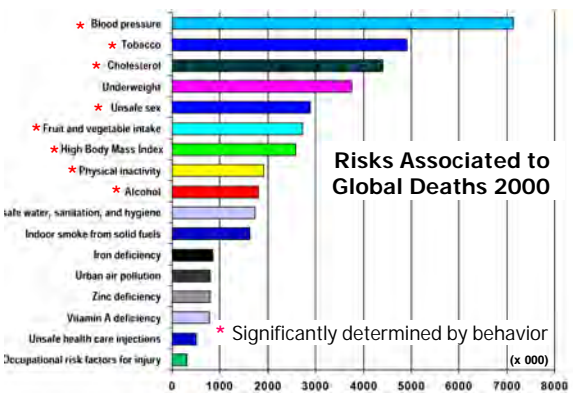
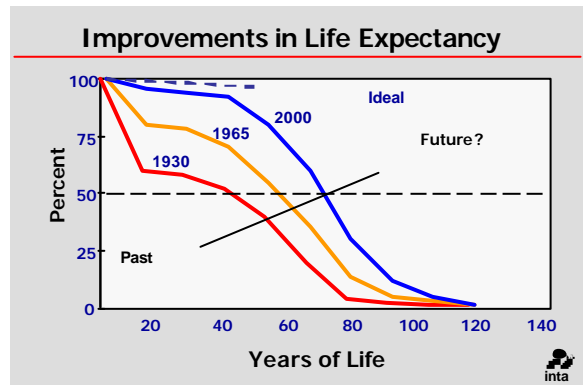
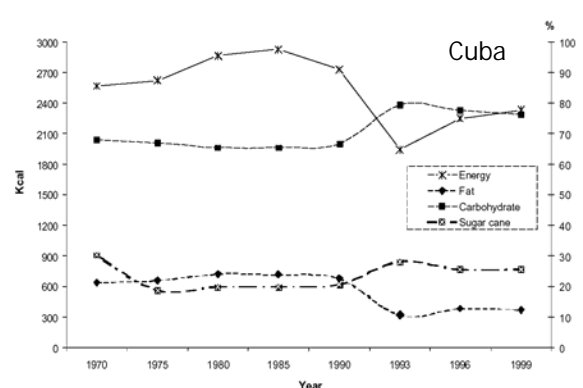


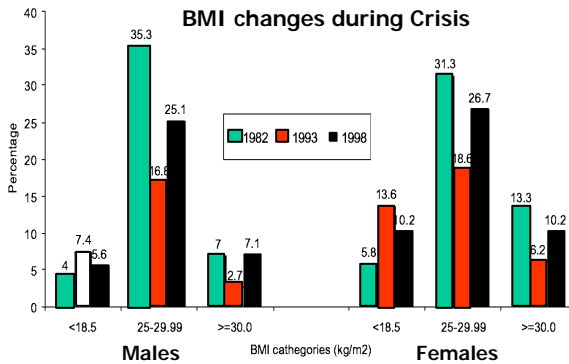
Behavioral Influences on What We Eat:
what we can,...we need, or just for the pleasure

Ricardo Uauy MD PhD
 London School of Hygiene and Tropical Medicine
 University of London www.lshtm.ac.uk and
 Institute of Nutrition University of Chile www.inta.cl



- ### Why do we eat? The list can be longer !!!
- What we can eat, only what we can afford ?
 - What our genes demand from us?
 - What we need to please our brain?
 - What our body needs for energy balance?
 - What we need to keep us content ?
 - What tempts our senses ?
 - For the fun of it, for plain pleasure ?
 - What ever our mothers made us eat ?
 - What ever we have time to eat?
 - What we are forced to eat ? (social forces)





