Microplanning:

Evidence on pro-equity interventions to improve immunization coverage for zero-dose children and missed communities

*Part of a series, this evidence brief presents results from a **rapid review** of the literature to understand the effectiveness of and implementation considerations for selected interventions, including microplanning, that could help achieve more equitable immunization coverage, specifically helping to increase coverage and reach among zero-dose children and missed communities*.

EVIDENCE SUMMARY

What is microplanning?	Microplanning is an intervention that bundles planning activities, community engagement, and mapping — among other strategies — at the local level and has been suggested as a critical intervention to identify and research zero-dose children and missed communities.
How effective is microplanning in identifying zero-dose children and missed communities?  PROMISING INTERVENTION	Based on findings from primary research studies identified, **microplanning, and enhancements made to existing microplanning processes, is a promising way to improve identification of and reach to zero-dose children and missed communities**. Results from six effectiveness studies found meaningful increases in vaccine coverage or identification of missed communities following the introduction or enhancement of microplanning, often through the addition of digital means. Microplanning also appears to be cost-effective by leading to more efficient use of resources, with some methods being more cost effective than others. Microplanning interventions were largely successful in **remote rural settings** and were often implemented as **part of supplementary immunization activities** (SIAs). There is limited evidence on the effectiveness of microplanning for routine immunization.
What are the main barriers and facilitators to implementation?	• **Major facilitators** to implementation include **community participation**, **training and supervision** of implementers, and the use of **geographic information system (GIS) software**. • **Major barriers** include lack of **accurate population baseline estimates** and **logistical challenges.** These barriers were especially related to accessing communities, whether due to difficult terrain or security issues.
What are the key gaps?	**Key gaps** include **the lack of systematic reviews** synthesizing existing evidence, lack of studies addressing **gender-related barriers**, a need for **more rigorous studies to assess microplanning independently** from other interventions, a lack of studies regarding microplanning in conflict and insecure settings, and **wider**

	use of microplanning to target zero-dose children as all effectiveness studies were implemented in Nigeria.

INTRODUCTION

What is microplanning?

Microplanning is the development of an integrated set of components to support the activities performed during a health campaign or in the context of routine immunization (RI), at the facility and/or district or other sub-national level (1). According to UNICEF, microplanning is a multifaceted process used to make or update facility and/or district-level maps, identify priority communities, pinpoint barriers to service utilization, and develop workplans with solutions (2). Microplanning combines the use of coverage and other operational data with population distribution and geography, often using mapping techniques and community input to guide action (3). The microplanning process is flexible and can be adapted to suit local needs (1), and it might involve digital and/or non-digital activities, such as creating a district or health center map or identifying priority health centers and communities. In addition to using data, mapping, and community knowledge to identify unreached or under-reached areas, microplans often include technical details relevant to the action plan developed to reach these areas, such as by providing estimates for resources, cold-chain plans, and tools and frameworks for reporting and monitoring. Microplanning requires quality population and health facility data to be effective in identifying priority populations for public health activities, such as health campaigns and RI (4).

Why is microplanning relevant for reaching zero-dose children and missed communities?

When considering zero-dose populations, microplanning leverages its localized approach to identify and reach missed populations. Indeed, it is often mentioned as part of Reach Every District (RED) strategy bundles, alongside social mobilization, community mapping, and community engagement techniques. As part of the RED approach, a critical step in the health facility microplanning process is to identify hard-to-reach areas or "problem" areas; name specific problems faced by these areas, such as lack of access or lack of utilization; and devise potential special activities that could help reach them (3). This can be a critical step for identifying areas with a high prevalence of zero-dose children or missed communities and understanding what potential strategies would help reach them. As noted by the World Health Organization (WHO), health facility microplans can be put together to form district microplans to coordinate larger-scale, regional responses to issues like supply shortages, cold-chain problems, and database management (3), thus hard to reach or "problem" areas identified at the local level can be targeted for a coordinated response. Although microplanning was developed to support immunization activities, some countries have used the strategy as a basis for other primary care interventions and integrated microplans with RI efforts (4). Given its potential importance as a strategy to improve equity, this evidence brief aims to evaluate the effectiveness of microplanning in identifying and/or reaching zero-dose children and missed communities. Additionally, this brief explores the main implementation considerations for carrying out microplanning to achieve equity.

Why was this rapid evidence synthesis on microplanning undertaken?

