

## Iron deficiency and impaired child development

*The relation may be causal, but it may not be a priority for intervention*

Papers p 1389

**I**ron deficiency affects 20% to 50% of the world's population, making it the most common nutritional deficiency.<sup>1</sup> In developing countries about half of all cases of anaemia in women and children result from iron deficiency, but other important and often coexisting contributors include malaria, hookworm infestation, HIV, and deficiencies in other nutrients such as vitamin A and folates.<sup>2,3</sup> Conversely, anaemia is just one manifestation of iron deficiency, and there are forms of mild to moderate iron deficiency in which anaemia is absent but tissue function is impaired.

In children iron deficiency develops slowly and produces few acute symptoms. As the deficiency worsens children become pale and weak, eat less, and tire easily. They gain weight poorly, have frequent respiratory and intestinal infections, and may develop pica. The most worrying association is that between iron deficiency and impaired development in behaviour, cognition, and psychomotor skills. Over the past three decades many studies have confirmed this relation, but whether iron deficiency is the sole cause of these deficits remains unclear. Last year a panel of experts concluded that a "significant body of causal evidence exists linking iron deficiency anaemia and child development."<sup>4</sup> A definitive link was excluded, because anaemia is associated with many other disadvantages such as poverty, low birth weight, malnutrition, poor education among mothers, and lack of stimulation in the home—all of which also affect child development.

A consistent finding in different countries is that severe, chronic iron deficiency in infancy identifies children with poorer cognitive function and lower scores in school achievement tests, suggesting that irreversible abnormalities result from a deficiency at a critical period of growth and differentiation of the brain.<sup>5</sup> Poorer function, however, may also result from psychosocial and economic disadvantage.

How reversible, then, are these effects? A Cochrane review concluded that cognitive or psychomotor skills in anaemic children aged less than 3 years failed to improve within 5-11 days of giving iron. Trials with longer periods of supplementation have mostly lacked randomised placebo groups and failed to show benefits, but one of two small randomised studies found a clear benefit.<sup>6</sup> In anaemic children 3 years or older the advantages of iron supplementation are more convincing: six of eight double blind trials showed benefits in measures such as achievement at

school, concentration, efficiency, discriminant learning, short term memory, and IQ.<sup>7</sup>

The paper by Stoltzfus et al in this week's issue (p 1389) is an important contribution.<sup>3</sup> Their finding of significant improvements in motor and language development after 12 months of supplemental iron is strong evidence that replenishing iron can positively influence development even in children with severe anaemia and iron deficiency. The study's large sample size and double blind design allow stronger causal inference. The paper also helps to clarify the contribution of anaemia and iron deficiency to developmental delay, indicating that although iron's effect on motor development is mediated through improved haemoglobin concentrations and oxygenation, development of language is promoted through other independent mechanisms.

What is the appropriate public health response to the high burden of anaemia and iron deficiency in pre-school children in poor countries? Preventing iron deficiency is the obvious response. Promoting exclusive breast feeding for the first six months of life and providing appropriately fortified weaning diets is the best way forward; but, at best, 10% of mothers breast feed exclusively for six months in many poor countries, and diets can improve only if poverty is reduced.<sup>8</sup> Fortification of food has been successful in developed countries but less so in the developing world—most poor families cannot afford infant foods fortified with iron. Currently, targeting pregnant women and young children for iron supplementation is the preferred strategy. Supplementation, however, is costly, distribution mechanisms are often ineffective, and compliance is low. Furthermore, the World Health Organization has said that, for maximum effectiveness in controlling anaemia, "integration should be sought with malaria prophylaxis, hookworm control, immunisation and environmental health programmes as well as programmes for prevention of micronutrient malnutrition and community based primary health care."<sup>9</sup> Unfortunately, implementation strategies have not kept pace with better scientific understanding of the disorder, and the gap between the necessary and the practical remains unbridged. There is no real prospect of a new generation of smarter and stronger children, replete with iron.

Is preventing iron deficiency in children a priority in areas with few resources? It has recently been proposed, somewhat idealistically, that as a minimum goal no child under two years should be allowed to become anaemic.<sup>10</sup> Fortification of staple foods

(cereals, flour, sugar, salt) to deliver micronutrients to children on a large scale is probably the most sustainable and affordable option, even though commitment from governments and the food industry is needed. Supplementation is a much less attractive alternative, and scarce resources may be better spent on increasing coverage of vaccination against measles and hepatitis B, supplying bed nets impregnated with insecticide in malarious areas, or improving access to nevirapine to prevent mother to child transmission of HIV. These are tough but unavoidable choices.

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## Smoking in teenagers and watching films showing smoking

*Hollywood needs to stop promoting smoking worldwide*

The tobacco industry recruits and retains smokers by associating its products with excitement, sex, wealth, rebellion, and independence. Films are a powerful way to make this connection—and, as a paper in this week's issue of *Tobacco Control* shows,<sup>1</sup> they succeed.

The tobacco industry has cultivated its relationship with Hollywood using everything from large payments to film studios to distributing free cigarettes to the people who make films.<sup>2,3</sup> And it has been a two way street. For example, in 1972 the president of a production company wrote to RJ Reynolds Tobacco reporting that all the characters in a suspense thriller his company was producing smoked, and added, "Movies are better than any commercial that has been run on television or any magazine, because the audience is totally unaware of any sponsor involvement."<sup>4</sup> The public has viewed smoking in films with increasing alarm, particularly after it became known that the tobacco industry was making large surreptitious payments to get scenes with smoking in films, and the United States Congress held hearings in 1989.<sup>2,3</sup> As a result, the cigarette companies adopted a voluntary code that purportedly ended product placement in films.

Despite this voluntary code, the amount of smoking shown in American films increased dramatically from 1991 and now exceeds that present in 1960.<sup>5</sup> More importantly, and in contrast to reality, smoking in films is usually associated with high profile, successful figures.<sup>6</sup> The appearance of specific brands, with Philip Morris's Marlboro dominating, is high, and use of specific brands by actors on screen has increased dramatically.<sup>7</sup> Smoking by high profile actors is associated with favourable attitudes towards smoking and actual smoking among teenagers.<sup>8,9</sup> Like its friends in the

### Steps Hollywood can take

- Certify in the credits that nobody involved in the production received anything of value—cash, loans, smokes, publicity, etc—in exchange for using or displaying tobacco.
- Require strong anti-tobacco advertisements before any film that contains scenes showing smoking (including on television, video and digital videodiscs releases) to immunise audiences from the pro-tobacco influences in the film.<sup>11</sup>
- Stop identifying brands.
- Rate "R" (children under 17 not admitted without a parent) any film with smoking to reduce box office receipts. This will make producers think twice about the need to include smoking in their films for "dramatic reasons."

tobacco industry, Hollywood has dealt with expressions of concern by spouting rhetoric about "free expression"—while shamelessly editing films to maximise revenues—and denying that smoking in films actually contributes to smoking.

The paper by Sargent *et al* in this issue (p 1394) provides powerful new evidence showing that the more smoking teenagers see in films the more likely they are to smoke.<sup>9</sup> Using a survey of 9-15 year olds, they related whether these children had smoked a cigarette to the amount of smoking they watched in films. Most of the viewing was on videotape and digital videodiscs. Watching films with 51-150 incidents of tobacco use doubled the odds that the teenagers had tried tobacco, and watching films with more than 150 incidents tripled