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Principles of Normal Growth and Development

Brent C. Williams, MD, MPH
Associate Professor of Internal Medicine
University of Michigan

Spring 2009

Outline

- Overview of course objectives, small group sessions and themes.
- Review principles of normal growth and development.
- Understand the demographic imperative of aging.
- Define life expectancy and life span.

Growth and Development Course Objectives - 1

- **Understand normal growth and development across the lifespan.**
  - ⇒apply this knowledge in the approach to the patient
- **Demonstrate knowledge of ways to optimize function for independent living.**
  - ⇒nutrition
  - ⇒exercise
  - ⇒medications

Growth and Development Course Objectives - 2

- **Recognize and appreciate parallels at opposite ends of life span with respect to:**
  - ⇒ impaired homeostasis and limitations in functional reserve
  - ⇒functional assessment
  - ⇒vulnerable populations; role of psychosocial support / caregivers
  - ⇒Team care

GD Resources
-1-

- Lecture presentations and handout materials on Course Tools web site.

- Recommended reference:
  - **Nutrition in Primary Care.**
  - Deen and Hark
  - Blackwell Publishing – 2007
  - Chapters 1-10

GD Course Components

- **General Lectures**
- **Age-specific**
  - Lectures
  - Small Groups
- **Nutrition session**
  - Preparatory self-assessment exercise
- **Multi-disciplinary conference**

GD Requirements (1)

- Attendance required for:
  - Introductory lecture
  - 4 small group sessions.
  - Body composition / nutrition assessment session in Learning Resource Center.
  - Multidisciplinary conference
    - » (Mon May 18; 10:00-12:00)

GD General Lectures

- Basic concepts
- Energy and Metabolism in Aging
- Pharmacology in Aging
- Biology of Aging

Ages in the Life Span

- **Lecture + small group**
  - Neonatal / Perinatal
  - School Age
  - Adolescent
  - Older Adult

Objectives for Small Group Sessions

- Characterize normal growth & development (e.g. body composition changes) across life span.
- Discover implications for approach to the patient history and physical.
- Present age-specific nutrition assessment: Anthropometry, Biochemical, Clinical, Dietary intake, Energy expenditure.
- Focus on primary prevention.

Objectives for Nutrition Segments

- **Calculate BMI, BMR**
  - Know norms
  - Apply in clinical practice
- **Nutritional requirements (Cals// Prot/ Fat/Carbs)**
- **Pt's experience of nutrition counseling**
- **Selected topics**
- **Demographics of obesity**

Nutrition segments do NOT cover

- Detailed nutrition basics
- Motivational interviewing
- Nutrition Counseling
- Behavioral aspects of nutrition
- Causes of malnutrition (medical, socioeconomic)

GD Requirements (2)

- **Nutrition Self-Assessment**
  - Log food intake, calculate BMI, questions for reflection.
  - Food log contents are known only to YOU – NOT turned in – for personal use only.
  - DO turn in questions for reflection.
  - If keeping a food log is deleterious to your health...
    - » Email Virginia Uhley for alternate assignment or any questions or concerns.
    - » Contact class counselor or class representative.
    - » Contact Williams at any time, for any reason.

GD Requirements (3)

- Evaluation
  - Attendance at required sessions.
  - Complete Nutrition Self assessment assignment. Due Friday May 22.
  - Final exam. On-line Fri May 22 1:00 PM – 11:59 PM Mon May 25, 2008.
    - » Closed book
    - » Embryology interim quiz separate.

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As you like it

All the world's a stage,

And all the men and women merely players:

They have their exits and their entrances;

And one man in his time plays many parts,

His acts being seven ages.

Seven Ages of Man

- **At first the infant, mewling and puking in the nurse's arms.**
- **Breast feeding problems?**
- **Malnutrition?**
- **Failure to thrive?**

Heather Burrows, MD – Neonatal / Perinatal Development

Seven Ages of Man

- **And then the whining school-boy, with his satchel, And shining morning face, creeping like snail unwillingly to school.**

- **Developmental delay?**
- **Hypothyroid?**
- **Learning disability?**

Julie Lumeng, MD – School Age Development

Seven Ages of Man

- **And then the lover,**

  Sighing like furnace,
  with a woeful ballad
  Made to his mistress'
  eyebrow.

- **Normal Sexual development?**
- **Dyadic relationships?**
- **Rejection?**

David Rosen, MD – Adolescent Development

Seven Ages of Man

- then the justice, in fair round belly with good capon lined, …

- Obesity
- Central adiposity
- Sedentary lifestyle
- Hyperlipidemia?

Brent Williams, MD – Physiology of Aging

Seven Ages of Man

- **the sixth stage shifts into the lean and slipper'd pantaloon, with spectacles on nose, … his youthful hose well saved, a world too wide for his shrunk shank; and his big manly voice, turning again to childish treble.**

- **Decline in BMI**
- **Loss of skeletal muscle mass**
- **Presbyopia**
- **Testosterone deficiency?**

Brent Williams, MD – Physiology of Aging

Seven Ages of Man

- **Last scene of all, … is second childishness and mere oblivion, sans teeth, sans eyes, sans taste, sans everything.**

- **Special senses loss**
- **Malnutrition**
- **Cognitive decline**
- **Palliative care**

