The Aging Workforce and NASA

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- No conflict of interest is associated with this presentation

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Learning Objectives

- Familiarization with the current scientific evidence on aging
- Understand the demographic trends in the US workforce and NASA in particular
- Review existing health and safety guidelines for the aging workforce
- Discuss potential health and safety practices for the aging workforce

Outline

- US and World demographic trends
- “Healthy Aging” the Evidence
- Guidelines promoting health and safety for the aging workforce
- NASA workforce age trends and issues
- Policies and Practices
- Conclusions

Definitions

- **Life expectancy**: demographic estimates of number of years a person will live
- **Life span**: boundary for expected longevity
- **Maximal potential life span**: highest attainable age in a specie
- **Notes**
  - Since 1840 life expectancy increased 3 months/year or 2,5 years/decade
  - Initial gains due to public health and medical interventions

Aging and Public Policy

- *"I have often thought that the process of aging could be slowed down if it had to go through Congress"*

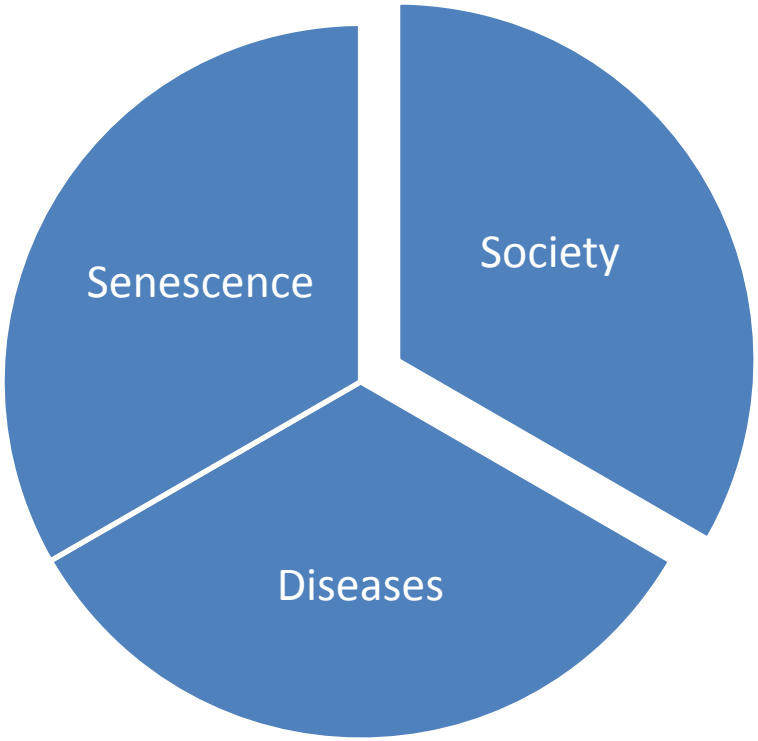
  George H. Bush

- *"And in the end, it's not the years in your life that count. It's the life in your years"* **Abraham Lincoln**

- *"If you live to the age of a hundred you have it made because very few people die past the age of a hundred"*

  George Burns

Interrelatinships



Society must prepare for handling longevity trends and needs

20th and 21st Centuries Society Evolution

Strauss, William & Howe, Neil. *Generations: The History of America's Future, 1584 to 2069*. Perennial, 1992

Generations

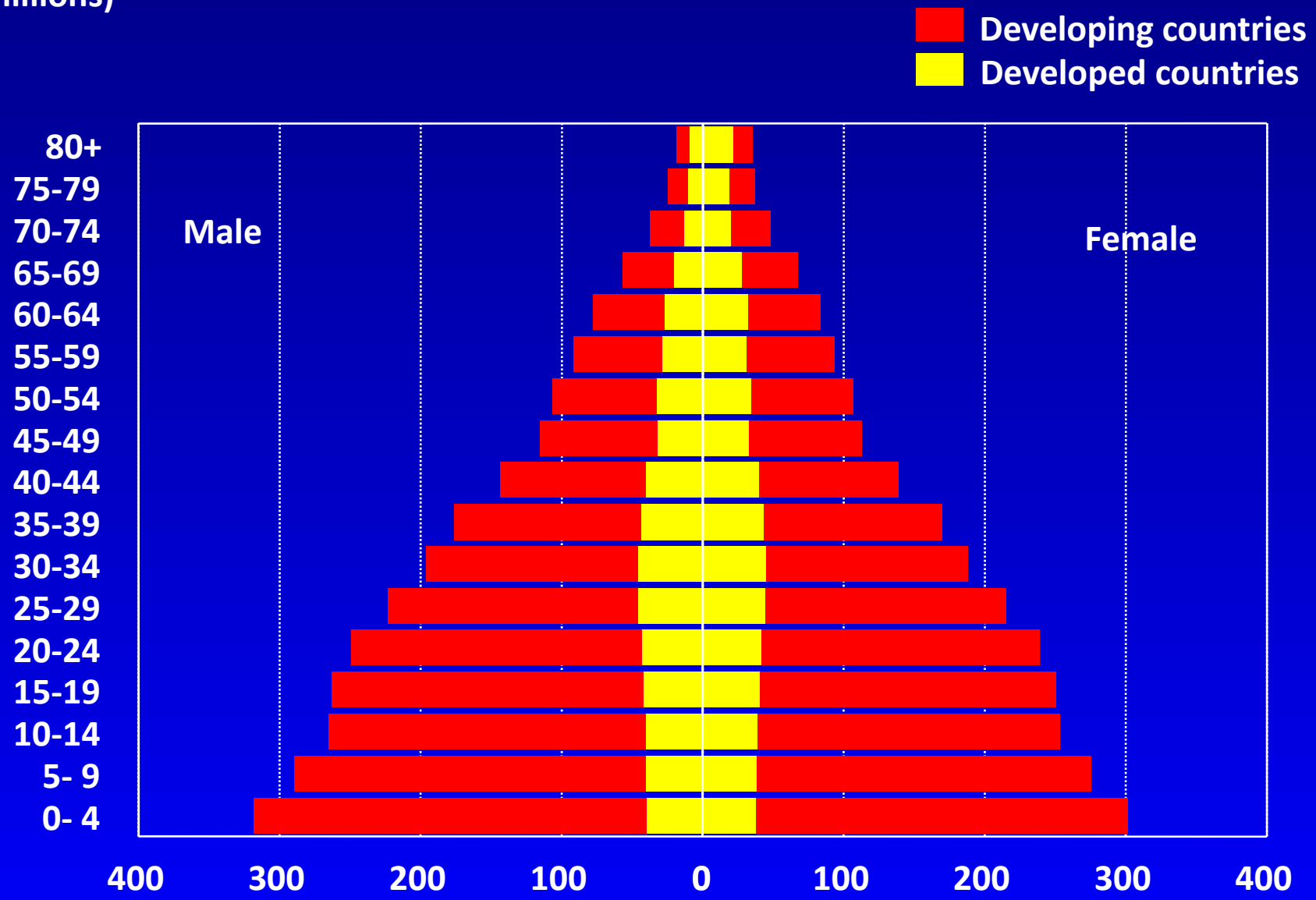
- 1917-30 Greatest Generation
- The Silent Generation
- 1945-50 Baby Boomers
- 1955-65 Jones Generation
- 1960-70 Gen X
- 1980- 90 Generation Y
- Generation Z?