The overall goal of this activity was to rapidly synthesize existing evidence on the effectiveness and implementation of microplanning to identify and reach vulnerable communities as part of a health

campaign or in the context of RI. Through a rapid review of peer-reviewed and grey literature, this work aimed to:

1. Evaluate the extent to which current microplanning practices and policies are effective in identifying and/or reaching zero-dose children or missed communities.
2. Identify the main implementation considerations for carrying out microplanning, specific to reaching zero-dose or missed communities.

The original purpose of this review was to evaluate the effectiveness of microplanning both within and outside of immunization; however, studies identified seldom compared microplanning interventions to the absence of microplanning. Instead, studies tended to evaluate the effectiveness of certain activities or strategies to enhance microplanning. Therefore, **the results described below are often based on comparisons of types of microplanning to evaluate the effectiveness of various components, such as GIS-mapping, intentional community engagement, and global positioning system (GPS) enabled android phones**. The conclusions concern activities designed to improve microplanning, with a pro-equity perspective. More information on the review methods is presented in Appendix A.

RESULTS: What is known about microplanning?

Effectiveness: What is known about whether microplanning "works"?

Twenty-four eligible articles and reports were included, including six effectiveness studies. **Studies mostly evaluated enhancements to existing microplanning processes, often involving digital technologies, and found positive results.** Studies primarily took place in Asia and Africa, with ten implemented in Nigeria alone. Sixteen studies, including four of the effectiveness studies, referenced equity when describing their intervention or reporting on intervention outcomes. Of these, at least ten studies had missed or underserved communities (a variety of terms were used by authors that fall into this category, including under-vaccinated, missed, unserved, vulnerable, and deprived) as the target population in their microplanning efforts (5-14).

Overall categorization of effectiveness

To help program planners assess whether an intervention, such as microplanning, should be considered for reaching zero-dose children and missed communities, a categorization scheme is used below to rate interventions as: potentially ineffective, inconclusive, promising, and proven. A more detailed description of this categorization can be found in the general methodology for reviews in this series [linked on the evidence map website].

Categorization	**Rationale**
	The six effectiveness studies that presented results all showed that microplanning, or enhancements to microplanning, aided in identification and reach in their respective interventions. Four studies presented evidence showing that microplanning aids in identifying zero-dose and under-vaccination communities, specifically during supplementary

 PROMISING INTERVENTION	immunization activities (SIAs). The studies implementing microplanning outside the traditional scope—looking at HIV prevention among sex workers, malaria prevention, and vaccination among canine populations—strengthen the case that microplanning is considered a useful tool in public health outreach. However, no rigorous studies have been conducted to analyze the effect of microplanning compared to a control or comparison arm that did not use microplanning. Additionally, all studies that analyzed the effectiveness of microplanning for identifying or reaching zero-dose children were conducted in Nigeria and many focused on SIAs, limiting our understanding of microplanning in routine immunization and across a variety of settings. For these reasons, this intervention was categorized as "promising." More rigorous effectiveness studies across a range of settings are needed before microplanning can be classified as "proven."

Specific evidence for deriving this categorization is presented below.

What evidence has been synthesized previously on the effectiveness of microplanning?

No relevant existing systematic reviews on microplanning were identified from 1980 to present; the evidence presented here is therefore based on individual studies published from 2010 through 2022.

What evidence exists on the effectiveness of microplanning within immunization?

All six effectiveness studies found positive results related to vaccine coverage based on either the activities used to enhance microplanning (comparing "new" versus more traditional techniques) or related to the microplanning process itself. Across these studies, four of which presented equity-focused results, almost all reported on digital activities, including use of geospatial technologies, such as GIS. Notably, all articles involved the use of microplanning for campaigns or other supplemental immunization activities (SIA).

The four equity-focused studies presented microplanning as a mechanism to reach and/or identify under-vaccinated communities and zero-dose children. This subset is most relevant to examining the effectiveness of implementing microplanning to improve equity. Below are detailed study descriptions:

- A descriptive cross-sectional study in Nigeria recognized that nomadic and underserved communities had been missed by SIA for poliovirus. Microplans were designed to collect GPS data and socio-demographic information on missed communities, with input of leaders from remote areas who provided lists of settlements and population estimates. Then, data collection teams, made up of veterinary and agricultural staff, enumerated residents, administered vaccinations, recorded relevant data, and tracked GPS coordinates using data collection forms and mobile phones. When compared with the previous microplans, 111 (34.3%) of the settlements had been missed by the most recent SIA, accounting for 3,533 households. Vaccines were administered to those that had not been immunized. 1,942 missed children were vaccinated for polio and of those, 527 (27.1%) were identified as zero-dose for DTP1. Overall, the researchers concluded that the previous microplans were inadequate because they did not capture nomadic populations in a meaningful way. They also noted other key gaps of the

microplanning process of the previous SIA, including logistical challenges due to lack of resources and insufficient engagement of traditional community leaders. The researchers concluded with a recommendation for governments to engage leaders and other stakeholders to reach nomads and underserved communities to identify missed settlements in microplans (6).

