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Everyone Everywhere Everyday

World Health Organization

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BE HE@LTHY BE MOBILE

A handbook on how to implement mActive

Be He@lthy, Be Mobile: A handbook on how to implement mobile health for physical activity

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Acknowledgements

The World Health Organization (WHO) and International Telecommunication Union (ITU) gratefully acknowledge the following contributors to this handbook:

Handbook coordination

WHO/ITU Be Healthy, Be Mobile team: Roman Chestnov, Javier Elkin, Hani Eskandar, Melissa Harper Shehadeh, Surabhi Joshi, Sameer Pujari, Ayush Shukla.

WHO Physical Activity Unit: Fiona Bull, May Myat Cho.

Content development

The preparation of this toolkit was undertaken by the Physical Activity Unit and Be Healthy, Be Mobile team at WHO headquarters. WHO acknowledges, with thanks, the contributions and guidance from members of the Be Healthy, Be Mobile mActive Informal Expert Group:

Marta Moreira Marques (University College London and Trinity College Dublin), Shifalika Goenka (Public Health Foundation of India and Center for Chronic Disease Control), Abby C King (Stanford University School of Medicine), Clover Maitland (University of Western Australia), Michael Rosenberg (University of Western Australia), Ajay Vamadevan Sarala (Goa Institute of Management, India).

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Ryan Rhodes (University of Victoria), Marlene Nunes Silva (Universidade de Lisboa), Anand Amlani (Health Insights, Public Health England), Craig Nossel (Carenomics, Australia), Chryssa Stefanidou (Health Insights, Public Health England), Cristina Isabel Albuquerque Godinho (Lisbon University Institute).

Guidance

WHO: Dr Naoko Yamamoto, Assistant Director-General / Dr Ruediger Krech, Director, Health Promotion.

Be Healthy, Be Mobile Steering Committee members:

WHO: Mr Bernardo Mariano Jr, Director, Digital Health and Innovations; Dr Ren Minghui, Assistant Director-General/Dr Bente Mikkelsen, Director, Noncommunicable Diseases.

ITU: Doreen Bogdan-Martin, Director, Telecommunication Development Bureau; Stephen Bereaux, Deputy to Director, Telecommunication Development Bureau; Marco Obiso, Chief, AI Digital Network and Society Department, Telecommunication Development Bureau.

Administrative support at WHO

Noha Gamal El-Din, Karina Wolbang.

Editing: Teresa Lander.

Layout and design: Optima Graphic Design Ltd.

Abbreviations

BHBM	Be He@lthy, Be Mobile
COPD	chronic obstructive pulmonary disease
GIF	Graphics Interchange Format
GPS	Global Positioning System
ITU	International Telecommunication Union
IVR	interactive voice response
MMS	multimedia messaging service
NHS	National Health Service, United Kingdom
SaaS	software as a service
SD	standard deviation
SDG	United Nations Sustainable Development Goal
SMART	specific, measurable, attainable, relevant and timely
SMD	standardized mean difference
SMS	short message service
TAG	technical advisory group
WHO	World Health Organization

Introduction

PHYSICAL ACTIVITY AND HEALTH

Regular physical activity is good for heart, body and mind. It is a key component of national action on the prevention and management of noncommunicable diseases, including heart disease, stroke, type-2 diabetes and some cancers. It helps in the prevention and management of hypertension and the maintenance of a healthy weight, and can improve mental health, cognitive function and overall well-being.[1,2] Regular physical activity is recommended for people of all ages and abilities, including those people living with chronic disease and disability and pregnant and post-partum women.

Physical activity is also an important part of healthy ageing. Older adults can benefit from regular physical activity to maintain balance and muscular strength, prevent falls and injuries from falls and improve mental health (including memory and cognitive function). Participation in appropriate and enjoyable physical activity can also be a way to maintain social contacts and reduce feelings of isolation and loneliness.[1]

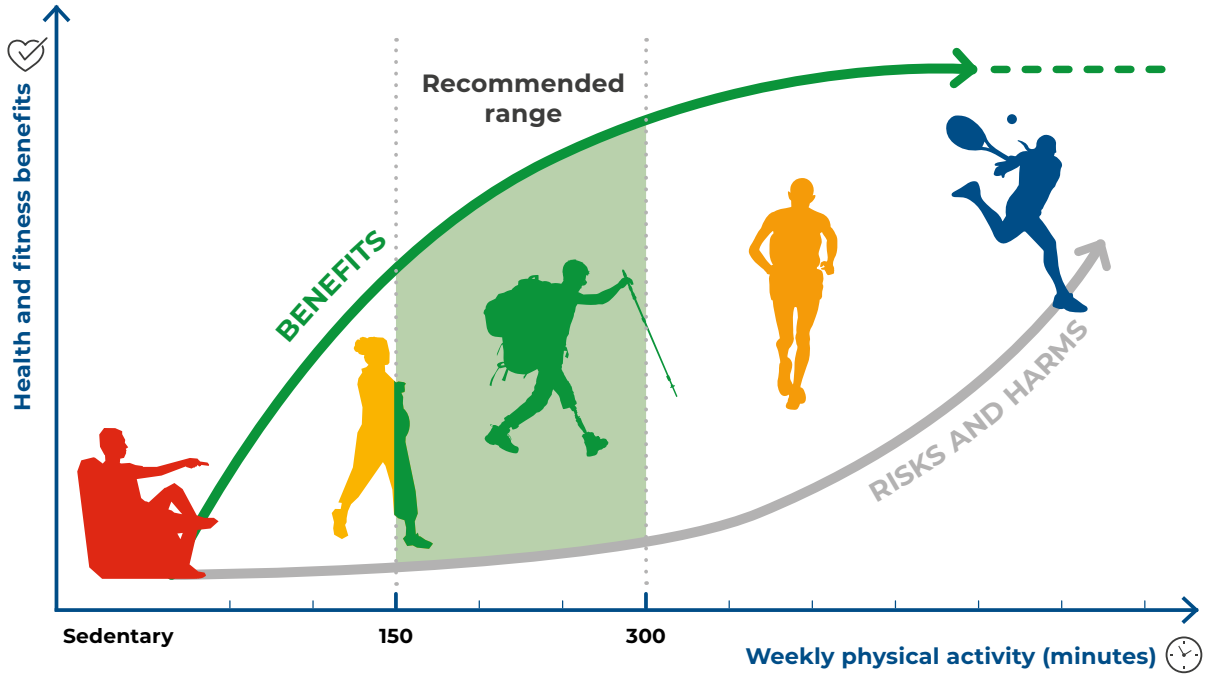
The benefits of physical activity extend beyond direct health benefits; policy actions and programmes that promote physical activity also improve the environment. For example, when countries promote and support more people in walking and cycling regularly, fewer people will use personal transportation for short trips and will thereby reduce their use of fossil fuel, lower congestion and improve air quality. These wider impacts of policy and programmes aimed at increasing physical activity, particularly through walking, can contribute to healthier, cleaner cities and communities, mitigate the effects of climate change and support the achievement of the United Nations Sustainable Development Goals (SDGs).[3]

The latest global estimates show that approximately one quarter of adults do not meet the recommended levels of activity.[4] However, levels of physical inactivity vary both within and between countries and can be as high as one half of the adult population, or higher in some countries. Older adults, women, people living with chronic disease and those living in disadvantaged communities are among the least active in the majority of countries.[4] Increasing levels of physical activity in the least active population is important focus of public health programmes.

Figure 1 shows that the greatest health gains in noncommunicable disease prevention come from increasing physical activity from very low levels up to the recommended level of at least 150 minutes (or 2.5 hours) per week in adults. Notably, greater benefits come from further increasing activity up to 300 mins and above per week in adults. It is important to note that, at these levels, and by choosing walking, there are very low risks of injury or adverse events.

FIGURE 1.

BENEFITS AND RISKS OF PHYSICAL ACTIVITY



Source: WHO Guidelines on Physical Activity and Sedentary Behaviour, 2020[1]

Why are people inactive?

Although the majority of people are aware that physical activity is a good for your health, a large proportion of the world's population do not engage in it often enough to gain the many physical and mental health benefits it offers. Understanding why people do and do not engage in physical activity is therefore important to guide and inform public health response and actions.

There is now considerable evidence providing practical insights into why some people are less active. Overall, the evidence shows there are multiple factors, across multiple sectors and settings, that influence levels of physical activity. Increasing participation will require coordinated, national and subnational approaches aimed at addressing both individual barriers (e.g. knowledge and motivation) and social, cultural and environmental barriers to help more people to be more active.[2]

Individual factors can include a lack of knowledge about the benefits of regular physical activity for physical and mental health, or the belief that physical activity is only for the young or for "sporty people" and that it requires a certain level of skill and fitness. Exercise can be perceived negatively and be associated with difficulty and discomfort. It is also still quite common for physical activity to be understood as something that has to be done in a gym or fitness centre, which can create a perceived economic barrier to participation. Communication campaigns and interventions such as mActive aim to increase people's understanding of what physical activity is and present positive and encouraging messages and programmes to help them start and maintain regular physical activity.

Beyond the individual factors mentioned above, family, community and societal values, as well as economic and environmental factors, can either hinder or enable people in being more active. For example, some cultural values and traditions can restrict or prohibit participation in physical activity, particularly for girls and women, older adults and people living with disability, and in some faith communities.

The physical environment may not be favourable in terms of access to local parks and sports facilities, or being able to walk and cycle safely in the local area. In addition, safety fears or weather conditions may deter individuals, particularly women and older adults, from being more active. In many cities and communities, the walking and cycling infrastructure which could enable and encourage people to walk and cycle, such as footpaths and cycle paths, is inadequate or poorly maintained. In these conditions, the fear of danger can prevent people walking or cycling for recreation or transport unless there are no other options.

Many people may not be familiar with the extensive benefits of physical activity such as walking, or know that regular walking for health, for recreation or simply to get from place to place, can be an effective form of physical activity. Walking also has the advantage of being free and simple to do and requiring no specific clothing or equipment. However, walking and cycling for transport can be associated with lower socioeconomic status and, in many countries, there is a strong desire to shift to motorized forms of transport as soon as economically possible. This is a barrier to retaining levels of walking and cycling in those countries where it is still a main form of transport, and can hinder efforts aimed at promoting walking and cycling as an alternative to motorized transport. Addressing these knowledge and cultural barriers where they exist is a key to successful promotion of physical activity through walking and cycling.

Finally, the most frequently cited individual barrier to participation in physical activity is the perception of a lack of time and lack of support. A perceived lack of time may be interpreted as placing a lower priority on being active compared with completing other demands in the available time. The perceived lack of support (from friends, family or a social network) reflects the need for help by those wishing to be more active, particularly in the initial stages when changes are needed to establish new routines. Yet, in many communities across the world, in both high and low- and middle-income countries, there are no appropriate or affordable programmes to help the people who are least active to start being more active and support them in maintaining behaviour change in the long term.

Given the multiple benefits of regular physical activity, there is an urgent need to develop and scale up initiatives that support more people in starting to be, and staying, more active. Comprehensive national approaches to promoting physical activity should combine the provision of information and individual support programmes with improvements to the urban environments to ensure there are safe and accessible places and facilities for people of all ages to be physically active. Increasing physical activity can reduce the health-related costs associated with physical inactivity that are incurred by already overburdened health-care systems. Health services that include the promotion of regular physical activity can prevent disease and improve health, and communities can benefit from the multiple and interconnected positive impacts of more active societies on the environment, economy and quality of life.

mHealth and the Global action plan on physical activity 2018–2030

In 2018, WHO launched a new Global action plan on physical activity 2018–2030 and set out a vision of "more active people for a healthier world"[2] with targets to reduce global levels of physical inactivity by 10% by 2025 and 15% by 2030. The Global action plan outlined a set of 20 evidence-based policy recommendations relevant to all countries, which they could adapt and tailor.

The Global action plan provides four key strategic action areas, which address: societal knowledge and value of sport and physical activity; the environment; the provision of programmes; and the policy and governance that support national action (**See Figure 2 on page 4**). One of the key policy recommendations was the development and scaling of innovative digital approaches to promoting physical activity (see Global action plan, policy action 4.2). This policy recommendation recognizes the significant opportunity provided by the digital transition to leverage the increased use and affordability of mobile phones[5] as well as the rapid increase in wearable technologies that can help support people in being more active. The development of mActive is a direct response and aims to support countries in utilizing mobile health technologies to increase physical activity and meet both national targets and global targets such as SDG 3.4.

FIGURE 2.

GLOBAL ACTION PLAN ON PHYSICAL ACTIVITY 2018–2030: POLICY AREAS

Source: WHO Global Action Plan on Physical Activity 2018-2030[2]

Be He@lthy Be Mobile

"Be He@lthy, Be Mobile" (BHBM) is a global initiative led by the World Health Organization (WHO) and the International Telecommunication Union (ITU). BHBM is based on digital technology for health (mHealth) to address noncommunicable diseases, including diabetes, cancer, cardiovascular diseases and chronic respiratory diseases, as well as communicable diseases.

BHBM supports Member States in integrating mHealth behaviour change programmes into their national health systems. BHBM offers several toolkits with messaging content that can be adapted to various platforms, such as voice, smartphone applications (apps) or conversational agents. All the content proposed for behaviour change is derived from evidence-based WHO guidelines that lead to positive health outcomes.

The BHBM initiative was originally devised to identify specific actions to be undertaken by Member States and included in the Global action plan for the prevention and control of noncommunicable diseases 2013–2020.[6] With the emergence of COVID-19 and the pressing issue of antimicrobial resistance as two examples of other fields of promise, BHBM is now expanding its focus to all areas where behaviour change can prevent adverse health conditions or modify disease trajectories. The initiative is in line with the 2030 Agenda for Sustainable Development and the associated Sustainable Development Goals.

The content of this toolkit was prepared by WHO and ITU in collaboration with an international group of experts. It is intended to provide operational guidance and resources, based on WHO guidelines, for implementing mobile-phone-based support (mHealth) for disease prevention and management. It is targeted at government officials, WHO staff members, implementing partners and academics who are involved in large-scale mHealth programmes. This toolkit describes how an mHealth programme can be used to strengthen existing prevention and management programmes, and illustrates the steps required for successful implementation. The toolkit content is intended for adaptation by Member States in their efforts to support national guidelines and existing health system interventions.

mActive for physical activity

In many countries, the least active populations are middle-aged and older adults, and are more likely to be women and people living in disadvantaged communities or living with a chronic condition such as diabetes, heart disease or hypertension.

The focus on walking as one way to be physically active is important, because it is an activity that requires no special skills or equipment; walking can be done by most people and in many environments – indoor and outdoor – and incurs no cost. Walking provides important health benefits: reducing risk of chronic disease, preventing progression of chronic disease, improving mental and cognitive health and helping to maintain balance and reduce the risk of falls.[1] Walking is also a very practical and convenient way to be more active, as it can be undertaken as part of everyday activities and as a form of transport for short trips.

mHealth for physical activity (mActive) is a programme with the central objective of assisting inactive adults, including older adults and adults living with chronic diseases such as type-2 diabetes, hypertension and chronic obstructive pulmonary disease (COPD), to increase their level of physical activity in line with global WHO recommendations on physical activity and sedentary behaviour.[1] The development of programmes such as mActive was a policy recommendation in the Global action plan on physical activity 2018–2030, which encouraged the development of innovative and digital approaches to support all countries in increasing physical activity by 15% by 2030.[2]

mActive is a 4–6 week mobile-phone-based, short message service (SMS – text message) programme, aimed at increasing physical activity through regular walking. The programme aims to motivate and support users to initiate, increase and maintain a regular (daily) walking routine. The behaviour change target is to help participants increase their levels of walking by setting weekly incremental goals towards achieving the WHO recommendation of at least 150 minutes of moderate-intensity physical activity per week. This goal is consistent with the new WHO guidelines on physical activity and sedentary behaviour, launched in 2020.[1]

The mActive programme consists of one-way and two-way SMS text messages, based on behavioural change theory. SMS was chosen because it is a simple and affordable modality and does not require an advanced smartphone. However, the mActive principles and message library can be adapted for implementation with all smartphones and for use in combination with other wearable devices, such as pedometers. **Table 1 on page 6** provides an overview of the mActive programme, including information on the target audience(s), programme goals, behaviour change theory and programme structure.

More detailed information on the mActive programme logic model, underpinning behaviour change theory and principles, and an mActive "user journey" can be found in **Annexes 2–5**. The mActive programme algorithm and message library examples can be found in **Annex 6** and the full message library is available on request through the website or via email to **bhbm@who.int**.

TABLE 1.

OVERVIEW OF THE mACTIVE PROGRAMME

PRINCIPLES	DESCRIPTION
Target audiences	Adult population, including older adults (aged 65 years and older), with low digital literacy, who are not following current WHO recommendations (referred to as "low active" or "inactive"); additional tailored options can target adult patient populations, such as adults living with hypertension and/or type-2 diabetes, more specifically.
Programme goals	Walk every day for 30 minutes, starting with 10 minutes daily.
Programme duration	The core programme lasts four weeks, with an option to enrol in the mActive PLUS programme (two weeks) and/or to repeat the core four-week programme.
Behaviour change theory	The programme uses the COM-B model (capability, opportunity, motivation) as a meta-framework to classify the influences (barriers and facilitators) on physical activity; each of these is informed by specific state-of-the-art theories of behaviour change (**see behaviour change model, in Annex 2 on page 70**). The behaviour change techniques that underpin the mActive programme are shown in the **mActive behaviour change model in Annex 2 on page 70.**
Programme structure: message type, tone, frequency, directionality	Walking is promoted in a variety of contexts for the users: as a form of transport for short trips (e.g. to and from work/education or other destinations); in or around the home; for travel; and for recreation. Messages incorporate evidence-based behaviour change techniques/reinforcers which aim to build the user's skills and motivation to achieve a walking goal. The mActive "plus" programme includes new and repeated messages introducing additional self-regulation skills to promote maintenance of regular walking. The programme template comprises one- and two-way messaging and offers practical advice in simple language. Messages emphasize the benefits of action (positive framing) over the consequences of inaction (negative framing). Users set a walking goal and progress is monitored on the achievement of the goal on a daily and weekly basis, as well as at the end of the programme. Additional messages are provided to enable countries to tailor mActive more specifically to their adult patient populations, such as adults living with hypertension or/and type-2 diabetes.
Alignment with global policy and recommendations	mActive promotes and is aligned with the core messages of the new 2020 global recommendations on physical activity and sedentary behaviour. The development and scaling-up of digital health behaviour change programmes, such as mActive, is a recommended policy action in the WHO Global action plan on physical activity 2018–2030.

Implementation of mActive with other policy and programmes

mActive can be implemented as a national behaviour change programme in conjunction with other physical activity policy initiatives to amplify the reach and impact and create a "multiplier" effect. For example, integrating mActive into health promotion clinics and primary health care services or combining the promotion of mActive within national public communication campaigns on physical activity will enable more people to hear about mActive from trusted sources; this will increase the number of people who participate and thus increase the impact of the programme.

mActive can also support countries in implementing and amplifying the impact of other recommended policy actions outlined in the Global action plan on physical activity 2018–2030. In particular, mActive has strong synergies with:

- implementation of national communication campaigns on physical activity to increase knowledge and awareness and support behaviour change (policy actions 1.2 and 1.3); and
- implementation of brief advice and behaviour change support services as part of primary health care (as recommended in policy action 3.2) and community wide programs, for example targeting older adults (policy recommendation 3.4)

More details on the opportunities to implement and promote mActive with other national strategies can be found in **Section 4 (on page 34)**.

About this handbook

This handbook is one of a series of practical BHBM resources that help Member States devise, plan and roll out mHealth programmes. It provides guidance on how to develop, integrate, implement and evaluate a national mActive programme in five key areas:

1. **operations management;**
2. **technology specifications;**
3. **content development and adaptation;**
4. **promotion, participation and retention; and**
5. **monitoring and evaluation.**

The handbook outlines the considerations necessary for planning and designing a national mActive programme. Some tools, such as checklists, templates can be found in each section. Further electronic tools such as spreadsheets and Word documents can be provided on request by the BHBM country support team (**bhbm@who.int**).

The WHO mActive message library is available on request through the WHO BHBM website or WHO Physical Activity website or via email (**bhbm@who.int** or **letsbeactive@who.int**). They are free for use by governments and not-for-profit or charitable organizations, on the condition that users share progress and evaluation reports with BHBM. For-profit companies can only use the content after entering into a direct agreement with BHBM.

The toolkit can be used independently or with support from the BHBM scale team and physical activity unit of experienced technical officers, ready to provide advice and support throughout implementation.

It is recommended that implementors read through the whole document before they start, as the chapters are operationalized concurrently. For example, although monitoring and evaluation is the last section in the guidance, it should be considered right from the start of implementation. Additional tools, resources and lessons learned can be found on the BHBM website.

To find out more about country assistance or the use of WHO content, contact **bhbm@who.int** or **letsbeactive@who.int**. Evidence supporting the development of the mActive logic model and library content are summarized in **Annex 1 on page 57**.

1 Operations management

1 Operations management

Operations management is the design and organization of the processes involved in making a product or carrying out a task. This includes defining the stakeholders involved in the project, their roles and defining the goals, outcomes, activities and outputs (including their timelines) of the project. It covers all project planning, organizing and management activities both on a strategic level and day-to-day running of the project.

This section describes the steps to complete the planning phase of a national mActive programme:

- Step 1: secure programme financing.
- Step 2: conduct a needs assessment.
- Step 3: establish the programme leadership and partnerships.
- Step 4: develop a workplan.

STEP 1: SECURE PROGRAMME FINANCING

As a prerequisite to implementation, BHBM suggests that funding for year 1 (at least) is secured prior to commencement. Experience shows that programmes are more successful where financial and political will and support from multiple sectors are harnessed from the outset, with many countries covering at least half of the cost from government budgets. For more information and lessons learned about financing mHealth programmes, **see Annex 7 (on page 81)**.

STEP 2: CONDUCT A NEEDS ASSESSMENT

For an mActive programme to be effective, it is essential to understand the context in which the intervention will be delivered. A needs assessment provides information for planning, identifying knowledge gaps, helping with decision-making and understanding the programme setting.

An mActive needs assessment involves visiting, observing and interviewing key informants and stakeholders, gathering local and national health data and documenting existing resources, including the technologies already being used for the promotion of physical activity to the wider community and initiatives

underway as part of efforts to prevent noncommunicable diseases.

The needs assessment should also determine the national capacity to promote physical activity using digital technologies, ensuring that it covers screening and management facilities, to support the programme's implementation and expansion. The data collected will inform the community-specific and country-specific development and implementation of mActive and can provide baseline measures from which the programme can be monitored and evaluated.

Table 2 outlines recommended issues and considerations to be explored when conducting a needs assessment. The time required to complete the assessment will vary from country to country, depending on the availability of existing data and relevant national health promotion and noncommunicable disease prevention and treatment programmes.

TABLE 2.
RECOMMENDED ISSUES AND CONSIDERATIONS FOR AN mACTIVE NEEDS ASSESSMENT

TOPIC	CONSIDERATIONS
Assess the population's current physical activity levels	Collect descriptive data on the number and percentage of people who are inactive, or insufficiently physically active, including age, gender and location (e.g. urban or rural). Collect descriptive data on participation in walking, including age, gender and location (e.g. urban or rural). Collect data on the impact of physical inactivity on NCDs (particularly cardiovascular disease, hypertension and diabetes). Collect data on the economic burden to the health sector of physical inactivity, to support advocacy for policies and programmes to increase physical activity. Use all data collected to identify priority populations and important population segments to focus the mActive programme.
Assess national physical activity policies, recommendations, action plans and programmes	Identify and review national and subnational policies on promoting physical activity. Collate current objectives of the physical activity programme (including behavioural objectives), constraints, institutional and human resources, funding and effectiveness (if available). Identify existing or planned synergies with noncommunicable disease programmes (e.g. cardiovascular disease, diabetes). Assess any current or planned campaigns and health promotion strategies for physical activity. Assess interest and support from nongovernmental, community and patient organizations. Identify relevant priorities of the government and health system. Identify alignment of mActive with other mHealth programmes.

TOPIC	CONSIDERATIONS
Determine current state of mobile communications	Statistics of use of mobile phones and text messaging, including in key demographic groups. Costs to consumers of text messaging, data and calling. Penetration and use of smartphones and mobile internet access. Statistics of popular mobile applications used in-country. Description of the mobile network environment (e.g. the number of network providers, whether they provide "value-added services", including any related to health). Whether unsolicited text messaging (spam) by companies is allowed, or occurs anyway. Whether health services use text messaging or smartphone apps. Cultural issues in the use of mobile phones. The projected evolution of the mobile phone market in the near future, particularly with respect to increased penetration of smart or semismart phones and mobile data access. Regulatory issues such as spam, consent to receive programmes, cost of message transmission, restrictions on the number of messages that can be sent each day. Existing mHealth programmes that could recruit participants or incorporate mActive messages.
Understand contextual, geographical, cultural and behavioural influences	Individual and cultural attitudes to participation in physical activity and walking, including for population subgroups. Determinants of physical activity including both individual and environmental factors. Cultural and social factors that may support or prevent individuals from adopting a healthier lifestyle. Physical environmental factors, including the built and the natural environment that may support or hinder walking and other physical activity (e.g. climate, roads and footpaths, places to walk, safety). Organizational, community, social and family structures that would support successful mActive outcomes. Potential motivation for individuals to participate in an mActive programme. Expected interactions of target populations with potential channels in health interventions: SMS, web, app, phone call, interactive voice response, brochure, face-to-face coaching or consultation. Convenience and cost of accessing health interventions for the population (who will pay: the population or the government?). Literacy and language considerations. Access to and functional ability issues in the use of mobile phones. Proportion of smartphone users in the population and distribution by socioeconomic status. Knowledge levels, cultural attitudes, behavioural skills, physical competence, perception of risk, and current behaviour and behavioural trends relating to physical activity.