Culture

- WWII, education, family , security
- The between wars generation value education and social change
- Post WWII; education, suburbs, opulence
- President Barack Obama represents this generation
- “Baby Bust” post Viet Nam and Cold War, tech savvy
- Millenials: IT mobile
- To be defined

Population, by Age and Sex: 1990

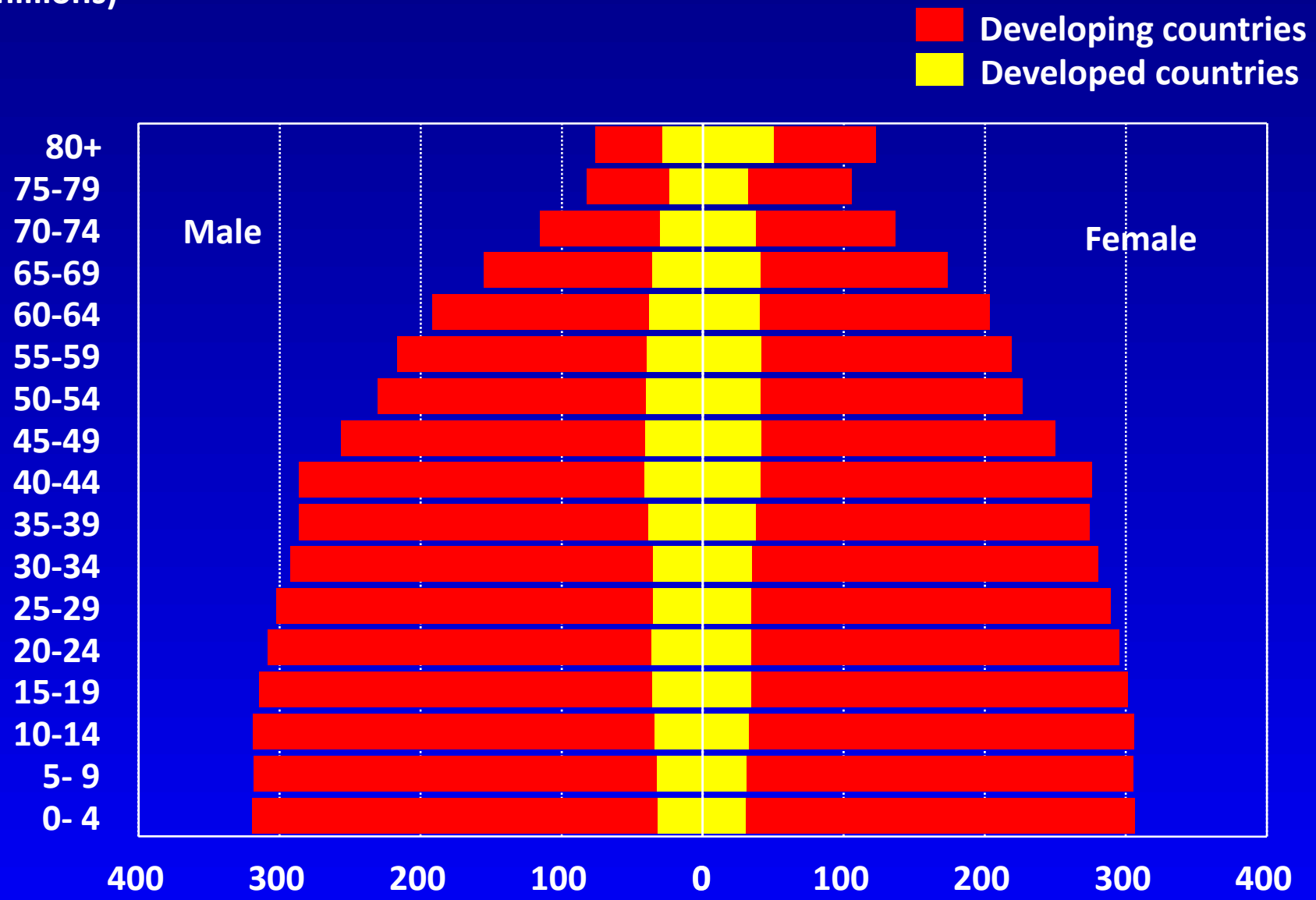
(In millions)



Sources: United Nations 1999 and U.S. Census Bureau 2000.

