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JOHNS HOPKINS
BLOOMBERG
SCHOOL of PUBLIC HEALTH

Breast and Complementary Feeding

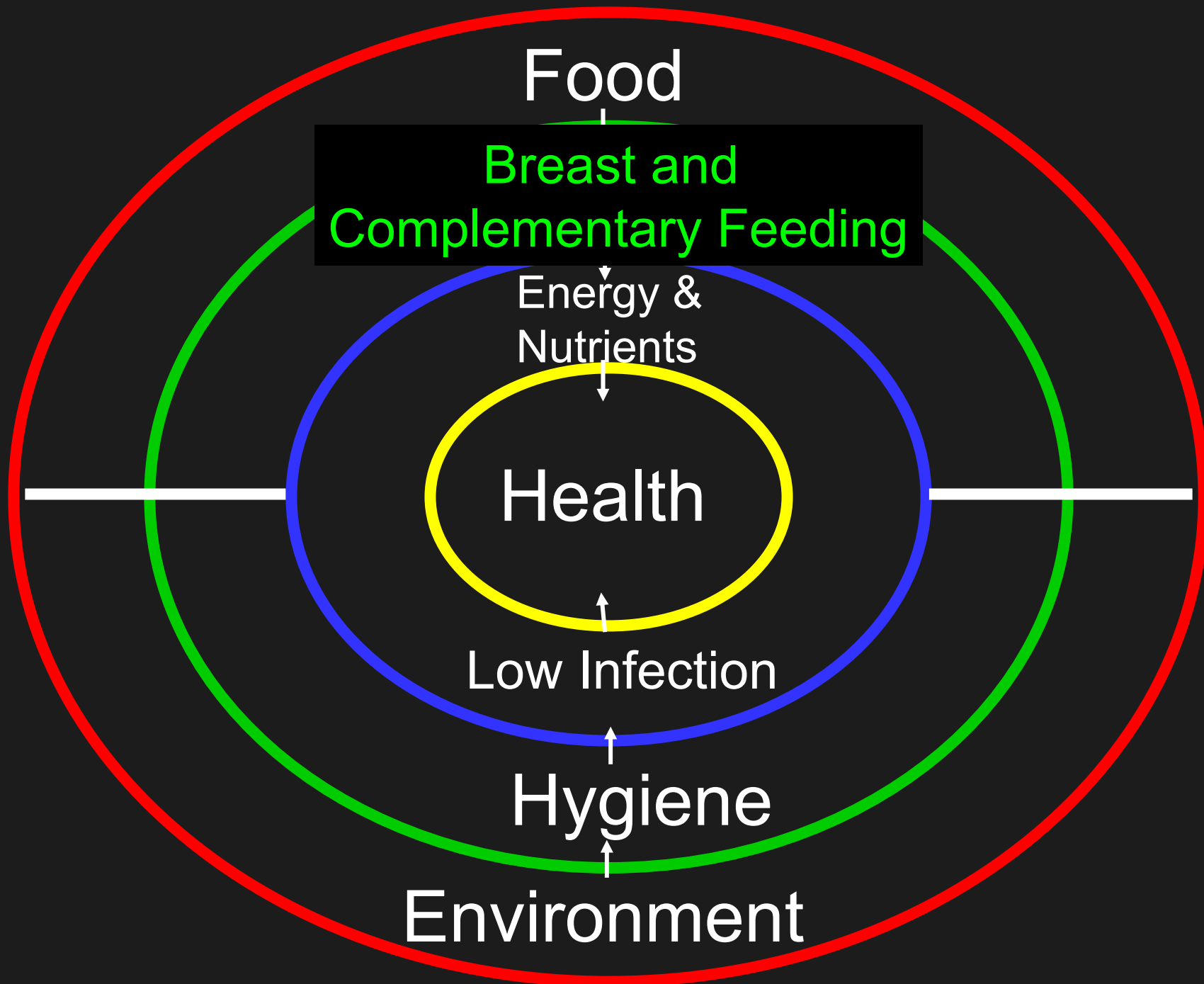
Household Actions to Keep Children Healthy

Keith P. West, Jr., Dr.P.H.
Professor

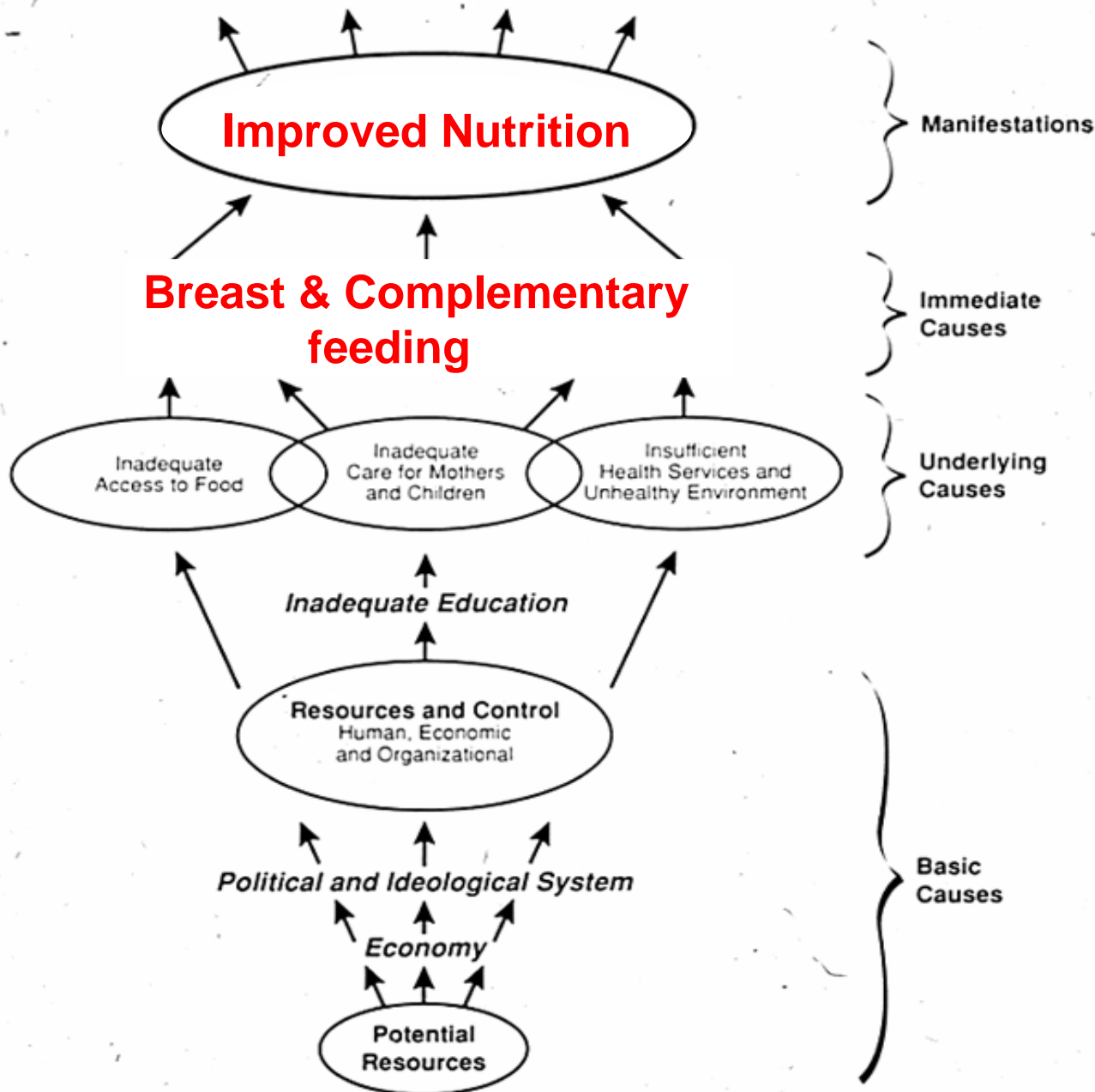


Breast feeding and complementary feeding practices represent the “front line” of maternal care, nurturing and interaction with infants and young children; adequacy of feeding determines many aspects of child growth, health and development. Breast feeding also can affect maternal health.

Photo: K. West



Health, Growth, Development



Adapting the UNICEF model of causation;

Mothers, supported by family, play pivotal role in protecting children from undernutrition

Breast feeding...

