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Tailoring malaria control interventions to suit local context: codesign of perennial malaria chemoprevention (PMC) programmes through the Plus Project

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ABSTRACT

With global malaria cases on the rise, the WHO has placed increased emphasis on National Malaria Programmes to tailor interventions to country and programmatic needs. This paper presents the Plus Project's experience of applying a codesign approach to design country-specific models of perennial malaria chemoprevention (PMC), a chemoprevention intervention aimed at reducing morbidity and mortality due to malaria and anaemia in children. Codesign workshops were held in each of the project's focus countries (Benin, Cameroon, Côte d'Ivoire and Mozambique) with the primary objective of designing the country-specific PMC model. The three-and-a-half-day workshops were adapted to each country's context and included stakeholders from national and subnational malaria, immunisation and child health programmes, as well as national and international development partners and research institutions. The meetings were iterative and collaborative, harnessing a variety of participatory methods including journey mapping and surveys to reach group consensus on the PMC models best suited to each country's specific context. The Plus Project's codesign approach resulted in four different PMC strategies, with a range from four to eight contact points and different codelivery interventions, each taking advantage of country-specific health system delivery platforms, operational logistics and political contexts. This collaborative, codesign process also helped gather additional programmatic insights to aid PMC implementation while providing an opportunity to increase stakeholder buy-in. With an emphasis on collaborative decision-making, the learnings collected through these workshops can be applied to a variety of programmatic applications, extending beyond malaria.

SUMMARY BOX

⇒ Codesign, also known as cocreation, processes are currently used in a variety of contexts; however, there is a knowledge gap in how the experiences and lessons learnt from these approaches are applied in malaria and other infectious disease programming.
⇒ This paper reports on using codesign as an iterative approach to develop country-specific schedules for perennial malaria chemoprevention (PMC) administration in four countries during the Plus Project, detailing the importance of tailoring WHO guidance to suit country needs through the use of participatory methods and diverse stakeholder engagement.
⇒ Research and implementation actors are encouraged to use this codesign approach to promote a more inclusive and participatory process in designing new health interventions.
⇒ Using a codesign model and accepting country variations and preferences resulted in country-specific PMC models for our project.

INTRODUCTION

Perennial malaria chemoprevention (PMC), previously called Intermittent Preventive Treatment in infants (IPTi), is a safe, effective and cost-effective chemopreventive method recommended for settings with year-round (perennial) high and moderate transmission aimed at reducing clinical cases of malaria and severe anaemia.[1] Initially, sulfadoxine-pyrimethamine (SP) was recommended for children under 1 year at three specific time points corresponding with specific routine immunisations (DPT2, DTP3 and measles at approximately 2, 3 and 9 months of age, respectively) noting clear cut-offs of genotypic markers for parasite SP drug resistance for when to use SP IPTi. Despite the cost-effectiveness of IPTi, the intervention was only adopted in one country, Sierra Leone,

following a successful pilot programme in 2017 and 2018, demonstrating safety and efficacy.[2 3] In response to new considerations on the likely effectiveness of SP IPTi in the context of SP resistant genotypes and the success of Seasonal Malaria Chemoprevention that uses SP,[3] the WHO updated its recommendation from IPTi to PMC in 2022, and provided countries with the flexibility to tailor PMC strategies to their local context by removing the restriction on the number and timing of PMC doses and no longer limiting the intervention to infants.[4] The new guidance expanded opportunities to identify new contacts (the point at which the drug is given to a child) using delivery channels in addition to the existing Expanded Programme on Immunisation (EPI) channel, promoting increased coverage of the intervention.[4]

Funded by Unitaid, the Plus Project seeks to reduce morbidity and mortality from malaria and anaemia in children under 2 years of age by supporting project countries to codesign, pilot and evaluate PMC strategies.[5] Since 2021, the project has supported the design, implementation and evaluation of PMC pilot implementation in Benin, Cameroon, Côte d'Ivoire and Mozambique in 25 districts. These implementation sites were selected based on their high malaria transmission rates, burden of disease among the target population and capacity of the local health system to support the implementation and evaluation of PMC.[6] Codesign workshops were held in Benin (Nov 2021), Cameroon (Oct 2021) and Côte d'Ivoire (Dec 2021), to convene key stakeholders to collaboratively design a PMC model tailored to their country's context. Mozambique's workshop followed in June 2022. The Plus Project used a participatory approach in these workshops, leveraging collective expertise from community, government and national stakeholders to reach consensus on a PMC model.

