ANAEMIA IN EARLY CHILDHOOD IN COX'S BAZAR

UNDERSTANDING FACTORS ASSOCIATED WITH ANAEMIA TO STRENGTHEN INTEGRATED ACTION FOR ROHINGYA CHILDREN

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AGENDA

1. Why anaemia matters in Cox’s Bazar?
2. Study approach and analytical framework
3. Key findings
4. Understanding the biological and contextual pathways
5. Implications for programming and integration
6. Conclusion and discussion

BACKGROUND

WHY ANAEMIA MATTERS?

- Anaemia remains highly prevalent among Rohingya children
  - About 32% of Rohingya children aged 6-59 months are anaemic
  - Prevalence exceeds 50% among children 6-11 months
- Most cases are mild to moderate, but highly consequential
- Early-life anaemia affects neurodevelopment and immunity
- Increases susceptibility to infection and growth faltering
- Risks are intensified in crowded, high-disease humanitarian settings

WHY A PATHWAY-FOCUSED ANALYSIS WAS NEEDED?

DIFFERENT SETTINGS, DIFFERENT ASSOCIATED PATTERNS

🦟 **Malaria-endemic regions**
Haemolysis & marrow suppression

🪱 **High-helminth Settings**
Chronic blood loss

🍚 **Food-insecure contexts**
Dietary iron inadequacy

🧬 **Hemoglobinopathy-prevalent populations**
Inherited red cell disorders

🔥 **Inflammation-heavy environments**
Iron sequestration (functional deficiency)

🥬 **B12/Folate-deficient contexts**
Impaired red cell production

Anaemia

WHY A PATHWAY-FOCUSED ANALYSIS WAS NEEDED?

- Prevalence figures show how big the problem is, not why it persists
- Anaemia remains high despite extensive nutrition and health support
- Children experience overlapping risks, not single factor
- Frequent illness changes how the body uses iron
- Iron intake alone does not guarantee improved haemoglobin
- Some programme effects are indirect and biologically mediated
- Simple comparisons can underestimate real impacts
- Clearer understanding is needed to guide meaningful action

Understanding local biological patterns is essential for effective and proportionate programming.

STUDY DESIGN

STUDY DESIGN & ANALYTICAL APPROACH

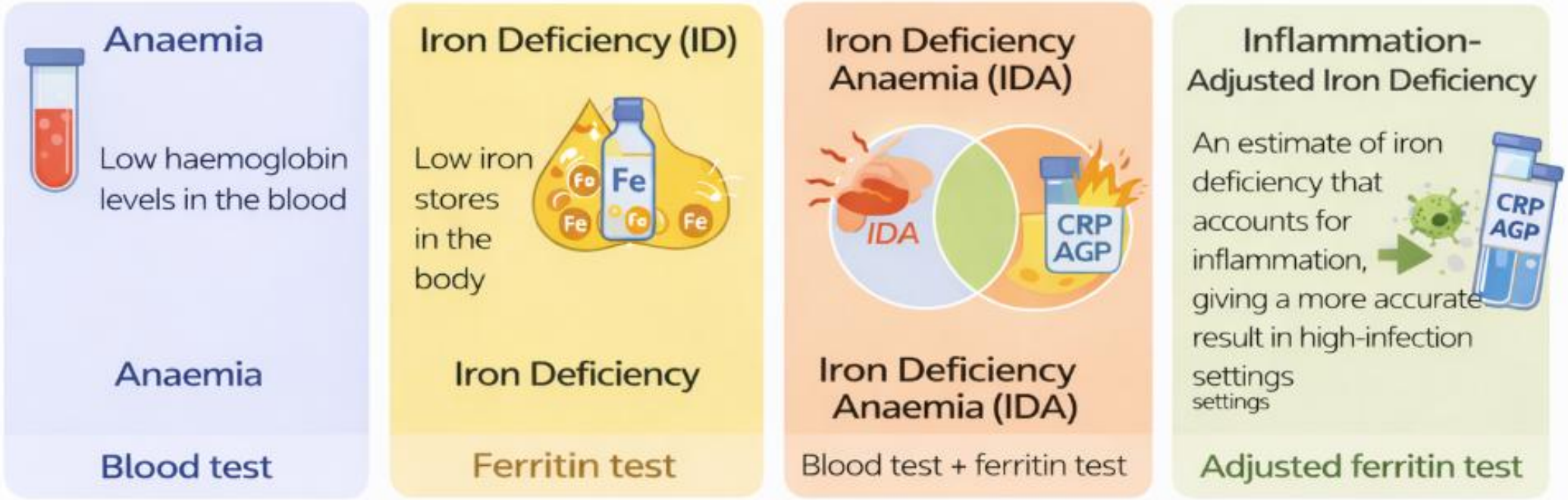
- Mixed-methods, cross-sectional study of children aged 6–59 months
- Conducted across all 33 FDMN camps in Cox’s Bazar
- Quantitative household survey linked to child-level data
- Venous blood biomarkers collected to assess biological mechanisms
- Measured anaemia, iron status, inflammation, and hematological indices
- Qualitative interviews with caregivers and programme stakeholders
- Analysis structured to separate contextual determinants from biological pathways

INDICATORS & SAMPLE SIZE

- Number of Camps = 33
- Number of households sampled = 1,020
- Number of households interviewed = 794
- Number of venous blood samples collected = 933
- Number of KIIs = 18
- Number of KSIs: 10
- Analytes tested Complete Blood Count (CBC), Reticulocyte Count, Total Iron-Binding Capacity (TIBC), Vitamin B12, Serum Ferritin, C-Reactive Protein (CRP), Hb Electrophoresis, Peripheral Blood Smears, Alpha-1-Acid Glycoprotein (AGP).
- Nutritional Indicators (enrollment in BSFP, TFSP, Vitamin A and Iron Supplementation, IYCF indicators)
- Non-nutritional Indicators (Use of ITN, anti-malarial treatment, ACT, WASH indicators, including use of improved drinking water, sanitation facility, etc.)
- Inflammation Indicators (Children with diarrhea, Treatment with ORS, Measles vaccination, and deworming).

