European Commission

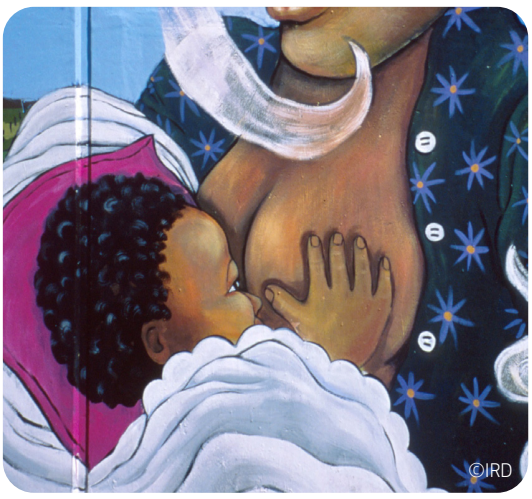
LONG-TERM EFFECTS ON CHILD COGNITIVE DEVELOPMENT OF MULTIPLE MICRONUTRIENT SUPPLEMENTATION FROM PREGNANCY TO EARLY CHILDHOOD: EVIDENCE IS INSUFFICIENT

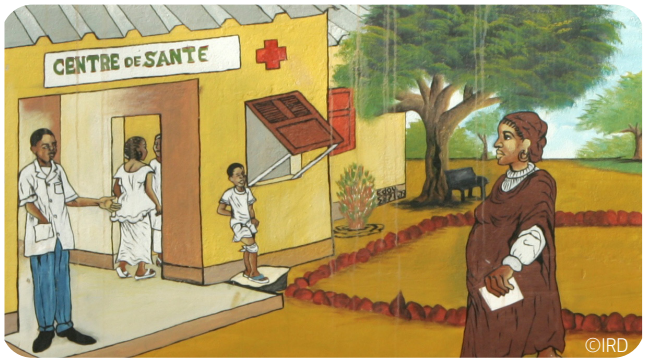
Nutrition Research Facility - March 2025

Micronutrient deficiencies remain widespread in low- and middle-income countries (LMICs), particularly among women and young children. Iron deficiency anaemia affects 37% of pregnant women globally , and interventions based on iron and folic acid (IFA) or multiple micronutrient (MMN) supplementation are implemented to address this public health challenge.

Because vitamins and minerals play a critical role in foetal growth and early brain development, the World Health Organisation (WHO) has long recommended IFA supplementation during pregnancy, as well as food supplementation with micronutrient powders (MNP) for young children (6-23 months) and children (2-12 years old).

Recent evidence suggests that replacing IFA with MMN during pregnancy could further improve birth weight. In 2020, the WHO has thus updated its guidance on MMN supplementation during pregnancy from "not recommended" to "recommended in the context of rigorous research ", as there are still a lot of uncertainties about other birth outcomes and the cost-efficiency of such an approach. There is a significant knowledge gap on the long-term impact of MMN supplementation on child cognitive development, which needs to be monitored.





As part of the Knowledge and Research for Nutrition project funded by the European Union, the Nutrition Research Facility has undertaken a systematic review of published studies to assess current evidence on the long-term effects on child cognitive development of MMN supplementation during pregnancy and early childhood.

The review found that:

- Evidence of micronutrient supplementation in its current formulation on cognitive health is limited. Eleven interventions covering 8,576 children fitted the criteria to be included in the review, but only 3 interventions covering 5,077 children assessed the UNIMMAP supplementation.
- Most tests measuring cognitive capacities of children aged 4-14 years (26 out of 36) did not show a significant difference between those who received MMN supplementation (during the foetal stage and/ or early childhood) and those who were in the control groups (who received IFA, zinc, vitamin A, placebo, or no supplementation).
- A positive effect was reported on procedural memory (one study on maternal MMN supplementation), intelligence (one study on maternal MMN supplementation), executive function (one study on early childhood supplementation), and pre-academic skills (one study on early childhood supplementation). However, a negative effect was reported in 6 tests, though these findings should be interpreted with caution as they come from two studies with methodological concerns).