Codesign approaches have been used in recent years as a way to develop, strengthen and/or adapt public health interventions to better suit local contexts. Defined as a collective process aimed to better align research and implementation activities with end-user need, projects developed using a codesign approach have benefited from greater project buy-in and visibility from key stakeholders as well as early insights into implementation barriers and potential solutions.[7–9] Additional benefits of this approach include the development of culturally adapted and accepted tools (eg, monitoring and evaluation (M&E) forms and processes) as well as the empowerment of codesign participants. This empowerment is achieved through participatory workshops, training sessions and feedback mechanisms, ensuring the developed tools and strategies are practical and culturally relevant.[10–12]

This paper aims to contribute to the understanding and implementation of PMC by detailing the collaborative codesign process undertaken by the Plus Project with country governments and key stakeholders. By tailoring a country-specific PMC model through this participatory approach, the project not only seeks to optimise PMC delivery alongside routine vaccinations and vitamin A supplementation, but also aims to generate transferable insights for similar health interventions. The lessons learnt from our codesign efforts under the Plus Project are intended to inform and inspire future adaptations of PMC and other health programmes across different contexts.

WORKSHOP OBJECTIVES

The codesign process aimed to enable National Malaria Programme (NMP), EPI and other key stakeholders within the malaria ecosystem to understand, design and agree on a country-specific model of PMC (see section Overview of workshop agenda for additional description). At the time of project initiation, the previous WHO recommendation for IPTi (three doses of SP given at the same time as existing routine vaccines to a child under 1 year old) was in effect.[13] The approved donor-funded project wished to expand on IPTi, but within established boundaries which included (1) countries needed to design models with more than three contacts (if countries were only interested in the three existing IPTi contacts, then the support of this project was not needed), (2) the PMC model could target children up to 2 years old and (3) SP would be the intervention drug. Additionally, contacts could be facility-based or community-based and could use any identified contact point between the child and the country's healthcare system. Home-based delivery without the support of a community health worker (CHW) (ie, without the medicine being directly observed as taken) was not eligible.

In each case, the workshop participants were able to develop a country-adapted PMC model. The formal review and approval process of the PMC designs post-workshop varied by country, but the main workshop objective was achieved in each country.

Each country's codesign workshop varied in its agenda, participants, objectives and outcomes, with the workshop in Mozambique showing the greatest differences from the others. It was the only workshop which was held after the updated 2022 WHO recommendations on chemoprevention and as the fourth workshop, it benefited from the prior experiences in terms of adaptations and modifications to the sessions, flow and participants types. In Mozambique, there was also an added objective of using the codesign workshop to design a PMC model that would be the country's overall PMC model, such that if additional funding were acquired the country model could be used in geographic areas beyond the scope of the Plus Project. Another difference in Mozambique was that the workshop was chaired by the NMP Director, while the other workshops were chaired by

project team members or a committee of country stakeholders.

DEVELOPING A CODESIGN APPROACH

Developing country-specific tools

To prepare for the workshop, project team members reviewed internal resources relating to participatory workshop methods and had informational discussions with professionals in public health who have used these approaches in their work. This information was used to design workshop tools, such as objectives, agendas and facilitation guides. The agenda was shared with the host NMP for review and revisions before the workshop. A basic stakeholder mapping exercise using a provided template was completed during the planning process by the country lead and their team and reviewed by the NMP. This activity aimed to assist country teams in identifying a diverse range of stakeholders to invite, ensuring representation from various relevant institutions.

Collecting background information

To set the stage for the development of the PMC models, representatives of the NMP and EPI prepared presentations on the current malaria and routine vaccination situation, providing relevant information such as malaria incidence and vaccine coverage . Depending on the context, other Ministry of Health (MoH) departments presented and included presentations from community health, family health and supply chain teams. These introductory presentations were part of all four codesign workshops and ensured that all participants had a baseline of knowledge about the malaria epidemiology, routine vaccination programme and coverage, and other relevant information. In addition, all workshops included a presentation of the results of the PMC dynamical modelling work completed by Swiss Tropical and Public Health Institute in 2021, to demonstrate the mechanism of PMC in different scenarios including the number of PMC contacts, PMC coverage and use of PMC in areas of differing malaria incidence.

