# Targeting Nutrition in Older Persons

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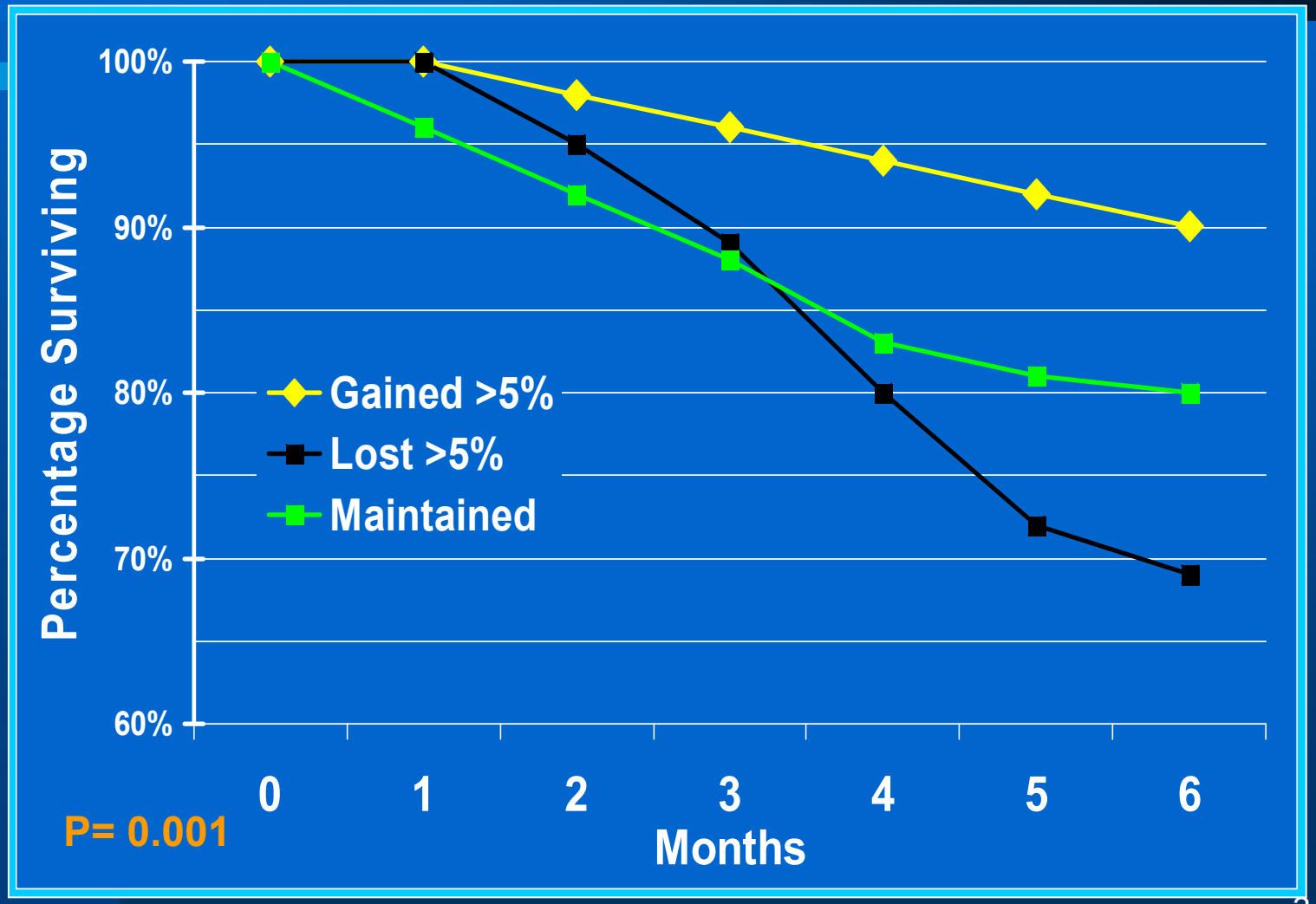
# …is the key to survival

