Multiplex Platforms to Assess Indicators of Micronutrient Status, Inflammation and Infectious Disease

Grand Challenges

Request for Proposals

Applications due no later than September 8, 2026, 11:30 a.m. U.S. Pacific Time

Before applying to this Grand Challenges request for proposals (RFP), applicants should familiarize themselves with the supporting documents, including the terms and conditions of the Gates Foundation, the Rules and Guidelines, Application Instructions, and Frequently Asked Questions (FAQs).

If you plan to apply to this RFP, we will host a dedicated webinar on August 11, 2026, 7:00-8:00 a.m. US PDT. The session will provide an overview of the RFP and include time for questions. To attend, please register and submit your questions in advance. A recording will be posted on the challenge page following the session for those unable to join live.

Background

Vitamins and minerals, collectively referred to as micronutrients), play essential roles in human metabolism and are required for physical growth, cognitive development, immune function, and the recovery from infection. Micronutrient deficiencies, particularly among vulnerable groups in low- and middle-income countries (chiefly women of child-bearing age, especially during pregnancy and lactation, preschool-age children and older adults), constrain social and economic development and limit progress toward good health and well-being. These deficiencies may arise from insufficient dietary intake, from concurrent disease or parasitism, or from genetic traits that affect MN metabolism. Diagnosing their causes, magnitude, severity, and population prevalence is essential for designing appropriate treatments and interventions, and for monitoring their effectiveness and safety.

Over the past fifty years, progress against several long-standing micronutrient deficiencies has been substantial. Goiter and cognitive impairment caused by iodine deficiency have largely disappeared with iodized salt and iodine supplementation in animal feed; survival and resistance to infection have improved through correction of vitamin A deficiency; and neural tube defects have fallen in many high-income countries through folic acid fortification and supplementation. Progress against iron deficiency and anemia has been more modest, in part because infection and inflammation impair iron absorption and utilization. Micronutrient status must therefore be assessed together with biomarkers of infection and inflammation. There is also a need to add bioindicators for micronutrients that are infrequently assessed but central to physiology: vitamins B2 and B12, for example, are essential for the conversion of folic acid into folate (the active form of vitamin B9) and for combined action as catalyzers of many enzymatic reactions. In non-affluent populations, B2 or B12 deficiency may be as important as B9 deficiency.

Recent advances in immunological and molecular recognition technologies allow several bioindicators to be measured simultaneously. For example, the Quansys multiplex kit measures several analytes (soluble transferrin receptor, ferritin, retinol binding protein, thyroglobulin and the acute-phase proteins CRP and AGP) in a single microplate well. This is possible because these analytes are immunogenic proteins for which specific antibodies can be generated. Extending this approach to less immunogenic bioindicators may now be feasible using other analyte-binding molecules, such as folate-binding protein from milk or porcine plasma, the B12 intrinsic factor, and synthetic nucleotide sequences, including RNA or DNA) aptamers that bind small molecules. This Grand Challenge seeks novel approaches to extend analytical coverage, improve sensitivity and specificity, simplify measurement, reduce cost, and enable frequent monitoring of micronutrient status by local institutions. A multiplex assay works only for analytes of similar chemical nature and concentration, so the wider micronutrient panel under discussion for the MNBI (for example zinc, vitamin C and vitamin D) cannot simply be folded into a single platform; those analytes require different detection principles and belong to separate future workstreams. No single platform is expected to carry every analyte, and this challenge focuses on the multiplex-compatible set, allowing a complementary, separate plate where needed (for example, red-blood-cell folate).

The Challenge

Although combined immunological measurement of several micronutrient biomarkers has been demonstrated, current methods still have important limitations. These include heterogeneity in the composition of standards and controls; inconsistent batch-to-batch performance of analyte-binding molecules; variable reactivity for some analytes, especially soluble transferrin receptor (sTfR); and a functional analytical range that is too narrow to cover the physiological values of some analytes, such as CRP. It would also be valuable to add bioindicators for vitamins B1, B2, B9 and B12, which may require binding molecules that recognize metabolites or proteins associated with deficiency, a specific vitamer (plasma methyl-tetrahydrofolate without reacting with folic acid), comparable reactivity across vitamers (several folate forms in red blood cells), or a specific carrier-protein form (holo-transcobalamin rather than apo-transcobalamin or haptocorrin for vitamin B12).

The improved assays must combine high analytical specificity, sensitivity and robustness with a functional analytical range matched to the physiological values expected in the target populations (women of reproductive age, including during pregnancy and lactation, preschool-age children and older adults). Assays must remain low-cost (no more than US$20 for all analytes measured in duplicate) and require very small sample volumes, preferably less than 10 µL of plasma or serum). The tests are intended for population surveillance rather than local clinical (point-of-care) use. They should be designed to run many samples in a single batch in a small number of national or regional reference laboratories. The goal is to reduce dependence on expensive, infrequent population surveys and on export of samples to specialized laboratories in high-income settings.

This challenge is structured around two alternatives, a minimum-scope approach and an optimistic-scope approach. Targets are aligned with the candidate Target Product Profile for this platform, and applicants will be held to the relevant performance, cost and instrument targets.

