Multiple Micronutrient Supplementation During Preconception in Low- and Middle-Income Countries

JANUARY 2026 **TECHNICAL BRIEF**

KEY MESSAGES

1. Multiple micronutrient supplementation (MMS) during pregnancy is a well-established, safe, and cost-effective intervention in low- and middle-income countries, with clear benefits for birth outcomes compared with iron–folic acid (IFA) supplementation.

2. Guidance on micronutrient supplementation before conception varies globally, ranging from folic acid alone to IFA or MMS, reflecting differences in evidence strength, nutritional risk, and programmatic considerations.

3. Countries are increasingly asking whether starting MMS before conception provides additional benefits beyond initiating supplementation during pregnancy, particularly in settings with a high burden of micronutrient deficiencies.

4. This technical brief reviews the current evidence on preconception MMS in low- and middle-income countries. Although some studies suggest benefits on maternal and infant outcomes, the limited evidence is heterogeneous, varying with supplement formulations, dosing regimens, co-interventions and study designs, which constrains definitive policy conclusions.

5. Only one large trial has directly compared MMS initiated before conception and continued during pregnancy with MMS initiated during pregnancy alone; preliminary findings suggested a reduction in miscarriage risk when MMS was initiated during preconception.

At present, evidence is insufficient to support routine, population-wide implementation of preconception MMS, underscoring the need for further clinical and implementation research on effectiveness, safety, feasibility, targeting, and cost-effectiveness before policy adoption.

INTRODUCTION AND AIM

The **preconception period** is increasingly recognized as a critical window for improving reproductive and pregnancy outcomes. This window includes both the broader reproductive life course and a more specific biological window of approximately three months prior to conception, during which oocyte maturation and a full cycle of spermatogenesis occur.[1,2]

Others refer to the **periconception period** covering the three months prior to conception up to 10 weeks after conception, encompassing oocyte growth, fertilization, implantation, embryogenesis and placentation.[3] Adequate micronutrient status during the preconception (or periconception) period is essential, as nutrients such as folate, iron, zinc, iodine, and vitamin D support gamete quality, hormonal regulation, implantation, and organogenesis.[1,3,4] As an example, during the periconception period, folic acid supplementation is known to reduce the risk of neural tube defects by as much as 70%.[5] However, two-thirds of non-pregnant women of reproductive age worldwide suffer from micronutrient deficiencies, with negative consequences for their own health, as well as on fertility and pregnancy outcomes.[6]

Prenatal **multiple micronutrient supplements (MMS)** are a cost-effective intervention designed to meet the increased micronutrient requirements **during pregnancy**, providing an estimated return of over $37 for every $1 invested.[7] When compared with supplements containing only iron and folic acid (IFA), prenatal MMS reduce the risk of low birthweight, preterm births, small for gestational age births, stillbirths, and early infant undernutrition.[8–10] The most extensively studied formulation - UNIMMAP MMS - contains 15 essential vitamins and minerals at doses close to the recommended dietary allowances (RDA) for pregnant women.[11]

With an increasing number of low- and middle-income countries (LMICs) transitioning from IFA to MMS programs for pregnant women, many stakeholders are now asking **whether there are additional benefits of providing MMS during the preconception period**.

Thus, the global MMS Technical Advisory Group (MMS TAG) conducted a review of the evidence on safety and additional benefits of extending the use of MMS to the preconception period, which is summarized in this Technical Brief. This document summarizes emerging evidence to inform research, policy dialogue, and future guidance.

GLOBAL AND NATIONAL POLICIES/GUIDANCE ON MICRONUTRIENT SUPPLEMENTATION IN PRECONCEPTION

There are some global policies or guidance that recommend micronutrient supplementation – folic acid, IFA or MMS – during preconception. The World Health Organization (WHO) recommends that folic acid supplementation should be initiated before conception to prevent neural tube defects (NTD).[12] To improve nutritional status of menstruating girls and women, WHO recommends daily iron supplementation in settings where anemia prevalence is 40% or higher,[13] and weekly IFA (60 mg iron and 2800 µg of folic acid) in settings with an anemia prevalence of 20% or higher.[14] Programmatic guidance from UNICEF supports the continued and consistent use of IFA or MMS, starting before conception and continuing throughout breastfeeding.[15]