***The ability to expend energy depends on intake***

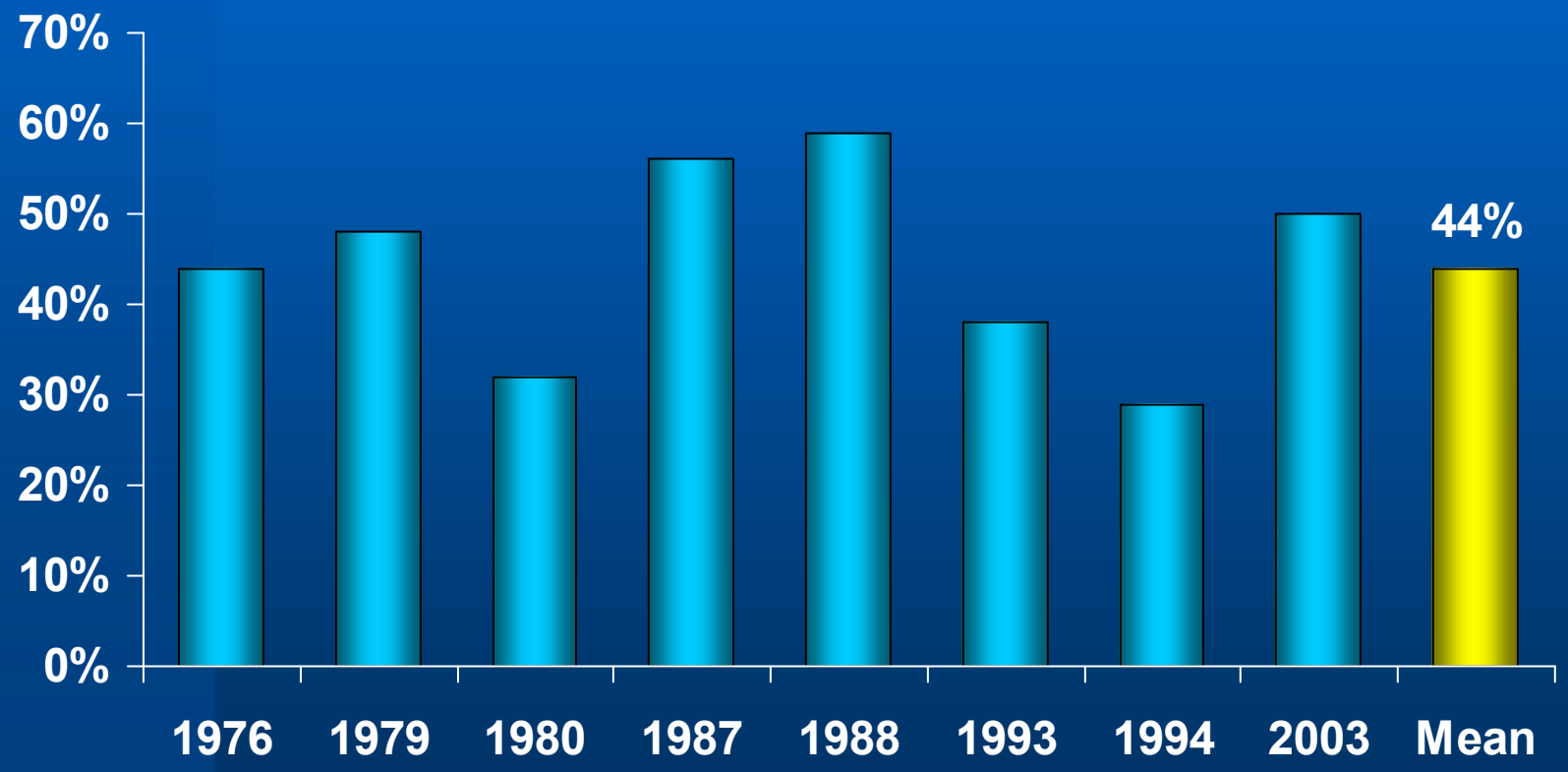
# Survival Curve

**Weight Change: Baseline vs. Final Weight**

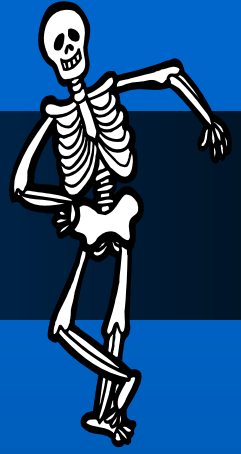


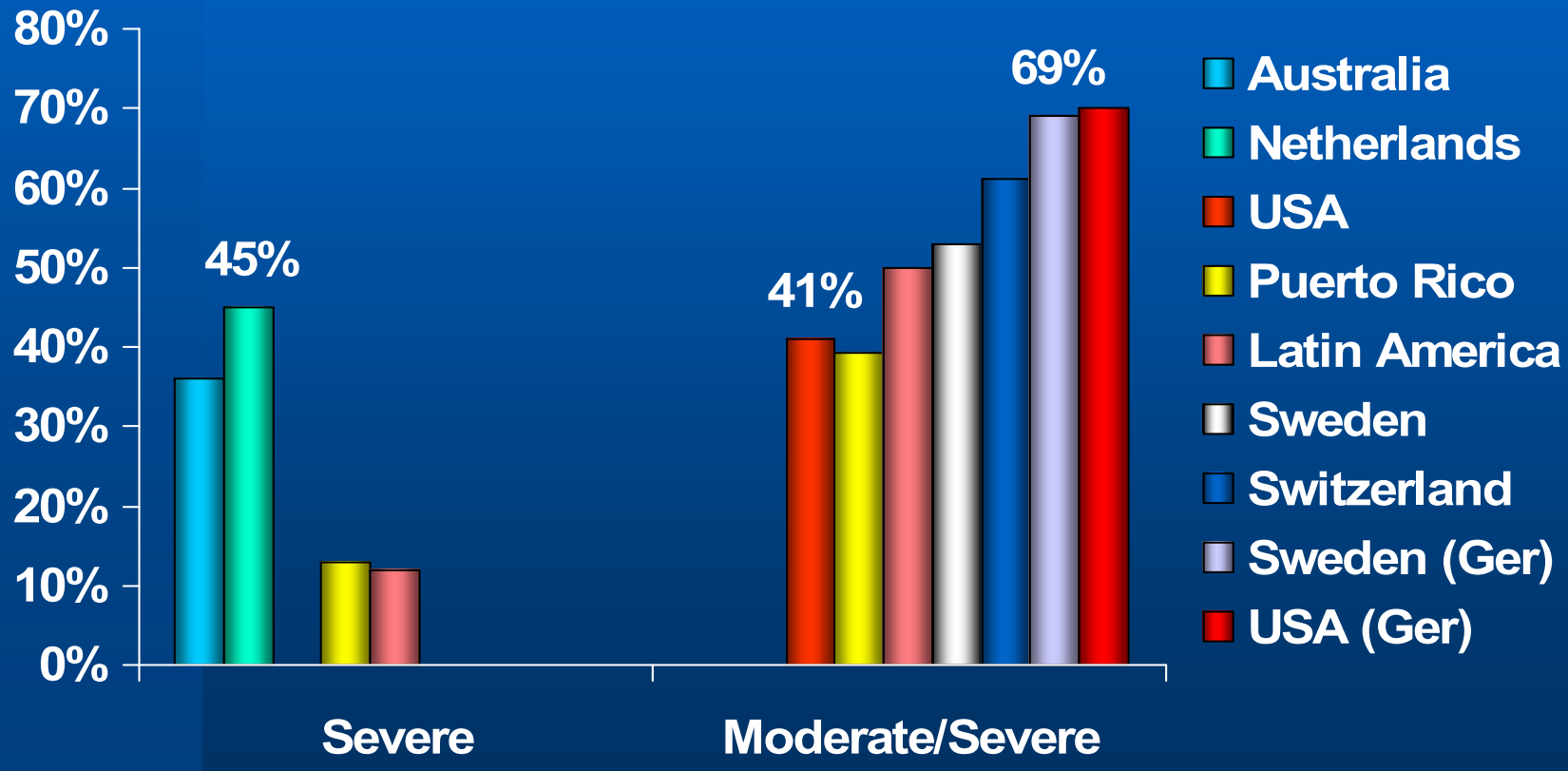
# Published Prevalence of Malnutrition in Random Samples of Hospitalized Patients