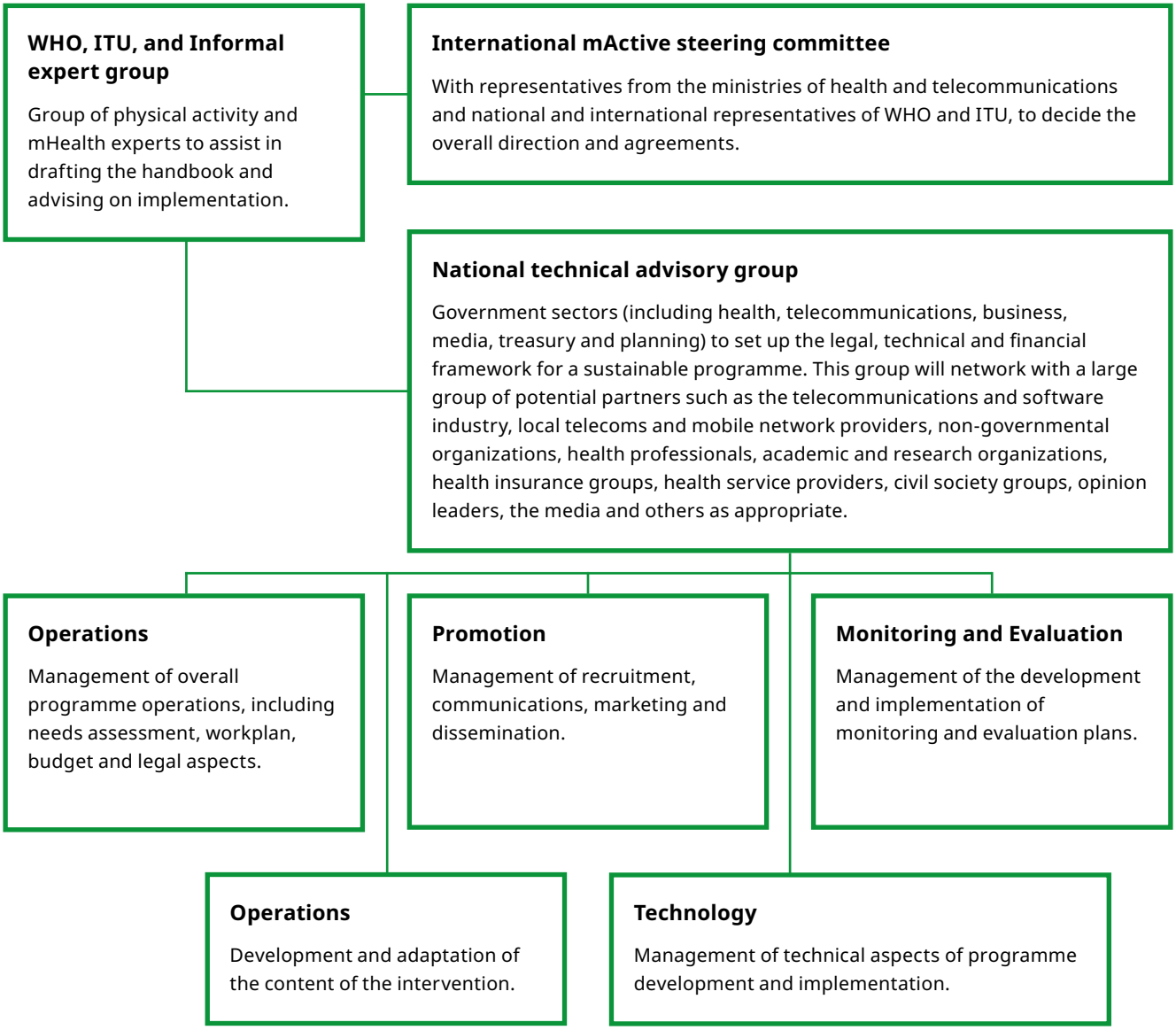
TOPIC	CONSIDERATIONS
Identify and engage multiple stakeholders	Identify relevant agencies, organizations, donors, companies and experts and their potential interest in supporting an mActive programme, including: • national and subnational/regional levels of public health experts; • funders of public health services; • ministry of health and other relevant government departments and agencies (potentially transport, planning, sport and recreation, education); • health-care and community workers who work in physical activity or prevention of chronic disease; • private physical activity professionals – working in the physical activity, sport and recreation or health industries; • government agencies responsible for telecommunications and data protection; • telecommunication companies, mobile network providers and industry bodies or associations; • any local mobile phone service providers or companies that provide mHealth services; • community advisory groups, volunteers; • health insurance companies, other private sector supporters; and • academic researchers (public health, physical activity, behaviour change, social marketing, mHealth).
Assess the available content	Content of messages: consider the current message library, context of the messages, consumer message preferences, language, triggers, audience, tone, frequency, intensity, type and timing. Source of messages: consider the credibility of text messages in terms of the sender of the message (health ministry, schools, community leaders, sports personalities). Client/receiver: who is the target audience? What do we know about them (from a demographic, psychographic, ethnographic point of view)? Feedback: what mechanisms will be used for feedback?
Assess existing promotional activities and user preferences in terms of materials	What channel will be used to promote the mActive programme? How will people be registered on the programme? What recruitment strategies will be used? Incentives for participation. Access to and availability of health-care services and resources.
Conduct further formative research	Further formative research may be needed if there is insufficient up-to-date information on country readiness for implementation of an mActive programme. Examples of further formative research include: • research to facilitate a successful launch; • research to identify appropriate implementation strategies; • operational research on which to base management decisions; • online surveys or focus groups with the specific target audience or stakeholders; • pilot studies covering selected areas or target groups; and • market research on existing mHealth apps or programmes used in the country (by both private and public sector).

STEP 3: ESTABLISH PROGRAMME LEADERSHIP AND PARTNERSHIPS

To facilitate planning, implementation and monitoring of the mActive programme, a management team should be established with clear responsibilities and accountability for the programme (**See Figure 3**). The team should be made up of enthusiastic and driven individuals who are committed to the goals of the programme.

The in-country management team typically consists of 5–8 people who work very closely with the programme. Successful programmes have had inclusive steering committees, technical advisory groups (TAGs) and in-country operations teams that meet regularly in a transparent input process, welcoming contributions from all.

FIGURE 3.
PROPOSED STRUCTURE OF AN mACTIVE MANAGEMENT TEAM



Description and responsibilities of the mActive country management team

WHO, ITU and informal expert group on mActive: the international experts that assisted in developing the mActive handbook also have experience in programme implementation and evaluation 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 of programme sustainability.

International mActive Steering Committee: the Steering Committee is responsible for presenting the mActive programme to governments and international agencies to disseminate activities, share lessons and engage the population and policy-makers. The Steering Committee should put mechanisms in place to formalize a clear governance structure and functions and programme ownership. Representatives of key government sectors involved in the programme should be part of the Steering Committee, including representatives of the ministry of health and ministry of telecommunications and international and national representatives of WHO and ITU. WHO and ITU members should contribute to decisions that maintain the coherence of the overall Be He@lthy, Be Mobile initiative and share lessons learned between countries.

National technical advisory group (national TAG): the national technical advisory group will also support implementation and promotion of the programme by assisting the in-country operational team in making important decisions, including type of programme, programme objectives, programme design, population segments to be included, evaluation design and scope, programme support and integration into existing health services and programmes. The group should be recruited from various government sectors (including health, telecommunications, commerce, media, treasury and planning). It should include those necessary to make decisions around funding and planning, programme design, promoting and evaluating the programme. The TAG will contribute to the programme's long-term sustainability. It should include those who understand or represent the mobile network environment in the country. Regular meetings will be required for information-sharing and progress updates. The national TAG will assign roles and responsibilities to various organizations involved in the different phases of the programme. This should include discussions on assigning overall programme ownership, funding and contracts or agreements on dealing with technical and other issues.

Project leaders for national operations, technology, content, promotion and monitoring and evaluation: project leaders include people who will run the country needs assessment, design, develop or adapt the programme to ensure cultural relevancy and technical accuracy. Project leaders will also be responsible for programme promotion, operationalization, maintenance, sustainability, integration into the health system and health promotion services and evaluation. This group may include physical activity and digital health specialists, evaluators and statistical experts, health promoters, behaviour change and communications experts (including language translators) and consumer groups. The project leader who leads the national operations team, is the person accountable overall, who will run the programme to budget and timeline and who reports directly or to a delegate of the national TAG and reports on progress to WHO and donors.

STEP 4: DEVELOP A WORKPLAN

Table 3 (on page 15) is a checklist for developing an mActive programme workplan. A workplan includes a plan for designing, developing, implementing and disseminating the mActive programme. Budget elements need to be considered for each of these areas.

TABLE 3.

CHECKLIST FOR DEVELOPING AN mACTIVE PROGRAMME WORKPLAN

1. OPERATIONS MANAGEMENT:
Planning decisions are made, a description of the programme is created and an operations management plan is developed that specifies those responsible for implementing the project and ensuring provision of services. Estimated time: 3–6 months

- ☐ Secure programme financing
- ☐ Conduct a needs assessment
- ☐ Establish programme leadership and partnerships
- ☐ Develop a workplan

2. TECHNOLOGY SPECIFICATIONS:
Decisions made about the considerations necessary for the infrastructure and rules of the programme. Estimated time: 4–6 weeks

- ☐ Select the appropriate technology for your context
- ☐ Identify other implementation needs
- ☐ Identify software needs
- ☐ Clarify the role of telecommunications (telecoms) operators

3. CONTENT DEVELOPMENT AND ADAPTATION:
A research-driven process of message refinement should be implemented. Estimated time: 6–8 weeks

- ☐ Adapt mActive programme design
- ☐ Adapt the existing mActive content library
- ☐ Additional content development
- ☐ Adapt content library for voice, messenger apps or chatbots

4. PROMOTION AND RECRUITMENT:
Decisions should be made about marketing and enrolment in the programme.
Estimated time: 6-8 weeks

- ☐ Promote the mActive programme
- ☐ Recruit participants into the mActive programme
- ☐ Ensure retention of participants

5. MONITORING AND EVALUATION:
Decisions made about what will be measured by the programme, how and with what frequency. This occurs before, during and after programme implementation

- ☐ Develop SMART objectives for the mActive programme
- ☐ Develop indicators
- ☐ Plan human and financial resources for monitoring and evaluation
- ☐ Source or develop monitoring and evaluation tools for data collection
- ☐ Analyse the data
- ☐ Report and disseminate findings to stakeholders

2 Technology specifications

2 Technology specifications

This section of the handbook covers the considerations to select and implement the best technology to get your behaviour change messages to your target population.

If you wish to create this mHealth programme within a wider ecosystem, review longer-term considerations of setting up a digital health platform.

For more on this, see the Digital Health Platform Handbook for Health: Building a Digital Information Infrastructure (Infostructure) for Health.

SELECTING THE APPROPRIATE TECHNOLOGY FOR YOUR CONTEXT

To define and design your programme as appropriate to your context and your target users, the following aspects of an mHealth programme must be considered by the national TAG and any other advisors involved from the start, in collaboration with local partners. The aspects that feature in the considerations for a needs assessment are marked with an asterisk (*).

1. **Key functions that the technology needs to perform, focusing on the experience of the end user:** for example, you have identified that you wish to deliver a health (text) message delivery system, sending automated messages according to an algorithm with a predefined frequency. You have identified how users access the programme and how often they will interact with it based on behaviour change theory.
2. **Current and predicted use and uptake of mobile technologies and communications*** for health in the target population both from public sector and private sector. Consider the preferences of the target population and the availability and sustainability of these technology options within the public sector (you may have gathered this information in your needs assessment).
3. **Market research** to identify which telecoms system is most appropriate in the country, based on its reach (subscribers), coverage, costs, security and sustainability?
4. **Equity of access to different technologies*** for technologically disadvantaged groups (SMS or interactive voice response (IVR) system are likely be most equitable), reach and access to different language versions.
5. **Communicating messages within the parameters of your chosen technology.** Should voice messages, video messages, images, Graphics Interchange Format (GIF) images, interactive messaging be used? What is the capacity for reach of these features and content in the country?
6. **Ensuring that the programme is free and available to all consumers** regardless of their device, carrier, network or location? Could the data cost of initial download of an app or the receipt of WhatsApp messages be waived by the telecoms provider for example?
7. **Data considerations and specifications** to ensure that data is handled sensitively, to protect human rights and personal safety. Using a need-to-know principle, what data collection is necessary? Who owns the data? Where is it hosted and how robust is the security of the host? What are the privacy regulations and how will data be protected, kept secure? What are the considerations for data protection and how should a central database best be maintained?
8. **Monitoring and evaluation:** How can user data be used to report on the key performance indicators? Again on a need-to-know basis, what frequency and which indicators should be used? How will the system produce reports and present data from users?
9. **Interoperability considerations** and with existing health systems and technologies.
10. **Sustainability factors** like ongoing operating costs of the programme, such as per message or unit of data, and how will these affect the scale of the programme?
11. **Contractual arrangements with partners,** for example the considerations regarding 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?

IDENTIFICATION OF OTHER IMPLEMENTATION NEEDS

Having identified the technology that you will use, you can then identify further technology needs for implementation e.g.:

- identification of process for procurement, adaptation and maintenance of the selected technology;
- dashboard development and access needs (what monitoring and success indicators should the dashboard present, and who should have access to the dashboard?);
- procurement of a short code (if using SMS or telephone networks for IVR);
- data security needs; and
- pre-testing and scale-up needs.

As mentioned previously, some of these needs may be apparent from your needs assessment, but if not, further research will be necessary to define these needs. It is worth investing in this step, because if you develop software and later have to make revisions to it based on unforeseen needs, it can be very costly indeed.

These considerations and the following simplified list of pros and cons (**Table 4**) will help you to select the technology or channels that you wish to use, e.g. SMS, multimedia messaging service (MMS), voice over internet/interactive voice response (IVR), existing messenger apps (e.g. WhatsApp, Facebook Messenger or local providers) or purpose-built apps.

TABLE 4.
TECHNOLOGY (AND APPLICATION) OPTIONS: STRENGTHS AND WEAKNESSES

CHANNEL	STRENGTHS	WEAKNESSES
IVR	• Voice- and phone-enabled access via a (free) number • Fast time-to-market • Supports natural language • Ease of integration • Accessible to those with feature phones	• Limited capability and development tools • Inability to pause, resume, forward and rewind • Two-way communication is limited and can have bugs
SMS	• Simple, easy and convenient • Can negotiate cost-effective delivery • Private communications • Fast communications • Accessible to those with feature phones	• Some security vulnerabilities • Fake SMS (spoofing) can result in trust issues • Two-way messaging is limited to simple interactions
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

CHANNEL	STRENGTHS	WEAKNESSES
MMS	• Direct and personal • Messages can be stored and forwarded • Interactivity through multimedia	• 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
Existing messenger services	• Low cost (e.g. can deploy many mHealth programmes simultaneously) • High usage • Increased interactivity and engagement • Maintained by the app provider • Allows graphics and videos to be sent • Can deploy conversational agents or chatbots (where responses are tailored to users' inputs) • Can be simple or elaborate (natural language processing and artificial intelligence) • Can carry an avatar or visual identity	• Third party private-sector involvement may necessary (e.g. WhatsApp or, if using bots, a bot provider to set up and manage back-end functions) • Potential data costs for end user to receive content • In the case of conversational agents, if using artificial intelligence capabilities, can require data and training before launch; also, bugs or bot miscomprehension of inputs can be dissatisfying and potentially risky • Some bot platforms are unable to start a conversation, meaning the user has to engage first, risking high drop-out
Smartphone applications	• Self-contained experience • Graphics and videos easily integrated • User-generated content and data input • Automatic updates and read content offline • Leverages device-native capabilities (camera, Global Positioning System (GPS), step counter) • Can deploy conversational agents (for tailored two-way messaging)	• Need to build for multiple platforms, with time and high cost • Managing multiple releases/updates • Client-side changes • Need to submit to app stores for approval • High user drop-out rates • Initial data required for download can be costly for end user • Often requires 3G or 4G coverage • Compatible with only two platforms (iOS and Android)
Mobile web	• More economical than mobile apps • Mobile phones and smart phones supported • Mobility for content and services • Videos and graphics easily integrated	• Less functionality, unable to use advanced phone features such as camera, GPS • Small display size • Low text input • Low bandwidth affects functionality

Software needs

A service delivery platform is an example of necessary software for running an mHealth programme to ensure that the programme is integrated with the mobile telecommunications network. Such a platform will have different capabilities and features depending on the technology you have chosen and also the wider digital health landscape in your country. Depending on your requirements, you will need to identify whether an existing platform is appropriate or whether a customized solution would be best. You can also look to other service providers or countries running similar mHealth programmes to see what they are using, the challenges they faced and what they have learned. **Table 5**, taken from WHO's toolkit for planning an information system[7] can help you to choose whether to use an existing solution or develop a customized one. Consider the pros and cons of each option, mapping your technology requirements to the capabilities of the platforms. Also understand the programming needs, the level of ongoing support available for each option, and the costs.

TABLE 5.
DIFFERENT MODELS OF SOFTWARE AND THEIR RISKS AND BENEFITS

MODEL	MHEALTH EXAMPLE	BENEFITS	RISKS
Custom-developed software (software system built from scratch)	Custom-developed software: The extraordinary situation related to COVID-19 has led to numerous mobile phone apps being developed for it.	You have control over technology, functionality and design. Development creates ownership and improves sustainability. Local IT engagement.	Custom development tends to be difficult to manage within timelines and budget. Satisfaction is not guaranteed as the end product depends on the capabilities of the technical team. Long-term support depends on continued availability of individuals.
Commercial off-the-shelf software (purchase of commercially available product)	BlueStar, by Welldoc. The first mobile health product to secure reimbursement as a diabetes therapy, WellDoc's BlueStar is an FDA-approved tool for chronic disease management, particularly for Type 1 and Type 2 diabetes management.	Lead time from selection to implementation is shorter. You can evaluate product before buying. The product is maintained and upgraded (at a cost). It has normally been tested and refined in other implementations.	Often expensive and sold with unclear fee structures (e.g. fee per server processor). Commercial off-the-shelf software is often not designed for implementation in low-resource settings.

MODEL	MHEALTH EXAMPLE	BENEFITS	RISKS
Open-source software (source code and product are freely available, often with a supporting community)	RapidPro SMS: UNICEF Innovation and Nyaruka created RapidPro in 2014, which is a suite of software designed to send and receive data using basic mobile phones, manage complex workflows, automate analysis and present data in real-time. RapidPro allows users to easily design, pilot, and scale SMS and IVR services that connect directly with a mobile phone user, without the help of a software developer.	You have the right to make changes to the software. You can engage the local IT industry. Benefit from communities and share development costs with other organizations.	Can end up with a poorly supported product. A loosely knit community might not be able to provide the business relationship you need. Some of the implementation and running costs are hidden.
Software as a Service (SaaS) (database and application are hosted on remote servers and software is sold or offered as a contracted service)	Software as a Service (SaaS): Flatiron Health supplies cancer-treatment centres with tools used by doctors for tracking patients' progress and finding out what heals and what does not. Flatiron's software allows medical cases to be shared with researchers to provide supplementary data.	Highly feasible to implement and maintain. Clarity about the cost to implement and run a SaaS application. Investment in improved software can easily be shared among customers.	Data hosted on remote servers: not always in agreement with national policy. Ministries of health are often not well positioned to pay a regular service fee.

In making your decision, the following considerations will in some cases be necessary:

- identify how software will integrate with the mobile telecoms environment – will it work across different mobile network operators?
- what partnerships need to be developed to activate the service (for example, partnerships with aggregators, network operators, mobile gateway providers)?
- consider how the platform will adapt to changes and advances in technology;
- depending on the platform, will the project need new or additional computers or a server to run the programme?
- consider issues around interoperability and licensing.

An example selection matrix can be found in the **Digital Health Platform Handbook for Health: Building a Digital Information Infrastructure (Infostructure) for Health**. This can help you to select the best option from your list of possible software solutions.

SELECTING A SOFTWARE PROVIDER

It is likely that your organization will have existing processes and procedures for the procurement of services and will likely issue a request for proposals (RFP). You can start by inputting to this RFP the background information you compiled (see checklist in Section 1) and make sure the goals, values, and desired outcomes for the programme are set out. Working with service providers whose values align with those of your programme will help with relationship management. Researching your service providers and having dialogue or interviews with service providers prior to selecting them can help to know if your values are aligned.

Next, use the list of requirements you have created to build the RFP. If you do not have a software specialist on your team, leave it to the software providers to suggest the more technical specifications that can meet your requirements. The BHBM country support team can also help you with writing the RFP.

Consider software providers that have implemented similar solutions at scale (and feel free to ask to see audit results). Ensure they can cope with the demand for the programme and maintain their service (e.g. ask what maintenance activities are included in the fee). Make sure that you understand what components of the software will be proprietary (and license them to the mDementia Programme owner if possible) but try to aim for open-source components wherever possible.

When selecting the company, you may wish to design or adapt an existing scoring matrix to help standardize any contracting decisions made. **See Annex 6 (on page 80)** of the **WHO planning an information systems project toolkit** for a comprehensive scoring matrix that can be adapted for your purpose.

THE ROLE OF TELECOMS OPERATORS

It is important to note that mobile communications network environments differ from country to country. The specificities of end user access to SMS, calls or mobile data (for stand-alone messenger apps) should be considered in the planning stage by including in the TAG technical experts (e.g. representatives of telecoms companies, operators, telecoms regulatory authorities, government departments responsible for information, communication and technology, cellular associations) or individuals knowledgeable about the communications network in the country. Network operators, telecoms companies or industry organizations can help to set up the programme and advise on its suitability and sustainability.

Some providers may view supporting such a programme as good publicity or a useful addition to the services they offer. This can work in your favour when negotiating with them. Try to consider the following before you invite them to become involved in technology specifications: what sort of arrangement with telecoms companies will best suit long-term implementation of the programme? What other partnerships can be useful or necessary? What are your parameters for negotiation with telecoms regulators, aggregators and operators for pricing of message dissemination?

In the absence of support from telecoms provider and in the case of an SMS or IVR programme, the programme can be delivered through a contractual arrangement with an “aggregator” or “gateway” company that has established relations with all telecoms companies and networks (**See Annex 9 on page 88**). This can be a cost-effective way to deliver messages to many participants, regardless of their mobile carrier or location, without establishing these interfaces individually. Although the aggregator adds a further cost, this cost decreases as the scale of the programme increases; using an aggregator can therefore be more cost-effective than attempting these activities in-house, unless the necessary capacity and infrastructure already exist.

3

Content development and adaptation

3 Content development and adaptation

A standard physical activity message library is available on request for countries to use as a basis for an mActive programme. This has been written in the format of SMS messages, but it can be adapted to other mHealth technologies, such as IVR, messenger apps or chatbots.

SMS is the most equitable modality for delivering health messaging in resource-restricted settings (where much of the population may not have access to a smartphone) or without digital literacy or skills. BHBM suggests that countries run SMS programming alongside other technology options, such as messenger apps or stand-alone apps, if countries wish to deliver the programme through smartphones. Programmes are most effectively improved through testing and content refinement with target users to provide essential insights and validate the finalization of programme design and content.

This section of the toolkit will provide guidance on

- adapting the programme design;
- adapting the existing BHBM mActive content library to your context;
- ways of creating additional content for your mActive programme, if the content we have provided is not sufficient for your needs; and
- considerations for adapting BHBM content library to other formats (e.g. voice and messenger apps and chatbots) and adding multimedia content.

Countries are invited to share any additional messages or content with the BHBM Secretariat to inform further iterations of the global message libraries and for sharing for the benefit of other countries.

ADAPTING AN mACTIVE PROGRAMME

mActive is designed with a duration of four weeks (CORE programme), with an additional optional component lasting two weeks (PLUS programme). This duration was chosen on the basis of evidence that shorter SMS programme duration increases retention among participants.[8,9] However, there is flexibility in mActive for countries to change and adapt the programme design, making it longer or shorter and more or less intensive, or adapting the system instructions, registration, opt-in/opt-out and other functions.

When adapting the programme, including its instructions and logistics, the following should be considered and guided by feedback from target users of the programme:

- objectives of the programme;
- telecommunications technology to be used;
- promotional media and channels to be used;
- timing, frequency and duration of the intervention;
- collection and storage of baseline and follow-up evaluation data;
- data privacy considerations (data protection rules);
- registration, opt-in and opt-out processes and administrative communication (if any);
- whether there will be two-way interaction, and associated cost;
- degree of choice and flexibility in the programme;
- possibility of stopping and/or changing the programme; and
- extent of interaction with clinicians or the health system.

Available on request as part of this toolkit is the mActive content library of messages for an "off-the-shelf" mActive programme, including suggested length of programme and frequency of messages (provided in the algorithm). The suggested algorithm is such that messages start at a higher frequency and diminish in the final week.

The content library was created by experts in physical activity, behaviour change, noncommunicable diseases, mHealth and health communications. The messages were drafted to align with the WHO Guidelines on physical activity and sedentary behaviour.[1]

Adaptation of messages is important because the messages must be understandable, acceptable and relevant to the people using them in order to increase their impact. Users will be able to relate better to the behaviour change strategies and implement them better, which should lead to higher retention of users. It is recommended that you consider tailoring messages for specific groups (according to e.g. gender, healthy population, population with chronic diseases, rural or urban populations, socioeconomic status, ethnic group, age).

Adding new content to the generic mActive content library

To assess whether new content is required for the programme, assess the following (some of which may already have been included in your needs assessment):

1. Will the programme target all adults or are there any specific subpopulations that should be targeted and that require adapted content? For example, people living with diabetes or hypertension are often less active, women are often less active than men; the mActive programme can be adapted with additional tailored messages for these subpopulation groups.
2. Are there any specific attitudes, beliefs or values relating to physical activity or risk reduction of noncommunicable diseases that are specific to your target population(s) and which might warrant additional programme content and messages?
3. Are there any special informational needs in your country resulting from a high prevalence of related conditions (e.g. overweight and obesity) or environmental contexts (e.g. weather conditions or safety concerns) that might warrant additional programme content and messages?
4. Is the proposed structure of the programme (frequency and duration of messages, interactivity. etc.) appropriate for your target users, or does it require adaptation?