- Gali et al (2016) compared microplans used in polio SIAs in Nigeria that were thought to be inaccurate versus enhanced microplans developed through a rigorous six-step process and validated using GIS maps. The six-steps included: (1) preparatory stage, (2) fieldwork, (3) revalidation, (4) workload rationalization, (5) feedback to key stakeholders, and (6) continuous microplan updating. The pre-post evaluation assessed the following key metrics: number of settlements enumerated, number of target children identified, and doses of oral polio vaccine administered, among others. In comparing the microplans, there was a 30% reduction in number of households identified and a 54% reduction in the number of target children, confirming the suspicion that the previous microplan population estimates were inflated. More reliable baseline data allowed campaigns to more effectively target chronically missed communities (those missed at least three consecutive times by polio SIAs), reducing the number from 374 settlements in September 2013 to 21 by April 2015 (9).
- Microplanning was one strategy implemented as part of an intervention bundle to reach children unvaccinated for poliovirus in the Kamacha river basin in Nigeria. In the pre-campaign phase, implementors conducted walk throughs of target settlements and enumerated the number of households and eligible children <5 and <1. This microplan data was used to prioritize "hot spot" communities with the highest number of missed children during the campaign and provide baseline data. The number of immunized children increased from 1,862,958 before the intervention to 1,922,940 15 months later. The proportion of areas with the threshold of >90% coverage increased from 67% to 84%. It should be noted that microplanning was one of six intervention strategies implemented throughout the campaign, so the results cannot be directly tied to microplanning (15).
- A study in Nigeria compared two microplanning approaches for its measles vaccination campaign: the Northern states used GIS-generated ward maps to develop microplans while the Southern states used the traditional "walk through" technique. The plans using GIS technology had more accurate population estimates than those in Southern states when compared with verified microplans, which were validated by a national team using a standardized checklist as part of the national micro-plan verification that checked for accuracy and consistency of target populations, cold chain capacity, human resource availability, assignment of settlements to vaccination posts, completion of microplan templates, and more. The post-campaign survey found that the sampled enumeration areas (EA) in the Northern states had a significant reduction in zero-dose clusters, excluding one EA in a state with security issues. The survey also found that GIS mapping was more successful in determining the optimal locations for vaccine activities, which participants in Northern states reported as removing a major barrier to seeking services (16).

Both non-equity focused studies reported on the use of technological innovations used to enhance microplanning and found positive results. As above, all articles focused on use of microplanning for campaign purposes. Below are further details on these studies:

- In Kenya, a mobile phone app was used to map target populations and logistical needs at a county level to strengthen the national level microplan in advance of a country-wide measles-rubella (MR) campaign. Data collectors conducted microplanning four weeks before the campaign and captured data in electronic forms with a phone-based application. Key information, such as the number of eligible children in specific catchments, availability and

condition of cold chain supplies, and density of health facilities was transmitted in real time to build national-level vaccination plans for the campaign. The app recorded 53,277 villages across 46 counties, and the microplans captured more than 3 million children who were not included in the national plan (17). Importantly, it is unclear what methods informed estimation within the national plan, including whether other forms of microplanning were used. Additionally, it is unclear from the study whether the other children identified were reached with vaccination.

- Monroe et al. (2021) compared traditional immunization techniques without microplanning, which involved setting up clinics in central areas and vaccinating dogs brought by their owners, with data self-reported by vaccinators, versus a technology-based microplanning approach. The technology-based approach used an app to map data about each vaccination including GPS location to evaluate their respective effectiveness in vaccinating dogs for rabies in Haiti. Two urban centers were split into areas using "traditional" immunization protocol and "technology-aided" microplanning areas, which used spatial coordination and real-time team communication via smartphone to map immunization data. Daily vaccination rates were higher for the traditional arm (41.7 per team/day) than the technology arm (26.8 per team/day), but the teams using microplans vaccinated all 14 days of the campaign, while the teams using traditional methods declared their areas complete after three and seven days, respectively. As a result, the traditional approach produced a 44% coverage rate while the technology-aided team hit an estimated 80% coverage—a critical threshold for reducing dog-to-human transmission (18).