## General Medicine Service



# Malnutrition in Hospitals Worldwide






*Thomas DR Nutrition 2003:19:907*

***"Doctors and nurses frequently fail to recognize undernourishment because they are not trained to look for it."***

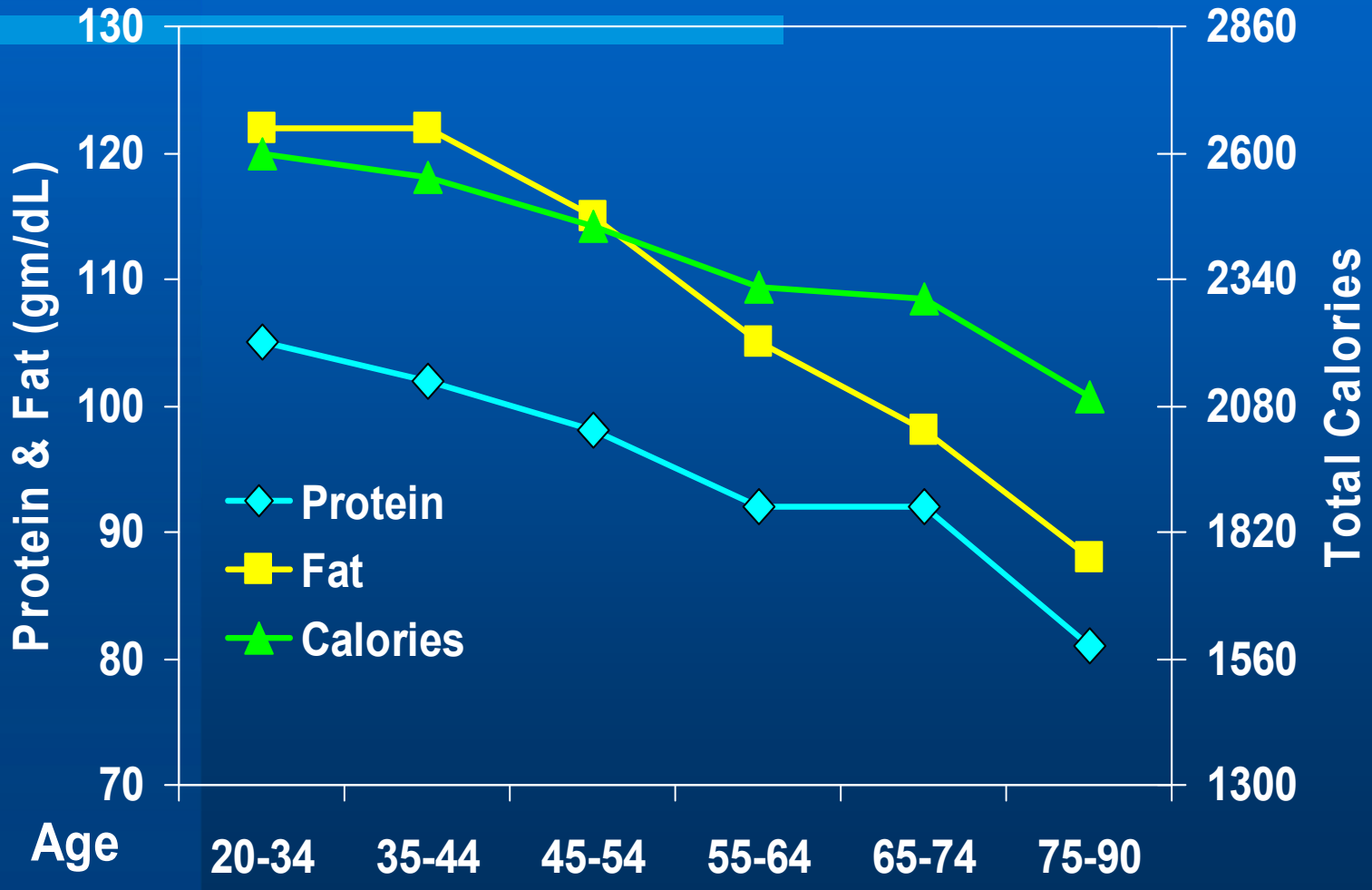
***--JE Lennard-Jones, 1992***

# Starvation

- Pure protein-energy deficiency
  - Short-term (fasting)
  - Long-term (chronic protein-energy undernutrition)
- May be improved solely by administration of nutrients

*A.S.P.E.N. The Clinical Guidelines Task Force, Guidelines for the use of parenteral and enteral nutrition in adult and pediatric patients. J Parenter Enteral Nutr. 26 suppl (2002), pp. S1*

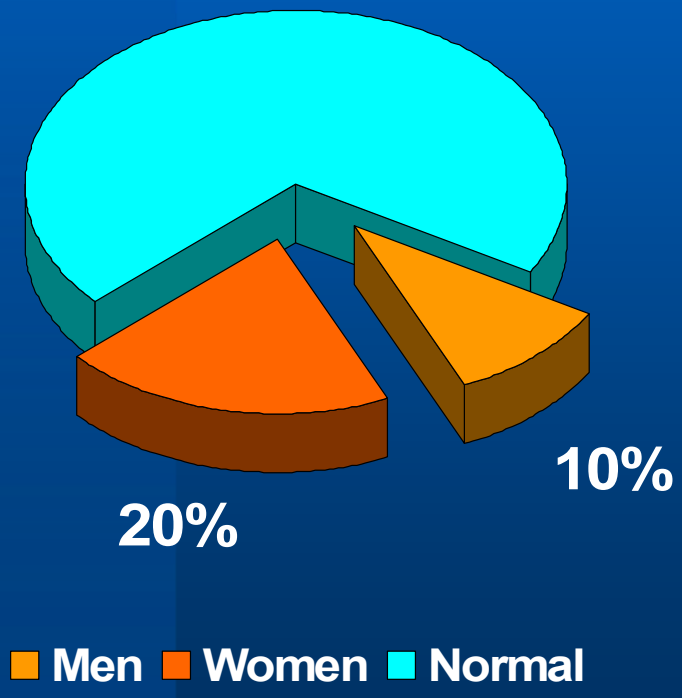
# Protein, Fat & Calorie Intake by Age (Males)