Identifying workshop participants

The selection of participants aimed to include a broad range of relevant experience and included representatives from the MoH, local and international research and academic institutions, country donors, healthcare providers and representation from non-governmental organisations and civil society organisations (CSOs). Participants from the MoH made up a large proportion of participants and came from several departments acknowledging the coordination needed for PMC. Plus Project country leads from other focus countries were invited to attend and learn from the codesign process, which facilitated translation of learnings from one workshop to the next. An overview of workshop participants by country is presented in table 1.

PROCESS OF COUNTRY-LED CODESIGN

Overview of workshop agenda

The project team designed the workshop agenda to be participatory and engaging, following a logical flow and emphasising small group work to encourage full participation and discussion in the decision-making process. To maximise the utility of this participatory and diverse format, it was considered essential for the workshop to be held in person. Immediately prior to the workshop, a 2-day in-person meeting with a smaller group of facilitators was held with the following objectives: (1) review the agenda and adapt it to the country context, (2) practice participatory activities, like the situational analysis presentations by MoH and (3) adjust the strategy for workshop management, for example, by designating a Presidium.

Although the three-and-a-half-day agenda was fully developed at the start of each workshop, a small facilitation team met daily to review the agenda. Typically, the workshops went from 8:00 to 16:00 hours with breaks. Session lengths varied based on objectives, content and format, but averaged 1 hour each. Each day ended with a short online evaluation. Variances in the agenda between countries allowed for customisation of each workshop (e.g., including a summary at the start of the day). Following is an example agenda for Côte d'Ivoire, figure 1 for additional details.

- Day 1 introduced PMC, provided background on malaria and EPI in each country and presented the Plus Project and the Journey Mapping exercise (called 'Parcours de Vie' in francophone workshops). (See Section Description of participatory methods for additional description).
- Day 2 shared additional background, including details on planned evaluations under the Plus Project, and significant time was used for small group work on the Journey Maps and model design process.
- Day 3 finalised the proposed PMC model through group alignment sessions, with a focus on reviewing existing data collection tools (eg, EPI register) and how they could be adapted to capture PMC data.
- Day 4 focused on integrating the proposed PMC model into existing training and supervision activities, using participants' professional and personal experiences.

Description of participatory methods

The workshop was designed to limit the number of presentations in order to provide only the most relevant, contextual information to participants. Participants spent their time in small groups where they were able to share their ideas and opinions. A key small group exercise during the workshop included the Journey Mapping exercise (figure 2A,B). This exercise was used to help participants visually map out key interactions between children under 2 and the health system. This process facilitated the design and selection of country-specific models of PMC by

Table 1 Stakeholders engaged in PMC codesign workshops in Benin, Cameroon, Côte d'Ivoire and Mozambique

Country	Benin	Cameroon	Côte d'Ivoire	Mozambique
National	► Beninese Paediatric Society* ► Expanded Programme on Immunisation (PEV)* ► Information Systems Department (DSI)* ► National Agency for Primary Health Care (ANSSP)* ► National Council for the Fight against HIV/AIDS, Tuberculosis, Malaria, Hepatitis, Sexually Transmitted Infections and Epidemics (CNLS-TP)* ► National Public Health Directorate (DNSP)* ► National Malaria Control Programme (PNLP)* ► SIDACTION~	► Cameroon Association for Social Marketing+ ► Cameroon National Institute of Statistics (INS)* ► Cameroon Paediatric Society (SOCAPED) ► Department of Disease Control, Epidemics and Pandemics (DLMEP)* ► Expanded Programme on Immunisation (PEV)* ► Impact Santé Afrique+ ► National Malaria Control Programme (PNLP)* ► National programme to combat maternal, newborn and child mortality (PLMI)* ► Deputy Direction for prevention and community action*	► Expanded Programme on Immunisation (PEV)* ► Information Technology and Health Information Department (DIIS)* ► National Malaria Control Programme (PNLP)* ► National Mother and Child Health Programme (PNSME)* ► New Public Health Pharmacy (NPSP)* ► Pharmaceutical Activities Department* ► Population Services International Côte d'Ivoire (PSI CI) + ► Scientific Support Group (GSA)*	► Extended Vaccination Programme* ► Manhiça Health Research Centre (CISM)^ ► Medicines and Medical Supplies Centre* ► Medicines Regulatory Authority* ► National APE Programme* ► National Health Institute (INS)* ► National Malaria Control Programme* ► Nutrition Programme* ► Population Services International Mocambique (PSI Mocambique)+ ► Public Health Programme* ► Women's and Children's Health Programme*
Subnational	► Community health workers* ► Health district representatives*	► Obala health district* ► Djoungolo health district*	► Bouafle health district*	► Extended Vaccination Programme* ► Sofala Provincial Health Directorate*
International	► UNICEF~ ► WHO~	► London School of Hygiene and Tropical Medicine (LSHTM)^ ► Plan International+ ► PNLP Benin Minsante* ► Population Services International Global+ ► US President's Malaria Initiative~	► Population Services International Global+ ► Save the Children+ ► The global fund CCM+ ► WHO~	► Barcelona Institute for Global Health (ISGlobal)^ ► LSHTM^ ► PSI regional team + ► US President's Malaria Initiative~ ► UNICEF~ ► WHO~