Evidence relevant to microplanning outside of immunization

A proposed randomized controlled trial (RCT) protocol and a modeling exercise demonstrate potential effective uses of microplanning for health service delivery outside of immunization. The studies propose novel means of incorporating microplanning into other health programming and highlight future directions of research:

- The cluster RCT in Zimbabwe is a **proposed** study protocol to implement the AMETHIST intervention, which uses a combination of microplanning and self-help groups to support adherence to HIV prevention, testing, and treatment among female sex workers (FSW). The study randomizes 22 towns with participants into two arms: the standard care (called the "Sisters program") or the intervention care (the Sisters program plus AMETHIST). The primary composite outcome is the proportion of FSWs at risk for either HIV acquisition or HIV transmission, assessed after two years of intervention delivery. Although results are still forthcoming, the published protocol reflects a wider interest in using microplanning outside of an immunization context (19).
- In Burkina Faso, researchers developed a microplanning **model** using village data from GPS to determine the most efficient visit itinerary to maximize community health workers' (CHWs) time and increase seasonal malaria chemoprevention (SMC) coverage. Results indicate that microplanning could reduce CHWs walking distance by 25%, increase the number of households visited by 36% ($p < 0.001$), and increase SMC coverage by 21% ($p < 0.001$) (12).

Effectiveness of microplanning in specific settings and programmatic contexts

Microplanning interventions were largely successful in remote rural settings and were often implemented as part of supplementary immunization activities (SIAs). There is limited evidence regarding the effectiveness of microplanning for routine immunization. Much of the existing research focuses on innovations to enhance microplanning, and it is **inconclusive which enhancements work best in various circumstances and contexts**.

IMPLEMENTATION: What is known about "how" microplanning works?

Barriers and facilitators to implementation by Equity Reference Group (ERG) setting

Twenty-two articles discussed implementation of microplanning and were included. Below is a summary of major facilitators and barriers to implementation by ERG setting:

Setting	Major facilitators	Major barriers
General (no ERG setting specified)	• Community participation/engagement • Buy-in/ownership by stakeholders (high acceptability) • Cost-effectiveness • Regular training and supervision • GIS software	• Lack of structure, oversight, coordination • Insufficient resources • Logistical challenges • High start-up cost • Limited time for microplanning activities
Remote rural	• GPS tracking systems • Easy to use tools for lay health workers • Training guides	• Lack of gold standard to compare against • Accurate population/target estimates • Transportation/difficult terrain • Varying classifications of "settlement" or "household"
Urban	Not reported	Not reported
Conflict	Not reported	• Security challenges in accessing some settlements/communities
Gender-related barriers	• Engagement of women in the microplanning process	Not reported

Implementation outcomes

Summaries of major implementation outcomes reported (i.e., feasibility, acceptability, adoption, costs, and sustainability) are summarized below:

Feasibility

Many articles discussed the feasibility of implementing microplanning across a range of settings. The most common ERG priority settings where microplanning interventions were implemented included remote rural and urban poor. One article discussed feasibility of implementation in relation to gender barriers. **Microplanning was considered feasible due to low costs (4, 18, 20) and the ability to be carried out quickly (10, 14)**. **Other facilitating factors included community participation (11, 13, 20), training and guides for standardizing the microplan process (21) and regularly updating microplans with the most up-to-date population data (22). Challenges to feasibility reported included difficulties setting accurate targets and population estimates, especially for large nomadic populations (9, 10, 16, 22, 23), security challenges in accessing some settlements and communities (8, 10, 14, 16, 23), and transportation barriers due to difficult terrain (7, 23, 24).** Other barriers included insufficient resources (18, 25), lack of existing standardized governance structure, systems and coordination (11, 24), "bulky and complex" tools that were difficult for community health workers to use (21), and insufficient or over-worked staff (21). Apeng et al. (2010) also reported on a variety of challenges related to financing during microplanning efforts in Papua New Guinea, including lack of payment to community health workers, problems with participants not receiving funds due to lack of understanding of government requirements and communication and transportation issues in isolated districts, and issues with staff providing receipts for work completed (7).