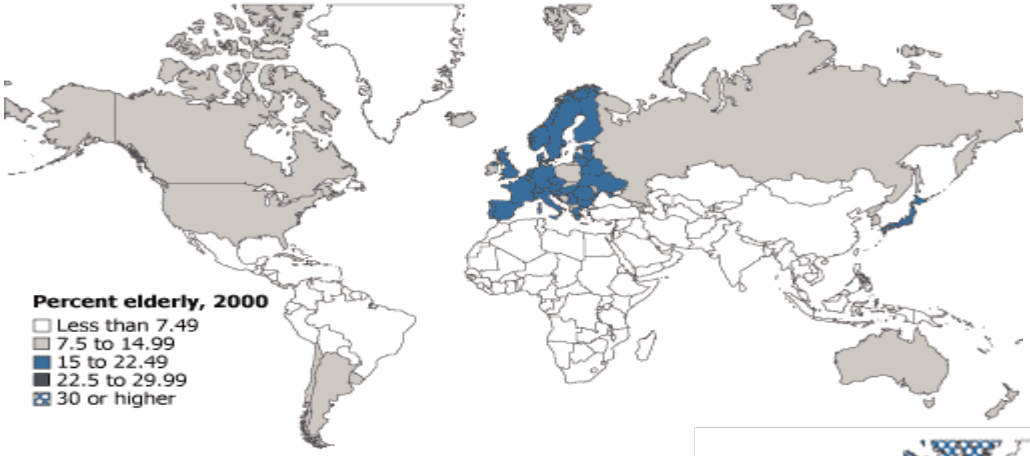
Population, by Age and Sex: 2030

(In millions)

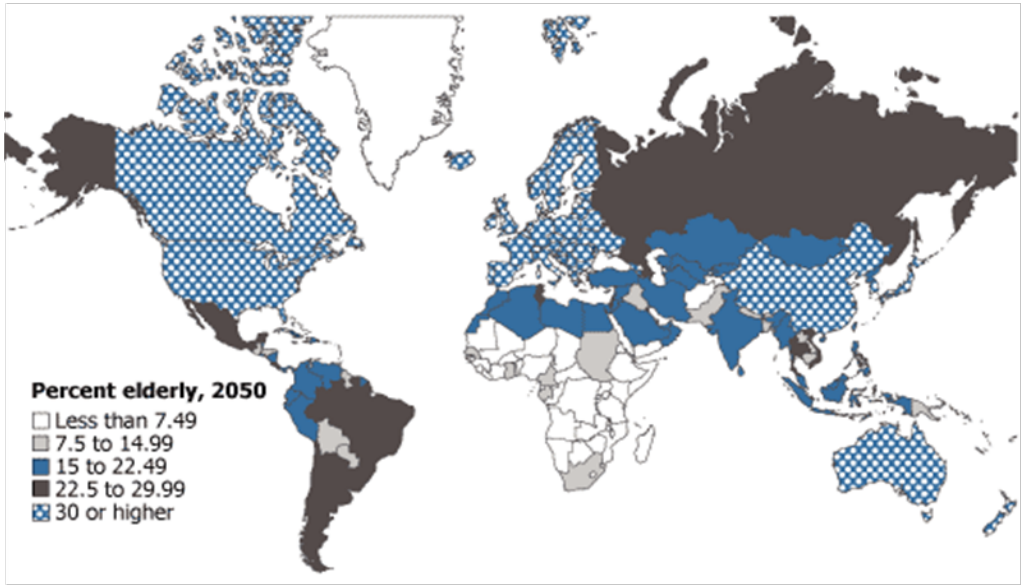


Sources: United Nations 1999 and U.S. Census Bureau 2000.

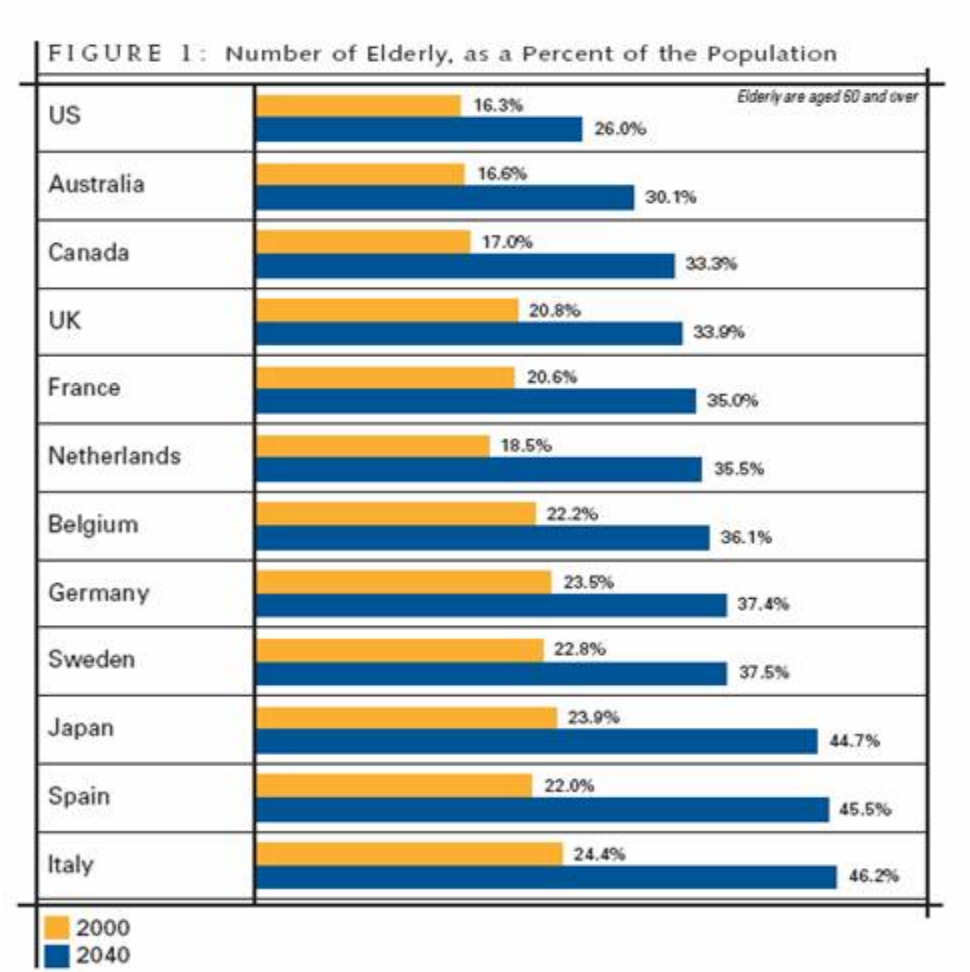
Percent of 60 and Older by Country for 2000 and 2050



Source: United Nations Population Division, *World Population Prospects: The 2004 Revision* (New York: United Nations, 2005).