Recently published good practice recommendations from the International Federation of Gynecology and Obstetrics (FIGO) Childbirth and Postpartum Hemorrhage (PPH) Committee state that MMS should be administered once daily throughout pregnancy and, for the prevention of fetal neural tube defects, MMS should be started at least 2–3 months before pregnancy.[16]

These recommendations specify that for women at low risk for fetal NTD, MMS should contain 400 µg of folic acid (from preconception and continued throughout pregnancy), while for women at high risk* of fetal NTD, 5 mg of folic

* categories of women at high risk of fetal neural tube defects: women (or their partners) who have neural tube defect or a family history of neural tube defect or other congenital malformations; women with a previous pregnancy that was affected by neural tube defect or other congenital malformations; women with type 1 or 2 diabetes mellitus; women with obesity with a BMI of 30 or above; and women on anti-folate medications.[16]

acid (in MMS or given in addition to MMS) should be given daily until 12 weeks of pregnancy, after which MMS containing 400 µg of folic acid should be taken daily throughout pregnancy.[16]

Among the South Asian countries with policies on preconception nutrition interventions, Sri Lanka was identified as the only country with a nationwide preconception care program (with risk screening, vaccinations, family planning services and folic acid supplements, among others), designed for newly married couples.[17,18]

Other countries have policies and universal programs specifically for folic acid supplementation (Bangladesh and Nepal, in addition to Sri Lanka) or weekly IFA (in Pakistan) for women planning for pregnancy.[19] In Africa, while some countries have preconception micronutrient supplementation guidelines (e.g. daily IFA for at least 3 months before conception in Ethiopia[20] or daily folic acid for at least 2 months before conception in South Africa[21]), it is estimated that supplementation containing folic acid during the preconception period is low (at 14%) in sub-Saharan African countries.[22]

MICRONUTRIENTS NEEDS IN WOMEN OF REPRODUCTIVE AGE (FEMALES 19-50 Y)

Table 1 presents the micronutrient requirements for healthy females (19-50 y), namely the Recommended Nutrient Intakes (RNI) by WHO/FAO as well as the Institute of Medicine's (IOM) Recommended Dietary Allowances (RDA) and Tolerable Upper Intake Levels (UL), for 15 vitamins and minerals.[23–25]

It also shows the composition of UNIMMAP MMS formulation and the modelled hypothetical scenario where women reach the RDAs for the 15 micronutrients through adequate and complete diets and consume one tablet daily of UNIMMAP MMS. In this scenario, the total micronutrient intake (from diet and UNIMMAP MMS) would be substantially below the UL for most micronutrients, except for iron and zinc, where the total intake would come close to the UL. This suggests that a daily UNIMMAP MMS during preconception would be a safe intervention, even among those who already reach adequate micronutrient intakes through the diet with or without food fortification. Notably, providing daily iron or IFA (with the recommended 30 to 60 mg of iron) during preconception would have a similar or greater likelihood of exceeding the UL for this mineral.

Table 1 - Recommended Nutrient Intakes (RNI), Recommended Dietary Allowances (RDAs) and Tolerable Upper Intake Levels (UL) for 15 vitamins and minerals for females (19-50 y), composition of UNIMMAP MMS formulation, the modelled intake from daily UNIMMAP MMS and an adequate diet (providing one RDA of the 15 micronutrients).[23-25]

Nutrient	RNI (WHO/FAO)	RDA (IOM)	UNIMMAP MMS formulation	UNIMMAP MMS + adequate diet (1 RDA)	UL (IOM)
Vitamin A	500 µg	700 µg	800 µg	1500 µg	3000 µg
Vitamin B1	1.1 mg	1.1 mg	1.4 mg	2.5 mg	Not determined
Vitamin B2	1.1 mg	1.1 mg	1.4 mg	2.5 mg	Not determined
Vitamin B3	14 mg	14 mg	18 mg	32 mg	35 mg
Vitamin B6	1.3 mg	1.3 mg	1.9 mg	3.2 mg	100 mg
Vitamin B9	400 µg DFE	400 µg	400 µg	800 µg	1000 µg
Vitamin B12	2.4 µg	2.4 µg	2.6 µg	5 µg	Not determined
Vitamin C	45 mg	75 mg	70 mg	145 mg	2000 mg
Vitamin D	200 IU	600 IU	200 IU	800 IU	4000 IU
Vitamin E	7.5 mg	15 mg	10 mg	25 mg	1000 mg
Copper	Not determined	900 µg	2000 µg	2900 µg	10,000 µg
Iodine	150 µg (13-18 y)	150 µg	150 µg	300 µg	1100 µg
Iron*	19.6 – 58.8 mg (15 to 5% bioavailability)*	18 mg	30 mg	**48 mg**	45 mg
Selenium	26 µg	55 µg	65 µg	120 µg	400 µg
Zinc	3.0 – 9.8 mg (high to low bioavailability)	8 mg	15 mg	**23 mg**	23 mg