Acceptability

Microplanning appeared to be an accepted intervention with robust community and stakeholder participation. For example, Dougherty et al. (2019) documented a GIS approach implemented by two states in Nigeria to generate and convert RI paper maps to digital maps for microplanning. Stakeholders from government and implementing partners participated in meetings to identify data sources and to validate microplan-derived maps. This engagement served to improve data quality and build confidence in the process (24). Another study by Hamisu et al. (2021) demonstrated that nearly 100% of wards in Nigeria participated in all steps of the microplan development process, which was confirmed in a secondary study verification phase (23). Acceptability was demonstrated in a cross-sectional study in remote rural and urban poor settings in Ethiopia when interviewees responded favorably about integrated microplanning (22). In comparing two methods of microplanning, Mendes et al. (2021) found that mapathons, a crowd-sourced method of geospatial mapping, strengthen community engagement and involvement of local vaccinators, noting that this enhances inclusivity (10). Another study demonstrated microplanning acceptability among traditional/religious leaders in nomadic communities in Nigeria through developing partnership between these leaders and immunization teams that were critical for success (13). Finally, Teshome et al. (2018) used microplanning that was community-based, participatory, and involved both grassroots health workers and community leaders (20).

Costs

Microplanning appears to be a cost-effective approach by leading to more efficient use of resources, with some methods being more cost-effective than others. Costs of microplanning were addressed in six studies. Some studies compared costs of different methods of microplanning. For example, Ali et al. (2020) compared the costs of two versions of microplanning: GIS-mapping vs. traditional microplanning. Using the costs of all inputs for each method, they calculated the incremental cost of GIS over traditional microplanning and the incremental cost-effectiveness ratios for each vaccine-preventable illness, death,

and disability-adjusted life year (DALY) averted. They found that GIS microplanning projected significantly more required vaccinations compared to traditional microplanning due to the ability of GIS to identify more unreached/missed populations. Authors conclude that while GIS was more expensive than traditional microplanning, drivers of the additional costs were related to vaccinating additional children who were identified through using GIS; thus, GIS microplanning was also more cost-effective and worth adopting. Of note, authors assumed the same costs at the state and local levels for both traditional and GIS microplanning. They found that using the GIS approach, the cost per DALY averted by measles and pertussis combined ranged between $128 and $176 (depending on LGA and coverage data used), and, using the cost-effective threshold of per capita GDP (US $1, 969), determined GIS microplanning was cost-effective (5). Another study compared costs of automatic feature extraction (AFE), a machine-learning algorithm, and mapathons. The study found that AFE is expensive, though costs are predicted to decrease with increased utilization, and that mapathons are significantly less expensive (i.e., participants were volunteers, main costs were GIS licenses and salaries for coordinators), but faced significant methodological challenges, including the significant amount of time necessary to implement a mapathon and potential for data quality issues (10). Ismail et al. (2017) compared automated versus manual systems of data collection for microplanning and found that the former was more cost-effective because collecting data via mobile apps is more efficient as it facilitates "timely data transfer, data integrity, tracking, real time data visualization reporting and analysis," as well as enables "real time feedback to national focal point by data entry clerks" and "trouble shooting by the administrator" (17). Finally, based on a study of microplanning applied to OPV campaigns in Kaduna State, Nigeria, Umeh et al. (2018) found that microplanning leads to more reliable denominators for RI and SIAs, which conserves resources by leading to more cost-effective campaigns informed by accurate data. For example, they demonstrated that conducting six OPV campaigns in 2017 would cost $8,705,902 USD using the under-five population estimate from July 2017 census data versus $5,683,795 USD using the under-five population estimate from August 2017 determined via microplanning, a 34% decrease (22).

Studies also reported on cost considerations of the microplanning process itself. Kanagat et al. (2022) interviewed key stakeholders in Ethiopia about integrated microplanning for vaccination and nutrition. The idea was met favorably by respondents who highlighted the potential efficiencies and cost-effectiveness and suggested that more activities be integrated into the microplans (14). Finally, Umeh et al. (2018) concluded that although microplanning can be "expensive and tedious," it may lead to more cost-effective campaigns that are based on accurate data and denominators, saving significant resources for governments and others working toward polio eradication (14).

Adoption and penetration

Adoption, or the initial decision or action undertaken to utilize an intervention, was described in some studies. **Studies demonstrated that innovative or technological microplanning strategies, such as community-based approaches or the use of GIS-enabled mobile phones, can have strong adoption but also face challenges**. For example, Barau et al. (2014) demonstrated that accurate maps based on coordinates can be created to improve microplanning in a remote rural setting in Nigeria and integrated into existing microplans to inform vaccination efforts (8).