- Breast milk supplies ideal mix, density and physiologic form of nutrients to promote adequate infant growth & development
- Reduces exposure of infant to enteropathogens
- Anti-bacterial & anti-viral
- Reduces infant infections
- Provides biologic & emotional bond between mother & infant
- Healthy for mother: reduces risk of ovarian & breast cancer, post-partum hemorrhage & anemia, increases birth spacing

WHO/UNICEF Recommendation: Exclusively breast feed for 1st 6 months



- EBF can provide adequate
 - Energy
 - Nutrients
 - Fluid
 - Protection from infection
 - Nutrition for growth
- Feeding colostrum: important
- Avg intake: 700-800 ml/day
- Individual exceptions exist

Photo: K. West

WHO/UNICEF 2001

**Selected Nutrient Concentrations
(mean \pm SD) in Mature Human Milk**
Energy: 740 kcal per liter

<u>Nutrient</u>	<u>Amount</u>
Protein (g/L)	10.5 \pm 2.0
Fat (g/L)	39.0 \pm 4.0
<u>Minerals</u>	
Calcium (mg/L)	280 \pm 26
Copper (mg/L)	0.25 \pm 0.03
Iodine (μ g/L)	110 \pm 40
Iron (mg/L)	0.30 \pm 0.10
Zinc (mg/L)	1.2 \pm 0.2

Selected Nutrient Concentrations (mean \pm SD) in Mature Human Milk

<u>Nutrient</u>	<u>Amount</u>
<u>Vitamins</u>	
Folate ($\mu\text{g/L}$)	85 \pm 37
Niacin (mg/L)	1.50 \pm 0.20
Riboflavin (mg/L)	0.35 \pm .025
Thiamin (mg/L)	0.21 \pm 0.03
Vitamin B ₆ ($\mu\text{g/L}$)	93 \pm 8
Vitamin B ₁₂ ($\mu\text{g/L}$)	0.97

Selected Nutrient Concentrations (mean \pm SD) in Mature Human Milk

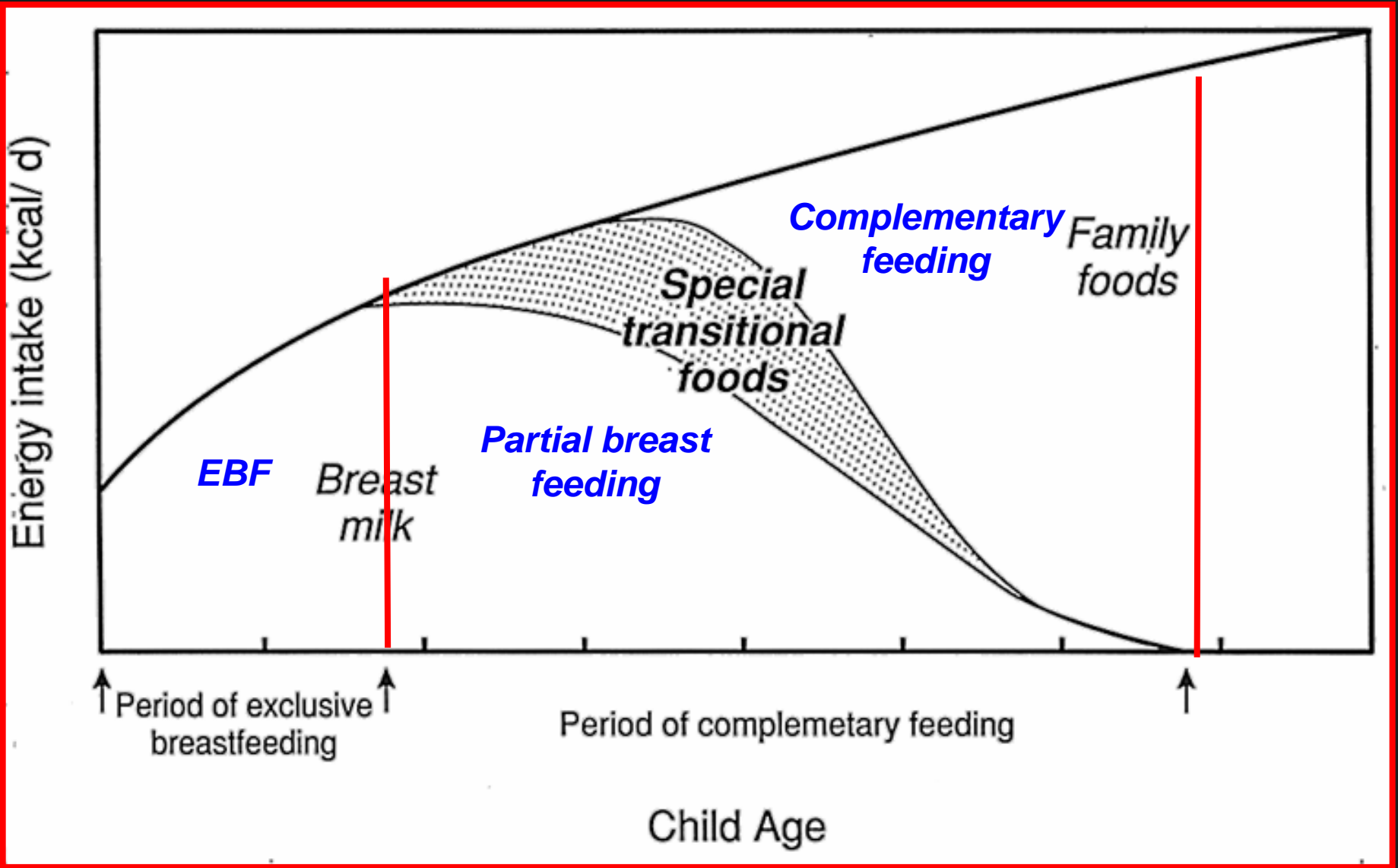
<u>Nutrient</u>	<u>Amount</u>
<u><i>Vitamins</i></u>	
Vitamin C (mg/L)	40 \pm 10
Vitamin A (μ g RE/L)	500
Vitamin D (μ g/L)	0.55 \pm 0.10
Vitamin E (mg/L)	2.3 \pm 1.0
Vitamin K (μ g/L)	2.1 \pm 0.1

Definitions: Breast Feeding

- **Exclusive (or Full) Breast feeding (EBF):** all fluid, energy and nutrients are from breast milk (except small amounts of medicinal supplements); minimal pathogen exposure
- **Almost EBF:** refers to use of water or other non-nutritive liquids plus EBF
- **Partial BF:** mixed feeding with breast milk plus non-human milk, some solids, other fluids as sources of energy and nutrients

Definitions: Complementary Feeding

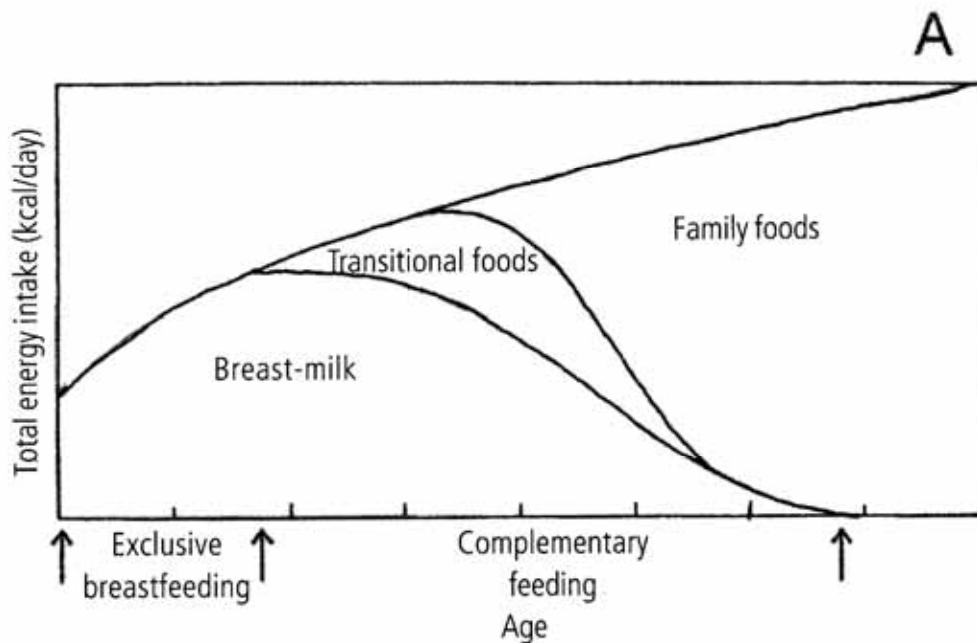
- **Period of complementary Feeding (CFg):** when other foods or liquids are given along with breast milk (previously “weaning period”)
- **Complementary Foods (CFs):** food or liquids other than breast milk given to young children during the period of complementary feeding
- **Transitional Foods (TF):** nutrient dense CFs designed meet nutritional needs of child
- **Weaning:** complete cessation of any breast feeding



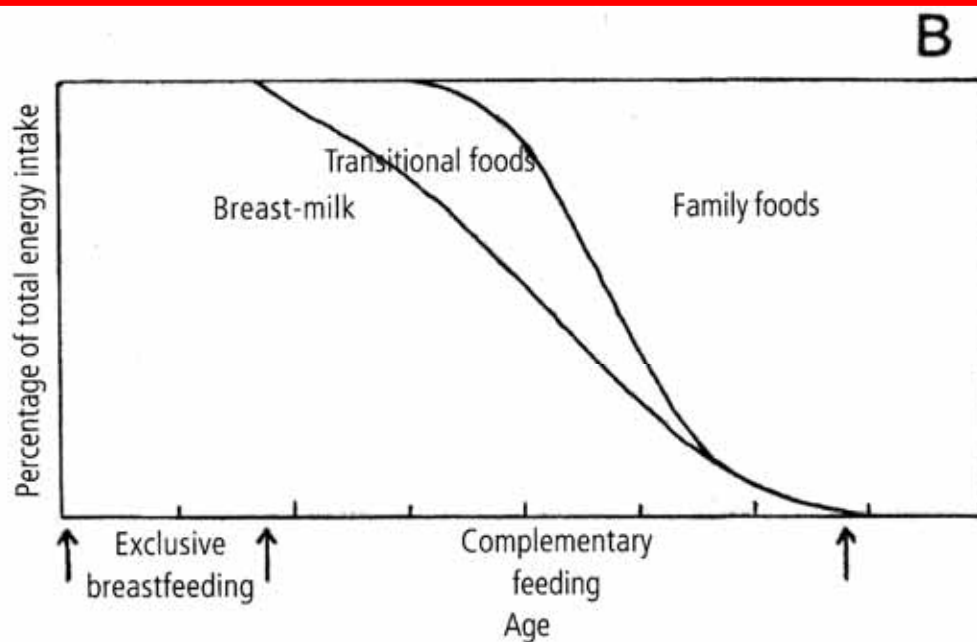
Adapted from: KH Brown, K Dewey & L Allen. Complementary Feeding of Young Children in Developing Countries. Geneva:WHO, 1998.
 Redrawn in KP West Jr, 2000

