

Obesity and Diabetes: Excess of Food or Toxic Environment

Food and Water: Venice 2008

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Goals of my talk

- How great is the problem of obesity?
- Why should we care?
- What are the misconceptions?
- What are the gaps in understanding?
- What has changed?
- What must be done?



Obesity is:

- Excess body fat
- Failure to regulate body fat appropriately

Diabetes is:

- Failure to regulate blood sugar appropriately

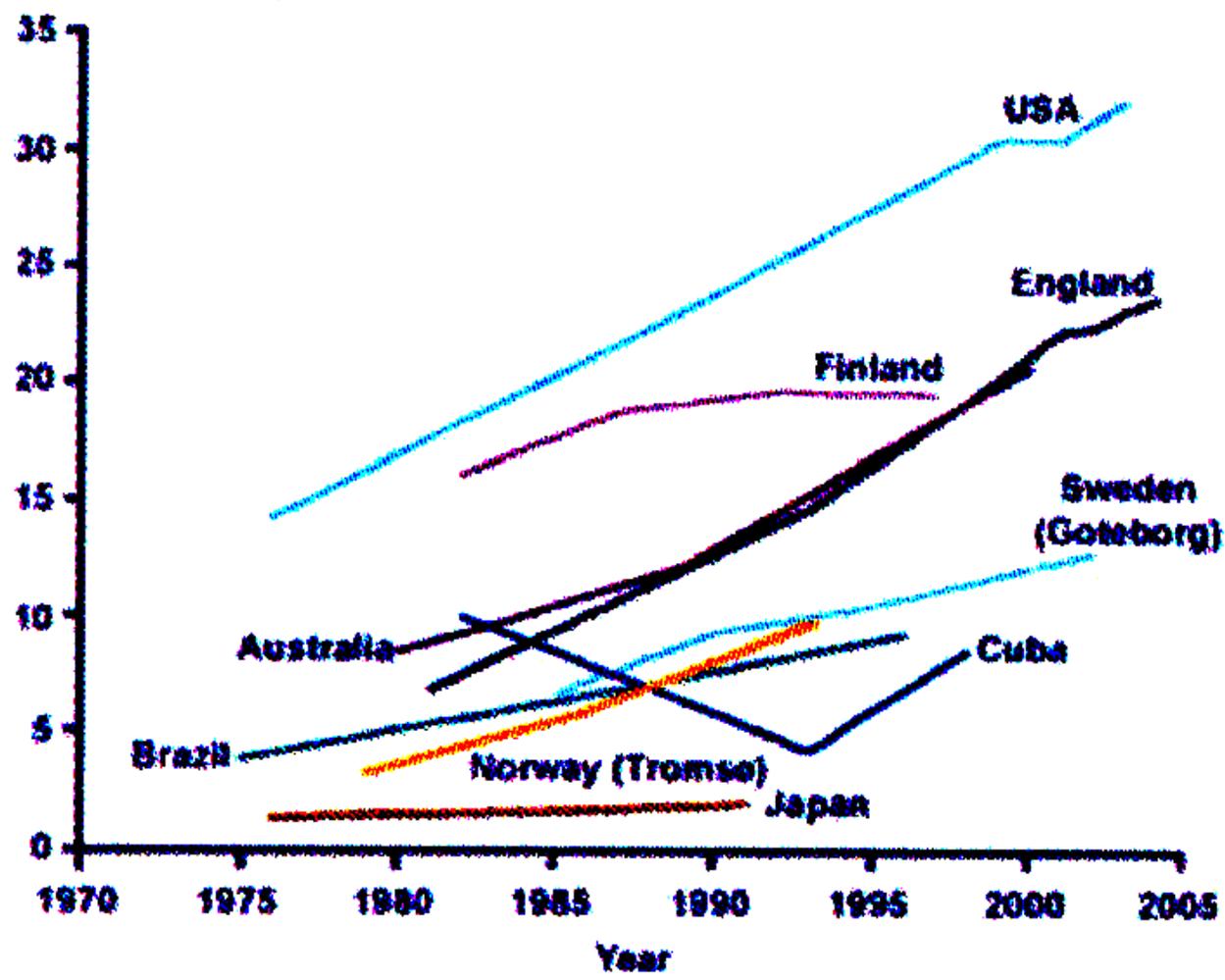
Regulation of sugar is changed by fat



Obesity Precedes Diabetes

- Obesity is excess fat, not a behavior
- Obesity is a disease that may be at least as complicated to treat as heart disease or cancer and may lead to those diseases
- There are genetic, environmental and behavioral causes of obesity

**% Obese
(BMI ≥ 30 kg/m²)**



Global Totals

2002
 Obese: 356 million
 O/wt ≥ 25 : 1.4 billion

2007
 Obese: 523 million
 O/wt ≥ 25 : 1.539 billion

2015
 Obese: 704 million
 O/wt ≥ 25 : 2.3 billion

- Norway (Tromsø)
- Sweden (Goteborg)
- Australia
- Japan
- Brazil
- Cuba
- USA

IOTF 2007



71 year old Guatemalan woman is nearly blind and severely disabled from diabetic neuropathy

Courtesy Meredith Hawkins



A woman who lives under a bridge in Bangkok

Courtesy Meredith Hawkins



A rural Ugandan woman with diabetes and cataracts

Courtesy Meredith Hawkins



Global Prediction by 2015

- Population 8.0 billion
- Obesity 1.5 billion
- NCD leading cause of morbidity
- Top 10 US and Japan (only devel)
- Biggest problem Asians, Hispanics
- Diabetes deaths Low, middle income



Escalating Medical Costs

- 80% of diabetes
- 30% of cardiovascular disease
- 11% of breast cancer
- 11% of uterine cancer
- Obesity accounts for nearly 30 percent of health care spending increase since '87



Misconceptions about Obesity

- Obesity is not a simple condition of eating too much
- Obesity is a serious, chronic disease
- No human condition — not race, religion, gender, ethnicity or disease state — compares to obesity in prevalence and prejudice, mortality and morbidity, sickness and stigma.