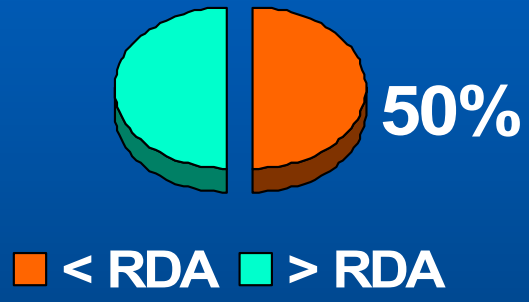

Hallfrisch et al. *J Gerontol.* 1990;45:M186-191

# Nutritional Intake in Older Persons

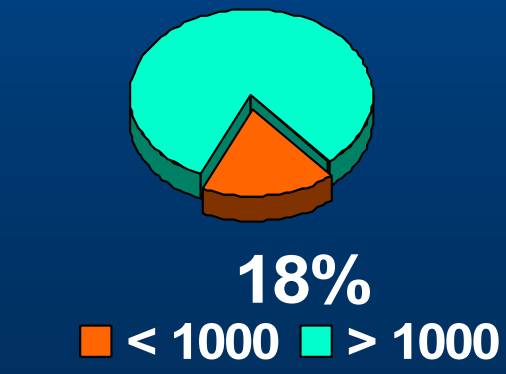
## Intake below RDA



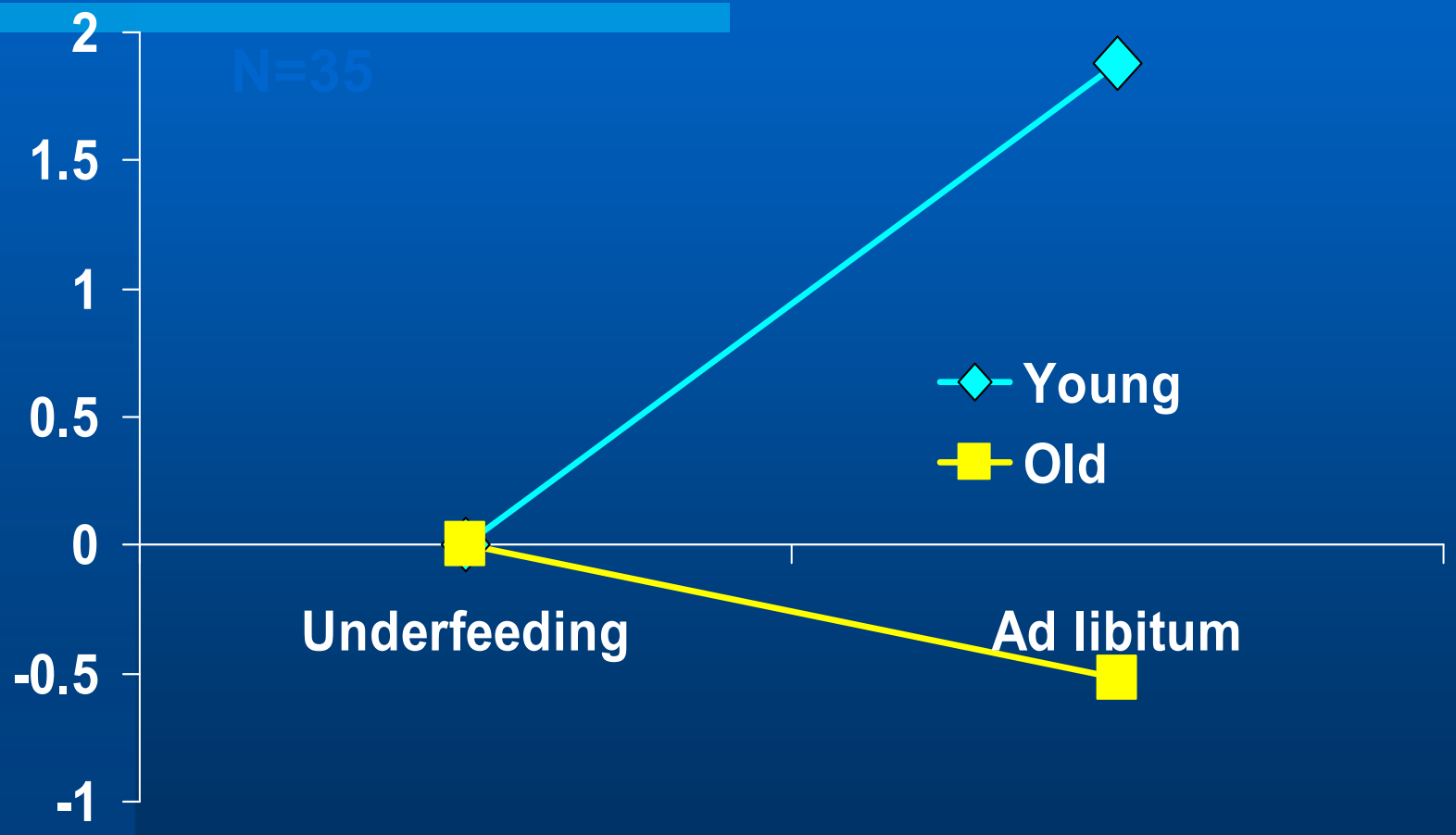