Fig. 1. Contribution of different food sources to young children's energy intake in relation to age

Total Energy Intake



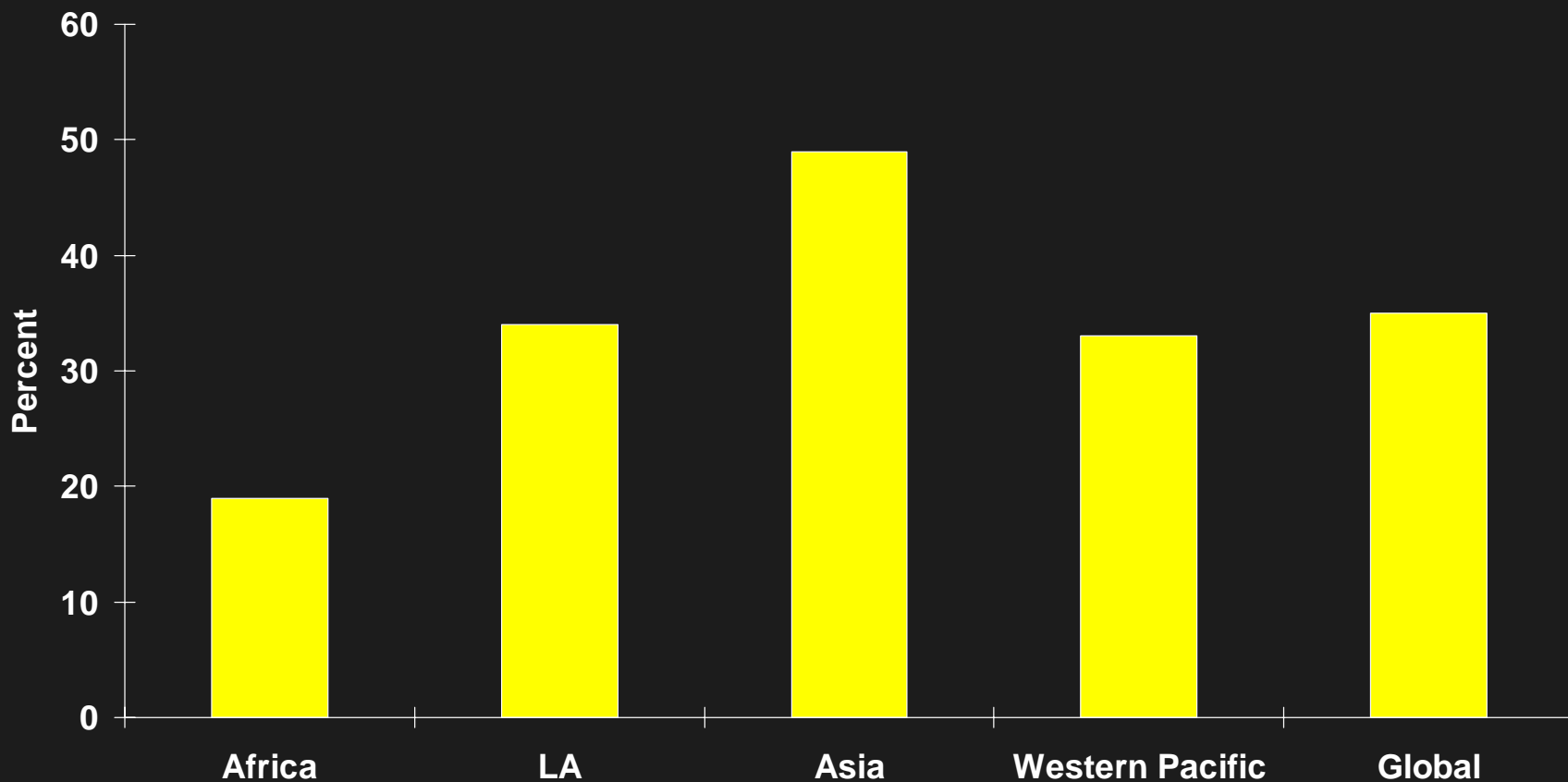
Percent Total Energy Intake



Graphs reproduced from: WHO/NUT/98.1

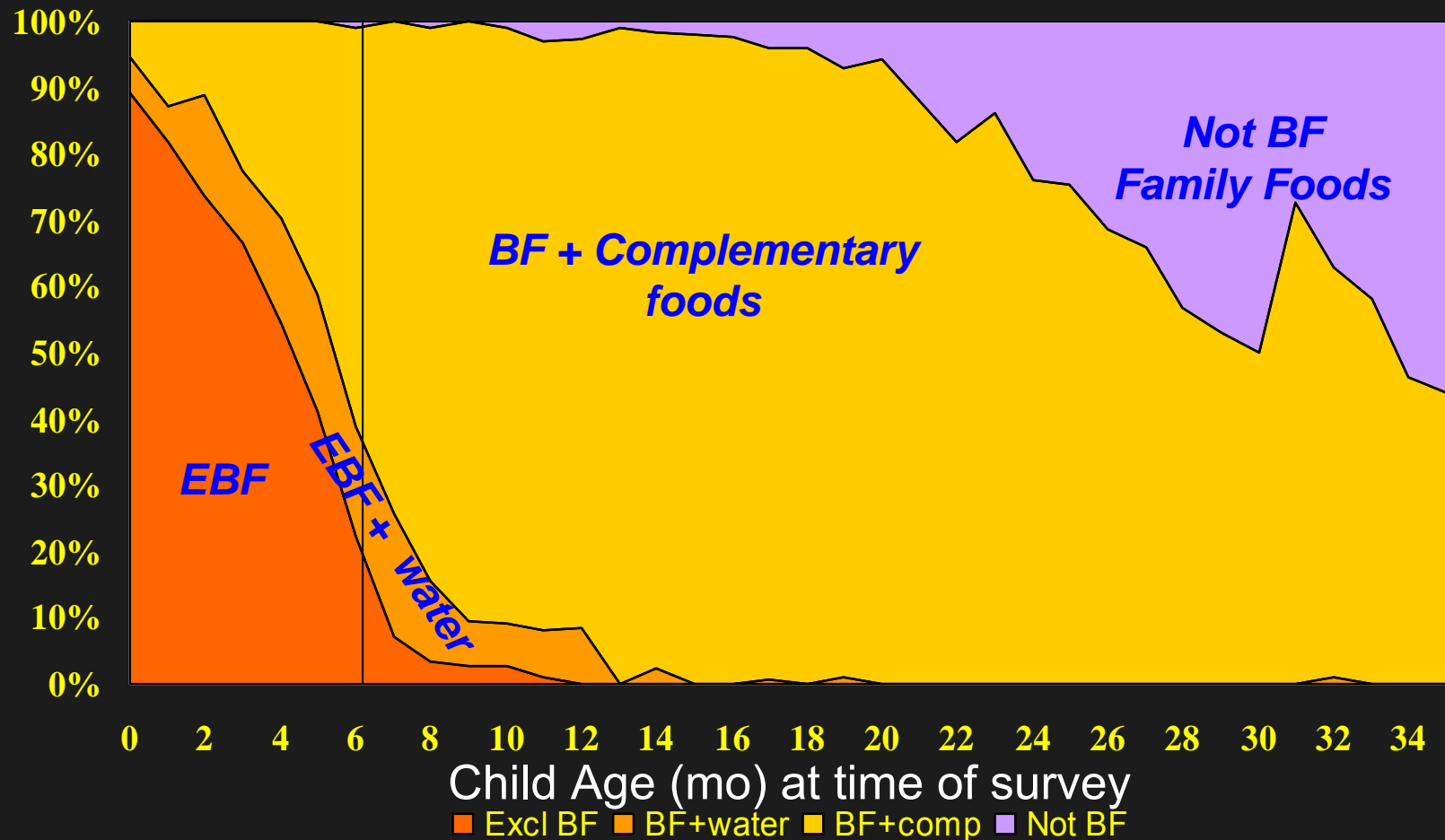
Exclusive Breastfeeding (EBF) <4 mo

WHO, 1996: 20 to 50%



Breastfeeding Status of Nepalese Children

