

FIGURE 3. PROPOSED STRUCTURE OF AN MBREATHEFREELY MANAGEMENT TEAM

WHO, ITU, and informal expert group

Group of COPD, asthma and mHealth experts to assist in drafting the handbook and advising on implementation

International mBreatheFreely Steering Committee

With representatives from the ministries of health and telecommunications and national and international representatives of WHO and ITU, to decide the overall direction and agreements

National Technical Advisory Group (National TAG)

Government sectors (including health, telecommunications, business, media, treasury and planning) to set up the legal, technical and financial framework for a sustainable programme. This group will network with a large group of potential partners such as the telecommunications and software industry, local telcom and mobile network providers, nongovernmental organizations, health professionals, academic and research organizations, health insurance groups, health service providers, civil society groups, opinion leaders, the media and others as appropriate

National operations, content, promotion, technology, and monitoring and evaluation project leaders (subset of the TAG)

Operations	Content	Promotion	Technology	Monitoring and Evaluation
Management of overall programme operations, including needs assessment, workplan, budget and legal aspects	Development and adaptation of the content of the intervention	Management of recruitment, communications, marketing and dissemination	Management of technical aspects of programme development and implementation	Management of the development and implementation of monitoring and evaluation plans

mBreatheFreely International Steering Committee

The Steering Committee should be responsible for presenting the mBreatheFreely programme to governments and international agencies. Additional responsibilities include sharing lessons learned and engaging the population and policy-makers. If possible, the Committee should publish success stories. All government agencies involved in the programme should be represented on the Steering Committee, as well as the main professional societies. Steering Committee membership should also include representatives from WHO and ITU headquarters, who should contribute to decisions to maintain the coher-

ence of the Be He@lthy Be Mobile programme and share lessons learned between countries.

National Technical Advisory Group (National TAG)

The TAG should support, inform and advise the programme throughout its inception, development, implementation and evaluation. It should include those necessary to make decisions around funding and planning, those who will be involved in implementing, promoting and evaluating the programme, those who can contribute to the programme's long-term sustainability, and someone who understands or represents the mobile network environment in the country. Regular meetings should be held for information sharing and updates on progress. The TAG will assign roles and responsibilities to various organizations in the different phases of development, adaptation, implementation, evaluation and continuing service provision. They should encourage discussion on overall programme ownership, funding and contracts or agreements on dealing with technical and other issues. The TAG will assist the national operational team in making decisions about the target population, type of programme, programme objectives, programme design, promotion of the programme and the evaluation plan.

WHO, ITU, and the Informal Expert Group

The international experts who helped draft the country handbook also have experience in programme implementation and will be available to advise on technical aspects, legal issues, choice of platforms for scaling up, and feasibility. Experts from international information technology organizations, health economists and business development experts can also be invited to advise on models for the programme's sustainability.

National operations, content, promotion, technology, and monitoring and evaluation project leaders

These groups include the people who will develop or adapt the programme to ensure cultural relevance and technical accuracy, promote the programme, operationalize and maintain it, integrate it into the health system and health promotion services and evaluate it. This group may include COPD and asthma specialists, evaluators and statistical experts, health promoters, behaviour change and communications experts and consumer groups. These teams would report to, or be a subset of, the TAG.

Programme partnerships

Partners are closely involved in all phases of an mBreatheFreely programme, from development to implementation and evaluation. They include the government, civil society organizations (such as patient organizations and professional societies), the private sector (telecom organizations, technological companies, pharmacy organizations, insurance companies), academic centres, non-governmental organizations and international organizations.

1.3 FORMATIVE RESEARCH (IF REQUIRED)

If there is insufficient up-to date information on country readiness for implementation of an mBreatheFreely programme, further background or formative research may be required. This might include online surveys of patients with asthma or COPD, or focus groups with the specific target audience. Pilot studies could also be conducted in selected areas in the country of interest.

1.4 WORKPLAN DEVELOPMENT

The next step after the needs assessment is to develop the workplan. This section of the handbook is intended as a checklist or template for developing a project workplan for use and adaptation by any country intending to implement an mBreatheFreely programme. The full checklist is reported in Table 2. A short version of the checklist can be found at the end of each subsection of this handbook.

TABLE 2. CONTENT CHECKLIST OF A WORKPLAN FOR AN MBREATHEFREELY PROGRAMME

CONTENT CHECKLIST
Development of a mBreatheFreely programme
In this section, information from the needs assessment that applies to decisions on the implementation strategy is used: ☐ Problem statement, describing the chronic respiratory disease problem that the programme intends to address ☐ Overview of the present chronic respiratory disease situation or context and programmes in the country ☐ State of mobile communications and mHealth programmes ☐ Levels of national and government commitment to the project ☐ Process followed in project identification and formulation: what information was used and which stakeholders have been involved? ☐ Relationship to other programmes and activities (past and current) in chronic respiratory disease prevention and control
Operations management
In this section, planning decisions are made, a description of the programme is created, and an operations management plan is developed that includes who will be responsible for implementing the project and for ensuring provision of the services. ☐ Overall project objective: for example, "to adapt mBreatheFreely programme for the population of X, particularly targeting X demographic of smokers who want to quit, and to implement it as a free national service" ☐ National and regional strategy: how it fits with any national and regional strategies (NCD, eHealth) ☐ Project strategy: how will it be operationalized and promoted? ☐ Roles and responsibilities for carrying out the project: project team members, responsibilities for the four main activities ☐ Overall description of project management ☐ Management team (if applicable, terms of reference) ☐ Accountability for project implementation
Content development and adaptation
In this section, a research-driven message refinement process should be implemented. ☐ Review existing programme content and rules of implementation ☐ Adapt text messages and service specifications ☐ Ensure a fully functioning and tested text messaging system ☐ Promote the programme to the target audience ☐ Plan for updating messages
Promotion and recruitment
In this section, decisions should be made about marketing of and enrolment in the programme. ☐ Promotion and recruitment plan (launch, short-term, mid-term and long-term strategy) ☐ Recruitment methods (by SMS, web, calls, third party) ☐ Promotion strategy (media, health workforce training, civil society outreach) adapted for various client groups (by demographics such as urban, rural, age, gender, income)

Technology

In this section, decisions are made about the considerations necessary for the infrastructure and rules of the programme

- ☐ The type of mHealth technology and channels to be used (SMS, Multimedia Messaging Service (MMS), voice, apps)
- ☐ Availability of existing technology options within the public and private sectors
- ☐ Process for procurement and adaption of technology
- ☐ Dashboard development and access
- ☐ Procurement of a short code
- ☐ Negotiation with telecom regulators, aggregators and operators for pricing
- ☐ Data security
- ☐ Technology pre-testing and scale-up plans

Monitoring and evaluation

In this section, decisions should be made about what will be measured by the programme, how, and with what frequency.

- ☐ The text messaging programme is fully functional with no technical issues
- ☐ Number of participants signing up to the programme per month or per year
- ☐ Percentage of the target audience signed up/completed the programme per year
- ☐ Percentage dropout rate (those texting "stop" to stop receiving messages)
- ☐ The proportion of the target audience who signed up to the programme
- ☐ The proportion of the target audience who received and completed the programme
- ☐ Programme user satisfaction
- ☐ Evaluation of the first 6 months, and then 12 months, of service provision.
- ☐ Definition of outcome indicators to measure impact and effectiveness

Estimated Time frames (Annex 4)

Estimated programme development timeframe: 4–6 months

- ☐ Needs assessment and formative research (the length of this phase depends on how much information is already accessible and the availability of local researchers to bring this together to inform the TAG
- ☐ TAG planning agreement on implementation plan, promotional plan, and evaluation plan. Mainly depends on getting the right partners engaged. For overall agreement on aspects of implementation, subgroups can be assigned to continue working on the different plans during the development phase
- ☐ Content adaptation: depends on whether any new content needs to be developed or if the project is a straight adaptation of an existing programme. Pretesting and refining can take a couple of rounds
- ☐ Technical development: for a company that already has a programme this could be as short as two months, whereas for a new company it could be considerably longer

Estimated programme development timeframe: 4–6 months

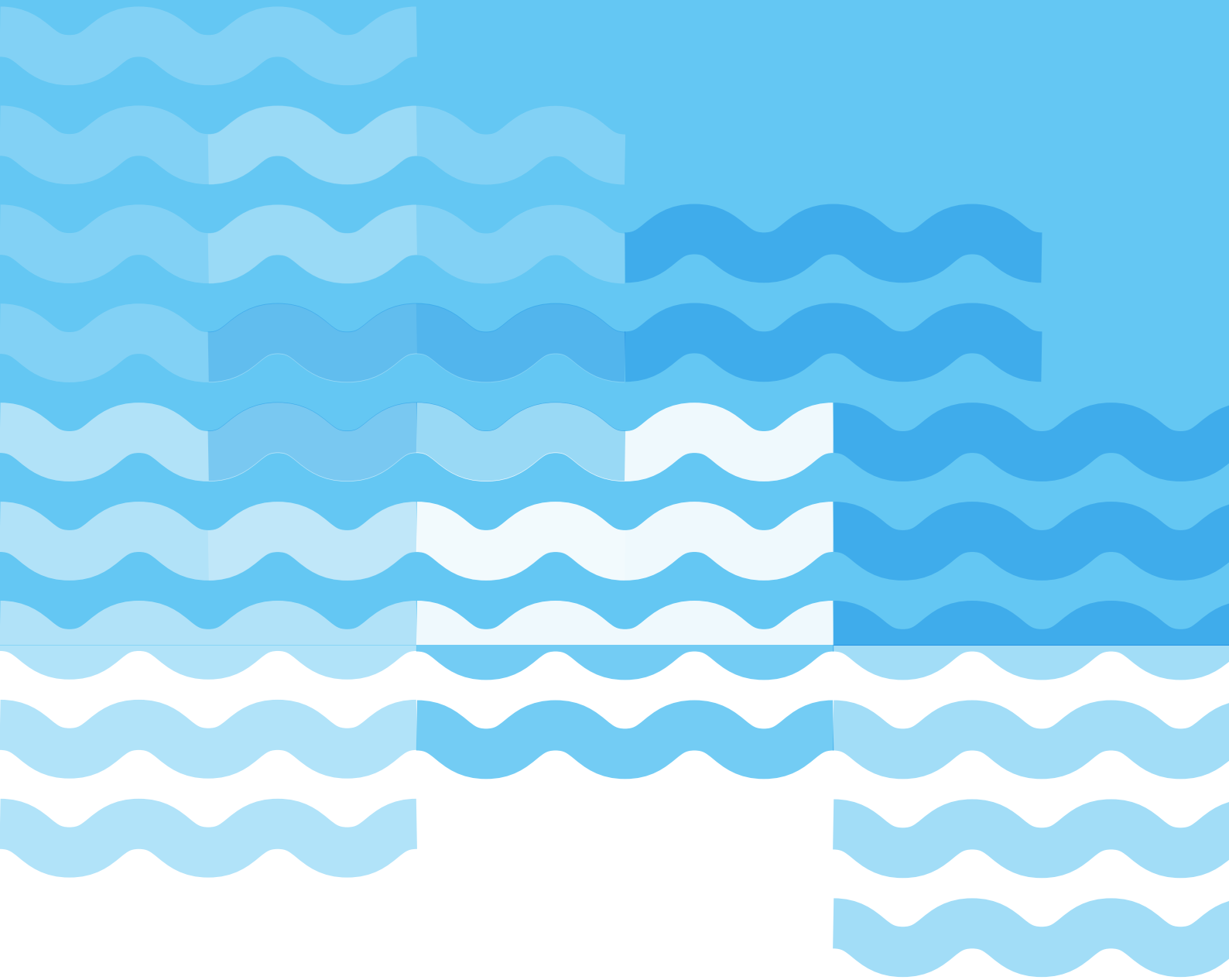
- ☐ Testing: full testing of the programme
- ☐ Launch: soft launch once testing fully completed, public media campaign
- ☐ Evaluation: at least 6 months follow-up of initial cohort
- ☐ Report on evaluation, refinement, improvement and on-going service provision

