Iron Fortification Programs And Iron Status

**Opportunity**
Iron fortification programs can improve a population’s iron status when three conditions are met:

1. Programs are well implemented and monitored
2. Coverage and consumption are optimized
3. Iron compounds are added at recommended concentrations

**Global burden of iron deficiency** (Stevens, 2013)
Data from 107 countries estimated the global prevalence of anemia in 2011 was 29% in non-pregnant women, 38% in pregnant women, and 43% in children (6-59 months). The proportion of anemia amenable to iron was estimated to be 50% in non-pregnant and pregnant women and 42% in children.

From 1995-2011, mean hemoglobin improved only slightly in non-pregnant women (125 g/L to 126 g/L), pregnant women (112 g/L to 114 g/L) and children (109 g/L to 111 g/L).

**Public health approaches**
Public health approaches to reduce iron deficiency include fortifying food staples or condiments, dietary diversification, biofortification, and dietary supplements.

Fortifying staple foods is considered the most cost-effective, safest (Hurrell 2010), and most practical approach to increase iron intake on a widespread and sustainable basis (Gera, 2012).

Wheat flour is the staple most commonly fortified with iron in large-scale fortification programs (Peña-Rosas 2014). Wheat flour fortification is currently mandated in 82 countries (FFI 2015).

**Efficacy studies of iron fortification in foods**
Three recent systematic reviews of the effect of iron-fortified foods (cereals, salt, condiments, and commercially processed foods) all showed positive effects on hemoglobin and/or iron status.

- Gera (2012) found a 41% reduction in anemia and a 52% reduction in iron deficiency.
- Das (2013) found a 45% reduction in anemia in children and 32% reduction in women.
- Athie (2013) found a significant increase in hemoglobin concentration of 5.09 g/L.

**Effectiveness studies of iron fortification in foods**
Success fortifying with iron as a public health intervention depends on several factors including:

- Adequate legislation and regulations (e.g., bioavailable iron compounds mandated at meaningful levels)
- Monitoring and enforcement
- Consumption of fortified foods in sufficient amounts (Martorell 2015).

In a review of wheat flour fortification programs, only 9 of 78 programs were judged to be effective; the others used iron compounds which were not bioavailable and/or provided too little iron fortificant (Hurrell 2010).

The few effectiveness studies (n=13) that exist provide limited evidence for the effectiveness of flour fortification for improving anemia prevalence; however, it is consistent for improving low ferritin prevalence in women (Pachón, in press).
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More recently, anemia in Costa Rica was shown to be lower after fortification in both children (19.3% versus 4.0%) and women (18.4% versus 10.2%). Iron deficiency declined in children from 26.9% to 6.8% and iron deficiency anemia declined from 6.2% to undetectable levels (Martorell, 2015).

**WHO guidelines for wheat flour fortification**

WHO issued interim guidelines which suggest the types of bioavailable iron fortificants and concentration levels to add to flour (WHO 2009).

WHO is conducting a Cochrane review to assess the effects of wheat flour fortification (Peña-Rosas 2014), and new WHO guidelines for wheat flour fortification will be published in 2016.

**References**


