

Patrice Sutton, MPH
Research Scientist
*Program on Reproductive
Health and the
Environment*

Green Choices

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University of California
San Francisco

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Food Matters



***Healthy Pregnancies
Generations***

Healthy Children

Healthy Future

Acknowledgements

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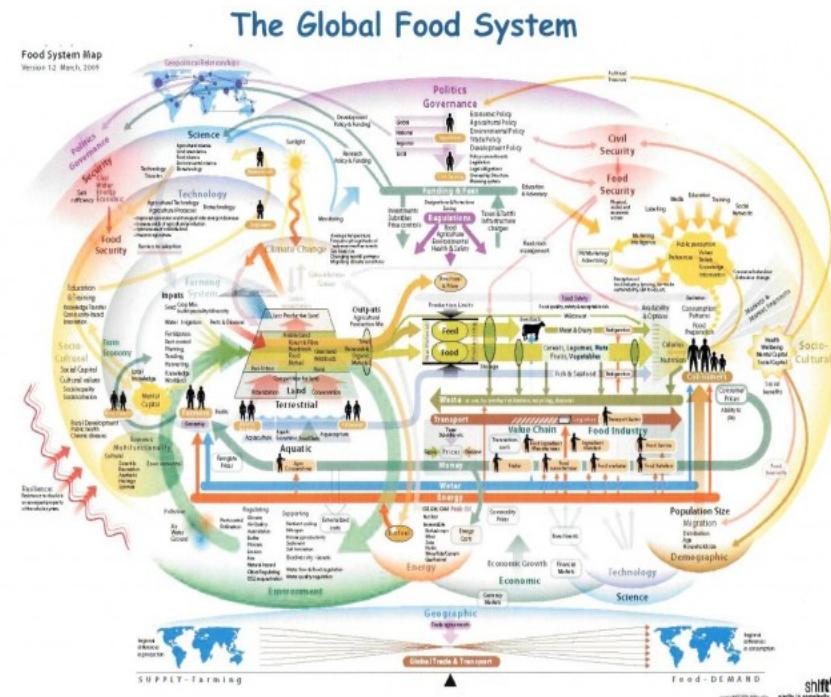
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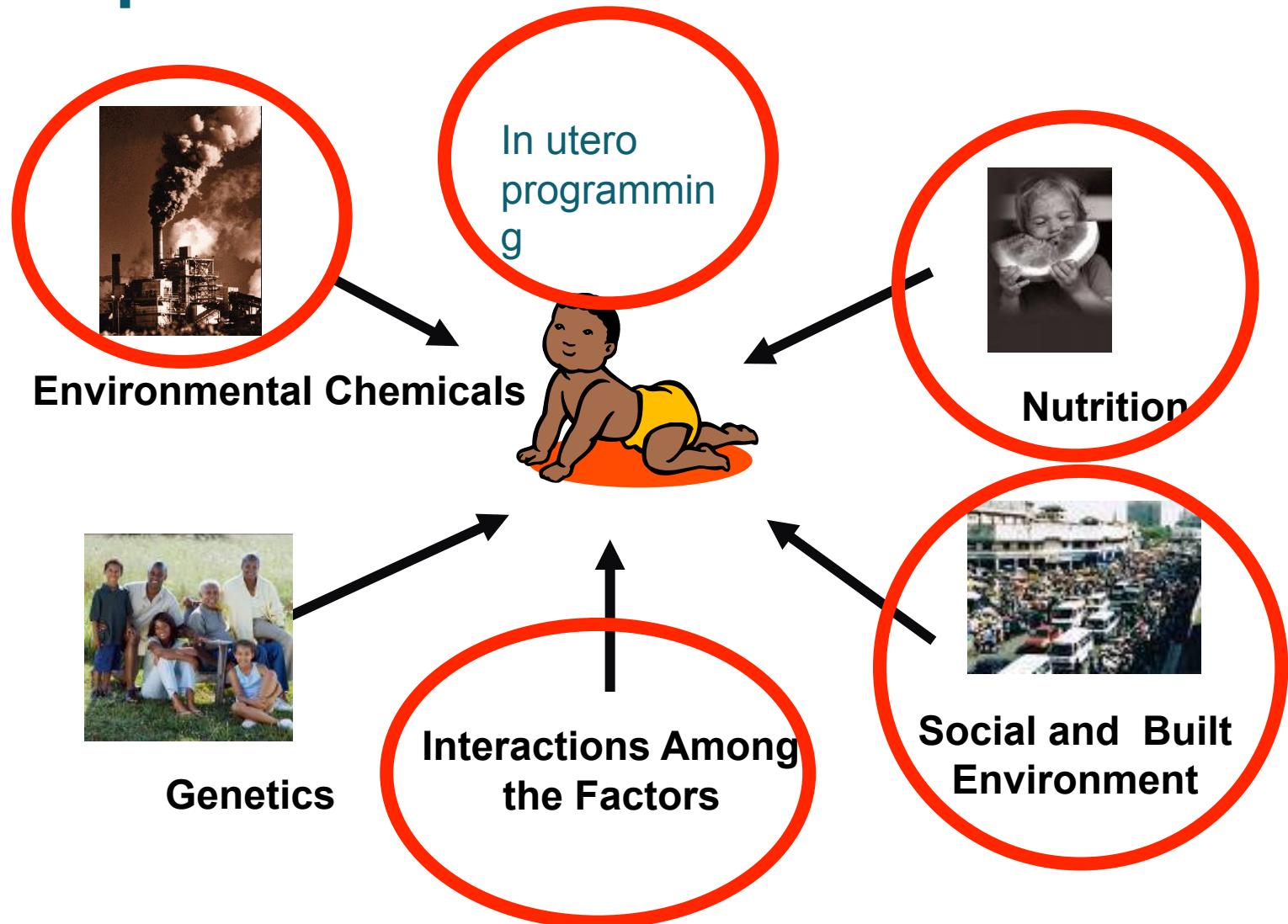
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paper, *Food Matters: What Clinicians Need to Know About
Our Food System To Help Ensure Healthy Pregnancies,
Children and Future Generations*