Simple Models are not Valid

- Fat accumulation does not correlate with overeating.
- Individuals who lose weight regain it rapidly
- Individuals who are forced to gain weight lose it rapidly
- Individuals at the same weight can eat very different quantities of food
- Most individuals with adequate access to food maintain same weight for long periods of time



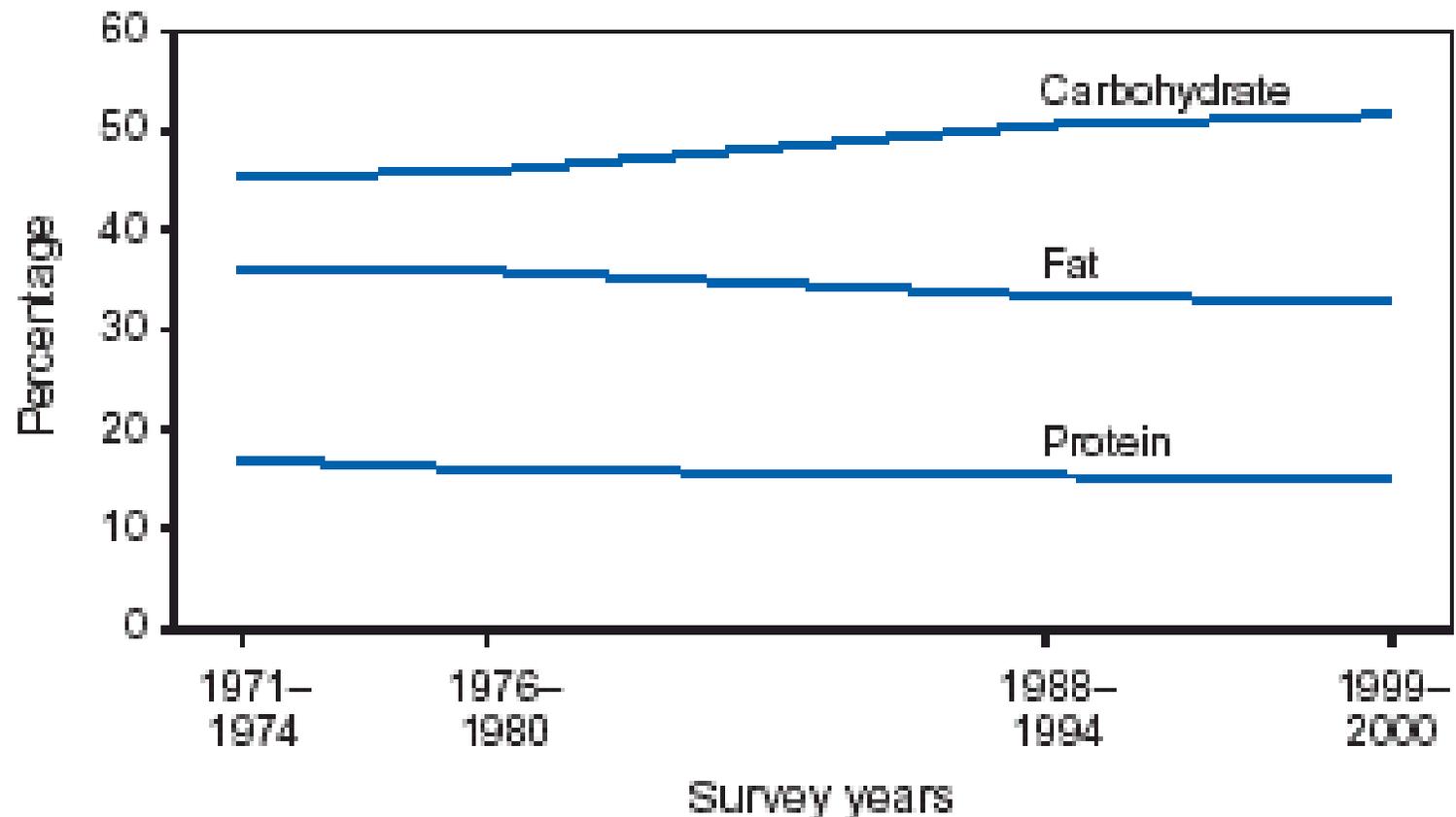
Overeating Does Not Cause Obesity

- Vermont prisoner study
- People maintain body weight in the short-term.
- Weight loss is rapidly followed by regain
- Weight gain is rapidly followed by loss

Fast Food Time Line

- 79 AD—Residents of Pompeii eat fast food of the day in the valley of Mount Vesuvius (before the volcano erupted!).
- Middle Ages—Town markets offer street food in the Middle East, North Africa, and South Asia.
- 13th century—Marco Polo travels to the Far East and finds barbequed meats, deep-fried delicacies, and roast lamb sold as street food.
- 18th century—At the start of the industrial revolution, street vendors sell baked potatoes in English cities.
- 18th century—Londoners and Parisians buy cooked fish and chips sold by street pushcart vendors.
- 1762—The Fourth Earl of Sandwich invents the sandwich.
- 1885—First self-service restaurant, the Exchange Buffet, opens across the street from the New York Stock Exchange.
- 1902—Horn & Hardart Baking Co's Automat, the first coin-operated automatic American restaurant, opens in Philadelphia.
- 1921—White Castle, America's first fast food chain, has its first opening in Wichita, Kansas.
- 1940s—Howard Johnson chain, featuring ice cream and orange porcelain tiled roofs, opens along America's highways.
- 1950s—McDonald's and Burger King start new fast food chains.

FIGURE 2. Percentage of kilocalories from macronutrient intake among women aged 20–74 years*, by survey years — National Health and Nutrition Examination Surveys (NHANES), United States, 1971–2000



*Age adjusted by direct standardization to the 2000 U.S. Census population by using age groups 20–39, 40–59, and 60–74 years.



Major Unanswered Questions

- How does obesity develop?
- How does fat decide where to go?
- What are the predisposing genetic factors?
- What are the facilitative environmental factors?
- What are optimal diets for good health?
- What are healthy life styles?



Why Do Large Gaps Exist?