## Vitamin intake




## Calorie consumption

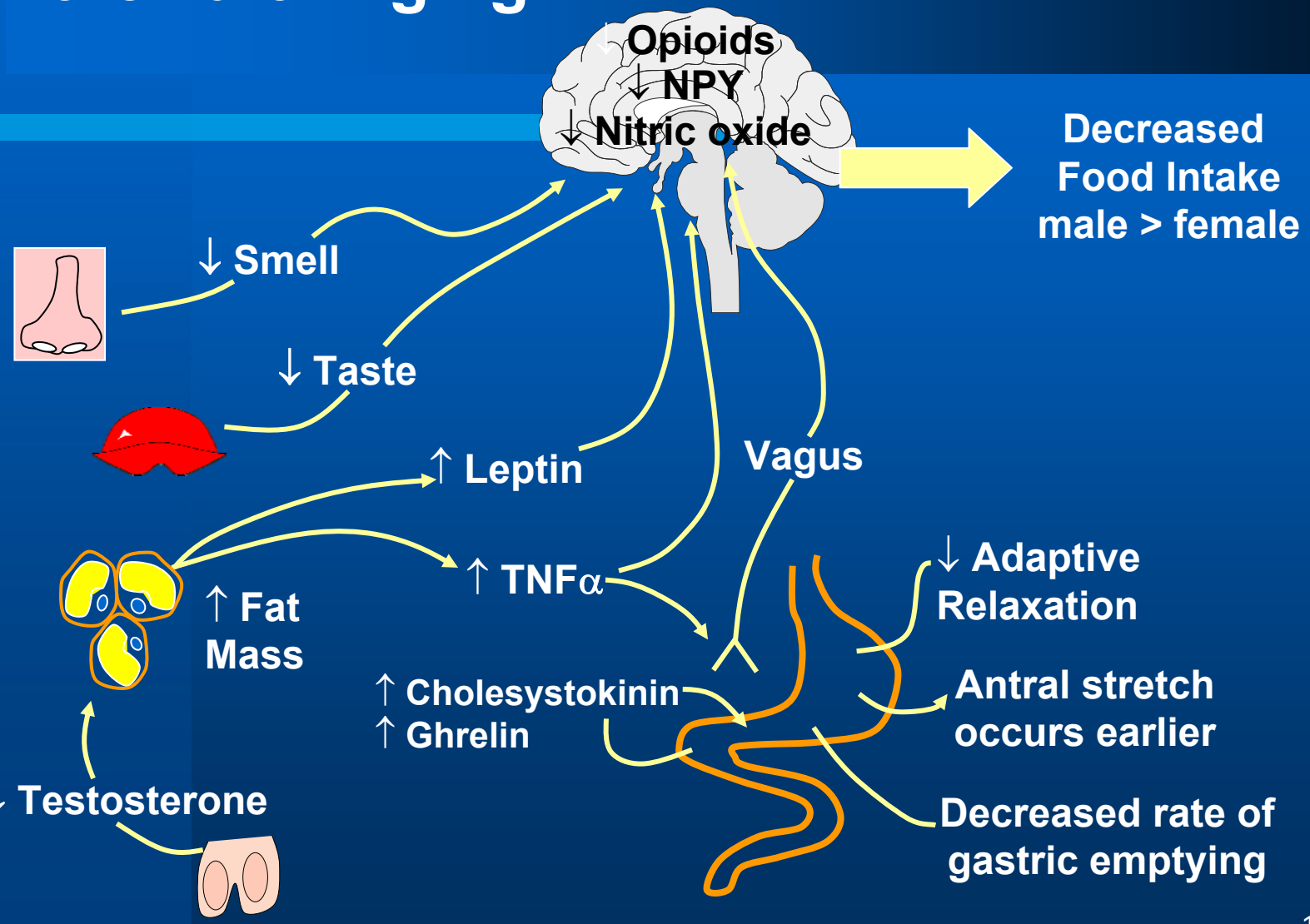


# Response to Underfeeding



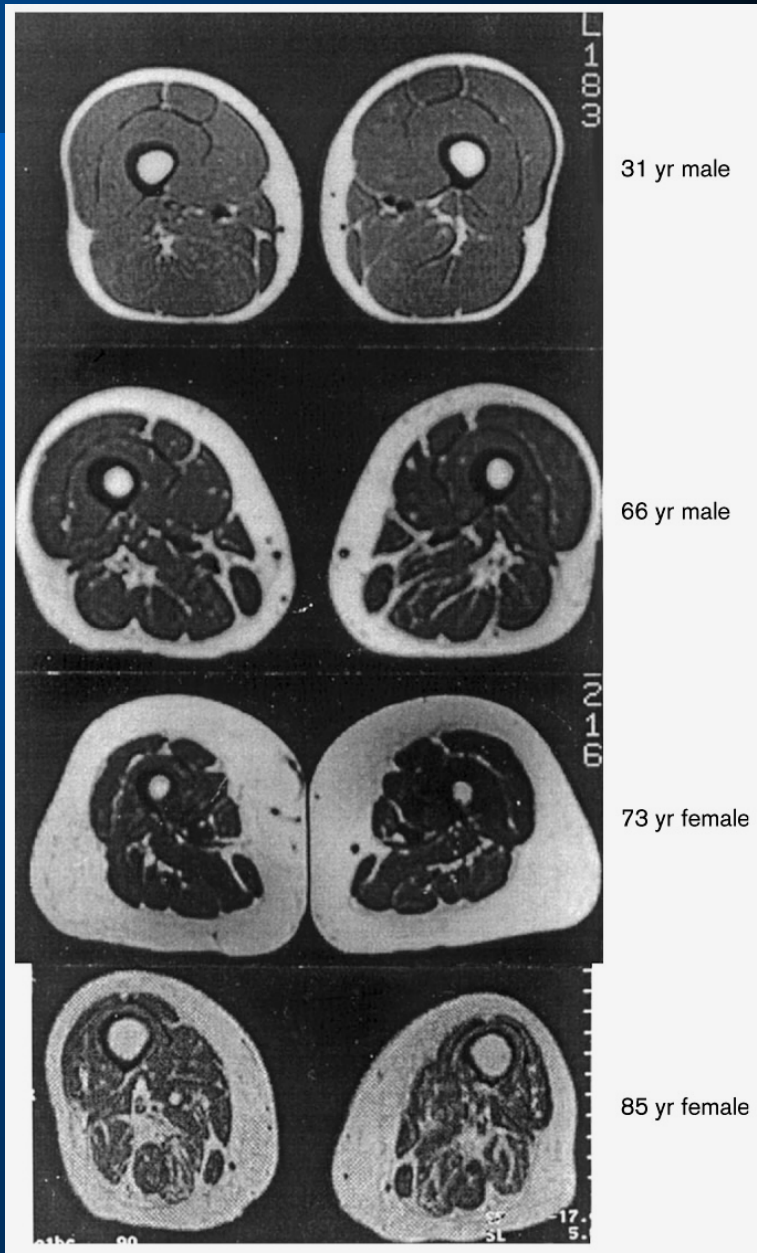

*Roberts SB. JAMA 1994:272:1601*

# Anorexia of Aging



# SARCOPENIA

Muscle mass and intramuscular fat decline with age.