DFE = Dietary Folate Equivalents; FAO = Food and Agriculture Organization; IOM = Institute of Medicine; IU = International Units; RDA = Recommended Dietary Allowances; RNI = Recommended Nutrient Intake; UL = Tolerable Upper Intake Levels; UNIMMAP MMS = The United Nations International Multiple Micronutrient Antenatal Preparation; WHO = World Health Organization
*For LMICs, the more realistic levels of iron bioavailability are 5 and 10% according to the WHO/FAO report from 2004.[25]

PUBLISHED TRIALS ASSESSING THE USE OF MMS DURING PRECONCEPTION, IN LMICS

We reviewed all the studies included in the three key recent systematic reviews on preconception nutrition interventions[26–28] and extracted the 18 studies that specifically assessed the effects of MMS in LMICs.

Each key systematic review used a different definition for MMS; when extracting data from the included trials, MMS provided between 10 to 29 micronutrients. The results presented below were grouped by type of MMS provided to the intervention group: UNIMMAP MMS, UNIMMAP-like MMS, and other MMS formulations. The studies assessed a range of maternal and infant outcomes, spanning from preconception until postpartum.

Methods: From Literature Searches to Included Trials

Electronic searches with the key terms "multiple micronutrient supplements/supplementation" and "preconception" were conducted on Pubmed, PROSPERO and trial registries to identify published and ongoing systematic reviews and randomized controlled trials conducted that assessed the effect of MMS in women of reproductive age, provided during the preconception period, as well as relevant global and national guidelines or policies. We identified 3 key recent systematic reviews[26–28] examining preconception nutrition interventions, which used systematic literature searches and were published between 2024 and 2025, although several interventions (MMS and others) were assessed. We identified 18 studies, mostly from these three systematic reviews, that specifically assessed the effect of MMS provided during preconception in LMICs, extracted all relevant data and presented the results into 3 groups: trials that used the UNIMMAP formulation (8 studies), trials that used a UNIMMAP-like formulation (same 15 micronutrients but in different amounts, 6 studies), and trials that used other formulations (varying between 10 and 29 micronutrients, 4 studies). We also identified two relevant ongoing trials in LMICs. Only 3 trials included in these systematic reviews were conducted in high income countries, using different formulations than UNIMMAP MMS. Risk of bias for the included trials was described in the Appendix Tables, if assessed by the systematic reviews Das, 2024[26] and Ali, 2025.[27]

In the studies that assessed post-conception outcomes, some continued MMS during pregnancy (or pregnancy and postpartum), while others switched to IFA after pregnancy confirmation – an important study design distinction, noted in the Appendix Tables. The control groups of the included studies received placebo or iron or folic acid or IFA, during preconception and/or pregnancy.

TRIALS THAT USED THE UNIMMAP MMS FORMULATION

Appendix Table 1 describes the four trials that used the UNIMMAP formulation (with a total of 8 publications linked to the four trials).

One trial (PMMST) provided daily UNIMMAP MMS (vs daily placebo) during preconception, followed by daily IFA (60 mg of elemental iron and 250 µg of folate) during pregnancy in both arms, to 376 women in the Gambia. The intervention increased hemoglobin concentration and reduced anemia by 41% after 12 months of supplementation,[29] with some suggested additional positive effects on genome methylation patterns[30] and placental vascular function.[31] One of the studies[31] was classified as low risk of bias (ROB) in most domains,[26] while another[32] was considered to have an overall high ROB.[27,32]

Three trials provided MMS in preconception and continued this intervention during pregnancy, or pregnancy and postpartum, in the intervention group. In a trial conducted with 115 Indonesian women, receiving preconception UNIMMAP MMS every two days followed by daily UNIMMAP during pregnancy resulted in improved fetal survival (gestation age >37 weeks) and resulted in a non-significantly higher umbilical cord insulin-like growth factor 1 concentration,[33] compared to those who received preconception placebo followed by daily IFA (60 mg of iron and 250 µg of folic acid) during pregnancy. It should be noted that this study is likely underpowered to detect differences in fetal survival and was classified with high ROB in some domains[26] and overall high ROB.[27] A conference abstract from a follow-up study of this trial reports that MMS also resulted in a significantly higher placental weight and birth weight.[34]