- Inadequate funding
- Promotion of misinformation
 - Excessive focus on behavior
 - No investigation into many environmental changes
- Big pharma seeks simple solutions
- Molecular biology not physiology



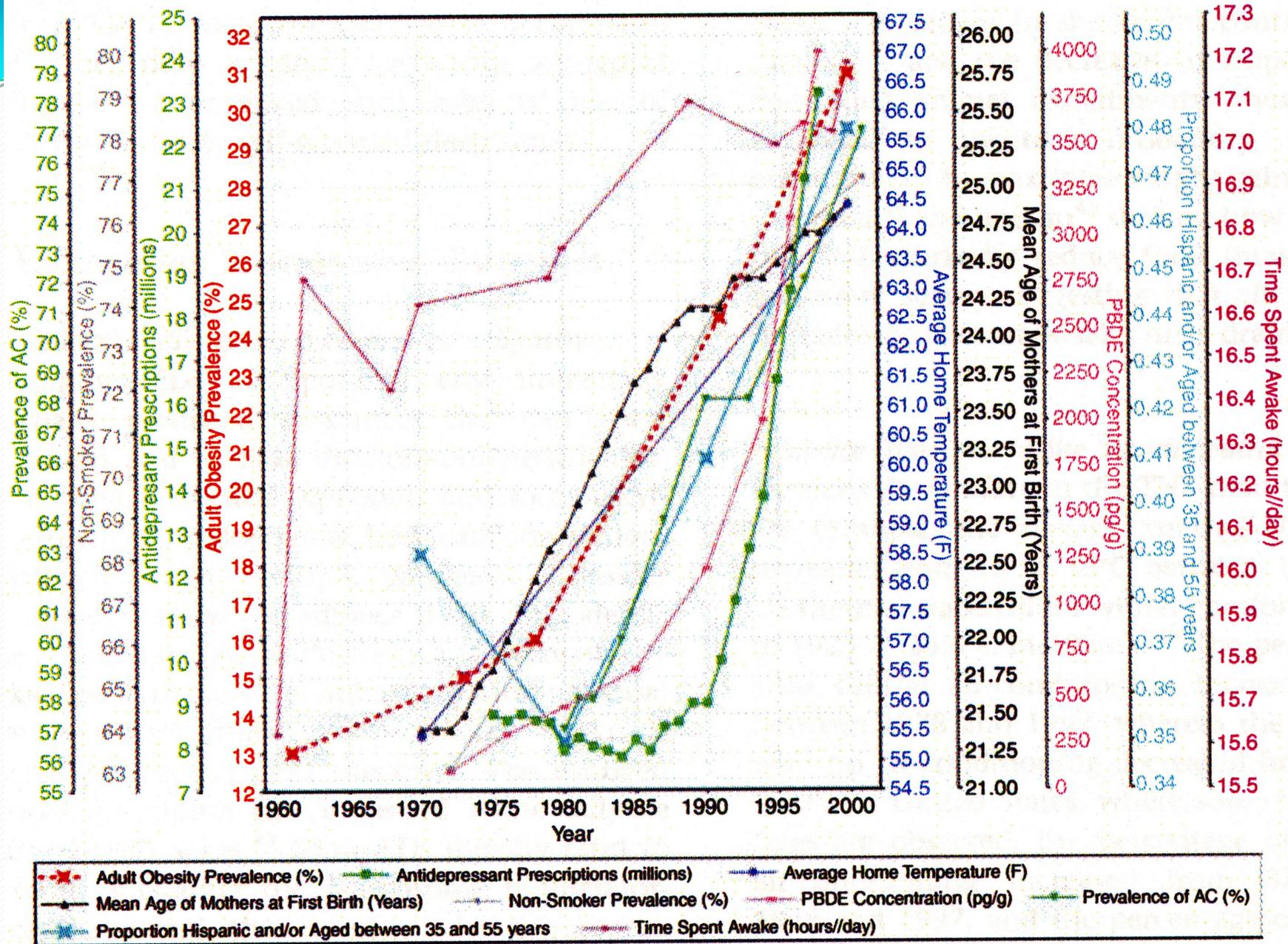
Changes from 1962-1994

- Income uncoupled from CHO and fat intake
- Increased fat in Africa, Latin America, Asia, Middle East
- Increased mechanization
- Shift from agrarian to urban lifestyle
- Increased motorized transport



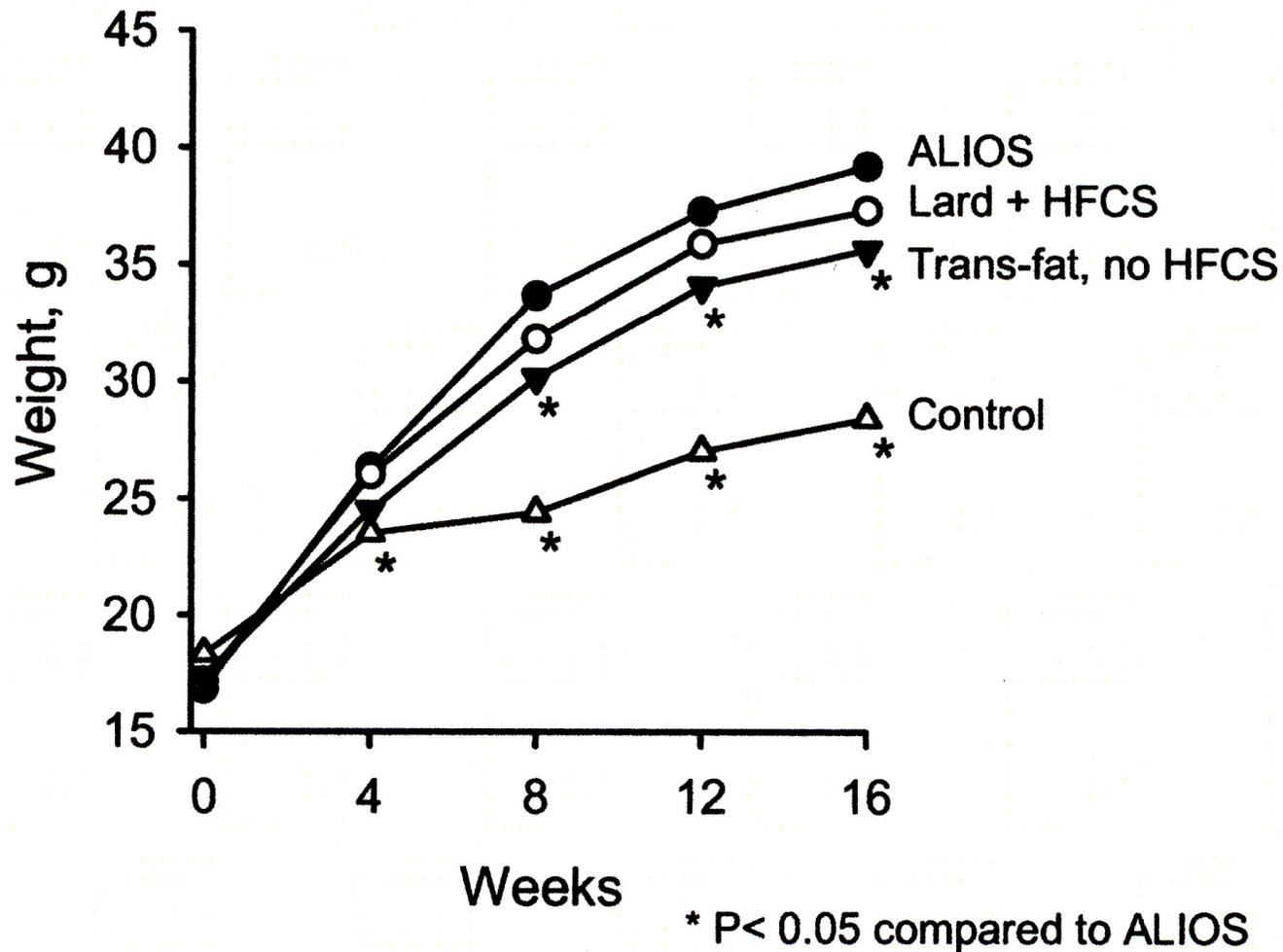
Mineral Content Has Changed?