KEY FINDINGS

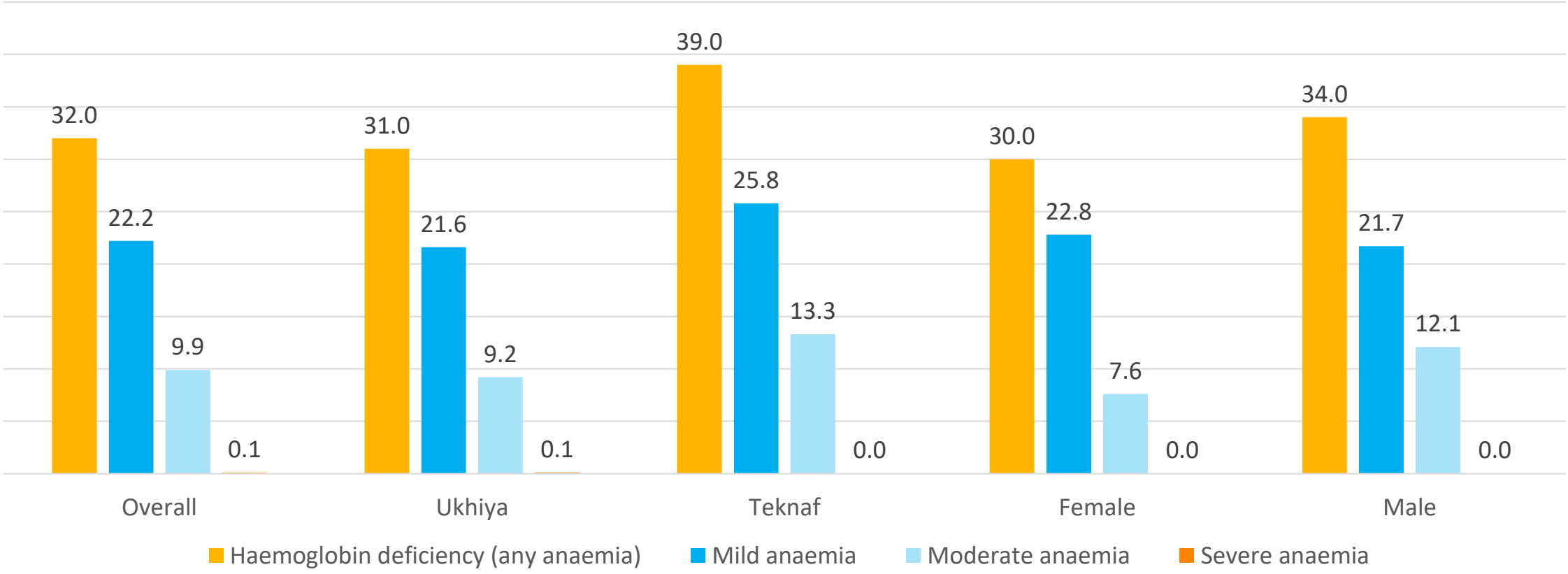
UNDERSTANDING ANAEMIA & IRON DEFICIENCY



Why This Matters

- Infection and inflammation can hide iron deficiency.
- Without adjustment, iron deficiency may be under- or overestimated.
- This is especially important in humanitarian or high-infection settings.

PREVALENCE OF ANAEMIA



KEY TAKEAWAY 1. ANAEMIA IS WIDESPREAD, POPULATION-LEVEL ISSUE

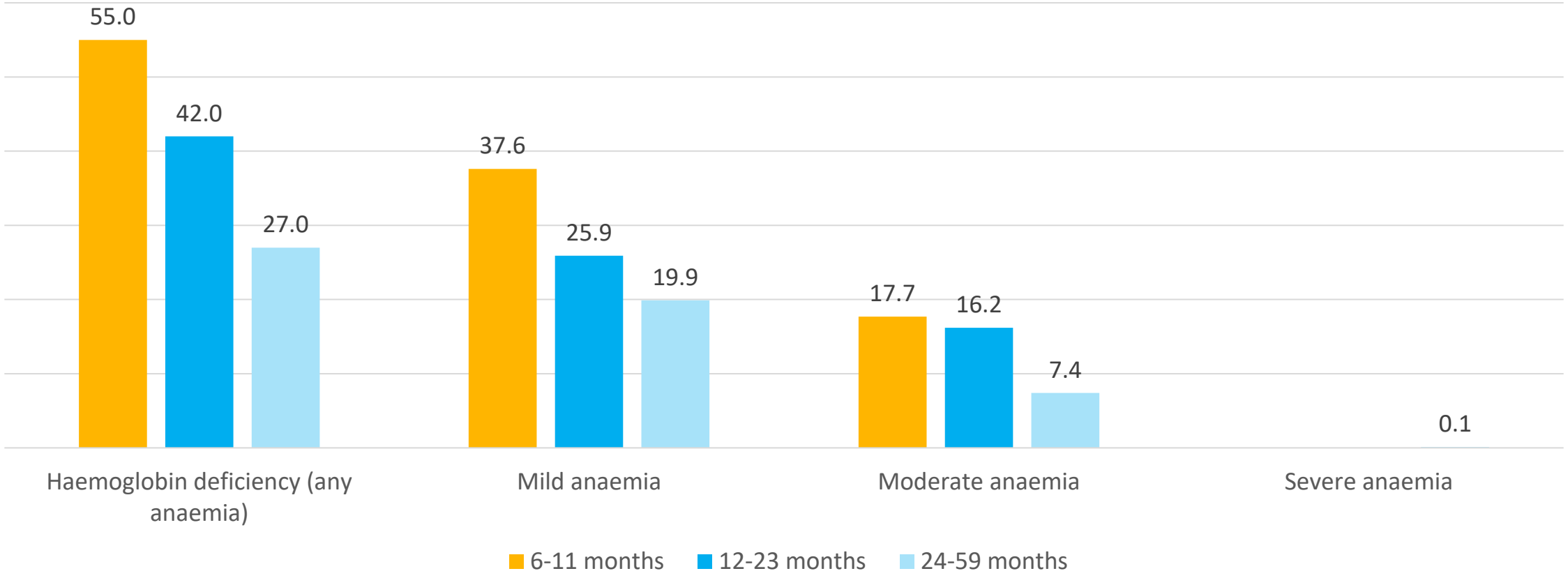
Prevalence
Anaemia affects about one-third of children

Severity
The burden is driven by mild and moderate anaemia, not severe cases

Geography and Gender
Patterns are remarkably consistent across geography and gender

If anaemia looks similar across camps and between boys and girls, the next question is: where is the burden really concentrated?

ANAEMIA BY AGE: WHERE THE BURDEN FALLS



KEY TAKEAWAY 2. AGE, NOT LOCATION OR SEX, IS THE STRONGEST AND MOST CONSISTENT FACTOR ASSOCIATED WITH ANAEMIA.

Early-life onset

Anaemia begins early in life, peaking in infancy. Risk declines after age two, suggesting early-life onset, not accumulation

Children under 2

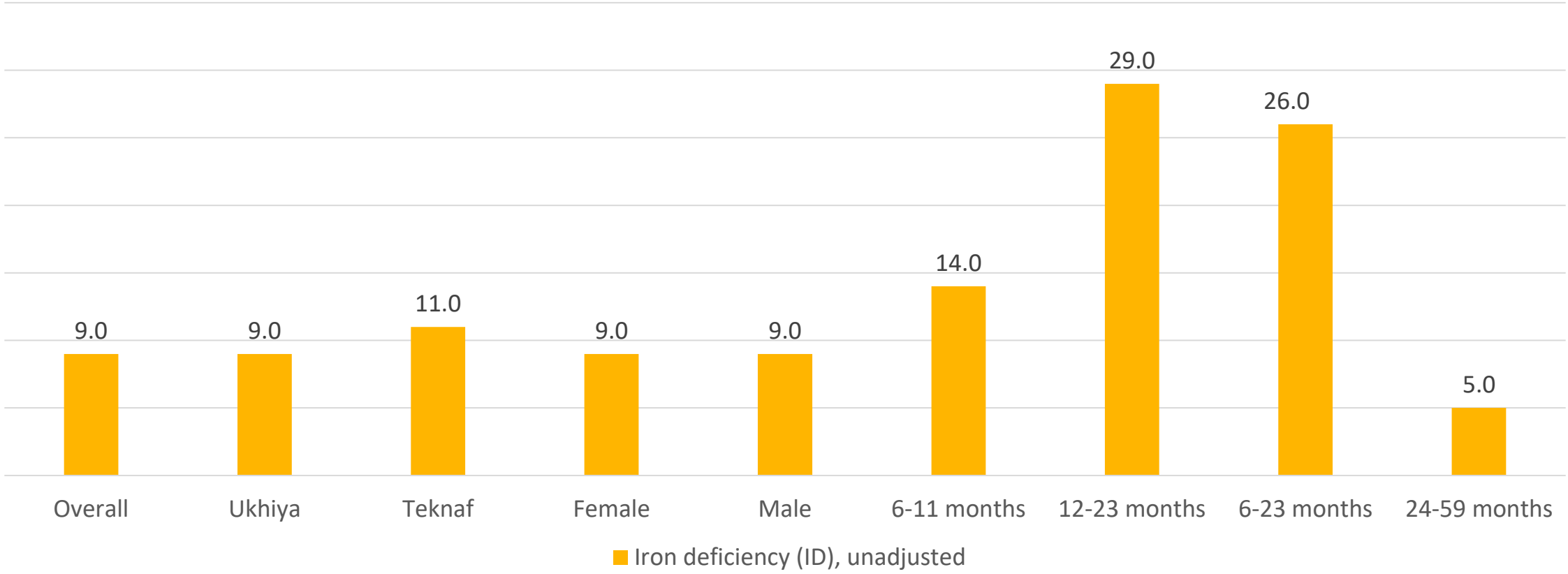
Children under two account for a disproportionate share of the burden