A small trial was conducted with only 19 Indonesian women and compared UNIMMAP MMS during preconception (weekly when participants were not menstruating and daily when menstruating) followed by daily UNIMMAP MMS during pregnancy vs. IFA (250 µg of folic acid, 200 mg of iron) during preconception (weekly if not menstruating; daily if menstruating) followed by daily IFA during pregnancy.[35,36]

The authors reported that the (MMS) intervention resulted in significantly higher birth weight[35] and length,[35,36] although this trial was classified as being at high ROB.[37,38]

In Pakistan, a substudy nested within the MaPPS Trial with 186 mother-infant dyads showed that providing twice weekly UNIMMAP MMS during preconception followed by daily UNIMMAP MMS during pregnancy and for 6 months postpartum, compared to no intervention during preconception followed by daily IFA during pregnancy and for 6 months postpartum, resulted in increased milk iodine and vitamin A concentrations, but not vitamins B12 or E, nor folate, and did not improve infant growth.[39] Notably, reported MMS adherence was moderate (67%).

TRIALS THAT USED UNIMMAP-LIKE MMS FORMULATIONS

Appendix Table 2 describes the two trials (with 6 associated studies) that used a UNIMMAP-like formulation, i.e. providing the same 15 micronutrients but in different amounts.

The PRECONCEPT is a three-arm trial with 5011 Vietnamese women, comparing weekly preconception MMS (providing 2800 μg of folic acid, 60 mg of iron, and 600 IU of Vitamin D) and weekly preconception IFA (with 60 mg of iron and 2800 μg of folic acid) with weekly preconception folic acid (2800 μg FA – control group). All three arms received IFA (60 mg of iron + 400 μg of folic acid) during pregnancy. Compared to women given folic acid only, the groups who received preconception MMS or IFA did not differ in birth outcomes (infant weight, preterm, SGA),[40] but they had modest increases in maternal and infant iron stores without impacting anemia,[41] improved linear growth at 2 years of age and reduced stunting (by 12% in MMS and 13% in IFA);[42] there was no effect on postpartum depressive symptoms overall but there may have been a benefit for women who were at risk for depression.[43] Children of women who received preconception MMS (but not those who received IFA) had improvement in certain domains of intellectual functioning at 6 years of age when compared with those whose mothers who received folic acid.[44] This trial was classified as having a low ROB assessment.[26,27]

In the PRIYA trial, a daily MMS providing ~50% of the RDAs for 15 micronutrients combined with daily vitamin B12 supplementation (2 μg/day) during preconception and pregnancy vs. government mandated IFA (preconception weekly 100 mg iron + 500 μg of folic acid, followed by daily IFA during pregnancy) resulted in improved B12 levels during pre-conception and pregnancy, which was reflected in higher cord blood holotranscobalamin levels, but no differences were seen in neurodevelopmental outcomes at 2 years of age.[45]

TRIALS THAT USED OTHER MMS FORMULATIONS

Appendix Table 3 describes the trials that used other formulations (varying between 10 and 29 micronutrients, 4 studies).

In a trial conducted with 466 women with a previous history of giving birth to a child with open NTD, providing MMS with 11 micronutrients (including 4 mg of folic acid) from preconception to 3 months of gestation vs control (iron and calcium) resulted in a non-significant reduction in open NTD.[46]

Another small trial found no differences in hemoglobin after supplementing 152 Mexican women with MMS (containing 14 micronutrients, 60 mg of iron) six days per week, for 12 weeks during preconception, compared with IFA (providing the same amount of iron and at the same frequency).[47]

Similar results were obtained in a trial with 802 women in Tanzania, where there were no differences in hemoglobin levels between intervention arms: daily MMS (containing 10 micronutrients, 30 mg of iron) or daily IFA (containing the same amount of iron), for 6 months.[48]

However, both interventions significantly reduced the risk of anemia, when compared with the control group that was provided only folic acid (400 μg of folic acid).