Budget considerations (see Annex 8)

- ☐ Formative research if required (focus groups, online surveys)
- ☐ TAG meetings/teleconferences (admin, venue, phone costs, printing, preparation of documents)
- ☐ Planning: development and documentation of country plan, promotional plan, evaluation plan, contracts
- ☐ Adaptation/development of content and functional specifications: expert time, admin and collation, preparation of documents, pretesting and reimbursement for time
- ☐ Technical development: subcontract IT company for development of software/interfaces
- ☐ Text messaging and gateway costs (will vary): set-up fee, per-text message costs (generally in bundles where the larger the bundle of messages/ month expected, the cheaper the message per text)
- ☐ Marketing/media costs: depends on media used
- ☐ Evaluation costs: researchers, interviews, data collection and management, analysis, interpretation and input from TAG, write-up

SECTION 2

CONTENT DEVELOPMENT AND ADAPTATION



Experience shows that despite the best efforts of an expert group to appropriately craft messages for a particular audience, critical improvements will be made to programmes through a primary research-driven message refinement process. The content development and adaptation stages are therefore essential to the programme's success.

When developing and pre-testing the mBreatheFreely programme, the mBreatheFreely team should:

A. take account of existing evidence on effective mHealth interventions;

B. take account of the findings of the needs assessment;

C. follow the steps recommended for developing health behaviour change communication interventions.

The steps below should be considered in preparing the message content for mBreatheFreely programmes (see Figure 4).

1. Review any existing mHealth or asthma/COPD programmes. This should be done by the national TAG, taking into account both the content and the rules for implementing the programme. This requires consideration of the text messages themselves and the rules on how the programme works.

2. Write the text messages, taking into consideration the following:

- language, tone, clarity, health literacy, technological literacy;
- how they fit with existing messages;
- how understandable they are;
- provision of both motivation and information;
- relevance of practical tips and strategies to the population;
- cultural considerations;
- degree of personalization (names included) and tailoring according to baseline data;
- tailoring for specific groups (patient populations, healthy populations, rural and urban, different socio-economic status, ethnic group, age, gender, populations with special needs);
- rules and logistical considerations (timing, frequency or intensity, chronological progression, duration, different programmes and messages for different groups, registration process and baseline data collection, two-way messages, interactive aspects, degree of choice and flexibility in the programme, possibility of stopping or changing the programme, whether participants will be able to change things themselves or will need to call or text an administrator, extent of interaction with clinicians or the health service system);
- alignment with existing policies on asthma and COPD.

3. Adapt existing messages. This should be done by local experts working together with mBreatheFreely experts and programme implementers, and should include translation, changes to wording, removing and adding new messages, changing the rules in the system, and designing the registration, opt-in, and administration functions of the new programme.

4. Pre-test the content of the text messages with members of the target audience to check coherence, acceptability, language, tone, appropriateness and relevance, through focus groups and consumer pre-testing. The two-step process described below can provide a cost and time balanced approach to message adaptation.

- Focus groups would be established for pre-testing in the target population. Group composition should include the key demographics of the geographic area (rural, urban, language group, income, patients, healthy individuals). The number of participants will

depend on the number of target populations, the degree of change from an existing tested programme, and initial feedback. Some focus groups can be substituted by telephone interviews if needed. The results from these focus groups will provide information about any major gaps in the programme before it is rolled out. It is important to note, however, that receiving a text message on a mobile telephone during the course of a normal day is different from sitting down to read a series of several text messages on paper. It is therefore best to conduct testing under the conditions in which the programme will ultimately be received, although this is not always feasible or practical. Focus groups are thus necessary before the launch but may not be sufficient, and the addition of real-world consumer testing, although time-consuming, is important.

- In real-world consumer testing to refine the messages, the revised programme is sent live to a pilot group of people who are opting in to mBreatheFreely. The group is surveyed periodically, mainly to determine the appropriateness of the messages. The results are used in designing the final programme.

5. Finalize the database of messages and agree on a plan for maintaining it. Messages might need to be reviewed and updated regularly. There should be a clear indication of who is responsible for this.

6. Document the functional specifications for how the programme is intended to operate. These are the business rules about who will receive which messages, when and how often.

During the content development and adaptation process, decisions must be made on several aspects of the programme. The key decisions that the content development team will need to consider are listed in Table 3. Each decision contains recommendations based on previous mHealth and asthma or COPD related programmes. The relevant stakeholders in each country can determine how they wish to develop their programmes based on the country's needs assessment.

FIGURE 4. DEVELOPMENT AND ADAPTATION OF PROGRAMME CONTENT

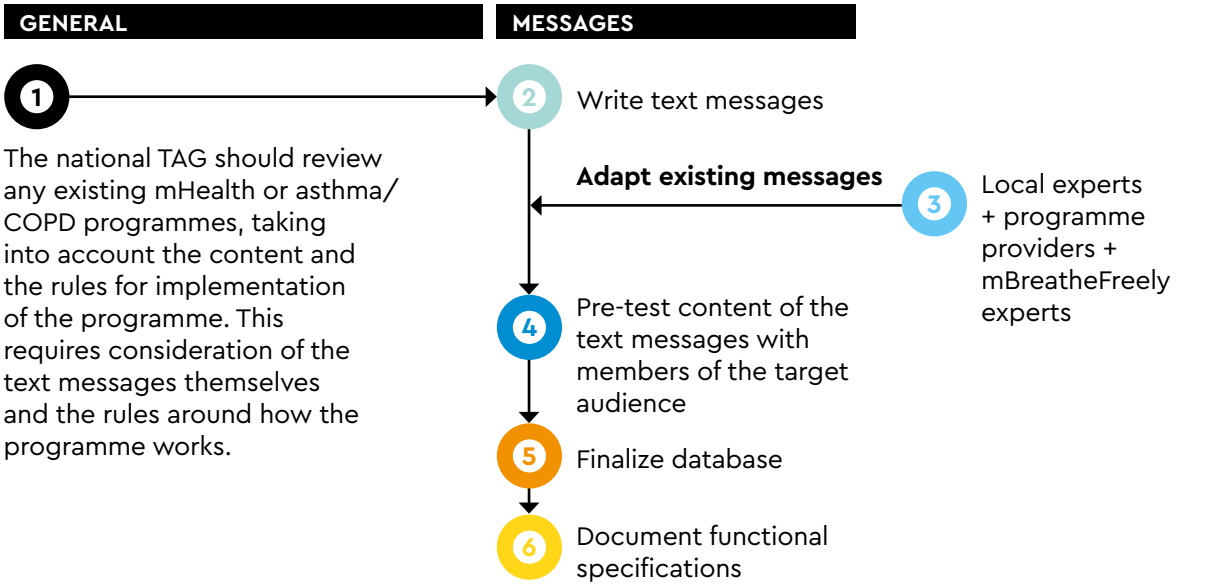


TABLE 3. DECISIONS AND SUGGESTED ACTIONS FOR MBREATHEFREELY PROGRAMME CONTENT DEVELOPMENT

DECISION	ACTIONS
Target audience	Target populations could be persons with asthma or COPD (diagnosed and undiagnosed), persons with risk factors for asthma or COPD (smoking, biomass smoke exposure) or caregivers (relatives) and health care workers for persons with asthma or COPD or with risk factors for asthma or COPD.
Programme Goals	Improve asthma and/or COPD along the continuum of care. Create awareness, improve prevention and diagnosis, offer support in the treatment and management of the diseases.
Behaviour change techniques used	Provide advice and information, reminders, instruction, and self-management techniques (see full list in Annex 5)
Programme algorithm (programme duration, message type, tone, frequency, order, directionality)	▌The programme should last at least six months ▌Start with general informative messages, moving to self-management with specific behaviour change techniques, and then to maintaining behaviour change in the later phase of the programme ▌Messages should start at high frequency for the first few weeks and subsequently decrease in frequency over time ▌Offer 2-way messaging ▌Messages should be clear and direct, offering practical and relevant advice, in simple language, for older adolescents and adults. Messages should emphasize the benefits of action (positive framing) over the consequences of inaction (negative framing)
Message components	Recommendations and healthy lifestyle behaviours are targeted according to international guidelines on asthma and COPD. To encourage behaviour change, messages incorporate relevant behaviour change techniques.
Pre-testing, piloting, and refining the messages	Once a first draft of messages and programme algorithm have been developed, the messages are pre-tested with the end user. Refine messages after pre-testing, then conduct a pilot programme. Refine messages and algorithm after pilot programme prior to national scale-up of programme.

As part of the needs assessment, the Steering Committee should have agreed on a set of target behaviours and specific determinants (barriers and facilitators) to behaviour change. The next task is to agree on the behaviour change techniques required to modify these behaviours. As highlighted in Figure 5, a technique that is likely to modify a particular behaviour has to influence its determinant. A table listing behaviour change techniques is included in Annex 5.

FIGURE 5. BEHAVIOUR CHANGE PROCESSES WITH MBREATHEFREELY-RELATED EXAMPLE FOR INDOOR AIR POLLUTION (21)

When developing an mBreatheFreely programme, four main focus areas should be taken into account (See Table 4). These can be described as the four As, the four Cs, the four Es and the four Ms. The four As are: Awareness, Accessibility, Adherence and Avoiding exacerbations. Key features that add value for the end user are known as the four Cs: Control, Compliance, Collaboration and Competence. These in turn have an impact on the four Es: Enablement, Engagement, Empowerment and Economic consequences. Lastly, feedback loops that either reinforce behaviour (good or bad) or balance a (good or bad) behaviour over time should be considered using the four Ms: Monitoring, Measuring, Management and Motivation. It can be easy to focus on the positive side of the four Ms, but they can also have a negative value. Monitoring can be a challenge, or could be burdensome. Measuring may be or become overwhelming, as the patient may not be able to cope with the information and the choices it provides. Being presented with the possibility of managing one's condition also represents a responsibility that can be stressful. If insufficient support is offered, the patient may be pushed further into depression. Systems and services need to support the patient over moving to the positive side of empowerment. For examples of message content libraries, see Annex 7.

TABLE 4. KEY FEATURES OF AN MBREATHEFREELY PROGRAMME - THE 4 AS, 4 CS, 4 ES AND 4 MS.