Ismail et al. (2017) described challenges harmonizing a "bottom-up", community-based microplan approach with the national plan in Kenya, which used national coverage data and population estimates, despite success of the microplanning process itself, including providing numbers and locations of the target children. However, successes related to adoption/penetration included the provision of real-time

feedback and campaign planning spanning from local to national levels, which informed the national level MR campaign plan. In addition, a mobile app created as part of the intervention, which collected information on RI and other primary health care activities linked to communities, was used in 46 of Kenya's 47 counties. Finally, the authors spoke to the importance of the bottom-up approach in health data mining for the microplanning process, noting its role in promoting community ownership and improving accuracy. Specifically, the phone-based app only allowed local input of data (based on the GIS position of the community team member entering data) and prevented editing of the data once uploaded by the community team. These safeguards were perceived as increasing communities' sense of ownership over the data (17).

Awareness of microplanning by health workers also demonstrated both strong adoption along with some challenges: While microplanning is often integrated into existing health facility processes and there is high awareness, there are challenges in terms of health worker expertise. Mafigiri et al. (2021) found that most health workers had general awareness of microplanning, recognizing its importance and general processes within their health facilities. The health workers also acknowledged the critical role microplanning has in identifying and helping develop solutions to community health challenges across district and national levels. Conversely, despite being aware of their existence and benefits, many health workers in higher tier facilities, or those that cover larger populations, reported no prior experience participating in microplanning processes nor knowledge of how to implement them (21).

Sustainability

Only one article directly analyzed the sustainability of microplanning processes using qualitative methods and found that microplanning contributes to sustainable impacts when there is youth participation and it is conducted regularly, though challenges to sustaining microplanning include staff turnover, in some cases due to gender barriers. A case study conducted in three villages in India trained young people in microplanning, culminating in selection of youth as village volunteers, who then established Village Information Posts to provide continuous information on schemes and programs and mobilized others to track key indicators to monitor program progress. In this instance, microplanning was used to plan for events and monitor programs across diverse health areas, such as immunization, sanitation, and family planning. The case study concluded that engaging youth in the microplanning process increased the sustainability of the positive impacts of microplanning. The case study also concluded that microplanning should become a periodic, regular activity to increase the sustainability of changes. However, challenges with sustainability were also noted, including significant drop-out following initial microplanning training, and drop out among young women trained as village volunteers following marriage (25).

Examples of implementation by type of microplanning intervention

Implementation studies presented a wide variety of microplans. Examples below highlight the diversity of microplanning methods by ERG setting.

Type of microplanning intervention	Example of implementation	ERG setting
GIS-based microplanning	Used GIS approach to convert RI paper primary health center catchment area maps to digital maps for microplanning in Northern	Remote rural and urban poor

	Nigeria, resulting in lessons learned for RI microplanning across two states (24).	
	GIS maps made were integrated into existing microplans used by health facilities for more efficient staff allocation and resource planning and to guide vaccine efforts in Nigeria. GPS tracking of vaccination teams **allowed health centers to identify missed areas** for mop-up activities (8).	Remote rural (some security concerns reported)
	GIS-generated ward maps (from data from previous polio programs) used during microplanning in Nigeria. Maps were used to identify catchment areas for fixed posts, develop daily implementation plans by highlighting landmarks (e.g., schools) for vaccination posts within one km of all settlements, and estimate daily workloads for teams. Found that ward maps generated through GIS improved quality and optimized vaccination post placement which **resulted in a "significant reduction in zero-dose clusters found during the post campaign coverage survey**" (16).	N/A (some security issues in one state)
RED/REC/REV	Examined the process and challenges of developing and utilizing microplans for improving immunization outcomes in Uganda. Microplanning was introduced in 2006 with the Reaching Every District strategy but has since seen **limited development and utilization** due to health workers' knowledge gaps surrounding microplanning, over-complicated tools to conduct microplanning, and competing tasks for health workers (21).	Remote rural
Preparation for SIA/campaign	Microplanning through **phone-based app** and data collection forms before MR campaign in Kenya provided **numbers and locations of target children**; 46/47 counties responded through app (17).	Remote rural and urban poor
	Conducted "**walk through microplans**" in Nigeria, which involved recording households and children under 5 and 1 years in catchment areas and settlements along the rivers. These microplans were used for SIAs, RI, and other vaccination activities (15).	Remote rural
	An investigation of the overestimated denominators used for immunization planning (particularly OPV campaigns) by microplanning (enumerating households) in Nigeria. Study team conducted walk throughs of settlements and enumerated households and children of various ages. Team then drew maps of the catchment area, including borders and important landmarks to guide SIAs. The **microplanning activity was found to produce more precise population estimates** than the census data (14).	N/A (some security challenges reported)
Microplanning for integration	Activities involved **joint microplanning for integrating multiple services**, including counseling on integrated young child feeding, iron and folic acid supplement distribution and immunization service delivery (including estimating target populations) in Ethiopia (22).	Remote rural and urban poor
	Evaluated the Swabhimaan program, which involves village-level women's groups that create and implement microplans for nutrition integration in India. Each microplan includes nutrition-related problems prioritized in target populations, activities lists and budgets. Implementation results showed **336 microplans developed**	Remote rural and gender-related barriers