Finally, a large trial (WINGs) with 13,500 Indian women studied the effect of a package of interventions (including MMS with 29 micronutrients and other interventions) delivered from preconception through early childhood, in 4 groups: 1) preconception, pregnancy and early childhood; 2) preconception only; 3) pregnancy and early childhood; 4) control: no preconception interventions, and routine pregnancy and early childhood care. Compared to the groups that did not receive preconception interventions (3 and 4), the groups with preconception interventions (1 and 2) had a significant reduction in low birthweight (by 15%), SGA (by 13%) and stunting at birth (by 19%), but not thereafter.[49] However, it is not possible to separate the specific effect of MMS from all the concomitant preconception interventions.

Only 3 trials included in these systematic reviews were conducted in high income countries, using different formulations than UNIMMAP MMS, which are not described here (outside the scope of this review).

RECENTLY COMPLETED OR ONGOING TRIALS ASSESSING THE USE OF MMS DURING PRECONCEPTION, IN LMICS

Appendix Table 4 describes the two ongoing or recently completed trials awaiting full publication.

One major trial with more than 4000 Bangladeshi primigravid women (JiVitA-5 Trial) compared daily UNIMMAP MMS from preconception to 12 weeks of gestation vs. placebo, after which all women switched to open label MMS through 3 months postpartum following an earlier trial in the same study population in which MMS versus IFA starting late in the 1st trimester had reduced low birth weight, preterm birth and stillbirth by 11-15%.[50] A conference abstract reports that the intervention, when started before women's last menstrual period, reduced miscarriage (up to 24 weeks) by 23% (RR: 0.77, 95% CI 0.63-0.95), with no effects on stillbirth or preterm birth (<37 weeks).[51]

To our knowledge, this is the only study that provided MMS during pregnancy in both intervention and control arms; thus, any difference between groups can be attributed to the effect of MMS provided during the periconceptional period. **This unique study design provides an answer to the question on the benefits of starting MMS during preconception, compared to starting MMS in pregnancy** (usually at the end of the first trimester or early in the second trimester).

Another ongoing trial is testing a 5-month preconception educational intervention alongside daily MMS during preconception and pregnancy (i.e. three bottles of MMS, with 180 tablets each, provided for 18 months) in Nepal,[52] compared to the standard of care; the results of this trial will not be available until 2029.

BARRIERS AND FACILITATORS TO PRECONCEPTION MMS ADHERENCE

We found a qualitative study (as part of an RCT) that explored facilitators and barriers to adherence to preconception MMS (composition not specified, except that it contained 27 mg of iron) and identified strategies for improving adherence in non-pregnant women of reproductive age in South Africa.

Facilitators included family support, interaction with community health workers, easy access to MMS, and experienced benefits of MMS.[53] In contrast, a lack of family support, the link of supplements with antenatal care, and doubts about the benefits were reported as barriers to supplementation adherence. Participants also expressed concerns about supplements being linked to medication and the stigma around medication, and difficulties in following the supplementation schedule. The authors concluded that for successful preconception MMS interventions, young women, their families, and communities need to be convinced of the value of supplementation.[53]

FINAL CONSIDERATIONS, CONCLUSIONS AND FUTURE RESEARCH

The evidence on the benefits of MMS is clear for pregnant women, the primary target population for this intervention. In contrast, high-quality evidence on the benefits of preconception MMS is still very limited. Findings from this review suggest that preconception MMS may improve maternal and infant micronutrient status, and some birth and child development outcomes. However, effects vary across studies and it's important to acknowledge the heterogeneity in duration and frequency of supplementation and supplement composition, the nature of the control group (placebo, folic acid, or iron–folic acid) and the presence of co-interventions.

Only one identified trial (JiVitA-5) has a study design that directly addresses the question on the additional benefits of starting MMS during preconception (vs during pregnacy), and the results (from a conference abstract, to be interpreted as preliminary until full peer-reviewed publication is available) show a significant reduction in miscarriages, with no additional improvements in birth outcomes.

More direct clinical evidence using similar study designs is needed to confirm these findings and determine whether preconception MMS offers meaningful advantages beyond supplementation starting early in pregnancy for women in LMICs.

In addition, there is a need for implementation research on feasibility (including delivery platforms, particularly in rural settings), adherence and cost effectiveness of providing MMS during the preconception period, to ensure the most vulnerable and high-risk women reach a state of nutritional adequacy before entering pregnancy. High-risk and priority groups are likely to include women with short inter-birth spacing, married adolescent girls and women living in settings with a high prevalence of nutritional deficiencies.