Critical window

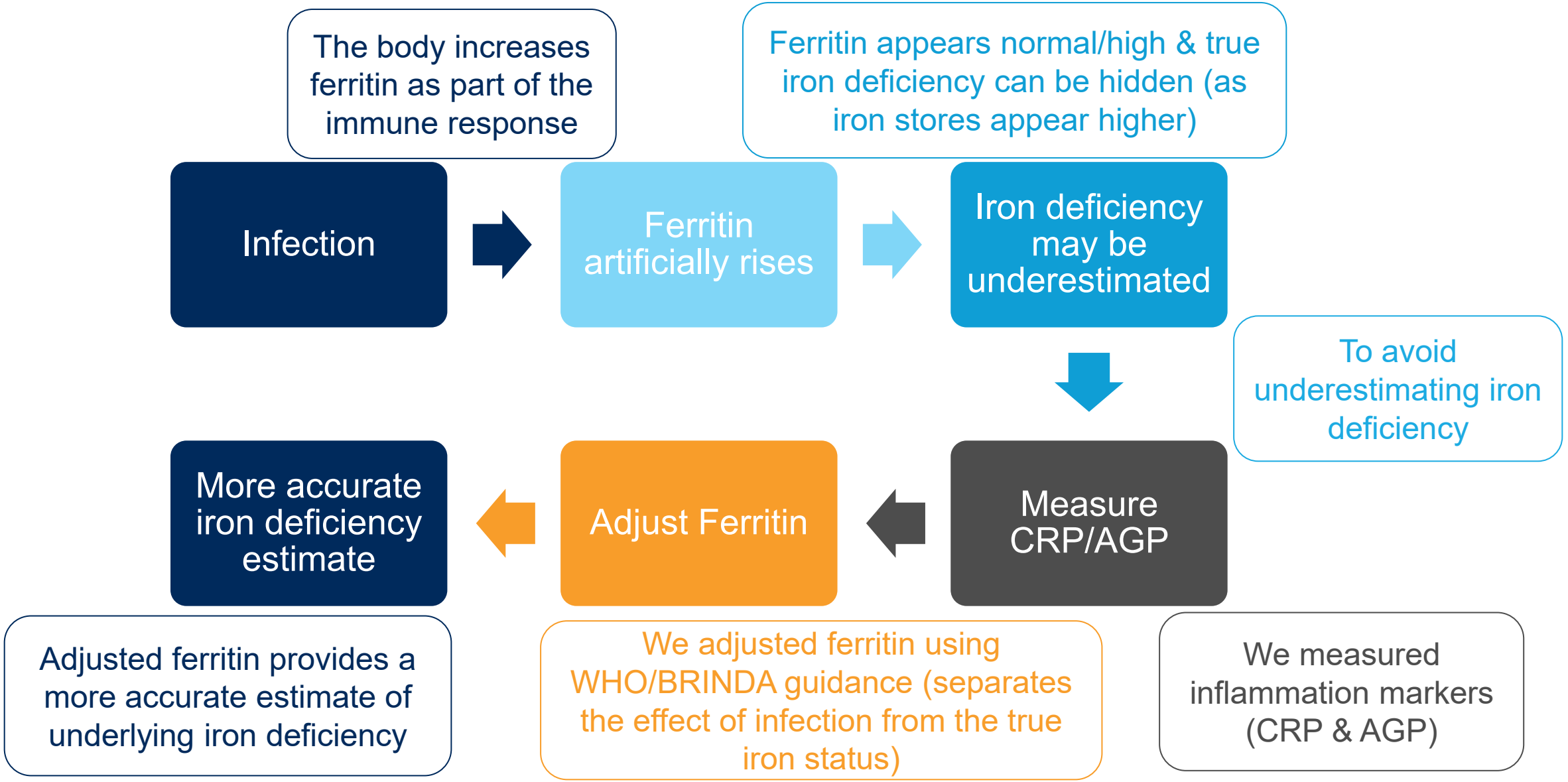
The first two years represent the critical window for prevention

Knowing that anaemia is concentrated in early life, the next question is whether this burden is associated with iron deficiency alone.

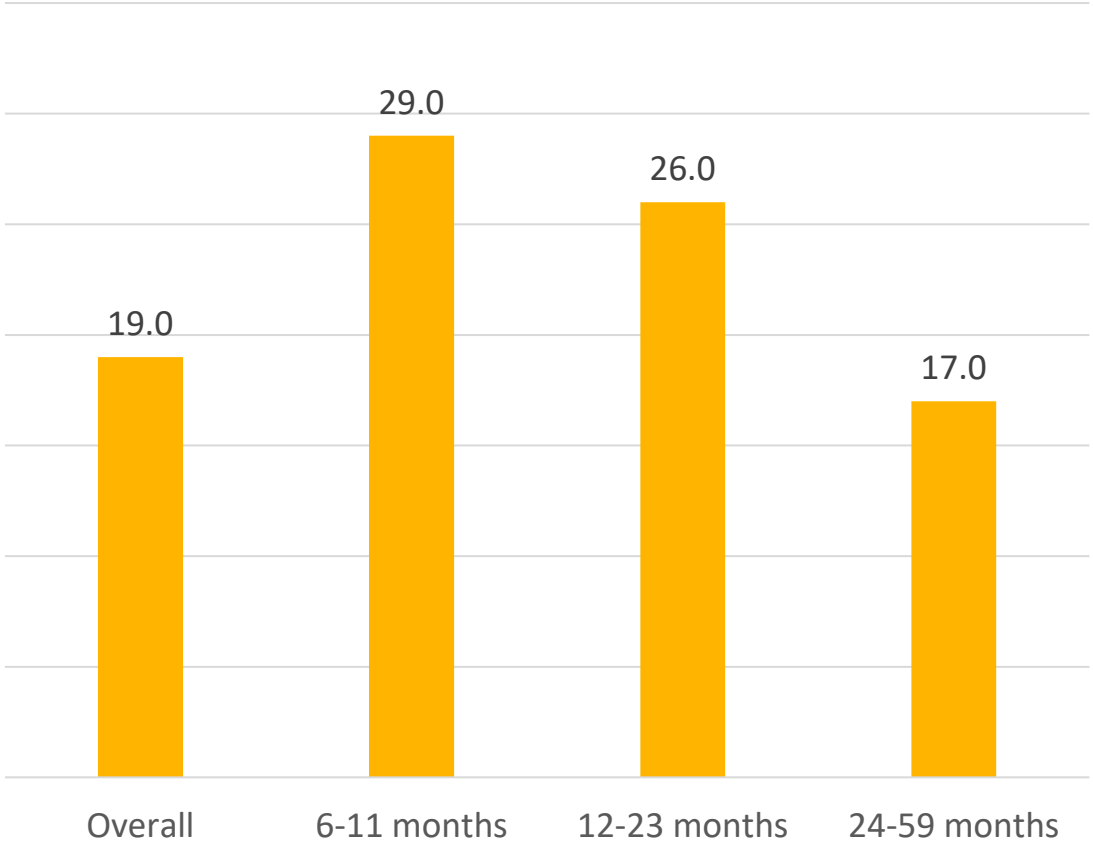
IRON DEFICIENCY (Measured by ferritin)