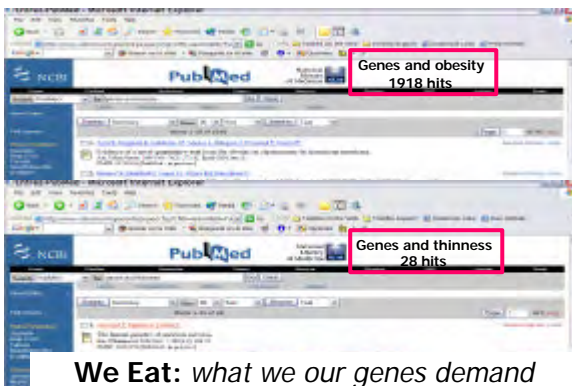
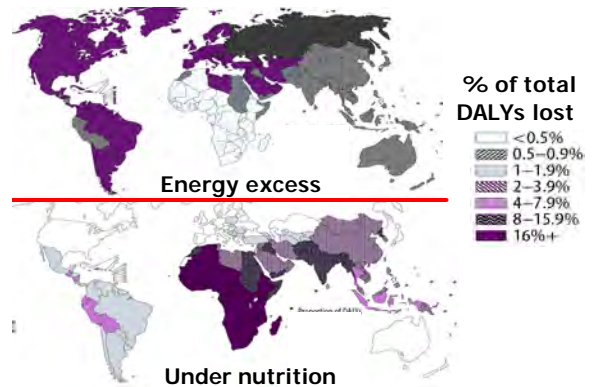
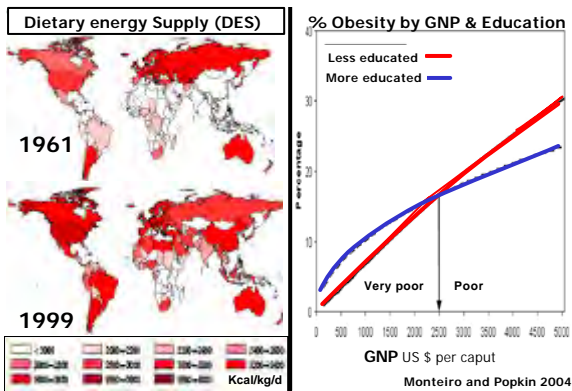
Dietary factors in epidemic neuropathy on the Isle of Youth, Cuba.

Gay J, Porrata C, Hernandez M, Clua AM, Arguelles JM, Cabrera A, Silva LC. Institute of Nutrition and Food Hygiene, Havana, Cuba.

An epidemic neuropathy that broke out in Cuba in late 1991 has exhibited clinical manifestations similar to those of other poly neuropathies of nutritional origin, ...

.....a broad range of specific dietary deficiencies, a sugar intake exceeding 15% of total caloric intake,and smoking.....

Bull Pan Am Health Organ. 1996 Mar;30(1):87-9.



Gene/Nutrition Interactions in Human Obesity

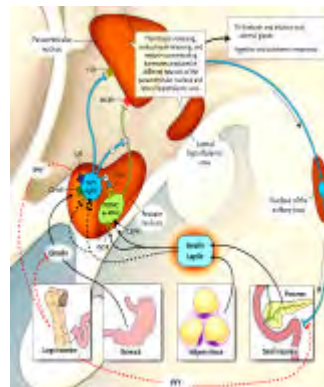
- Even if the OBESITY epidemic is due to changes in the environment, genes are interacting with the environment to cause weight gain.
- Studies of twins reared apart suggest that around 2/3 of the variability in BMI is attributed to genetic factors, for non twins around 40 %.
- Prospective studies in Pima Indians suggest that 12% of the variability in BMI to metabolic rate, 5% to fat oxidation, and another probable 10% to the level of spontaneous physical activity.
- Control of obesity will include targeting the genes that regulate food intake and activity level in conjunction with environmental changes that make the healthy choice the easy choice, and favouring active lives.

We Eat: to please our brains

The mutated agouti protein binds to melanocortin receptors MCR-1 in the mouse's skin and hinders the production of black pigment, also blocks MCR-3 and MCR-4, that quell feeding.



It's the perfect drug for a midlife crisis: Lose weight, get a tan, and boost your sex life, all in one pill. The target for the drug is melanocortin receptor-1 (MCR-1), based on mutant mouse called agouti that is fat and bears a coat of shockingly yellow fur (Science 1997).



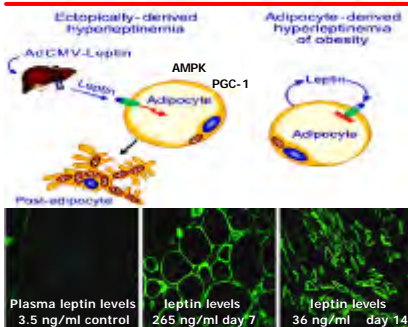
The paraventricular & arcuate nuclei contain neurons capable of stimulating/inhibiting food intake.