To reach women with unplanned pregnancies (representing 45% of all pregnancies[54]) and those not accessing health systems, population level interventions such as food fortification, nutrition education, and social behavior change are required.[55]

Nevertheless, in many settings, fortification programs have poor coverage and/or low consumption of fortified foods,[56,57] whereas even in countries with high quality programs in place, these fortification programs alone are never designed to be the sole solution to meet recommended nutrient intakes for women of reproductive age. More evidence and guidance on the use of MMS during the preconception period is therefore urgently required, while MMS programs should prioritize pregnant women.

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APPENDICES

Appendix Table 1 – Summary of trials providing UNIMMAP MMS in preconception, in LMICs

Trial (and associated publications); ROB	Population	Intervention	Duration of preconception intervention	Control	Findings
MMS during preconception, then IFA during pregnancy					
PMMST trial[29,31,32] (Gulati, 2009; Khulan, 2012; Owens, 2015) Mostly low ROB for Owens (Das, 2024) but Overall highROB for Khulan/Cupper (Ali, 2025)	Non-pregnant women (17-45 y), The Gambia N = 376	Daily UNIMMAP in preconception; IFA (60 mg of elemental iron and 250 µg of folate) once pregnant	Up to 12-14 mo (until pregnancy)	Daily placebo in preconception; IFA (60 mg of elemental iron and 250 µg of folate) once pregnant	MMS **increased hemoglobin (Hb) concentrations** (MD: 0.6g/dL overall, and 1.2g/dL in anemic participants) and **reduced the risk of anemia by 41%, 12 mo after supplementation initiation** (Gulati, 2009); had positive effects on **newborn whole genome methylation patterns** (Khulan, 2012). **Placental vascular function** was modifiable by periconceptional micronutrient supplementation but did not further affect other variables of placental function (Owens 2015).
MMS during preconception and pregnancy (or pregnancy and postpartum)					
Sumarmi, 2015 and Surnami, 2017 (abstract)[33,34] Overall high ROB (Ali, 2025)	Newly married women (16-35 y) Indonesia N = 115	UNIMMAP MMS every 2 days in preconception; daily when pregnant	2-6 months before pregnancy	Placebo during preconception; daily IFA (60 mg iron and 250 µg folic acid (FA) when pregnant	MMS significantly **improved fetal survival** (>37 wks: 96.2% vs 81.8%; OR = 6) and resulted in a non significantly higher umbilical cord IGF-1 concentration, p=0.07 (Sumarmi, 2015); also resulted in a significantly **higher human placental lactogen, placental weight and birth weight** (Sumarmi, 2017).
Widasari (2019; 2020)[35,36] Overall high ROB (Ali, 2025)	Non-pregnant women Indonesia N = 19	UNIMMAP MMS during preconception*; daily UNIMMAP MMS during pregnancy	Not reported	IFA (250 µg of FA, iron 200 mg) during preconception*; daily IFA during pregnancy	MMS resulted in significantly **higher birth weight, by 193 g** (Widasari, 2019) and **length, by 1.64 cm** (Widasari, 2020). *Note: very small sample size and publication is difficult to understand.*
Baxter, 2025[39]	Non-pregnant women (15-23 y) Pakistan N = 186	UNIMMAP MMS twice-weekly during preconception; daily during pregnancy and postpartum (6 mo)	Maximum of 2 years	SOC (daily IFA during pregnancy and postpartum)	MMS **increased milk iodine (MD 45 µg/L) and vitamin A (MD 1.5 µg/g fat)** concentrations, but not vitamins B12 or E, nor folate, and did not improve infant growth.

* weekly if not menstruating; daily in menstruation. ROB = Risk of Bias, if applicable (as assessed by the systematic reviews Das, 2024[26] and Ali, 2025[27])

Appendix Table 2 – Summary of trials providing UNIMMAP MMS-like formulations in preconception, in LMICs