4 As	AWARENESS	ACCESSIBILITY	ADHERENCE	AVOIDING EXACERBATION
	Raise awareness about conditions involving breathlessness and other asthma and COPD symptoms among the community, health care workers, and policy-makers. This also includes Promoting smoking cessation for smokers, and improving cooking and heating practices for households using solid fuels.	Access to diagnostic services, medicines, health services, technology and devices, and ensuring that all those who need them are able to use any existing services. Universal access: what are the requirements for people living with COPD or asthma in different regions of the world?	Adherence to and correct use of medication and devices for children and adults. Adherence is a common challenge in all countries. How can we use technology, and mHealth in particular, to overcome adherence challenges?	Early diagnosis and recognition of exacerbation leads to early action (self-help, visit health centre early on) to prevent hospitalization and more complex problems (asthma/COPD attacks).

4 Cs	CONTROL	COMPLIANCE	COLLABORATION	COMPETENCE
	The patient or family member is given control over their behaviour, risk factors and condition.	Medication adherence and compliance with lifestyle recommendations are encouraged.	Collaboration with different stakeholders, including health care professionals and the community, reduces feelings of isolation and builds a support network around the patient.	Support the patient to have an active role in managing their condition.
4 Es	**ENABLEMENT**	**ENGAGEMENT**	**EMPOWERMENT AND SELF-ESTEEM**	**ECONOMIC**
	Enable patients to activate their own resources in everyday life and in cases of illness.	Through enablement, the patient is able to engage constructively in managing his or her own condition.	The patient gains the confidence to take control of the condition, rather than the condition being in control of the patient. This increases self-esteem and reduces the risk of long-term negative results.	Ill-health can have severe financial consequences, pushing people into hardship and poverty. Affordable tools can reduce this risk both for patients and their families.
4 Ms	**MONITORING**	**MEASURING**	**MANAGEMENT**	**MOTIVATION**
	The patient recognises his or her own trigger functions: when they make bad choices, and how they can break that cycle. They can assess how much autonomy they have and recognise whether they are good at self-monitoring.	The patient is self-aware and knows and how he or she functions over time, paying attention to trends and learning.	The patient adheres to medication; self-learning from monitoring measurements improves the probability of making better choices.	The patient feels responsible and can set personalized goals.

For an example mBreatheFreely programme algorithm, see Annex 5. The description of mBreatheFreely modules and a summary table by condition are described in Annex 6. An example message library can be found in Annex 7.

Checklist for content development and adaptation (see Table 2)

- ☐ Review existing programme content and rules of implementation
- ☐ Adapt text messages and service specifications
- ☐ Ensure a fully functioning and tested text messaging system
- ☐ Promote the programme to the target audience
- ☐ Plan for updating messages

SECTION 3

PROMOTION AND RECRUITMENT

Promoting the programme to the public is important and potentially expensive. This section describes the elements to be taken into consideration for programme promotion and recruitment. Consumer recruitment and the enrolment of culturally and socioeconomically diverse populations, sometimes with different languages, is likely to be a challenge in any nationwide programme and must be considered early in the planning stages. The promotion and recruitment strategy should include consideration of:

- the target audience(s) and the best means of reaching them with promotional material;
- who the public views as the "owner" of the programme, as the operational model is likely to direct the promotional campaign;
- whether the campaign can be linked to or leveraged by organizations or notable personalities currently involved in mass media campaigns for respiratory diseases control or prevention, and whether there are lessons to be learned about effective promotional techniques;
- how people will register or sign up – directly by text message, online, by telephone, in person, or through a third party – and the amount, methods and format of data collection at baseline to allow tailoring and ensure follow-up. Enrolment needs to be easy;
- the local mobile network environment, such as whether sending unsolicited text messages is allowed (this is illegal or contravenes network codes of conduct in some countries), which may also be an important consideration in the potential effectiveness of or engagement in the programme: whether a population that has been desensitized to receiving unsolicited health-related text messages will be likely to read mBreatheFreely text messages;
- use of incentives (preferably non-monetary to ensure sustainability, such as free call time for programme completion) to encourage participation;
- the effectiveness of mobile outreach for enrolment: the response rates to messages asking people to subscribe to a service are < 1%, even if it is free;
- whether marketing and promotional campaigns can be leveraged by stakeholder agencies, including technical partners; and
- and the timing of the campaign, perhaps with a "soft launch" before the promotional campaign, to ensure that all processes are working well before many participants sign up.

Checklist for promotion and recruitment (see Table 2)

- ☐ Promotion and recruitment plan (launch, short-term, mid-term and long-term strategy), with roles, activities, timelines, targets and a budget.
- ☐ Recruitment methods (by SMS, web, missed calls, third party)
- ☐ Promotion strategy (media, health workforce training, civil society outreach) adapted for various client groups (by demographics such as urban, rural, age, gender, income)

SECTION 4

TECHNOLOGY SPECIFICATIONS

The following technical aspects of an mBreathe-Freely programme must be considered by the national TAG from the start, in collaboration with local partners:

- type of mHealth intervention, channels to be used (SMS, voice, apps, see Table 5);
- availability of technology options in the public or private sectors;
- process for procuring and adapting technology;
- procurement of a short code (the 5- or 6-digit unique number used to send and receive SMS to and from mobile phones, "send a message to 123123 to enrol in the programme");
- negotiation with telecommunications regulators, aggregators and operators for pricing (see Table 6);
- data security;
- review and clearance by appropriate ethics or regulatory bodies; and
- technology pre-testing and scale-up plans.

Mobile communications network environments differ both between and within countries. The specificities for each location should be considered in the planning stage by including technical representatives (such as from telecommunications companies) or individuals knowledgeable about the communications network in the country, as members of the TAG. Networks, telecommunications companies or an industry organization can help with setting up the programme and advising on its sustainability. Some providers may consider their support of such a programme as good publicity or as a useful addition to their offers.

In the absence of such support, a programme can be delivered by a contractual arrangement with an "aggregator" or "gateway" company that has established relations with all telecommunications companies and networks. This can be a cost-effective method for delivering messages to a large number of participants, regardless of their carrier or location, without establishing these interfaces individually. Although the aggregator adds a cost to the programme, this decreases with an increase in scale; using an aggregator is more cost-effective than attempting these activities "in house". See Figure 6 for an example two-way SMS system.

When thinking about the technical aspects of an mHealth programme, the TAG may also consider:

- **Partnerships (see Table 6):** What sort of arrangement with telecommunications companies or the aggregator will best suit long-term implementation of the programme?
- **Communicating messages (see Table 5):** Should one-way text, voice, or interactive messaging (including interactive voice response systems) be used? What are the capacity, cost-effectiveness and reach of the available technologies in the country?
- **Free access:** How can we ensure that the programme is free and available to all consumers regardless of their carrier, network or location?
- **Research:** Who will conduct interviews and through which medium?
- **Data ownership, privacy, security and interoperability with current health systems:** What are the considerations, and how should a central database best be maintained?
- **Sustainability:** What are the operating costs of the programme, such as per message, and how will these affect the size of the programme?
- **Contracts:** In establishing contractual arrangements with partners, what are the issues with regard to intellectual property, security and privacy of mobile phone numbers, testing, expectations of involvement in monitoring and evaluation and service agreements? Who will hold the contractual arrangements, and what support will be given for maintenance and any other problems? What lessons can be drawn from previous experiences in other countries?

FIGURE 6. SMS MHEALTH SERVICES (2-WAY): WITH AGGREGATOR AND SHORT CODE

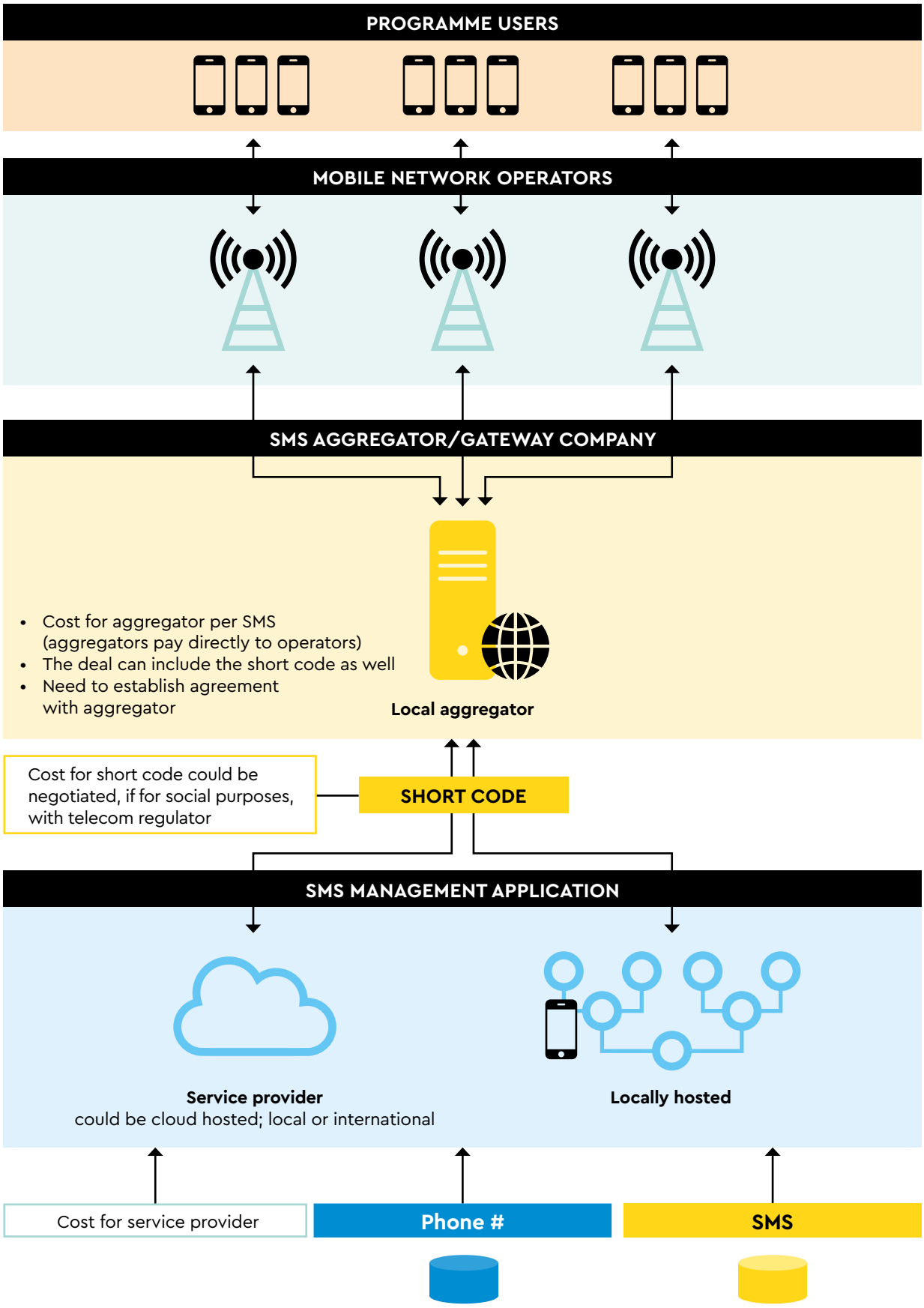


TABLE 5. EXAMPLES OF TECHNOLOGY OPTIONS FOR HEALTH PROMOTION

CHANNEL	STRENGTHS	WEAKNESSES
IVR (Interactive Voice Response)	▌Voice- and phone-enabled access ▌Fast time-to-market ▌Supports natural language ▌Ease of integration	▌Limited capability and development tools ▌Inability to pause, resume, forward and rewind
SMS	▌Simple, easy and convenient ▌Cost effective ▌Private communications ▌Fast communications	▌Some security vulnerabilities ▌Fake SMS (spoofing)
USSD (Unstructured Supplementary Service Data)	▌Simple and logical ▌Real-time, fast and responsive ▌Inexpensive ▌Interactive navigation	▌Session-based timeouts ▌Codes more difficult to remember than Common Short Codes
MMS	▌Direct and personal ▌Messages can be stored and forwarded ▌Interactivity through multi-media	▌Not compatible with basic phones ▌More expensive than SMS ▌Content adaptation limited by screen size and resolution variations ▌Read and response rates lower than SMS
Data Applications	▌Self-contained experience ▌Graphics and user-generated content ▌Automatic updates and read content offline ▌Leverages device-native capabilities (camera, GPS) ▌Strong paid model	▌Fragmentation, need to build for multiple platforms, with time and costs ▌Managing multiple releases ▌Client side changes ▌Need to submit app to some stores for approval
Mobile Web	▌More economical than mobile apps ▌Mobile phones and smartphones supported ▌Mobility for content and services ▌Videos and photos	▌Less functionality, unable to use advanced phone features such as camera, global position system (GPS) ▌Small display size ▌Low text input and low bandwidth