Korner J and R Leibel NEJM 349:10 2003

Y1R/Y2R denote subtypes of the neuropeptide Y (NPY) receptor
 MC4R melanocortin 4 receptor
 PYY peptide YY 3-36,
 GHSR GH hormone secretagogue rec
 AgRP agouti-related protein,
 POMC proopiomelanocortin
 α-MSH α-melanocyte-stimulating protein
 LEPR leptin rec, and INSR insulin rec

Rapid transformation of white adipocytes into fat-oxidizing machines

L Orzi and R Unger PNAS Feb 17, 2004 101:2058-63



When high leptin is derived ectopically, as in normal rats Rx with recombinant adenovirus + leptin cDNA, there is no blockade of leptin action on adipocytes.

Liver-derived high leptin rapidly transforms fat cells into mitochondria-rich, fat burning postadipocytes that are virtually fatless.

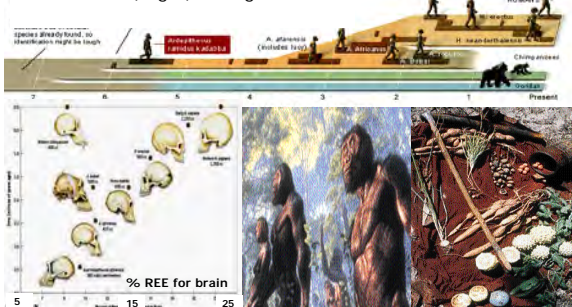
Excerpts from Korner J and R Leibel NEJM 349:10 2003

- It appears that orexigenic pathways are so critical to survival that the absence of one peptide compensated for by the actions of others.
- It is unlikely that any one molecule or derivative will provide a magic bullet to induce and maintain weight loss.
- Successful drug treatment for obesity may be possible only by simultaneously targeting the interlocking, redundant systems that drive food intake and act to resist the loss of body fat.

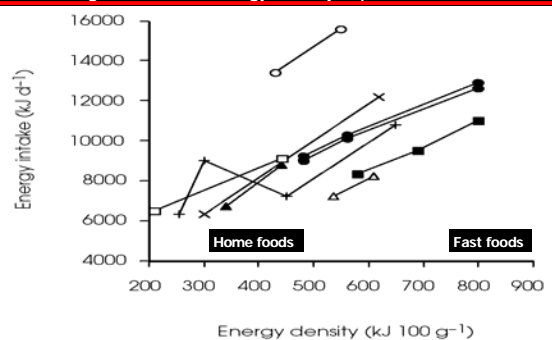
RU: Possible actions.....Multidrugs or the combined effect of diet change and physical activity .

A WALK THROUGH HUMAN EVOLUTION

We eat: to secure our survival, fuel for our brain (sugar) during evolution

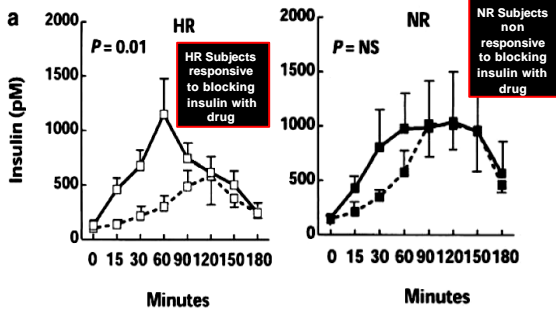


Fat and sugars increase energy density & promote excess intake

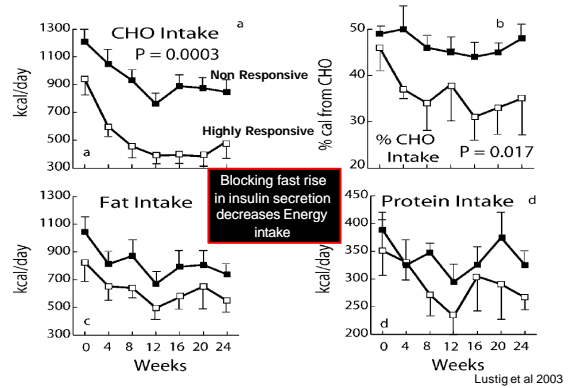


Prentice & Jebb Obesity reviews 187-194 (2003)

Suppression of insulin secretion with drug



Velasquez et al Int J of Obesity (2003) 27, 219-226.