Trial (and associated publications); ROB	Population	Intervention	Duration of preconception intervention	Control	Findings
MMS during preconception, then IFA during pregnancy					
PRECONCEPT trial [40,41,42,43,44] (Ramakrishnan, 2016; Nguyen, 2016, 2017 a), 2017 b), 2021) Overall low ROB (Ali, 2025) Mostly low ROB (Das, 2024)	Married women (18-40 y) Vietnam N = 5011	1) weekly preconception MMS* (60 mg of iron), followed by daily IFA (60 mg Fe + 400 mg folic acid (FA) during pregnancy 2) weekly IFA (60 mg Fe and 2800 µg FA); followed by daily IFA (60 mg Fe + 400 mg FA) during pregnancy	Maximum of 2 years	Weekly preconception FA (2800 µg), followed by daily IFA (60 mg Fe + 400 mg FA) during pregnancy	Compared to FA, **weekly MMS or IFA** before conception: • did not affect birth outcomes (infant weight, preterm, SGA) compared with FA (Ramakrishnan, 2016), • had **modest increases in maternal (first prenatal visit and 3 mo postpartum) and infant iron stores at birth**, without impacting anemia (Nguyen 2016), • **had higher length for age z-score (LAZ) (MD 0.1 in MMS; 0.14 in IFA) and reduced stunting (by 12% in MMS and 13% in IFA) at 2 y** (Nguyen, 2017 a)); IFA had **improved (fine) motor development** • had no effect on postpartum depressive symptoms, but **benefited women (lower mean EPDS scores) in 1st and 2nd trimesters) at risk for depression** (Nguyen, 2017 b)) **Compared to FA**, **MMS** (not IFA) improved certain domains of **intellectual functioning*** at 6 years of age** (Nguyen, 2021).
MMS + B12 during preconception and pregnancy (or pregnancy and postpartum)					
PRIYA Trial [45] (D'souza, 2021)	Married non-pregnant adolescent girls (~17 y) India N = 74	1) daily B12 (2 µg/day) + daily MMS**, during preconception and pregnancy 2) daily B12 alone (2 µg/day), during preconception and pregnancy Both groups received government mandated IFA	For at least 3 years or until the birth of their first child	Placebo (includes government mandated IFA: preconception weekly 100 mg iron + 500 µg of folic acid, followed by daily IFA during pregnancy)	**Daily MMS combined with a vitamin B12 tablet improved serum B12 levels** during pre-conception and pregnancy (at 28 wks, mean (pM) = 134 control vs 164 MMS+B12 vs 204 B12 only), which was reflected in **higher cord blood holotranscobalamin (holo-TC) levels** (mean (pM) = 40.7 control vs 79.4 MMS+B12 vs 96.1 B12 only), but no differences were seen in neurodevelopmental outcomes at 2 years of age.

*Similar to UNIMMAP MMS but 2800 µg FA, 60 mg iron, and a higher amount of Vitamin D (600 IU) to be consistent with the recent IOM recommendations.
**Included micronutrients are similar, but the doses are ~50% of the RDAs. Iron and folic acid were excluded due to government mandated IFA.
*** FSIQ (β = 1.7; 95% CI: 0.1, 3.3), Working Memory Index (WMI) (β = 1.7; 95% CI: 0.2, 3.2), and PSI (Processing Speed Index) (β = 2.5; 95% CI: 0.9, 4.1)
ROB = Risk of Bias, if applicable (as assessed by the systematic reviews Das, 2024[26] and Ali, 2025[27])

Appendix Table 3 – Summary of trials providing other MMS formulations (containing 10 to 29 micronutrients) in preconception, in LMICs

Trial (and associated publications); ROB	Population	Intervention	Duration of preconception intervention	Control	Findings
ICMR, 2000[46] Some concerns/ROB (Ali, 2025)	Women with history of giving birth to a child with open neural tube defect (NTD) India N = 466	Daily MMS (with 11 micronutrients (MN) and 4 mg of folic acid (FA)) during preconception and pregnancy (3 mo)	At least one month prior to conception and until 3 mo after conception	Placebo (iron and calcium)	The recurrence of open NTD in the MMS group was 2.92% compared to 7.04% in the placebo group, but the difference was not statistically significant.
Moriarty-Craige, 2004[47] Some concerns/ROB (Ali, 2025)	Non-pregnant women Mexico N = 152	MMS (14 MN, with 60 mg of iron) 6 days/wk during preconception only	12 weeks	Iron (60 mg) 6 days/wk	Changes in hemoglobin (Hb) were not significantly different between groups. However, the change in Hb in anemic subjects was greater in the control group than in the MMS group.
Gunaratna, 2015[48] Overall low ROB (Ali, 2025)	Non-pregnant women and adolescent girls (15–29 y) Tanzania N = 802	1) daily IFA (30mg iron + 400 µg FA) 2) daily MMS (with 30 mg iron, 10 MN at ~ 1 RDA) for 6 mo During preconception only	6 months	FA (400 µg)	Hb levels were not different across treatments. However, compared with the FA arm, there was a **significant reduction in the risk of hypochromic microcytic anemia in the IFA arm (by 39%) and the MMS arm (by 33%).**
WINGS trial[49] (Taneja, 2022) Mostly low ROB (Das, 2024)	Married women (18-30y) with no or one child India N = 13,500	Package of interventions:* 1) Preconception, pregnancy and early childhood interventions 2) Preconception interventions only (followed by SOC in pregnancy**) 3) Pregnancy and early childhood interventions	Until confirmed pregnancy or until 18 months of follow up	No preconception interventions, and routine pregnancy and early childhood care scheme**	Compared to "no preconception" groups (group 3 and control group), the preconception groups (groups 1 and 2) had a **significant reduction in low birthweight (RR 0.85), SGA (0.85), and stunting at birth (0.81)**, with no differences observed on anthropometric outcomes assessed at 24 months of age.