If you answer "yes" to any of the above questions, you should find out whether potential content exists in other health communications and physical activity campaigns in your country. If not, try to gather as much information as you can in order to create and test the new content. You should gather opinions of specialists in the health topic area concerned in order to write new content.

When writing the additional content, consider the following points to ensure messages, app content or chat bot scripts are understandable, acceptable and relevant to the users:

- language, tone and clarity of the health messages;
- health literacy and technological literacy level of the target users;
- provision of information, concrete instruction for self-managed behaviour change, reminders and motivational content;
- relevance and usefulness of practical tips and strategies for the population;
- the need to avoid an alarmist tone or negative framing in behaviour change messages – if a negative frame is used, be sure to provide also an instruction, solution or positive statement to avoid causing anxiety and a feeling of disempowerment in the user;
- including an "active" component, or an "ask" (e.g. women are more likely to act on messages that give a concisely written true statement and then ask them to act on it, such as "get screened now");
- whether the information should be static or dynamic, which depends on whether the messages are one-way or two-way, or fully interactive via a chatbot or an app (based on input from the user); and
- length of characters per message allowed in each country, or the data implications of sending the content (more applicable to images and videos).

Research shows that there are "mediators of meaning" when developing written messages, which go beyond the basic tailoring of messages to different cultural settings.[10] These mediators help explain the hidden assumptions related to culture, health and the health system, which may be interpreted through health communication messages. Maar et al.[10] identified six main themes or factors that influence the level of congruence between message content as perceived by developers and the content that is actually perceived by the recipients. **Table 6** shows the relationship between the six main strategies, operationalizing strategies and the affected behaviour change conditions, which should be borne in mind when composing the messages. New content should then be tested with target users, as outlined above in the adaptation section.

TABLE 6.

MAIN THEMES AND OPERATIONALIZING STRATEGIES FOR MESSAGE DEVELOPMENT

MAIN STRATEGIES BASED ON THEMES	OPERATIONALIZING STRATEGIES FOR MESSAGE DEVELOPMENT BASED ON SUBTHEMES	COM-B MODEL OF BEHAVIOUR CHANGE
1. Use positively framed messages, as they are more persuasive; avoid negative or non-affirming framing of messages.	Empower and ease stress by pointing to successes. Inspire and show respect for message receivers. Show compatibility with positive indigenous views of health as "living a good life".	Motivation
2. Avoid fear- or stress-inducing messages.	Do not exacerbate people's stressful lives (e.g. experience of low income or racism).	Motivation

MAIN STRATEGIES BASED ON THEMES	OPERATIONALIZING STRATEGIES FOR MESSAGE DEVELOPMENT BASED ON SUBTHEMES	COM-B MODEL OF BEHAVIOUR CHANGE
3. Avoid oppressive or authoritarian messages.	Show respect for autonomy. Authoritarian messages may be perceived as lacking in respect; invoke historic distrust issues with colonial/medical system; and may cause defiant response. Provide healthy lifestyle education messages. Empower with a strengths-based approach to local culture.	Motivation Capability, opportunity, motivation
4. Build on healthy cultural and traditional practices whenever possible; avoid incongruity with cultural and traditional practices.	Show respect for culture.	Capability, opportunity, motivation
5. Recognize social determinants of health as drivers of ability to adopt behaviours; avoid disconnect with the reality of social determinants of health and the diversity of cultures within a population.	Consider cultural settings and cultural norms related to lifestyle. Understand affordability and accessibility of physical activity. Consider access to providers and/or medications in the health-care system.	Capability, opportunity
6. Ensure pragmatic content within the local setting ; avoid lack of clarity and lack of practicality of content.	Preference for practical tips over higher level advice. Avoid ambiguity in wording and assumptions. Consider and check the local dialect in translation.	Capability

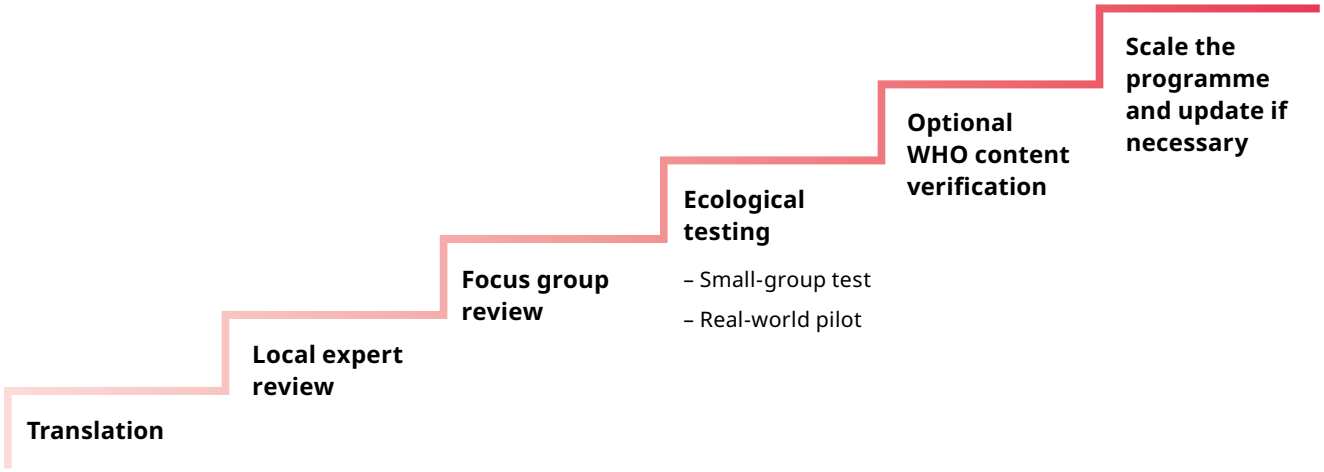
Source: (12).

Steps in completing content library adaptation

After editing or adding the message library, the following steps are recommended to complete the adaptation process. **Figure 4 (on page 29)** provides the overview of the suggested content library adaptation process.

FIGURE. 4.

OVERVIEW OF THE SUGGESTED ADAPTATION PROCESS



Step 1. Translation:

The first step of adaptation is the translation of messages into the local language or languages. Careful translation is important, so the messages retain their intent and are clear and engaging. These considerations are important when translating programme content.

In which languages will the programme will be available?

Experience of running BHBM programmes and feedback from users shows that some users did not engage in programmes because they were not delivered in major and accessible languages. For example, the Tunisian implementors quickly realized that the programme must be available in Arabic as well as French to facilitate local enrolments. In India, many languages are spoken, and the team learned that having at least Hindi in addition to English was crucial to obtain more subscriptions.

What dialect should be used?

In countries where multiple dialects are used, it may be necessary to decide which dialect will be acceptable to the most people and whether it is necessary to have the programme provided in more than one dialect. Other considerations may include spoken versus written or classical forms of the language – for example, would writing that follows a spoken style of Arabic be more engaging for users than classical, written Arabic?

Verification of translation: blind back-translation

Once the messages have been translated from English into the local language, it is recommended the translated messages be back-translated into English by a different translator (one who has not seen the original English content) to check its accuracy. This does not need a professional translator, but a person who, preferably, is bilingual. If there are discrepancies between the original and the back-translated English versions, the two translators and the implementing team can discuss the best alternatives to reach a sensitive and accurate translation into the local language.

Local experts, with input from the local community, should guide the adaptation process, creating a library of messages (or other content such as chatbot scripts or app content) that are easy to understand, appropriate and relevant to the target users. Input can be gathered through review processes and qualitative methods, including focus groups, surveys and consumer pre-testing. The testing can be conducted in-house, or externally by a specialist market research company.

Various messages of the mActive message may need adaptation. The challenge is to maintain the scientific accuracy of the message while making it locally relevant. For example, if it is too hot to walk outside, adapt it by asking participants to walk inside their home or take the stairs at home or work.

The following process can provide a user-centred and cost- and time-balanced approach to adaptation.

Step 2. Local physical activity expert review:

Local experts in physical activity, including primary care health workers, health promotion professionals, health communications specialists and academics, who have physical activity, exercise and or behavioural science expertise can be invited to provide a review of the translated materials. Experts may complete the review for free in exchange for an acknowledgement in the local programme reporting and dissemination materials. If resources are available, an mActive adaptation workshop can be convened, in person or online, for experts to meet and discuss their review and recommendations.

Specialists should have a background in behaviour change or health promotion in the field of physical activity, or experience in working with people who have, or are at risk of developing, noncommunicable diseases. It is important to ask the experts during this review whether additional message content should be developed (see additional content development **Adding new content to the generic mActive content library section on page 26**). A sample case study of the adaptation of messages (**Case study 1**) can be found in the box below.

The expert review and consultation should generate a local mActive content library. The next step is to validate the adapted content with the target population.

CASE STUDY 1.

ADAPTATION OF mTOBACCOCESSATION: THE TAKORE I TE KAI 'AVA'AVA PROGRAMME

A New Zealand smoking cessation text message programme (STOMP)[1] was adapted for use in the Cook Islands by the Ministry of Health and the University of Auckland in New Zealand (financed by WHO). The STOMP programme, which is theory-based and has been shown to be effective in supporting smoking cessation, had previously been adapted for the United Kingdom,[2] Argentina[3] and Samoa.[4] The adaptation process involved including the linguistic and cultural nuances necessary for the new context while maintaining the integrity of the original, evidence-based programme.

The messages needed to be adapted to be more focused on the direct health effects of smoking, rather than being general motivational messages to support behaviour change. This was due to the low level of previous population-based education on the harms of smoking in the Cook Islands. Another key feature of the adaptation was the need for formal language to be used in both the English and Cook Island Māori versions, without abbreviations or text language.

The final version of the free text message programme was named "Takore i te Kai Ava'ava", and a shortened version of the name ("TextTakore") appeared at the start of all text messages to distinguish them from unsolicited messages, which are common in the Cook Islands. As the local telecommunications provider was unable to provide two-way message functionality, different language versions of the programme, as well as personalization and tailoring within messages, had to be delivered from New Zealand, through a gateway company, direct to users in the Cook Islands. A pilot study of Takore i te Kai Ava'ava found the programme to be highly acceptable and demonstrated the potential to provide motivational support for smokers in the Cook Islands wanting to quit.

1. Rodgers A et al. Do u smoke after txt? Results of a randomised trial of smoking cessation using mobile phone text messaging. Tob Control. 2005;14(4):255–61. doi:10.1136/tc.2005.011577.

2. Free C, Whittaker R, Knight R, Abramsky T, Rodgers A, Roberts IG. Txt2stop: a pilot randomised controlled trial of mobile phone-based smoking cessation support. Tob Control. 2009;18(2):88–91. doi:10.1136/tc.2008.026146.

3. Colantonio LD, Peña L, Whittaker R, Mejia RM. Cross-cultural adaptation of a text message-based program for smoking cessation in Buenos Aires, Argentina. Nicotine Tob Res. 2015;18(3):314–20. doi:10.1093/ntr/ntv061.

4. McCool J, Tanielu H, Umali E, Whittaker R. Assessing the cross-cultural adaptation and translation of a text-based mobile smoking cessation program in Samoa (TXTTaofiTapaa): pilot study. JMIR Mhealth Uhealth. 2018;6(8):e173. doi:10.2196/mhealth.9033.

Step 3. Focus group review of messages:

Testing the messages with the target audience prior to implementation is a critical step, and can be done using focus groups. It is quite resource-intensive, but many BHBM programmes in other countries have found this step to be invaluable and well worth the investment. This testing phase may comprise a small number of in-person (or online) focus groups of target users and health workers (e.g. five groups of approximately 8–10 participants). If preferred, some focus groups could be replaced by telephone interviews with members of the target population. The typical length of the focus group sessions ranges between 1 and 2 hours, depending on the length of the mActive programme. Recruitment for focus groups can occur through community message boards, local community events or social media. For ethical reasons, it is advisable to obtain informed consent from all participants. It is common in some countries to remunerate participants for their time.

Focus group discussion in India for mTobaccoCessation
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The focus group should include persons representative of the target population, observing geographical diversity (rural, urban, various districts or regions nationwide), linguistic diversity (regional dialects), diverse socioeconomic statuses and different types of health worker (if these constitute the target population). Consider group dynamics and cultural norms when composing your focus groups, e.g. is it appropriate or may it inhibit participation in the discussion if elders are mixed with young people, or if groups are mixed gender. Focus-group participants should feel comfortable and disinhibited when participating with other group members.

The goal of the focus groups is to verify whether the programme content fulfils the following criteria.

- **Understandable** – are the concepts and terminology used in the programme understood by users? Can users describe in their own words what the messages are saying?
- **Acceptable** – are the messages respectful of and sensitive to the local context and inoffensive? Are the messages likely to be received with approval and acceptance?
- **Relevant** – are all the messages necessary and applicable to the environment and context of the user? Will people engage with the messages? Do users find the messages personally relevant and do they motivate users to take action?

The following can be used as prompts for discussion if necessary, so the facilitator of the group can ask for example: “please tell me in your own words what the message is saying” or “what do you understand this message to mean?” or “can you paraphrase what this message means?”, “how acceptable is this message to you and your community?” or “how is this message relevant to you?”. It is useful to record the focus groups (with their permission) and common to have a note-taker to record the discussion.

In one BHBM country programme, users had highlighted their need to change the time of day the messages were sent and the fact that two messages a day (at the start of the programme) was too many. The focus group discussion can also include questions about the delivery method and the time of day participants would prefer to receive messages and whether the planned number of messages (or expected engagement in the case of apps or chatbots) is acceptable.

Once the data and feedback from the focus groups have been gathered, convene the project team to decide on any modifications to the programme. It is recommended that any changes are documented. This information will be very useful to the BHBM Secretariat for improving the mActive content library and understanding more about its global relevance.

Step 4. Ecological testing:

This is a process of implementing the programme content in a controlled manner that mimics the conditions in which the programme will ultimately be received. A sample of users can be recruited to participate in a real-world consumer test of the programme. Controlled implementation, where users are monitored for their use of the programme and provide additional feedback on

their experience when they have completed it, can help to fine-tune the delivery, message content and order of the programme and is likely to reduce unexpected problems when implemented among a larger population.

Small-group testing: this may involve a small group of participants (approximately 15) who test the sign-up process and programme messages (or app or bot) for 1–2 weeks. Ask participants to rate each message (or session) immediately as they receive it, providing feedback on the acceptability and helpfulness of the message (e.g. "How did you find the sign-up process on a scale of 1 (being very easy) to 5 (being very difficult)?"). "Please estimate how long in minutes it required to sign up (approximately). Please reply with the number of minutes." "How much did you like the message (this exercise or exchange in the case of apps or bots)?", "How helpful was this on a scale of 1 to 5?" or "How likely would you be to implement the suggested advice or instruction in the message on a scale of 1 to 5?", "Was the message relevant to you? Did the message make you think about taking action today? On scale of 1 to 5, how motivating is the message to you?"

Real-world pilot testing: in one BHBM country annual report, it was stated that user testing and piloting was considered "essential". In a real-world consumer test, a select group of users is invited to participate in the programme prior to its wider public release. The pilot test could be part of the "soft launch", which occurs before the programme is marketed publicly. This pilot is identical to the programme, with the same dose and frequency of messages (or interactions), although it may be completed over a shorter period of time, e.g. over the first two weeks of the programme instead of the whole six weeks. Participants are surveyed over the telephone periodically during the course to obtain feedback on the overall user experience, how likely they are to engage in the suggested behaviour and whether the messages are understandable, acceptable and relevant. The results are used to refine the programme. **See Case study 2** below for details of the soft launch preceding the rollout of an mTobaccoCessation programme in Tunisia.

CASE STUDY 2.

mTOBACCOCESSATION PHASE 1 TESTING IN TUNISIA

In Tunisia, ahead of the at-scale rollout of the mTobaccoCessation programme, implementers adapted message content with expert input and then carried out a soft launch among 1086 subscribers to test the programme ahead of national programme implementation. The team gathered user feedback through telephone surveys, with 413 completers and 349 drop-outs. This very valuable information was then used to improve messages and the programme as a whole. Feedback included the following:

- improve the enrolment process to make it less burdensome;
- provide French and Arabic versions where necessary;
- provide more clear and practical advice and avoid stereotyped advice;
- provide more real-time two-way messaging (not just scheduled messages) when users need support; and
- adapt the messages to the users' social, physical and environmental situation.

Step 5. Optional fidelity-checking of the adapted content:

At BHBM, the expert group members who contributed to the original WHO content library are available for review of the mActive programme or message adaptations and mActive translations (using the back-translated, English language version) before pilot testing and widespread use in your country. You may send your content library to **bhbm@who.int** and the team will arrange for a scientific review by the expert group. Allow at least a three-week time frame for this review.

Adapting content library for voice, messenger apps or chatbots

The mActive content library was developed for use in an SMS format. The messages can easily be adapted to freephone voice messages, which are a good way to get messages to low-literacy or visually impaired populations. However, the mActive content library also includes messages that can be adapted for voice, messenger apps or chatbots. For more detailed guidance showing how to adapt messages to other formats, **see Annex 8 (on page 85)**.

If the results of the needs assessment and feedback from target users of the programme suggest that the programme should be delivered through smartphone apps in addition to SMS, adapt the content library for the messenger app (as normal instant messages or in chatbot format), or as a stand-alone app. **See Table 4 (on page 19)** in the technology section for the pros and cons of each technology.

Step 6. Scale the programme and update if necessary:

Once content has been verified, consider implementing the programme. Implementation should include a review to assess impact on the intended population. This will enable improvements to be made before implementing at scale.

4

Promotion, participation and retention

4 Promotion, participation and retention

PROMOTING AN mACTIVE PROGRAMME

It is important to plan and invest in the promotion of the mActive programme in order to raise awareness among potential users in the community and inform them on how they should enrol. Wide scale promotion of mActive is needed to ensure the programme has sufficient visibility and reach to the target audience and then attracts sufficient uptake to the programme so as to enable large scale population outcomes and impact.

Integrating the mActive programme into other planned or existing services and initiatives is a cost-effective way to promote awareness and encourage use of the programme. There are many different ways to implement an mActive programme; three examples are described below.

Implementing mActive by promoting and integrating the programme in primary health care settings

mActive can be implemented and promoted by primary health care professionals in clinical and/or community-based health centres and settings. It is suitable to include as part of services offered to patients as primary prevention of noncommunicable diseases and, for example, in clinical programmes for the management of diabetes and or hypertension. mActive can also be included as part of well-being and health promotion services.

Health-care professionals are an important source of advice and integrating physical activity assessment and counselling is recommended as a cost-effective noncommunicable disease "best buy"[11] and is one of the recommended policy actions in the Global action plan on physical activity 2018–2030 (policy recommendation 3.2).[2] mActive can be integrated within new or existing national protocols for assessing and counselling on physical activity by health-care professionals

mActive can be delivered through primary health care as part of an integrated package of services for noncommunicable disease prevention and management for people at risk of, or diagnosed with, a noncommunicable disease and as part of other programmes such GLOBAL HEARTS and PEN.[12,13] Provision of brief assessment and counselling interventions on physical activity is included in the WHO menu of interventions in UHC Compendium.[14]

One of the barriers that prevent health workers providing effective advice to patients about increasing physical activity is the absence of simple, effective tools to support patients as they commence behaviour change. mActive provides a simple, evidence-based, free-of-charge physical activity programme that is suitable for the majority of adult patients. It focuses on promoting regular walking, which is a free, simple way to be active and has low risk of injury for most patients.

The promotion of physical activity through the use of mActive by health-care professionals can be undertaken as part of self-management strategies and can provide patients with a tailored physical activity programme. For adults living with a chronic condition, such as diabetes or hypertension, regular physical activity is recommended and can generally be done safely when matched to a person's ability and in consultation with a health care provider. mActive can be adapted and tailored for people living with specific health conditions (see section 2 for further details on adaptation).

The promotion of mActive in health-care settings can reinforce wider community-based promotion and recruitment strategies. A sample case study from Portugal appears below.

CASE STUDY 3.

DIGITAL TOOLS FOR PHYSICAL ACTIVITY PROMOTION IN THE PORTUGUESE NATIONAL HEALTH SERVICE

In 2017, the National Programme for Promotion of Physical Activity of the Portuguese Directorate-General of Health (part of the Ministry of Health), developed three digital tools to facilitate physical activity promotion in primary health care.

The first two tools, aimed at health-care professionals, consisted of (1) a physical activity assessment tool (weekly moderate-to-vigorous physical activity and daily time spent sitting) integrated into the national electronic health record platform (*SClínico Cuidados de Saúde Primários*); and (2) a brief counselling system for physical activity promotion, consisting of the digital tool integrated into the Portuguese electronic medical prescription platform and containing five interrelated "guides" delivered to patients by phone/email or printed, tailored to their current motivational and physical activity levels using a decision algorithm. These tools were developed using scientific evidence, and are designed to be self-explanatory, allowing patients to explore them independently without consuming significant health-care professional/patient interaction time.

The third digital tool was a physical activity card incorporated in a smartphone app (MySNS Carteira) reading the accelerometer data from the device and giving citizens reports about their number of steps, energy expenditure and distance. From September 2017 to December 2018, 63 817 patients had their physical activity assessed through the assessment tool (i.e. 928 per 100 000 users of the National Health Service). Of these, 5443 received physical activity brief counselling guides (a proportion of 65 per 100 000 residents in the country aged 15 years or over).

Regarding the app *MySNS Carteira*, 93 320 users activated the physical activity card between February and December 2018. The effectiveness and cost-effectiveness of the Portuguese model for primary health care physical activity promotion are being evaluated through a randomized controlled trial, and process evaluation will be conducting using qualitative data.

Funding: this project was funded by Direção-Geral da Saúde, Portugal.

Characteristics that enhance the uptake of mActive programme in health-care settings

To facilitate the uptake of an mActive programme in health-care settings, it may be useful to consider five characteristics that have been demonstrated to influence the likelihood of adoption of a technological innovation. These are outlined in **Table 7 (on page 37)** below. They have been adapted from the WHO mHypertension handbook.[15]

TABLE 7.

FACILITATING IMPLEMENTATION AND UPTAKE OF THE mACTIVE INNOVATION WITHIN TRADITIONAL HEALTH-CARE SETTINGS

Compatibility	Has mActive been designed to fit well with goals, objectives, operations, approaches of local communities?
Relative advantage	Does mActive improve current practices, such as contacting patients with results of their existing disease, support reminders, etc.? Will mActive accelerate progress towards the national goal of more physically active adults?
Level of complexity	Is mActive easy to understand and use? Are arrangements in place for training, support, troubleshooting, project management and oversight?
Observability of results	How easily and quickly will mActive produce results that can be shared with users and countries? Have the results been organized in a format that different groups will understand and relate to?
Piloting	Can users try out mActive before committing to adopting it? Has enough time and consultation among all stakeholders been allowed for the pilots?

Source: (adapted from 15).

Health-care workers should be made aware of the programme and actively encouraged to motivate their patients to register through worker-targeted promotion plans. Health workers can be asked (again through focus groups) for their ideas on how to engage patients as an important stakeholder group.

When engaging health services for promotion of the programme, consider the following points.

- Is change management among health workers necessary (they may have questions or be apprehensive about change and the use of mHealth). If so, why? How can you manage their apprehension and get their support to promote the programme to their patients?
- The level of community engagement and number of volunteers or health-care workers who may assist in promoting the mActive programme.
- How users of the health service will register with or sign up to the programme: directly by text message, online, by telephone, in person, or through the health worker.

Promoting mActive in national or large-scale public education campaigns

mActive can be implemented as part of national public education and communication campaigns on physical activity, providing a tangible way for target audiences to respond to the campaign 'call to action' on physical activity. National public education communication campaigns on physical activity are recommended by WHO and identified as a cost-effective "best buy" for noncommunicable disease prevention and management.[11] Effective communication campaigns can provide a return of US$ 3 for every US$ 1 invested.[16] Promoting mActive as part of national or large-scale sub national communication and public education campaigns on physical activity can increase the campaign impact and cost-effectiveness.

The WHO Global action plan on physical activity 2018–2030 recommends that all countries implement regular and sustained communication campaigns to raise awareness and knowledge about the importance of regular physical activity (policy recommendation 1.1).[2] WHO also recommends that the most effective communication campaigns on physical activity are combined with providing access to community-based programmes to support behaviour change. mActive can be promoted as a free, simple community-based programme aimed at increasing regular walking.

A recommendation from other BHBM programmes is to promote the programme through multiple channels of engagement and conduct campaigns regularly to raise awareness and encourage participation. Experience from the mTobaccoCessation and mDiabetes programmes (Costa Rica, India and Tunisia) suggest the use of multiple media outlets for promoting activities; social media channels such as Facebook as particularly fruitful, as were SMS communications and traditional media such as posters.

Promoting physical activity as part of preventive service package in health insurance schemes

The promotion of physical activity is increasingly seen as an important, and cost-effective, component of prevention packages in health insurance schemes.[17] mActive may be implemented as part of an existing physical activity initiative offered by health insurance well-being programmes, or as a new noncommunicable disease risk factor prevention programme or well-being service.

Identifying any interest and engaging health insurance companies early in the development, testing and adaptation of an mActive programme can be helpful. Health insurance programmes can disseminate mActive promotional materials to their clients, and may be able to support pilot testing and evaluation.

Implementation of mActive through health insurance programmes can also be a useful way to develop and test the effectiveness of incentives and conduct more detailed evaluations of updating and adherence in selected sample populations, following appropriate research methods and ethical protocols. Health insurance companies may also contribute to the development of mActive by sharing important lessons from their own mHealth programmes and physical-activity-related initiatives. A sample case study **(Case study 4)** from a private health insurance company integrating digital technology-based physical activity promotion in their insurance scheme can be found in the box below.

CASE STUDY 4.