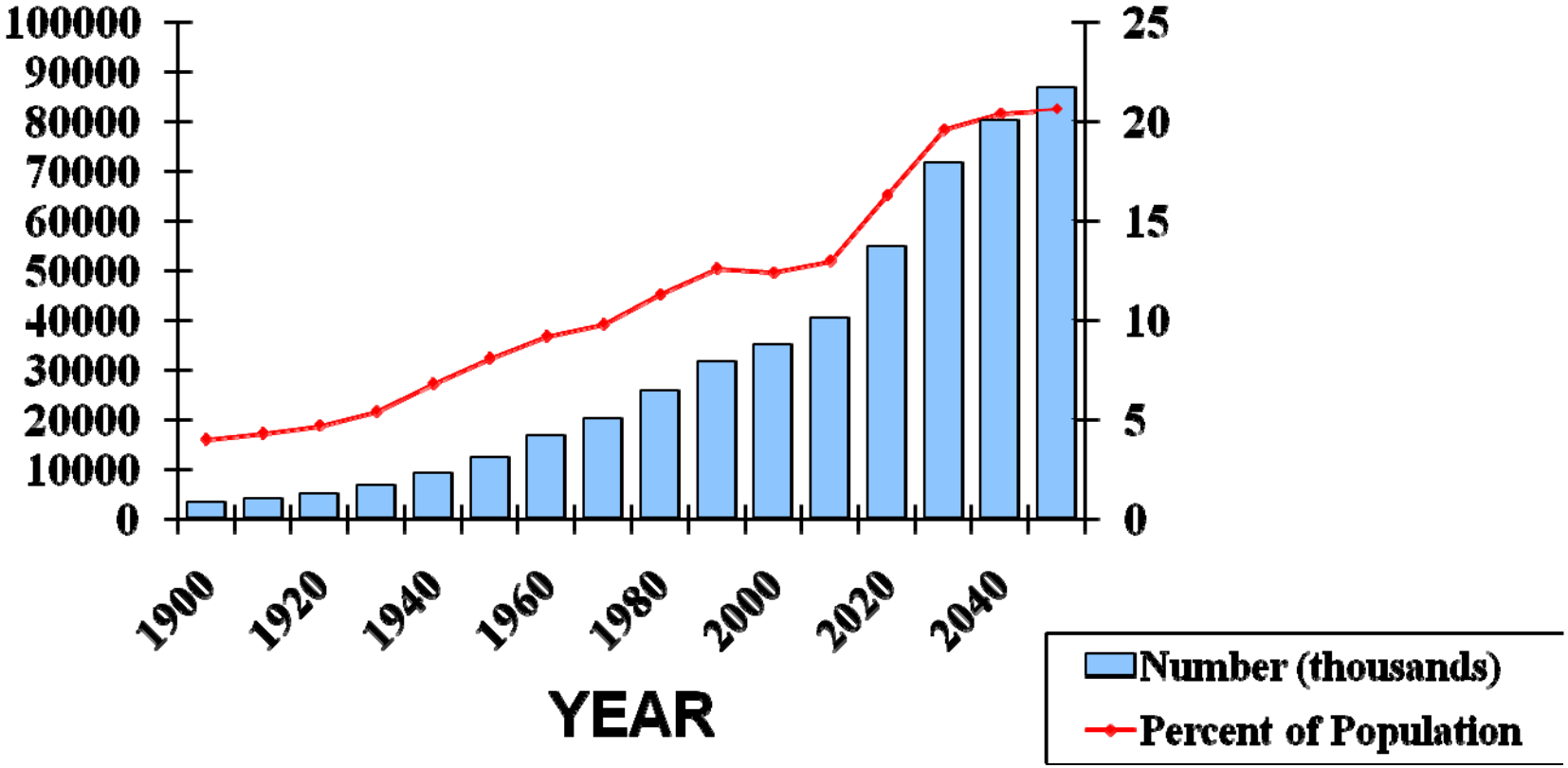


Number of >60 year old by Country



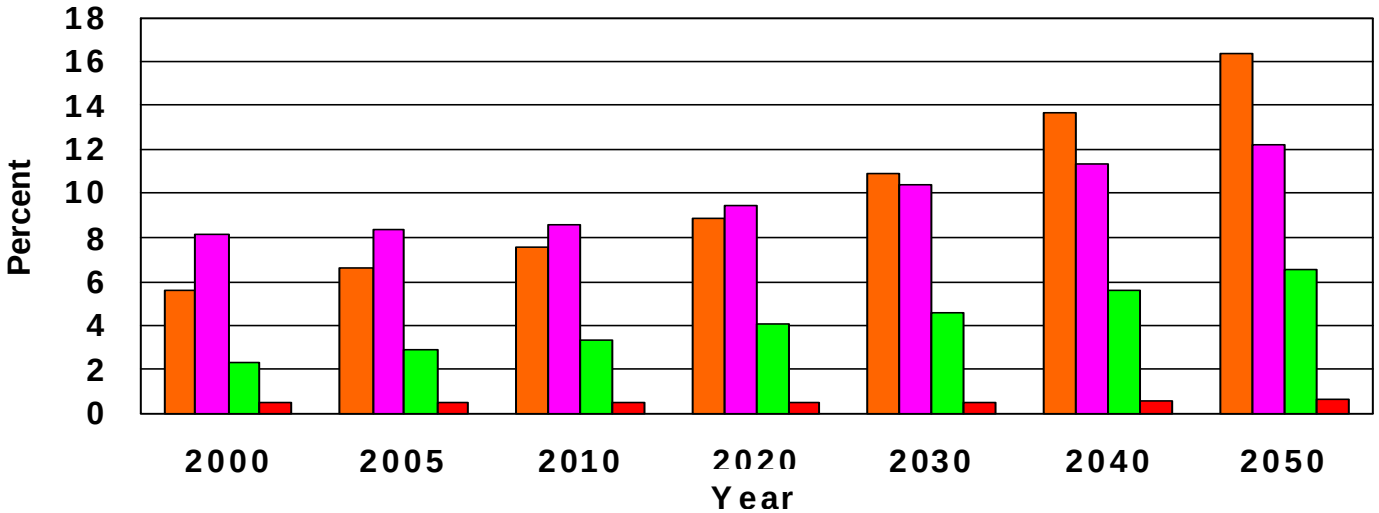
US Census 2000

POPULATION GROWTH OF OLDER AMERICANS (65 Years and Older)



(Federal Interagency Forum on Aging-Related Statistics, 2004)