Ministry of health, *; development partners, +; research institutions, ^^; civil society, ~
Ministry of health, *; development partners, +; research institutions, ^; civil society, ~

identifying points of contact for codelivery with other interventions for the age group, including routine vaccinations and vitamin A.

The concept of this exercise was first introduced by the facilitation team in plenary, and then used in small break-out groups over several sessions. Each small group was purposely composed to include a diverse representation of stakeholders present at the workshop to ensure different perspectives were present for each discussion. In the first session, the small groups identified all possible contacts between children under 2 years old and the health system in an open brainstorm session. Participants returned to their same small groups in the following session

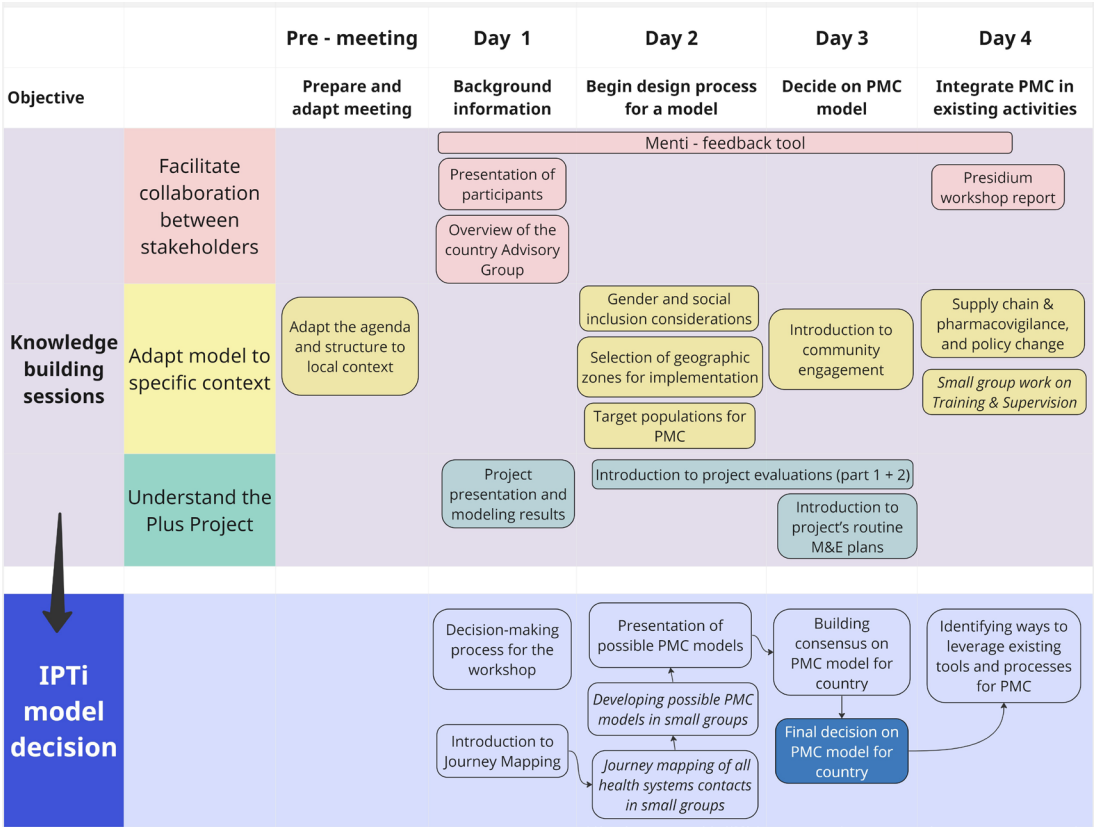
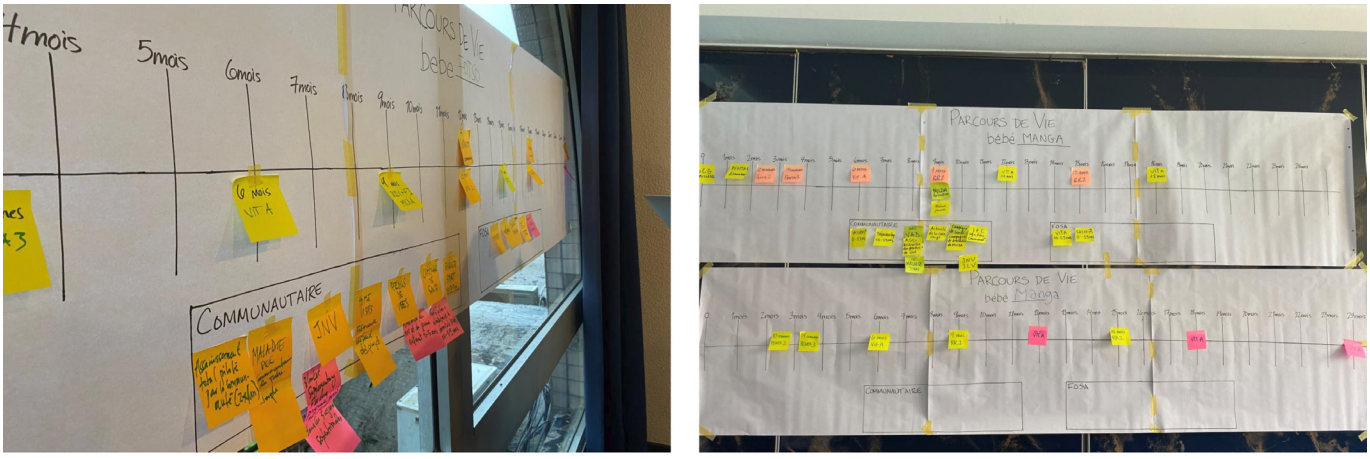