VITALITY: INTEGRATING DIGITAL-TECHNOLOGY-BASED PHYSICAL ACTIVITY PROMOTION INTO PRIVATE HEALTH INSURANCE PROGRAMMES

Vitality is a private health insurance company offering services in health and life insurance, investment and the Vitality Programme. Vitality integrated technology-based incentives to drive physical activity for healthier lives among members who subscribed to the Vitality health or life insurance plans. A three-year-programme called Vitality Active Rewards used digital devices to track physical activity (steps, heart rate, calories and gym visits) with the aim of getting 100 million people 20% more active by 2025.[1] The programme linked the technology capabilities of the Apple Watch to track and set goals on physical activity, personalizing them to match individual needs. Vitality Active Rewards attracted over 5 million members and tracked over 2 million activities per day. The programme included providing a weekly reward as an incentive to help increase physical activity. The main incentive was the APPLE Watch itself, whereby eligible members were able to buy the device at a heavily discounted upfront price, with their monthly payments linked to their own level of physical activity. By being more active, members "paid off" the purchase of the APPLE Watch In addition, the Vitality Active Rewards programme collaborated with other private sector partners (such as Starbucks Coffee, travel and tourism companies), to provide other rewards and incentive to members and increase their motivation and adherence to the programme

Evaluation of the Vitality Active Rewards programme found that 34% of participants were more active (on average by 4.8 more "active days" per month) and that the variety of incentives did work. Vitality concluded that the providing a mobile technology-based goal-setting physical activity programme in combination with incentives can improve physical activity level in the long term.[2]

1. Hafner M, Pollard J, Van Stolk C. An assessment of the association between Vitality's Active Rewards with Apple Watch benefit and sustained physical activity improvements. In: Rand Corporation [website]. Santa Monica (CA): Rand Corporation; 2018 (https://www.rand.org/pubs/research_reports/RR2870.html, accessed 25 March 2021).

2. Behaviour change study on physical activity. In: Vitality [website]. London: Vitality; 2021 (https://www.vitality.co.uk/about/behaviour-change-study/ accessed 25 March 2021).

LESSONS LEARNED FROM BHBM mHEALTH PROGRAMMES IN DEVELOPING PROMOTIONAL STRATEGIES

BHBM implemented mHealth programmes in more than 10 countries. Experiences in developing promotional messages and strategies are gathered from those countries and some important considerations, learning points and suggestions are summarized in **Table 8**.

TABLE 8.
IMPORTANT CONSIDERATIONS IN DEVELOPING PROMOTIONAL STRATEGIES

Target audience	Promotion and recruitment strategies that are tailored to the target population are more effective at encouraging people to subscribe than general messages. Segmentation is essential as part of developing specific messages to promote the programme to the target audience; one BHBM programme suggested that the target population should be segmented by different characteristics (e.g. gender, values) and that different promotional materials should be produced for different groups according to their characteristics.
Cost of the promotional/ advertising campaign	Both social media advertising and traditional media such as radio and TV (assuming they are suitable for the target users) remain important methods for promoting the programme; although costs can be high in some countries, they remain a valuable investment to increase awareness and increase participation. Initial underestimation of promotional costs is common, and can be difficult to remedy later; the principles of negotiation with telecoms companies/operators (**see Annex 9 on page 88**) can also be useful when negotiating with broadcasting and social media companies.
Existing strategies and synergies and leveraging of other campaigns	Consider which organizations (and/or other notable personalities) are currently involved in campaigns for health and assess whether their campaigns can be linked or leveraged for the programme; leveraging the existing marketing and health promotion campaigns of programme stakeholders or partner agencies, such as telecoms companies, can enable cost savings. Review other mHealth programmes that have previously been implemented and whether they established which promotional techniques were effective. If the country is currently running a campaign or events on the same issue as the mActive programme, integrating mHealth as an "add-on" can be cost-effective and reach a larger audience (assuming the audience/target population is the same); for example, if you have mass participation events such as a community fun run/walk for a national cancer day, you can use the day/event to announce and promote the mActive programme as well and attract users.
Accessibility of promotional materials	Consider the target audience and whether/how they access certain media channels ; what is the media channel most likely to be seen and engaged with by the target group? How can recruitment materials be more equitable to minority populations or people with disabilities? Base strategies on actual research with target audiences to enable identification of the best channel and the most relevant time to use it. Some BHBM programmes found greater engagement among males of higher socioeconomic status and much lower uptake by female users; promotion should be tailored to the target group; other BHBM programmes have found social media and the messaging medium itself (e.g. SMS messaging) most effective for recruitment.

Content of the campaign	Having seen the promotion materials, the potential user should know who the programme is for, have all relevant instructions and know how to sign up. A BHBM programme in Tunisia found that users reported signing up because it was convenient via mobile phone and not because they thought the programme would work; so Tunisia included information on the effectiveness of programmes.
The "owner" or perceived messenger of the programme	BHBM evaluations have shown that users trust and value the messages if they come from the ministry of health; for example, in one BHBM programme, users said that they now believed cervical cancer to be very important because the ministry would not be sending messages about it if it were not a serious health problem; if possible, ensure that the user sees that the message comes from the ministry of health or other trusted health authority. Identify the local partners and stakeholders that will help with promotion and recruitment, e.g. community health centres, religious organizations, ethnic groups, diabetes associations, private clinics and hospitals (if applicable), diabetes nurse educators, etc. Word-of-mouth communication channels are very effective; engaging a locally trusted person/religious or social influencer proved to be an effective promotional strategy in some studies.
Using marketing specialists or learning from the private sector	If the ministry of health or other implementing agency does not have the in-house expertise to plan and deliver an effective promotion campaign, consider contracting the task out to a marketing agency; this may be more expensive, but if the appropriate agency has a good track-record in conducting health related communications this can increase programme awareness and participation. Creating a call for proposals with the aim of the promotion campaign and disseminating it to companies will solicit proposals with a range of methodologies; choosing which company to contract will depend on any market research you have done with target users (i.e. if the proposed methods are appropriate), the company's success and experience with other health campaigns, and a competitive price. In the case of Sudan, the programme held meetings with large private-sector companies to get tips on marketing, which helped it to design the campaign; these meetings were negotiated to incur no cost to the programme.
Testing the recruitment strategy through a soft launch	Consider a test-run or soft launch prior to starting the promotional campaign to ensure that all processes are working well before a large number of participants sign up. This may entail running focus groups with users, comparing some differently worded or presented promotion campaign materials, or asking them about the messages about the programme and marketing materials that would make them want to sign up.
Pre-intervention information session	Launching information sessions about an mHealth programme at places frequently visited by your target audience can also enhance the visibility of the programme and can encourage participation; this can be part of the promotion and campaign strategy; placing flyers in places that your target audience will visit frequently, e.g. religious centres, clinics or community centres, can also increase the accessibility of materials.
The local mobile communications environment	Check whether sending unsolicited messages is allowed (this contravenes telecoms codes of conduct in some countries); consider whether a population that often receives unsolicited health-related messages will be likely to read and respond to messages from the programme; also consider the issue of message receipt versus message engagement.

Below are some case studies from successful BHBM recruitment and promotion campaigns.

CASE STUDY 5.

PROMOTION AND RECRUITMENT OF mDIABETES IN EGYPT

In February 2016, the Ministry of Health and Population of Egypt announced the national mDiabetes programme[1] at a media event. The aim of the programme is to increase people's access to information on diabetes prevention and management. mDiabetes is a three-month one-way SMS service programme with a phased rollout (three phases in total, including the month of Ramadan).

Promotion and recruitment: mDiabetes was promoted through different channels, including promotion at health-care facilities in Greater Cairo (Cairo, Giza and Qalyobia governorates) and public places such as train and metro stations.

A Facebook page "رسالة في صحتك" (Your Health in A Message) was set up for targeted recruitment. Banners, posters and brochures were distributed to patients with prescriptions and in outpatient waiting areas, pharmacies and offices of various ministries. The Ministry of Health and Population also worked with popular radio and television channels and journalists to promote the programme. The Ministry and WHO conducted a media workshop to inform journalists about the programme, which resulted in widespread media coverage.

A group of social change agents, "raedat refeyat", were trained to promote the mDiabetes programme during their home visits within the catchment areas of primary health care centres in Giza and Qalyobia governorates, giving diabetes patients the option to register by giving their mobile numbers. A database of diabetes patients was also obtained from public hospital and primary health care centre records and national diabetes institutes, and from a database of government-sponsored patients enrolled in the national programme of treatment.

These patients populated the database for the mDiabetes programme.

Self-registration was encouraged through two mobile numbers listed on all promotional materials. Diabetic patients had the option to register either by sending a text or WhatsApp message or by making a missed call to one of the two numbers, or they could register via the Ministry website.

Source: BHBM mDiabetes programme, Egypt.

Promotion materials from mDiabetes in Egypt

CASE STUDY 6.

PROMOTION AND RECRUITMENT OF mDIABETES IN SUDAN

The mDiabetes programme was launched by the Federal Ministry of Health of Sudan in February 2020. The programme aimed to scale up awareness about the disease in patients and the community, as well as providing a comprehensive education package for patients. The programme is a free SMS programme launched by the Ministry in partnership with WHO, the Sudanese Diabetes Association for adults, the Sudan Childhood Diabetes Society and the Telecommunication and Post Regulatory Authority.

Promotion materials from mDiabetes in Sudan

Promotion and recruitment: Promotion activities included designing a campaign and contracting a private marketing company to run it. The campaign lasted for three weeks and included a video and audio advertisement in addition to posters, brochures and stickers. In the first week, several media channels were used (social media, TV and radio). In the second week, advertisement through text messages was sent to all mobile phone subscribers in Sudan through the three main operators in the country. The message reached more than 11 million active SIM cards. In the third week, the programme promotion was done by distributing the printed materials in public places in different states of Sudan. The campaign successfully enrolled over 75 000 participants in less than three weeks. Initially, mDiabetes ran for 1.5 months, and a new campaign called mRamadan was added to the original programme. mRamadan was designed to promote good health and disseminate diabetes-related information during the holy month of Ramadan. In total, 71 242 participants successfully completed the programme.

Source: BHBM mDiabetes programme, Sudan.

PARTICIPATION IN THE mACTIVE PROGRAMME

An effective promotion campaign will attract interest, and potential users will be ready to interact with the mHealth programme and sign up. **The sign-up process must have been tested and must be clear, simple and quick to complete. See Case study 7 on page 43** below for details of the sign-up process in an Indian programme.

Two major barriers to uptake of digital health programmes are costs and difficulties associated with signing up. Other BHBM programme evaluations have shown that long or complicated sign-up processes can lose up to 30% of interested persons. One survey of interested users found that those who did not complete the process reported the sign-up fee as the biggest impediment to joining the programme. Programmes should be free for the user wherever possible, including replying to messages (**see Annex 9 on page 88** on negotiating with telecoms operators) and downloads associated with use of the programme where smartphones are involved.

CASE STUDY 7.

SIGN-UP PROCESS FOR mTOBACCOCESSATION PROGRAMME, INDIA

In 2016, as part of the Prime Minister's Digital India initiative, the Ministry of Health and Family Welfare and the Ministry of Communication and Information Technology of India worked with BHBM to bring in innovative technologies for strengthening tobacco cessation services in the country through the mTobaccoCessation programme. mTobaccoCessation was a two-way SMS programme.

Sign-up process for mTobaccoCessation: participants could sign up either by making a missed call (i.e. they called from a mobile and hung up within two rings) to the toll-free number 011 22 901 701, or by registering on the website http://www.nhp.gov.in/quit-tobacco. Confirmation messages were sent back to the subscriber confirming the registration.

The programme sent out up to 150 text messages to registered users over a period of six months. The text messages encouraged users to set and achieve quitting goals, promoting self-management skills at the same time. The cost of the programme (sending "push" text messages) was borne entirely by the Government; the user did not incur any cost for the received messages. The "pull" messages (sent by the users in response to questions asked) were charged and the cost incurred on the responses to all the questions was almost US$ 0.5. However, sending these text message responses was entirely optional, as the push messages continued even if a response was not sent by the user.

Source: BHBM mTobaccoCessation programme, India.

The more burdensome or tedious the sign-up, the more likely it is that users will be lost before they have even started. User testing can again be a good way to get feedback from target users and revise the process to make it user-friendly. A balance will need to be struck between getting all the data from the user that you need (in order to place them in a segment that receives tailored content or to act as a baseline for key evaluation indicators) and not tiring or boring them so that they give up. Careful design of this process is necessary, and user testing will be essential in getting this right. BHBM suggests getting to know your target users and testing and refining the sign-up process with them wherever possible.

Another option is automatic enrolment for particular groups of health service or telecoms service users. This approach has been used in some BHBM programmes. In Zambia, all customers of one telecoms carrier received messages. In India and Sudan, users were automatically enrolled through health services or door-to-door when they screened positive for being at risk of diabetes (as part of a national inclusive screening programme) and there was a free and easy opt-out mechanism. If appropriate, and in partnership with health or screening services, this option could be a possibility, though contextual factors should be considered (legality of sending unsolicited messages and acceptability of such an approach).

Once users have enrolled in the programme, implementors have no idea whether they are engaged and participating in the programme. Two-way messages or gathering of data in an app can help to gauge the ongoing participation of users (providing that responses are free). These messages or requests can be part of the basic content package, e.g. motivational messages, or designed for the purpose of checking participation and monitoring health behaviour change (e.g. "How did it go with your walking goal today? Reply 1 for met, 2 for..."). Information on participation can also be captured at the evaluation stage; for example, BHBM has collected useful data in surveys in which users were asked to estimate the proportion of messages that they (a) saw and (b) read, and whether they sustained behaviour change throughout the programme.

Retention: drop-out is high in many health behaviour change programmes, and mobile health programmes are no exception. For example, 30% of participants dropped out in the first week of a BHBM mRamadan programme. In another example, 56% dropped out in month 1, rising to 68% by month 4, in one of the mTobaccoCessation programmes. This section suggests some ways to reduce drop-out, based on BHBM programming experience.

Two-way messaging or interactivity is one means of improving effectiveness and retention, where the user receives dynamic and focused support (e.g. in a messaging programme that sends the word CRAVE to get support when having a craving) or messages/tasks about goal-setting and follow-up.

The more users feel the programme is relevant to them and that they are making concrete progress, the more likely they will be to complete the programme. Therefore, it is stressed that user testing of the programme content

is important to get the content right for your users. BHBM programme implementors have also suggested that programmes should be tailored to different user groups for the same reason. For example, it is obviously necessary to tailor a diabetes programme for a user who has been diagnosed with diabetes or is at risk of diabetes, but consider, in the country context, whether it is necessary to tailor the programme according to age or gender, or for users who live rurally or in the city. Tailoring will mean that screening questions will be necessary, to place users in a given group. The reply to these questions should be free, but if users cannot reply for any reason other than cost, they should still be enrolled in a generic version of the programme.

The programme should run smoothly and responsively on the technology platform of choice. Technical problems, especially if there is no technical support for users, can be very frustrating and are a major reason for drop-out in BHBM programming. Two BHBM programmes had catastrophic issues with mobile communications carriers having technical difficulties, with 60% of messages not being sent and another instance where no messages were sent for six weeks. Ensure, by pre-testing the platform, that messages or content will be both sent or accessible and timely. For example, if the programme features two-way messaging, the response to the user's reply should be instantaneous, otherwise the user will become frustrated and may leave the programme. An app should be free of bugs and be responsive.

UNSUBSCRIBE or STOP messages are often included in SMS or other text-based programmes to enable the user to stop receiving messages (e.g. "Reply 8 if you wish to UNSUBSCRIBE"). It is an ethical imperative that users should be able to unsubscribe or stop receiving messages if they wish, and it is important in any BHBM programme that they know how to do this. However, the literature suggests that programmes with more frequent STOP/ UNSUBSCRIBE messages have higher drop-out rates. Consider how many times it is necessary to send these messages.

If users drop out and two-way messaging is free or app users can be contacted, it is useful to ask why they are leaving. (Consent should be obtained for contacting participants about drop-out.) Telephone surveys are another way to gather this information. BHBM programmes have surveyed drop-outs with interesting findings, for instance in Tunisia, where 47% of those surveyed left because the programme did not meet their expectations (judging by what was advertised). A total of 53% said they left because the guidance in the programme was hard for them to follow, with 40% suggesting that more tailoring was needed. Another important factor is the messages themselves, with users in India stating they were not motivating enough. Drop-outs in India and Tunisia reported that using videos and images would be more effective and also combining the mTobaccoCessation messaging programme with other quit services and support would have been beneficial.

5

Monitoring and evaluation of mActive

5 Monitoring and evaluation of mActive

Robust monitoring and evaluation are valuable for all mHealth interventions, helping to improve future implementation, facilitate scaling-up of the programme and generate support for the introduction of other mHealth interventions.

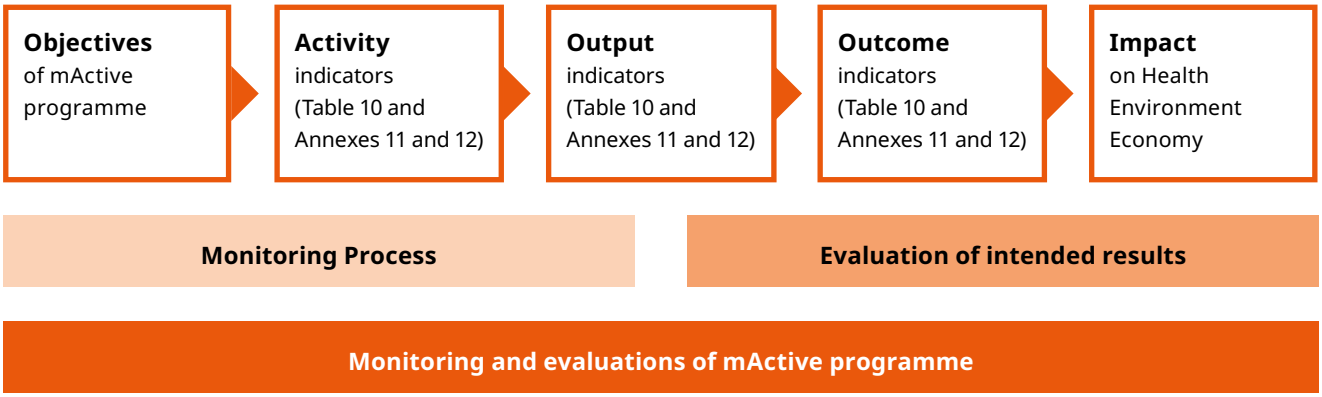
Monitoring and evaluation are more likely to be beneficial when they are built around an established framework. The mActive results chain, or "logic model", is a visual framework that illustrates the presumed relationship between inputs and activities, outputs, outcomes and impacts. **Figure 5 (on page 47)** illustrates the results chain for a sample mActive intervention.

A national policy on physical activity sets up the broader goals or recommendations for the promotion of relevant activities that encourage individuals to be more active. To accomplish these goals, specific and measurable objectives must be defined. A SMART framework is a useful way to define these **objectives**. It stands for **s**pecific, **m**easurable, **a**ttainable, **r**elevant and **t**imely, and helps to guide stakeholders in the process of defining the objectives of mActive interventions for monitoring and evaluation. The SMART framework can also be used to identify quality indicators for activities, outputs, outcomes and impact.

Once the objectives of a programme are defined, resources are required for the operation of the programme (**inputs**) to accomplish planned **activities**. If accomplished, the planned activities will deliver a number of products or services (**outputs**). These outputs will benefit individuals by generating positive (or negative) outcomes that will be assessed against the objectives of the intervention (**impact**).

FIGURE 5.

RESULTS CHAIN FOR MONITORING AND EVALUATION OF mACTIVE PROGRAMME

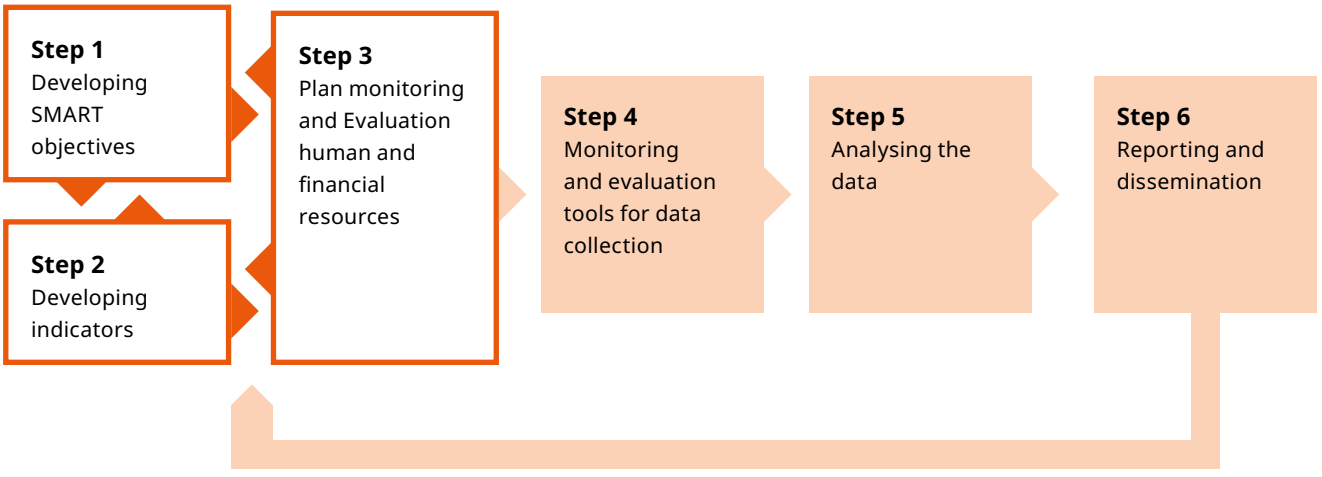


The long-term impact of mActive can be measured in terms of the contribution of increased physical activity to key SDGs related to health, such as SDG3: "Ensure healthy lives and promote well-being for all at all ages" and SDG11 "Sustainable cities and communities". Measuring impact is a resource-intensive activity, which usually requires longitudinal studies over a considerable period of time and can entail significant investment of funds and time. It is for this reason that this handbook focuses on the **monitoring of process** (activities and outputs) and **outcome indicators** (evaluation).

Monitoring should be planned, resourced and integrated into routine programme management functions as an ongoing activity **from the start of** implementation to establish accountability and track progress of outcomes. Outcomes should be evaluated to assess whether the programme objectives are being met. The development and implementation of process monitoring and outcome evaluation should be led by mActive focal points, in collaboration with the units responsible for the specific disease or risk factor; where needed, it should involve external experts. This section of the handbook presents a compact guide for process monitoring and outcome evaluation for mActive in six steps, which are outlined in **See Figure 6**.

FIGURE 6.

OVERVIEW OF THE NECESSARY STEPS FOR MONITORING AND EVALUATION OF mACTIVE PROGRAMME



STEP 1: DEVELOPING SMART OBJECTIVES OF AN mACTIVE PROGRAMME

SMART objectives should be developed at the start of an mActive intervention. This is important because SMART objectives will determine the amount of time spent and funds needed to implement mActive and to conduct monitoring and evaluation.

SMART objectives should be developed and directly linked to the mActive outputs and outcomes. **Table 9** below show examples of SMART objectives linked to outputs and outcomes of an mActive programme.

TABLE 9.

EXAMPLES OF SMART OBJECTIVES LINKED TO OUTPUTS AND OUTCOMES OF A mACTIVE PROGRAMME

TYPE OF OBJECTIVE	EXAMPLE OF SMART OBJECTIVE
Objectives linked to activity	
Content	XX number of content development or adaptation focus groups/user-testing sessions conducted.
Objectives linked to outputs	
Promotion	XX number of promotion campaigns implemented.
Recruitment	XX% or XX number of target audience registered for the mActive programme within one month of launch.
Retention	XX% or XX number of the registered participants retained at end of week 2 of mActive programme.
Completion	XX% or XX number of registered participants completing four-week mActive core programme.
Objectives linked to outcomes	
Walking	XX% or XX number of users meeting their self-identified goal of walking every week.
Knowledge	XX% of users report having improved knowledge on benefits of physical activity.

STEP 2: DEVELOPING INDICATORS

The monitoring and evaluation framework and activities should be directly linked to the programme's SMART objectives, developed in Step 1. SMART indicators should be informed by scientific evidence and should be useful, responsive to change and achievable in the planned time frame. The elements outlined in the results chain model in **See Figure 5 (on page 47)** form the basis for monitoring progress and performance towards mActive programme objectives.

To assist countries, 13 core indicators have been developed for use by all BHBM mHealth programmes. The purpose of these core indicators is both to enable comparison of results across all BHBM mHealth programmes and to monitor process and evaluate outcomes of specific mHealth programmes. A summary of these indicators, and the three supplementary indicators, can be found in **Table 10**.

Nine of the 13 core indicators (numbers 1, 4, 5, 6, 7, 8, 9, 10 and 16) are general BHBM indicators, applicable in mActive evaluation and in other mHealth programmes.

Four core indicators (numbers 11, 12, 13 and15) are specifically tailored to mActive. Core indicators 15 and 16 require the use of a pre-post-participant survey to collect the relevant data; for mActive programmes, specifically, the survey is needed to assess physical activity levels. For more information on pre-post surveys see Step 4.

In addition to the 13 core indicators, three supplementary indicators are also listed in **Table 10** and highlighted in grey. While these supplementary indicators are not essential, and are dependent on available time and resources, they are highly recommended for mActive. Collecting data on supplementary indicators will provide a complete assessment of the mActive programme. Further information on the 13 core indicators, with information on data collection methods, frequency of collection and description of indicators can be found in **Annex 11 (on page 91)**. A full list of supplementary indicators for mActive programmes can be found in **Annex 12 (on page 94)**.

TABLE 10.

CORE AND SUPPLEMENTARY ACTIVITY, OUTPUT AND OUTCOME INDICATORS FOR mACTIVE PROGRAMMES

The core indicators have been adapted from BHBM mHealth programmes.