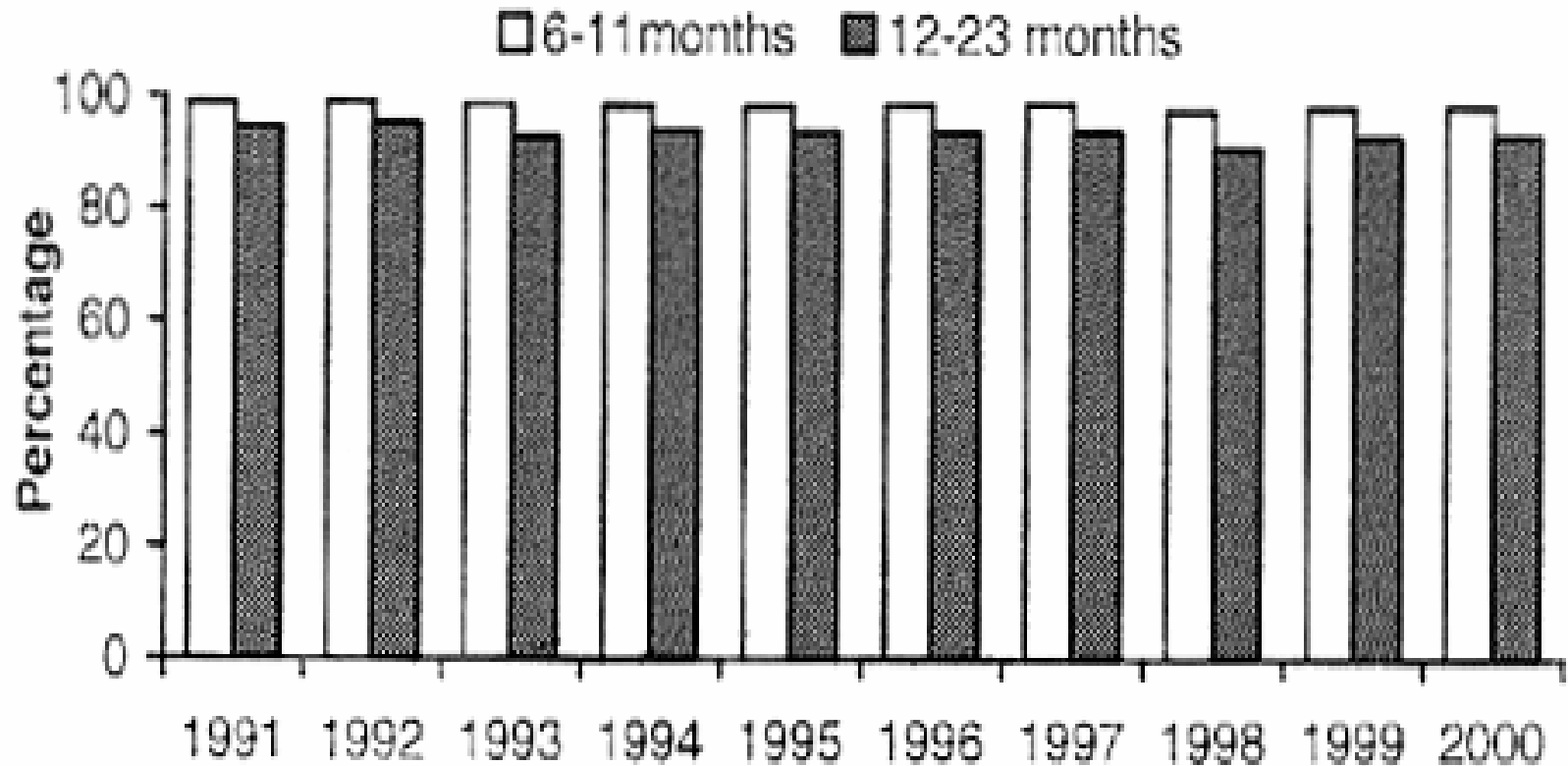
Ages 0-35 months, 2001 DHS in Nepal



Breast feeding and
complementary
feeding: 0 to 4 mo

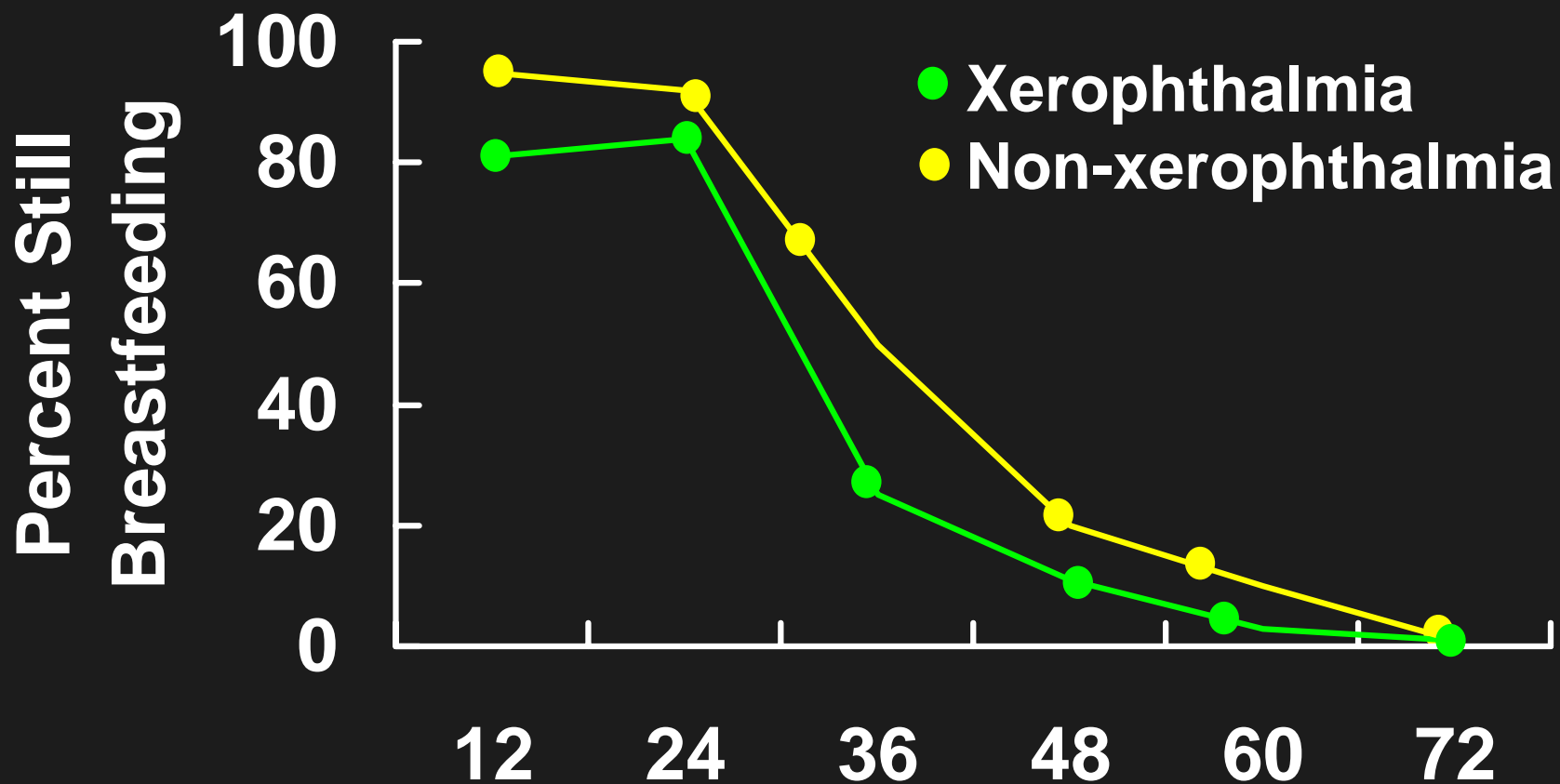
In most developing
countries, most
breast fed infants
also receive liquids
and other foods in
addition to breast
milk.

Percentage of Bangladeshi children 6 to 11 and 12 to 23 months of age reported to be breast fed, 1991-2000 (n=170,967): >90%