Multidisciplinary Team – Care of Frail Elderly

As You Like It; Wm. Shakespeare
Act II; Scene VII

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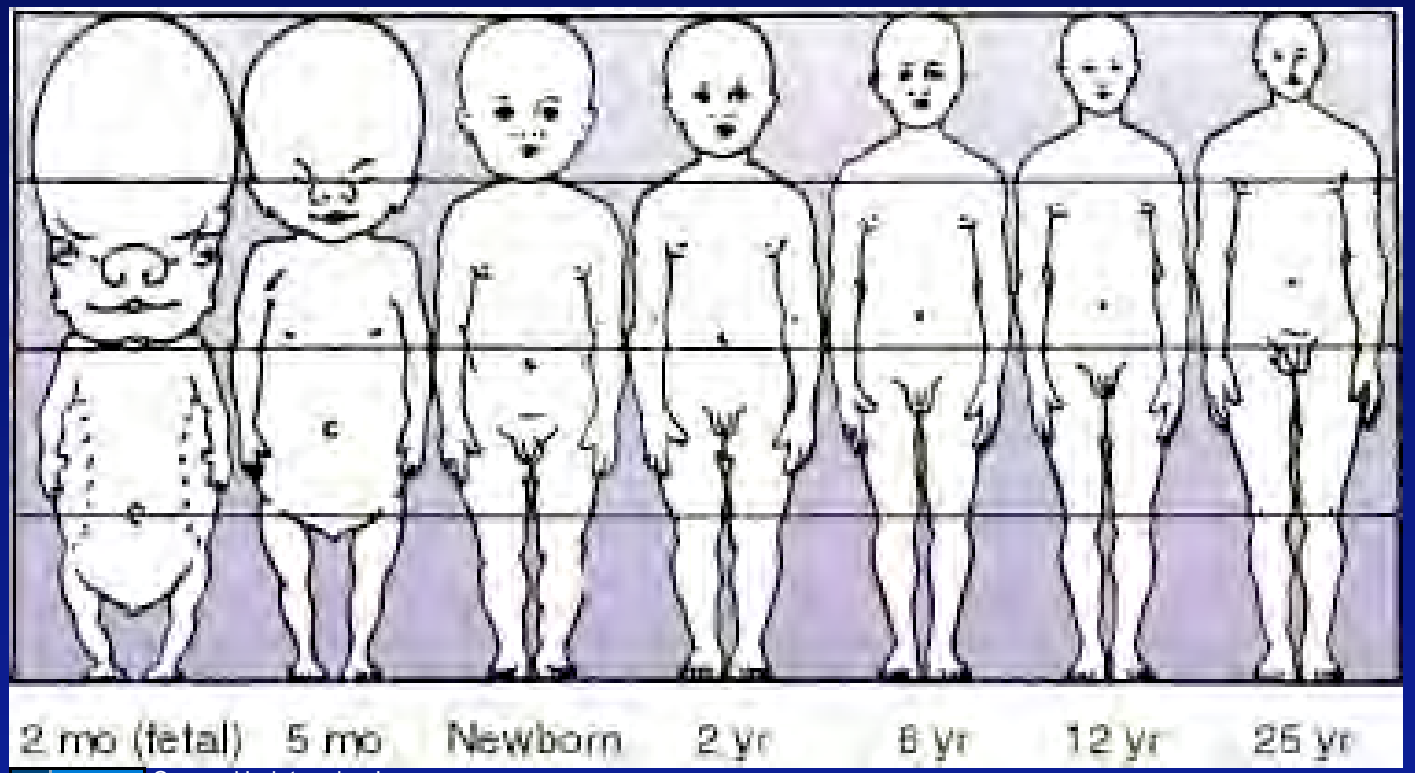
Principles of Growth and Development

- **Gender differences**
  - At developmentally equivalent ages, male is larger but with smaller percent fat.
  - Male grows for longer time period.
  - Longevity greater for females.

Principles of Growth and Development:
Growth patterns

- Size at birth determined by maternal variables
- 3 to 4-fold weight gain in first year
- Steady growth in school-age child
- Adolescence/menarche/sexual maturation
  - Great increase in energy requirements
  - Growth spurt; up to 14 cm/yr in males
  - Decrease in fat mass



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Principles of Growth and Development

- **Development is a dynamic process.**
- **Individual variation in timing.**
- **Order, hierarchy to sequence.**
  - Increasing complexity in childhood
  - Loss of function in activities of daily living
- **Sequential progression in gross motor development**
  - Cephalocaudal and proximodistal

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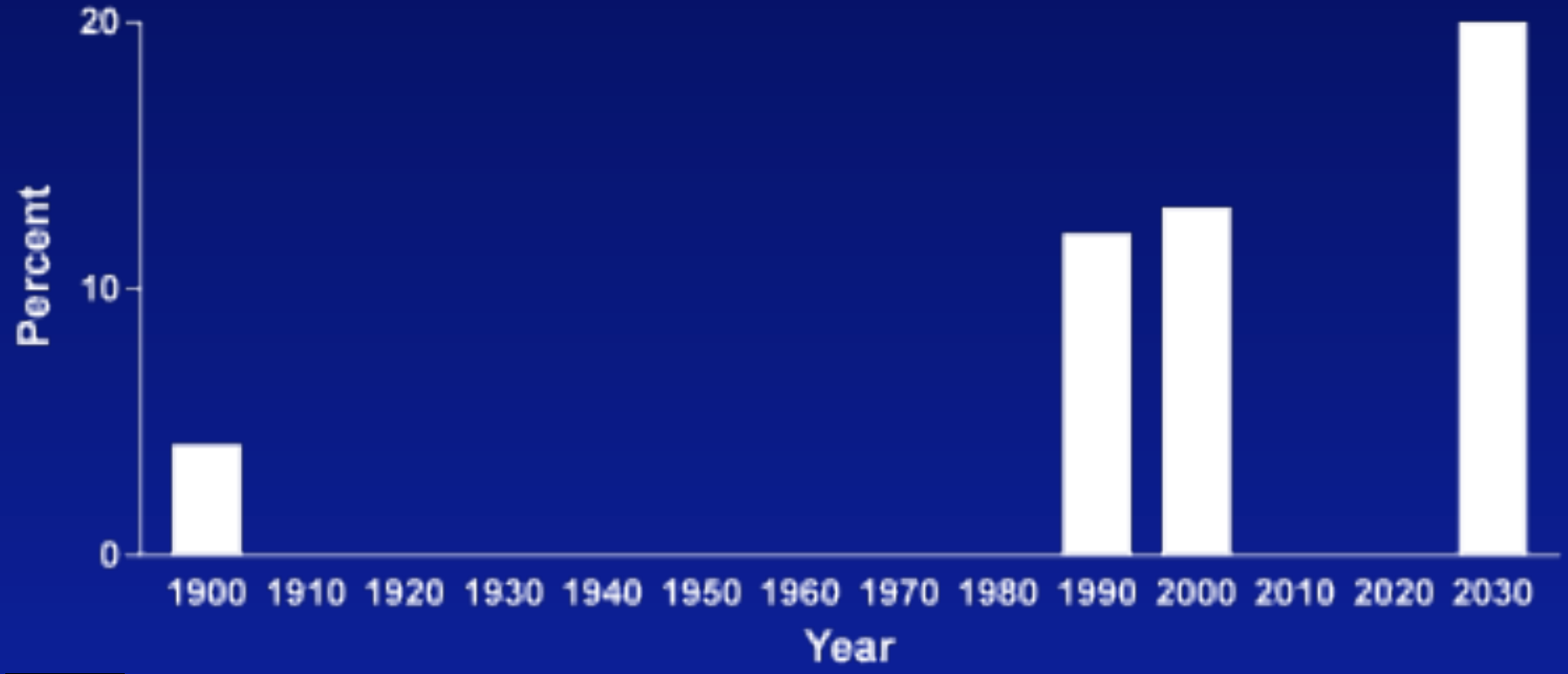
Aging: The Demographic Imperative