	INDICATOR NAME	BHBM INDICATOR TYPE
	Activity indicators	
1	Number of content development or adaptation focus groups/user-testing sessions	Core indicator
2	Existence/creation of a national technical advisory group for mActive	Supplementary indicator – programme-specific
3	Existence of programme design specifications	Supplementary indicator – programme-specific
	Output indicators	
4	Number of promotion campaigns implemented and type	Core indicator
5	Number of total individuals subscribed/ registered	Core indicator
6	% of target population registered	Core indicator

	INDICATOR NAME	BHBM INDICATOR TYPE
7	Number of messages delivered and rate of successful delivery of messages	Core indicator
8	% messages sent from programme that are responded to appropriately by user	Core indicator
9	% of users who report satisfaction with the content they received	Core indicator
10	% of users retained in the programme (user engagement at week 1, 2, 3)	Core indicator – programme-specific
11	% of users completing the mActive four-week programme	Core indicator – programme-specific
12	% of users completing mActive two-week PLUS programme	Core indicator – programme-specific
	Outcome indicators	
13	% of users meeting the self-identified goal of walking every week	Core indicator
14	% of users meeting mActive goal of walking 150 mins per week	Supplementary indicator
	Post-implementation indicators obtained through surveys for outcome evaluation (see Step 4)	
15	% of users with more active days per week/ month after mActive four-week programme	Core indicator
16	% of users who report having improved knowledge on benefit of physical activity	Core indicator

For detailed information on the 13 core indicators, **see Annex 11 (on page 91)**. For the full list of supplementary indicators, **see Annex 12 (on page 94)**.

A case study (**Case study 8 on page 51**) presented in this section on monitoring and evaluation of digital health programmes using mobile phone apps is drawn from the National Health Service (NHS) in England, United Kingdom (Active 10 application).

CASE STUDY 8:

MONITORING AND EVALUATION OF "ACTIVE 10" APP, UNITED KINGDOM

Active 10 is a free national walking app using smartphones, launched by NHS England in March 2017 and available to all adults in the United Kingdom. The app promotes 10 minutes of brisk walking per day and tracks the time and intensity of walking.[1] The app allows self-monitoring of daily activity, as well as weekly and monthly monitoring.

Promotion of walking through the use of Active 10 was found to be successful, with evaluation results showing an increase in brisk walking. For example, 73% of users who had previously achieved less than 10 minutes of brisk walking per day increased their minutes of brisk walking by the eighth week.

Other indicators used in the Active 10 evaluation included[2]

- number of users who downloaded the Active 10 app in a defined period;
- % of target audience with campaign awareness;
- number of users who used the app for over eight weeks;
- baseline minutes of brisk walking in week 1;
- % of users meeting the guideline of 10 minutes of continuous brisk walking per day at the end of eighth week; and
- number of users who kept the app for more than six months.

1 One you Active 10. In: Public Health England [website]. London: Public Health England; 2021 (https://campaignresources.phe.gov.uk/resources/campaigns/60-one-you-active-10/Overview, accessed 25 March 2021).

2 Ciravegna F, Gao J, Ireson N, Copeland R, Walsh J, Lanfranchi V. Active 10: brisk walking to support regular physical activity. Sheffield: University of Sheffield White Rose Research Online; 2019 (http://eprints.whiterose.ac.uk/145438/1/CiravegnaPervasiveHealth2019_V18.pdf, accessed 25 March 2021).

STEP 3: PLAN HUMAN AND FINANCIAL RESOURCES FOR MONITORING AND EVALUATION

The second step is to assign roles to the completion of monitoring and evaluation among the team. If there is no monitoring and evaluation experience in the team, hire or train someone to support monitoring and evaluation design, data collection and analysis. High-quality monitoring and evaluation require adequate resources, and the overall budget should be planned at this stage with that in mind. The final human and financial resources for monitoring and evaluation, including dissemination of the results, should be adjusted/allocated once the monitoring and evaluation framework is established.

STEP 4. MONITORING AND EVALUATION TOOLS FOR DATA COLLECTION

The next step after identifying the monitoring and evaluation framework and indicators is identifying and selecting the appropriate data collection tools. Different tools can be used to collect data, and it is important to consider feasibility. The following tools can be used for collecting data on the indicators outlined in Step 3.

1. Service analytics (mainly for monitoring but can also be used for evaluation).
2. Pre-post surveys (phone interviews and online surveys) (can be used for both monitoring and evaluation).
3. Post-only intervention surveys on sustainability (for evaluation).
4. Desk review of meeting reports, technical reports or official records, memorandums of understanding, terms of reference, etc. (mainly for evaluation).
5. Focus group interviews (for evaluation).

Service analytics

The IT system adopted by mActive, usually generated by the telecoms operators, provides a large amount of data on users and their engagement with the programme. Analysing data generated from an mActive programme is called service analytics; it helps to monitor the progress of mActive. For example, the IT system can generate the number of days participants meet the walking goal per week to know whether participants are progressing towards their goal or whether they have fallen behind in the programme in any given week. Service analytics provides crucial feedback on the way people engage with the mActive messages and help to identify any modifications required to improve retention and engagement. Service analytics can also be used to monitor which messages and which timing of message delivery are effective.

Pre-post surveys

A pre-survey is taken before a user starts the programme. Post-surveys are typically a repeat of the pre-survey at the end of the programme. Pre-programme measures (baseline measures) are taken after registration, but before the programme starts or at the beginning of the programme (for example you can ask "How active are you?" on day 1 of an mActive programme to obtain the baseline). This enables a comparison between the baseline measures and post-measures for the same participant, giving more confidence about measuring the effect of the programme, than a post-intervention only survey.

Post-only intervention surveys

A post-only intervention survey is a survey carried out only at the conclusion of the programme to obtain information about the results of the intervention, for instance the number of days the participants continue to be active after completing an mActive programme. This approach does not collect any information on pre-intervention (such as physical activity levels before the mActive intervention); thus one cannot assess changes resulting from the intervention or programme. However, it is the cheapest way to gather evaluation data from users if they continue to be active after completion of the mActive programme. Post-only surveys can be conducted over the telephone in a structured interview, online in a self-report form, or as a series of questions and responses using the programme medium (SMS, messenger app, etc.).

Focus group interviews

Conducting focus group interviews with participants after the programme allows in-depth exploration of experiences, satisfaction of and knowledge gained from mActive programme. Focus groups can also be conducted to explore different interpretations of survey findings and to brainstorm ideas for improving the programme.

In general, the monitoring and evaluation focal point will define a group responsible for collecting data from the required sources. However, it is also possible to outsource or assign a specific institution to collect and assess data for the mActive programme if independent assessment is required.

More detailed information on design of monitoring and evaluation tools can be found in the WHO guide on monitoring and evaluating digital health interventions.[18] **See Annex 13 (on page 101)** for information on potential research designs for evaluation of mActive programmes.

STEP 5: ANALYSING THE DATA

The data must be analysed for reporting purposes. The analysis can be simple: percentage calculations or collating qualitative data in themes. If possible, statistical tests can be applied to the data. All collected data contribute to evaluating the outcomes of a mActive programme. The BHBM country support team can provide assistance on data analysis if necessary. After analysing the data, you should be able to substantiate the SMART objectives of the programme created in step 1 and create an evidence base.

STEP 6: REPORTING AND DISSEMINATION

Findings based on the data should be reported regularly to provide feedback for decision-makers and other stakeholders. Findings should be presented clearly and concisely in a user-friendly format relevant to the target audience. These results should be incorporated into planning and resource management for future activities. For example, if the findings show irregularities in registration, delivery of messages or user responses, then these issues should be raised with decision-makers through regular performance improvement meetings. In addition, the results should feed into the annual monitoring process and outcome evaluation report to demonstrate progress and lessons learned.

If there are multiple audiences, such as programme implementers rather than policy-makers, the findings need to be packaged and formatted differently to match each audience's main interests and preferences. Evaluators should generate a list of all relevant stakeholders (e.g. policy-makers, donors, programme staff) and consider who is most likely to use the results from the evaluation and how they might utilize that information, and hence the required communication style of the report.

Evaluation findings should be disseminated in an accessible and timely manner through:

- formal and informal networks, via meetings, newsletters and other forums;
- professional conferences, via discussion papers or posters;
- journals (scientific or lay); and
- electronic media, such as webpages, social media and email.

LESSONS LEARNED FROM MONITORING AND EVALUATING OTHER BE HEALTHY BE MOBILE mHEALTH PROGRAMMES

The box below shows lessons learned from other BHBM programmes (mDiabetes, mTobaccoCessation, etc.) in monitoring and evaluating mHealth programmes implemented in different countries.

LESSONS LEARNED FROM OTHER COUNTRIES IMPLEMENTING BHBM PROGRAMMES

- Begin with a phase 1 implementation on a smaller scale and conduct evaluation and collect user feedback.
- Plan for monitoring and evaluation from the very beginning.
- Most BHBM implementors reflected that they should have collected data on more indicators and that all indicators should have been clearly linked to programme aims.
- Define indicators before data collection, for example: what numerator and denominator should be used in a tobacco quit rate calculation; or what level of physical activity will be used as a reference (e.g. meeting 150 mins per week or meeting 10 mins/day or other).
- Include the reporting dashboard and data for monitoring and evaluation indicators as a deliverable in the terms of reference agreed with any third-party service provider. Be specific about the data you will need and when.
- Ensure that you have a mechanism for reporting service outages and plan how they will be dealt with, and potentially compensated, by third-party service providers.
- Ideally arrange for reply SMS to be free, as response rates and reply messages are much lower if it is not free for the user.
- Consider a six-month follow-up survey to see if behaviour change is sustained

For detailed information on monitoring and evaluation of digital health interventions, see the WHO. Monitoring and evaluating digital health interventions: a practical guide to conducting research and assessment.[19] This guide provides an introduction to the approaches and methods to support countries in strengthening their digital health deployments, develop robust evaluations and scale up their activities nationally and regionally.

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Annexes

ANNEX 1. SUMMARY OF LITERATURE REVIEWS ON mHEALTH AND PHYSICAL ACTIVITY

This annex presents a summary of the evidence synthesis conducted prior to the development of the mActive logic model and library content. Selected reviews include studies that meet the following criteria: (1) SMS as part of the intervention; (2) physical activity outcomes, (3) adults and (4) systematic review or meta-analysis (narrative and other literature reviews excluded). Table A1.1 below presents a summary of the reviews that were selected, followed by a more detailed description of the aim/scope, methods, key findings and implications for each.

TABLE A1.1.

REVIEW OF SELECTED LITERATURE ON mHEALTH AND PHYSICAL ACTIVITY

AUTHOR/ TITLE	TYPE OF REVIEW; SCOPE	TECHNOLOGY USED	SAMPLE	STUDIES INCLUDED	KEY FINDINGS
Smith et al., 2020[1]	Meta-analysis; Effectiveness of text message interventions for physical activity	Text messages to target physical activity	Adults	59 randomized controlled trials (N=8742) Published prior to December 2017 Measuring physical activity objectively Included multicomponent interventions	Increased physical activity in text message interventions vs. control conditions with moderate effect sizes, significant for steps/day
Dugas et al., 2020[2]	Systematic review; effectiveness of mHealth interventions, analysis of behaviour change techniques	Text messages, apps/ wearables, personal digital assistants	Healthy adults, or those with overweight/ obesity, or those with chronic conditions	21 randomized clinical trials Published prior to December 2017 Outcomes were physical activity, weight loss or chronic condition management	Evidence is mixed (vs. non-technology controls): eight studies reported non-significant differences, six studies reported improvements, three found significant improvements for at least one primary outcome, and one study found worse outcomes Behaviour change technique most reported in effective studies was the use of prompts/cues (87.5%)

AUTHOR/ TITLE	TYPE OF REVIEW; SCOPE	TECHNOLOGY USED	SAMPLE	STUDIES INCLUDED	KEY FINDINGS
Elavsky et al., 2019[3]	Systematic review; mHealth interventions for physical activity, sedentary behaviour and sleep in adults aged over 50 yrs	Text message, apps and combined interventions	Primary older adults (>50 yrs) Health and medical conditions (e.g. diabetes, cancer)	52 studies (mean sample size 114): 34 randomized clinical trials, 18 quasi-experimental design, 15 pre-test/ post-test Reviews covered time frame from 2008 to 2017	Mobile interventions have potential to increase physical activity and reduce sedentary behaviour in older adults (aged over 50 yrs) Effectiveness of text-messaging interventions (included in 60% of all studies) targeting sedentary behaviour and physical activity in adults aged over 50 is supported by evidence
Joseph et al., 2019[4]	Systematic review, effectiveness of e-Health and mHealth physical activity Interventions for African-American and Hispanic women	Websites, text messaging, Facebook	African-American and Hispanic women (multicontext: healthy, overweight or obesity, older aged, postpartum condition)	10 studies (8 pilot studies, 2 randomized clinical trials) Published between 2000 and August 2017 Any study design and studies focusing on multiple outcomes	Majority of studies reported increased physical activity among participants in the intervention conditions vs. control conditions Physical activity outcomes were primarily self-reported; smaller effect sizes were reported for objective measures
2018 Physical Activity Guidelines Advisory Committee, 2018[5]	Evidence synthesis; any intervention for physical activity and sedentary behaviour*	Mobile phones, smartphones, mobile wireless devices, personal digital assistants, apps	Study populations primarily young-to-middle-aged women who are well educated	8 reviews, 5 systematic reviews, 3 meta-analyses Reviews covered various periods from 2000 to2016	Moderate evidence that mobile phone programmes consisting of or including text-messaging have a small-to-moderate positive effect on physical activity levels in general adult populations Strong evidence demonstrating that behaviour change theories and techniques are effective for increasing physical activity levels in general adult populations

AUTHOR/ TITLE	TYPE OF REVIEW; SCOPE	TECHNOLOGY USED	SAMPLE	STUDIES INCLUDED	KEY FINDINGS
Eckerstorfer et al., 2018[6]	Meta-analysis, meta-regression; effectiveness of mHealth interventions, analysis of effective behaviour change techniques	Interventions automatically delivered via mobile phone or smartphone by either app or texting	All populations	50 randomized controlled trials (N=5997). Published prior to 2017 Some studies had multiple intervention goals (health or weight management) including increasing physical activity (self-reported and objectively measured)	Small-to-moderate effects of mHealth interventions in increasing physical activity Interventions using the behaviour change techniques, set behaviour goals or self-monitoring were associated with greater effects
Direito et al., 2017[7]	Meta-analysis; effectiveness of mHealth interventions for physical activity and sedentary behaviour, analysis of frequency of behaviour change techniques	mHealth technologies – mobile phone using SMS and more complex functionalities, such as Bluetooth technology and smartphone apps	Adults, children and older people with no pre-existing medical conditions	21 randomized controlled trials (N=1701) Published prior to January 2015 Physical activity and sedentary behaviour outcomes	Sedentary behaviour decreased significantly following interventions (standardized mean difference (SMD) –0.26, 95% CI –0.53 to 0.00) Effect sizes were small-to-moderate across studies and non-significant for total physical activity, moderate-to-vigorous physical activity and walking Behaviour change techniques were employed more frequently in intervention than in comparator conditions. Most used: goal-setting – behaviour, self-monitoring of behaviour, social support – unspecified
Müller et al., 2016[8]	Systematic review; effectiveness of evaluation and monitoring – health interventions to promote physical activity and healthy diet	Internet, mobile phone text messages or mobile phone calls, smartphone apps and other wireless devices	Adults, children and older people in developing countries who were healthy or at risk of diabetes or hypertension	15 studies in 13 developing countries (N=75 930) Published prior to August 2016 Included all types of study designs; 7 studies used text messaging, 6 studies used website or email, 2 phone calls and 2 a combination of technologies	Two out of 9 interventions using text messages were effective for physical activity; 4 out 5 web-based interventions were effective for physical activity No differential characteristics between effective and non-effective interventions Seven studies provided evidence of significant positive effect on physical activity (50%)

AUTHOR/ TITLE	TYPE OF REVIEW; SCOPE	TECHNOLOGY USED	SAMPLE	STUDIES INCLUDED	KEY FINDINGS
Free et al., 2013[9]	Systematic review; Effectiveness of mHealth behaviour change and disease management interventions	Mobile technology (mobile phone, smartphone, game consoles, media players, tablets)	Adults, children and older people from high-income countries (various conditions: overweight, COPD, etc.)	Total 75 trials. Included interventions for disease management (N=49) and behaviour change (N=26) 26 randomized controlled trials focused on health behaviour change (N=10 706), 7 trials aimed to increase physical activity, 7 trials aimed to increase physical activity and reduce calorie intake Published 1990–September 2010	Short term benefits for SMS messages around physical activity, although not enough long-term (median = 12 weeks) follow-up to know whether the effects were sustained. Seven of the 14 studies that assessed physical activity through self-reported measures provided evidence of statistically significant benefits and one study found statistically significant increases in daily number of steps
O'Reilly and Spruijt-Metz, 2013[10]	Systematic review; Effectiveness of mHealth technologies for physical activity assessment and promotion	Mobile phone and web-based including email if a mobile platform was used, and SMS for motivation via automated and personalized messages	Not specified	22 studies included (randomized clinical trials) Mobile journals or questionnaires were the most-used mobile technology (11 studies), followed by SMS messaging to encourage physical activity (8 studies) Studies published before June 2012	The wide variations in technologies used and outcomes measured limit comparability across studies Physical activity outcomes for interventions using SMS were mixed Intervention studies that reported successful promotion of physical activity behaviour change incorporated text-messaging and mobile journals/ questionnaires
Fanning et al., 2012[11]	Meta-analysis; Effectiveness of mHealth for physical activity	Mobile phone; SMS was primary technology	Child and adult populations (9–68 years)	11 studies included, 8 used SMS (N=1351) 5 studies reported on moderate-to-vigorous physical activity, 3 reported step counts, 1 reported frequency of moderate-to-vigorous physical activity Published between 2000 and July 2012	Evidence for moderate effects of mobile devices in influencing physical activity behaviour SMS useful for providing feedback and supplementary material, and to a lesser extent real-time assessment of behaviour

*For the purposes of the mActive handbook, we include only the evidence synthesis referring to evaluation and monitoring health interventions, including text messaging, and use of theory and behaviour change techniques.

Smith DM, Duque L, Huffman JC, Healy BC, Celano CM. Text message interventions for physical activity: a systematic review and meta-analysis. Am J Prev Med. 2020;58(1):142–51

Authors' conclusions

Text-messaging interventions alone or integrated into multicomponent interventions are effective in achieving small-to-medium-sized positive effects on physical activity levels (moderate-to-vigorous physical activity and daily steps) when compared to a no-message control condition, with significant effects for objectively measured daily steps. Tailored interventions, with higher intensity and targeting specific populations, seem to be more effective, but more rigorous and well powered controlled trials are needed to support the trend of these findings.

Study characteristics

Overall, 59 unique studies were reviewed involving 8742 participants (41% of the studies with >100 participants). The weighted average age of the pooled sample was 42.2 years and 56.2% of the participants were female. Studies were published between 2009 and 2017, had a median intervention duration of 12 weeks (ranging from 1 week to 2 years), and were conducted in the United States of America (23 studies), Europe (12 studies), Australia (9 studies), Asia (6 studies), Canada (3 studies), Middle East (2 studies), New Zealand (2 studies), and South America (2 studies). Nineteen studies included adults with overweight or obesity (19), and 11 studies included adults with chronic diseases, but also included normal healthy adults (e.g. college students) or adults in a specific context but free of disease (e.g. pregnancy, women with children, workplace intervention for employees). The majority included a comparison group (14 studies compared groups with different types of text-messaging interventions and 40 studies compared with no-message or minimal intervention control group).

Interventions contained motivational messages to encourage physical activity (45 studies) or educational information about physical activity benefits and sedentary behaviour risks (12 studies). Step counters were also provided by some interventions that used text messages to deliver feedback on physical activity and progress towards goals (12 studies). Text messages were used as a prompts/reminders of participants' plans, goals, or future activity related appointments (11 studies), and were also personalized with baseline preferences and demographic information (5 studies), participants' goals (4 studies), or ongoing intervention data (2 studies).

Some interventions used combined components (e.g. text plus emails, phone calls; 9 studies), provided self-monitoring devices (16 studies), or used text messages as a complementary component of phone interventions (4 studies), in-person counselling sessions (9 studies), online websites and forums (4 studies), or face-to-face interventions (6 studies).

Effectiveness

A total of 43% of the studies that included a no-text message comparison group (20 of 47) presented significantly better results in physical activity for the intervention when compared with that control condition. Data from 17 randomized controlled trials were analysed for effect size extrapolation with a median effect of Cohen's d = 0.23 (small). About half of the one-arm trial presented significant improvements in physical activity (7 of 12 studies). The extrapolated median effect size was d = 0.54 (11 studies).

Thirteen studies were included in the meta-analysis (1346 participants), with different types of sample characteristics (chronic diseases, women only) and an intervention duration typically around 12 weeks (4 studies) or 24–26 weeks (5 studies). Five studies presented moderate-to-vigorous physical activity (minutes per day) as outcome data. When compared to the control condition (no-text messages) text-messaging interventions led to small-to-medium-sized, marginally non-significant moderate-to-vigorous improvements in physical activity (Cohen's d = 0.31, 95% CI = –0.01, 0.63, p=0.06). However, heterogeneity was high (I2 = 70%, 95% CI = 24%, 88%, p < 0.01). Ten studies presented daily steps as an outcome. When compared with control condition (no-text message), interventions led to a small to medium size improvement in post-intervention steps/day (SMD = 0.38, 95% CI = 0.19, 0.58, p<0.001). Heterogeneity was low (I2 = 33%, 95% CI = 0%, 68%, p = 0.14). Subgroup analyses provided no evidence of significant differences when considering intervention intensity, medical populations, intervention duration or SMS tailoring. However, compared with the control condition, effect size was greater for tailored than for untailored text messages, greater for medical than for non-medical samples, and greater for high-intensity than for low-intensity interventions.

Dugas M, Gao G, Agarwal R. Unpacking mHealth interventions: a systematic review of behavior change techniques used in randomized controlled trials assessing mHealth effectiveness. Digit Health. 2020;6:2055207620905411. doi:10.1177/2055207620905411

Authors' conclusions

mHealth is being applied in a variety of lifestyle interventions to impact health outcomes reflecting flexibility. Mixed results suggest that there is a need for optimization of use in behaviour change techniques.

Study characteristics

Overall, 21 randomized controlled trials published between 2008 and 2017 were reviewed. The most common behaviour targeted was physical activity (5 studies). About one third of the participants (32%) did not suffer from a medical condition; some had previously been diagnosed with chronic conditions (40.1%) or had overweight or obesity (22.7%). Technologies used to deliver the interventions were SMS (9 studies), apps/wearables (10 studies), and personal digital assistants (2 studies). Self-monitoring was the most frequent behaviour change technique used (50% of arms), followed by feedback on behaviour (46.9%) and adjusting intervention content to performance (40.6%). Gamification was used in 6.3% of intervention arms.

Intervention effectiveness

Evidence of mHealth interventions effectiveness is mixed when compared to non-technology controls: eight studies reported non-significant differences, six studies reported improvements, three found significant improvements for at least one primary outcome, and one study found that the intervention arm resulted in worse outcomes than in the comparator arm. The behaviour change technique found most often in effective studies was the use of prompts/cues (87.5% of arms), followed by general personalization (50% of arms), goal-setting behaviour (37.5%), and action planning (37.5%). The behaviour change techniques most used in ineffective studies were self-monitoring of behaviour (70%), social support – unspecified (60%), feedback on behaviour (50%) and prompt/cues (40%).

Elavsky S, Knapova L, Klocek A, Smahel D. Mobile health interventions for physical activity, sedentary behavior, and sleep in adults aged 50 years and older: a systematic literature review. J Aging Phys Act. 2019;27(4), 565–93.

Authors' conclusions

Mobile interventions have the potential to increase physical activity and reduce sedentary behaviour in older adults (aged over 50 years). Regarding physical activity, most reviewed studies provided some evidence of effectiveness for increasing physical activity. The effectiveness of text-messaging interventions (included in 60% of all studies) targeting sedentary behaviour and physical activity in adults aged over 50 years is supported by evidence.

Study characteristics

Fifty-two studies were included in the review, with the sample size across studies ranging from 8 to 710 (mean = 114). Participants had an average of 59.6 years. Studies were published between 2008 and 2017 and were conducted in north America, Europe, Asia, Africa, Oceania and the Middle East. Thirty-four studies were randomized controlled trials, 18 were quasi-experimental studies, and 15 were pre-test/post-test single group studies. The mean lengths of interventions were 3.5 months with a range of 0.5 to 12. Fourteen studies focused on healthy populations and 38 recruited participants with chronic conditions (9 heart or cardiovascular disease risk factors, 7 diabetes, 5 COPD, 2 COPD or diabetes, 7 metabolic syndrome/obesity, 2 obstructive sleep apnoea, 2 cancer, 2 rheumatoid arthritis, 1 orthopaedic, 1 primary care patient). Most of studies target physical activity only (33 studies), or physical activity and sedentary behaviour (13 studies). Twenty-three studies used self-reported instruments to assess behaviours, 17 employed device-based assessments, and 12 used a combination of both subjective and objective methods. Nineteen studies were theory-framed. The most-used theory was social cognitive theory (6 studies) and other behaviour change theory and techniques (4 studies). Twelve studies used text messaging only, 16 used apps, and 24 used a combination of technologies (text messages, apps or web platforms). Text messages were used mainly to provide reminders, advice/information, support, self-monitoring and goal-setting. Mobile apps included features such as the provision of feedback (automated/tailored), goal-setting, emotional support or motivational cues and social components (chats). Text messaging was frequently incorporated in studies (60% of all studies) but also in combination with other technologies (79% of hybrid interventions included SMS, plus either web or app components).

Effectiveness

From the 21 studies examined for pre/post change, 13 reported evidence of effectiveness (3 studies containing text messages). From the 29 examined randomized controlled trials with a non-mobile control group, 17 reported benefits in physical activity parameters (steps, device-assessed or self-reported moderate-to-vigorous physical activity). The effective duration of randomized controlled interventions ranged from 1 week to 6 months, and 14 of the 17 incorporated text-messaging features. Overall, 14 studies reported sedentary behaviour measures. Nine reported reductions in sedentary behaviour outcomes, of which six included text-messaging features.