Environmental Influences on Reproductive Health





What we eat profoundly impacts the health of individuals, communities and the environment we depend on for human sustenance

Our current industrialized food system is energy intensive

It produces vast quantities of food of low nutritional quality

Features of our industrialized food are harmful to public and ecological health

Obesity, diabetes, malnutrition, childhood cancer, and other chronic disease impacts are costly human consequences of our industrialized food system



Food Matters to Pregnant Women, Children and Future Generations

Nutrition Matters

Good nutrition is an essential requirement of healthy human development

Timing Matters

Health consequences of *in-utero* and early life exposures can manifest across an individual's lifespan

Vulnerability Matters

Developing fetus and human are highly vulnerable to environmental exposures



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Timing Matters

Critical and Sensitive Windows of Development



Blastocyst



Embryo
Fetus



Infant



Child
Adolescent

Periconception

Prenatal

Postnatal

Childhood →

Environmental Exposures

Immediate & Long Term
Consequences



Developmental Origins of Adult Disease

“ It is suggested that poor nutrition in early life increases susceptibility to the effects of an affluent diet”

THE LANCET, MAY 10, 1986

Epidemiology

INFANT MORTALITY, CHILDHOOD NUTRITION, AND ISCHAEMIC HEART DISEASE IN ENGLAND AND WALES

D. J. P. BARKER

C. OSMOND

MRC Environmental Epidemiology Unit, University of Southampton, Southampton General Hospital, Southampton SO9 4XY

Summary Although the rise in ischaemic heart disease in England and Wales has been associated with increasing prosperity, mortality rates are highest in the least affluent areas. On division of the country into two hundred and twelve local authority areas a strong geographical relation was found between ischaemic heart disease mortality rates in 1968–78 and infant mortality in 1921–25. Of the twenty-four other common causes of death only bronchitis, stomach cancer, and rheumatic heart disease were similarly related to infant mortality. These diseases are associated with poor living conditions and mortality from them is declining. Ischaemic heart disease is strongly correlated with both neonatal and postneonatal mortality. It is suggested that poor nutrition in early life increases susceptibility to the effects of an affluent diet.