Percentages of Elderly U.S. Population(Age 65+) by Race and Hispanic Origin

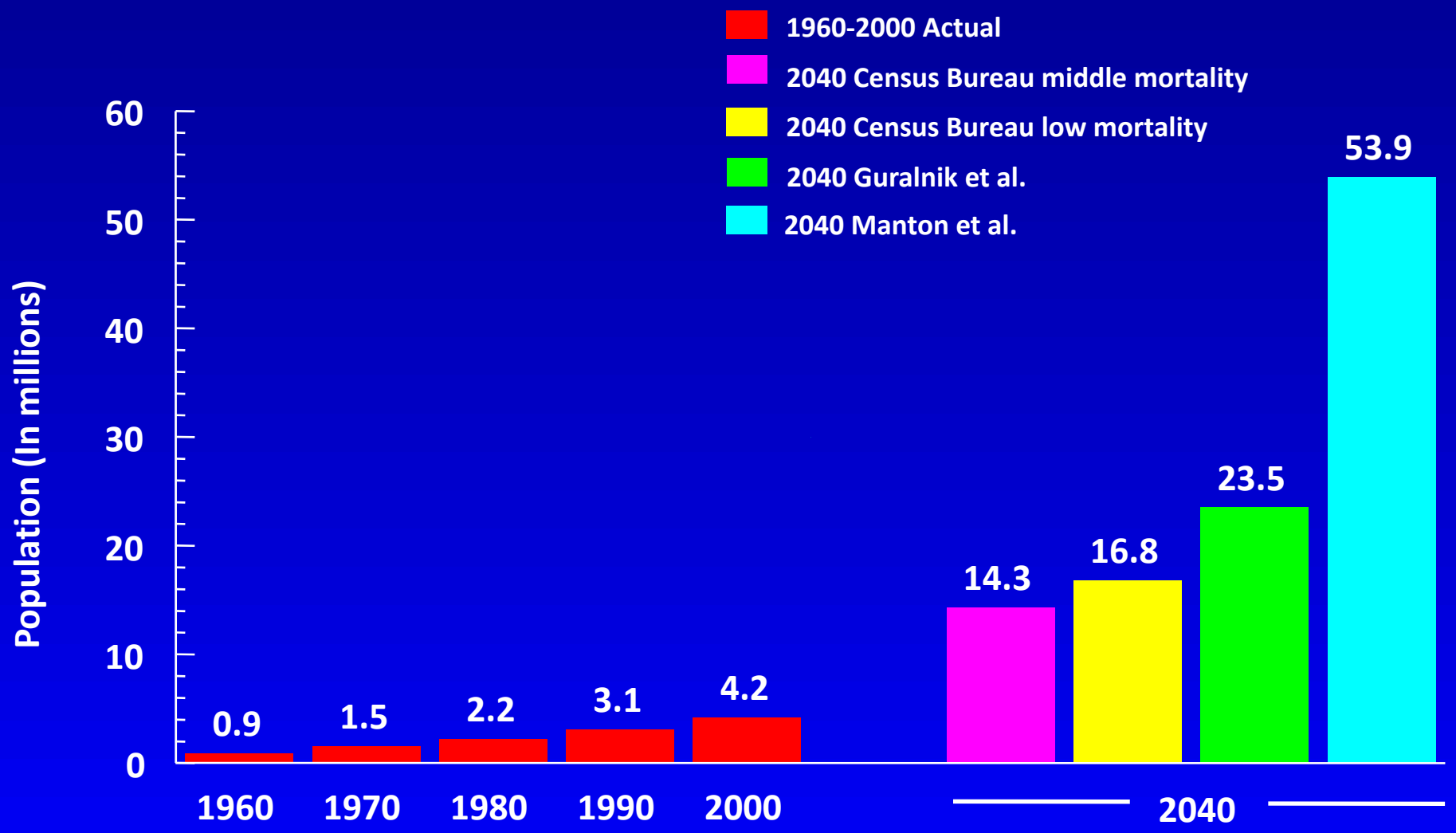


Hispanic
Black (non-Hispanic)
Asian and Pacific Islander (non-Hispanic)
American Indian and Alaska Native (non-Hispanic)