Joseph RP, Royse KE, Benitez TJ. A systematic review of electronic and mobile health (e- and mHealth) physical activity interventions for African American and Hispanic women. J Phys Act Health. 2019;16(3):230–9. doi:10.1123/jpah.2018-0103.

Authors' conclusions

Seven out of 10 studies reported significant within-group or between-group differences in physical activity increase favouring the intervention condition. Studies with self-reported measures presented larger effect sizes than objective physical activity measures.

Study characteristics

Ten studies were reviewed with a median of sample sizes of 33.5 (ranging from 11 to 370). The median age of the pooled sample was 37 years (mean range across samples from 21.1 to 69.7) and 100% of the participants were female. Studies were published between 2010 and 2017, had a median intervention duration of three months (ranging from one week to 12 months), and were conducted in the United States of America. Studies included women with overweight or obesity (2 studies), older age (2 studies), or in a postpartum condition (1 study) but also included healthy women with no special characteristics (5 studies). The majority were pilot studies (8 studies), with a single group pre-test/post-test design (4 studies), a randomized controlled design (2 studies), a non-randomized quasi-experimental design (1 study) and a secondary analysis of a larger three-arm randomized trial. The two remaining studies were randomized controlled full-scale trials.

Six studies targeted physical activity alone, and four also included intervention components focusing on eating behaviour or calorie intake for weight loss. Seven studies did not report using specific physical-activity-related goals. Six studies used websites to deliver the intervention, including features such as physical activity tracking tools (4 provided pedometers), general physical activity advice and tips to increase physical activity, exercise videos or message board forums. Three studies used text messages, one study with one-way text messages, two studies did not specify participant interaction. One text-messaging intervention also provided a pedometer. One study utilized Facebook alongside the text messages.

Nine studies identified having used a behavioural science theory; social cognitive theory was one the most frequently reported (7 studies), followed by the transtheoretical model (4 studies). The health belief model and information-motivation-behavioural skills model were each used in one study. From these, seven studies clearly reported how specific theoretical constructs were operationalized in the intervention content and design (e.g. through motivational readiness for physical activity, social support). Seven studies reported cultural adaptation strategies for the intervention activities.

Effectiveness

No meta-analysis was conducted owing to the heterogeneity of physical activity assessments. From the seven studies that used self-reported measures to assess physical activity, five reported significant post-intervention increases in moderate-to-vigorous physical activity, with an effect size ranging from Cohen's d 0.17 to 2.59. Of the four studies that incorporated accelerometers as a secondary measure to corroborate self-reported physical activity findings, only one study reported significant pre-intervention and post-intervention increases in accelerometer-measured moderate-to-vigorous physical activity. Objective physical activity assessment was used as the primary outcome in three studies. Two reported significant increases in post-intervention physical activity levels. However, effect sizes were smaller than for self-reported moderate-to-vigorous physical activity.

2018 Physical Activity Guidelines Advisory Committee. Physical Activity Guidelines Advisory Committee scientific report. Washington (DC): United States Department of Health and Human Services; 2018.

Authors' conclusions

Owing to their accessibility and ability to generate moderate to strong increases in physical activity, text-messaging and smartphone applications represent promising public health strategies that could be implemented alone or as adjuncts to other interventions.

Evidence showed that interventions framed in behaviour change theories and techniques are effective in increasing physical activity levels in an adult population. Self-monitoring is a particularly promising technique to promote physical activity behaviour. Strategically mobilizing programming features that include individual, social and environmental constructs could be useful to increase effectiveness.

Study characteristics

Overall, eight reviews were included (5 systematic reviews, 3 meta-analyses) covering the period from inception to October 2016. Reviews examined the effectiveness of mobile phone interventions, employing smartphones, mobile wireless devices or personal digital assistants. Almost all studies measured physical activity via wearable devices or combining device-based and self-reported assessments, mostly focusing on increasing steps per day of walking and moderate-to-vigorous physical activity, and were of short duration (less than 6 months).

Concerning theory use, another review of the literature was conducted based on existing meta-analyses that included 82 theory-based randomized controlled trials to promote physical activity. A total of 61 studies were based on a single theory, 31 were based on the transtheoretical model, 16 were based on social cognitive theory, eight were based on the theory of planned behaviour, five were based on self-determination theory, and one was based on protection motivation theory. Fourteen studies combined two theories, and seven studies included three to five theories. Intervention length ranged from one week to various number of years.

Effectiveness

Text-messaging interventions: it was reported that, of the limited number of randomized controlled trials of text-messaging interventions, the populations studied were primarily young or middle-aged women or well educated women. Text messaging was used mainly to provide cues or convey simple messages about active lifestyles (either as primary target or as part of a weight loss intervention). Few studies focused on persons with chronic diseases, and no study was found involving a text-messaging intervention to promote physical activity in youth in the period 2011–2016. Two meta-analyses and one systematic review found significant sizes of positive effect (relative to controls) that were on average 0.40 or greater, in general adult populations, with intervention lengths ranging from four to 52 weeks.

Smartphone app interventions: for younger populations, interventions reported small-to-moderate effects in both boys and girls (Cohen's d coefficient ranging from 0.36 to 0.86). Combinations of behaviour change techniques resulted in increased effectiveness in children (general encouragement, modelling of appropriate behaviour) vs. adolescents (consequences of behaviour, information related to others' approval, self-monitoring, behavioural contracts).

Few controlled studies employed smartphone apps to promote physical activity with adults. One review found that 52% of the examined studies (11/21 studies) reported significant positive effects on at least one physical activity variable when compared with control conditions (effect sizes estimates not provided). Furthermore, studies that combined apps with other mHealth strategies (e.g. telephone coaching, SMS, emails) were more likely to yield significant benefits in behavioural outcomes than those using apps only.

Regarding theoretic underpinnings, the review meta-analytic procedures yielded an overall average effect of 0.31 (95% CI 0.24, 0.37) when comparing intervention groups with control groups. Studies that were underpinned on one theory yielded effect sizes of 0.26 to 0.61. No differences were found in physical activity outcomes between different theories, but single-theory trials had stronger effects than multi-theory trials (d = 0.35 vs. d = 0.21 (95% CI 0.11, 0.32)).

The Bird et al. review[12] reported that 21 of the 41 included studies found a statistically significant effect on cycling and/or walking outcomes, 12 found a non-significant positive effect, and 13 did not provide information on statistical significance for these physical activity outcomes. Concerning behaviour change techniques, studies reporting significant results included on average 6.43 techniques, those with non-significant results included on average 4.42 techniques, and those not reporting significance of physical activity outcomes included on average 1.69 techniques. Although the use of a combination of behaviour change techniques resulted in a successful increase in walking and cycling behaviours, there is no evidence of any particularly effective combination of techniques. The most-used techniques were self-monitoring of behaviour and intention formation.

Eckerstorfer LV, Tanzer NK, Vogrincic-Haselbacher C, Kedia G, Brohmer H, Dinslaken I et al. Key elements of mHealth interventions to successfully increase physical activity: meta-regression. JMIR Mhealth and Uhealth. 2018;6(11):17. doi:10.2196/10076.

Authors' conclusions

mHealth interventions presented small-to-moderate effects in increasing post-intervention physical activity. Interventions that included behavioural goals or self-monitoring produced greater effects, but these were not cumulative (no substantial benefit if both techniques are used simultaneously). More research is needed to understand the effectiveness of behaviour change techniques and their interactions.

Study characteristics

Fifty studies published between 2007 and 2016 were reviewed including a total of 5997 participants (41% of the studies had >100 participants). The weighted average age of the pooled sample was 40.6 years, and on average 62.7% of the participants were female. Studies targeted physical activity (29 studies), health (13 studies) and weight management (8 studies). Twenty studies used subjective measures of physical activity. Only the five most-used behaviour change techniques were tested: behavioural goals (30 studies), self-monitoring (26 studies), general information (24), information on where and when (19 studies) and instructions on how to (18 studies). Two studies did not report sufficient details about the intervention components to allow for the identification of behaviour change techniques.

Effectiveness

Post-intervention group differences for physical activity outcomes showed a small overall effect size (Hedges' g = 0.29 [95% CI = 0.20 to 0.37]; g = 0.22 after correcting for publication bias). Moderator analysis indicated that the use of behavioural goals or self-monitoring increased the effects of the intervention by Δg = 0.31, but combining both did not provide cumulative benefits (Δg = 0.36). No differences were found between studies using self-reported or objectively measured physical activity outcomes, or when both methods were used in the same study.

Direito A, Carraça E, Rawstorn J, Whittaker R, Maddison R. Mhealth technologies to influence physical activity and sedentary behaviours: behavior change techniques, systematic review and meta-analysis of randomized controlled trials. Ann Behav Med. 2017;51(2):226–39. doi:10.1007/s12160-016-9846-0.

Authors' conclusions

Meta-analysis showed that mHealth interventions promoted small decreases in sedentary behaviour of free-living individuals, and small-to-moderate effects were reached for physical activity and walking outcomes, however these did not reach statistical significance. An average of five behaviour change techniques were implemented across studies, the most frequently used were goal-setting (behaviour), self-monitoring (behaviour), feedback (behaviour), social support, instruction on how to perform the behaviour, information about health consequences, prompts/cues and adding objectives to the environment.

Study characteristics

Twenty-one studies were reviewed, involving 1701 participants with an average sample size of 81 (ranging from 20 to 301). The median age of the pooled sample was 40.1 years (mean range 8.4–71.7), and 64% of the participants were female. Studies were conducted in the U.S. (11 studies), in Europe (6 studies), Australia (3 studies) and Canada (1 study), and were published between 2007 and 2015. Nine studies presented objectively measured physical activity outcomes and 12 employed self-reported measures (4 studies employed both). Studies had a median intervention duration of three months (ranged from one week to 12 months). The majority of the interventions were delivered at an individual level; the mHealth technologies used were personal digital assistants (1 study), mobile phone/SMS (11 studies), biosensors (3 studies), smartphones/apps (7 studies), tablet computers (1 study) and websites (4 studies). Studies included free-living young people and adults, one study included only females, and another included only males. All studies were randomized controlled trials and were compared against minimal contact/usual care groups, both using technology (e.g. pedometer) (8 studies) and non-technology treatments (e.g. counselling) (10 studies). One study had a control group with no intervention.

Intervention content was heterogeneously reported. An average of 5.4 (behaviour change techniques) were included across studies (standard deviation (SD) = 2.6,

range 0 to 12). The most frequently used behaviour change techniques, coded using the behaviour change techniques taxonomy v1[13] were goal-setting – behaviour (81% of the studies), self-monitoring of behaviour (74%), social support – unspecified (65%), feedback on behaviour (55%), instructions on how to perform the behaviour (55%), adding objects to the environment (48%), information about health consequences (45%) and prompts/cues (45%).

Effectiveness

Post-intervention effects across studies were small-to-moderate but non-significant for total physical activity(SMD) –0.26, 95% CI = –0.53 to –0.00), moderate-to-vigorous physical activity (SMD 0.37, 95% CI = –0.03 to 0.77) and walking (SMD 0.14, 95% CI = –0.01 to 0.29). Heterogeneity was statistically significant for all physical activity measures except for walking behaviour. Sedentary behaviour was reported in five studies and results showed statistically significant decreases after mHealth interventions compared with controls (SMD–0.26, 95% CI = –0.53 to 0.00) with no evidence of heterogeneity (I2 = 0%; $\chi 2 = 0.28$; p = 0.99). Subgroup analysis presented no differences in physical activity outcomes or in sedentary behaviour between studies employing objective or self-reported measures.

Müller AM, Alley S, Schoeppe S, Vandelanotte C. The effectiveness of e-& mHealth interventions to promote physical activity and healthy diets in developing countries: a systematic review. Int J Behav Nutr Phys Act. 2016;13(1):109. doi:10.1186/s12966-016-0434-2.

Authors' conclusions

Most internet-based interventions were effective in promoting physical activity in developing countries, while the evidence for mobile-phone interventions (text message and counselling) was mixed. Interventions were heterogeneous in terms of location, intervention components and trial methods applied. Results should be interpreted with caution, as more rigorous designs are recommended.

Study characteristics

Overall, 15 studies were reviewed (16 articles) including 75 930 participants (ranging from 22 to 69 219). One study enrolled children and adolescents, and the other studies recruited adults from 18 to 74 years old. Studies were published between 2011 and 2016 and were conducted in Asia (9 studies), South America (3 studies), Europe (1 study), in Africa (1 study), and one study was a multicountry trial. The average intervention duration was 6.4 months. Studies included healthy participants, but also included at risk of developing diabetes or hypertension (10 studies) or diabetic participants (5 studies). Interventions were delivered through text messages (7 studies), website or email (6 studies), mobile phone calls (2 studies) and combined components (2 studies; phone calls plus text messages and website plus text messages). Studies with text messages had a delivery frequency ranging from twice weekly to daily (mean = 4.5 text messages per week). Five studies reported using theory – transtheoretical model of change was the most frequently reported (3 studies), followed by the social cognitive theory (2 studies) and the theory of planned behaviour (1 study).

Effectiveness

Fourteen studies assessed physical activity outcomes, mostly with self-reported measures (10 studies). Seven studies provided evidence of significant positive effects on physical activity (50%). Four studies did not report significant positive effects for either physical activity or eating behaviour.

Free C, Phillips G, Galli L, Watson L, Felix L, Edwards P et al. The effectiveness of mobile-health technology-based health behaviour change or disease management interventions for health care consumers: a systematic review. PLoS Med. 2013;10(1):e1001362. doi:10.1371/journal.pmed.1001362.

Authors' conclusions

Seven studies (out of 14) provided evidence of statistically significant physical activity benefits (self-reported assessments). One study found statistically significant increases in daily number of steps. For health behaviour change interventions, the evidence suggests positive effects, but these are required to be robustly established in long-term randomized control trials.

Study characteristics

Overall, 75 studies were included: 49 studies aimed at disease management and 26 focused on health behaviour change. The health behaviour change trials involved 10 706 participants with sample sizes ranging from 17 to 5800. Studies were randomized controlled trials with parallel groups (26 studies) or non-randomized controlled trials (1 study) and aimed to increase physical activity (7 trials), to reduce calorie intake plus increasing physical activity (7 studies), to reduce calorie intake (3 trials), to increase smoking cessation (5 trials), to increase safety in sexual behaviour (3 trials) and to reduce alcohol consumption (1 study). Studies involving physical activity were published from 1990 to 2010 and were conducted in the United States of America (8 studies), Europe (4 studies), Taiwan (1 study) and New Zealand (1 study). Average duration was 17 weeks ranging from 4 weeks to 52 weeks (median = 12 weeks).

Health behaviour change interventions mainly relied on mobile phones or personal digital assistants to deliver the intervention. Thirteen studies used text-messaging only, one used telephone calls, one used MP3 function, one used MP4 function, five used apps, two used computer based software, one used the audio function of an MP3 player, and one study incorporated multiple components (app, SMS and calls). Of the 26 studies, seven reported using behaviour change theories to frame the intervention. The most-used behaviour change techniques were: provide feedback on performance (13 interventions), goal-setting (12 interventions), provide information on the consequences of behaviour (11 interventions), tailoring (11 interventions), prompt self-monitoring of behaviour (10 interventions) and identify barriers to behaviour/problem solving/ identify ways of overcoming barriers (8 interventions). The maximum numbers of techniques used in a trial was 18 and the median number was six.

Effectiveness

Seven of the 14 studies that assessed physical activity through self-reported measures provided evidence of statistically significant benefits and one study found statistically significant increases in daily number of steps, objectively assessed with a pedometer device.

O'Reilly GA, Spruijt-Metz D. Current mHealth technologies for physical activity assessment and promotion. Am J Prev Med. 2013;45(4):501–7.

Authors' conclusions

Mhealth interventions to promote physical activity and reduce sedentary behaviour that employ text-messaging and mobile journals and questionnaires can positively impact health behaviours. Interventions that provide real-time feedback, or personalized or adaptative systems need to be developed and tested for efficacy.

Study characteristics

Twenty-two studies were included, published between 2005 and 2010. Seventeen studies employed mobile technologies for physical activity promotion, and five studies employed these technologies for physical activity assessment. Mobile journals or questionnaires were the most-used mobile technology (11 studies), followed by SMS messaging (8 studies) to encourage physical activity (6 automated messages, 2 personalized messages). Five studies used on-body activity sensing devices. Seven studies used a multicomponent approach.

Effectiveness

Studies comparing different collection methods of self-reported physical activity and sedentary behaviours found an agreement between mobile journals/questionnaires and validated physical activity measurement tools. Nine out of 12 studies that used mHealth to promote physical activity reported significant changes in physical activity or sedentary behaviour, employing text messaging (4 studies), physical activity self-monitoring through mobile technologies (4 studies), or multiple components (1 study).

Tailoring strategies were used in six intervention, and included the provision of personal physical activity data and progress towards goals, the personalized SMS messages and personalized feedback. Results were mixed: three studies reported changes in physical activity behaviours; two studies reported no changes, and one did not report results. Feasibility results demonstrate that mHealth technologies can be feasible for physical activity measurement and physical activity promotion.

Fanning J, Mullen SP, McAuley E. Increasing physical activity with mobile devices: a meta-analysis. J Med Internet Res. 2012;14(6):e161. doi:10.2196/jmir.2171.

Authors' conclusions

Preliminary support for mHealth interventions to promote physical activity. However, the use of mobile technology in physical activity was in its early stages.

Study characteristics

Eleven studies were reviews involving 1351 participants. Sample sizes ranged from 17 to 357 participants (average = 121.1) and the average ages ranged from 8.7 to 68 years. Intervention length ranged from two to 52 weeks (average =14.6 weeks). Eight studies used SMS, four used mobile software and two reported the use of personal digital assistants. Studies were published from 2007 to 2012.

Intervention effectiveness

Five trials reported duration of moderate-to-vigorous physical activity, three reported pedometer step count, two reported metabolic equivalents of task, one reported moderate-to-vigorous physical activity frequency, one reported percentage of time spent in moderate-to-vigorous physical activity, one reported accelerometer data and one reported number of days per week walking or exercising. The random effects meta-analysis showed a significant moderate overall weighted mean effect size (Hedge's g = 0.54, 95% CI 0.17, 0.91), although heterogeneity within the studies was significant (Q = 87.79, df = 10, P < 0.001, I2 = 88.61%). A significant moderate to large effect was found for pedometer steps (g = 1.05, 95% CI 0.75, 1.35). Interventions delivered through mobile phone attained a significant moderate effect (g = 0.52, 95% CI = 0.11, 0.94). No significant effects were found for moderate-to-vigorous physical activity duration or for interventions that were delivered via personal digital assistants.

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ANNEX 2. BEHAVIOUR CHANGE APPROACH

The logic model of the mActive programme followed the core steps of the Behaviour Change Wheel[1], an integrative framework to aid the systematic development and evaluation of behaviour change interventions and guidelines for the development of digital behaviour change interventions. The first step was the selection and specification of the target behaviour and population; the second was identification of the influences of the behaviour selected in step 1 (mechanisms of action) with the support of theories of behaviour change; and the third was selection of the behaviour change techniques to be implemented in mActive.

The selection of the mechanisms of action for walking was based on the best evidence available from state-of-the-art theories of behaviour change. These were organized in a simplified behaviour change model, the COM-B Model[1] (**Figure. A2.1**). This model identifies three key areas which influence behaviour.

1. **Capability** – people's physical skills, strength and stamina and psychological capability, such as the knowledge, behavioural regulation and psychological skills required to perform the behaviour.
2. **Opportunity** – social environment involving aspects such as social norms or social influences and physical environment, in terms of resources, locations and time.
3. **Motivation** – automatic processes, such as habits, or emotional states and reflective processes, such as self-conscious intentions or beliefs that energize and direct behaviour.

FIGURE A2.1.

BEHAVIOUR CHANGE MODEL

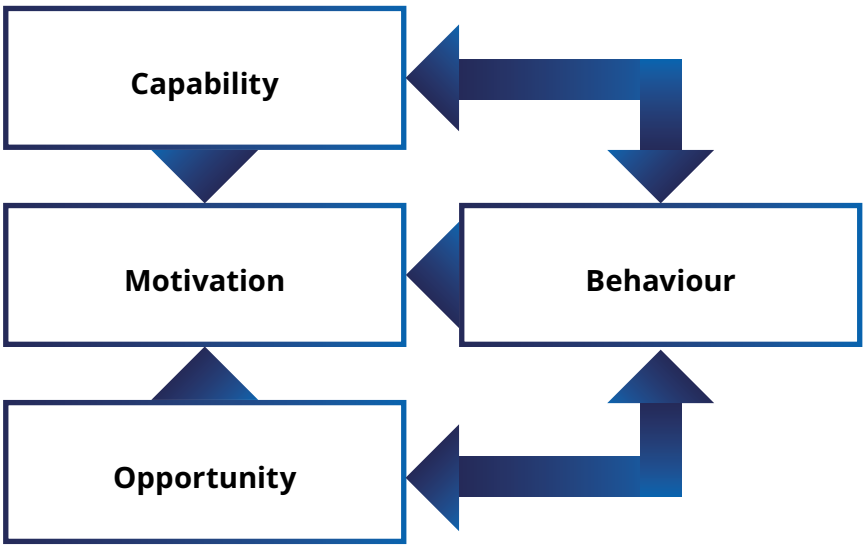

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Table. A2.1 shows the selected behaviour change techniques and the mechanisms of action to achieve the short-term and long-term behaviour change outcomes of more walking and physical activity.

TABLE. A2.1.

UNDERPINNING BEHAVIOUR CHANGE TECHNIQUES AND MECHANISMS OF ACTION FOR mACTIVE

Behaviour change techniques

- Values identification – identify reasons for change
- Linking values with behaviour
- Provide choice
- Information about how to perform behaviour
- Information about consequences of behaviour
- Goal-setting (behaviour)
- Graded tasks (incremental goal)
- Self-monitoring (behaviour)
- Feedback (behaviour and outcome)
- Goal revision (behaviour)
- Action planning
- Coping planning (barriers and solutions)
- Prompts/cues
- Incentivizing and reinforcing both progress and achievements (praise, encouragement and self-reward)
- Behavioural substitution
- Self-identity changes
- Emotion regulation
- Social support and impact on community
- Habit formation

Mechanisms of action

Capability

- Knowledge
- Self-efficacy
- Self-regulation skills/capacity: planning, control (attention), establishment of a routine; emotion regulation

Motivation

- Goal-setting
- Enjoyment
- Increased autonomous motivation
- Habit
- Values
- Self-identity changes
- Satisfaction

Opportunity

- Social support
- Community resources
- Social networks

Contextual factors (mActive does not directly focus on these factors, but can indirectly influence)

- Wider sociocultural factors encouraging physical activity
- Neighbourhood environmental factors (e.g. “walkability” of local environments)
- Road (pedestrian) safety factors
- Personal safety (fear of crime)

ANNEX 3. KEY PRINCIPLES OF THE mACTIVE PROGRAMME

The following table describes the key principles supporting the mActive programme and explains the considerations for each principle. There are six important programme principles to be aware of when implementing mActive.

	mACTIVE INTERVENTION KEY PRINCIPLES	BACKGROUND NOTES/ CONSIDERATIONS
Intervention focus	Intervention focuses on increasing walking as the physical activity behavioural outcome using incremental goals.	Evidence that walking is associated with a wide range of positive health outcomes, including noncommunicable diseases; walking is generally achievable for inactive/ low-active people; walking is comparatively inexpensive and safe (injuries).[1]
Intervention specifications	A 4+2 week text message based intervention delivered in weekly blocks with message frequency highest in week 1 and decreasing over time.	Wide range of intervention lengths is evident (4–52 weeks).[1] Physical activity text message interventions have used a range of, and varying, message frequencies.[2, 3, 4] A meta-analysis of text messaging interventions to change health behaviours recommended reducing and varying message intensity throughout the intervention.[5] mActive message frequency is high compared with other physical activity text message interventions, but consistent with other BHBM mHealth interventions. As optimal message dose required for change is unclear, the intention of mActive is to provide a balance between an effective message dose and overwhelming or annoying people. Intention of weekly blocks is to provide participants with routine but not be repetitive; also allows option to repeat a block (e.g. when not meeting goals or to continue after eight weeks).

	mACTIVE INTERVENTION KEY PRINCIPLES	BACKGROUND NOTES/ CONSIDERATIONS
Intervention logic	All messages implement one or more evidence-based and theory driven behaviour change techniques. All messages target evidence-based and theory driven mechanisms of action that have an influence on physical activity behaviour (e.g. walking).	See underpinning behaviour change techniques and mechanisms of action in **Table A2.1** above. These techniques have a direct impact on changing behaviour (walking), through the mechanisms of action. For more information on behaviour change techniques.[6, 7, 8] See underpinning behaviour change techniques and mechanisms of action in **Table A2.1** above. Mechanisms of action are the processes through which a behaviour change technique affects behaviour.
Message content	Messages addressing goal-setting, goal revision, self-monitoring and feedback and prompts are included each week throughout the intervention; messages addressing action planning, values, barriers and social support are introduced in weeks 1–2 (focus on adoption). Messages addressing emotion regulation, habit formation and autonomous motivation influencing others are introduced in weeks 3–4 (focus on adoption and initial maintenance). Messages targeting maintenance of walking, addressing additional coping planning skills, identity change, action control, impact on other, and enjoyment are part of the mActive PLUS (weeks 5–6). Messages address the individual and their environment.	Principles for message content informed by reviews of strategies and approaches to increase physical activity.[1, 2, 9–12] The environment for physical activity encompasses social (family, community) and physical (natural, built) factors.[13] Supportive environments are critical for maintenance of physical activity behaviour and extension of intervention effects.[1]

	mACTIVE INTERVENTION KEY PRINCIPLES	BACKGROUND NOTES/ CONSIDERATIONS
Message types	All mActive "two-way response" messages are incorporated for a reason (e.g. tailoring, reflection, evaluation).	Tailoring (potential to increase relevance of messaging; personalize messaging; provide participant with control of programme). Reflection (review of goals). Evaluation of mActive (and research). Consider – what will participants gain from this question? Consider cost/time/technology/expertise implications in-country. Each tailoring response requires more message content and adds complexity. Responses may cost participants money and be a barrier to participation.
Intervention adaptation	The final "global" mActive programme will be available for adaptation and tailoring in structure, message delivery and specific messages (including translation) for use in participating countries under the guidance of the global expert steering group for mActive.	In-country, formative evaluation should address behaviour, delivery and technology use. Can choose from a variety of formative evaluation techniques – literature review/ qualitative/quantitative. mActive messages have been written to be simple and clear (unambiguous), not too prescriptive and autonomy-supportive (i.e. instructive yet encouraging participant to take control). Messages can be adapted for each country and target group, while maintaining mActive approach and guiding principles. English content should be translated to local language and then back-translated to ensure correct sentiment and accuracy of evidence.