Demographics

US Population > Age 65



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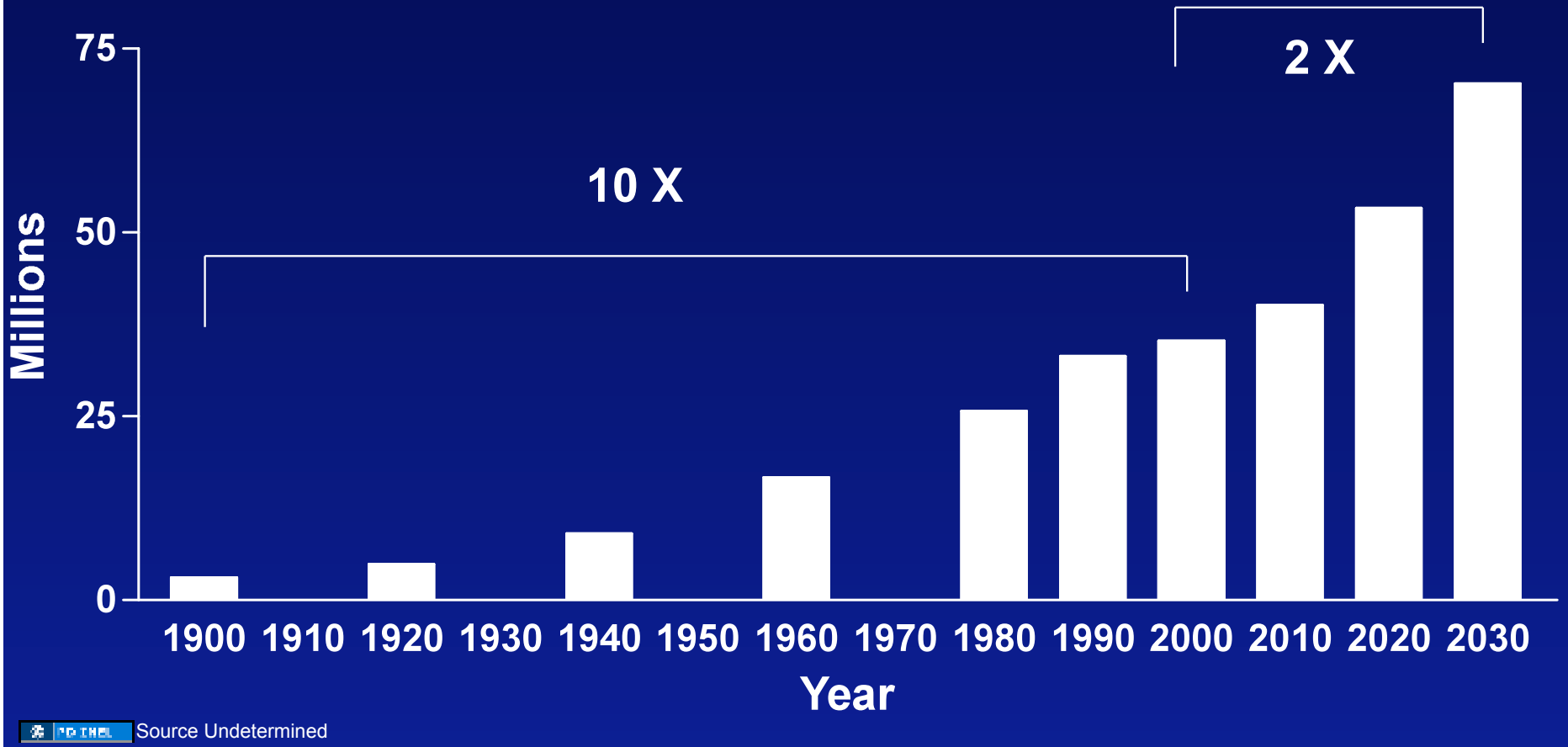
US Population 65+ Years



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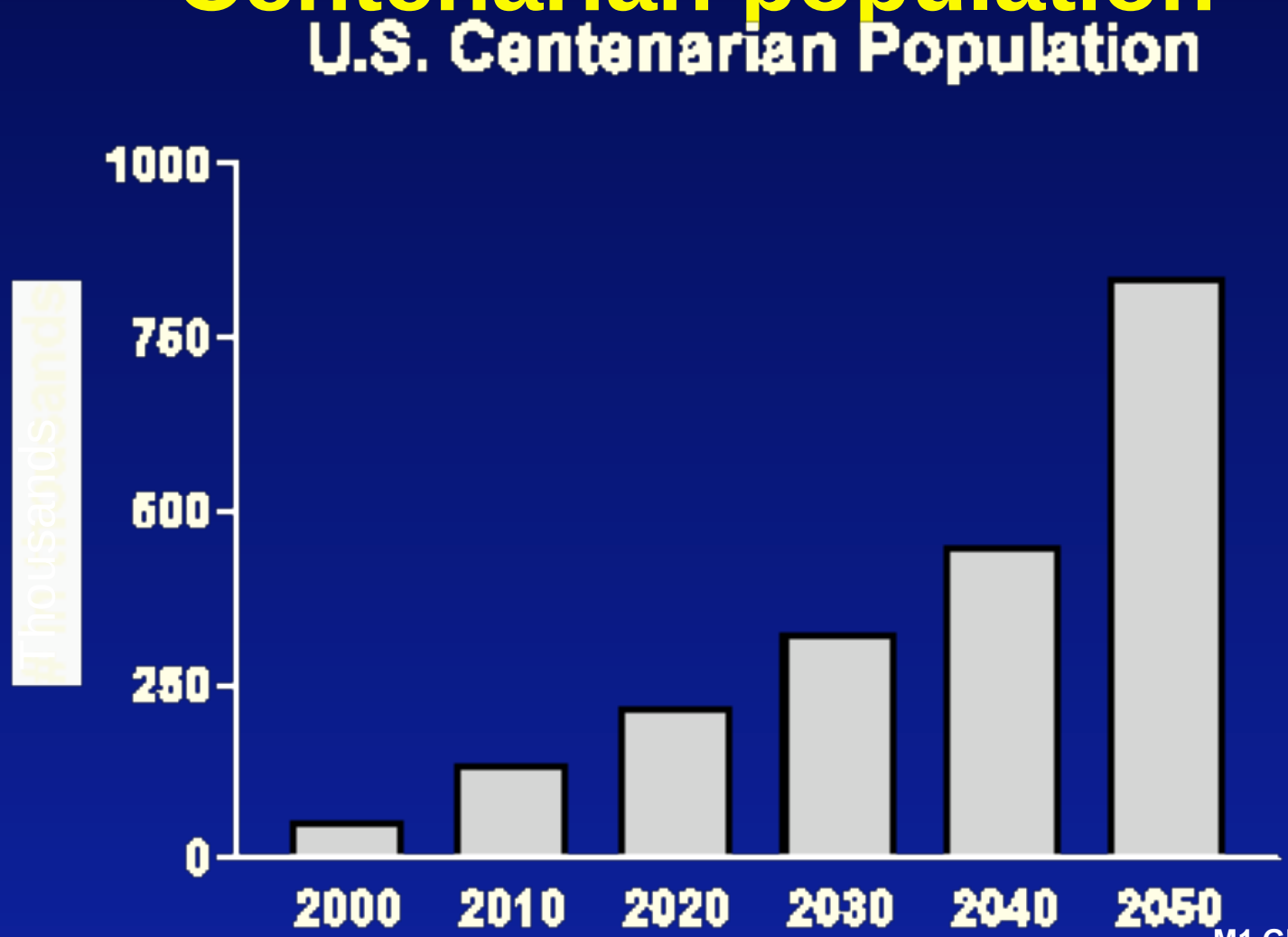
Centenarian population