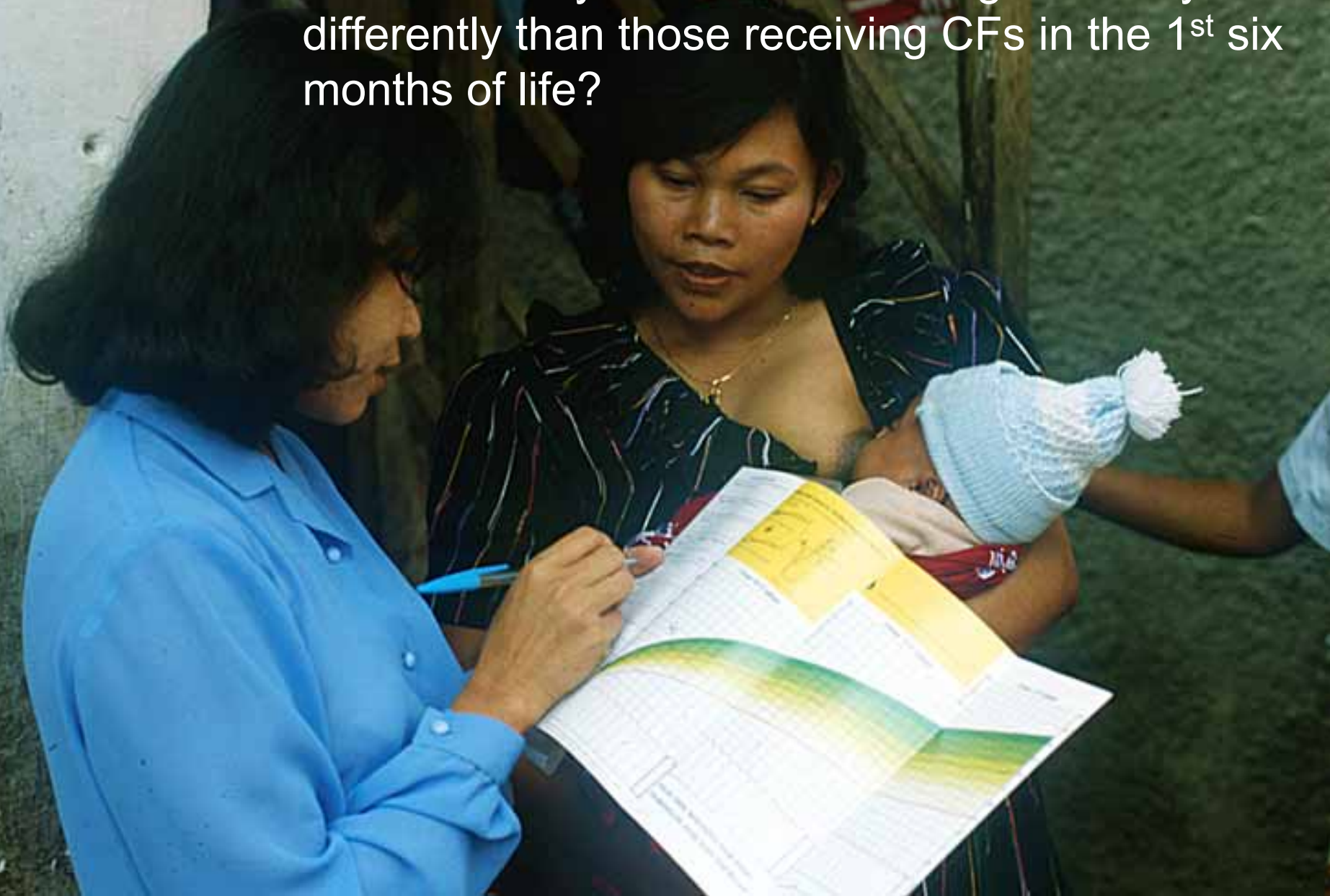


Partial Breastfeeding Patterns by Age

Bangladesh Nutritional Blindness Survey, 1983



Do exclusively breast fed infants growth any differently than those receiving CFs in the 1st six months of life?



Age of Introduction of Complementary Foods: Effects on Intake and Growth in Honduras

- Infants of low-income, primiparous mothers EBF to 4 mo post partum
- Randomized from 4 to 6 mo to
 - (1) EBF (n=50)
 - (2) CF plus *ad lib* BF (n=47)
 - (3) CF **plus maintained** BF frequency (n=44)

Other Changes in Feeding Variables from 4 to 6 Months of Age in Honduran Infants by Randomized Group

R Cohen et al Lancet 1994;343:288-93

Group	BF Frequency (x per day)	BF Duration (min/day)	Energy (kJ/day)
EBF	-0.2	-28	
CF+AL BF	-2.4	-60	+210
CF+M BF	-0.5	-30	+260

Complementary feeding without counseling about breast feeding (ad lib) decreased BF frequency and duration. Increased energy intakes **did not** translate into improved infant growth.

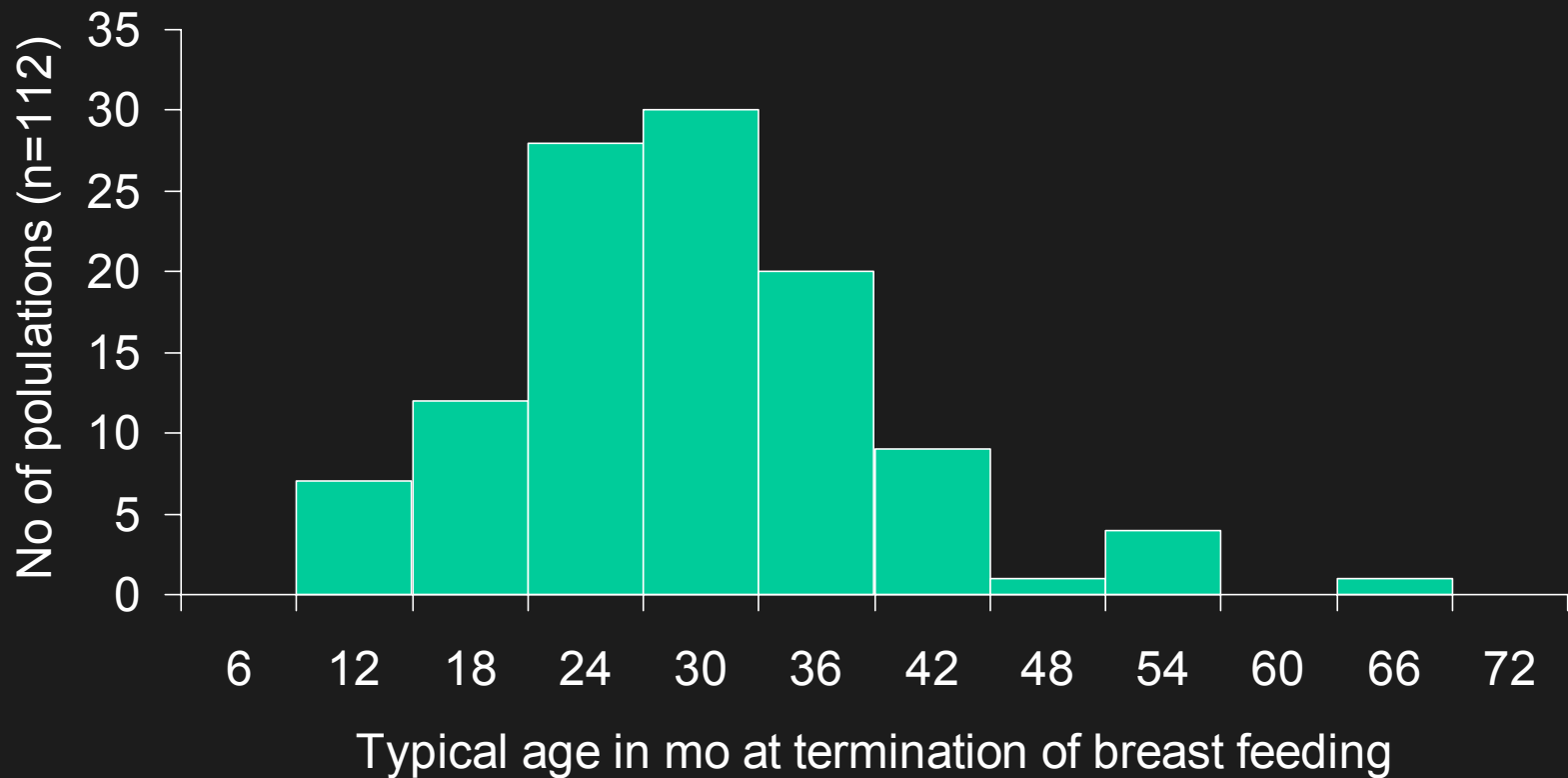
WHO Global Infant Feeding Recommendations, 2002

- Start BF early (<1hr after birth)
- Exclusive breast feeding for 6 months
- Start complementary feeding at 6 months with continued breast feeding to ≥ 2 yrs
- Provide appropriate complementary feeding:
 - Timely
 - Adequate
 - Safe
 - Properly fed

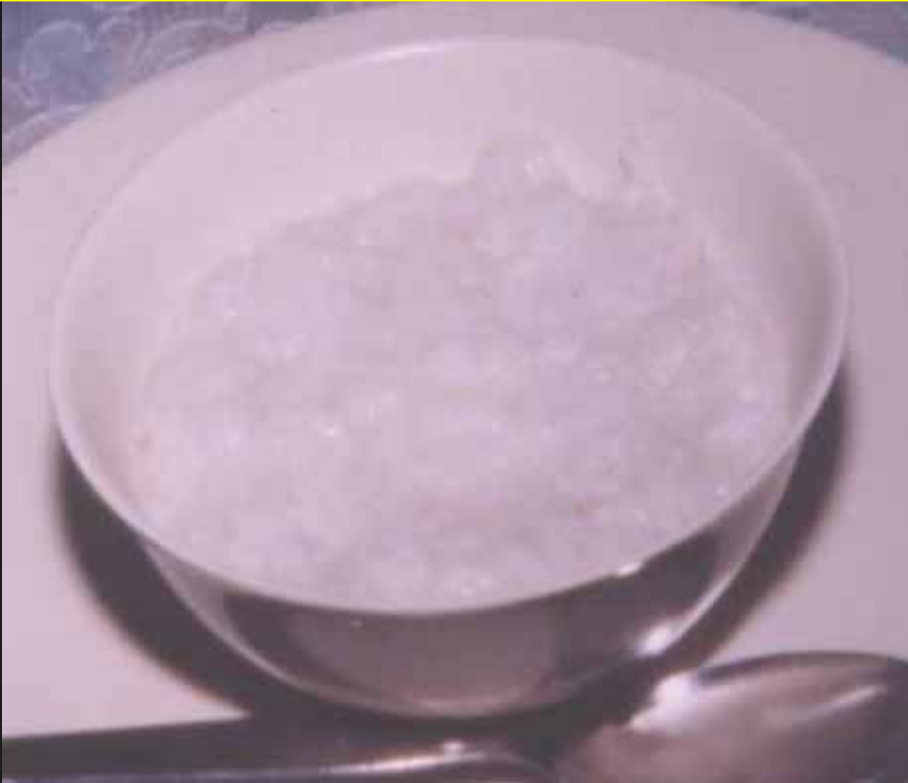
Complementary Feeding...