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ANNEX 4. SUMMARY OF mACTIVE PROGRAMME ALGORITHM (USER JOURNEY)

This includes behaviour change techniques.

WEEK 1 = 28 MESSAGES		
Focus	**Behaviour change techniques**	**Mechanics**
Introduction, establish weekly goal, identify value and motivation.	Information, set goal, identify and link to value, self-monitoring, reinforcement, feedback and planning, Encouragement, prompt/cue, social support, provision of information, goal monitoring, feedback+ reward.	5 messages on day 1 (D1) and 3 messages per day on D2–D7.

WEEK 2 = 12 MESSAGES		
Focus	**Behaviour change techniques**	**Mechanics**
Goal-setting and reinforcement, tips, barriers identification and solutions, follow-up.	Goal revision, self-regulation, self-monitoring, problem-solving, information provision, action planning, social opportunities, assess non-participation; goal monitoring, feedback + strategies to overcome barriers, reflection.	1 message per day in general except D8 (3 messages) and D9 (3 messages).

WEEK 3 = 13 MESSAGES		
Focus	**Behaviour change techniques**	**Mechanics**
Goal revision,-setting, tips, value reinforcement, goal check and reinforcement, follow-up.	Goal revision, information provision, social support, behavioural substitution, emotional regulation, feedback values, prompt/cue, self-monitoring, feedback + strategies to overcome barriers, motivation reinforcement, assess non-participation; goal monitoring.	1 message per day in general except D15 (4 messages) and D21 (5 messages).

WEEK 4 = 11 MESSAGES		
Focus	**Behaviour change techniques**	**Mechanics**
Goal-setting and reinforcement, tips, value reinforcement, goal check and closing and summary.	Goal revision, habit formation, self-regulation, prompt/cue, autonomous motivation, value reinforcement, emotional/ physiological regulation, self-monitoring, feedback + reward, maintenance.	5 messages on D1 and 3 per day on D2–D7.

mActive PLUS

WEEK 5 = 8 MESSAGES		
Focus	**Behaviour change techniques**	**Mechanics**
Welcome, barriers identification and solution, tips on motivation and support, goal check.	Coping planning, problem-solving (barriers and solutions), values identity, emotional regulation, social support, action control, self-monitoring and reinforcement.	1 message per day in general except D29 (2 messages).

WEEK 6 = 8 MESSAGES		
Focus	**Behaviour change techniques**	**Mechanics**
Tips on solutions and motivation, goal and value reinforcement, closing.	Habit formation, social support, enjoyment, provide choice, identity change, self-reward, values – community impact.	1 message per day in general except D42 (2 messages).

ANNEX 5. DETAIL OF mACTIVE MESSAGE ALGORITHM AND BEHAVIOUR CHANGE TECHNIQUES

WEEK	DAY*	BEHAVIOUR CHANGE TECHNIQUE (NUMBER OF MESSAGES)
1	1	Introduction + motivation (3); Baseline evaluation (1); Information (2); Goal-setting (1)
	1E	Goal-setting (1)
	2	Values link (reasons for joining) (2)
	2E	Self-monitoring (1); Feedback + planning (1)
	3	Prompt + values link (reinforce personal values) (1)
	3E	Self-monitoring (1); Feedback + strategies for self-monitoring (1)
	4	Prompt (Capability – social support) (1)
	4E	Self-monitoring (1); Feedback behaviour + encouragement (1)
	5	Encouragement (1)
	5E	Self-monitoring (1); Feedback behaviour + social support (1)
	6	Prompt + information (1)

WEEK	DAY*	BEHAVIOUR CHANGE TECHNIQUE (NUMBER OF MESSAGES)
	6E	Self-monitoring (1); Feedback behaviour (1)
	7	Information (1)
	7E	Self-monitoring (1); Feedback + reward (1)
2	1	Goal revision + setting (2); Self-regulation + self-monitoring (1)
	2	Problem-solving (barriers and solutions) (2)
	3	Information (1)
	4	Action planning (1)
	5	Social / community opportunities (1)
	6	Non-response + goal monitoring (1)
	7E	Weekly goal monitoring (1); Feedback + strategies to overcome barriers (1); Reflection (1)
3	1	Goal revision + setting (3); Information (1)
	2	Social support (1)
	3	Behavioural substitution (1)
	4	Emotional regulation (1)
	5	Feedback values (1)
	6	Prompt (1)
	7E	Weekly goal monitoring (1); Feedback + strategies to overcome barriers (1); Motivation reinforcement (1); Assess non-participation; Goal monitoring (1)
4	1	Goal revision + setting (2); Habit formation (1)
	2	Self-regulation (1)
	3	Prompt (1)
	4	Motivation + value reinforcement (1)
	5	Emotional/physiological regulation (1)
	6	Provide choice (1)
	7E	Weekly goal monitoring (1); Feedback + reward (1); Maintenance (1)

WEEK	DAY*	BEHAVIOUR CHANGE TECHNIQUE (NUMBER OF MESSAGES)
5	1	Welcome (1); Coping planning (1)
	2	Values identity (1)
	3	Emotional regulation (1)
	4	Social support seeking (1)
	5	Action control (1)
	6	Coping planning (1)
	7E	Weekly goal monitoring (1)
6	1	Habit formation (1)
	2	Social support(1)
	3	Enjoyment (positive emotions) (1)
	4	Autonomous motivation (1)
	5	Identity change (1)
	6	Self-reward (1)
	7	Values – community impact (1); Closing (1)

* E indicates message to be delivered in the evening

ANNEX 6. SAMPLE MESSAGES FROM mACTIVE MESSAGE LIBRARY

PRINCIPLES	DESCRIPTION
Target audiences	• Adult population, in particular older adults (aged 65 years and older), who are not meeting current WHO recommendations (and referred to as 'low active' or 'inactive'). Additional tailored options can target more specifically patient populations such as adults living with hypertension or/and type two diabetes.
Programme goals	• Walk every day for 30 minutes, starting with 10 minutes daily.
Programme duration	• The core programme is four weeks with an option to enrol in the mActive PLUS programme (2 weeks) and/or to repeat the core 4-week programme.
Behaviour change theory	• The programme uses the COM-B model (Capability, Opportunity, Motivation) to classify the influences (barriers and facilitators) to physical activity. Each of these are informed by behaviour change theory. • The behaviour change techniques that underpin the mActive programme are also shown in the mActive logic model in **Annex 3 (on page 72)** of the mActive Handbook.
Programme structure: message type, tone, frequency, directionality	• Walking is promoted in a variety of contexts for the users, including: as a form of transport for short trips (e.g. to and from work/educational or other destinations); in or around the home; for travel; and for recreation. • Messages incorporate evidence-based behaviour change techniques / reinforcers which aim to build the user's skills, and motivation to achieve a walking goal. • The mActive 'plus' programme includes some new and some repeated messages introducing additional self-regulation skills to promote maintenance of regular walking. • The programme template comprises 1- and 2-way messaging and offer practical advice in simple language. • Messages emphasize the benefits of action (positive framing) over the consequences of inaction (negative framing). • Users set a walking goal and progress is monitored on the achievement of the goal on a daily and weekly basis as well as at the end of the programme. • Additional messages are provided to enable countries to implement mActive tailored to more specifically to adult patient populations such as adults living with hypertension or/and type two diabetes.
Alignment with Global Policy and Recommendations	• mActive promotes and is aligned with the core messages of the new 2020 global recommendations on physical activity and sedentary behaviour. • The development and scaling of digital health behaviour change programmes, such as mActive, is a recommended policy action in the WHO Global action plan on physical activity 2018-2030.

Example message for the general adult population

- **Congratulations on becoming part of mActive!** mActive is a 4-week text message program to support you becoming more physically active through walking.
- **Why do you want to be more active? Please REPLY with one NUMBER**
  1. To improve health;
  2. To try new ways;
  3. People around me want me to;
  4. To set a good example;
  5. I want to contribute to a healthier [NAME COUNTRY/ COMMUNITY];
  6. Other.
- **It's great that you want to make physical activity a regular part of your life to feel better and improve your health by reducing your risk of many diseases**
- **How did it go today with your walking goal of [x minutes]? Please REPLY with the NUMBER of your choice.**
  1. I met my walking goal today;
  2. I walked more than my goal today;
  3. I walked less than my goal today;
  4. I didn't walk today.
- **Congratulations! Try recording your daily active minutes on a phone or calendar. Tracking your progress can help you choose challenging goals and motivate you!**
- **Changes aren't easy. Joining mActive is a great first step towards what you want to achieve. Keep it up by going for a walk today.**
- **If you don't feel safe walking in your neighbourhood, try to find a local walking group, or be more active in your home - use the stairs and make chores count.**
- **Can you create your own prompt to remind you to walk each day? Try to put your walking shoes where they can be seen or add a regular walking time to your diary.**

ANNEX 7. LESSONS LEARNED ABOUT FINANCING mHEALTH PROGRAMMES

Ensuring a robust funding model for mHealth programming is the first and critical step towards success. Having secure financing enables countries to take ownership of and create a sustainable model for the long-term delivery of mHealth solutions. While the initial cost is seemingly high, careful consideration and systems thinking can lead to easy integration of other digital health programmes, building upon the initial investment and work.

Each country implementing a Be He@lthy, Be Mobile (BHBM) mHealth programme commits financial and human resources, as well as political will, to ensure the programme's success. BHBM has several funding specifications that partner countries must meet prior to a technical support agreement.

A. Country will need funding to cover initial investment in the platform and annual operational expenditure of running the service (including staff time). This will mean establishing a fixed budget line for the basic costs of the service.

B. Countries can (and are encouraged to) use existing infrastructure, staff support etc. to reduce this cost. However, they must show a clear budget breakdown of the areas they are covering versus the gaps which will need to be covered.

C. Part of this funding must come from the government itself (see below).

D. The funding must have been obtained or confirmed in some way. Identifying potential donors is not in itself a sufficient commitment.

BUDGETING FOR A SCALABLE mHEALTH PROGRAMME

The budget required for mHealth programming varies between countries (e.g. US$ 90 000–200 000 for year 1) and will depend on a number of factors.

1. The delivery platform and need for software development

The delivery platform (SMS, existing messenger app, in-app messaging, purpose-built app, website, diagnostic tool, etc.), can have a great effect on the budget, as can be seen in the budget estimation table below.

A technology assessment and an understanding of the needs and preferences of your end users will be necessary to choose your delivery platform. **See section 2 on carrying out a technology assessment**.

2. Current and needed resources (human resources, content and technology/ software)

3. Need for new content

In this toolkit is some messaging content, but if your programme requires translation, cultural and contextual adaptation, additional content such as e-learning content, diagnostic guidance etc., this could require development. Again, an assessment of current relevant resources is necessary to identify the need for and cost of new materials.

4. Promotion and recruitment methods

Marketing your product or programme can be costly, e.g. social media advertising. End users can also be involved in designing your marketing strategy to increase relevance and chances of success.

5. Monitoring and evaluation capacity

Robust monitoring and evaluation can be costly, but they are worth investing in, because reliable data and dissemination of those data can help make the case for programme expansion and further funding.

The goal is to incur no cost for end users, as this is a major barrier for adoption. Creative or collaborative solutions may be necessary to ensure that there are no data charges for downloading an app, for example, or no cost incurred for signing up or sending an SMS as part of a two-way messaging programme. For advice on negotiating with telecoms companies, **see Annex 9 (on page 88)**.

It is difficult to provide even a rough idea of the budget required to take an mHealth programme to scale. Local infrastructure and procurement costs will vary, and so too will costs for a given item depending on the design and scale of the programme. Year 1 costs will be typically higher, accounting for the capital costs of content and software development and higher engagement and support needs. We tend to suggest to countries the following very rough estimates:

- programme coordination US$ 30 000;
- content adaptation US$ 15 000;
- technology platforms and procurement US$ 30 000–100 000;
- promotion US$ 30 000; and
- monitoring and evaluation US$ 40 000.

We suggest including a budget buffer or contingency budget line of around 10%, as it is often the case with technological programming that unexpected costs can arise, for example, software bug-fixing or necessary last-minute changes to specifications. This buffer can then either be repaid to the donor or absorbed into financing subsequent project phases.

SOURCES OF SUSTAINABLE FUNDING

BHBM programmes have identified several sustainable and successful business models for digital health programming at scale. Options for funding broadly fall into three categories, government-funded, bilateral or multilateral support or from third-party grants. However, each of these may entail pursuing separate directions and dividing efforts, so opportunities for efficiencies and common requests from potential funding sources should be studied. A general principle that may be helpful is that starting early can help to generate an overall fund mobilization strategy with clear aims, goals and timelines to generate sustainable funding.

It is important to note that one or more of the options below can (and mostly likely, should) be explored simultaneously as they may be of interest in the short or long term. Though these options may not be mutually exclusive, it may depend on the option's specific guidance and requirements (e.g. some grants may make obtaining existing co-funding mandatory/recommended). The options below are, national funding, grant-based options and strategic partnerships.

National government funding: political will and financial commitment from governments maximizes the programme's chances of success. The main barrier to implementation at scale, in BHBM's experience, is lack of financial and personal buy-in from countries.

mHealth programmes are most sustainable when owned and operated by countries. This requires the programmes to be fully covered by national budgets, and there are many ways to achieve this. Obtaining support for any ambitious initiative is difficult, so it is a good starting point to explore the possibility of integrating the programmes into existing funding mechanisms. mHealth grants have been found to fit successfully within several national strategy priorities, which makes it simpler to embed them in existing grants or budgets.

For example, an mHealth programme has an obvious health component, and it may therefore be possible to secure funds, depending on national priorities related to disease-specific or secondary strategies. Government funding can come from existing budget lines, for example, funding for mDementia could come from a national health strategy where a pillar is dedicated to noncommunicable diseases or to this specific condition. Or, because part of mDementiaPrevention focuses on tobacco cessation, it may be worth exploring funding from dedicated tobacco control units, those concerned with cardiovascular disease or cancer, or the national initiative for the prevention of noncommunicable diseases.

Tax levies or mandatory contribution funds are another way of financing mHealth. For example, universal service funds (also known as universal access or obligation funds) are collected from telecoms companies in some countries; though these types of funds do not commonly fund mHealth, this possibility could be explored. Another example could be funds raised from tobacco excise duties or sugar taxes, for smoking cessation or diabetes mHealth programmes, respectively. It is worth finding out whether such budget lines exist and how to apply to them for funding.

As an example, the Government of India has demonstrated important political commitment towards the scaling-up of the mTobaccoCessation and mDiabetes programmes, which gained traction in part owing to the Prime Minister's digital health initiative. Other Government bodies were engaged in the programme to provide technical support, including the Ministry of Health and Family Welfare, the Ministry of Communications and Information Technology, the Prime Minister's office's MyGov platform and the National Informatics Centre.

In Egypt, in 2014, the Ministry of Health and Population established a central noncommunicable disease unit to accelerate the implementation of the mHealth programme. The following year, this ministry and two others – the Ministry of Communications and Information Technology and the Ministry of Scientific Research – initiated a collaboration with BHBM and three local mobile network operators to support implementation of mDiabetes in Egypt.

All BHBM programmes are technology-agnostic, which means they can be deployed across a variety of mobile technologies (including SMS, smartphone apps, chatbots powered by artificial intelligence, interactive voice recordings, etc.). As BHBM is a partnership between WHO and ITU, the technology angle is another avenue for securing funding. Indeed, it is common for ministries of telecommunications to have larger budgets than ministries of health, and a collaboration between the two is the best way to ensure long-term sustainability of mHealth projects. As BHBM mHealth programmes rely on technological infrastructure that can contribute toward the digitalization of a health system, they can be embedded in digital transformation budgets, which are often larger in size and broader in scope.

mHealth can therefore fit into the broader digital agenda and can be considered as an upgrade of the digital elements of health programmes. mHealth programmes should be considered part of a larger national digital

health platform, which may, in turn, be part of broader national digital ecosystem. Integrating the programme into larger components also ensures that it is sustainable and scalable for expansion into other areas.

Bilateral and multilateral support

Bilateral support is investment in one Member State by another Member State. Multilateral support typically comes from a multilateral development bank, chartered by two or more countries, for example, the African Development Bank. An example of both bilateral and multilateral financing is seen in Sudan, where the African Development Bank, the Italian Agency for Development Cooperation and the Federal Ministry of Health are investing over US$ 1 million in BHBM programmes.

Grants

Grants typically come from international health donors, from national nongovernmental organizations or health donors, philanthropists or from the private sector. Normally, funds are secured from these organizations through careful outreach and relationship cultivation, unsolicited proposals or responses to short or topic-specific calls for proposals. These may be focused on specific disease areas (e.g. diabetes, mental health) or on processes and systems (e.g. eHealth, mobile, technology-specific).

The search identification strategy should extend to other multilateral funding institutions and to specific charitable organizations that may be interested in funding parts of the research or monitoring and evaluation components within each programme (e.g. Wellcome Trust). Ideally, secured funding should be obtained for the longer term (4+ years), as relying on donor funding may impact sustainability. Nevertheless, it may be a powerful tool to demonstrate impact and results and build a strong case for investment from national funds.

Fundraising requires time and effort and well written proposals that lay out the need for the programme, goals and objectives and how they will be achieved, making sure to communicate the added value for the various stakeholders involved. Often donors will have their own structured grant proposal form but, if they do not, a grant proposal should take the following broad structure:

1. history of your organization or department of the ministry, including mission statement/vision;
2. project summary;
3. background, context and beneficiaries;
4. statement of need;
5. about the programme (including goals and objectives, strategy, scope, expected outputs and anticipated impact; this section can include a business model);
6. project timeline;
7. project budget (including any other funds or statements of in-kind support from partners);
8. monitoring and evaluation and donor reporting;
9. project risk identification and management (only include this if it is a requirement from the donor);
10. future funding, scalability and sustainability; and
11. appendices (if necessary).

Other tips for fundraising:

- appearance is important, so try to make documents look sleek and remember to copy-edit them; send PDFs (not working documents) and a cover letter with your organization's letterhead;
- try to get to know your donor before you apply, so that you understand what is important to the donor when you are building the case for your programme; always think about the donor's mission and agenda and the ways in which the proposal aligns with and will advance their agenda;
- include concepts such as ensuring equity to access to the programme, capacity-building, monitoring and evaluation and sustainability, as these are important areas that are sometimes overlooked in proposals; and
- be sure to highlight what is unique about your ability to carry out the programme successfully.

ANNEX 8. ADAPTING CONTENT LIBRARY FOR VOICE, MESSENGER APPS OR CHATBOTS

Adapting to voice

Interactive voice response (IVR) enables you to reach people who may not be able to interact with text content. An actor records the adapted messages in the BHBM content library and they are delivered by inbound or outbound phone calls to a smartphone or feature phone. The call should be free. With IVR, the user can input a response using keywords ("Have you reached your walking goal today? Say YES or NO"; depending on the user's answer, the programme gives an appropriate prerecorded response).

You can be more creative with voice messages if that would be appropriate for and engage the target users (again, they should be asked their preferences). You could make a series of short 1 3-minute audio plays or stories in order to deliver the BHBM content via the telephone. Actors could be recorded engaging in a discussion, using a number of scenarios (e.g. a doctor and a patient receiving information, advice or instruction, or other trusted community member providing information or behaviour change strategies). Be sure to maintain the original intent of the message from the BHBM content library.

Adapting to messenger apps

People check their phones for messages and notifications between 50 and 100 times a day. Messages through messenger apps such as Messenger from Facebook, WhatsApp, WeChat and Viber therefore provide an opportunity to get your messages read and noticed, as these apps are so often used. Messenger apps also provide more freedom with the length of messages you can send and with the different media you can interact and engage people with, such as audio files, images, GIFs and videos or external web links. They are however restricted to reach users with higher income levels who have smartphones.

Start from the BHBM content library and add more details to messages where you think the user could benefit from more clarity, preserving the scientific fidelity of the programme to the original library. We suggest that you ask target users what they would likely engage with in terms of multimedia. **See Table A8.1** below for some multimedia "do"s and "don't"s.

TABLE A8.1.

"DO"S AND "DON'T"S FOR MULTIMEDIA CONTENT

MULTIMEDIA CONTENT "DO"S	MULTIMEDIA CONTENT "DON'T"S
Do ensure equal representation of men and women and different ethnic groups within your target population in all visual content.	Don't use stereotyped images of particular social groups.
Do consider the file size and data usage costs for users, avoiding "heavy" files and compressing image files and video files if possible.	Don't use colours or gestures associated with a particular political or social group.
Do use a variety of relevant regional accents if possible in audio materials.	Don't use complicated infographics, graphs or other visual representations of information; keep them simple.
Do try quizzes: they can be a fun way to engage, reward and collect data about knowledge gains and behaviour change	Be aware of accidental product placement in photographs or videos (e.g. a branded good in the background).
Do be creative with content, try to use visuals alongside education messages (e.g. illustration of a culturally appropriate healthy meal alongside a nutrition instruction about healthy meals).	

Conversationalizing content

If you wish to create a more interactive and tailored experience, a chatbot is one way to achieve this. It is necessary to consider the user experience of a chatbot as you design the conversational scripts for the bot. It is expensive, can be imprecise and less feasible to use a natural language processing (NLP) chatbot, because NLP incorporates an artificial intelligence system that has to be trained using lots of data and maintained. On the other hand, a conversational interface chatbot (CIC) is much easier to set up than an NLP chatbot. A CIC chatbot presents limited input options for users to select using buttons, emojis or typing the corresponding number or keyword from a list of information topics. This results in the user navigating the bot and getting the tailored information they desire with less likelihood of the bot misunderstanding free text inputs. **See Figure. A8.1** for an example of a CIC (the WHO Health Alert service provided through WhatsApp).

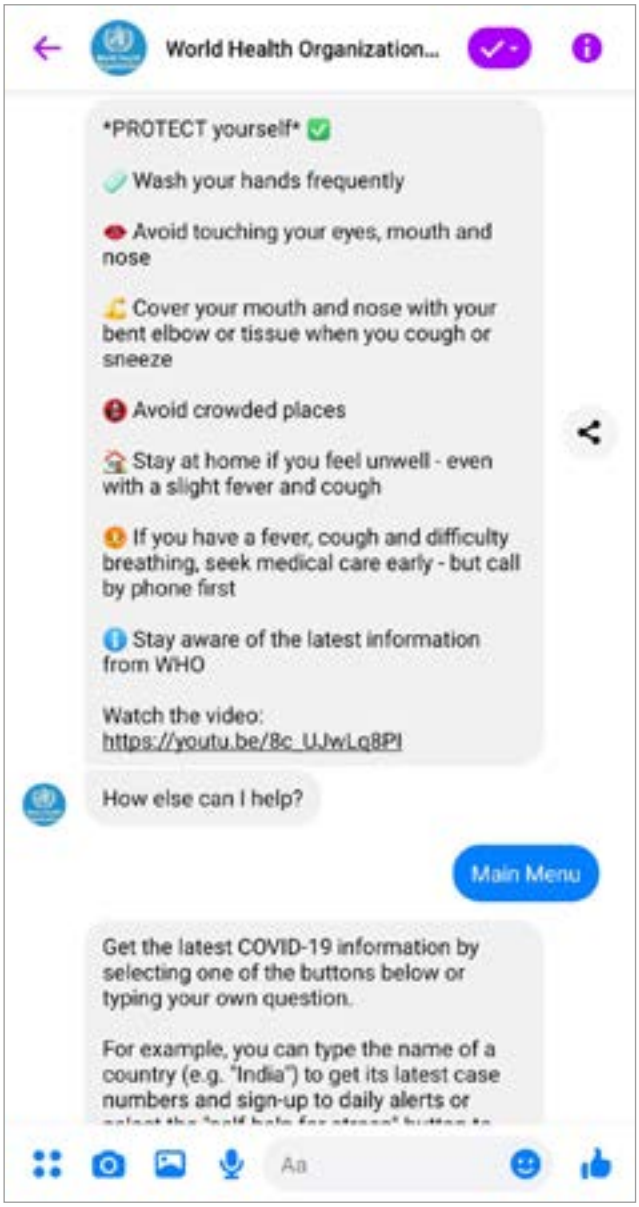
Bots also carry the capability to provide links to external websites for further information, to send audio or image files, GIFs or videos, so you can be more creative with the content you provide and potentially retain more users. You should however be aware of the mobile data costs that such content carries for the users. An important limitation however of bots on certain platforms is that the user has to start the conversation each time. Messenger by Facebook is currently the only bot platform where the first message of a conversation (aside from initial enrolment) or a notification comes from the app, potentially leading to higher retention rates.

CICs require a conversational script to be entered into the bot management software, the content of which can be adapted from the BHBM content library. It is however a good idea to start with the programme goals and knowledge gain and behaviour change aims, then use the BHBM content library to base relevant messages on.

The first step is to prepare the thematic outline of the bot. This is an outline of the themes of each conversation that segmented groups should receive (information, questions, behaviours). The groups for segmenting will depend on your target users and the aims of the programme. It may be that you will segment users into youth, middle-adulthood and elderly groups and by gender and disease risk status (general population, at risk or diagnosed). For less sophisticated bots, this will likely be two or three questions at the beginning of each session, the responses to which will place the user into a particular segment or group to follow a given algorithm. (Some more expensive and sophisticated bots can remember and tag a user as in a specific group for all future sessions, but this creates a complicated back-end structure, rather like having many separate bots in fact, and may not be feasible.)