Barker DJ, Osmond C. Infant mortality, childhood nutrition, and ischaemic heart disease in England and Wales. Lancet. 1986 May 10;1(8489):1077-81.

Timing Matters

- Human evidence from study of Dutch famine during WW II
- Maternal under-nutrition during gestation has important effects on health in later life
- The timing of the nutritional insult determines which organ system is affected



Painter RC, Roseboom TJ, Bleker OP. Prenatal exposure to the Dutch famine and disease in later life: an overview. *Reprod Toxicol.* 2005 Sep-Oct;20(3):345-52.

Timing Matters

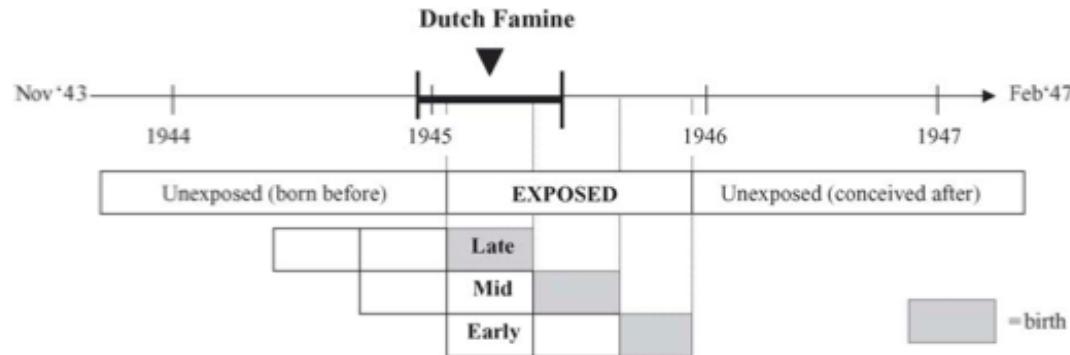


Fig. 1. The Dutch famine birth cohort: famine exposure and birth in relation to the timing of the Dutch famine.

2414 people, aged 50 years, born as term singletons around the time of the 1944-1945 Dutch famine, of which 912 people participated in an interview and 741 subjects were also available for hospital examination

- Exposure in early gestation: three-fold increase in coronary heart disease, more obesity
- Exposure in mid-gestation: increase in obstructive airways disease
- Exposure in late gestation: impaired glucose tolerance

Painter RC, Roseboom TJ, Bleker OP. Prenatal exposure to the Dutch famine and disease in later life: an overview. *Reprod Toxicol.* 2005 Sep-Oct;20(3):345-52.

Developmental Origins of Adult Disease

DES

(Diethylstilboestrol):
Intergenerational
harm can result from
in utero chemical
exposures

Harm revealed
decades after
exposure

Medscape® www.medscape.com



Source: J Midwifery Womens Health © 2003 Elsevier Science, Inc.

Sources: Newbold, R.R., Lessons learned from perinatal exposure to diethylstilbestrol. *Toxicol Appl Pharmacol*, 2004. 199 (2): p. 142-50.; Ibarreta D, Swan SH. The DES story: long-term consequences of prenatal exposure. In: European Environment Agency. 2001. Late lessons from early warnings: The precautionary principle 1896—2000. Environmental Issue Report No. 22. Luxembourg: Office for Official Publications of the European Communities. http://reports.eea.europa.eu/environmental_issue_report_2001_22/en

Pesticide Chlorpyrifos

Animal Evidence of “Timing Matters”

- Subtle widespread effects on developing brain below the threshold for any signs of exposure related to irreversible inhibition of acetylcholinesterase
- Stage specific effects disrupts the rat brain through a variety of cellular and molecular mechanisms - mechanism and outcome change with progression of cell differentiation