- **Timely** : CFs introduced when need for energy and nutrients exceeds that provided by BF
- **Adequate**: CFs should provide sufficient energy, protein, and micronutrients
- **Safe**: CFs that they are hygienically stored and prepared and fed
- **Properly fed**: CFs given in line with child's signals for appetite and satiety and that meal frequency and feeding method (active) are suitable for age

Distribution of Reported Ages at Weaning in Non-industrialized Societies



Complementary Foods Vary in Quality



rice



fish+vegetable+oil

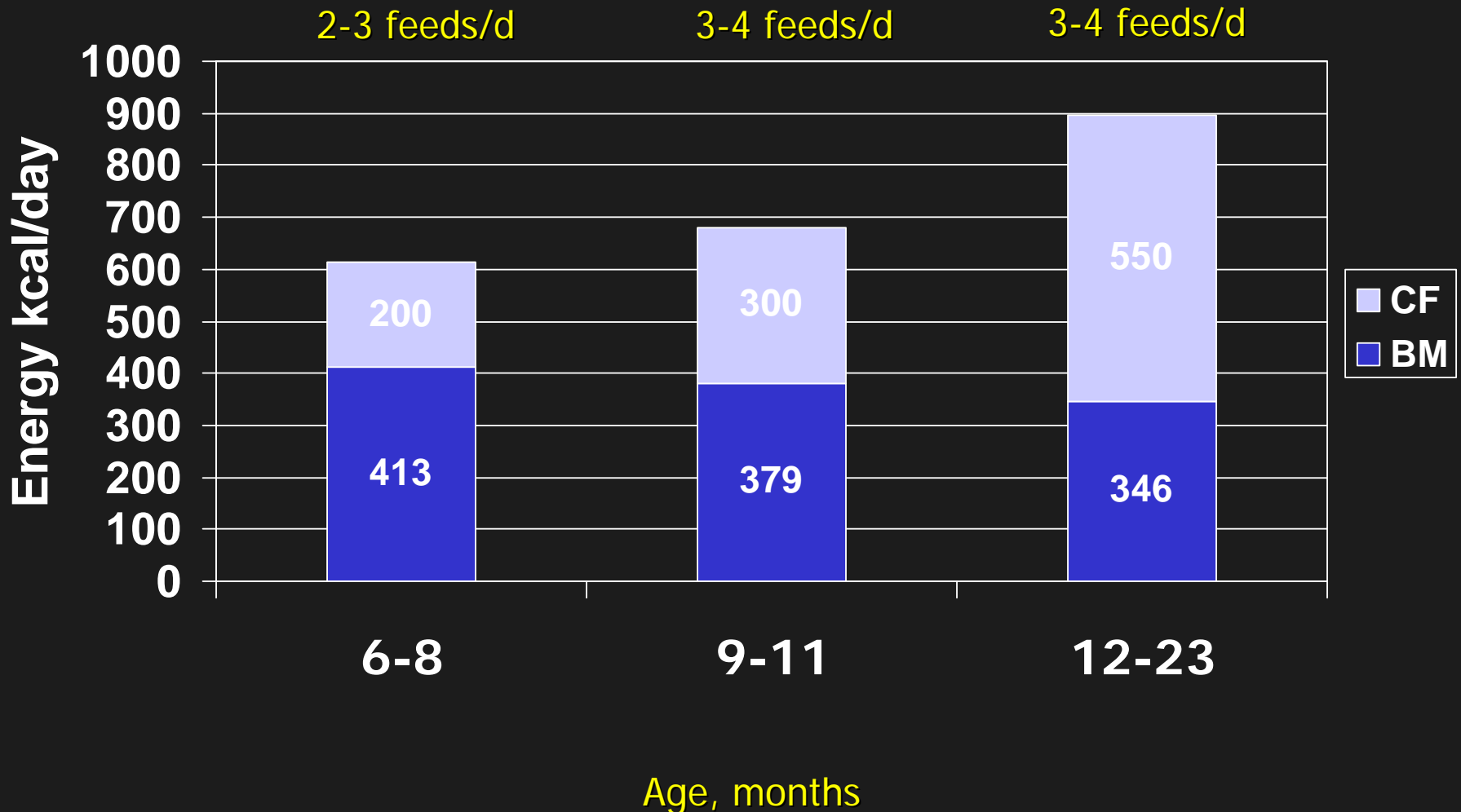
Social Concerns about Complementary Feeding

- Feeding mode is rooted in poverty
- Food insecurity (limits access)
- Maternal responsibility (vs other HH members)
- Food taboos and social norms govern types and timing of CF introduction
- No CFg advocacy, few CFg programs
- Part of larger development problem

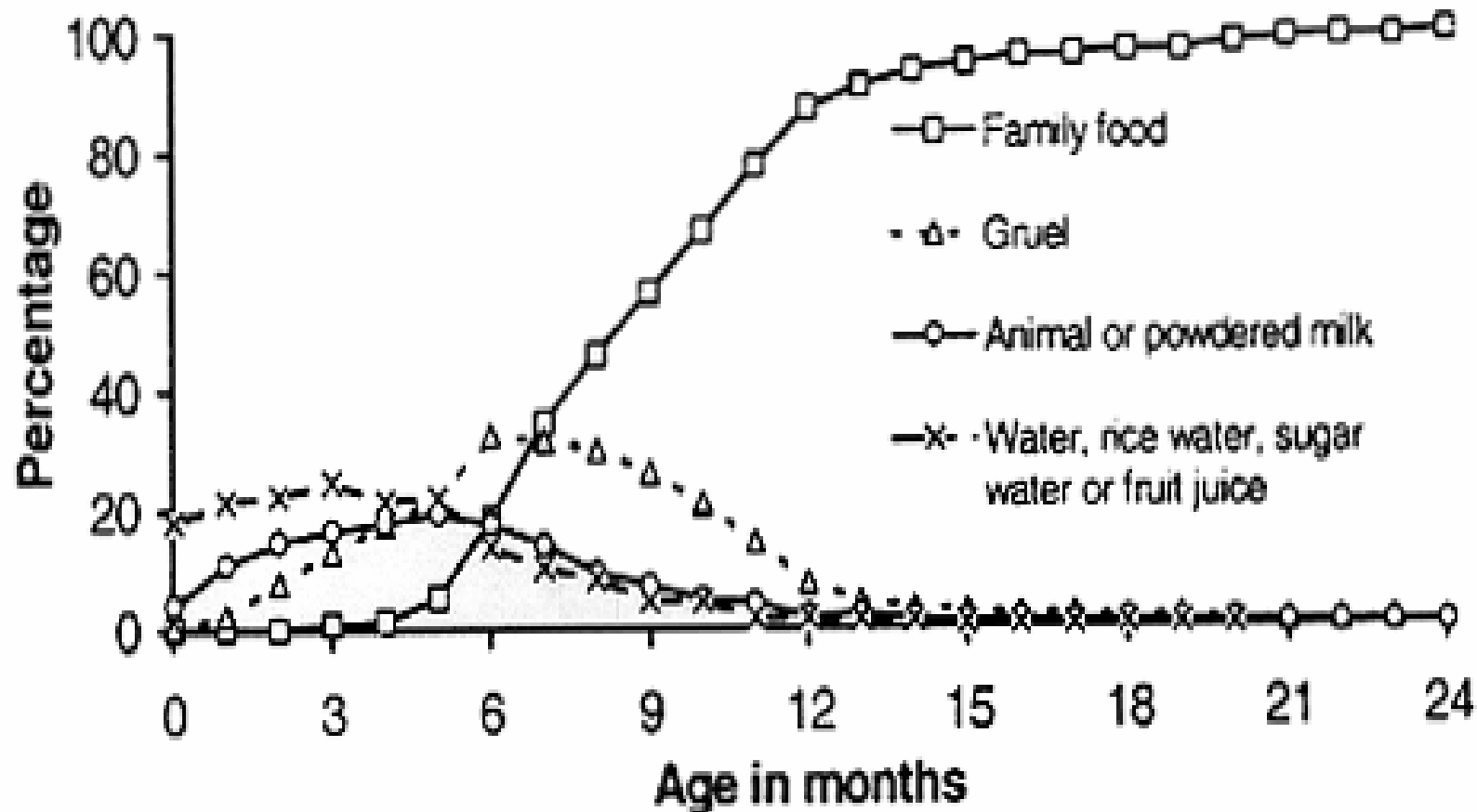
Nutritional Concerns about Complementary Feeding

- Density and total intake of energy
- Quality vs quantity
- Hygienic delivery
- Appropriate age at introduction
- Impact of CF intake on breast milk intake

Energy Required from Complementary Foods (CF) Assuming Average Breast Milk (BM) Intake



Main types of food given to infants and young children < 24 months of age in rural Bangladesh (n=26,557)



Correlation of Food Intake Patterns in Nepalese Children by Type of Food Usually Eaten in 1st 2 Years

	<u>“r” with Sib Diet</u>
Meat w/liver	0.38
Egg	0.53
Fish w/liver	0.39
Mango	0.54

Fig. 13. Factors affecting the energy density of complementary foods and energy intake by the infant and young child.

The direction of influence is indicated as positive (+) or negative (-).