[1] WHO, 2019 (https://www.who.int/news-room/fact-sheets/detail/anaemia)
[1] WHO, 2020 (https://iris.who.int/bitstream/handle/10665/333561/9789240007789-eng.pdf?sequence=1)

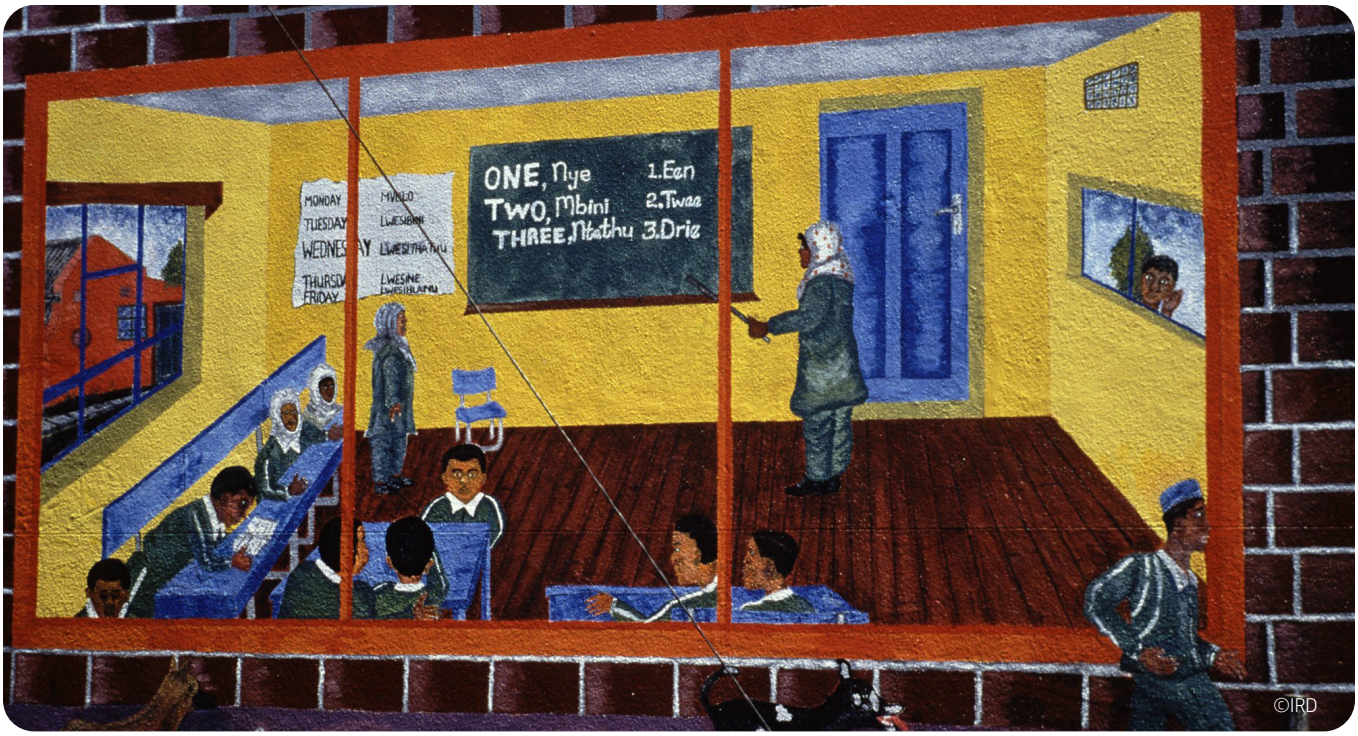
Overall, no clear and consistent effect on cognitive health emerges from existing studies. To date, there is not enough evidence to draw a strong conclusion about the long-term effect on child cognitive development of MMN supplementation during pregnancy and early childhood.

At this stage, several factors contribute to explain the lack of observation of significant and consistent effects:

- Cognitive development is shaped by a broad set of factors - health, nutrition, caregiving, education - which are difficult to control and were not consistently accounted for across the reviewed studies.
- The formulations differ, and the supplementation duration may have been too short. Additionally, the effects may have been measured too early after the intervention to detect significant changes.
- There are not enough studies and most studies are not designed to detect subtle and long-term effects in cognition.
- There may be a dilution effect since the interventions did not specifically focus on mothers with micronutrient deficiencies, for whom the effect on the children may be higher than for the general population.

While MMN supplementation and point-of-use fortification provide health benefits, their long-term effects on child cognitive development remain inconclusive. More rigorous, well-designed research is needed to determine whether MMN supplementation during pregnancy and early childhood can lead to sustained cognitive gains. Future studies should employ randomized controlled trial designs with sample sizes adequately powered to detect changes in cognitive scores. These studies should assess outcomes at multiple developmental stages, including childhood, early adolescence, and late adolescence, to capture the varying trajectories of cognitive development. This aligns fully with WHO's recommendation to replace IFA with MMN during pregnancy in the context of rigorous research, as well as the use of point-of-use MNPs during childhood and adolescence.

The European Commission and donors should continue to support MMN and MNP programs where appropriate, while prioritizing future funding for studies that explicitly assess long-term developmental outcomes.



This policy brief was produced by the Nutrition Research Facility, as part of the Knowledge and Research for Nutrition project of the European Commission.

For more information:
https://www.nutrition-research-facility-studies.eu/micronutrient-supplementation

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