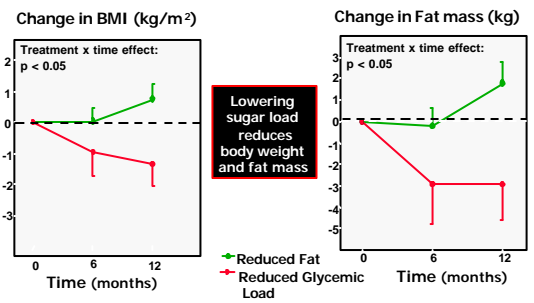
Lustig et al 2003

Effects of Glycemic Load on Body Weight

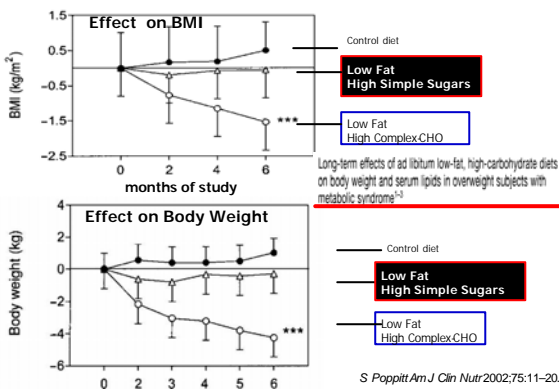
- 16 obese adolescents, 13 - 21 yrs old studied for 12 mo
- Intervention for 6 months :
 - Ad lib* low GL vs energy-restricted reduced-fat diet
 - Total of 14 treatment visits with a dietitian
- Treatment intensity, behavioral approaches, physical activity prescription identical between groups
- Changes in diet assessed by 3 and 7 day food records
- Follow up for 6 m, > 85% completion rate at 12 months

Ebbeling CB et al Arch Pediatr Adolesc Med. 157: 773-9. 2003

Effects of Glycemic Load on BMI and Body Fat



Ebbeling CB et al Arch Pediatr Adolesc Med. 157: 773-9. 2003



USDA Food Based Dietary Guidelines



Calorie level	Added sugars allowance	Added sugars kcal	% sugars kcal of total kcal
1000	20 g*	80 kcal	8%
1200	20 g	80 kcal	6.7%
1400	20 g	80 kcal	5.7%
1600	24 g	96 kcal	6%
1800	32 g	128 kcal	7.1%
2000	40 g	160 kcal	8%
2200	48 g	192 kcal	8.7%
2400	56 g	224 kcal	9.3%
2600	64 g	256 kcal	9.8%
2800	72 g	288 kcal	10.2%
3000	80 g	320 kcal	10.6%
3200	112 g	448 kcal	14%

* 1 teaspoon sugar = 4 grams 1 gram sugar = 4 kcal

in a dietary pattern of any calorie level, if consumers eat the recommended amounts of vegetables and fruits, grains, low-fat meats and beans, low-fat dairy & additional fats,

...they should have a few calories left over. These extra calories may be filled with added sugars.

How else can we Suppress Excess Insulin Secretion

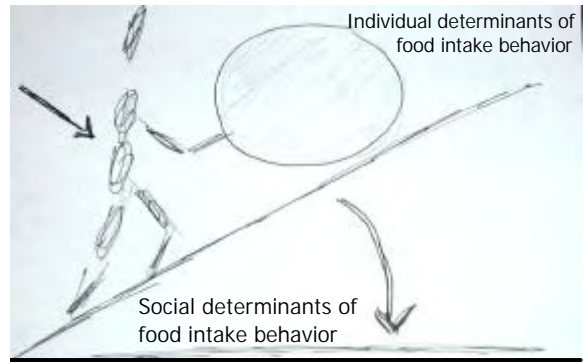
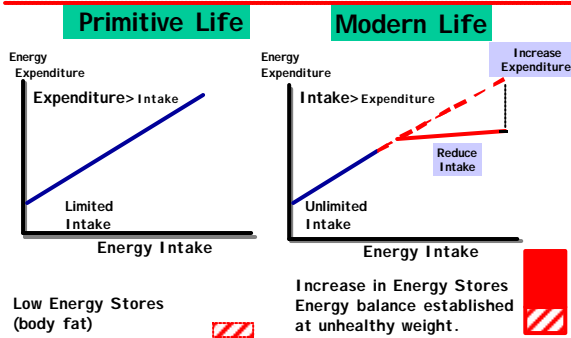
- Eating less or eating smaller meals more often will decrease pancreatic insulin secretion.
- Increasing physical activity will burn up fuels, enhance insulin sensitivity and decrease need for insulin
- Reducing total intake of sugars and or increasing % complex carbohydrates (NSP/fiber) relative to sugars
- Food processing/preparation making starches more resistant to enzymatic hydrolysis or increasing proportion of NSP in diet.