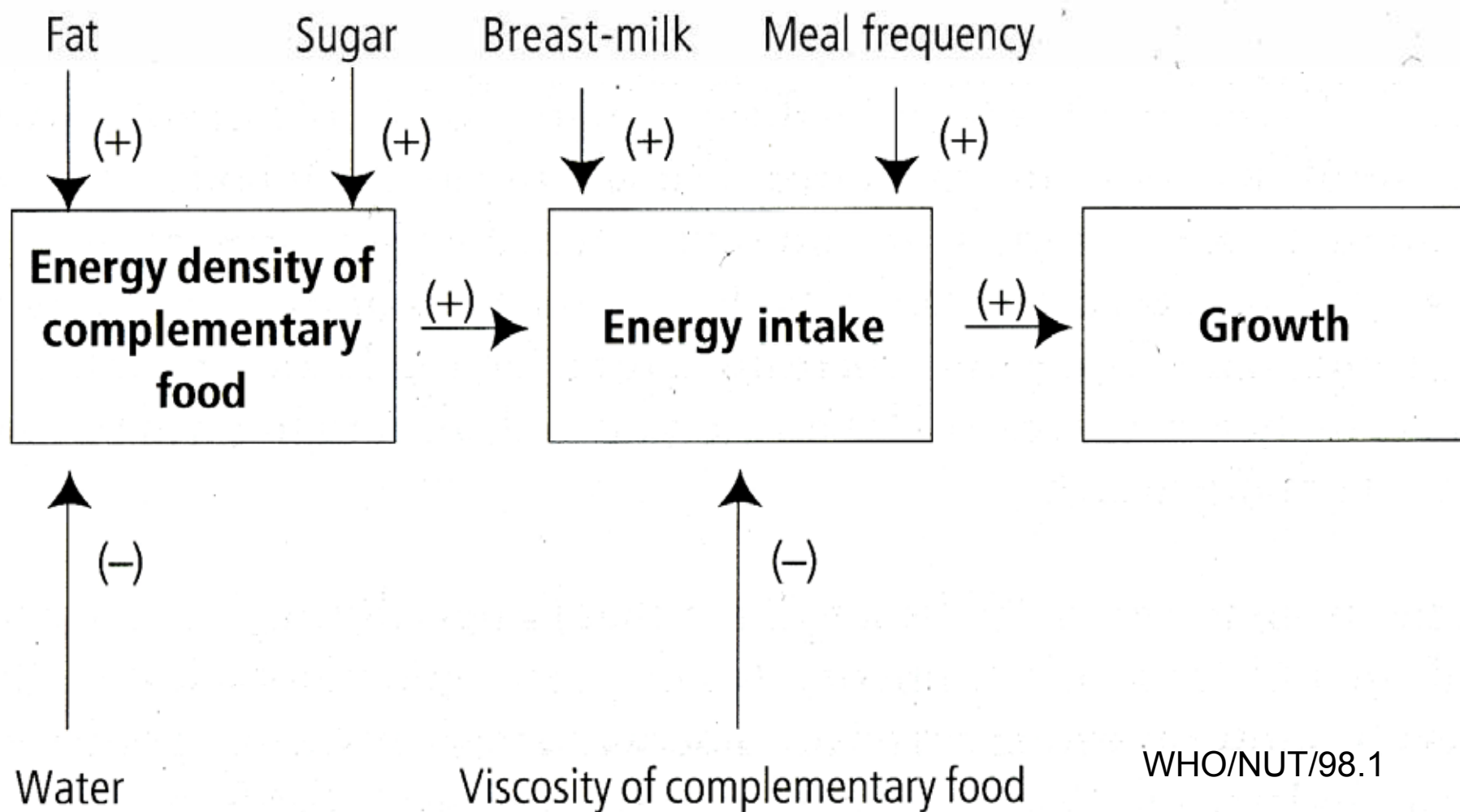
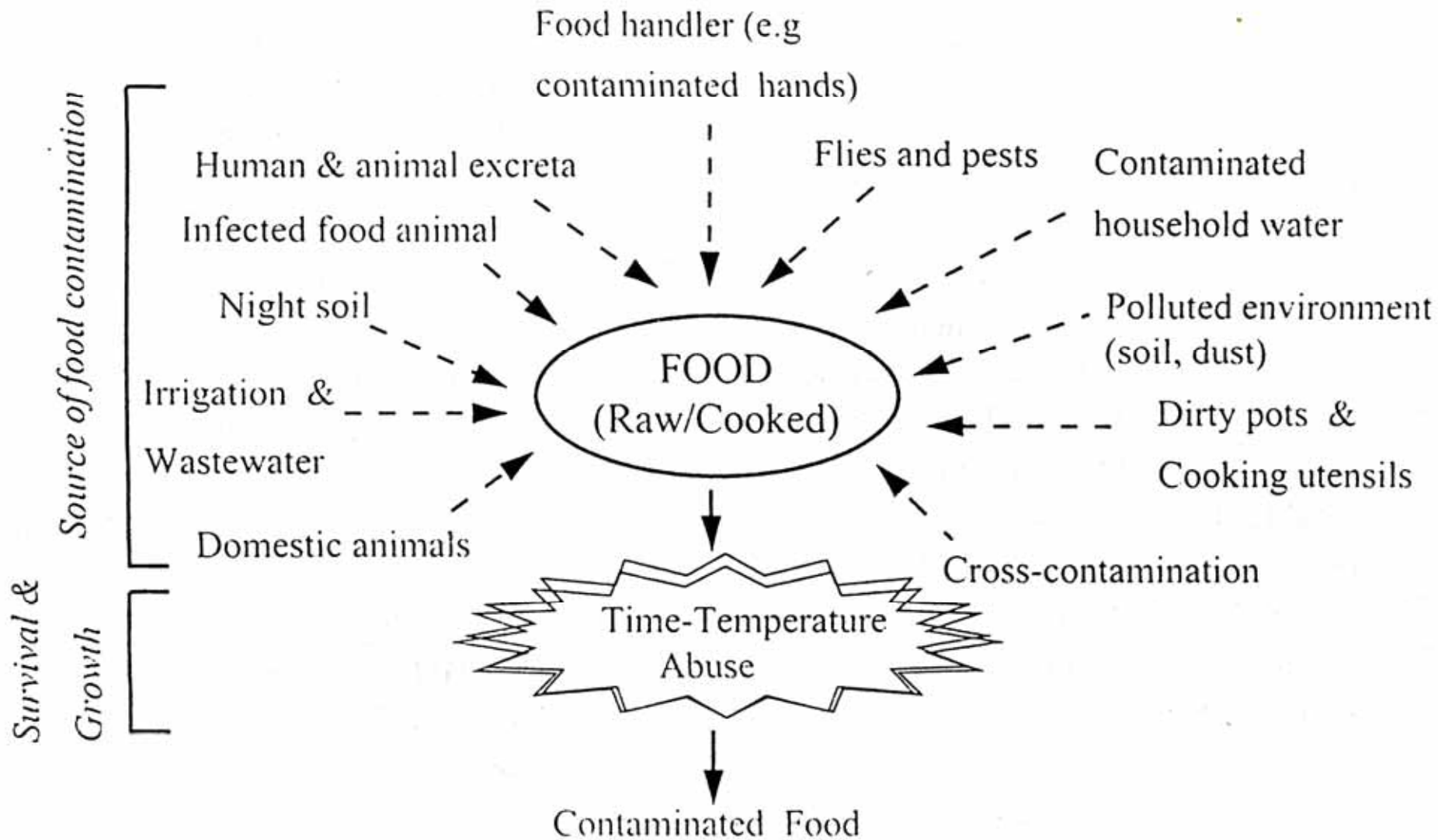


Figure 7. Sources of food contamination



Guiding principles for complementary feeding of the breast fed child

Dewey K, Lutter C. PAHO, Division of Health Promotion
And Protection, Food and Nutrition Program, Washington DC,
2003; <http://www.paho.org>

1. Practice EBF from birth to 6 mo; introduce CF at 6 mo while continuing to breast feed

- May, 2001, 54th WHA global recommendation to BF exclusively up to 6 mo of age
- Protects against gastrointestinal infections
- Possible enhanced motor development
- Prolongs lactational amenorrhea & accelerates maternal weight loss
- No adverse effects of EBF on *population basis*
- Nutritional needs met for most infants: If not gaining weight or appears hungry, give CFs

2. Continue frequent, on-demand breast feeding until 2 years of age (or beyond)

- Breast milk continues as vital source of energy (30-40%, on avg) and nutrients into 2nd yr of life
- Key source of
 - protein & essential fatty acids
 - micronutrients:
 - 70% of vitamin A
 - 40% of calcium & riboflavin
 - fluid and nutrients *during infection*
- Associated with greater linear growth
- Linked to lower risk of chronic diseases & obesity

3. Practice responsive feeding

- Feed infants directly & assist older toddlers eat; be sensitive to hunger & satiety cues
- Feed patiently; encourage, but don't force
- If child refuses, experiment with different food combinations, tastes, textures
- Minimize distractions during meals
- Talk to child during feeding; maintain eye contact
- **Key: what, but also how, when, where & by whom child is fed**

4. Practice good hygiene & proper food handling

- Washing caregiver's and child's hands before preparing, handling and eating food
- Store foods safely; serve shortly after prepared
- Use clean utensils to prepare & serve food
- Use clean bowls & cups when feeding child
- Avoid feeding bottles which are hard to clean
- **Note: Diarrhea and growth faltering peak in 2nd half of infancy, directly related to CFg**