Chronicle / Lance Iversen



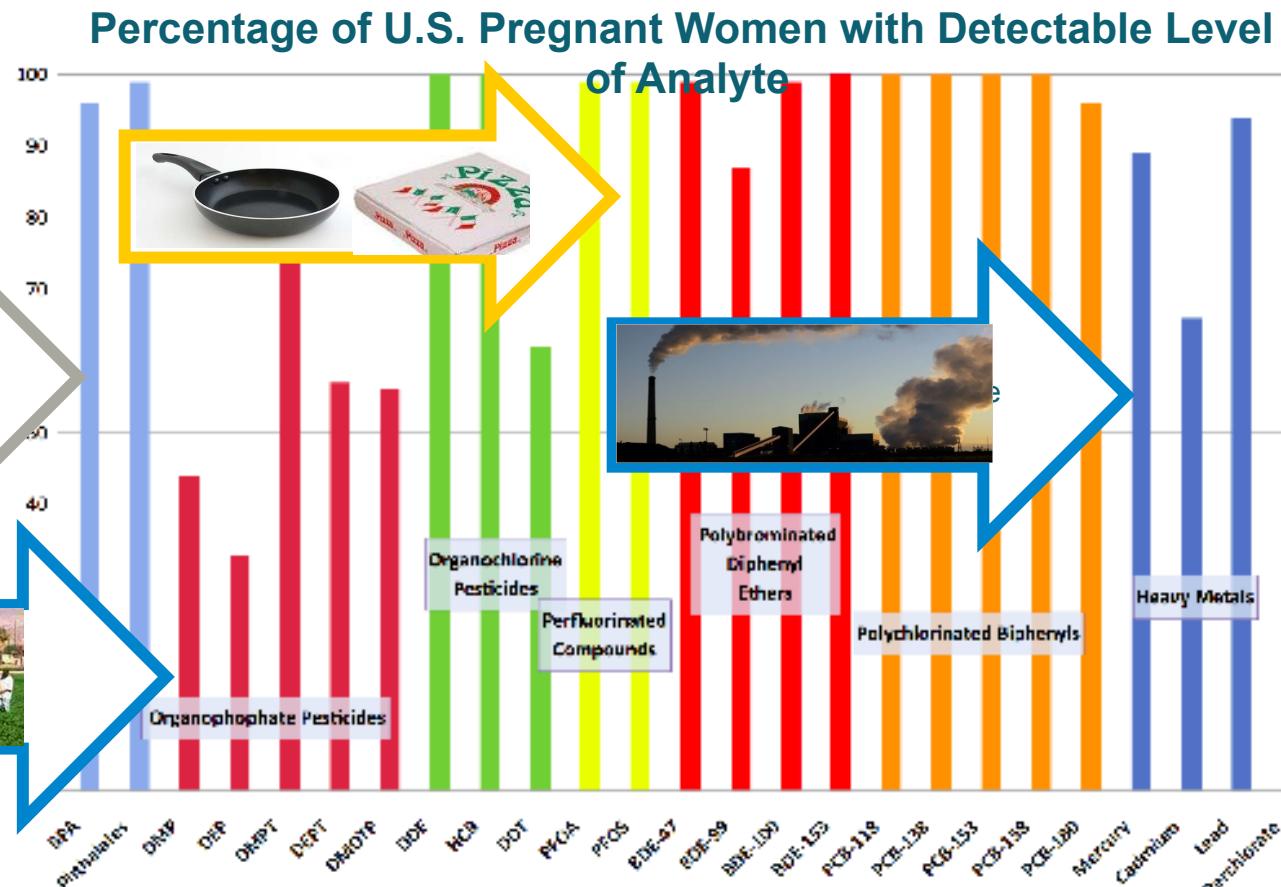
Connors, S.L., et al., *Fetal mechanisms in neurodevelopmental disorders*. Pediatr Neurol, 2008. **38**(3): p. 163-76; Slotkin, T.A., F.J. Seidler, and F. Fumagalli, *Exposure to organophosphates reduces the expression of neurotrophic factors in neonatal rat brain regions: similarities and differences in the effects of chlorpyrifos and diazinon on the fibroblast growth factor superfamily*. Environ Health Perspect, 2007. **115**(6): p. 909-16.