# *Longitudinal changes in body composition*


*4.7 years, N=78*
*Am J Physiol Endocrinol Metab 2000'279:E366.*

# Cachexia

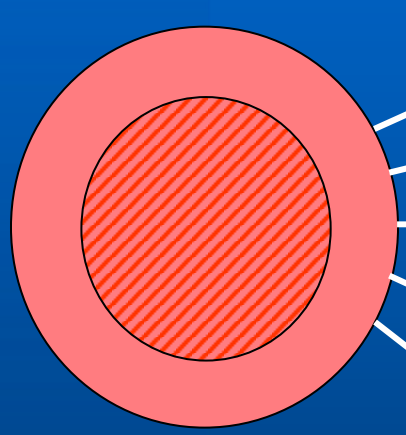
- A complex metabolic syndrome associated with underlying illness and characterized by loss of muscle with or without loss of fat mass
- Prominent clinical feature of is weight loss in adults
- Distinct from starvation, age-related loss of muscle mass, primary depression, malabsorbtion and hyperthyroidism

*Thomas DR. Clinical Nutrition, 2007;26(4):389-99.*

# Effect of Illness

- Spontaneous reduction in food intake
- Paradoxical response in face of increased need for nutrients
- Common to most species

# Effect of proinflammatory cytokines



IL-1
IL-2
IL-6
TNFα
CNTF

Anorexia
Cachexia

Muscle wasting

↓ Nitrogen retention

anemia, immune function

↓↓ Albumin synthesis

Extravasation of albumin from intravascular space

↓ Circulating levels of albumin and cholesterol

*Thomas DR. Geriatric Clin N Amer 2002;11*

# Nutritional effects of proinflammatory cytokines

| Cytokine | Food intake | Body weight | Protein Synthesis |
|---|---|---|---|
| TNF | ↓ | ↓ | ↓ |
| Interleukin 1 | ↓ | ↓ | ↓ |
| Interleukin 6 | ↓ | ↓ | ↓ |
| Interferon gamma | ↓ | ↓ | ↓ |
| Leukemia inhibitor factor | ↓ | ↓ | ↓ |

Tisdale MJ. Nutrition 2001;17:438

# Cachexia in Clinical Illness

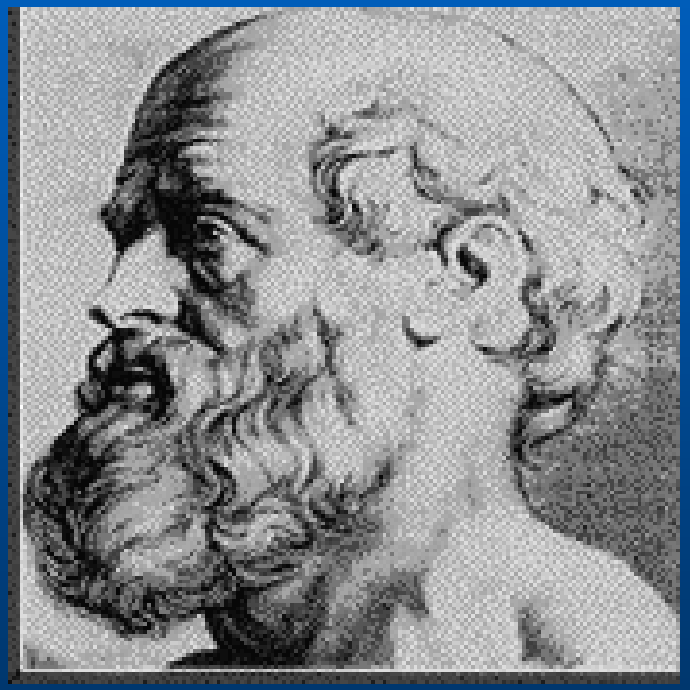
- Infections, eg. tuberculosis, AIDS
- Cancer
- Congestive heart failure
- End-stage renal disease
- Rheumatoid arthritis
- Chronic obstructive pulmonary disease
- Cystic fibrosis
- Crohn's disease
- Alcoholic liver disease
- Elderly persons without obvious disease

# Cachexia in Clinical Diseases

- Pulmonary cachexia ➢ TNF
- Cardiac cachexia ➢ TNF/proinflammatory, CRP
- ESRD cachexia ➢ α-macroglobulin & c-reactive protein
- Cancer cachexia ➢ Fibrinogen & tumor factors
- HIV cachexia ➢ Reduced body cell mass
- Rheumatological cachexia ➢ TNF & interleukin-1
- Hypogonadism ➢ Hypoanabolic state

# Cachexia

"The flesh is consumed and becomes water,... the shoulders, clavicles, chest and thighs melt away. This illness is fatal...."



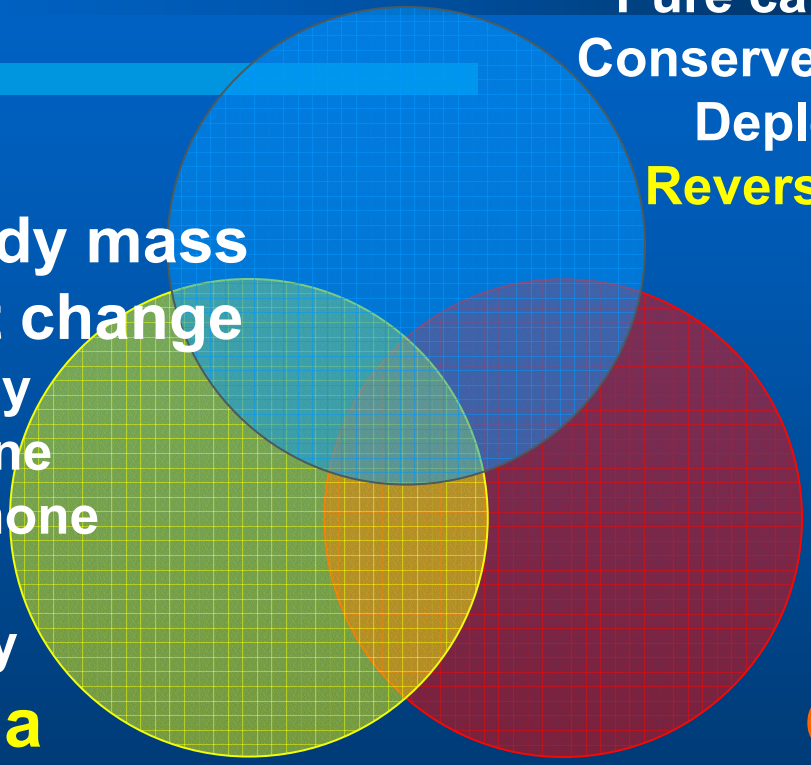
*Hippocrates (about 460-370 BC)*

# Starvation/wasting

Pure caloric deficiency
Conserve lean body mass
Deplete fat mass
Reversed by feeding

Deplete lean body mass
Weight may not change
Mediated by
Testosterone
Growth hormone
ILGF-1
Immobility

**Sarcopenia**



**Cachexia**

Chronic inflammatory disease
Deplete lean and fat mass
Mediated by cytokines
Not affected by feeding