Figure 1 Example flow chart of workshop activities from Côte d'Ivoire. IPTi, Intermittent Preventive Treatment in infants; M&E, monitoring and evaluation; PMC, perennial malaria chemoprevention.

to protype possible models of PMC and describe the benefits and challenges of each selected possible contact. Each group presented their respective model to the full group. Models defined the contacts PMC would use to integrate the health system, selecting the existing interventions (specific vaccinations, vitamin A) that PMC would be codelivered with, the number of doses, and the delivery channels. After discussions, consensus was built leading to the final selection of the country-specific PMC model.

Small group work was also used in other sessions to elaborate on country-specific theories of change



A B

Figure 2 (A) Journey mapping exercise during the Cameroon codesign in October 2021. Parcours de Vie refers to the life journey of a child, in this case baby Fotso, where all the potential points of contact with the health facility are added with sticky notes. (B) Journey mapping exercise during the Benin codesign in November 2021, showing baby names used to bring playfulness and realism to the activity. Parcours de Vie refers to the life journey of a child; in this exercise, it was used to show all the potential points of contact of a baby with the health facility.

(except in Mozambique where it was not included in the agenda) and to discuss the existing systems and tools which could be leveraged for integration of PMC. Topics discussed included M&E, training and supervision, supply chain and pharmacovigilance. Discussion sessions were built into the agenda and participant feedback was encouraged throughout.

Workshop evaluation

The free version of Mentimeter (2022) was used at the end of each day to provide a mechanism for constructive feedback from participants and get suggestions for improvements to be incorporated for the following day. During these polls, participants were asked a series of multiple choice and Likert-scale questions on workshop satisfaction and session preference as well as open-ended questions on workshop improvements (online supplemental file 1).