Key Health Concerns of Our Industrialized Food System

1. Widespread exposure to toxic chemicals
2. Antibiotic resistance
3. Food-borne illnesses
4. Environmental destruction
5. High level of consumption of foods of low nutritional value



1. Widespread exposure to chemicals with reproductive/developmental toxicity



Based on analysis of representative sample of U.S. population by NHANES 2003-2004. Note, not all women were tested for all chemicals

Source: Woodruff TJ, Zota A, Swartz JM. Environmental Chemicals in Pregnant Women in the US: NHANES 2003-2004. UCSF Program on Reproductive Health and the Environment. (*Environmental Health Perspectives* (in press))

Cumulative Exposures Add Up

Approximately 40% of children in the US may have levels in excess of benchmark exposures for neurological impacts from cumulative exposures to OP pesticides



Payne-Sturges D, Cohen J, Castorina R, et al. Evaluating cumulative organophosphorus pesticide body burden of children: a national case study. Environ Sci Technol. 2009 Oct 15;43(20):7924-30.

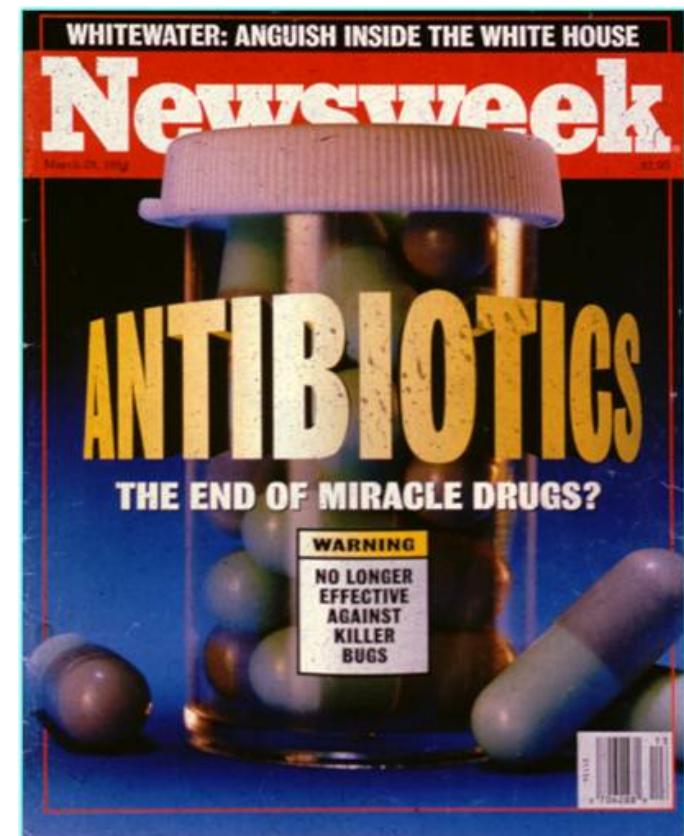
2. Antibiotic resistance

Factory Farms

As much as 70% of all antimicrobials in the U.S. are given to otherwise healthy beef cattle, swine, and poultry in their feed as a routine part of their production

Many of these antimicrobials are thought to be from seven drug classes important to human medicine

This practice is prohibited in many industrialized countries



3. Food-borne illnesses

76 million illnesses, 325,000 hospitalizations, and 5000 deaths in the US each year



- Highly centralized large distribution channels can may make detection of contaminated foods easier, but also greatly expands the reach and magnitude health consequences due to a breach in food safety
- 2009 peanut butter salmonella contamination – 529 individuals 43 states