	at village level, 77,000 females screened and 15,122 identified as at-risk and referred for services. (11).	
Community-based/grass-roots microplanning	Evaluated the Swabhimaan program and found that **microplans developed by women's collectives with funds from the state contributed to increasing coverage of nutrition interventions** for women and girls in underserved areas in India, partly due to their ability to respond to their community's needs (11).	Remote rural and gender-related barriers
	Two-part microplanning protocol rolled out in five communities in Port-au-Prince, Haiti to improve mass drug administration in urban areas. Included identifying areas with limited access by "geolocalizing" distribution posts, outlining supervision area boundaries, and microplanning workshops. Involved **engaging community leaders, community promoters, and other key stakeholders** (26).	Urban poor
	Described the design, implementation, and effectiveness of an intervention to improve enumeration and microplanning for missed nomadic communities in Nigeria. Found that establishing and maintaining a **partnership between traditional rulers, religious leaders and immunization teams was critical for success** (improvements in terms of visits by vaccine teams and updated microplans among previously unlisted settlements) (13).	Remote rural
	Described pilot interventions to assess implementation and cost of cholera vaccine in new setting in Ethiopia. Included a "bottom-up" approach to participatory microplanning, involving public health field staff and community leaders." Authors argued that "thorough **community-based participatory microplanning involving grassroots health workers and community leaders, supported by a dynamic site management team, was key to success**" (20).	Remote rural

Existing evidence gaps and recommendations for further research

This review identified several important gaps regarding the evidence base for microplanning and its ability to reach zero-dose children and missed communities:

- There is a lack of systematic reviews on microplanning, even outside the scope of immunization. Given the overall positive results of individual studies identified in this rapid review, a formal synthesis of current evidence would be beneficial.
- Studies often noted that other interventions were implemented concurrently with microplanning, thus results presented could be attributable to activities other than microplanning (9, 15). Additionally, application of microplanning varied widely and often distinctions between activities involved in the microplanning process and other interventions being implemented were unclear. The lack of clear definitions further complicates the ability to tease out the effects of microplanning from other interventions.

- There is a need for more rigorous studies to understand whether microplanning is effective in identifying and/or reaching vulnerable populations. Designing such evaluations will be especially challenging since microplanning is often implemented in parallel with other strategies.
- To address this, it may be advantageous to conduct studies to assess the effectiveness of specific elements or activities designed to improve the microplanning process, with research questions aiming to understand considerations such as effectiveness and cost-effectiveness.

- All effectiveness studies specific to identifying/reaching zero-dose children were implemented in the same country, Nigeria, and involved SIAs conducted among mostly remote rural populations. While this concentration of evidence provides significant depth to our understanding of facilitators and barriers in one setting, it limits generalizability to different settings. It would be valuable to bolster evidence within more varied contexts, countries and uses, including within routine immunization programs.

Limitations

Despite undertaking a comprehensive search strategy, this synthesis involved a rapid literature review; it is possible that relevant citations were missed. Additionally, this review included only relevant peer-reviewed publications and available grey literature sources. It is possible that more evidence exists, especially programmatic data unavailable through the sources searched. Publication bias, although not formally assessed, might be of relevance, especially if successful microplanning interventions are more likely to be published than unsuccessful ones. Also, despite the use of standardized forms and trained staff members, data interpretation is somewhat subjective, especially given that formal, quantitative synthesis of outcomes was infeasible. Additionally, it was sometimes challenging to distinguish microplanning intervention from a larger bundle of activities, thus suggesting that microplanning often occurs in tandem with other interventions and results cannot always be traced back to the microplanning process itself. Finally, this review identified many interventions that use GIS mapping or other digital means to inform microplanning activities. As these digital technologies are relatively new, it is possible that the extent of GIS mapping-based interventions identified in this review does not accurately reflect the extent of its use overall; it might reflect a temporal bias towards reporting on use of these technological innovations.