Year	Total Number	White (non-Hispanic)
2000	29,097	83.53%
2050	52,684	64.25%

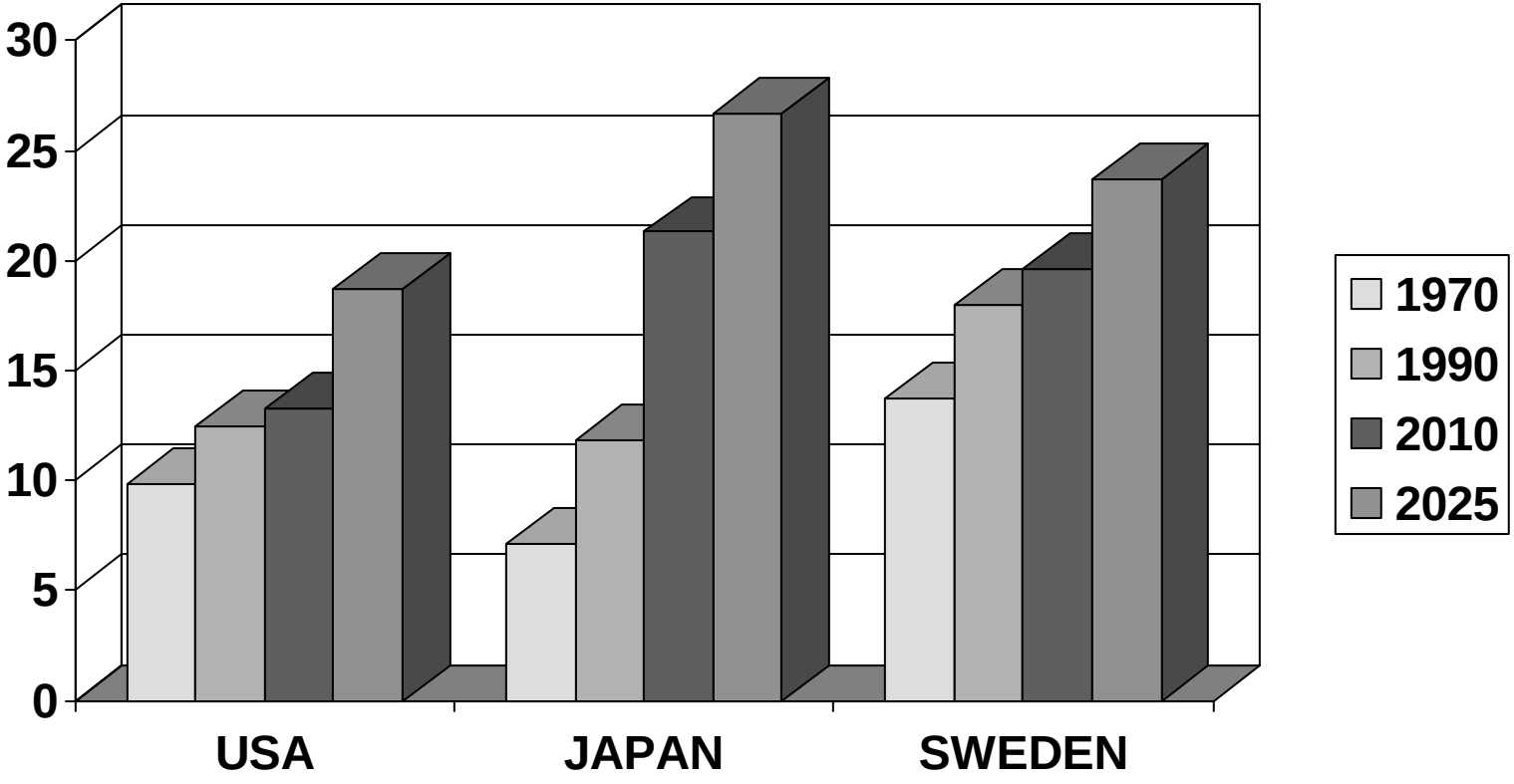
U.S. Census Bureau

Forecasts of the United States Population Aged 85 and Over



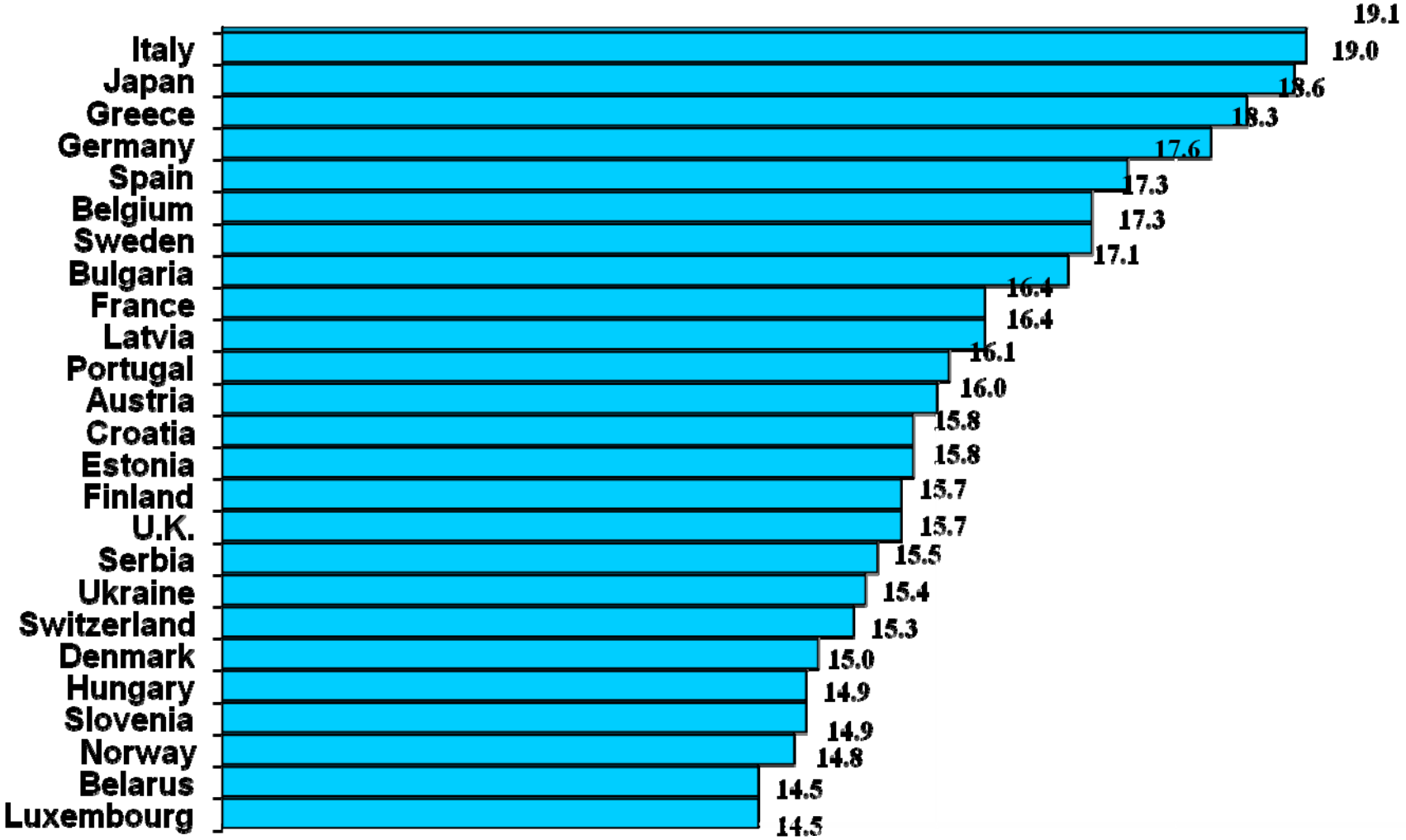
Sources: Guralnik et al. 1988; and Manton et al. 1993; and U.S. Census Bureau, 1983, 1992, and 2000b.

PERCENT OF POPULATION 65 YEARS AND OVER, 1970 TO 2025 (est)



The World's 25 Oldest Countries: 2004

(Percent of population 65 years and older)



Source: U.S. Census Bureau, 2004.