The TAG should also consider the detailed logistics and functional plan, and finalize the functional specifications. This should be done in collaboration with the technical partners who will build the appropriate systems and interfaces, and test internal and user acceptance. Table 6 provides an overview of the roles of the various stakeholders when determining the logistics of the system.

TABLE 6. ROLES OF STAKEHOLDERS IN SETTING UP MHEALTH TECHNOLOGY

STAKEHOLDER	ROLE
Ministry of Health	▌Official owner and custodian of the programme, part of the governance body ▌Assess and identify needs, develop and validate content ▌Contract service providers or build in-house infrastructure/platform ▌Sign cooperation agreements with all operators and/or Service provider ▌Fund or partially fund the programme ▌Can host the mHealth platform/database and own the short code ▌Manage the promotion and marketing campaigns
Telecommunications Ministry **eGovernment entity (if applicable)**	▌Policy making to enable m-services in terms of regulations and policies ▌Fund (partially) the programme, part of the governing body ▌Provide technical expertise to Ministry of Health ▌Possibly host the platform ▌Facilitate dialog between Ministry of Health and ICT stakeholders ▌Support the negotiation of preferential prices for m-services
Telecommunication Regulatory Authority	▌Verify eligibility for short code acquisition ▌Allocate short code ▌Facilitate dialogue between Ministry of Health and ICT stakeholders ▌Fund or partially fund the programme
mHealth service providers (if Ministry of Health or eGov does not have a platform)	▌Provide SMS management application/platform ▌Manage the platform and run SMS campaigns ▌Provide 24/7 technical support ▌Deals with telecom operators can possibly manage the short code
Telecom operators	▌Deliver SMS to end users ▌Set the cost of SMS and agree on special tarifs with Ministry of Health if possible ▌Facilitate interfacing with service providers and/or local aggregator ▌Support the promotion of the service
Local aggregator	▌Provide interface with all operators and manage relationship and invoicing process ▌Provide reporting on services delivered/failed ▌Possibly own and manage the short code
Data Privacy Commission	▌Set the rules for data protection ▌Enforce the application of data protection regulations ▌Authorize mHealth services providing they respect data privacy ▌Authorize the case of data storage outside of country
WHO and ITU	▌Provide technical expertise and share knoweldge from other countries ▌Help convene stakeholders

Checklist for technology (see Table 2)

- ☐ The type of mHealth technology and channels to be used (SMS, MMS, voice, apps)
- ☐ Availability of technology options within the public and private sectors
- ☐ Process for procurement and adaption of technology
- ☐ Dashboard development and access
- ☐ Procurement of a short code
- ☐ Negotiation with telecom regulators, aggregators and operators for pricing
- ☐ Data security
- ☐ Technology pre-testing and scale-up plans

SECTION 5

MONITORING AND EVALUATION

Monitoring is the *routine* tracking of an intervention's performance using data collected on a regular and on-going basis on specified indicators. This information is used to assess the extent to which an intervention is achieving its intended targets on time and on budget.

Evaluation is an *episodic* assessment of either a completed or on-going programme or intervention, to determine the extent to which its stated objectives were achieved efficiently and effectively.

Monitoring and evaluation of an mBreatheFreely programme are intended to inform decision-makers, strenghten the programme, improve its outcomes, and highlight when objectives have been met. Monitoring and evaluation also facilitate implementation and up-scaling, and generate information that will enable the introduction of other mHealth programmes in the country and inform stakeholders, including those in other countries, about barriers, enablers and effectiveness with regard to a given mBreatheFreely programme.

The following steps should be considered when thinking about a programme evaluation.

1) Establishing a framework and evaluation plan from the beginning in order to understand the level of evidence and the outcomes that may be required by local decision-makers to sustain or extend the programme. Evaluations of both process and outcomes are useful, as they provide lessons for others and inform local improvements in the programme. The following aspects of a monitoring and evaluation plan should be agreed by the TAG:

- the outcomes to be measured: health (evidence of behaviour change or intent to change, number of hospitalizations/emergency visits before and after the programme, deaths due to asthma and COPD before and after the programme), technical impact, economic impact, social impact and the effectiveness of the business model, and other outcomes when appropriate;
- desired degree of demographic stratification of results and sample size;
- research design: randomized clinical trial, pre- or post- study, survey or questionnaire;
- validation;
- continual monitoring of the programme and targeted research; and
- costs of evaluation and operational costs of monitoring.

2) Agreeing on a publication plan to share results of the evaluation.

3) Collecting data on the programme wherever possible, such as through text messages, online questionnaires or interviews with a sample of participants. This can provide real-time data for the administration and operation of the programme, and can also be used for monitoring.

More expensive, independent evaluations could be scheduled less frequently to answer specific questions about impact. The benefits of evaluation include:

- informing management decisions when operationalizing the programme;
- providing feedback for continuous improvement of the programme;
- external reporting to funders on overall performance and impact to justify further investment; and
- drawing lessons from programme implementation that could be used elsewhere (other mHealth programmes).

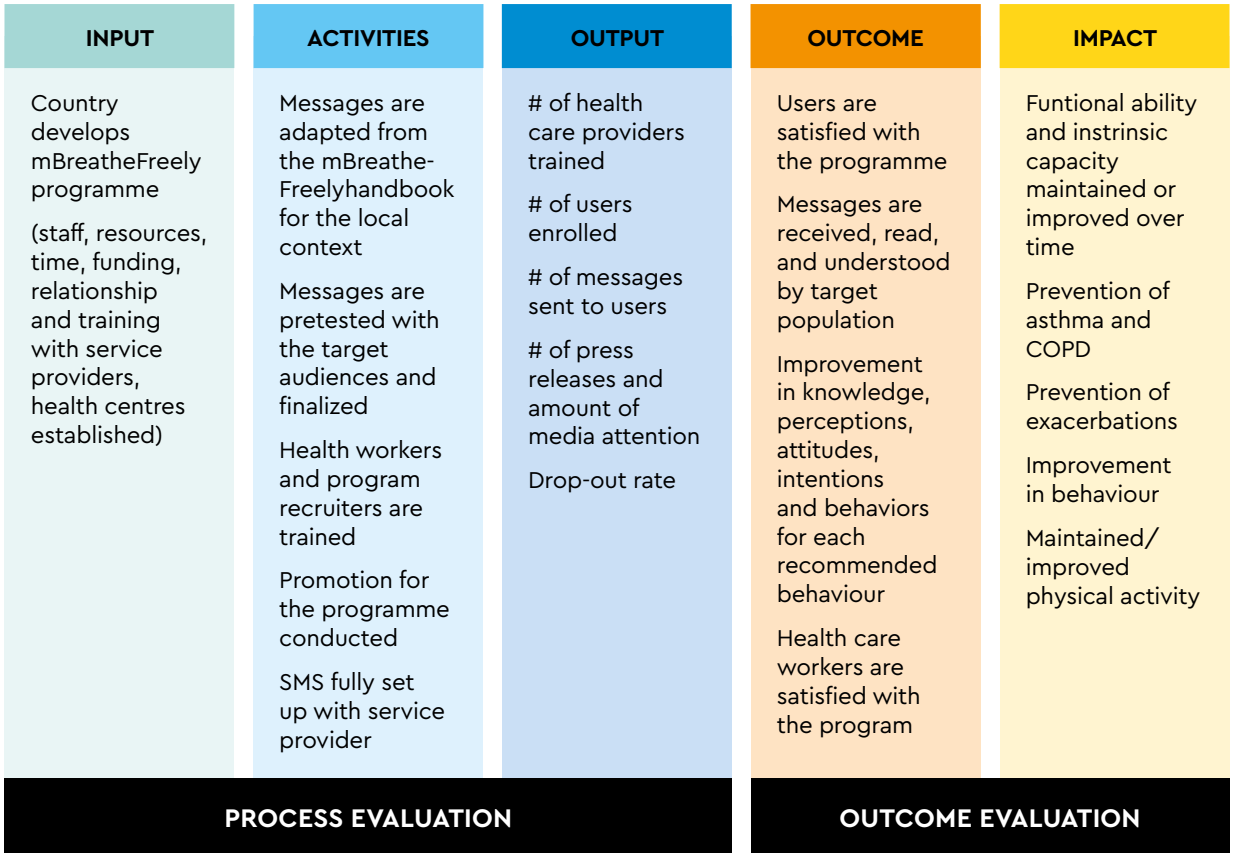
A detailed monitoring and evaluation handbook for mHealth programmes has been developed through the Be He@lthy Be Mobile initiative (22). As described in detail in the handbook, it is helpful if all mHealth interventions use a logic model for monitoring and evaluation. This model can illustrate the presumed relationships between its inputs, outputs, outcomes and impact. An illustrative example of the mHealth logic model is shown in Figure 7. The logic model has been divided into two domains: the person-centred domain and the programme-centred domain, which will allow mid-course adjustments and improvements to be made to the programme.

Using the person-centred domain and the programme-centred domain, a logic model can be used for process and outcome evaluations of an mHealth programme. Stakeholders in each participating country should be consulted when defining potential evaluation questions and identifying relevant programme outcomes and measures. Examples of other logic models can be found online (23–25), and an example of a logic model for an mBreatheFreely programme is presented in Figure 8.

FIGURE 7. LOGIC MODEL

	INPUT	OUTPUT	OUTCOME	IMPACT
PERSON CENTERED DOMAIN	Outgoing messages Incoming messages Surveys, Interviews	Reach and registration Information about the user population Ease of understanding messages	Improved literacy/ knowledge/ outreach Behaviour change Return on investment Technology performance	Improved health outcome Improved use of resources
PROGRAM CENTERED DOMAIN	Governance Policy data Resources (Finance, Human resources, ICT architecture Content development Outreach and promotion Data from "Person centered domain"	Coverage of intervention Intervention quality Interoperability	Integration with health systems Improved health literacy Access to intervention	Improved health outcomes (SDG 3) Improved digital capacity (SDG 9) Efficiency & efficacy

FIGURE 8. EXAMPLE LOGIC MODEL FOR MBREATHEFREELY EVALUATION



5.1 WHO SHOULD CONDUCT THE MONITORING?

In line with the Be He@lthy Be Mobile monitoring and evaluation handbook, monitoring should be integrated into routine programme management functions as an ongoing activity. It should be led by mHealth focal points in collaboration with the concerned unit responsible for the disease or risk factor specific area.