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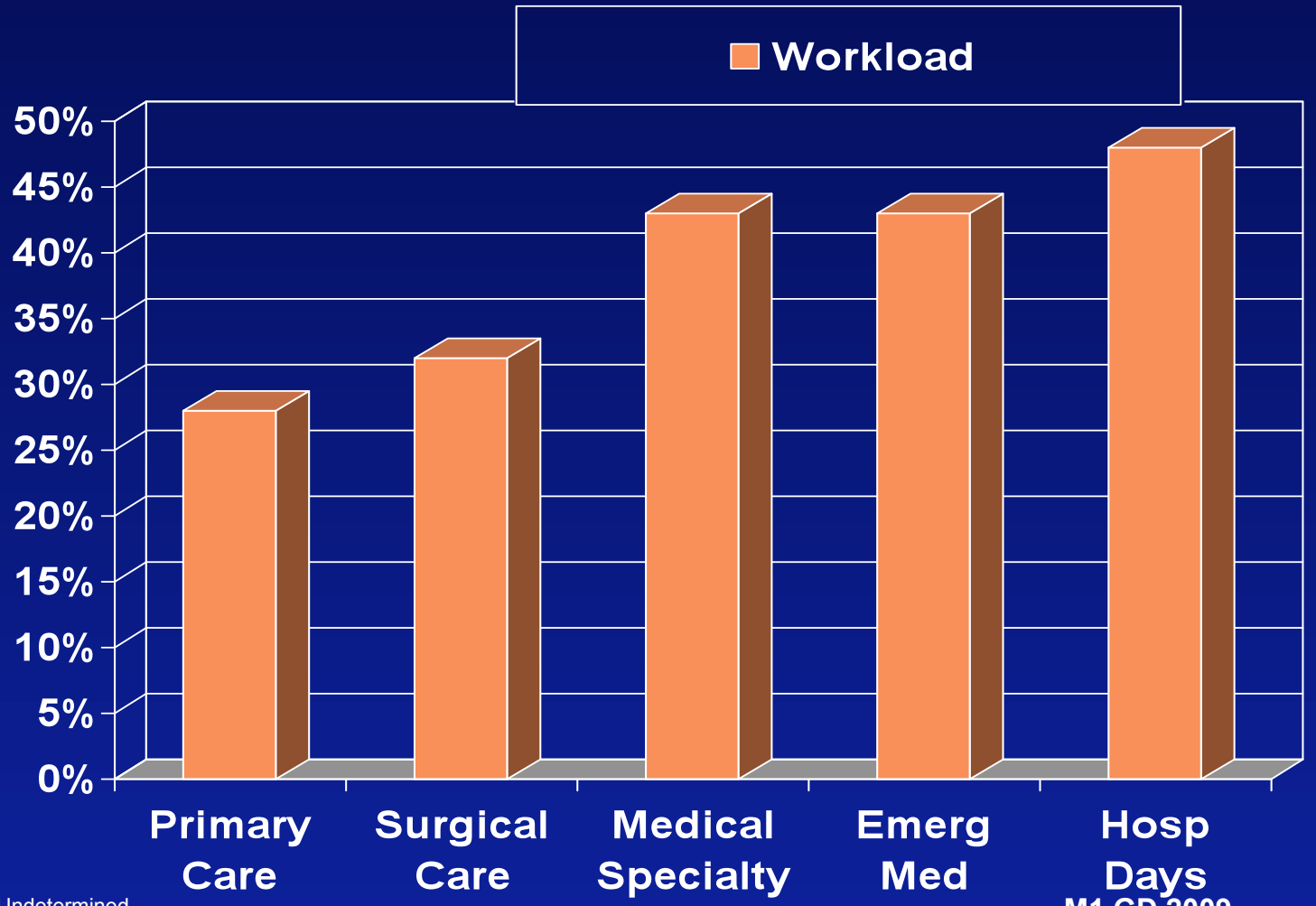
Demographic Imperative

Pts >65



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Ambulatory Visits by Patients ≥ 65*
% of all visits by Specialty (1999-2001)

Ophthalmology	52	
Urology	49	
Gen Surg		33
Otolaryngology	23	
Orthopedics	23	

•Represents 14% of U.S. Population

Derived from: Warshaw G, Bragg L. Part of ADGAP Longitudinal Study of Training and Practice in Geriatric Medic
funded by the Donald W. Reynolds Foundation, Feb, 2004. www.adgapstudy.UC.edu

Number Surgical Procedures: US, 2000 [1, 2]

(Acute Hospital)

Procedure	All Ages	> 65 yr (%)
All	40,000	14,380 (37)
CABG	519	286 (55)
Cholecystectomy	419	149 (36)
Prostatectomy	184	134 (73)
Total knee	299	211 (71)

1. Advance Data No. 329, June 19, 2002
2. Data are in thousands

Rate of Surgical Procedures, US, 2000 [1]

	All ages	65 and over
All procedures	1,500	4,500

1. Per 10,000 population

Emergency Department Visits by Age [1]

- Number of Visits as Percent of Population/Year

All Ages	27
≥ 65	32
≥ 75	65

- Older ED patients are sicker and have higher admission rate[2]

1. National Hospital Ambulatory Medical Care Survey, 2000
2. Denman SJ, et al. Short-term outcomes of elderly patients discharged from an emergency department.J Am Geriatr Soc 1989:37; 937-47.

