NUTRITION: Provision of iron supplementation to children 6-23 months (daily) and 24-59 months (intermittent)
(DCP4 ID: NUTR02-01 and NUTR02-02)
Cluster: Nutrition

FairChoices
DCP Analytic Tool

Iron supplementation to children

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Description of condition and intervention

Iron deficiency is one of most common causes of anemia in children and an important cause of disease burden in low- and middle-income countries (LLMICs). Iron deficiency among children is often caused by inadequate intake or absorption of dietary iron, increased need in periods of growth, or infection by intestinal helminths. Iron is an essential nutrient for development and cell growth in the immune and neural systems, as well as in regulation of energy metabolism and exercise. The economic costs of iron deficiency anemia from annual physical productivity losses have been calculated to be around US$ 2.32 per capita, or 0.57% of gross domestic product in LLMICs. The WHO has consistently recommended oral iron supplementation as one of the interventions that can reduce the prevalence of anemia. Iron is required for the survival and virulence of many pathogens. Concerns have been expressed on a possible increased risk of malaria with iron interventions in malaria-endemic areas, particularly among iron-replete children. The intervention assessed in this Evidence Brief is iron supplementation in children, 10–12.5 mg elemental iron given as drops/syrups daily 6-23 months and 25 mg elemental iron per week intermittently 24-59 months. (*Source: WHO 2016, WHO 2011).* This evidence brief assesses effects and costs for three interventions being analyzed in FairChoices: DCP analytical tool (For an overview of other interventions, see appendix below and the separate evidence briefs for these):

NUTR01-02-01-01	**Daily iron supplementation for children 6 to 23 months**
NUTR01-02-01-02	**Daily iron supplementation in children health center**
NUTR01-02-02	**Intermittent iron supplementation in children (24 -59 months)**

International guidelines for iron supplementation

Organization	Indications/recommendations	Applicability in LIC & Lower MIC settings
WHO 2016	Daily iron supplementation:10-12.5mg elemental iron supplementation in infants and young children (age 6-23 months) given as drops/syrups for three consecutive months in a year. This 10-12.5mg elemental iron corresponds to 50–	If prevalence of anemia in infants and young

	62.5 mg of ferrous sulfate heptahydrate, 30–37.5 mg of ferrous fumarate or 83.3–104.2 mg of ferrous gluconate.	children is 40% or higher
WHO 2011	Intermittent iron supplementation: Every week 25 mg of elemental iron suggested in form of drops/syrup for three months duration, alternated with three months of no supplementation. This 25 mg of elemental iron corresponds to 75 mg of ferrous fumarate, 125 mg of ferrous sulfate heptahydrate or 210 mg of ferrous gluconate.	If prevalence of anemia in preschool children (24-59 months) is 20% or higher

Source: Organization GWH. Guideline: Daily iron supplementation in infants and children 2016

Intervention attributes

Type of interventions & delivery platform

Table 1: Type of interventions & delivery platform

Intervention	Type	Delivery platform
Daily iron supplementation	Prevention	Community
Daily iron supplementation	Prevention	Health center
Intermittent iron supplementation	Prevention	Community

Equity

In addition to considerations like cost-effectiveness and health systems factors, dimensions of equity can be relevant for priority setting. The opportunity for a long and healthy life varies according to the severity of a health condition that individuals might have, so there are inequities in individuals' opportunities for long and healthy lives based on the health conditions they face. Metrics used to estimate the severity of illness at an individual level can be used to help prioritize those with less opportunity for lifetime health. FairChoices: DCP

Analytics Tool uses Health adjusted age of death (HAAD), which is a metric that estimates the number of years lived from birth to death, discounting years lived with disability. A high HAAD thus represents a disease less severe in terms of lifetime health loss, while a low HAAD represents a disease that is severe on average, causing early death or a long period of severe disability. It is also possible to estimate the distribution of HAAD across individuals with a health condition. FairChoices shows for each intervention an average HAAD value of the conditions that are affected by respective interventions that have health effects. Additionally, a plot shows HAAD values for around 290 conditions (Johansson KA et al 2020).

Population in need of interventions

Table 2: Population in need of interventions

Intervention	Treated population		Affected population		Disease state addressed
	Treated age	Treated fraction	Affected age	Affected fraction	
Daily iron supplementation (Community)	0 to 1 years (From six months of age when breastfeeding is not adequate)	According to Henriksen et al. Treated fraction will be 0.5	0 to 1 years (From six months of age when breastfeeding is not adequate)	Those with the condition, both genders: According to Henriksen et al. Treated fraction is 0.5 for community level (Unpublished work in progress)	Dietary iron deficiency
Daily iron supplementation (Health center)	0 to 1 years (From six months of age when breastfeeding is not adequate)	According to Henriksen et al. Treated fraction will be 0.5	0 to 1 years (From six months of age when breastfeeding is not adequate)	Those with the condition, both genders: According to Henriksen et al. Treated fraction is 0.5 for health center level (Unpublished work in progress)	Dietary iron deficiency

Intermittent iron supplementation	2 to 5 years (From 24-59 months)	According to Henriksen et al. Treated fraction will be 1(all)	2 to 5 years (From 24-59 months)	Those with the condition, both genders: According to Henriksen et al. Treated fraction is 1 for community level (Unpublished work in progress)	Dietary iron deficiency