WORKSHOP OUTCOMES

Each workshop was able to achieve the primary objective of designing one PMC model that included the number, timing and delivery channel of doses. In Benin and Côte d'Ivoire workshops, the geography of where PMC was to be implemented was an additional objective. After the workshop, next steps to validate the proposed PMC schedule were guided by each country's normal process used when approving a new pilot intervention; in each case, the proposed PMC schedule from the workshop was confirmed as the one to be implemented without changes.

The four country models, presented in figure 3, varied in number of doses, proposed codelivery interventions and delivery models. Only Cameroon decided that CHWs could serve as a delivery channel giving SP directly to children once a child reaches 6 months of age. Although this delivery channel was discussed in other countries, the existing policy environment did not allow for CHW delivery of SP and was therefore not proposed as part of their final PMC models. These PMC models were the first PMC schedules for all countries, except for Cameroon, which already had a five-dose PMC programme; the outcome of the workshop expanded on it to include three additional contact points.

REFLECTIONS

The codesign approach was employed to develop PMC schedules across all countries; however, this paper does not formally assess the impact of codesign compared with traditional top-down methods. However, the PMC schedules implemented are being evaluated for their cost-effectiveness at reducing malaria cases and severe anaemia, as well as acceptability and feasibility. Insights into the codesign process and its outcomes were gathered through reflections on the experience of implementing multiple codesigns in a short period, with a deliberate focus on continuous improvement.

What worked well

The codesign workshops enabled each country to successfully develop a PMC schedule tailored to its specific context. Since then, the models have been implemented in all four focus countries. The results from participant satisfaction surveys showed that participants felt overall positively about the workshop. In Cameroon, the rate of satisfaction with the workshop was high, with the percentage of participants responding either 'very good' or 'excellent', ranging between 82% and 93% on the surveys which were distributed at the end of the 4 days. The most popular words to describe the workshop Cameroon were 'dynamic', 'participative', 'innovative', 'productive' and 'motivating'. Other countries reported similar satisfaction rates: Côte d'Ivoire (76.9%–89%), Benin (76.5%–94%) and Mozambique (87.5%–100%).

These achievements can be attributed to several factors. A key element was the range of stakeholders present in each country who were the decision-makers throughout the process. They agreed on a country-led model for PMC developed in and for their context. Aside from the initial donor-imposed limitations (more than three doses, no self/home-based delivery, use of SP only), the project team members attending the workshops refrained from imposing influence, allowing for organic discussions and country-owned decisions. Another success factor was the absence of a predetermined PMC model, allowing genuine openness to outcomes.

Moreover, the workshop departed from the traditional presentation-based workshop format, opting instead for a participatory focused and interactive model. This change engaged and captivated participants, fostering a more dynamic and collaborative learning environment, which was shown through the mentimeter workshop results. Holding the codesign workshops in person in hotel meeting rooms outside of the capital cities further facilitated full participant engagement by minimising distractions from competing work activities and obligations (in Cameroon, it was in Douala; in Benin, it was Porto Novo; in Côte d'Ivoire, it was in Yamoussoukro; in Mozambique, it was in Macaneta).

Premeetings with country teams and workshop agenda adaptations further contributed to success. This flexibility allowed tailoring of content, timing and session order to country-specific contexts and previous workshop experiences.

Further, the presence of a diverse project facilitation team, including consistent regional technical leadership and cross-country learning, provided a comprehensive support network that facilitated the iterative learning approach and contributed to the overall success of the workshop. These factors collectively ensured that the codesign approach for the PMC public health intervention workshop was effective and well-received by participants.

Finally, the Plus Project supported the launch of Advisory and/or Technical Working Groups in each country, which meet routinely to review PMC implementation