- Fruits 27⁰% less zinc
- Meats 41⁰% less calcium
- Meats 54⁰% less iron
- Apples and oranges 67⁰% less iron
- Broccoli 75⁰% less calcium
- Spinach 96⁰% less copper
- Rutabaga 110⁰% more phosphorus

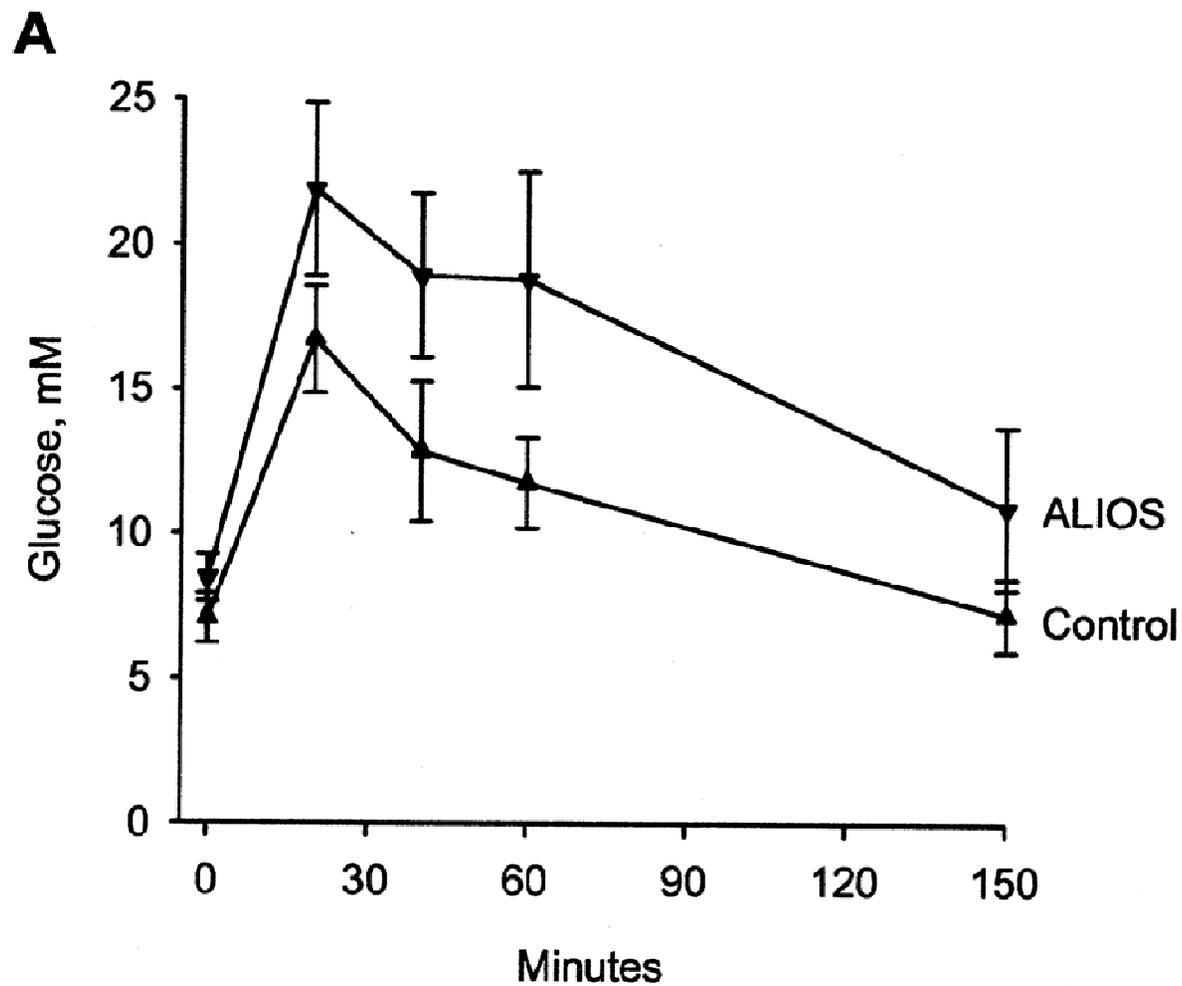


Keith et al Int J Obesity 2006 Putative Contributors to the Secular Increase in Obesity: Exploring the Roads Less Traveled