Disease stage addressed

Delay or prevent development of iron deficiency anemia

Intervention effectiveness and safety

Table 3: Effectiveness and safety of daily iron supplementation in 6-23 months children

Effect of intervention		Certainty of evidence
Prevalence of **iron deficiency** (population: 6-23 months children) Pasricha et al 2013 found that with daily iron supplementation relative risk of iron deficiency anemia was 0·14 (95% CI: 0·10–0·22)	Pasricha et al 2013. Demonstrates high evidence of daily iron supplementation for prevention of iron deficiency anemia, but high uncertainty of evidence on child growth	⊕⊕⊕⊕ Very high

Table 3.1: Effectiveness and safety of intermittent iron supplementation in 24-59 months children

What happens?	No intervention	With intervention	Certainty of evidence	Transferability of evidence
Effects on children 24-59 months due to the condition				
Prevalence De-Regil et al 2011 found that children receiving intermittent iron supplementation had a lower risk of anemia (RR=0.51, 95% CI: 0.37 to 0.72)			⊕⊕⊕⊖ Moderate	

Model assumptions

Table 4.0: Summary of model parameters and values used in FairChoices – DCP Analytical Tool

Category	Model parameter	Notes
Intervention	**Daily iron supplementation**	
Cost parameters		
Treated population Treated fraction Treated fraction age	Children with dietary iron deficiency 0.5 0 to 1 year	Global Burden of Disease study
Effect calculation		
Affected Population	Children with dietary iron deficiency	
Affected gender	Both gender	
Affected fraction age	0 to 1 year	
Affected fraction	0.5	
Comparison	Placebo	
Prevalence Reduction (RRR)	0.86	

Table 4.1: Summary of model parameters and values used in FairChoices – DCP Analytical Tool

Category	Model parameter	Notes
Intervention	**Intermittent iron supplementation**	
Cost calculation		
Treated population Treated fraction Treated fraction age	Children with dietary iron deficiency 0.5 2 to 5 year	Global Burden of Disease study
Effect calculation		
Affected Population	Children with dietary iron deficiency	
Affected gender	Both gender	
Affected fraction age	2 to 5 year	
Affected fraction	0.5	
Comparison	Placebo	
Prevalence Reduction (RRR)	0.49	

Intervention Cost

The total unit cost is estimated to be **USD 4.87** (Year: 2020) per case per child by giving daily iron supplementation on a community-based level for the prevention of dietary iron deficiency anemia according to *Henriksen et al. (Unpublished work in progress)*

The total unit cost is estimated to be **USD 5.24** (Year: 2020) per case per child by giving daily iron supplementation on a health center level for the prevention of dietary iron deficiency anemia according to *Henriksen et al. (Unpublished work in progress)*

The total unit cost is estimated to be **USD 3.59** (Year: 2020) per case per child by giving intermittent iron supplementation on a community-based level for the prevention of dietary iron deficiency anemia according to *Henriksen et al. (Unpublished work in progress)*

References

WHO 2016: Guideline: Daily iron supplementation in infants and children. Geneva: World Health Organization; 2016.

Pasricha et al 2013: Pasricha SR, Hayes E, Kalumba K, Biggs BA. Effect of daily iron supplementation on health in children aged 4-23 months: a systematic review and meta-analysis of randomised controlled trials. Lancet Glob Health. 2013;1(2):e77-e86.

De-Regil et al 2011: De-Regil LM, Jefferds ME, Sylvetsky AC, Dowswell T. Intermittent iron supplementation for improving nutrition and development in children under 12 years of age. Cochrane Database Syst Rev. 2011(12):CD009085.

Henriksen ES, Økeland J, Malawim O, Said S, Kaur G, Rava` MS, et al. Economic evaluation of nutritional interventions in Zanzibar: An analysis using FairChoices – DCP analytic tool.(Work in progress)

Appendix

Literature Review for effectiveness & safety

This literature search is an example of level 4 evidence(metaanlysis) for intervention inputs taken from DCP3. (Despite low significant level for efficacy)

Level of evidence of efficacy studies:

1. Low (expert opinions, case series, reports, low-quality case control studies)

2. Moderate (high quality case control studies, low quality cohort studies)

3. High (high quality cohort studies, individual RCTs)

4. Very high (Multiple RCTs, metaanalysis, systematic reviews, clinical practice guidelines)

An overview of all NUTR interventions in FairChoices-DCP analytical tool (Interventions assessed in this evidence brief are marked in bold)

NUTR01-01	Daily Iron Folic acid supplementation (pregnant women)
NUTR01-02	Calcium supplementation, pregnancy
NUTR01-03	Food and caloric supplementation to pregnant women in insecure households
NUTR01-04-02	Promotion of breastfeeding and/ or complementary feeding
NUTR01-05	Intermittent Iron-folic acid supplementation (Menstruating women)
NUTR01-06	Food to non-pregnant women in insecure households
NUTR01-02-01-01	**Daily iron supplementation for children 6 to 23 months**
NUTR01-02-01-02	**Daily iron supplementation in children health center**
NUTR01-02-02	**Intermittent iron supplementation in children (24 -59 months)**
NUTR01-02-03	Vitamin A supplementation to children 6 to 59 months
NUTR01-02-04	Zink to children 6 to 59 months
NUTR01-02-05	Food to children, if below basic food poverty line
NUTR01-03-01	Management of severe acute malnutrition without medical complications
NUTR01-03-02	Management of severe acute malnutrition associated with medical complications