*Thomas DR. Geriatric Clin N Amer 2002;11*

# Distinguishing Starvation from Cachexia

| | *Starvation* | *Cachexia* |
|---|---|---|
| Appetite | Suppressed in late phase | Suppressed in early phase |
| Serum Albumin | Low in late phase | Low in early phase |
| Cholesterol | May remain normal | Low |
| Total Lymphocyte count | Low, responds to refeeding | Low, unresponsive to refeeding |
| C-reactive protein | Little data | Elevated |
| Body mass index | Not predictive of mortality | Predictive of mortality |
| Inflammatory disease | Usually not present | Present |
| Response to refeeding | Reversible | Resistant |



*Thomas DR. Geriatric Clin N Amer 2002;18:883*

# Interventions

# *Protein and energy supplementation in elderly people at risk from malnutrition*

34 trials in 3021 randomized subjects

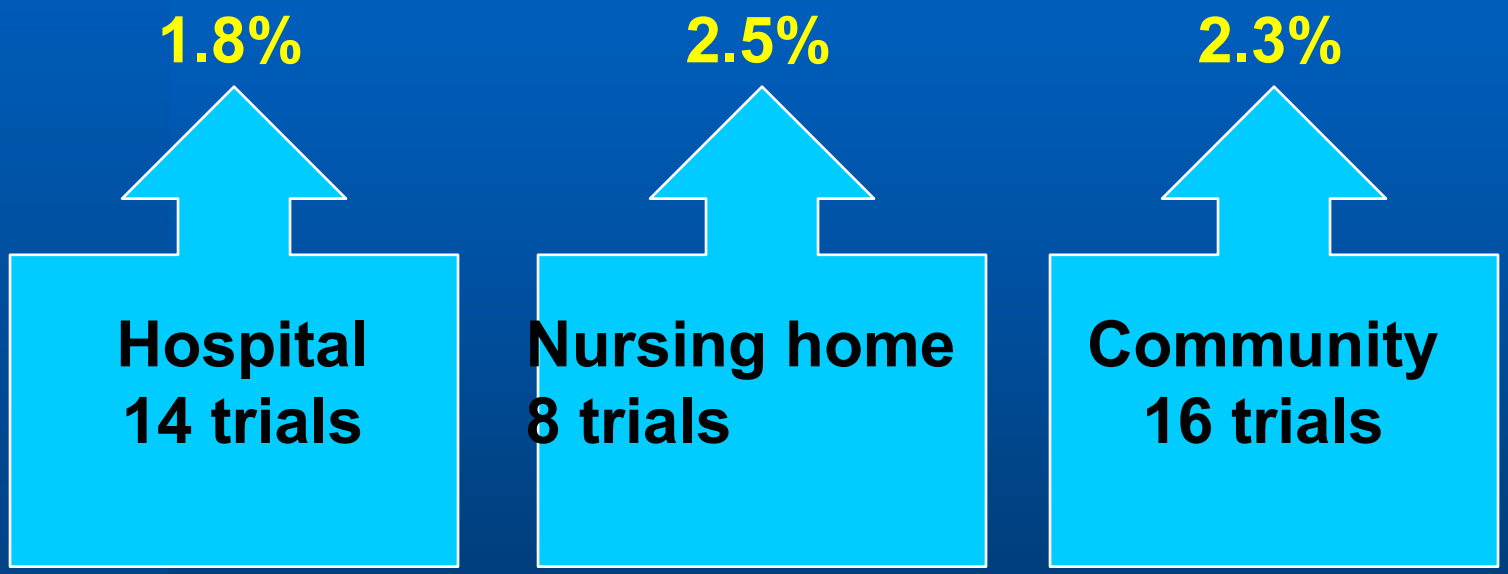
Mean weight gain 2.3% (1.3 kg)

26% decrease in relative risk of death

*Milne, AC et al. Cochrane Database of Systematic Reviews. 1, 2005.*

# Meta-Analysis: Protein and Energy Supplementation in Older People:

***Percent Weight Gain***




*Milne, AC et al. Ann Intern Med. 2006;144:37-48.*

# *Meta-Analysis: Protein and Energy Supplementation in Older People:*

## *Mortality by nutrition status*

35 reports in 3021 randomized subjects

**28% reduction in mortality when only undernourished subjects included**

*Milne, AC et al. Ann Intern Med. 2006;144:37-48.*

# Meta-Analysis: Protein and Energy Supplementation in Older People:

## *Mortality by Subgroups*


*Milne, AC et al. Ann Intern Med. 2006;144:37-48.*

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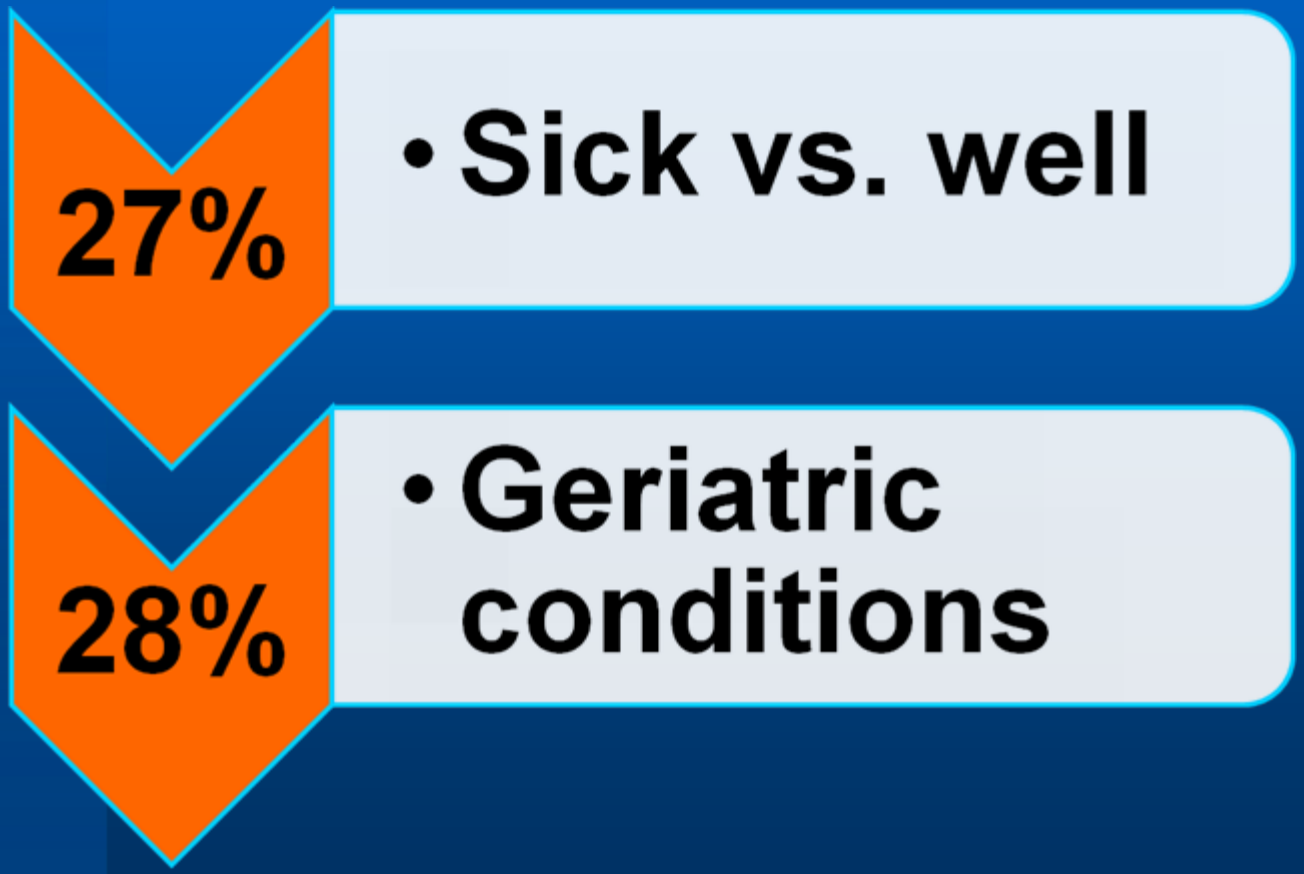