Change in Rank Order of Disease Burden for Top Ten Leading Causes in the World: 1990 and 2020

(Disease burden measured in disability-adjusted life years or DALY)

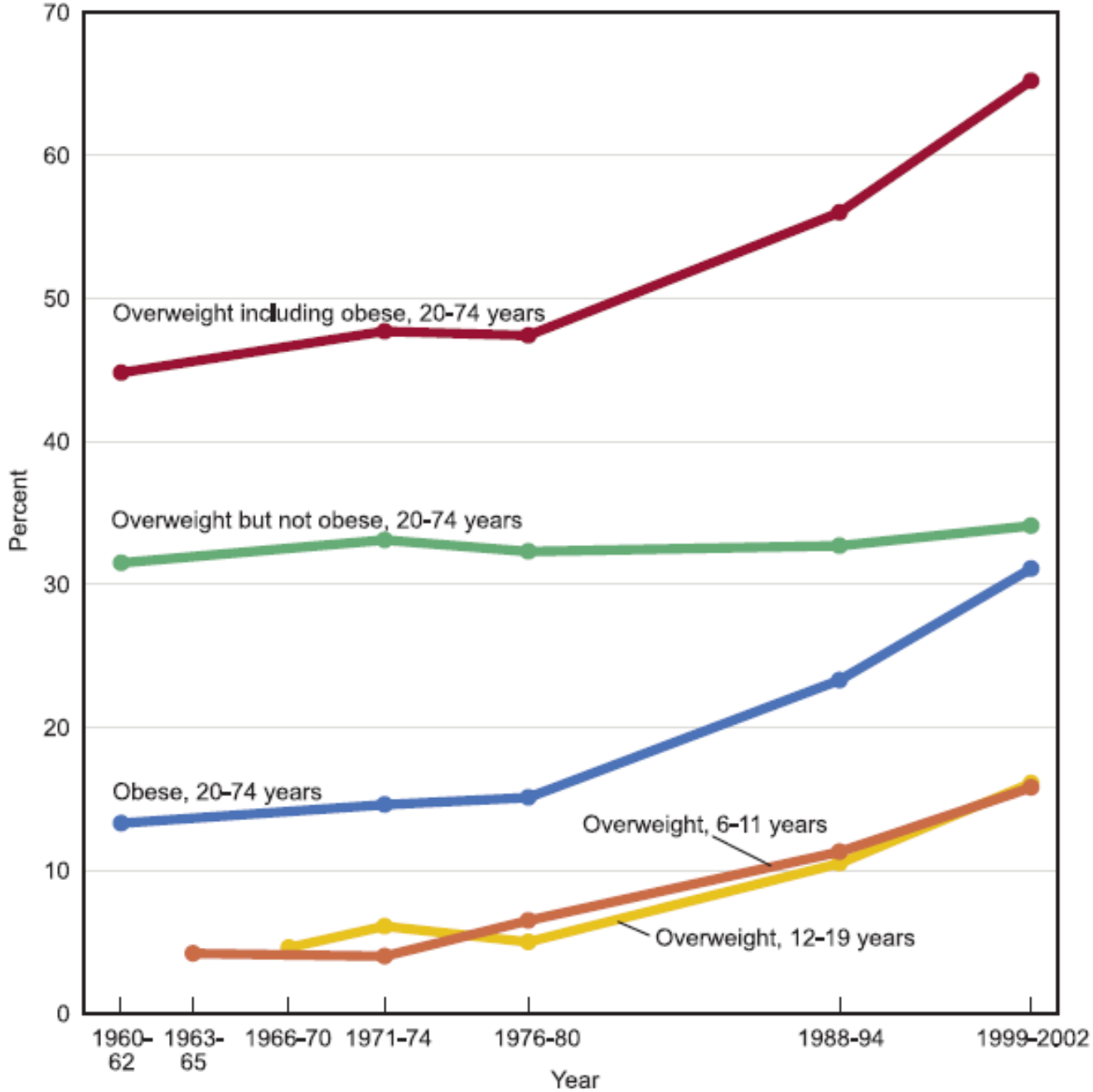
	1990	2020
Rank	Disease or injury	Disease or injury
▪	Lower respiratory infections	Ischemic heart disease
▪	Diarrhoeal diseases	Unipolar major depression
▪	Conditions arising during the perinatal period	Road traffic accidents
▪	Unipolar major depression	Cerebrovascular disease
▪	Ischemic heart disease	Chronic obstructive pulmonary disease
▪	Cerebrovascular disease	Lower respiratory infections
▪	Tuberculosis	Tuberculosis
▪	Measles	War
▪	Road traffic accidents	Diarrhoeal diseases
▪	Congenital anomalies	HIV

Source: Murray and Lopez, 1996.

Characterizing Disability Trends --

- There has been a significant decline over time in the functional limitations of older people in the US
- Probably occurring in other developed countries, but because of imperfect data systems, little is known for sure
- Big question –will it continue?