Conclusions

How should pro-equity programming shift based on findings?

As efforts to improve and innovate microplanning contribute to increased success in both identifying *and* reaching zero-dose and missed communities, it is an intervention well-suited to improving equity. Many studies included missed and underserved communities as target populations for microplanning activities. Ali et al. explicitly argued GIS microplanning's value due to its impact on equity:

"The benefit of ensuring equitable service provision and reaching hard-to-reach areas and populations costs more but it also holds immense value from the public health perspective because of the significant number of additional children who are identified and vaccinated" (5).

Similarly, two studies included female sex workers as their target population, a vulnerable and marginalized population (19, 27). One study used microplanning forms to understand barriers to reaching children with immunization (17). These examples demonstrate microplanning's alignment with pro-equity. Authors argued that microplanning promotes equity by reaching more under-vaccinated populations and enabling community ownership, and that more effective microplanning will increase equity (5, 25). Pro-equity programming would benefit from increasing and strengthening microplanning.

Based on the findings, should microplanning interventions with an equity perspective be brought to scale?

Based on the findings of this review, scaling up newer, enhanced methods of microplanning are a promising pro-equity approach to identify and reach zero-dose children and missed communities. However, the limited number of studies identified, and the disparate microplanning enhancements found limit the ability to determine how and when microplanning interventions should be brought to scale to enhance equity. Some overarching findings that are relevant to scale-up include:

- **Scale-up is feasible**: There was evidence that enhanced microplanning can be scaled as demonstrated by some national-level microplanning interventions. Interventions at lower levels demonstrated that it is likely feasible to bring activities and strategies to improve microplanning to scale, though there would be associated costs and challenges.
- **Quality matters**: Many studies compared different types of microplanning or compared older microplanning methods with improved or innovative methods. These comparisons mostly found that the quality of microplanning matters, with newer, more comprehensive models identifying and reaching more vulnerable communities. These findings suggest that quality and comprehensiveness are critical qualities to consider during scale-up.
- **Existing evidence for cost-effectiveness:** While studies included in this review suggest that making enhancements to microplanning can be cost-effective, it is not certain which models work best and whether results are generalizable. Additionally, although some information on costs of microplanning were identified, costs varied widely depending on the type of microplanning being implemented, and not all microplanning applications presented cost data.

Critical questions relevant to scale-up remain unanswered. For example, it is unclear which microplanning models work best and under which circumstances/contexts enhancements would be best used. The benefits of enhancing or expanding microplanning need to be weighed carefully against the additional costs and associated challenges. For these reasons, it is recommended that microplanning, including activities to enhance existing microplanning, be brought to scale in a phased approach alongside a rigorous learning agenda. To determine concrete next steps of scaling-up microplanning for immunization programs, robust implementation and effectiveness research is necessary for evidence-based planning.

Appendix A. Review methods

How was this evidence synthesis conducted?

SEARCHING, DATA EXTRACTION, AND ANALYSIS: The review followed a general methodology for all topics in this series. In brief, the methodology involved comprehensively searching electronic databases from January 2010 through November 2022, conducting a grey literature search, screening through all citations, and developing topic-specific inclusion criteria. Data were extracted into standardized forms, and results were synthesized narratively.

INCLUSION CRITERIA: We included studies that took place in low- or middle-income countries and described an intervention that used microplanning in support of a health campaign or RI efforts. For effectiveness studies, articles needed to present data relevant to reach or identification of priority populations through microplanning, or identification of barriers to immunization for underserved populations through microplanning. We included both effectiveness studies (defined as using a multi-arm design or using pre/post or time series data to evaluate an intervention involving microplanning) and implementation studies (defined as any study containing descriptive or comparative data relevant to implementation outcomes).

SEARCH RESULTS:

- 159 articles were identified in the published literature search.
    - 124 identified were excluded during title and abstract screening for irrelevance, leaving a total of 35 articles for full-text review.
    - 11 articles were excluded during full text review for a total of 24 articles included.
        - 6 articles contained information relevant to effectiveness while 22 included information relevant to implementation.
- 3 potential articles were identified in the grey literature.
    - 0 articles were identified as eligible based on inclusion criteria.
- In total, 24 articles were included:
    - 6 studies related to effectiveness.
    - 22 studies related to implementation.
    - 2 others (1 study protocol and 1 modelling study).

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