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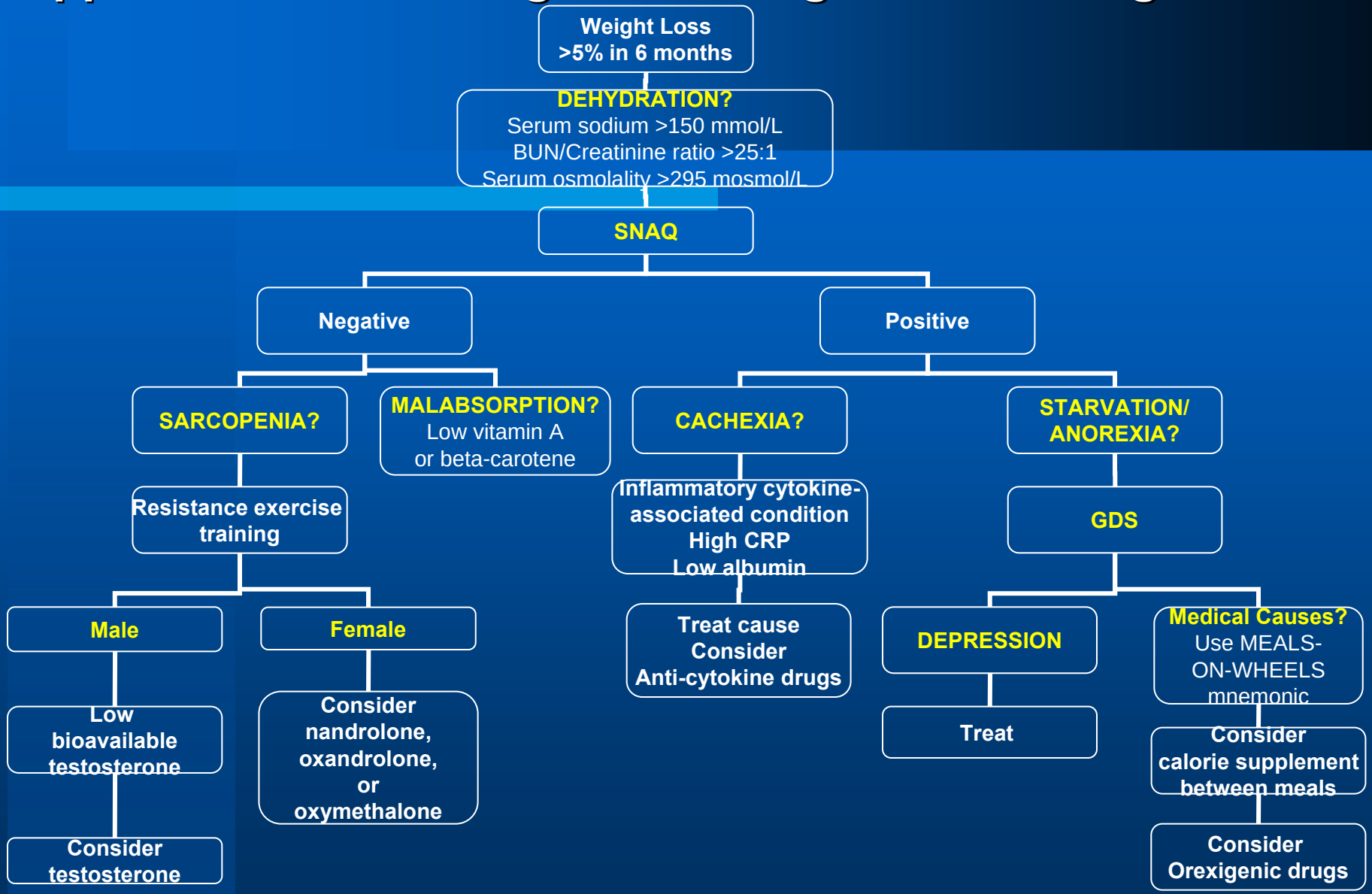
# Approach to the Management of Age-related Weight Loss




CRP: C-reactive protein; GDS: Geriatric Depression Scale; SNAQ: Simplified Nutrition Assessment Questionnaire

*Thomas DR. Clinical Nutrition, 2007;26(4):389-99*

"..for wasting which represents old age (sarcopenia) and wasting that is secondary to fever (cachexia) and wasting which is called doalgashi (starvation)"

....Maimonides (1135-1204)

# Future Directions

- How best to target nutritional supplementation
  - Nutritional screening critical
  - Supplements generally best for persons with BMI <20
  - Supplements may have little or no value in weight stable persons