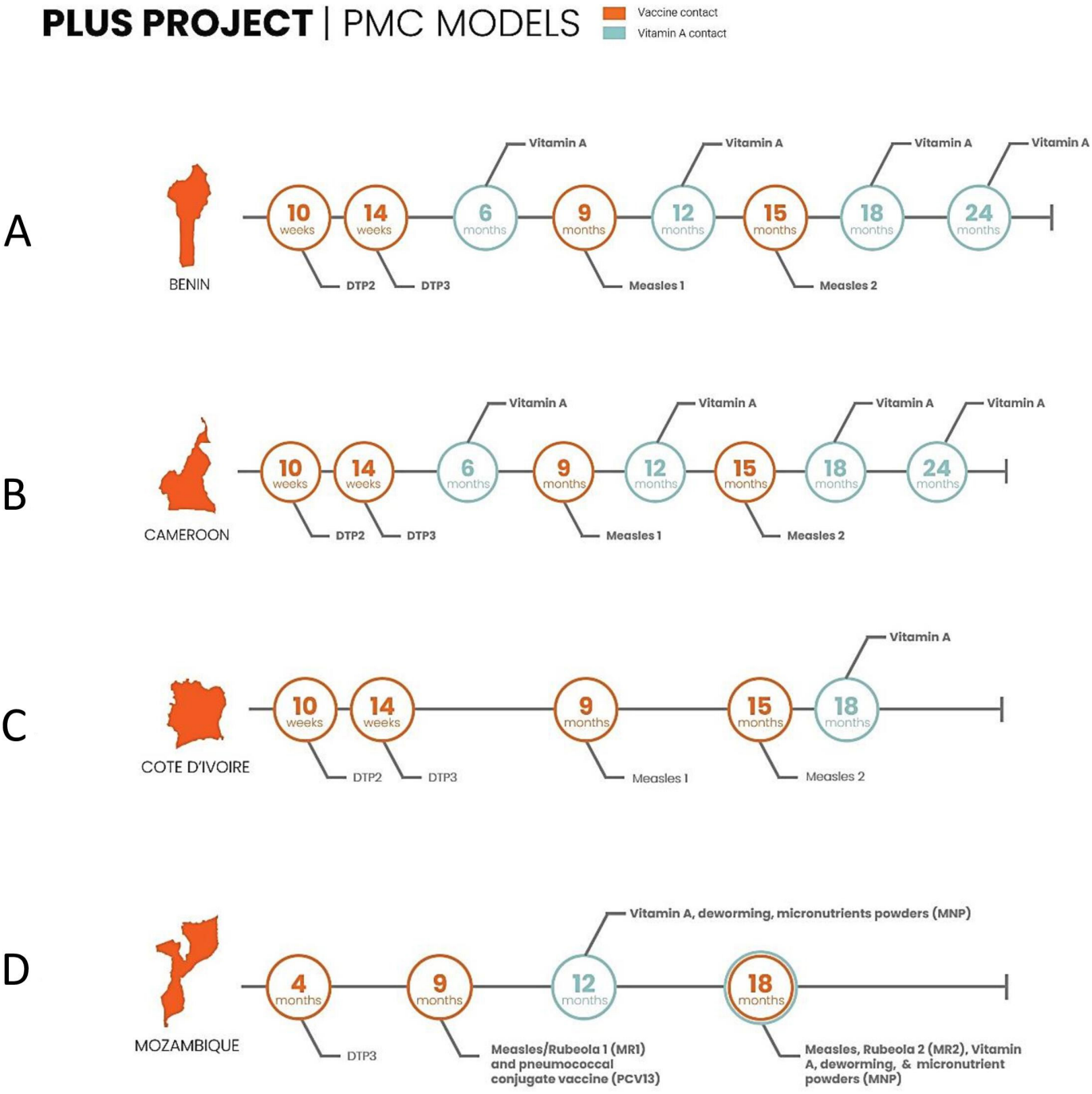


Figure 3 PMC delivery models in Benin, Cameroon, Cote d'Ivoire and Mozambique.

progress. This approach has led to adjustments based on implementation learnings, such as improved outreach and awareness initiatives. Specific adaptations in response to challenges include addressing vitamin A stock-outs by working with UNICEF in Benin and expanding PMC to additional districts and adding a fifth contact to the PMC schedule in Mozambique.

What can be improved

Some participants from the subnational level of MoH staff provided valuable insights and were empowered to speak candidly about the feasibility and risks of the models in their catchment areas. However, a key challenge was the limited participation of CSOs and CHWs. Proportionally, they were a small part of those invited, and existing dynamics around power with their superiors at times present in the same room likely reduced engagement, particularly in plenary sessions. To address this, small group work was prioritised to ensure space for their input. While facilitators, chosen by the NMP, were selected to engage participants, they did not always promote inclusive participation effectively. Caregivers and parents, crucial for ensuring intervention success, were also absent. Purposeful representation and dedicated time for CSOs, CHWs and caregivers are essential, as they are closest to

implementation but often excluded from national-level workshops.