5.2 METHODS AND DATA USED FOR MHEALTH MONITORING

The monitoring and evaluation handbook recommends setting up a routine reporting mechanism to monitor the core indicators and key deliverables. In countries with sufficiently sophisticated web-based platforms, creating a real-time online dashboard supports regular monitoring of the programme. An example of a dashboard can be found in the handbook (22). Some core indicators apply to all mHealth programmes, such as "reach and registration", "information about the user population" and "feasibility of the programme" (22). Core indicators specific to mBreatheFreely depend on local context and target groups. These can include:

- User knowledge of asthma and COPD risk factors;
- Behaviour change (avoiding risk factors);
- Better self-management of asthma and COPD; and
- Health care usage (visiting health care providers when symptoms are present).

When planning an mBreatheFreely programme, one should think about the type of output, possible data sources available in the local context, and frequency of measurements (Table 7). Monitoring reports and dashboards can provide a quick overview to evaluate a programme's objectives.

TABLE 7. MEASUREABLE INDICATORS FOR OUTPUTS OF AN MBREATHEFREELY PROGRAMME

OUTPUT	CORE INDICATOR	POSSIBLE DATA SOURCE	FREQUENCY OF MEASUREMENT
Number of health care providers trained	Number of health care providers completing mBreatheFreely programme	Government mHealth dashboard	6 months
Number of users enrolled	Number of users enrolled in the mBreatheFreely programme	mBreatheFreely programme database	6 months, 12 months
Number of messages sent to users	Number of messages sent to users	mBreatheFreely programme database	6 months, 12 months
Number of press releases and amount of media attention	Number of press releases and amount of media attention	Administration from media in the country (newspapers, television, radio)	12 months
Drop-out rate	Percentage of patients quitting the mBreatheFreely programme	mBreatheFreely programme database	Monitor continuously
Retention rate	Percentage of patients who followed the mBreatheFreely programme through to completion	mBreatheFreely programme database	Monitor continuously
Improvement in knowledge, perceptions, attitudes, intentions and behaviours of mBreatheFreely users	Evaluating whether there is an improvement in knowledge, perceptions, attitudes, intentions and behaviours	Check ins/surveys of the mBreatheFreely programme	Baseline, 6 months, 12 months
User satisfaction	Evaluating whether users are satisfied with the programme	Check ins/surveys of the mBreatheFreely programme (See Annex 7 for example messages)	6 months, 12 months
Impact on health care use	Evaluating whether more/less people are attending their health care providers	Registrations in regional health care centres Hospital admissions	12 months
Availability of the programme	Availability in the different regions of the country	mBreatheFreely programme database	6 months
Impact on the prevalence of asthma and COPD	Number of visits to the emergency department, number of hospitalizations, number of patients lost to follow-up	National administration, regional administration in health care centres	Continuous monitoring
Death rate	Percentage of people dying from asthma and/or COPD	National administration, registration in regional health care centers	12 months, 24 months

TABLE 8. BEHAVIOUR CHANGE INDICATORS AND EXAMPLES OF CORRESPONDING QUESTIONS

BEHAVIOUR CHANGE INDICATOR	TARGET GROUP	EXAMPLE QUESTIONS	MEASUREMENT METHOD
Avoiding asthma/ COPD triggers	Adolescents and adults with asthma, caregivers of patients with asthma, adults with COPD	Have you changed your cooking habits by switching from ____ to ____?	Check-ins/surveys by text
		Do you avoid going out when levels of air pollution are high?	Check-ins/surveys by text
		Have you changed smoking habits or do you avoid being in a room where there are people smoking?	Check-ins/surveys by text
		What triggers for asthma/COPD do you know?	Follow-up phone interview
		Have you changed the type of fuel in your house from ____ to____?	Check-ins/surveys by text
Using medication	Adolescents and adults with asthma, caregivers of patients with asthma, adults with COPD	Are you using your inhalers as prescribed?	Check-ins/surveys by text
		Could you please show how you use your inhaler?	At clinic
		Do you adhere to medication "x"?	Check-ins/surveys by text
		Do you know the impact of non-adherence to medication	Follow-up phone interview
		Has your lung function improved?	Spirometry/peak flow at clinic
Smoking	All target groups	Have you quit smoking?	Check-ins/surveys by text
		Have you changed your smoking habits?	Follow-up phone interview
		Check smoking status	Using cotinine-sensitive dipstick
		Are you currently smoking?	Check-ins/surveys by text
		Smoking rates in the country	Community numbers
Physical activity	All target groups	Are you regularly physically active?	Check-ins/surveys by text
		Have you changed your lifestyle?	Check-ins/surveys by text
		Do you know the importance of being physically active?	Follow-up phone interview
		Has your fitness increased?	At clinic
		Are you using a physical activity action plan?	Check-ins/surveys by text
		Do you exercise for 30 minutes 3 times a week?	Check-ins/surveys by text

Monitoring reports are usually designed for programme managers and decision makers to strengthen the programme and make corrections and revisions as needed. Part of the dashboard may also be designed for the general public, using a different viewpoint and set of indicators.

The raw data will include a wealth of information and its storage should be discussed beforehand. At this point, it will also be important to agree to the frequency of report updating, methods of analysis, presentation of the consolidated information on the dashboard and access issues. Some questions for consideration include:

- Which of the report indicators can be automated?
- What will be the frequency of data collection for the indicators?
- What would be the format for analysing data that is not featured on the dashboard?

5.3 TIMING THE MONITORING

Monitoring should start at the programme's inception, with routine data being collected and used to monitor the provided service. These routine data should be analysed on a regular basis to provide information on progress and give feedback to programme staff and other key stakeholders.

Managers should review progress on a regular basis (monthly would be a good frequency). They should look at all broad factors such as participation, technical errors and message activity. Questions to discuss during the monthly review may include:

- Is the month's number of new registrants consistent with past months and compared to this time last year? If not, what events might explain a higher or lower number? Who can help increase participation?
- Are all messages being delivered as planned? What factors might explain any technical problems? What is the team doing to reduce technical problems?

5.4 METHODS FOR EVALUATIONS

Table 9 lists various methods for conducting evaluations, along with key considerations for each method. If databases are already used in the country, they should be used for this purpose as well. For a list of core indicators for mBreatheFreely, refer to table 7. Select indicators could also be integrated in national NCD plans.

TABLE 9. METHODS FOR EVALUATIONS

METHOD	PURPOSE	CONSIDERATIONS AND EXAMPLES
Survey	▌Assess the perceptions, behaviours, knowledge and attitudes, and intentions of registered users	▌Can be administered on the web or on a mobile device (recommended) or by an interviewer over the phone or in person ▌Should be short as possible and employ multiple choice questions or yes/no wherever possible
Focus group and conceptual mapping	▌Deepen understanding of users' experiences and explore the factors that may affect users' experience, such as language ability, gender, age, geographic location	▌Conducted by a facilitator in groups of 5–8 people. ▌Can also be used to brainstorm ideas for increasing registration, improving the programme and enhancing desired outcomes
Interview	▌Interviews with users: qualitative feedback on their experience, perceptions and satisfaction with the mBreatheFreely programme. ▌Interviews with programme implementers: information on perceived strengths, weaknesses and needs related to the programme's delivery, processes, staff and management structures, capacity and communications methods	▌For qualitative methodology of focus groups and interviews, refer to: Patton MQ_. Enhancing the quality and credibility of qualitative analysis. Health Services Research. 1999;34(5):1189–1208.
Objective measure of outcomes	▌Collect data on biomechanical or physiological outcomes of performing behaviours, often collected in real time. Care managers can administer objective measures, such as spirometry or peak flow. ▌Physical activity can be measured using pedometers and physical ability by the six-minute walk test. ▌Questionnaires can be used to measure patient reported outcomes such as health status or disease control (COPD Control Questionnaire; COPD Assessment Test, Control of Allergic Rhinitis and Asthma Test ▌Outcomes could be measured at baseline and again at follow up appointments in order to evaluate changes over time.	▌Literature searches can help identify objective assessment methods for relevant health behaviours. ▌Examples include devices such as spirometry and peak flow to measure lung function, but also appointments made and held, exams conducted, community health worker contacts, workshops attended, clinical and bio markers. ▌If it is not feasible to collect objective measures on all participants, the measures could be used on a sub-sample of the mBreatheFreely user group, which can be generalized to the total sample if matched demographically.
Cost analysis	▌Compare the cost per user of the mHealth approach with traditional approaches of reaching people in similar COPD or Asthma programmes.	▌Collect costs on items such as development/planning, staff, marketing and technology.

5.5 EXAMPLE OF HOW TO DELIVER MONITORING OR EVALUATION QUESTIONS VIA MOBILE PHONE

An example of how to deliver evaluation questions is given below. Several questions or questionnaires can be included. The content of the questions depends on the target audience.

The structure of offering questions is shown in Figure 9. A list of behaviour change indicators and corresponding questions can be found in Table 8. An example of the evaluation of an mHealth project can be found in Annex 3.

Example mobile phone survey questions for a patient diagnosed with COPD

QUESTION 1:
During the past week, how often did you feel short of breath at rest?

Respond with a number:

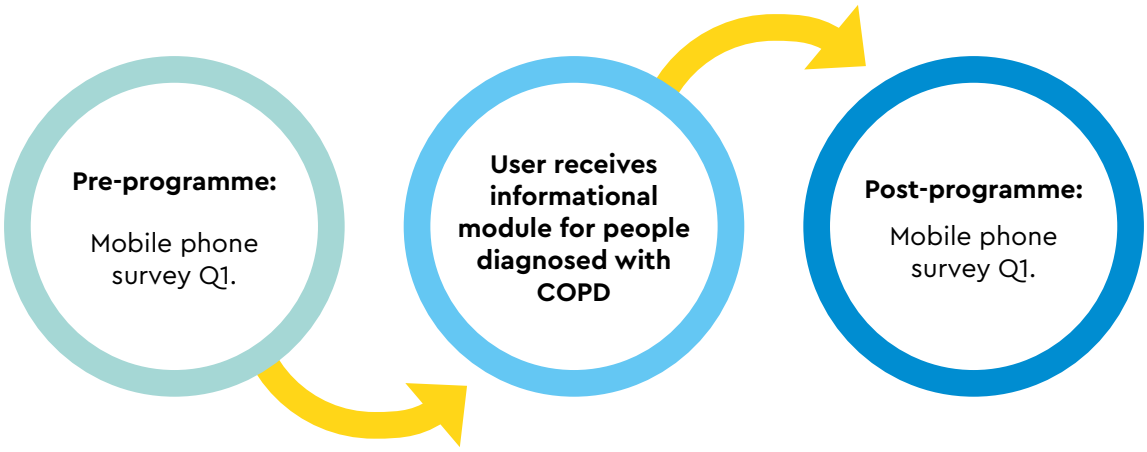
0=never
1=hardly ever
2=a few times
3=several times
5=many times
6=a great many times
7=almost all the time.