Parameter	Alternative A — Minimum scope	Alternative B — Optimistic scope
Analyte panel	Strengthen and modestly extend the current multiplex test. Measure: soluble transferrin receptor, ferritin, RBP4, thyroglobulin, plasma methyl-tetrahydrofolate (without cross-reactivity with folic acid; a complementary folic-acid-specific test may be proposed), holo-transcobalamin (without cross-reactivity with apo-transcobalamin and all-haptocorrin), CRP and AGP.	All Alternative A analytes, plus metabolites or proteins associated with vitamin B1 and B2 deficiency, and thyroid hormones. A complementary test for whole-folate vitamers in red blood cells may also be included, on a separate microtiter platform if needed.
Sample volume	≤10 µL plasma/serum	≤5 µL plasma/serum. Other specimen types, such as dried blood spots (DBS), may also be addressed as optimistic scope; see note below. Response (not optimization) in twice that volume of whole blood from the same individuals should also be measured and reported, together with hematocrit.
Analytical Precision (CV)	<20% CV total; <15% within-run at the functional analytical sensitivity covering the expected physiological range of each analyte	<10% CV total; <8% within-run at the functional analytical sensitivity covering the expected physiological range of each analyte
Analytical sensitivity (LoD)	sTfR: 2–30 mg/L Ferritin: 5–100 µg/L RBP4: 0.3–3.0 µmol/L Thyroglobulin: 10–100 µg/L Methyl-THF: 5–50 nmol/L Holo-transcobalamin: to be defined CRP: 1–30 mg/L AGP: 0.5–5 g/L	sTfR: 1–40 mg/L Ferritin: 2–200 µg/L RBP4: 0.2–4.0 µmol/L Thyroglobulin: 5–300 µg/L Methyl-THF: 2–100 nmol/L RBC folate: 100–2000 nmol/L Holo-transcobalamin: to be defined CRP: 1–50 mg/L AGP: 0.25–5 g/L Thyroid hormones, B1, B2: as required for satisfactory diagnostic performance

Parameter	Alternative A — Minimum scope	Alternative B — Optimistic scope
Accuracy (Bias / Trueness)	≤ 10% bias across the measuring range for all target analytes when tested against certified reference materials	≤ 5% bias across the measuring range for all target analytes when tested against certified reference materials
Concordance	≥90% concordance when measured against, validated laboratory immunoassays or analytical gold standard methods, for all target analytes	≥95% concordance when measured against, validated laboratory immunoassays or analytical gold standard methods, for all target analytes
Cost target	≤US$20 per sample for all analytes measured in duplicate (i.e., 2 wells). This ceiling is per sample for the full panel in duplicate, not per analyte.	≤US$20 per sample for all analytes measured in duplicate (i.e., 2 wells). Optimistic stretch goal: ≤US$10 per sample for the full panel in duplicate.
Instrument	Bench-top signal-detection device, ≤US$30,000 per unit.	Bench-top signal-detection device, ≤US$25,000 per unit.
Funding & term	Awards up to US$200,000 per project; grant term up to 12 months.	Awards up to US$800,000 per project; grant term up to 24 months. Budgets and terms evaluated per project and commensurate with scope.

Note on dried blood spots: application of these assays to dried blood spots is a distinct downstream study to be undertaken once the tests are developed, and is not part of the core development scope of either alternative. Sample-volume targets are included to keep this pathway open. Applicants with an integrated, DBS-capable approach may optionally submit DBS-readiness data; such data are invited but will not be scored.

Specifically, the objectives of this challenge are to:

- **Improve the current multiplex test for immunological determination of nutritional-status analytes**, overcoming standard heterogeneity, widening the functional analytical range to the expected physiological values, and maintaining simplicity and low cost (Alternatives A and B).
- **Extend the panel to bioindicators of vitamins B9 and B12** by introducing novel binding molecules (Alternatives A and B).
- **Measure the nutritional status of vitamins B1 and B2** using metabolites or proteins associated with their deficiency (Alternative B).
- **Develop an immunological or other binding-based test for total folate in red blood cells that gives** results comparable to the microbiological assay, and maintain accuracy

and precision from small plasma/serum volumes to enable later application to dried blood spots (Alternative B).

- Maintain accuracy and precision using small plasma or serum volumes in order to enable later application to dried blood spots.

Funding Level

Awards depend on the alternative proposed:

- **Alternative A (minimum scope):** awards up to US$200,000 per project, with a grant term of up to 12 months.
- **Alternative B (optimistic scope):** awards up to US$800,000 per project, with a grant term of up to 24 months, evaluated per project.

Application budgets should be commensurate with the scope of work proposed. Indirect costs may be included in the budget, up to a maximum of 15% of the total budget (subject to the Gates Foundation's indirect cost policy).

Eligibility Criteria

This initiative is open to nonprofit organizations, for-profit companies, international organizations, government agencies and academic institutions. We particularly encourage applications led by women or in collaboration with women-led organizations, and applications from or in collaboration with institutions based in low- and middle-income countries. Only applicants applying through a legally recognized corporate entity are eligible. Because no single institution is likely to hold all the necessary expertise, collaboration among groups working in human metabolism, biomolecule characterization and immunology is strongly encouraged.

We are looking for proposals that:

- Address a clearly defined analyte, performance or cost target within the scope of this challenge.
- Demonstrate a novel or innovative approach to extending multiplex analytical coverage (e.g., new analyte-binding molecules).
- Demonstrate collaboration and coordination among institutions with complementary expertise.
- Can realistically achieve the objectives within the proposed timeframe.
- Include a feasible implementation plan for low- and middle-income reference laboratories, with attention to affordability and end-user needs.
- Show potential for scalability at low cost and assure the future supply of equipment and reagents.
- Offer ongoing technical assistance and equipment maintenance.

We will not fund proposals that:

- Fall outside the thematic focus of this RFP.
- Offer incremental improvements without meaningful innovation.
- Are commercialization-only efforts.
- Constitute basic research without translational relevance.
- Focus on excluded geographies or populations.