5. Start at 6 mo with small amounts of food; increase quantity with age, maintaining frequent breast feeding

- Energy needs from CFs should “complement” energy intake from breast milk
 - Nutritional principle: adjust CF intake to meet energy requirements by age not obtained from breast milk
- If infant breast feeds more or less than average, adjust CF intake accordingly
- In practice: this is achieved through “responsive feeding”

6. Increase food consistency & variety with age, adapting as you go

- Can feed pureed, mashed & semi-solids @ 6 mo; “lumpy” foods before 10 mo
- Can feed finger foods by 8 mo
- By 12 mo, family foods can be eaten, keeping in mind need for nutrient-dense (transitional) foods
- Avoid foods that can cause choking (eg, nuts, carrots, grapes, etc)
- **Key: Poor choices in CFs can depress intake**

7. Increase meal frequency with age

- On average, provide CFs
 - 2-3 x per day by 6-8 mo
 - 3-4 x per day by 9-11 mo, and
 - by 12-24 mo add 1-2 snacks (soft fruit, bread w/ nut paste)
- Nutritional principles:
 - Number of feeds based on estimated gastric capacity of 30 g of food per kg per day & minimum CF energy density of 0.8 kcal per gram
 - When amount eaten per feed or energy density are lower, increase meal frequency
- **Key: Be mindful not to displace breast feeds**

The "Weanling's Dilemma"

- Delayed introduction of complementary foods may lead to insufficient energy and nutrient intakes and poor growth

BUT

- Premature introduction of CF can increase pathogen exposure, risk of infection and mortality



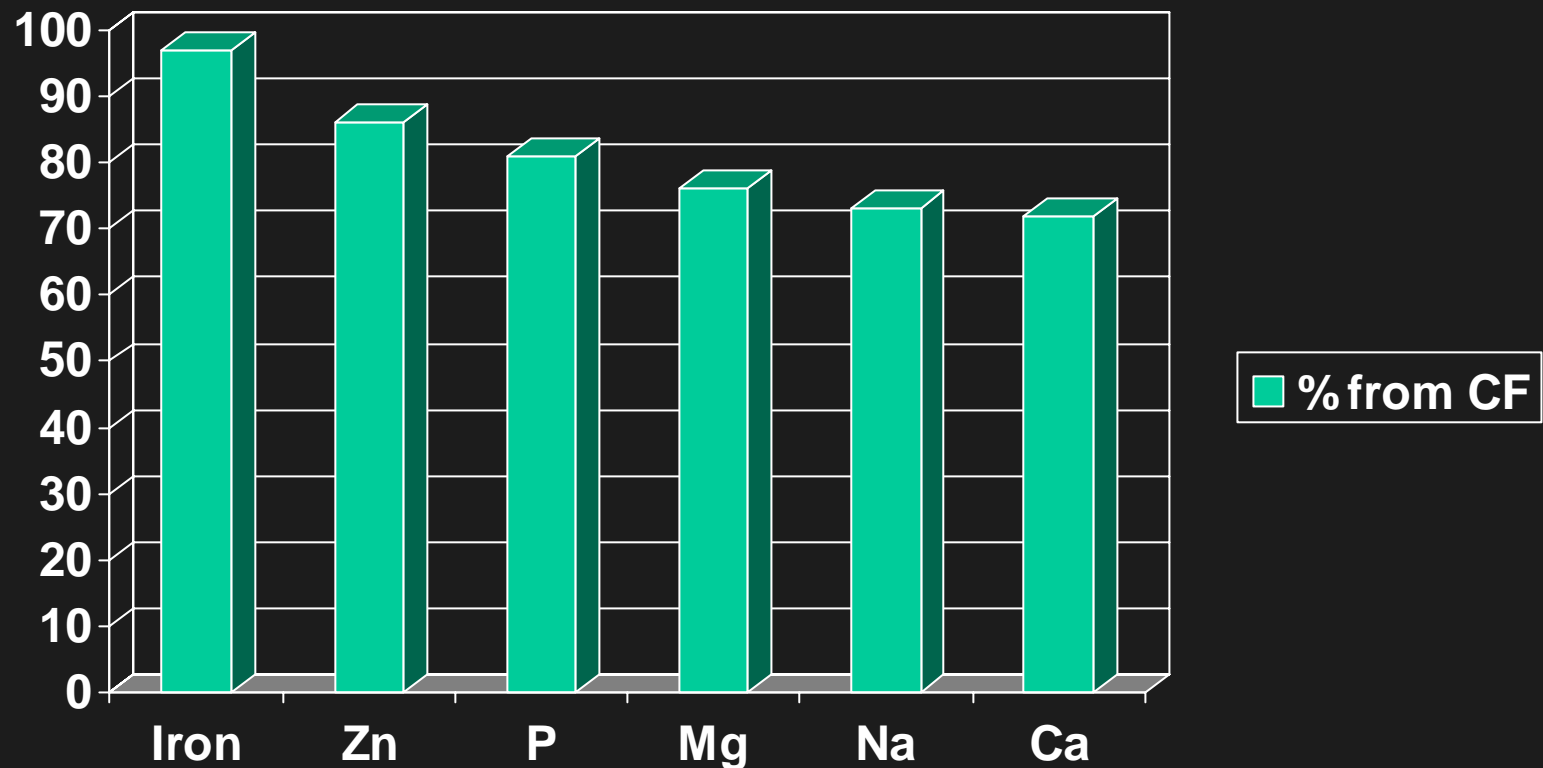
Photo: K. West

8. Ensure nutrient density* and content of CFs are met through dietary variety

- Meat/fish/poultry/eggs daily or often
- Provide non-human milk in cooked gruels
- Vegetarian diets generally can not meet nutrient needs at this age without supplements or fortification
- Feed carotene-rich fruits and vegetables
- Avoid giving drinks of low nutrient value (eg, tea, coffee, sugar-beverages)
- Limit amount of “juice” to avoid displacing more nutritious foods

*Nutrient content/100 calories

Percent of Recommended Nutrient Intake Required from CFs by 9-11 Mo of Age (not provided by breast milk)



K Dewey Ped Clin N Amer 2001;48:87

9. Use fortified CF or micronutrient supplements for infants or mothers, as needed

- Animal source foods help keep nutrient density high, but are costly
- Difficult to achieve adequate iron, zinc or calcium density in usual CF mixtures
- Mothers in some undernourished populations may require added micronutrients, from supplements or fortified foods
- “Sprinkles” home-based fortification of CFs may be a future partial solution

10. Feed a child more fluid & food during illness including breast milk & soft, varied, appetizing, favorite foods

- After illness:
 - give food more often than usual
 - encourage child to eat more
- Meet increased fluid requirement
- Sick children prefer breast milk
- Encourage food intake despite poor appetite
- Catch-up growth after illness depends on extra food intake

International Code of Marketing of Breast Milk Substitutes (1)

- Resolution (34.22) passed by the 34th WHA on May 21, 1981
- Governments shall inform citizens of
 - Benefits of breast feeding (BF)
 - Importance of maternal preparation for BF
 - Negative effects of bottle-feeding
 - Health hazards of unnecessary or improper use of infant formula or breast milk substitutes

International Code of Marketing of Breast Milk Substitutes (2)

- Governments shall
 - Restrict advertising, use of visual materials that promote use of BM substitutes
 - Restrict direct & indirect access of manufacturers & distributors to pregnant women & families
 - Prohibit free sample & gift distributions
 - Review & approve educational materials on breast feeding and BM substitute use
 - Assure no health facility promotes formula
 - Comply with rigid code of conduct in approval & use of BM substitutes, when indicated

Baby Friendly Hospital Initiative

As of 2002...

- 16,000 hospitals certified
- 33 certified in USA: Barrier...
 - Must comply with the Breast Milk Substitute Marketing Code

Innocenti Declaration on the Protection, Promotion & Support of Breast Feeding (1990)

- Appoint national breast feeding authority
- Assure each maternal service facility fully practices *Ten Steps to Successful Breast Feeding* (WHO/UNICEF)
- Give effect to principles and aim of all Articles of the Intl Code of Marketing Breast Milk Substitutes and later WHA resolutions
- Enact legislation to protect and enforce breast feeding rights

Ten Steps to Successful Breast Feeding

1. Written, routinely communicated breast feeding (BF) policy
2. Train all health care staff to implement policy
3. Inform all pregnant women about benefits and management of BF
4. Help mothers initiate BF w/in 1/2 hr of birth
5. Show mothers how to initiate and maintain BF

Ten Steps to Successful Breast Feeding

6. Give newborns no food or drink other than BM
7. Practice rooming-in 24 hrs a day
8. Encourage BF on demand
9. Give no artificial teats or pacifiers to BF infants
10. Foster BF support groups/ refer mothers to them on discharge from hospital or clinic

WHO/UNAIDS/UNICEF

Feeding Options for Infants of HIV-Infected Mothers

- Exclusive breast feeding by mother for 1st 6 months of life, continuing to ≥ 2 yrs
- EBF with early cessation & rapid weaning to replacement milk
- Breast milk expression with heat treatment, fed via cup
- Wet-nursing by an HIV- mother

WHO/UNAIDS/UNICEF

Replacement Milks for Infants of HIV-Infected Mothers

- Commercial infant formula
- Fresh full cream milk, boiled, with added water, sugar and micronutrients
- Evaporated or powdered full cream milk with added water, sugar & micronutrients