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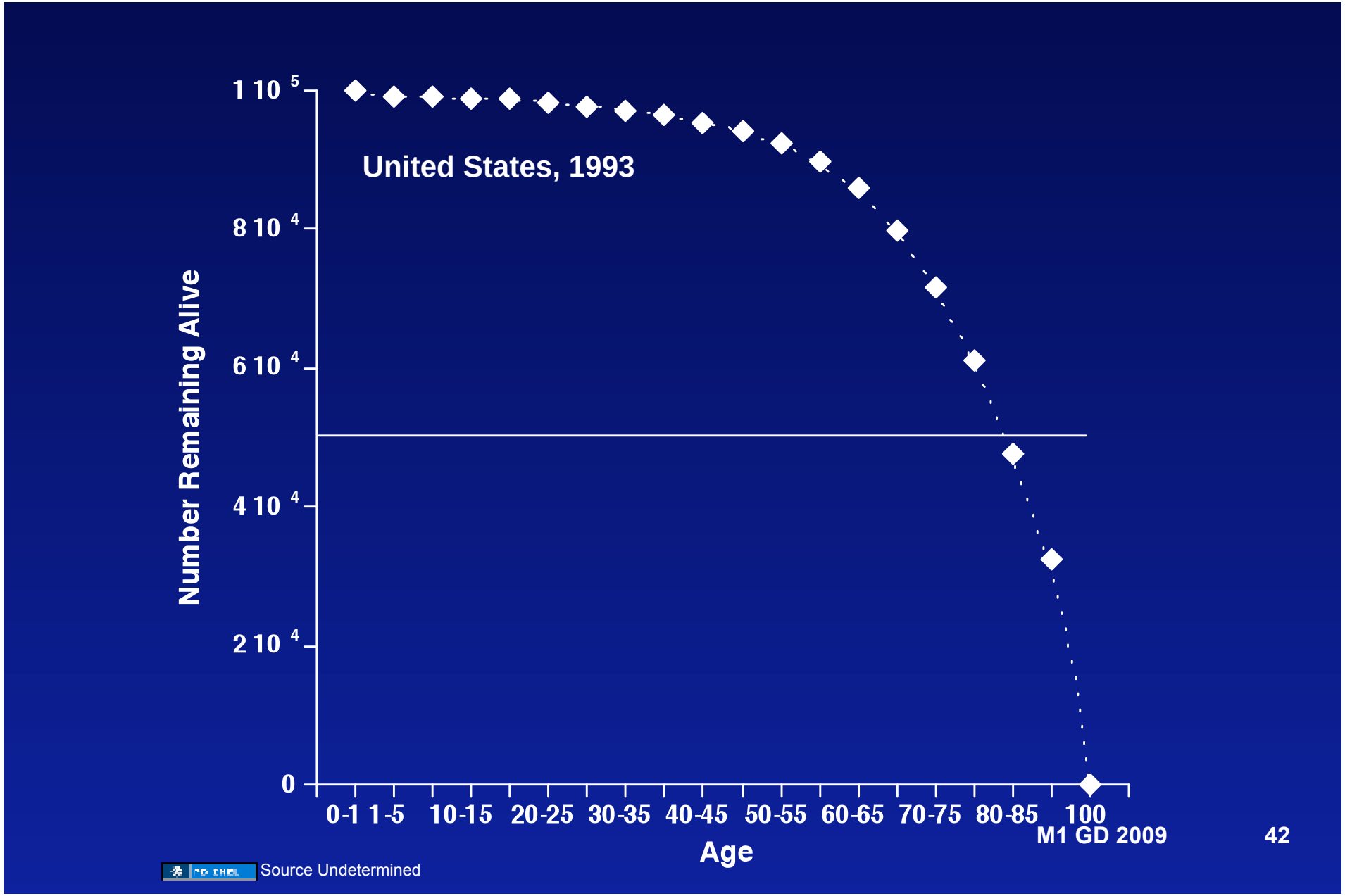

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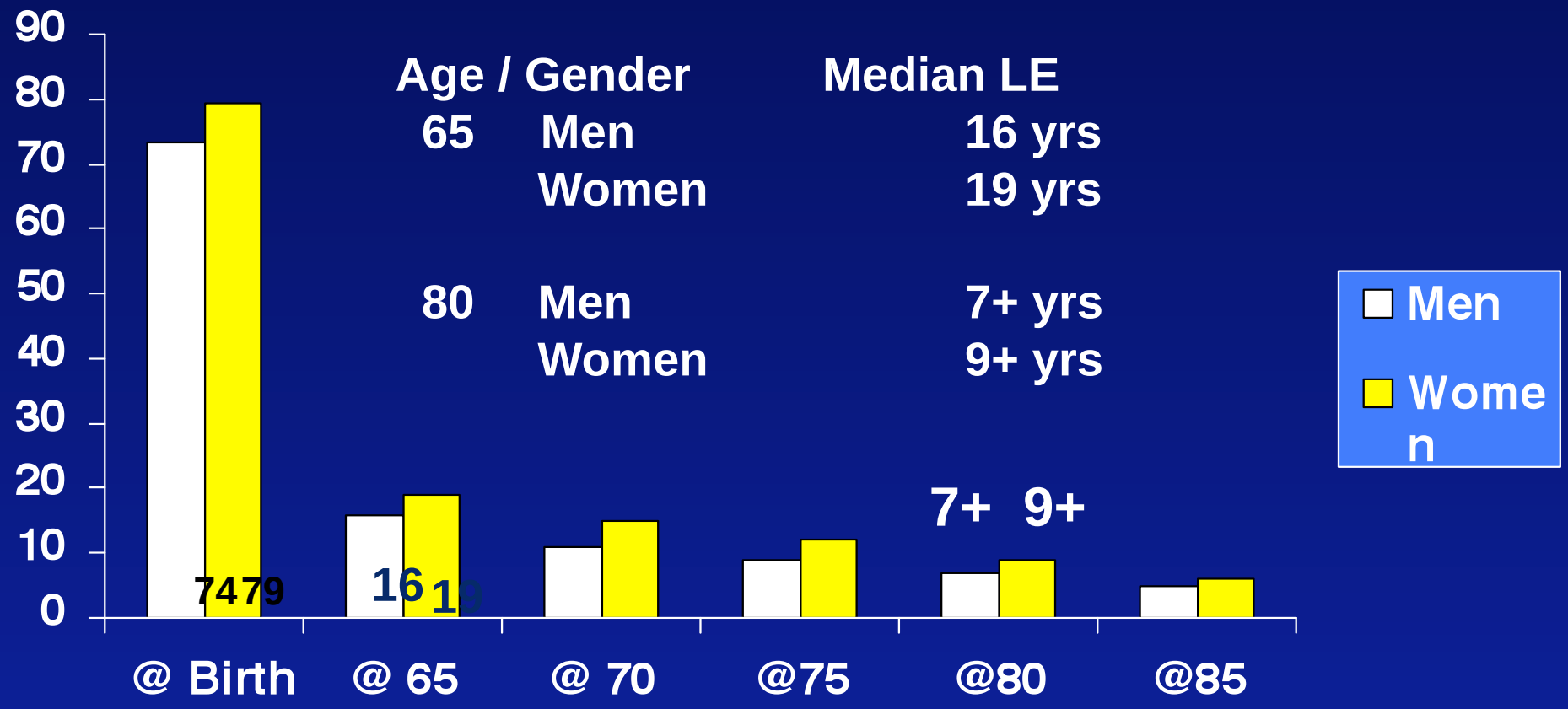
- **Life span – (theoretical) Relatively fixed upper limit to human longevity. Approximately 100 years.**