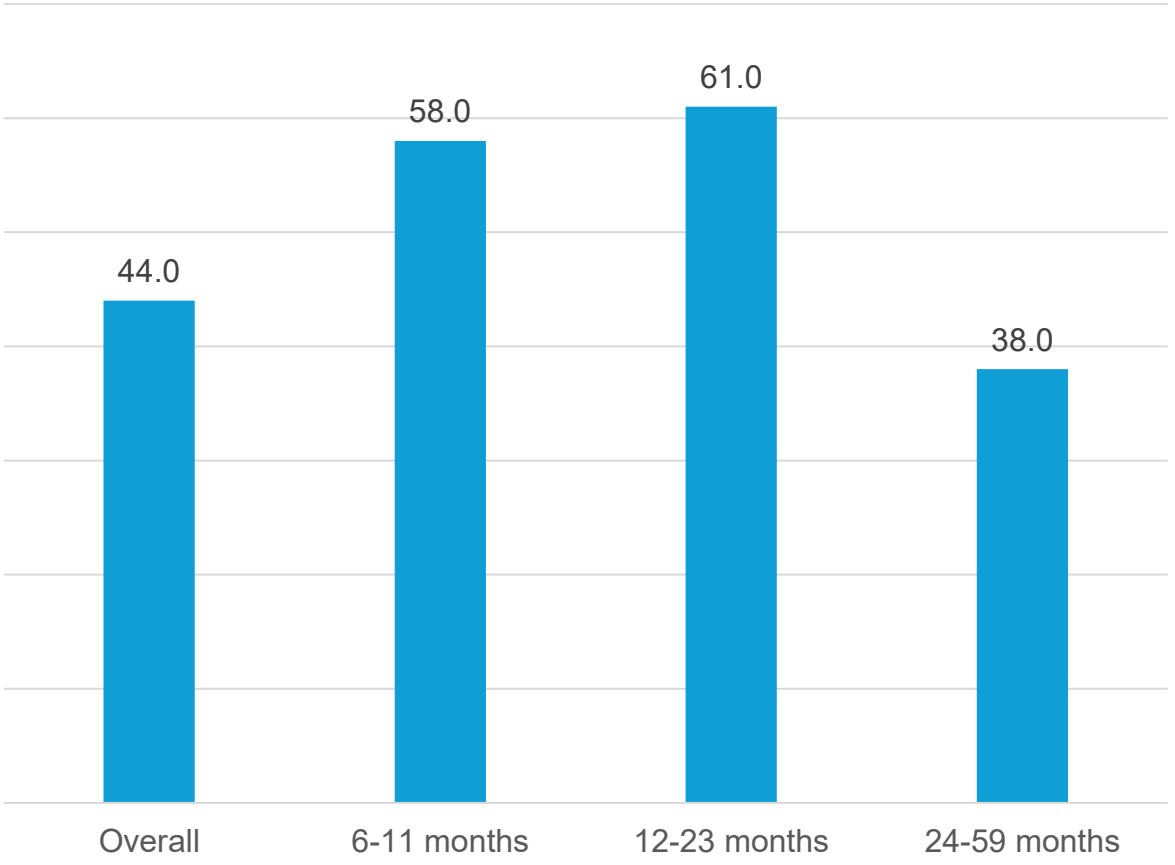
IRON DEFICIENCY AND INFECTION



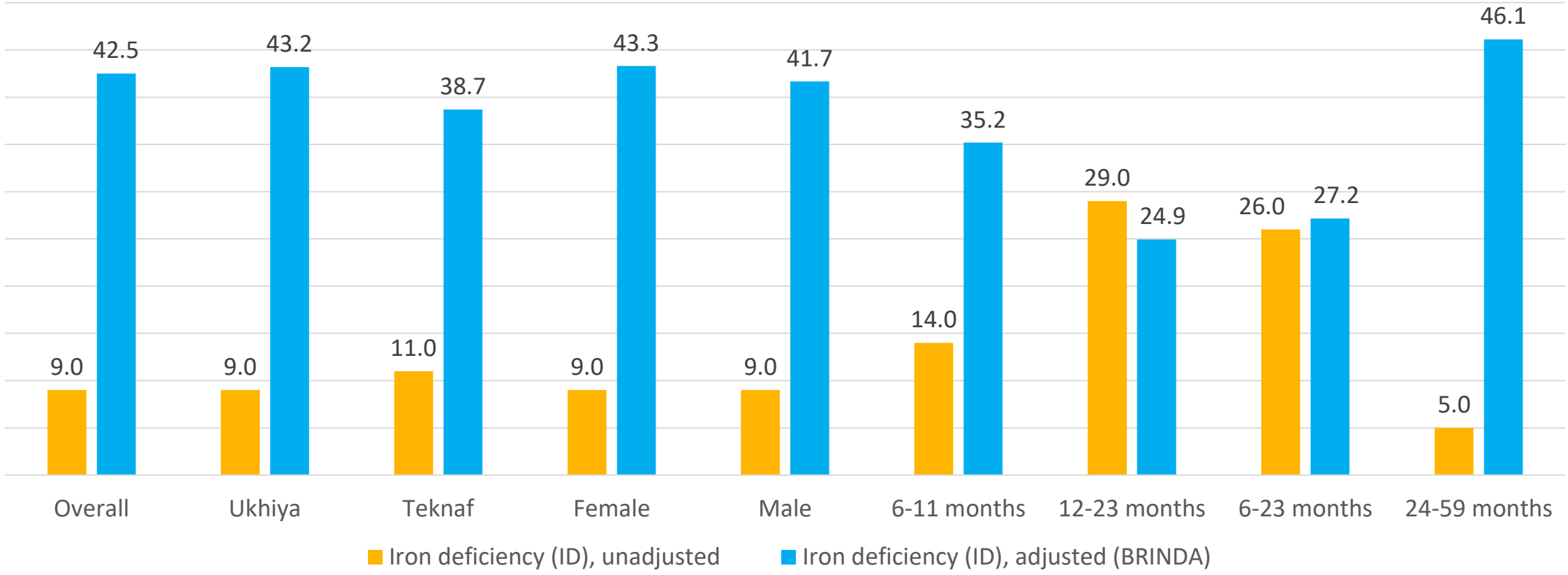
CRP: ELEVATED CRP INDICATES RECENT OR ACUTE INFECTION



AGP: ELEVATED AGP REFLECTS ONGOING OR CHRONIC INFLAMMATION



IRON DEFICIENCY



Unadjusted Ferritin = Iron Stores + Inflammation Effect
Adjusted Ferritin = Iron Stores Only

KEY TAKEAWAY 3. IRON DEFICIENCY IS HIDDEN, BUT NOT THE WHOLE STORY

Iron Deficiency, Unadjusted

Standard measures underestimate iron deficiency in this setting

Iron Deficiency, Adjusted

Once adjusted for illness, iron deficiency is much more common

Children under 2

The gap is largest among children under two. Yet iron deficiency does not show the strongest association

This raises an important question: if iron deficiency is only part of the picture, what other biological processes are shaping anaemia in young children?.

Caregiver Perspectives

“Young children get sick often, especially in the first year. when one illness ends, another begins.”

“It is difficult for a child to regain strength when sickness comes again and again.”

“Fever and cough are common in small children. we focus on treating what we can see.”