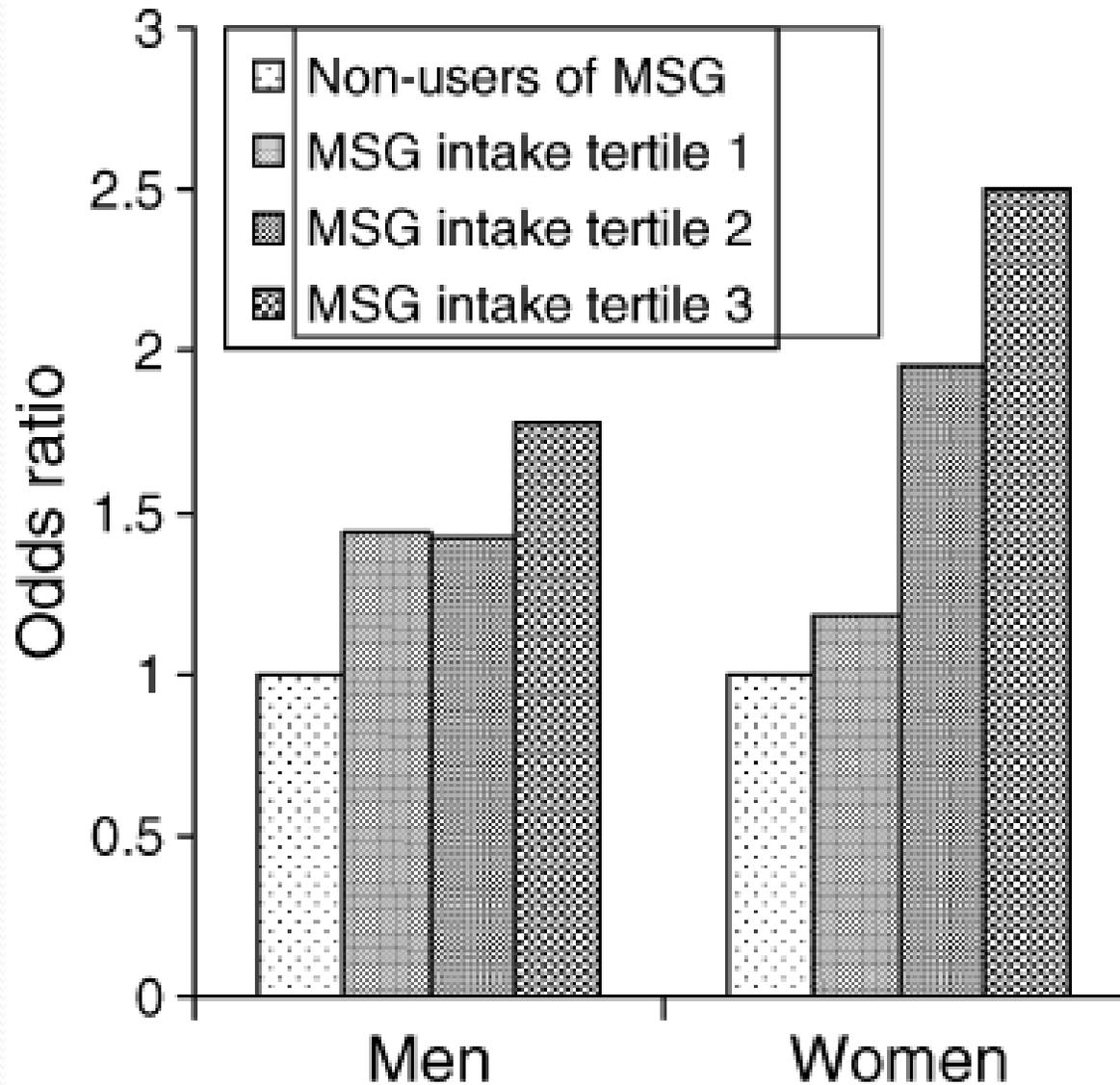
Trans-fat Causes Weight Gain



Trans-fat Impairs GTT



Likelihood of Overweight

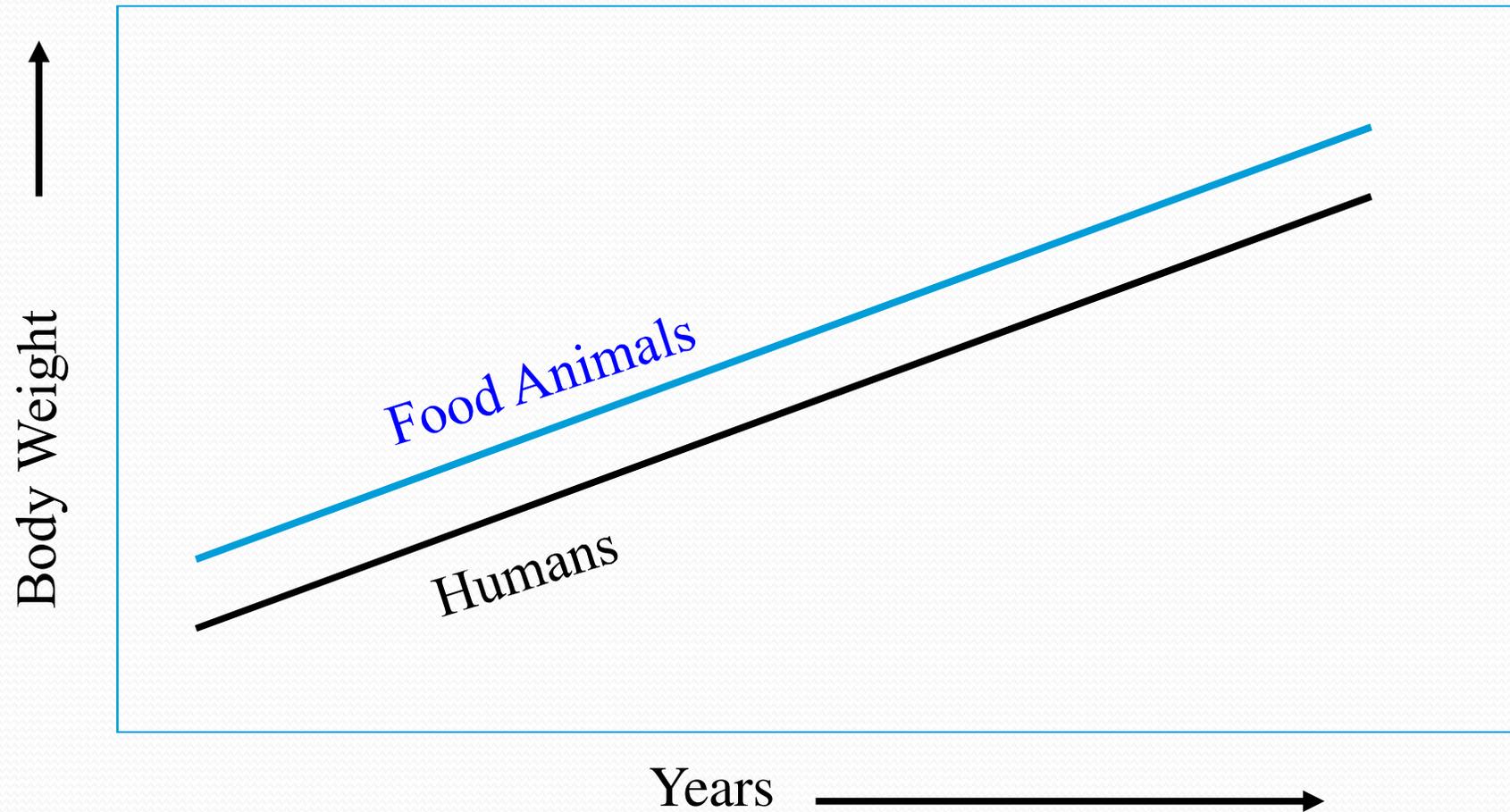


He et al 2008 Obesity 16:1875
Association of MSG with
Overweight in Chinese Adults