Fatty-acid ratios in WT and fat-1 mice (TM)

Kang JX et al NATURE VOL 427 5 FEBRUARY 2004	n-6 / n-3 *		AA / (EPA+DPA+DHA)	
	WT	TM	WT	TM
Muscle	49.0	0.7	11.3	0.4
Milk†	32.7	5.7	15.7	2.5
Erythrocyte	46.6	2.9	27.0	1.6
Heart	22.8	1.8	14.3	0.9
Brain	3.9	0.8	3.6	0.7
Liver	26.0	2.5	12.5	0.9
Kidney	16.5	1.7	11.9	1.2
Lung	32.3	2.2	19.8	1.2
Spleen	23.8	2.4	17.3	1.5

Both wild-type (WT) and transgenic (TM) mice were 8-week-old females fed on the diet.
 *The n-6:n-3 fatty-acid ratio is given by (18:2n-6 & 20:4 n-6 & 22:5 n-6):(18:3 n-3 & 20:5 n-3 & 22:6 n-3).
 †The milk was taken from the stomach contents of 5-day-old neonatal mice born to wild-type or transgenic mothers.

We eat: to keep Energy Balance



Puska and Uauy 2003

We Eat: what we are "forced" to eat



REAL ESTATE | 5-BANK WINNERS | **Forbes** | Pushing Your Buy Button | Neuroscience Meets Marketing

Pushing Your Buy Button

Ability | Credit | Legs | Last



REVIEW OF RESEARCH ON THE EFFECTS OF FOOD PROMOTION TO CHILDREN

Food Standards Agency to examine the current research evidence on:

- the extent and nature of food promotion to children
- the effect, if any, that this promotion has on their food knowledge, preferences and behaviour.

<http://www.foodstandards.gov.uk/>

• 'Big Four' : pre-sugared breakfast cereals, soft-drinks, confectionary and savoury snacks. In the last years due to fast food it is now the 'Big Five'. The advertised diet contrasts sharply with that recommended.

• Themes of fun and fantasy or taste, rather than health and nutrition, are used to promote snacks to children. The recommended diet gets little promotional support.

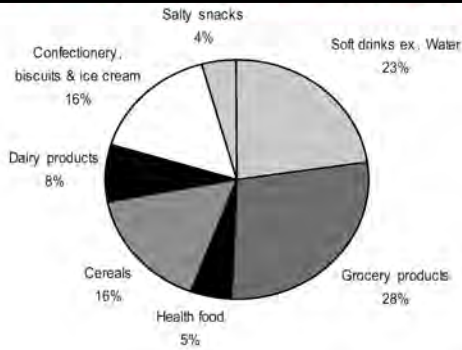
• Seeing soft drink and cereal adverts reduced young children's ability to determine whether certain products contained fruit.

• Exposure to advertising influenced which foods they claimed to like: labelling and signs on vending machine affect what is bought.

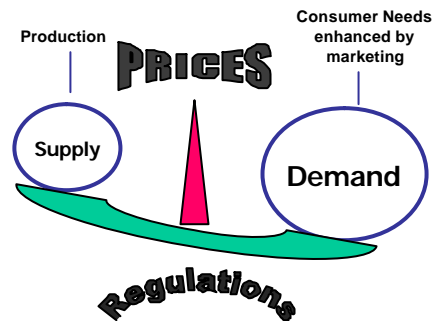
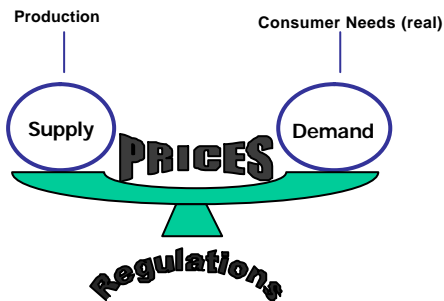
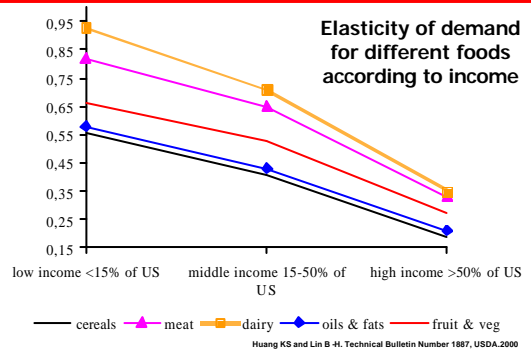
• Food advertising can influence what children eat. Advertising influenced a primary class's choice of daily snack at playtime.