KEY TAKEAWAY 4. INFECTION & INFLAMMATION: CRP & AGP

Overall

Infection and inflammation are widespread among young children. Nearly half of children show signs of ongoing inflammation (AGP)

By Age

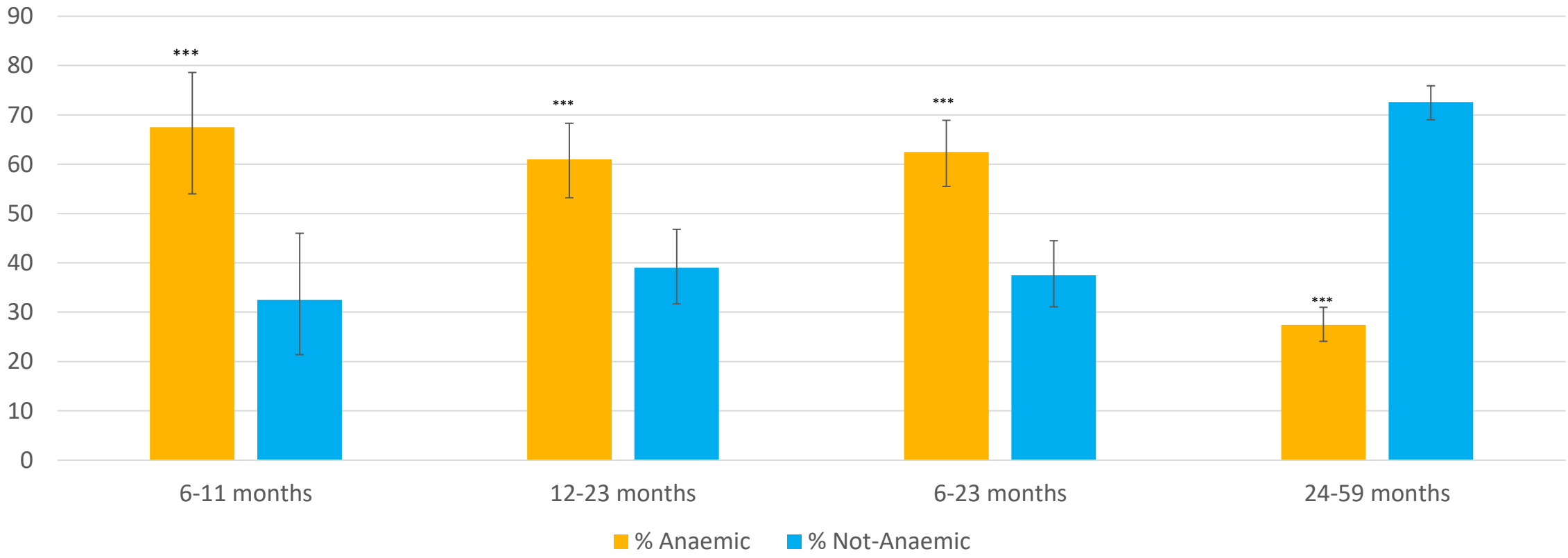
Levels are highest in children under two, the same group with the highest anaemia

Infection/Illnesses

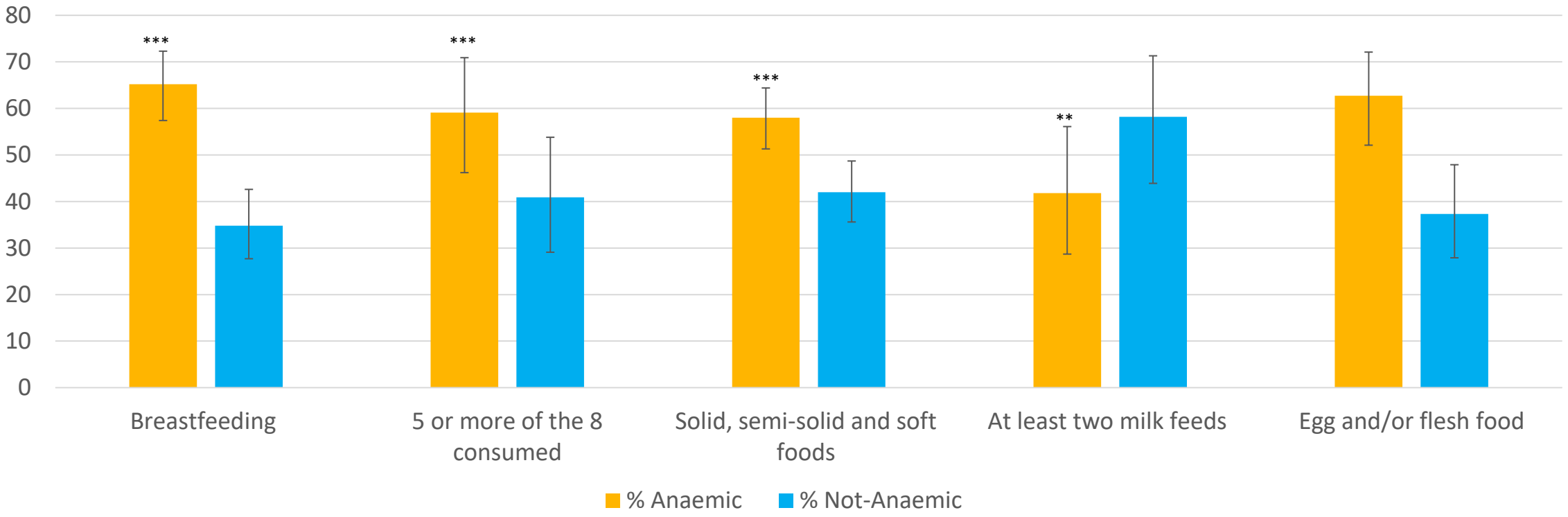
Many children experience chronic inflammatory stress, not just short illness episodes

Taken together, these findings show that anaemia in Cox's Bazar cannot be understood without considering infection and inflammation.
The next step is to examine how anaemia is associated with key child, household, and programme factors when we look at these relationships one at a time.