Another area of improvement would be stronger and more equal engagement of the EPI or other relevant departments (such as the Family Health Department in Mozambique) in relation to the NMP. In Benin and Côte d'Ivoire, the level of seniority for participating staff from the NMP was higher than from the EPI. A codesign approach aims to build consensus around decision making. That is sometimes challenging given the heterogeneity of participants and their backgrounds. Making consensus in that regard requires diplomacy skills and trade-offs.

Overall, the internal validity of codesign workshop outcomes may be affected by selection bias, where participant demographics and perspectives may not fully represent those of all stakeholders in the field for a specific country. Additionally, challenges such as participant maturation over the course of the workshop and the influence of testing effects during the codesign process may have impacted the consistency and reliability of the project outcomes, although these effects would be minimal due to the short timeline of the workshop. Externally, the generalisability of workshop findings to different contexts may be limited by geography and local settings, in which the relevance of these workshop outcomes may diminish over time as public health priorities and guidelines evolve.

CONCLUSIONS

The codesign process, used by the Plus Project, serves as a conduit for tapping into the expertise of community and subnational participants, whose valuable but often underutilised perspectives and experiences significantly inform the successful design of PMC initiatives. This subnationally contextualised knowledge will only become increasingly important in dec ision making, as global health challenges continue to grow in complexity and there is a need to tailor interventions to more localised solutions. In conclusion, codesign lays a solid foundation for collaboration and improved health outcomes by bringing stakeholders together and harnessing their experience and expertise. This approach holds promise for promoting inclusivity, innovation and effectiveness in the development and implementation of similar programmes and interventions for introducing new health interventions.

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REFERENCES

1 World Health Organization. New WHO recommendations for perennial malaria chemoprevention in young children (PMC). 2022. Available: https://www.who.int/multi-media/details/new-who-recommendations-for-perennial-malaria-chemoprevention-in-young-children
2 Conteh L, Sicuri E, Manzi F, *et al*. The cost-effectiveness of intermittent preventive treatment for malaria in infants in Sub-Saharan Africa. *PLoS ONE* 2010;5:e10313.
3 Esu EB, Oringanje C, Meremikwu MM. Intermittent preventive treatment for malaria in infants. *Cochrane Database Syst Rev* 2019;12:CD011525.
4 World Health Organization. WHO guidelines for malaria. 2023. Available: https://www.who.int/publications/i/item/guidelines-for-malaria
5 Unitaid. A new initiative will deliver enhanced malaria prevention to children under two across africa through a WHO-recommended but under-implemented intervention. 2021. Available: https://unitaid.org/news-blog/ipti-enhanced-malaria-prevention-for-children/#en

6 Population Services International (PSI). PMC supportive supervision overview. PSI: the plus project. 2023. Available: https://www.psi.org/plusproject-posts/pmc-supportive-supervision-overview
7 Slattery P, Saeri AK, Bragge P. Research co-design in health: a rapid overview of reviews. *Health Res Policy Sys* 2020;18.
8 Sanders EB-N, Stappers PJ. Co-creation and the new landscapes of design. *CoDesign* 2008;4:5–18.
9 Murtagh MJ, Minion JT, Turner A, *et al*. The ECOUTER methodology for stakeholder engagement in translational research. *BMC Med Ethics* 2017;18:24.
10 Ospina-Pinillos L, Davenport T, Mendoza Diaz A, *et al*. Using participatory design methodologies to co-design and culturally adapt the spanish version of the mental health eclinic (preprint. *J Med Internet Res* e37679 [Preprint] 2019.
11 Qasim R, Farooqui WA, Rahman A, *et al*. Community centred co-design methodology for designing and implementing socio-behavioural interventions to counter COVID-19 related misinformation among marginalized population living in the squatter settlements of Karachi, Pakistan: a methodology paper. *BMC Proc* 2023;17:15.
12 Timothy A, Coetzee D, Morgan C, *et al*. Using an adaptive, codesign approach to strengthen clinic-level immunisation services in Khayelitsha, Western Cape Province, South Africa. *BMJ Glob Health* 2021;6:e004004.
13 *WHO guidelines for malaria, 16 October 2023. (WHO/UCN/GMP/2023.01 Rev.1)*. Geneva: World Health Organization, 2023.