QUESTION 2:
In general, during the past week, how often did you cough?

Respond with a number:

0=never
1=hardly ever
2=a few times
3=several times
5=many times
6=a great many times 7=almost all the time.

FIGURE 9. EXAMPLE QUESTION AND ADMINISTRATION OF A SURVEY QUESTION DELIVERED BY MOBILE PHONE



Checklist for monitoring and evaluation (see Table 2)

- ☐ the text messaging programme is fully functional with no technical issues
- ☐ number of participants signing up to the programme per month or per year
- ☐ percentage of the target audience signed up/completed the programme per year
- ☐ percentage dropout rate (those texting "stop" to stop receiving messages)
- ☐ The proportion of the target audience who signed up to the programme
- ☐ The proportion of the target audience who received and completed the programme
- ☐ Evaluation of the first 6 months, and then 12 months, of service provision
- ☐ Programme user satisfaction
- ☐ Definition of outcome indicators

Conclusion

This handbook provides guidance on how to develop, implement and evaluate a national mBreatheFreely programme for the prevention and control of asthma and COPD. The most important components of which are: operations management; content development and adaptation, promotion and recruitment, technology specifications; and monitoring and evaluation. The content of the mBreatheFreely programme will complement existing health care services and routine care offered by the healthcare professionals. All content in this handbook is based on WHO guidelines, existing research evidence on effectiveness, content and delivery, and expert opinions. The templates and mHealth programmes described here should be considered as examples and must be adapted to local context of each participating country.

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ANNEX 1

Literature on mHealth for asthma and COPD

A systematic review and meta-analysis were conducted to evaluate the efficacy of mHealth on clinical outcomes and adherence in individuals with asthma. Nine studies were reviewed (26). The review showed that while mHealth is efficacious for self-management in individuals with asthma, it is no more so than paper-based monitoring. Another paper summarized recent developments of mHealth for asthma (27). A meta-analysis could only review data from three trials, which showed improved asthma control, although the overall clinical effectiveness of apps, typically incorporating multiple features, varied. Further studies are needed to identify the features associated with adoption of and adherence to use of the mobile app and those that improve health outcomes (28).

Some studies were not reported in the meta-analyses. MyAirCoach data provide strong support for mHealth for asthma self-management, but highlight fundamental differences between the perspectives of asthmatic patients and healthcare professionals (29,30). The ADAPT intervention was tested in a community pharmacy-based cluster to assess self-management of adolescents with asthma (31). Initial findings from the Asthma Mobile Health Study, including on recruitment, consent, and enrolment conducted entirely remotely by smartphone, were reported recently (32). The app allows longitudinal, multidimensional data (surveys, devices, geolocation, air quality). The Allergy Diary from MASK14 has enrolled over 10 000 users with rhinitis and many of them had asthma. MASK is designed to be the mHealth tool for the new ARIA guidelines (implementing care pathways using emerging technologies in asthma and rhinitis multimorbidity) (16). Self-management is common and work productivity can be assessed using an app (33,34). mHealth for asthma was also examined in developing countries (35).

Errors in the use of different inhalers are common. Multiple electronic devices provide feedback on the accuracy of patient inhaler technique. One review described the inhaler technique feedback provided by these devices, including specific technique steps measured, how feedback is displayed, target of feedback (patient, provider, researcher), and compatibility with inhaler type (metered-dose inhaler [MDI], inhaled powder, etc.) (36).

Telemedicine has been shown to be as effective as in-person visits for patients with asthma (37). Defined as "the medical application of advanced technology to disease management", telemedicine could be used to very interesting effect in patients with COPD. Different devices and systems are used. The legal problems associated with telemedicine, however, remain controversial. Economic advantages for health care systems, though potentially high have not been sufficiently investigated. A European Respiratory Society Task Force has defined indications, follow-up, equipment, facilities, legal and economic issues of tele-monitoring of COPD patients, including those undergoing home mechanical ventilation (38).

A review of COPD apps was published recently (39), which showed that of the 20 apps downloaded, 13 (65%) included an education section, 5 (25%) focused on medication and guidelines and 6 (30%) included a calendar or diary and other features such as reminders or symptom tracking. Little has been published about the effectiveness of COPD apps. Many of the apps downloaded were found to lack features such

as a social networking tool, personalized education, feedback, e-coaching and psychological motivation to enhance behavioural change. An older review found that although literature on the role of smartphones in reducing COPD exacerbations was limited (40), findings suggested that smartphones are useful in reducing the number of patients with COPD exacerbation. Heterogeneity among the studies, however, means that these results should be treated with caution. Rigorous studies with adequate sample sizes would determine the validity and clinical utility of smartphone interventions in COPD management.

Facilitation of pulmonary rehabilitation in patients with COPD through telerehabilitation is proving promising and becoming more common (41). Telerehabilitation consists of monitoring symptoms and delivering a physical exercise coaching programme through a smartphone, with the option for more intensive monitoring through Bluetooth-enabled devices. In clinical studies these programmes have been shown to improve exercise capacity, daily physical activity and quality of life.

Telemedicine care models for managing advanced COPD may benefit from the addition of motion sensing, spirometry, and a tablet-based symptom tracking diary, but more data are needed to fully understand their effectiveness (42).

The improvement of health resource use and clinical outcomes was found with a telemonitoring-based programme in COPD patients with frequent hospitalization (43). The Maugeri Centre for Telehealth and Telecare initiated a real-life integrated experience in chronic patients and showed that a multidisciplinary telehealth and telecare integrated approach can provide efficient management for COPD patients (44). Other studies, however, did not find any significant differences in health-related quality of life between telehealth and usual practice, and patient stratification may be needed to optimize the effectiveness of mHealth (12,45). Home monitoring of breathing rate in people with COPD may predict exacerbations (46).

ANNEX 2

Examples of mHealth programmes and studies in asthma and COPD

EXAMPLES OF MHEALTH PROGRAMMES THAT HAVE BEEN SHOWN TO IMPROVE OUTCOMES IN PATIENTS WITH COPD AND ASTHMA

LOCATION	SPAIN	TAIWAN
Target condition	**COPD**	**COPD**
Components	▌Mobile phone connected to internet ▌Free access to online educational materials ▌Three times weekly SMS messages to motivate recipients to exercise	▌Mobile phone pre-loaded with music ▌Encouragement to exercise sent by telephone
Outcomes	▌Increase in 6-minute walk distance, and St. George's respiratory questionnaire activities domain after 8 weeks	▌Increase in incremental shuttle walk test, short form 36 and decrease in exacerbations and hospitalizations at 12 weeks
References	Barberan-Garcia A. Effects and barriers to deployment of telehealth wellness programmes for chronic patients across 3 European countries. Respir Med. 2014 Apr;108(4):628–37	Liu Liu W, Wang C, Lin H, Lin S, Lee K, Lo Y, et al. Efficacy of a cell phone-based exercise programme for COPD. Eur Respir J 2008 Sep;32(3):651-659

GERMANY	USA	USA
COPD	**Asthma**	**Asthma**
▌Telemonitoring station for symptom assessment ▌Hand-held spirometer ▌Accelerometer	▌Interactive and personalized asthma management ▌Daily reminders for medication use ▌Daily reminders for trigger avoidance measures	▌Personalized text messages
▌Decrease in COPD-related hospitalizations after 9 months	▌Measures to avoid asthma triggers improved ▌Users had a better understanding of asthma after using the app, prefer this medium for receiving asthma education compared with other modalities. ▌Users said they would recommend it to friends and family members with asthma.	▌High ratings on acceptability. Improvements in quality of life.
Jehn Jehn M, Donaldson G, Kiran B, Liebers U, Mueller K, Scherer D, et al. Tele-monitoring reduces exacerbation of COPD in the context of climate change – a randomized controlled trial. Environ Health 2013;12(1):99	Farooqui, N., Philips, G., Barrett, C. & Stukus, D. Acceptability of an interactive asthma management mobile health application for children and adolescents. Ann Allergy Asthma Immunol, 2015. 114, 527–529.	Britto MT, Rohan JM, Dodds CM, byczkowski TL. A randomized trial of user-controlled text messaging to improve asthma outcomes. Clin Pediatr (phila). 2017;56: 1336–1344.

ANNEX 3

Example evaluation of an mHealth programme

EXAMPLE: EVALUATION OF THE MASK STUDY - ALLERGY DIARY

For the Allergy Diary, several steps have been achieved.

1. IS THE PROJECT REACHING THE RIGHT PEOPLE?

The first step in using the Allergy Diary app of the MASK project is to provide explicit content in terms of the use of the data collected. This step is probably a filter process to those who may not really be concerned by the health theme of the app. Once the legal steps have been accepted and finalized, and before answering the questions related to symptom severity, the user is asked a few questions for profiling. We need to know if the app user has any allergic symptoms that they know of. This information will then be confirmed (or not) through the use of the app. As can be seen to date (June 17), more than 80% of the 11 300 users of the app have allergies, with variable severity profiles. Since the objective of the use of the app is clearly mentioned in the app description, available in the stores (Play store, iTunes), people who downloads the app tend to be within its target zone.

Through monitoring and mining the data collected daily by the app, it can be noted that many users will "try" the app and use it only once. Few will continue use for more than a few months. The main information collected by the app is, however, generated by the targeted population. All publications written thus far about this project and quoted above, confirm this. The quality of the data collected so far is the proof-of-concept that the app targets users appropriately (33, 34).

Quantitatively, it can be noted that the app is not used as expected around the world if we compare the number of downloads to the number of allergic patients. Advertising it is therefore the main priority for the coming year. We have already been involved in this process by promoting the app use through the European Innovation partnership on Active and Healthy Ageing Reference Site Network (Twining) (47). The early drop of users is also an issue to be assessed in terms of communication and patient literacy. Users need to understand the mid- and long-term benefits of the app use in a context where apps are famous mostly for short-term benefits.

2. ARE WE PROVIDING A HIGH-QUALITY PROJECT?

- What is the performance level of the system used?
- What is the reliability level of the system used?
- What is the security level of the system used?

The main philosophy of the app was to be as simple as possible and to be available to everyone, worldwide, whatever the level of education or knowledge of disease. While we will not sacrifice data collection quality to the ergonomics of the app, it was designed following a main concept of "privacy by design" as the strength of the app will depend more on the quantity of data collected (continuously if possible, i.e. daily) rather than on the precision of the information collected (to a certain extend). This is the main challenge of the app conception and development.

The metric used to assess the performance level of the app use is quite simple: number of downloads. By increasing continuously with expected and observed use, intensity peaks during the local pollen season and performance is easy to consider. There are more than 11 300 downloads to date (June 2017). Any major communication event relayed by the public media can be spotted (on Google trends for example) and is often correlated to a local increase of downloads.

The quality and reliability of app data collection have been initially evaluated by comparing the data collected through a questionnaire, in printed copy and in electronic version. So far, in the 22 countries where the app has been launched, no major technical issued have remained unresolved, and the data collection to date is extremely reliable. As far as data security is concerned, all appropriate processes have been set up to certify data management according to European directives and are being monitored constantly.