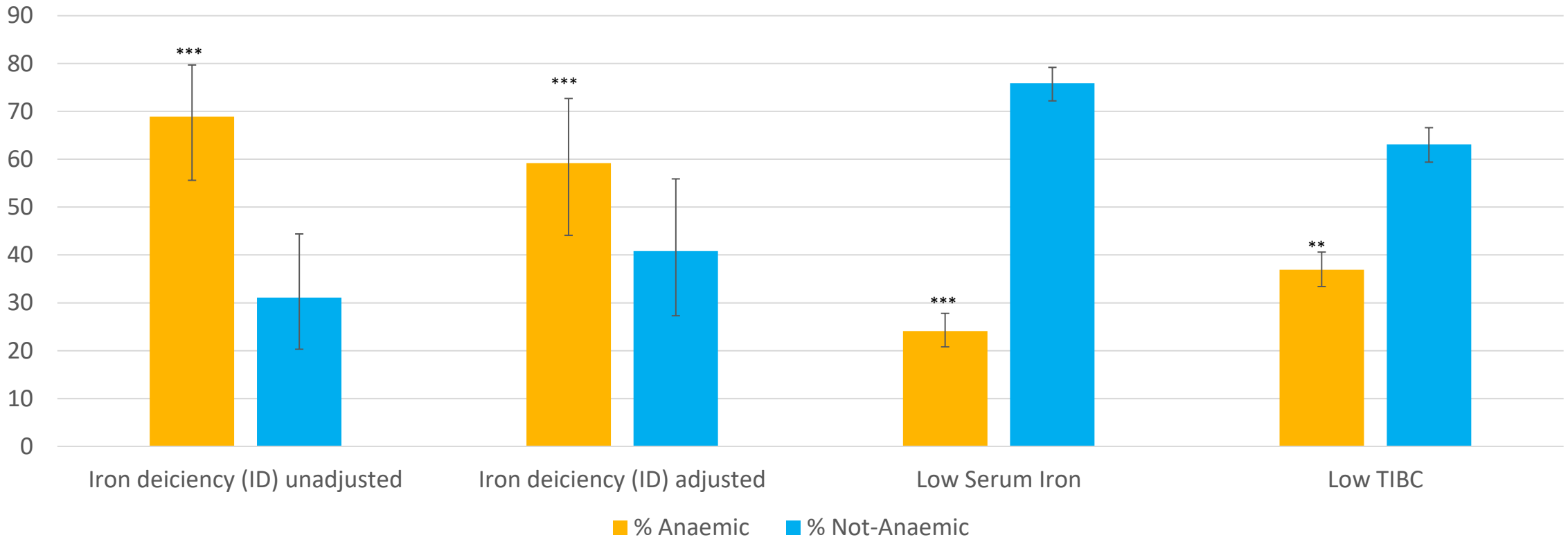
AGE IS THE STRONGEST AND MOST CONSISTENT DIVIDER



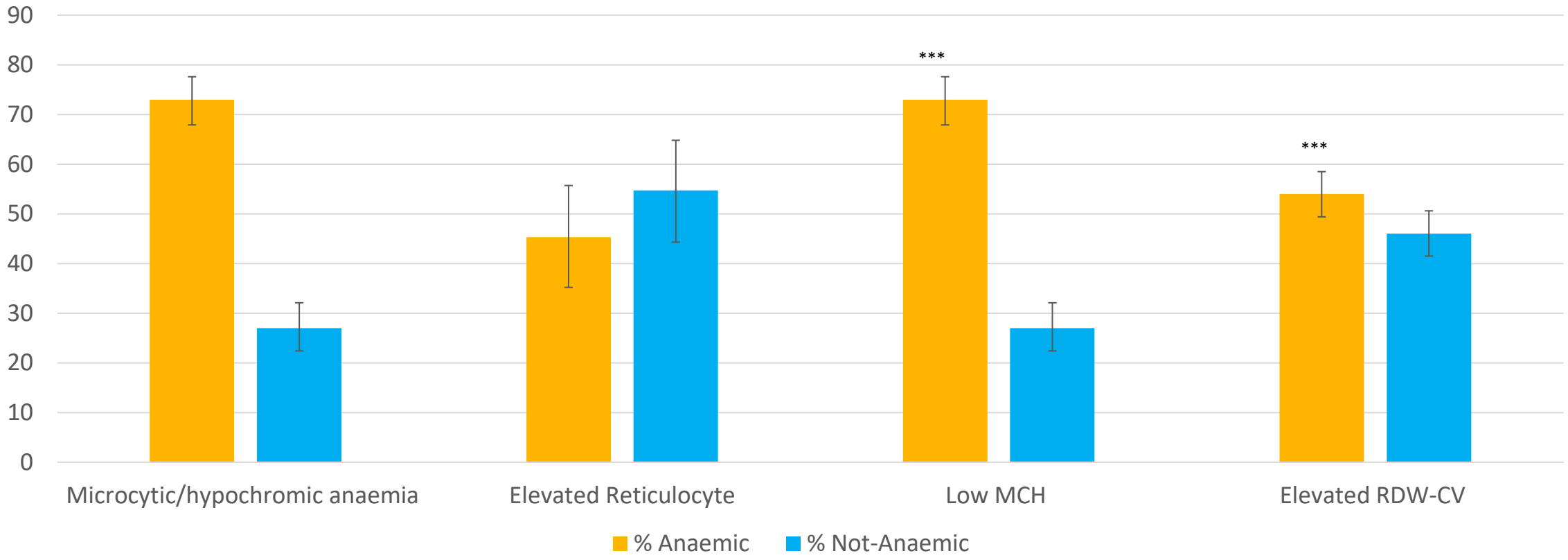
FEEDING PRACTICES ARE ASSOCIATED WITH ANAEMIA, BUT DO NOT FULLY EXPLAIN IT



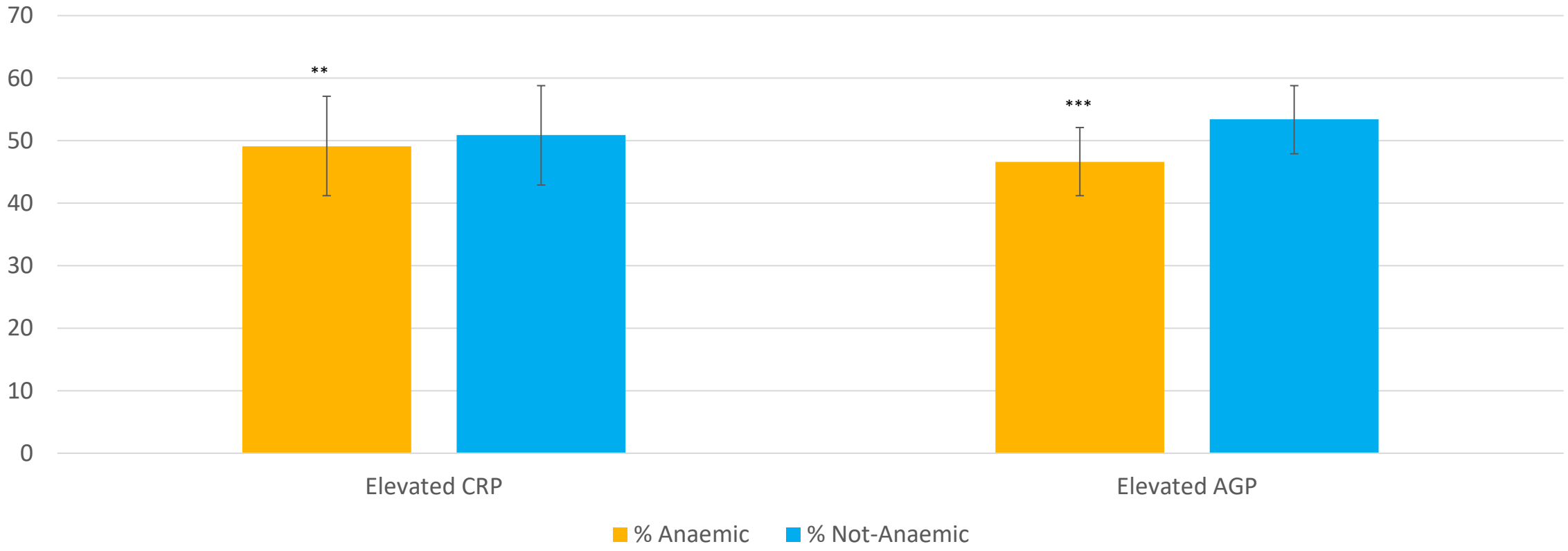
IRON BIOMARKERS SHOW A COMPLEX PICTURE



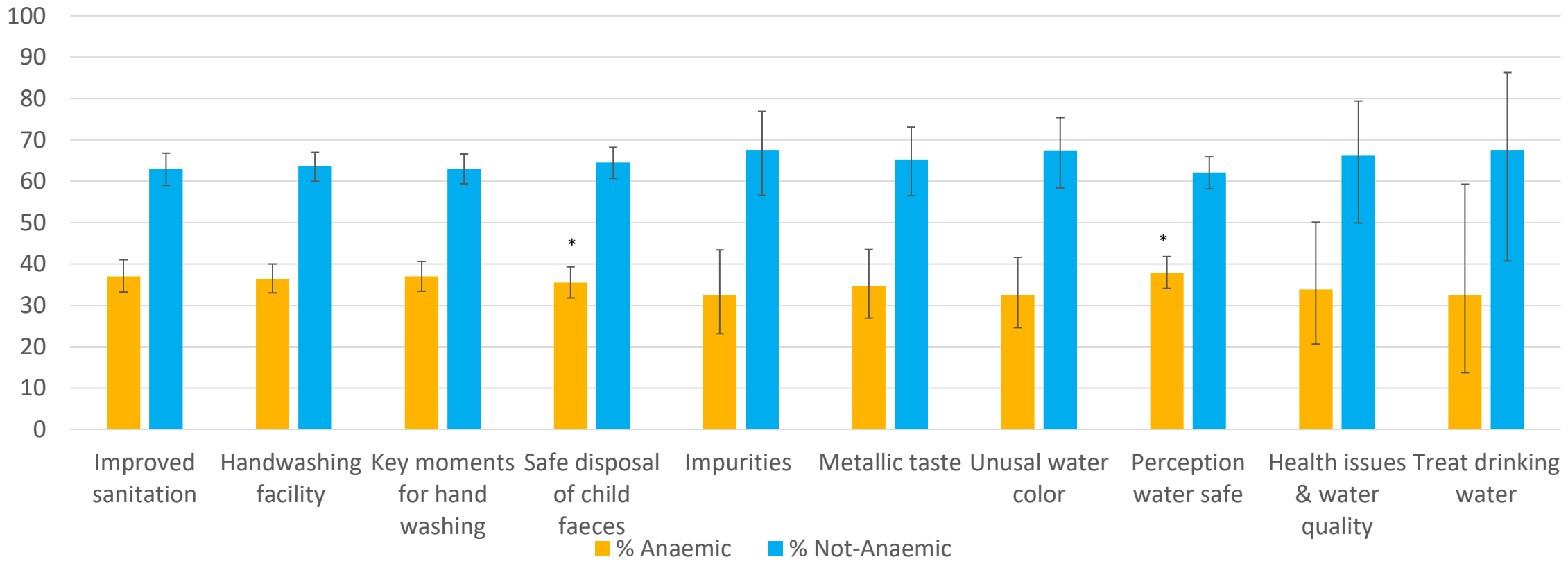
RED BLOOD CELL MARKERS SUPPORT THE BIOLOGICAL PATTERN



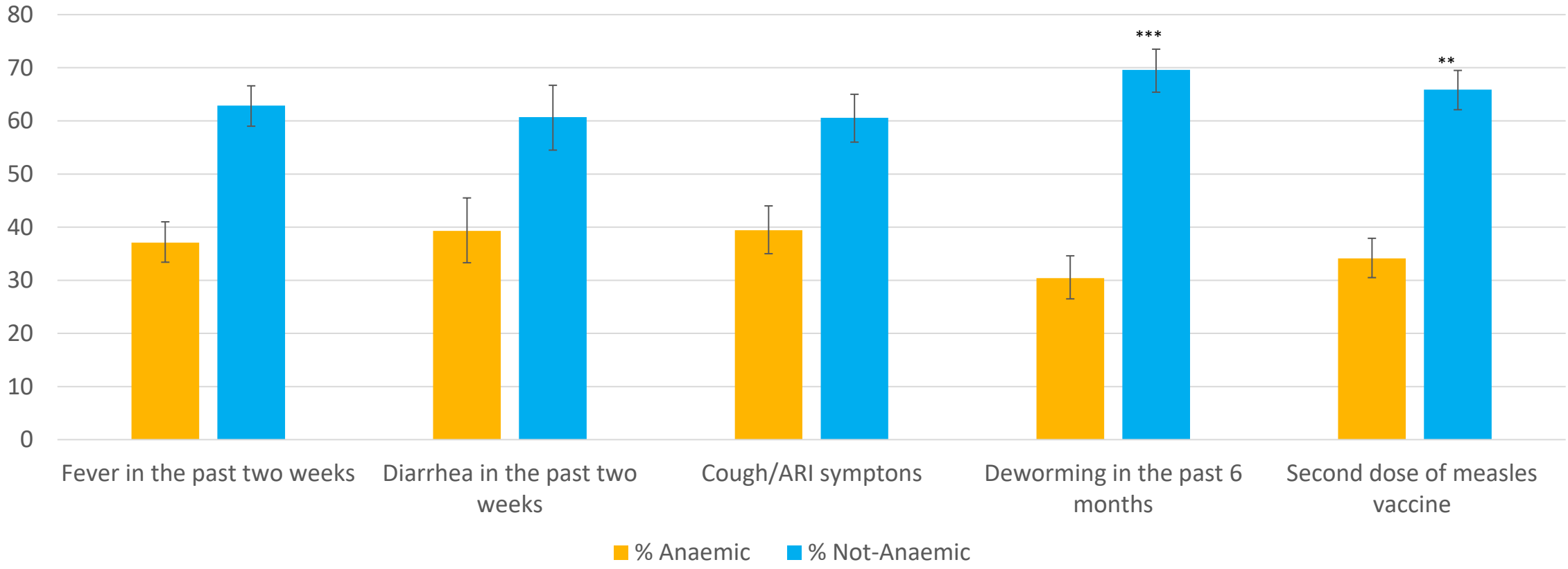
INFECTION AND INFLAMMATION ARE STRONGLY LINKED TO ANAEMIA



WASH INDICATORS SHOW LIMITED DIRECT ASSOCIATION WITH ANAEMIA



HEALTH-SEEKING BEHAVIOURS SHOW LIMITED DIRECT ASSOCIATION WITH ANAEMIA



Caregiver Perspectives

Anaemia is not easy to recognise. we notice sickness, not low blood.

If the child looks active, we do not think something is wrong

We go to the clinic when there is fever or diarrhoea, not for weakness.

STEPWISE MODELS TO SEPARATE SOCIAL AND BIOLOGICAL EFFECTS

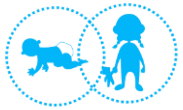
Model 1: Demographic, household, and programme factors

Model 2: Adds infection and inflammation (CRP, AGP)

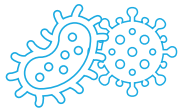
Model 3: Adds iron and haematological markers

AFTER CONTROLLING FOR ALL FACTORS, WHAT TRULY MATTERS?

REMAINS SIGNIFICANT



AGE < 2 YEARS



CHRONIC INFLAMMATION (AGP)

IRON & HAEMATOLOGICAL MARKERS

DOES NOT REMAIN SIGNIFICANT

WASH INDICATORS

CAMP LOCATION

SEX

HOUSEHOLD SIZE

PROGRAMME EXPOSURE

WHAT THE MULTIVARIATE ANALYSIS TELLS US……

- Anaemia is strongly associated with early age & biological stress
- Infection and inflammation play a central mediating role
- Iron deficiency matters, but is not the only factor associated with anaemia.
- Contextual factors matter indirectly
- Prevention requires early, integrated action