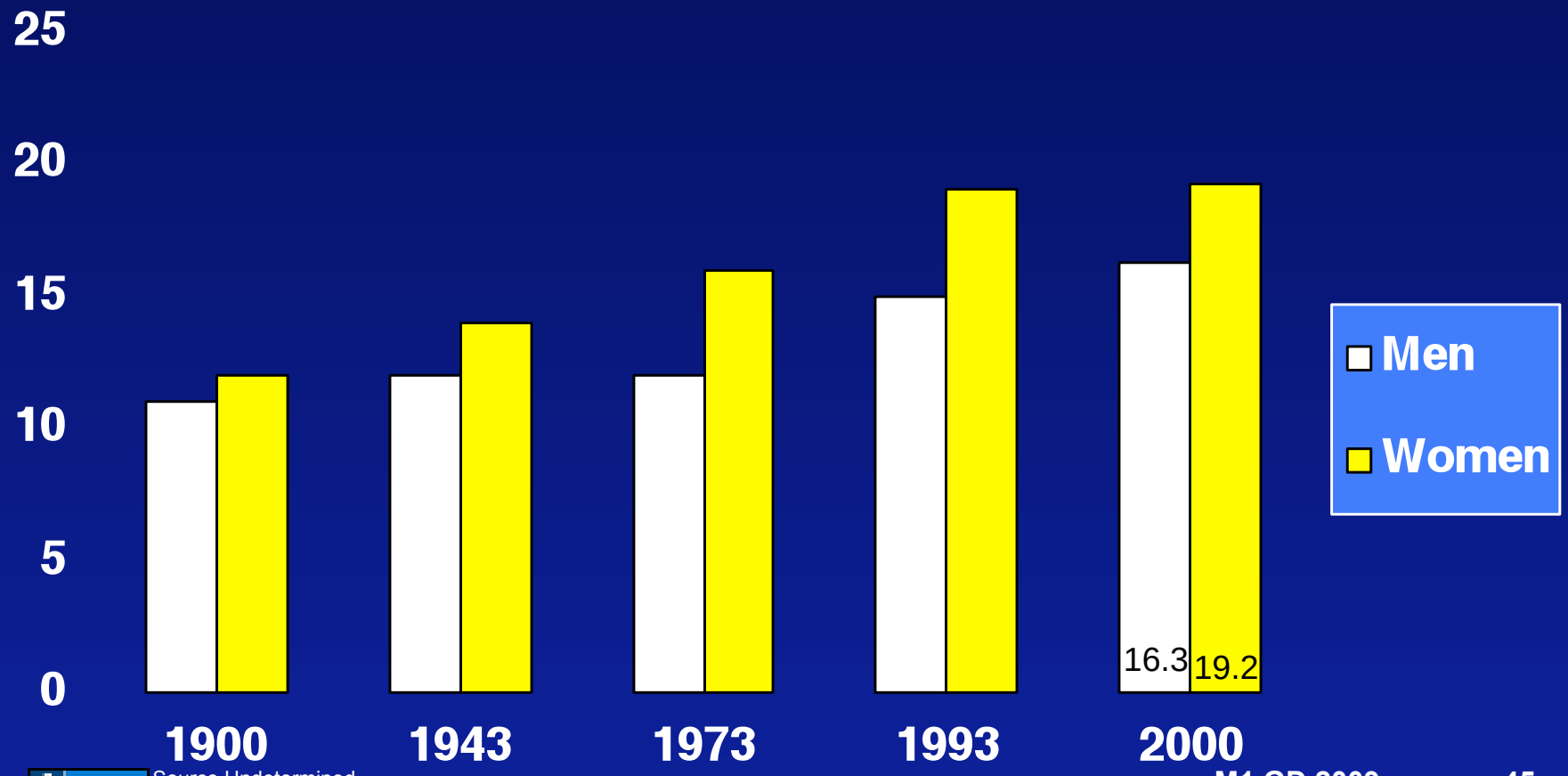
- **Life expectancy – (observed) 50th percentile survival in years.**

Average Life Expectancy at Given Ages



Walter LC, Covinsky KE. Cancer screening in elderly patients: A framework for individualized decision making. JAMA 2001;285:2750-2756.

Average Years of Life Remaining @ Age 65



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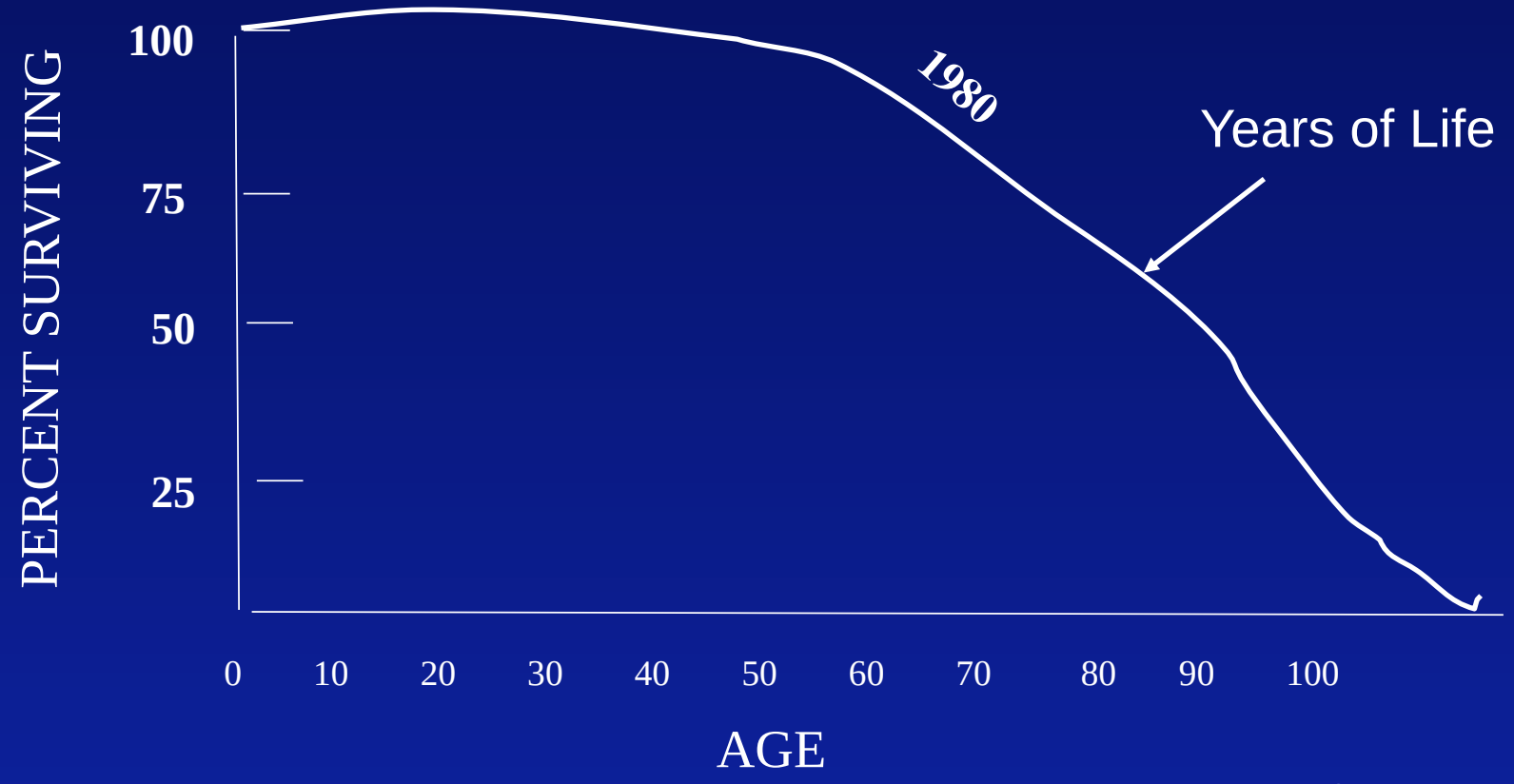
Compression vs. Expansion of Morbidity