- High-speed, automated methods of slaughtering and food processing that may make contamination more likely and more difficult to detect



Source: Jackson RJM, Ray; Naumoff, Kyra S; Shrimali, Bina Patel; Martin, Lisa K. Agriculture Policy is Health Policy. *Journal of Hunger and Environmental Nutrition*. 2009;4:393-408; Mead PS, Slutsker L, Dietz V, McCaig LF, Bresee JS, Shapiro C, et al. Food-related illness and death in the United States. *Emerg Infect Dis*. 1999 Sep-Oct;5(5):607-25; CDC. Multistate Outbreak of Salmonella Infections Associated with Peanut Butter and Peanut Butter--Containing Products --- United States, 2008--2009 2009 February 6, 2009

4. Environmental Destruction

- **Energy inefficient**
 - 3 kcal in to create 1 kcal food energy
- **Polluting – pesticides, nitrogen fertilizer runoff**
- **Fossil fuel dependent**
 - Needed to run the machinery
 - Natural gas-derived fertilizers – In 2007, 58% of nearly 23 million tons of chemical fertilizers nitrogen-based
 - Petroleum-derived pesticides –
 - Transportation throughout the supply chain (small relative to livestock production)

Why are we eating



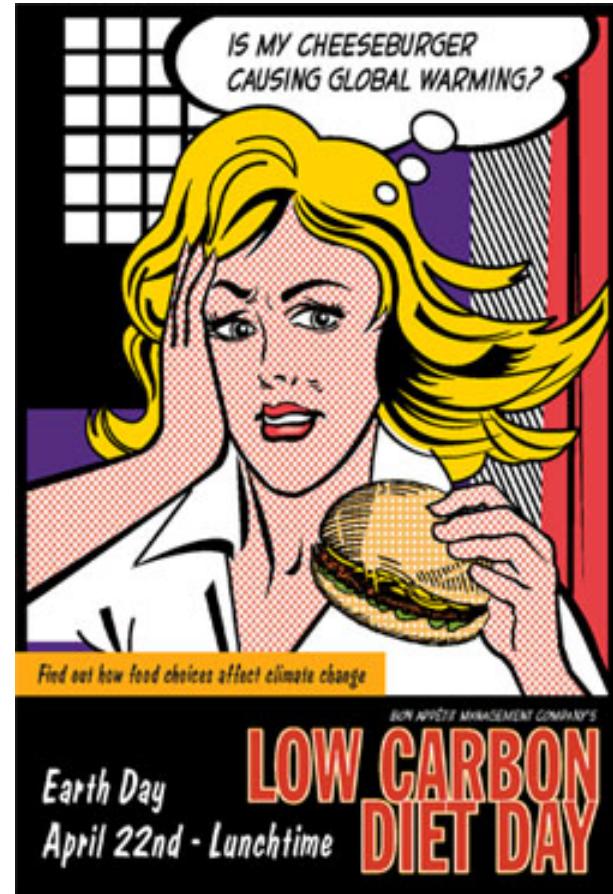
FOSSIL FUELS?

Sustainable Living-Elana Dell-Joyce

Graphic <http://www.sedona.biz/sustainable-living0107.htm>

4. Environmental Destruction

- Climate change contributor
 - Global livestock production contributes 18% of global anthropogenic greenhouse gas emissions (transportation (14%); energy production (21%))
 - The climate impacts of livestock are largely due to the use of fossil-fuel intensive grain, rather than pasture or grass, to feed the animals



5. High level of consumption of foods of low nutritional value

- 1 in 3 children ages 2-19 years is overweight or obese
- Average consumption of HFCS has increased by over 25% in the last 30 years
- Prepared and processed food is readily accessible, inexpensive and heavily promoted
- Over \$ 1.6 billion was spent in marketing to children and adolescents in 2006 by food, beverage, and quick-serve restaurant companies to promote their products to young people



Next:

What Can Health Care Professionals Do to Promote a Healthy Food System?