IMPLICATIONS

Anaemia Requires an Early-Life Focus

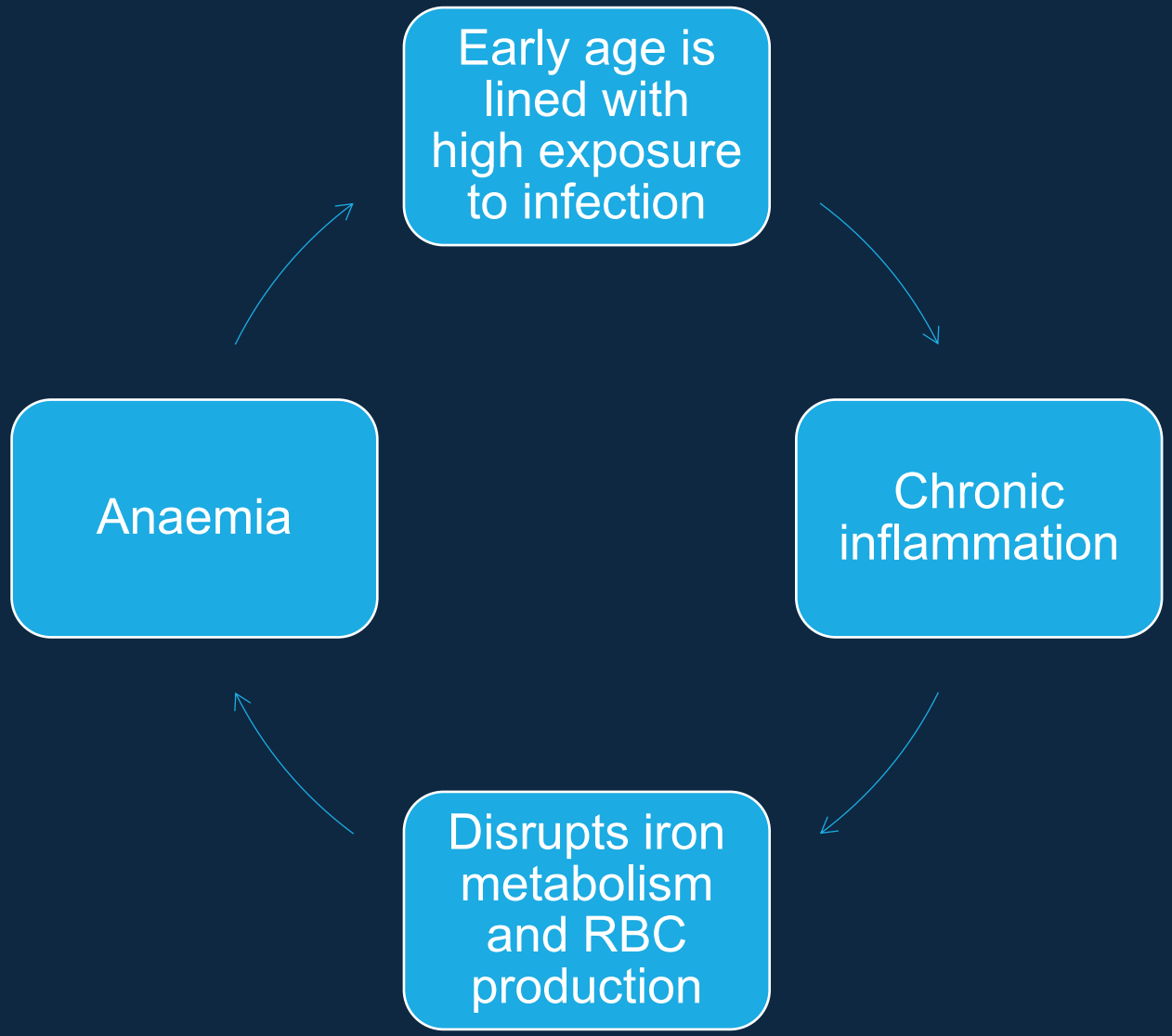
Shift emphasis toward the first 1,000 days, with particular focus on infants 6–23 months.

Iron Interventions Are Necessary, but Not Sufficient

Iron interventions must be paired with strategies that reduce infection and inflammation.

Infection and Inflammation Are Central, Not Peripheral

Anaemia programming should explicitly incorporate infection prevention and child health strategies.



Causal Pathway Summary

IMPLICATIONS FOR NUTRITION PROGRAMMING

NUTRITION INTERVENTIONS ARE NECESSARY, BUT THEIR EFFECTIVENESS DEPENDS ON THE BIOLOGICAL CONTEXT IN WHICH THEY ARE DELIVERED

WHAT THE EVIDENCE SHOWS

- Anaemia begins early, before age two
- Iron deficiency contributes, but is frequently masked by inflammation
- Feeding practices alone do not fully protect against anaemia

IMPLICATIONS FOR NUTRITION

- Prioritise infants 6–23 months as the highest-risk group
- Continue iron interventions, but do not rely on iron alone
- Align supplementation and fortified foods with illness prevention efforts
- Strengthen screening and interpretation of iron status in high-inflammation settings
- Set realistic expectations for nutrition-only impact on anaemia prevalence
- Nutrition interventions are necessary, but their effectiveness depends on the biological context in which they are delivered.

IMPLICATIONS FOR HEALTH PROGRAMMING

IN HIGH-INFLAMMATION SETTINGS, IRON-ONLY STRATEGIES MAY HAVE LIMITED EFFECTIVENESS.

WHAT THE EVIDENCE SHOWS

- Chronic inflammation (AGP) remains independently associated with anaemia
- Repeated illness is common in early life
- Inflammation interferes with iron absorption and red blood cell production

IMPLICATIONS FOR NUTRITION

- Strengthen infection prevention and early treatment, especially for infants
- Integrate anaemia prevention into routine child health services
- Emphasise preventive care (immunisation, deworming, illness management)
- Recognise inflammation reduction as a core anaemia strategy, not a secondary one
- Improve coordination between nutrition and child health platforms

IMPLICATIONS FOR WASH PROGRAMMING

WASH MATTERS FOR ANAEMIA BY REDUCING INFECTION AND INFLAMMATION OVER TIME, NOT THROUGH IMMEDIATE HAEMOGLOBIN CHANGES

WHAT THE EVIDENCE SHOWS

- Direct bivariate associations with anaemia are weak or inconsistent
- WASH effects likely operate indirectly, through infection and inflammation
- Single household indicators do not capture cumulative exposure

IMPLICATIONS FOR NUTRITION

- Frame WASH as foundational to reducing biological stress, not as a stand-alone anaemia solution
- Prioritise WASH interventions that reduce repeated infection in early childhood
- Strengthen integration with health and nutrition messaging
- Focus on sustained exposure reduction, not just infrastructure coverage
- Use anaemia findings to support integrated programming, not to assess WASH effectiveness in isolation

THESE FINDINGS DO NOT CALL FOR ENTIRELY NEW PROGRAMMES, BUT FOR BETTER ALIGNMENT, TIMING, AND INTEGRATION OF WHAT IS ALREADY IN PLACE.

ANAEMIA IS NOT A FAILURE OF EFFORT: IT IS A SIGNAL THAT BIOLOGY, TIMING, AND INTEGRATION MATTER.

PROPOSED PROGRAMMATIC ADJUSTMENTS

SHORT-TERM

- Maintain prioritization of children 6–23 months
- Ensure iron interventions are delivered within routine illness assessment platforms
- Integrate anaemia awareness into existing GMP and child health contacts
- Continue maternal anaemia prevention per existing policy (not assessed in this study)

MEDIUM-TERM

- Strengthen platforms that reduce early-childhood infection exposure
- Enhance counselling that reflects both nutritional and inflammatory pathways
- Support coordination across Nutrition, Health, and WASH platforms

LIMITATIONS & FUTURE STUDIES

- This study did not assess women of reproductive age; therefore, programmatic recommendations are limited to child-level findings.
- Global evidence supports continued prioritization of maternal anaemia prevention in humanitarian contexts.
- Maternal anaemia analysis and programming should be guided by separate assessments.

THANK YOU!

- Rohingya caregivers and families who shared their time and experiences
- UNICEF Team for technical guidance and partnership
- Implementing partners and sector colleagues across Nutrition, Health, and WASH
- Mitra and Associates Team for field data collection and coordination
- Popular Diagnostics for laboratory analysis
- Icddr,b for AGP testing
- RISE International Consulting team

Q+A

We will now open the floor for questions.