The quality of the project also remains dynamic. In a context of technical information and communication, daily improvements and fashion trends seem to appear in the app design. If we consider that new medical apps show up in the stores all the time, launching an app (even a medical app) with definitively fixed content would be counterproductive. Users expect to be surprised or motivated. Questions about tobacco consumption will also be added. Step by step, through a dynamic process, the app use will become more accurate for patients, and the app data collection will become increasingly precise and the data more and more effective when used by health care professionals.

3. IS THE PROJECT EFFECTIVE?

Overall knowledge about allergic rhinitis has improved through the analysis of the data gathered through the app. This is the first reliable source of data on daily symptoms as experienced by the app user. Moreover, the medical treatment declared by the users at the time of recording their daily symptoms is a main aspect of analysis and research to understand self-medication, treatment adherence and treatment efficacy. Finally, some global ARIA recommendations for allergic rhinitis medical treatment (16,48) have been included in the professional version of the app to harmonize global rhinitis care and provide consistent expert information to health care providers globally (15). All these points suggest that the project is effective.

4. ARE THERE ANY NEGATIVE CONSEQUENCES OF THE PROJECT?

So far, no negative consequences of using the app have been reported anywhere in the world, either by users (patients) or by health care professionals. The app is classified as a "class 1 medical device".

The scope of the app is clearly defined in the two legal documents that have been translated into all of the local languages of the countries where the app has been launched. This should avoid any misunderstanding in the use of the app, user expectations and negative consequences.

ANNEX 4

Estimated timeframe to implement an mBreatheFreely programme

TASK	YEAR 1				YEAR 2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
TAG formation	x							
Stakeholder engagement	x							
Needs assessment	x	x						
Resource assessment	x	x						
Creation of target population database		x						
Refinement of SMS content and delivery algorithm		x						
mBreatheFreely pilot testing			x	x				
Refinement of target population and intervention					x			
Implementation of mBreatheFreely intervention						x	x	x
Monitoring and evaluation						x	x	x

Q = quarter

ANNEX 5

mBreatheFreely programme algorithm

This annex provides advice on the mBreatheFreely programme algorithm. The content is based on literature recommended by experts from the fields of mHealth, behaviour change, and pulmonary medicine.

A. DESIGNING THE FRAMEWORK OF THE PROGRAMME

DURATION OF THE PROGRAMME

Recent reviews and studies of mHealth interventions have found no clear conclusions on the optimal length of programmes, due to the low number of randomized controlled trials and heterogeneity of mHealth interventions (49–52). The duration of programmes evaluated in these studies ranged from 3 weeks to 12 months.

Behaviour change research shows that it can take six months of engaging in a new behaviour to move into the maintenance stage of behaviour change (53,54). There is limited data for persons with chronic lung disease, but two mHealth trials delivering text message-based interventions to older adults (mean age ~60 years old, N=294) with coronary heart disease, found participants were receptive to the 24-week programme (55,56). Feedback revealed that most participants thought 24-weeks was the appropriate length for a programme.

SUGGESTION

The programme should last six months.

TIMING AND FREQUENCY OF MESSAGES

As with the duration of mHealth programmes, few studies drew strong conclusions on effective message algorithms. Despite this, recommendations on the number and frequency of messages are given, although this still needs further investigation. Previous studies have reported that a higher number of messages received resulted in greater behaviour change but gave no indication of the optimal number of messages per week (57). One review found message frequency that is customizable or declines over time was more effective than fixed frequency (a low or high number of fixed messages) (58). Another systematic review found that sending one message at least every three days appeared effective to change behaviours (56).

Although this handbook includes recommendations on the number and frequency of messages, this should be evaluated over time and adjusted according to individual country experiences and local context.

SUGGESTION

Messages should start at a high frequency for the first few weeks, which should gradually decrease over time. For a 24-week* programme (168 days), the algorithm could be:

Weeks 1–6: 1 message per day = 42
Weeks 7–12: 5 messages per week = 30
Weeks 13–18: 1 message every 2 days = 21
Weeks 19–24: 1 message every 3 days = 14 (plus 1 concluding message)
Total number of messages = 105

*Calculated in days and weeks rather than months for simplicity.

Run the programme until the user stops replying "YES" to the questions "Are these messages helpful?"

ORDER OF MESSAGES

There is little evidence in literature regarding the optimum order of messages. Programmes should begin with introductory and general messages, with messages subsequently becoming more specific (44, 45). Maar et al. (59) recommend placing positive content before negative content, which may be more relevant for individual message framing.

For instance, the messages could be more informational for the first few weeks, followed later by specific instructions and self-management techniques.

SUGGESTION

Start with positive, general informative messages, moving to self-management and specific behaviour change techniques. Specific behaviour change goals should start slowly and progress gradually as the programme continues. Certain sets of messages can be repeated until a user answers "yes" to specific questions (such as, for persons with symptoms, continue sending general information messages until they answer "yes" to the question "have you seen your health care provider"). The second half of the programme can include messages that focus on maintenance of these newly adopted behaviours.

REPETITION OF MESSAGES

Although multiple behaviour change has not been studied sufficiently, a growing body of evidence points to the effectiveness of changing multiple rather than single behaviour (60, 61). A few studies have examined the effectiveness of changing multiple behaviours sequentially rather than simultaneously. A recent review found no clear pattern, suggesting that both sequential and simultaneous multiple health behaviour changes are effective (60).

SUGGESTION

To avoid repetition and participant boredom, we recommend simultaneous multiple behaviour change. Programme outcomes should be delivered simultaneously (each day a new topic) and all messages should be unique. See the message algorithm template in Table 2 for further clarification.

TIME OF MESSAGE DELIVERY

One systematic review suggested that the time of day when messages are delivered should be tailored, as customizable interventions are most successful (58). Allowing user choice for delivery is important; however in previous studies most participants chose to receive messages in the 9am–12pm time slot (55, 56).

SUGGESTION

Allow users to choose when they wish to receive messages if possible. If tailored programmes are too costly, deliver messages around a time of day when participants are most receptive (mid-day: neither too late nor too early).

DIRECTIONALITY OF MESSAGES

Head et al. (58) found two-way messaging was more effective than one-way. Despite this, plenty of one-way mHealth interventions have been effective in changing behaviours (49).

SUGGESTION

Encourage two-way messaging, if feasible.

MESSAGE FRAMING

A Cochrane review on message framing found no clear pattern for the use of positive or negative framing and behaviour change (62). Since then, however, many studies have shown that positive framing is more effective and acceptable. Positive messages are benefit-oriented rather than consequence-oriented (63). Positively framed messages resulted in greater behaviour change, as patients preferred and remembered positive messages compared to negatively framed messages (59).

Authoritarian and stern tones should be avoided, while reminders, encouragement, and cultural practices are encouraged (59). Patients expressed a preference for direct messages, but disliked messages with immediate commands (64). Advice should be clear, practical, and realistic for the intended user (59). Specific content should be targeted to what older adults find relevant (65), since tailored and targeted messages are more effective in changing behaviour (58).

Messages should be written in simple and concise language with one "idea" per message. To ensure that the language is at an appropriate level, literary testing of messages in respective languages is recommended (e.g. Google Web Corpus or Lexile Analyzer) (65). A previous study found that messages with accurate spelling and correct grammar were preferred to messages that included informal language (e.g. "u r", "gr8", etc.) (63). This study also found that individuals with a lower level of education were more likely to prefer the inclusion of an emoticon than those with a higher level of education. There were no preferences in terms of punctuation, such as the number of exclamation marks or use of capital letters compared to messages with no visible emphasis.

SUGGESTION

Messages should be clear and direct, offering practical and relevant advice, in simple language, for persons with asthma and COPD. Messages should emphasize the benefits of action (positive framing) over the consequences of inaction (negative framing).

B. BEHAVIOUR CHANGE TECHNIQUES

The following table lists the behaviour change techniques (BCT) from the message library and matches them with the corresponding specific techniques from Michie et al.'s taxonomy (66) (see Table 1). The list is not exhaustive as some messages may contain additional BCTs.

TABLE 1. LIST OF BEHAVIOUR CHANGE TECHNIQUES INCLUDED IN THE MBREATHEFREELY PROGRAMME FROM MICHIE TAXONOMY

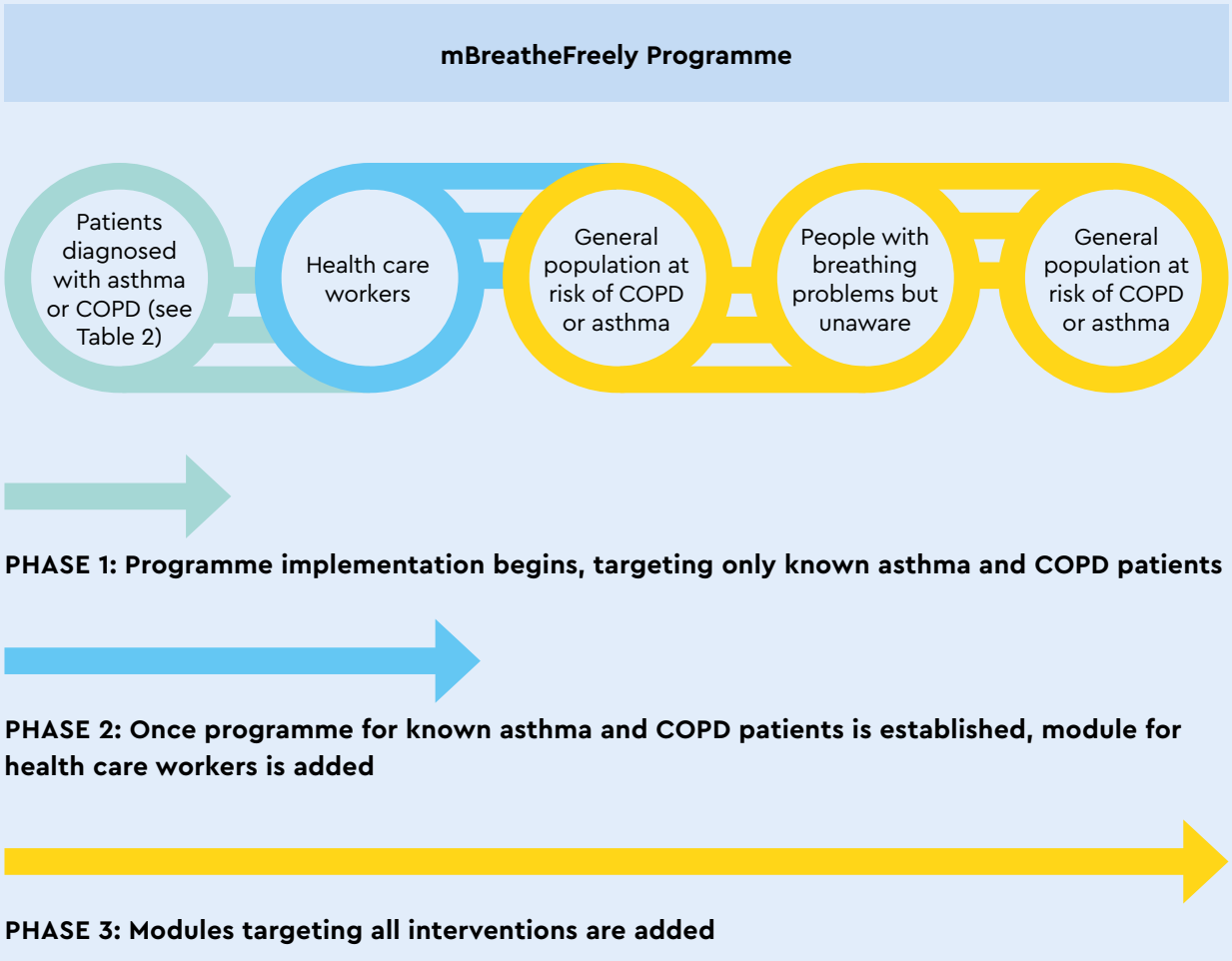
CONSTRUCT	MICHIE BCT	BCT NO.*
Advice/information	Goal setting (behaviour)	1.1
	Information about health consequences	5.1
	Information about emotional consequences	5.6
	Credible source	9.1
Reminders	Prompts/cues	7.1
Instruction	Instruction on how to perform a behaviour	4.1
	Information about antecedents	4.2
	Graded tasks	8.7
	Reduce negative emotions	11.2
	Restructure physical environment	12.1
	Restructure social environment	12.2
Self-management	Goal setting (behaviour)	1.1
	Problem solving	1.2
	Action planning	1.4
	Self-monitoring of behaviour	2.3
	Self-monitoring of outcomes of behaviour	2.4
	Social support (unspecified)	3.1
	Social support (practical)	3.2
	Social support (emotional)	3.3
	Monitoring of emotional consequences	5.4
	Habit formation	8.3
	Social reward	10.4
	Verbal persuasion about capability	15.1
Two-way messaging	Feedback on behaviour	2.2
	Social reward	10.4
	Verbal persuasion about capability	15.1