FIGURE A8.1.

EXAMPLE NAVIGATION OF THE COVID-19 HEALTH ALERT CHATBOT



The thematic bot outline could be in a table form or a diagram, whichever suits you and your team. It may be informed by the messages in BHBM content library, or you can start from scratch and map the key messages from the BHBM library back to it later. You can outline the different key messages you want users to receive in which week if you wish, or you may give users the choice what they wish to learn each session, so have all available at each chat.

Secondly, create a bot diagram and write the messages according to the thematic bot structure. This diagram maps out the messages that are sent and received by the bot and is a pictorial representation of the algorithm for each chat session. Users may get fatigued with after 3-7 reply-bot exchanges, so keep chat sessions short and to the point. When creating a diagram, you could enter the actual messages, or a code corresponding to another document with the full messages written (according to the need of the bot content management system).

Careful maintenance of the script management spreadsheet will be very important. This will also be key for interaction with service providers and may have implications for cost. For example, if messages can be managed using a spreadsheet in advance, this can be used to obtain feedback on the project and approach a company with well organized and structured content, they may provide a lower quote than if they would have to enter and provide a content management system. BHBM can provide assistance with this.

After you have designed the possible topics and conversations, you can make accompanying audio files, images, videos or links according to user preferences. **See Table A8.2** for "do"s and "don't"s for multimedia content creation.

TABLE A8.2.

"DO"S AND "DON'T"S FOR CREATING BOT CONVERSATIONS COMPILED FOR A VARIETY OF BLOGS AND TECHNOLOGY MAGAZINE ARTICLES

CHATBOT CONVERSATION "DO"S	CHATBOT CONVERSATION "DON'T"S
✔ Do keep messages short, simple and to the point.	✖ Don't use casual fillers ("like", "you know") as you would in normal speech, since these can be misinterpreted.
✔ Do explain clearly how the user navigates ("select from the buttons below" "type the number of your desired response").	✖ Don't be too chatty.
✔ Do have the function to save the user's progress so they can come back to the same point if they have to leave the conversation.	✖ Don't overwhelm.
✔ Keep the goal of the bot in mind when writing the script.	✖ Don't use humour unless you are sure it will be understood by all; it could create confusion.
✔ Be consistent with your voice and tone throughout the script and with tenses.	✖ Don't request clarification on every input, just clarify for important questions such as screening questions for tailoring purposes.
✔ Do proofread and test your script for errors in the algorithm; it is essential that all content works smoothly.	✖ Avoid using emojis if multiple messenger apps will be used, as they can't be recognized over all platforms.
✔ Make sure it is clear when a chat session is over and how and when the user can next engage Personalize either by writing all messages in first person or including a name or a mascot for the service (characterizing the speaker).	

ANNEX 9. ENGAGING WITH TELECOMS OPERATORS

Strategic partnerships can be mutually beneficial if they are a good fit with one or more organizations' long-term corporate strategies. Through consultation with private companies, BHBM has identified a number of factors that motivate the private sector to collaborate with country programmes, including shared missions, and the opportunity to share knowledge and extend programme reach, among others. In addition, the private sector and particularly telecoms operators provide BHBM programmes with several opportunities to improve service delivery.

It is necessary to ensure that any partnership remains impartial and that the organization does not pose a conflict of interest. Any contracts or written agreements should be accompanied by a declaration of interests and a due diligence process with clear clauses regarding data ownership and intellectual property. In order to maximize chances of success, attempts should be made at selecting companies whose longer-term engagement is consistent with their corporate strategy and core business. This will ensure a sustainable and long-term partnership. BHBM has some experience in working with private partners and can provide advice and support with managing these potential partners.

For example, private companies may benefit from exposure or association through a direct partnership and as a result may provide reduced fee, free, or in-kind services. Negotiating with telecoms operators will be key to the success of the programme, because if there is any cost to the end user, they feel the programme is not secure or it is tedious to use, it is likely that they will not engage with the programme. This is relevant whether you are running the programme via SMS or via smartphone applications. In the case of SMS, there should be no fee to receive or reply to programme messages; in the case of messenger apps, it will be necessary to waive data costs associated with receipt and reply to messages. If you choose to build a stand-alone app, the initial download must be free (both the app itself and the data required for its download) and subsequent information exchanges should also be free. In all cases, users' data should be private and secured.

The objectives of the negotiations are to:

1. reduce or cut costs associated with the programmes, especially the costs incurred by the intended user;
2. make the programme uncomplicated to use for the end users; and
3. ensure data protection and privacy of the end users.

It is essential to enter the discussions well prepared. Here are some tips, gathered throughout the seven years of BHBM programming, to give yourself a good chance of success.

- Before the negotiations, **consult the relevant authorities** (e.g. telecoms authority, national ministries, market regulators) to identify and understand the benefits/privileges that can be granted to telecoms operators in return for their collaboration (for example, the visibility options that could be offered to the operator to showcase its corporate social responsibility).
- Have an IT expert with **technical knowledge** of the platform and software you are using on hand to respond to technical questions and participate in technical discussions.
- Share your values and vision and discuss those of the telecoms company, highlighting the places where these values match.
- **ITU and its regional offices can facilitate negotiations** between the ministry of health, telecoms authority and telecoms companies.
- The **intended number of users** of the programme must be estimated before commencing negotiations with telecoms companies. This will help to assess the scale of contribution that telecoms companies will be asked to make.
- The negotiators must be aware of the current costs of services, costs of packages and sliding rates, which are vital for the negotiations.
- It is important to incentivize the participation of telecommunication companies (see below).

To incentivize preferential rates and engagement, the negotiators could leverage any combination of the arguments listed below.

- **Direct benefits** to the operators **from Ministry of Commerce**, example: tax reductions.
- **Incentive to increase policy and consumer confidence and appetite for additional services.**
- Offering the added benefit of an **access point into a new market by understanding mHealth service structure and user experiences**.
- Within the broader programme timeline, operators can use their growing experience to **develop their independent mHealth portfolios**, nationally or internationally, driven by rising national demand.

- Showing effectiveness of mHealth services could offer operators a **new source of future revenue in value-added health services.**
- **A telecoms operator can distinguish itself from the rest of the marke**t by demonstrating its ability to offer additional benefits to its users; this is beneficial because, in most countries, the telecoms market consists of two or three major providers with more or less similar subscription plans.
- **Early-mover advantage:** knowledge transfer. Operators can learn how to run large-scale public health campaigns. Participation in the programme will **maximize quantity and quality of knowledge in comparison with the competition**.
- **PR angle:** showcasing the company's contribution to public well-being through marketing and good visibility as a socially responsible company. The ministry of health should offer options for this visibility, including: promotion in mobile stores with the ministry's logo, mobile operator office, website and public campaigns.
- **Good working relationship with the ministry of health (and potentially with the telecommunication authority).**
- Operators may need support with their own interests in mHealth if these are aligned with the Ministry of Health interests, like mobile money to support out of pocket payment for mobile health services or mobile health insurance. **Telecoms companies can work to identify priority areas where the ministry of health can consider providing them with support in the future**.
- Position them favourably for future innovations and experience (both nationally and internationally).
- Benefits to the employees of telecoms companies:
    - employees get priority when registering for the programme;
    - boost morale; and
    - contribute to employee wellness, productivity and corporate health insurance.

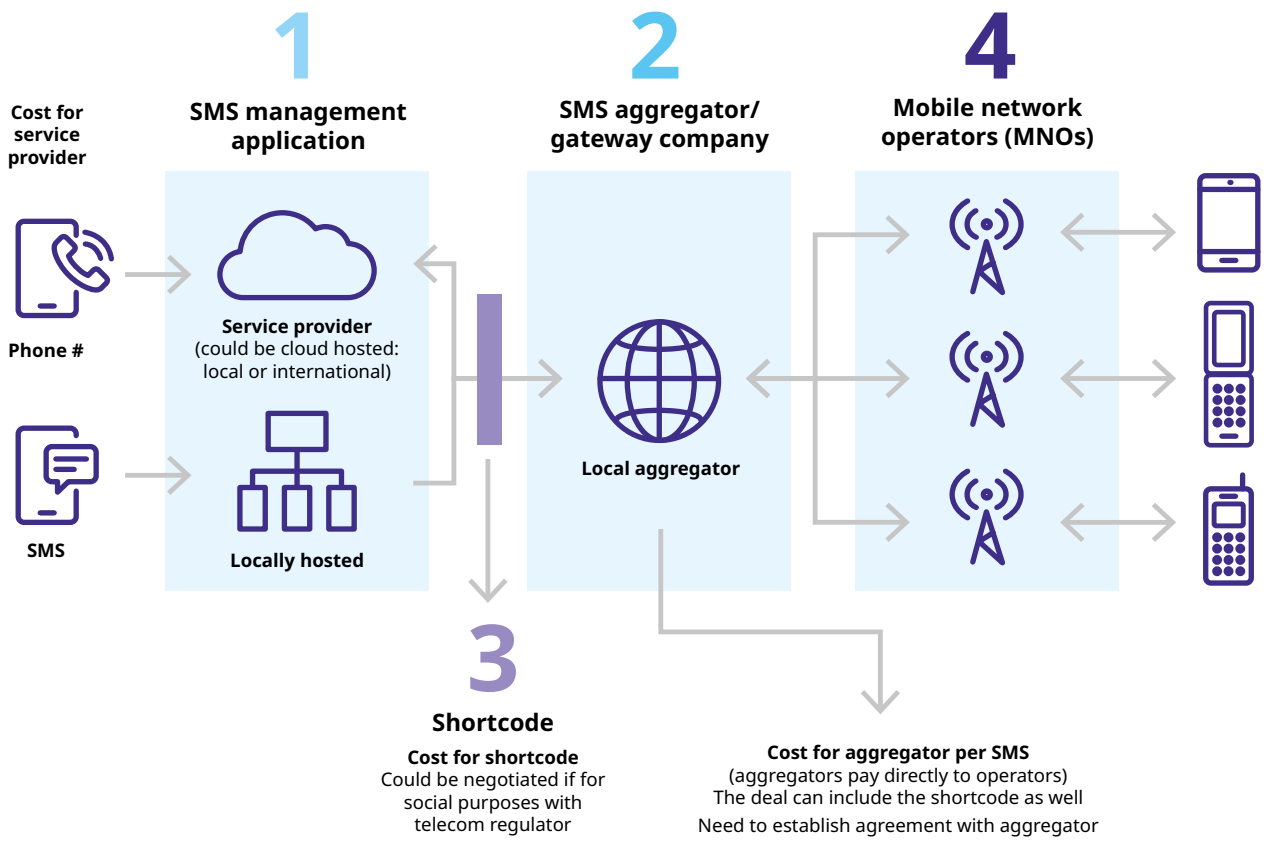
BHBM is here to help with this effort, and its ITU Secretariat members can accompany you in negotiations. Email **bhbm@who.int** for assistance.

ANNEX 10. TWO-WAY SMS SYSTEM WITH AGGREGATOR AND SHORT CODE

It is important to note that mobile communications network environments differ from country to country. The specificities of end user access to SMS, calls or mobile data (for stand-alone of messenger apps) should be considered in the planning stage. Network operators, telecoms companies or industry organizations can provide help in setting up the programme. **Figure. A10.1** The following figure is an example of a two-way SMS system with aggregator and short code.

FIG. A10.1.

TWO-WAY SMS SYSTEM WITH AGGREGATOR AND SHORT CODE



ANNEX 11. SUMMARY OF CORE INDICATORS (ACTIVITY, OUTCOME AND IMPACT) OF mACTIVE PROGRAMME

NO.	ACTIVITY INDICATOR NAME	BHBM INDICATOR TYPE	DATA COLLECTION METHOD	FREQUENCY OF COLLECTION	COMMENT FROM BE HEALTHY BE MOBILE TEAM
1	Number of content development or adaptation focus groups/user testing sessions	Core indicator	Review of reports submitted by operations team	Annually (if new content is produced after year 1)	The number of user testing sessions with different informants, e.g. focus groups with community members, health workers, specialist clinicians, academics. Format example as below **Informants** / **No. of groups** / **Total no. of informants** Academics and specialists / 1 / 6 Community members / 3 / 24 Health workers / 1 / 7
2	% of users who report satisfaction with the content they received	Core indicator	Records of user testing/ post-intervention survey (SMS or telephone)	User testing phase and post-programme	**These suggested indicators can be rated on a Likert scale 1–5, e.g.:** • ease of understanding the messages • easy to operationalize advice or instruction • content appropriateness • content relevance • programme length • likelihood that user will suggest programme to a friend.

NO.	ACTIVITY INDICATOR NAME	BHBM INDICATOR TYPE	DATA COLLECTION METHOD	FREQUENCY OF COLLECTION	COMMENT FROM BE HEALTHY BE MOBILE TEAM
3	Number of promotion campaigns and type	Core indicator	User-testing phase and post-programme	Monthly	**Marketing medium** / **Target population** / **No. of events** / **Reach (No. people)** Facebook advertisement / General population / 3 / 300 000 Radio advertisement / General population / 4 / Approx. 800 000
4	Number of messages delivered and rate of successful delivery of messages	Core indicator	Service analytics* and/ or message survey responses	Monthly	The numerator is the number of messages delivered and the denominator is the number of message attempts.
5	Number of total subscribed/ registered	Core indicator	Service analytics	Monthly	A number is requested.
6	% of target population registered	Core indicator	Service analytics and promotion analytics	Monthly	It may be helpful to report this as a % of the total number of people that your promotion campaigns were estimated to reach, to gauge its success. Or it could be expressed as a % of the target population who are able to access the programme (e.g. who have access to a phone and power source) if the number is known, e.g. ((total registered users/promotion reach) x100).
7	% messages sent from programme that are responded to appropriately by user	Core indicator	Survey / service analytics	Weekly	This indicator measures active engagement and indicates whether users are complying with instructions or messaging as directed.

NO.	ACTIVITY INDICATOR NAME	BHBM INDICATOR TYPE	DATA COLLECTION METHOD	FREQUENCY OF COLLECTION	COMMENT FROM BE HEALTHY BE MOBILE TEAM
8	% of users retained in the programme (User engagement at 1,2, 3 week)	Core indicator	Service analytics	At : - 1 week of programme - 2 week of programme - 3 week of programme	This can be captured by a representative telephone survey, a message survey or through analytics of STOP replies/opt outs. Depending on how you capture this data, the definition of retention will change and the denominator used in the % calculation will change (number surveyed vs. number enrolled in programme). % of users retained for: - 1 week of programme - 2 week of programme - at the end of the programme
9	% of users completing the mActive four-week programme	Core indicator	Service analytics	Annually	-
10	% of users finishing mActive two-week PLUS programme	Core indicator	Service analytics	Every six weeks	-
11	% of users meeting the self-identified goal of walking every week	Core indicator	Service analytics	Annually	-
12	% users with more active days per week/month after mActive four-week programme	Core indicator	Telephone surveys / message survey replies	Weekly/ monthly	-
13	% of surveyed users who report having improved knowledge on benefit of physical activity	Core indicator	Telephone surveys / message survey replies	Six-monthly	-

* Service analytics = routinely collected back-end data from a platform that can be provided by the service operator (e.g. telecoms provider, chatbot provider).

ANNEX 12. SUMMARY OF SUPPLEMENTARY INDICATORS (ACTIVITY, OUTCOME AND IMPACT) FOR mACTIVE PROGRAMME

The indicators highlighted in grey are the ones already listed in **Table 10**.

NO.	SUPPLEMENTARY INDICATOR NAME	INDICATOR TYPE ACCORDING TO RESULTS CHAIN MODEL OF MONITORING AND EVALUATION	DATA COLLECTION METHOD	FREQUENCY OF COLLECTION	COMMENT FROM BE HEALTHY BE MOBILE TEAM
1	Number of full-time equivalent persons working at **LEAD agency** on programme	Inputs	Review of terms of reference of involved employees or verbally from team lead	Annually	This gauges the human resources commitment from the leading implementation agency.
2	Number of full-time equivalent persons working at **SUPPORTING agencies** on programme	Inputs	Review of terms of reference of involved employees or verbally from team lead	Annually	This gauges the human resources commitment from supporting agencies such as WHO or ITU and their regional or country offices.
3	Existence/creation of national technical advisory group for mActive	Inputs	Review of official record or meeting record of the set up	Year 1, month 3	This records whether the team is functioning by month 3; review of composition of the national technical group and roles and responsibilities as recommended in mActive Handbook should be conducted; this records whether the team is functioning effectively.
4	Amount and duration of funding committed (in US$)	Inputs	Review of meeting records and financial statements	Annually	Where the funding is coming from, for how much and how long, will help to plan whether more funding is needed and plan accordingly.

NO.	SUPPLEMENTARY INDICATOR NAME	INDICATOR TYPE ACCORDING TO RESULTS CHAIN MODEL OF MONITORING AND EVALUATION	DATA COLLECTION METHOD	FREQUENCY OF COLLECTION	COMMENT FROM BE HEALTHY BE MOBILE TEAM
5	Number of fundraising activities for sustainability	Activity	Review of reports submitted by operations team	Annually	Suggest thinking about sustainability from the outset and nurturing funding relationships throughout.
Indicators related to programme content					
6	Needs assessment conducted	Activity	Review of need assessment report	Beginning of the programme (within first three months)	This will identify what are the current situations on technology, coverage of mobile network, existing operators in-country and use of mHealth in-country. What are the other mHealth programmes operating in the country and how to integrate mActive in them.
7	Number of consultations or meetings conducted for programme content	Activity	Review of reports submitted by operations team	Year 1 end	–
8	Existence of programme design specifications	Inputs		End 2nd quarter	Whether programme design specifications have been set, e.g. verifying the aims, adapting the logic model if necessary, designing the length of programme and its rules.
9	Number of new messages developed/ new app content or features	Output (as you use inputs and activities to arrive to these new messages/apps)	Desk review – comparison of generic message bank and new messages added	Annually	Numeric if messages, description if app; please send any new content to BHBM Secretariat (**bhbm@who.int**).
10	Messages adapted	Output	Yes/No	End 2nd quarter	This may be relevant only to year 1.

NO.	SUPPLEMENTARY INDICATOR NAME	INDICATOR TYPE ACCORDING TO RESULTS CHAIN MODEL OF MONITORING AND EVALUATION	DATA COLLECTION METHOD	FREQUENCY OF COLLECTION	COMMENT FROM BE HEALTHY BE MOBILE TEAM
11	Verification of fidelity of messages using COM-B constructs (COM-B constructs - capacity, opportunity, motivation)	Activity	Using questionnaire measuring COM-B	End 2nd quarter	This may be relevant only to year 1.
12	Content management system set up and/or maintained	Output	Review of reports submitted by operations team (this could be the annex of the report)	Annually	The content management system may be as simple as an Excel spreadsheet or Word document (passed on to telecoms companies or bot providers), or as advanced as an in-house software solution with interoperable programming language; what is important is whether the system exists and is maintained.
Indicators related to promotion					
13	Promotion strategy compiled	Output	Review of meeting and activity reports	Annually	A promotion strategy is a plan laying out the promotion activities that will be completed and when.
14	Number of users who were made aware of the mActive intervention by a given marketing channel	Output	Survey through message channel or telephone survey	Annually	How did you hear about the programme?

NO.	SUPPLEMENTARY INDICATOR NAME	INDICATOR TYPE ACCORDING TO RESULTS CHAIN MODEL OF MONITORING AND EVALUATION	DATA COLLECTION METHOD	FREQUENCY OF COLLECTION	COMMENT FROM BE HEALTHY BE MOBILE TEAM
15	% target audience with campaign reach	Output	Record of number of people visiting promotional activities OR review of traffic data generated by the website	Monthly	–
16	User satisfaction with promotion campaign	Output	Survey	Annually	User satisfaction questions could include: Were the promotion materials easy to understand? Were they appropriate for you and your community? Were you able to sign up with the information provided by the promotion campaign?
17	% of surveyed health-care workers who know about (or use) the programme	Output	Survey of health-care workers	Annually	–
18	Number of health-care workers trained for mActive (if integrated in primary health care)	Output	Review of reports submitted by operations team	Annually	–
19	% of surveyed health-care workers who encourage their patients to use the programme	Output	Survey of health-care workers	Six-monthly	This indicator attempts to understand the health-care worker's programme engagement.

NO.	SUPPLEMENTARY INDICATOR NAME	INDICATOR TYPE ACCORDING TO RESULTS CHAIN MODEL OF MONITORING AND EVALUATION	DATA COLLECTION METHOD	FREQUENCY OF COLLECTION	COMMENT FROM BE HEALTHY BE MOBILE TEAM
Indicators related to functionality and technology performance					
20	Functioning dashboard	Input	Yes/No	Annually	
21	Ease of sign-up	Output	Message or telephone survey responses	User testing and 1st quarter	Survey question: was it easy to subscribe on a scale of 1–5? Any barriers to sign up may have a serious effect on number of subscribers; the process should be clear, easy and not too burdensome; this indicator can check this – if users say it was not easy, you may need to revisit the design of your sign-up procedure.
22	Number of system errors	Output	Service analytics* and/ or message or telephone survey responses	Quarterly	An error in the operating system that may or may not impact the delivery of content.
23	Number of days/weeks of system down time	Output	Service analytics	Monthly	This records any amount of time that content did not reach users owing to a system error.

NO.	SUPPLEMENTARY INDICATOR NAME	INDICATOR TYPE ACCORDING TO RESULTS CHAIN MODEL OF MONITORING AND EVALUATION	DATA COLLECTION METHOD	FREQUENCY OF COLLECTION	COMMENT FROM BE HEALTHY BE MOBILE TEAM
24	Number of software bugs reported and fixed (for apps)	Output	Service analytics	Monthly	
Indicators related to reach and retention					
25	Number of total subscribed/registered	Output	Service analytics	Monthly	A number is requested.
26	% of target population registered	Output	Service analytics and promotion analytics	6-monthly	It may be helpful to report this as a % of the total number of people that your promotion campaigns were estimated to reach, to gauge its success; or it could be expressed as a % of the target population who are able to access the programme (e.g. who have access to a phone and power source) if the number is known, e.g. ((total registered users/promotion reach) x100).
27	Number of new subscribers per month	Output	Service analytics	Monthly	This helps to see whether appetite for the programme is maintained and can help you to work out whether promotion strategies are achieving the aim of recruitment.
28	Demographic information about users	Output	Telephone surveys / message survey replies	Quarterly	This can help you to assess what groups are accessing and which target user groups may not be equitably accessing the programme.

NO.	SUPPLEMENTARY INDICATOR NAME	INDICATOR TYPE ACCORDING TO RESULTS CHAIN MODEL OF MONITORING AND EVALUATION	DATA COLLECTION METHOD	FREQUENCY OF COLLECTION	COMMENT FROM BE HEALTHY BE MOBILE TEAM
29	Number of messages/ inputs received from users	Output	Service analytics	Quarterly	For two-way messages, on average, how many responses were received from participants? This could be reported as a %, with the total number of prompts for reply as the denominator for the % calculation ((replies/no. of prompts)x100).
30	% of messages sent from programme that are responded appropriately by user	Output	Service analytics	6-monthly	This indicator measures active engagement and indicates whether users are complying with instructions or messaging as directed.
Indicators related to behaviour change					
31	% of surveyed users meeting mActive goals of walking 150mins per week	Outcome	Service analytics	Annually	
32	% of surveyed users that subscribed to mActive walking programme more than once	Outcome	Service analytics or current and old data	Annually	

* Service analytics = routinely collected back-end data from a platform that can be provided by the service operator (e.g. telecoms provider, chatbot provider).

ANNEX 13. POTENTIAL RESEARCH DESIGNS FOR EVALUATION OF mACTIVE PROGRAMMES

Two potential research designs to measure the effectiveness and impact of a mActive programme are outlined in this annex for further consideration for assessing the impact. This is not an exhaustive list of possible evaluation designs. For more information, see part 4a of this comprehensive digital health monitoring and evaluation guidance.[1]

In some cases, monitoring and evaluation may require a review and clearance by an ethical review committee, but it is important to check specific country's laws and regulations. The government or agency responsible may identify the need to secure any necessary ethics approval for the process. This may be from national or local ethics committees, or from other stakeholder institutions with formal ethics approval systems.

Prospective cohort studies

This is where a study population is split into groups: for example, a group who did not receive messages (the intervention group) and a group that did not. A survey or other measurement is taken among both groups before (the baseline measure) and after the programme is completed by the intervention group, then the results from both groups are compared. The two groups can be matched on specific characteristics that may have an effect on the outcomes being measured, for example, recruiting persons in the same age range or those who are non-smokers, in order to reduce biasing factors. This is called cohort study matching. This leads to more accurate interpretation of cause and effect (i.e. that it is really the programme that gives rise to differences between the groups).

Randomized controlled trials

In this design, participants are placed randomly into groups (e.g. programme and non-programme) and measures are taken before and after the programme. The random group allocation should mean, if the population is large enough, that biasing characteristics of the participants should be equally present in both groups, Also, elements of the study are controlled, e.g. participant selection characteristics, for example only participants who do not take medicines for cardiovascular diseases. This way, the differences measured pre-programme and post-programme are more likely to be attributable to the programme and not to other factors. This type of trial is, however, very expensive to run and is sometimes not ecologically valid to the reality of running scale programmes.

1. Monitoring and evaluating digital health interventions: a practical guide to conducting research and assessment. Geneva: World Health Organization 2016 (https://www.who.int/reproductivehealth/publications/mhealth/digital-health-interventions/en/, accessed 7 April 2021).

World Health Organization
20 Avenue Appia
1211 Genève 27
Switzerland

International Telecommunication Union
Place des Nations
CH-1211 Geneva 20
Switzerland

website: www.who.int/initiatives/behealthy
e-mail: bhbm@who.in
e-mail: mHealth@itu.int