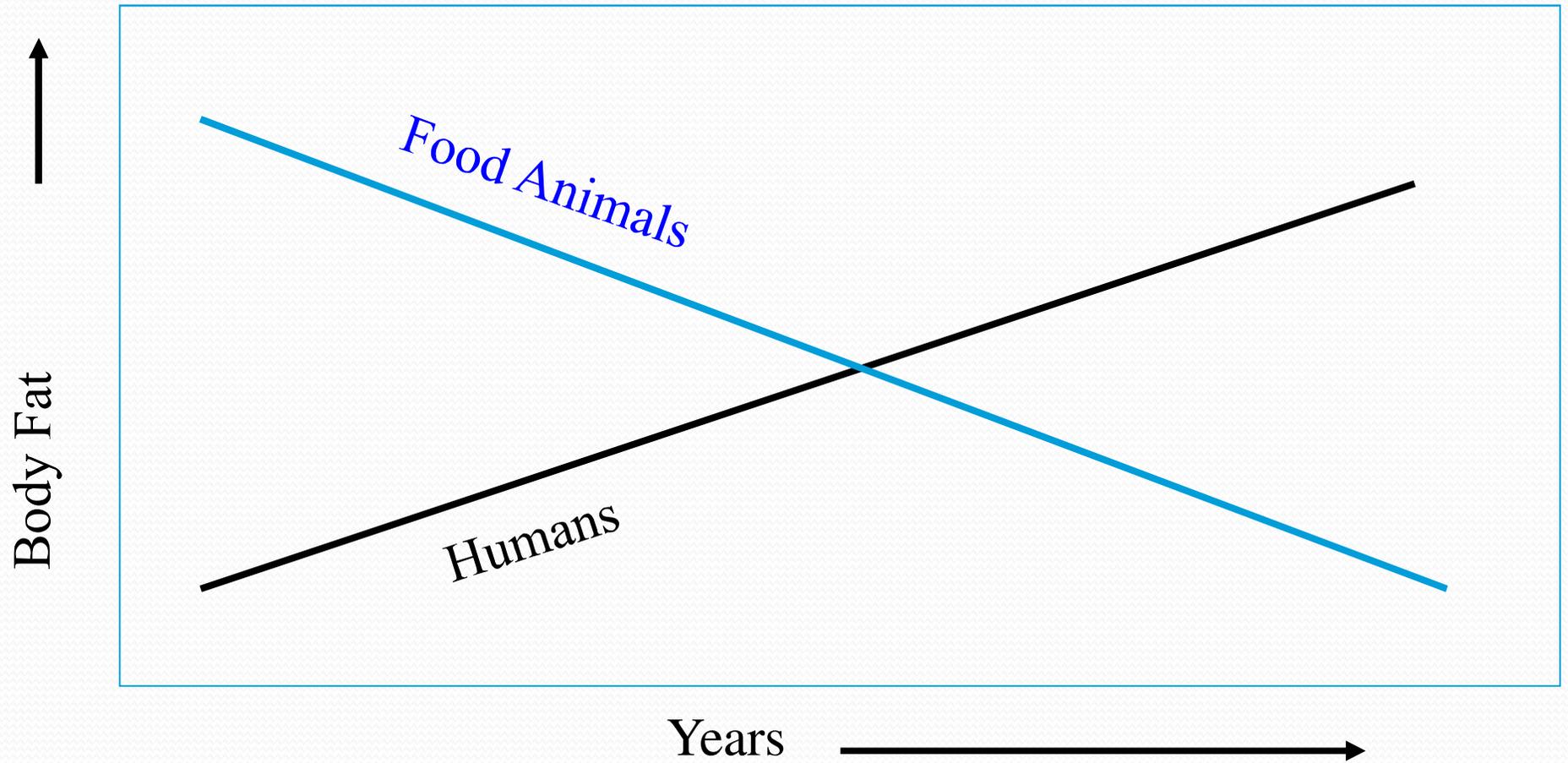
The Last 50 Years



Body Weight Trends

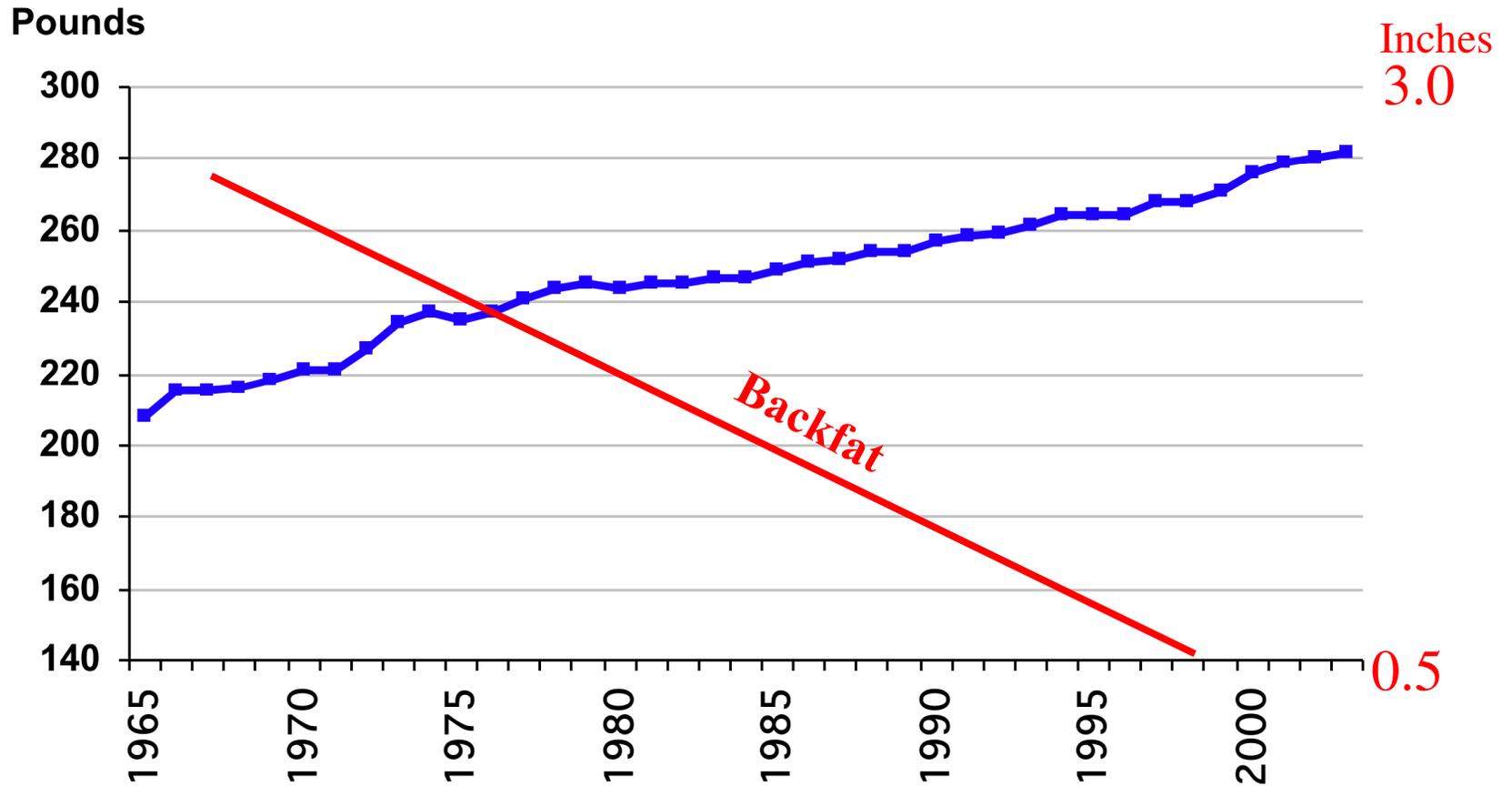


Body Fat Trends



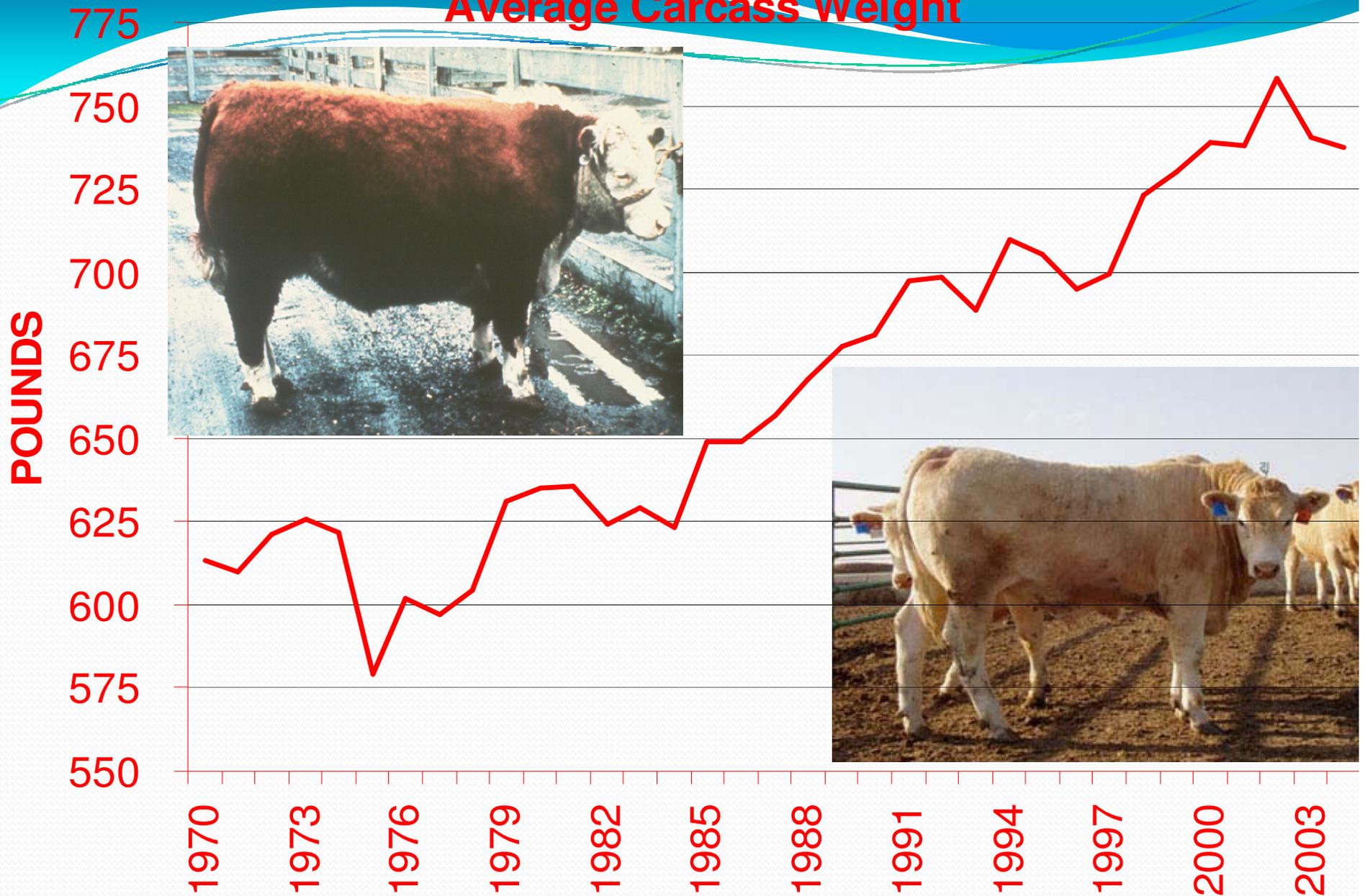
Courtesy Elanco

Average Live Weight, 1965-2003



Courtesy Elanco

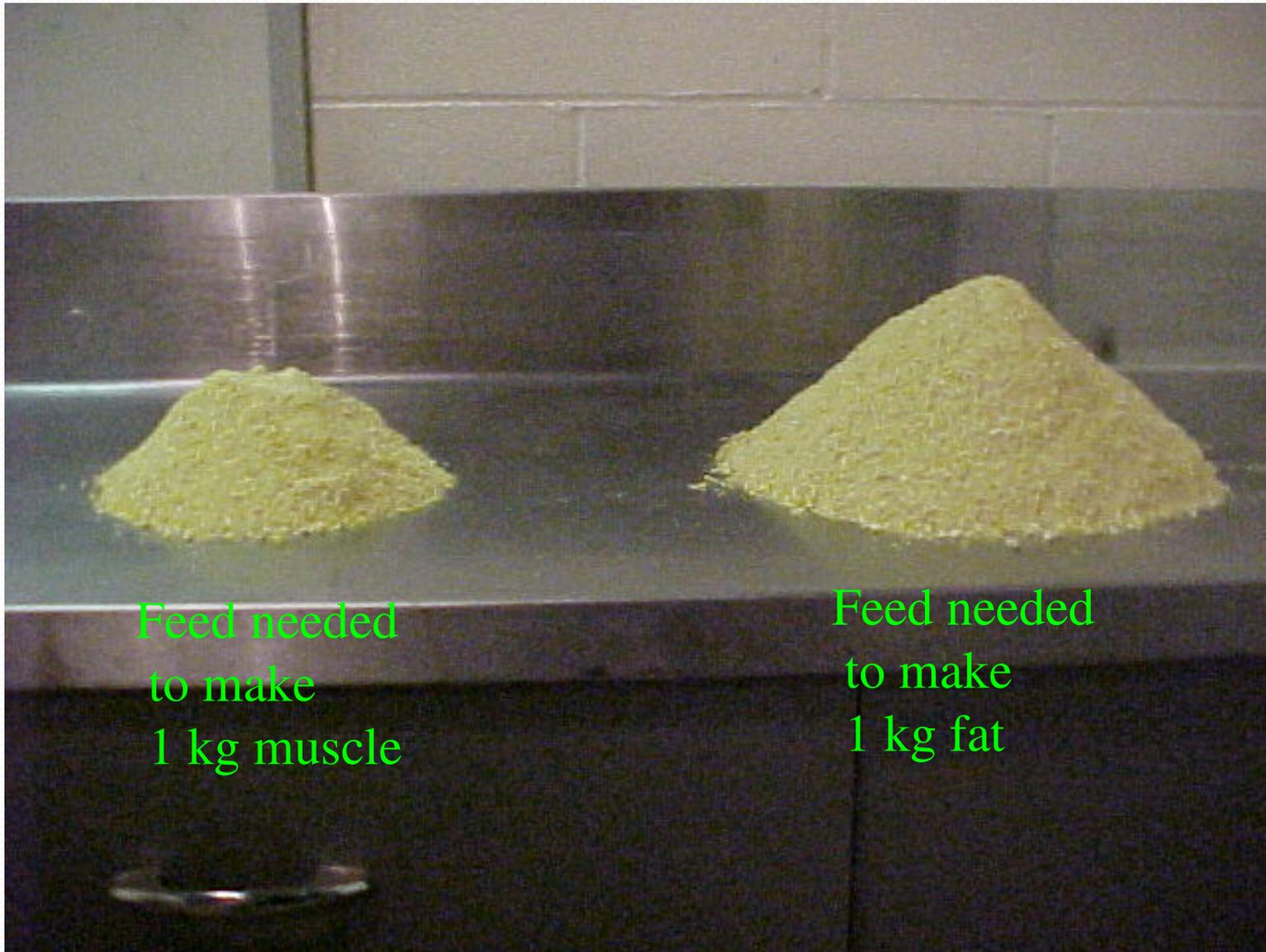
Average Carcass Weight



Courtesy Elanco

US Broiler Performance

Year	Market Age (days)	Market Wt (lbs)	Feed to Meat Gain	Mortality %
1925	112	2.5	4.7	18
1935	98	2.86	4.4	14
1945	84	3.03	4.0	10
1955	70	3.07	3.0	7
1965	63	3.48	2.4	6
1975	56	3.75	2.1	5
1985	49	4.19	2.0	5
1995	47	4.67	1.95	5
2005	42	5.34	1.67	5



Feed needed
to make
1 kg muscle

Feed needed
to make
1 kg fat



Science: Too Little Research

- Researchers are attracted to work in areas where there is lots of money
- Obesity requires translational research: collaboration among basic, clinical and population scientists
- Clinical research is in dire straits: too little funding, too little support and an impossible and growing demand on physicians



How can we solve the problem?

- Understand the basic causes and roles of different tissues in obesity
- Make effective drugs
- Determine effective lifestyle modifications
- Make effective lifestyle modifications



Obesity is a Problem that can be Solved by Research

- Billions of dollars should be spent, not on the consequences of obesity, but on obesity itself
- Little has been done to study fat storage
- Little has been done to study effects of 4000 food additives on obesity
- Target-based drug discovery does not work
- Discovery of solutions is inhibited by assertions that obesity is easily prevented

Conclusion 1

“Undo attention has been devoted to reduced physical activity and food marketing practices as postulated causes for increases in the prevalence of obesity, leading to neglect of other plausible mechanisms and well-intentioned, but potentially ill-founded proposals for reducing obesity rates.”

Conclusion 2

Treating malnutrition in children with solutions that cause obesity and chronic disease would be disastrous

Conclusion 3

We do not have the solution

We must demand solutions

Interventions lacking strong evidence-based support are experiments

**Future Science must Improve
our Understanding of
Nutrition with Consideration
for Economic and Ethical
Consequences of Poor
Choices**