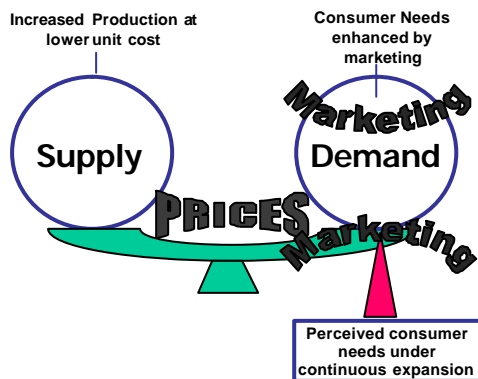
REVIEW OF RESEARCH ON THE EFFECTS OF FOOD PROMOTION TO CHILDREN
G Hastings et al FSA Sept 22 2003

Measured advertising spending of major brands in the US by category



We Eat: to make the most with what we have





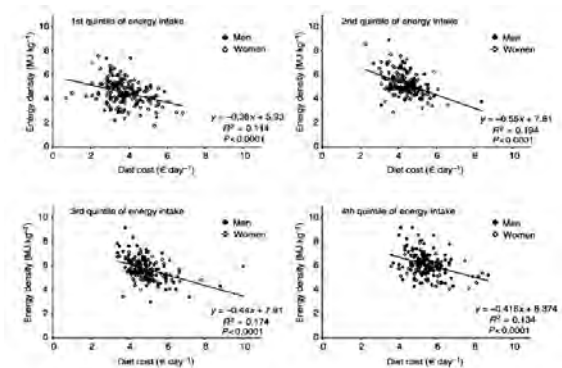
CDC: Americans eating more than ever



Experts say bigger portion sizes and junk food are partly to blame for the increased calorie consumption in the past three decades.

Women consume 335 more calories a day; carbs mostly to blame Men ate 168 more calories -- slightly more than a 12-ounce Pepsi per day Americans, especially women, are getting fatter because they eat much more of everything than they did 30 years ago, and carbs are the biggest culprit, the government said Thursday.

Study released Thursday Feb 5th by the Centers for Disease Control and Prevention.



Darmon N, Briand A, Drewnowski A Public Health Nutrition 007: 21-27, 2004

Darmon N, Briand A, Drewnowski A Public Health Nutrition 007: 21-27, 2004

Energy dense diets are less expensive and healthy diets cost more adjusting for intake

A focus on the economics of food choice is greatly overdue. Studies on the obesity epidemic and the contribution of snacks, fast foods, foods away from home and the phenomenon of supersizing, have not addressed the very low energy costs of added sugars and fat.

Among suggested strategies for reducing the consumption of energy-dense foods are taxes, levies, limits on advertising and outright bans.

Whether such punitive tactics will steer lower-income consumers toward more costly food choices is an unresolved issue.

There is a need for additional studies on diet structure and food costs on which to base responsible nutrition interventions and fiscal food policy.

Strengthen Supply of Healthy Choices:

- **Optimize chain from farmer to consumer.** Improvements in technology to produce and preserve food, less steps in commerce of fruits and vegetables.
- **Re-allocation of subsidies to agricultural and industrial food production.** Eliminate gradually subsidies to sugar, alcohol and animal food products. Provide incentives to consumption of healthy foods (vegetables and fruits).
- **Trade regulations favoring consumption of healthy foods.** Prevent dumping of excess fat and sugar in developing countries.
- **Government must practice what it preaches:** School lunch programs, institutional feeding (hospitals, others) should set standards promoting healthy choices

Strengthen Demand for Healthy Foods:

- **Change relative price of foods:** Increase those that are less desirable and decrease price of healthy foods. i.e. low fat milk, subsidize fruits and vegetables
- **Facilitate the selection and consumption of healthy foods for lowest price:** Consumer cooperatives, "Best buy" nutrient dense energy dilute foods for lowest price.
- **Provide information to consumer at place of food sale** (Supermarket). Implement dietary guidelines, simple format leaflets. Nutritional Info Booth independent of commercial interests.