*The BCT identification number, rather than a description, is used in the message template.

C. MESSAGE ALGORITHMS

Countries may not be ready or able to implement all modules of an mBreatheFreely programme at once. Some may wish to start with just one target population and add additional modules as time goes on and the programme becomes more established. Figure 1 provides an example of a phased approach to implementation.

FIGURE 1. PHASED APPROACH FOR MBREATHEFREELY IMPLEMENTATION



In Table 2, an example of the message algorithm is provided for patients with asthma or COPD. This template is flexible and can be adapted according to the populations selected to be the target of the mBreatheFreely programme (see implementation examples above).

TABLE 2. TEMPLATE FOR MBREATHEFREELY MESSAGE ALGORITHM FOR PATIENTS WITH ASTHMA OR COPD

WEEK	DAY	CONSTRUCT
1	1	General introduction
	2	Informational message
	3	Informational message
	4	Instruction/advice message
	5	Monitoring and evaluation
	6	Reminder message
	7	Self-management message
2	1	Informational message
	2	Instruction/advice message
	3	Monitoring and evaluation
	4	Reminder message
	5	Self-management message
	6	Informational message
	7	Instruction/advice message
3	1	Monitoring and evaluation
	2	Reminder message
	3	Self-management message
	4	Informational message
	5	Instruction/advice message
	6	Monitoring and evaluation
	7	Reminder message
4	1	Self-management message
	2	Informational message
	3	Instruction/advice message
	4	Monitoring and evaluation
	5	Reminder message
	6	Self-management message
	7	Informational message

WEEK	DAY	CONSTRUCT
5	1	Instruction/advice message
	2	Monitoring and evaluation
	3	Reminder message
	4	Self-management message
	5	Informational message
	6	Instruction/advice message
	7	Monitoring and evaluation
6	1	Reminder message
	2	Self-management message
	3	Informational message
	4	Instruction/advice message
	5	Monitoring and evaluation
	6	Reminder message
	7	Self-management message
7	1	
	2	Reminder message
	3	Self-management message
	4	
	5	Informational message
	6	Instruction/advice message
	7	Monitoring and evaluation
8	1	
	2	Reminder message
	3	Self-management message
	4	
	5	Informational message
	6	Instruction/advice message
	7	Monitoring and evaluation

WEEK	DAY	CONSTRUCT
9	1	
	2	Reminder message
	3	Self-management message
	4	
	5	Informational message
	6	Instruction/advice message
	7	Monitoring and evaluation
10	1	Reminder message
	2	Self-management message
	3	Informational message
	4	
	5	Instruction/advice message
	6	Monitoring and evaluation
	7	Reminder message
11	1	
	2	Self-management message
	3	Informational message
	4	
	5	Instruction/advice message
	6	Monitoring and evaluation
	7	Reminder message
12	1	
	2	Self-management message
	3	Informational message
	4	
	5	Instruction/advice message
	6	Monitoring and evaluation
	7	Reminder message
13	1	
	2	Self-management message
	3	
	4	Informational message
	5	
	6	Instruction/advice message
	7	

WEEK	DAY	CONSTRUCT
14	1	Monitoring and evaluation
	2	
	3	Reminder message
	4	
	5	Self-management message
	6	
	7	Informational message
15	1	
	2	Instruction/advice message
	3	
	4	Monitoring and evaluation
	5	
	6	Reminder message
	7	
16	1	Self-management message
	2	
	3	Informational message
	4	
	5	Instruction/advice message
	6	
	7	Monitoring and evaluation
17	1	
	2	Reminder message
	3	
	4	Self-management message
	5	
	6	Informational message
	7	
18	1	Instruction/advice message
	2	
	3	Monitoring and evaluation
	4	
	5	Reminder message
	6	
	7	Self-management message

WEEK	DAY	CONSTRUCT
19	1	
	2	Informational message
	3	
	4	
	5	Instruction/advice message
	6	
	7	
20	1	Monitoring and evaluation
	2	
	3	
	4	Reminder message
	5	
	6	
	7	Self-management message
21	1	
	2	
	3	Informational message
	4	
	5	
	6	Instruction/advice message
	7	

WEEK	DAY	CONSTRUCT
22	1	
	2	Monitoring and evaluation
	3	
	4	
	5	Reminder message
	6	
	7	
23	1	Self-management message
	2	
	3	
	4	Informational message
	5	
	6	
	7	Instruction/advice message
24	1	
	2	
	3	Monitoring and evaluation
	4	
	5	
	6	Reminder message
	7	Concluding message

ANNEX 6

mBreatheFreely modules and summary table per condition

A description of mBreatheFreely modules is presented in Table 1. The specific content of the message will be personalized for the target recipient. A summary table, by condition, is also presented below.

TABLE1. MBREATHEFREELY MODULES

MODULE	DESCRIPTION	SUGGESTED ALGORITHM	EXAMPLE MESSAGE
Informational	Overarching theme, messages include general information on each condition, tailored to the particular (e.g. symptoms of asthma, risk factors for COPD)	1–2 messages per week for 12 weeks, followed by 0–1 per week for 12 weeks	Despite your best efforts, sometimes your child will need urgent attention by a health care provider.
Instructional	Specific instructions to prevent development of the disease, manage symptoms or prevent exacerbations	1–2 messages per week for 12 weeks, followed by 0–1 per week for 12 weeks	Keep the rooms well ventilated – it will help with your breathing
Monitoring and evaluation	Evaluation of baseline needs and changes in behaviour over time and in response to the intervention	1–2 messages per week for 12 weeks, followed by 0–1 per week for 6 weeks and 1 per week for 6 weeks	Have you quit smoking?
Reminders	Reinforcement of previous information and instructions provided in previous interactions	1–2 messages per week for 12 weeks, followed by 1 per week for 12 weeks	Vaccines can prevent exacerbations of COPD
Self-management	Specific instructions to changes in behaviour to improve outcomes in CRDs	1–2 messages per week for 12 weeks, followed by 1 per week for 12 weeks	Are you ready to quit smoking? (yes –> programme); no –> info

TABLE 2. SUMMARY, BY CONDITION

HEALTH CONDITION	END-USER	EXAMPLE MESSAGE
Asthma	Adolescents	Are you using your inhaler correctly? Press 1 for yes, 2 for no
	Adults	If something at work is causing your asthma, you need to see a specialist. Talk to your doctor. If something in particular is triggering your asthma, avoid it
	General population	Asthma and COPD can slow down by dealing with it properly
	Health care workers	A stepwise approach for adjusting asthma treatment needs to be implemented for each asthma patient
	Parent of children with asthma	Worsening of asthma in very young children may be triggered by infections. This could include a fever.
COPD	At risk population	COPD is a lung disease characterized by chronic obstruction of lung airflow that interferes with normal breathing and is not fully reversible
	Diagnosed with COPD	Physical exercise is important to improve your symptoms of breathlessness and fatigue
	Health care workers	COPD patients benefit from physical activity: encourage them to exercise
COPD & Asthma	Those with breathing problems (COPD, asthma or other condition, but unaware)	If you get attacks of breathlessness/coughing, this could be a disease which can be treated: check with your health provider

ANNEX 7

The mBreatheFreely example message library is available upon request. To request the mBreatheFreely message library, please contact:

Sameer Pujari at
pujaris@who.int

or Briana Lucido at
lucidob@who.int.

ANNEX 8

Example budget breakdown

ACTIVITY	TYPE OF EXPENSE	PHASE COMPONENT	PRODUCT OR OUTCOME	ESTIMATED COST (US$)
FORMULATION, DESIGN AND DEVELOPMENT	Capital (one-off expense)	Operations management	Formative research and successful evidence Review	
			Develop database for the country	
			Piloting and deployment at country level • Telecoms provider / SMS gateway integration • Multi-language set-up and user language tracking	
			Application maintenance and fine tuning	
			Platform hosting and maintenance	
			Testing technical platform and messages	
IMPLEMENTATION AND SUPPORT	Capital (one-off expense)	Promotion and recruitment	Promotion, marketing, preparation of materials to recruit participants	
			Strengthen human resource capacity to effectively implement m-Health for NCD projects	
		Operations management	Train local partners in project design, platform, SMS database, sampling, results framework and evaluation of results	
			Training in use of mTraining tools	
	Operational	Promotion and recruitment	Marketing	
			Patient communication (telecommunications company)	
			Maintenance of infrastructure	
PROGRAMME MANAGEMENT	Operational	Operations management	Project team (one senior staff, one junior staff and one administrative support)	
			Miscellaneous (e.g. travel, meetings, communication)	
MONITORING AND EVALUATION	Capital (one-off expense)	Monitoring and evaluation	Develop method for data collection and analysis of results, sample size and results framework	
			Adapt global mHealth impact assessment indicators for country	
			Adapt global mHealth impact data collection instrument for country	
			Develop reporting and analysis module for monitoring and evaluation	
			Develop cost impact assessment model for sustainable financing based on global model	

ACTIVITY	TYPE OF EXPENSE	PHASE COMPONENT	PRODUCT OR OUTCOME	ESTIMATED COST (US$)
	Operational	Monitoring and evaluation	Continuous evaluation and assessment	
			Analysis and reporting	
			Results dissemination	
			Continuous adjustments	
	Miscellaneous			
TOTAL OPERATIONAL EXPENDITURE (ANNUALLY RECURRING)				
TOTAL CAPITAL EXPENDITURE (ONE-OFF)				
TOTAL COST (CAPITAL + OPERATIONAL FOR 1 YEAR)				

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