*Preconception interventions: weekly IFA, MMS with 29 MN 3x/wk, eggs/milk if BMI <21 kg/m^2, screening and treatment for malnutrition and anemia, psychosocial support, and WaSH.
Pregnancy and postpartum interventions: daily MMS with 29 MN + IFA, calcium, and vit D; locally prepared snacks, milk 6 days/wk., an additional weekly BEP if BMI < 25 kg/m^2, psychosocial support, and WaSH.
**Weekly IFA for those without anemia during preconception; daily IFA, calcium, and vit D during pregnancy and postpartum + supplementary foods through the ICDS scheme
ROB = Risk of Bias, if applicable (as assessed by the systematic reviews Das, 2024[26] and Ali, 2025[27])

Appendix Table 4 – Summary of ongoing or recently completed trials providing UNIMMAP MMS in preconception, in LMICs

Trial (and associated publications)	Population	Intervention	Control	Outcomes assessed or findings (if available)
MMS during preconception and pregnancy (or pregnancy and postpartum)				
JiVitA-5 trial[51] West, 2023 (published conference abstract)	Primigravid women in rural Bangladesh N = 4269	Daily UNIMMAP MMS from preconception to 12-weeks gestation. By the end of the 1st trimester, all women were switched to open label MMS through 3 months postpartum	Daily placebo until the 1st trimester, then switched to open label MMS through 3 months postpartum	Miscarriage rate was 11.3% and 8.9% in the placebo and MMS groups respectively. **MMS reduced the risk of miscarriage (<24 wks) by 23%** (RR: 0.77, 95% CI 0.63-0.95). No apparent effect on stillbirth or preterm birth (<37 weeks). *"Nutrients of interest include vitamins E and D, both widely deficient in rural South Asia and associated with risk of miscarriage"*.
Diamond-Smith, 2025 (ongoing)[52]	Primigravid women in Nepal N = unknown	Educational group intervention (Sumadhur) for 5 months + UNIMMAP MMS for ~ 18 months (3 x 180 tablets)	SOC (MMS will be freely available at primary health centers in control villages)	**Outcomes**: Primary: change in the prevalence of anemia and deficiency/insufficiency in micronutrients (iron, folate and vitamin B12) Secondary: reproductive behaviours, birth outcomes and intrahousehold relationship dynamics.

Scan for Translations in French and Portuguese

Suggested citation: Multiple Micronutrient Supplementation Technical Advisory Group (MMS TAG). *Technical brief: multiple micronutrient supplementation during preconception in low- and middle-income countries.* Washington, DC: Micronutrient Forum; 2026.

ABOUT HMHB

The Healthy Mothers Healthy Babies Consortium (HMHB), hosted by the **Micronutrient Forum,** is the central platform for evidence, knowledge, collaboration, and advocacy in maternal nutrition. HMHB accelerates progress by fostering collective action on critical priority interventions such as multiple micronutrient supplementation (MMS) and balanced energy and protein (BEP) dietary supplementation, proven strategies to improve maternal and newborn health outcomes, particularly in low- and middle-income countries (LMICs). Comprising over 500 individuals and organizations, HMHB also hosts Technical Advisory Groups (TAGs) on **MMS** and **BEP,** bringing together experts in nutrition, maternal health, and public health to interpret evidence, identify knowledge gaps, and provide guidance to governments, NGOs, and partners.

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