Stanford Faculty Development Program. Geriatrics in Primary Care. 2002.

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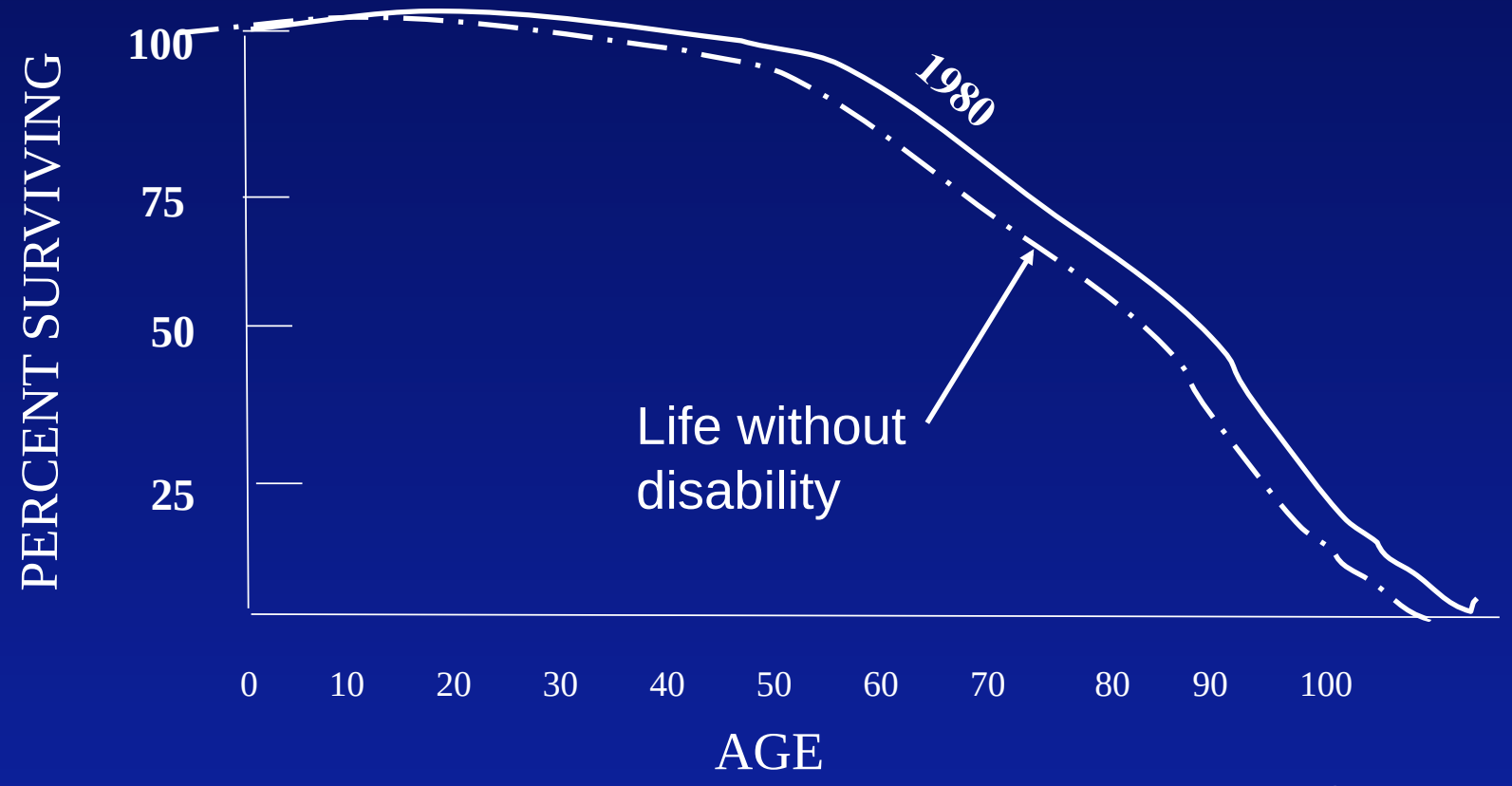

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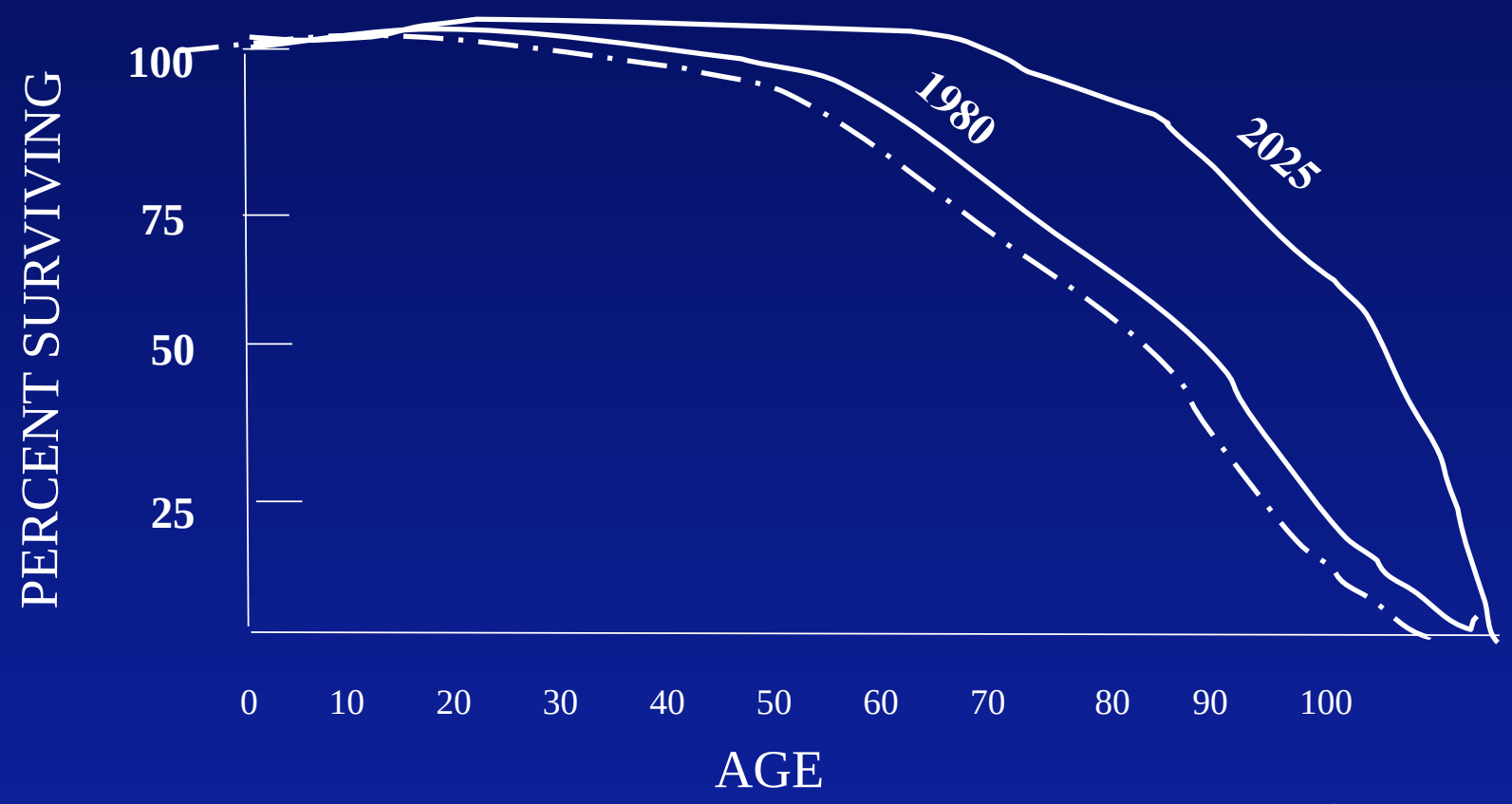

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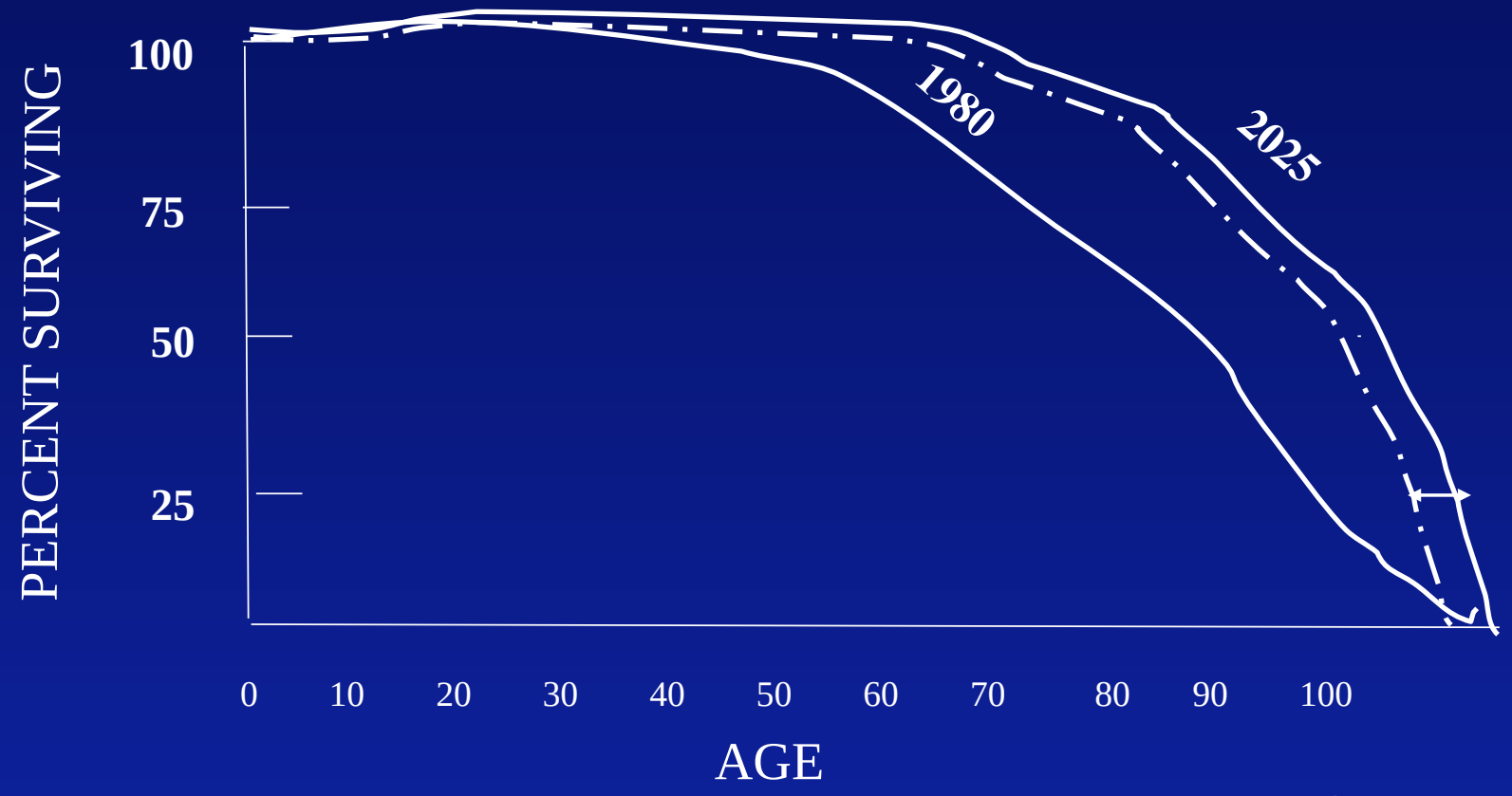

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