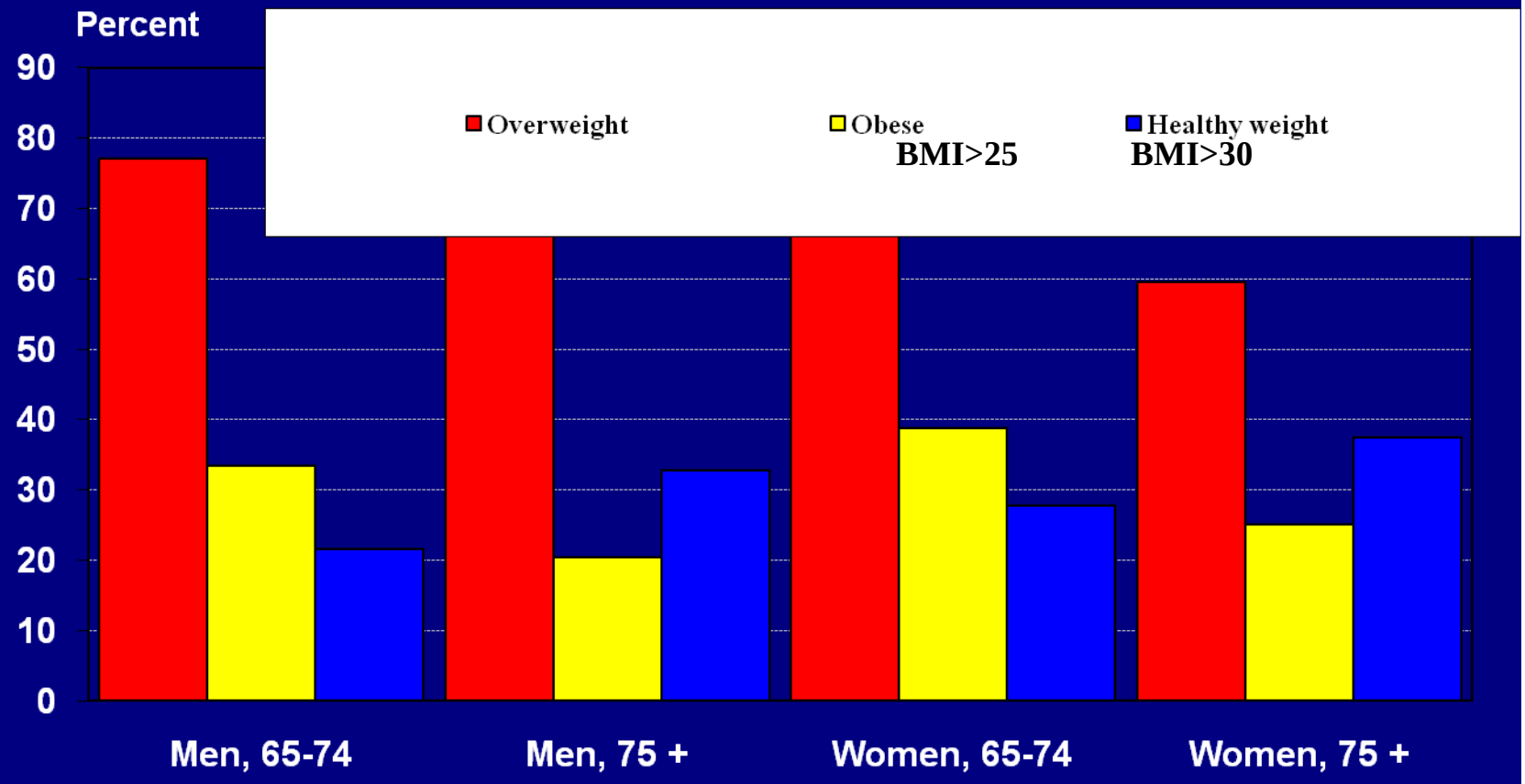
Overweight and Obesity



National Health Interview Survey

U.S. Elderly by Weight Category: Circa 2000

BODY MASS INDEX = KILOGRAMS/METERS SQUARED



Source: U.S. National Center for Health Statistics; data exclude small percentages of people whose low weight is considered unhealthy.

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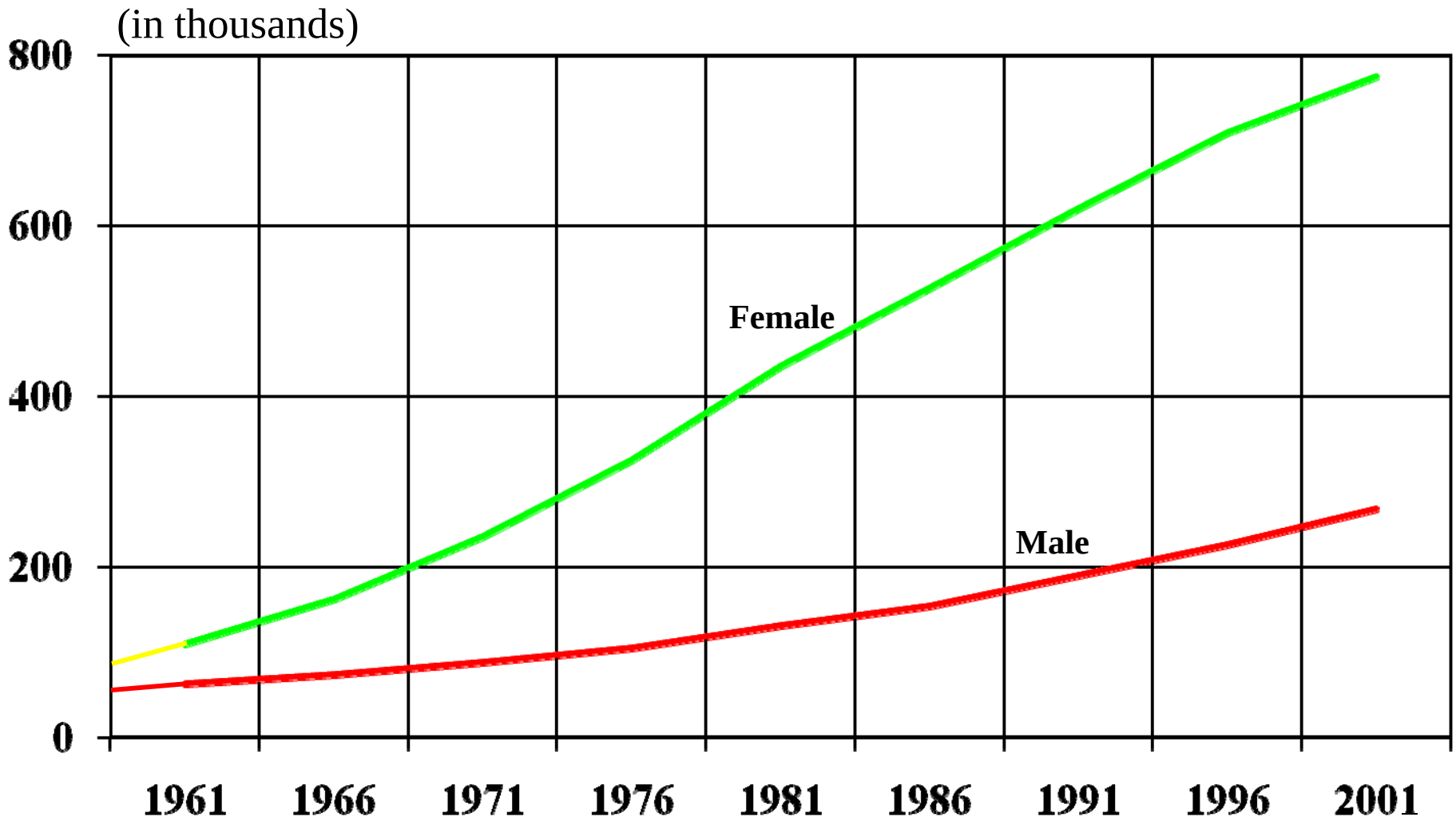
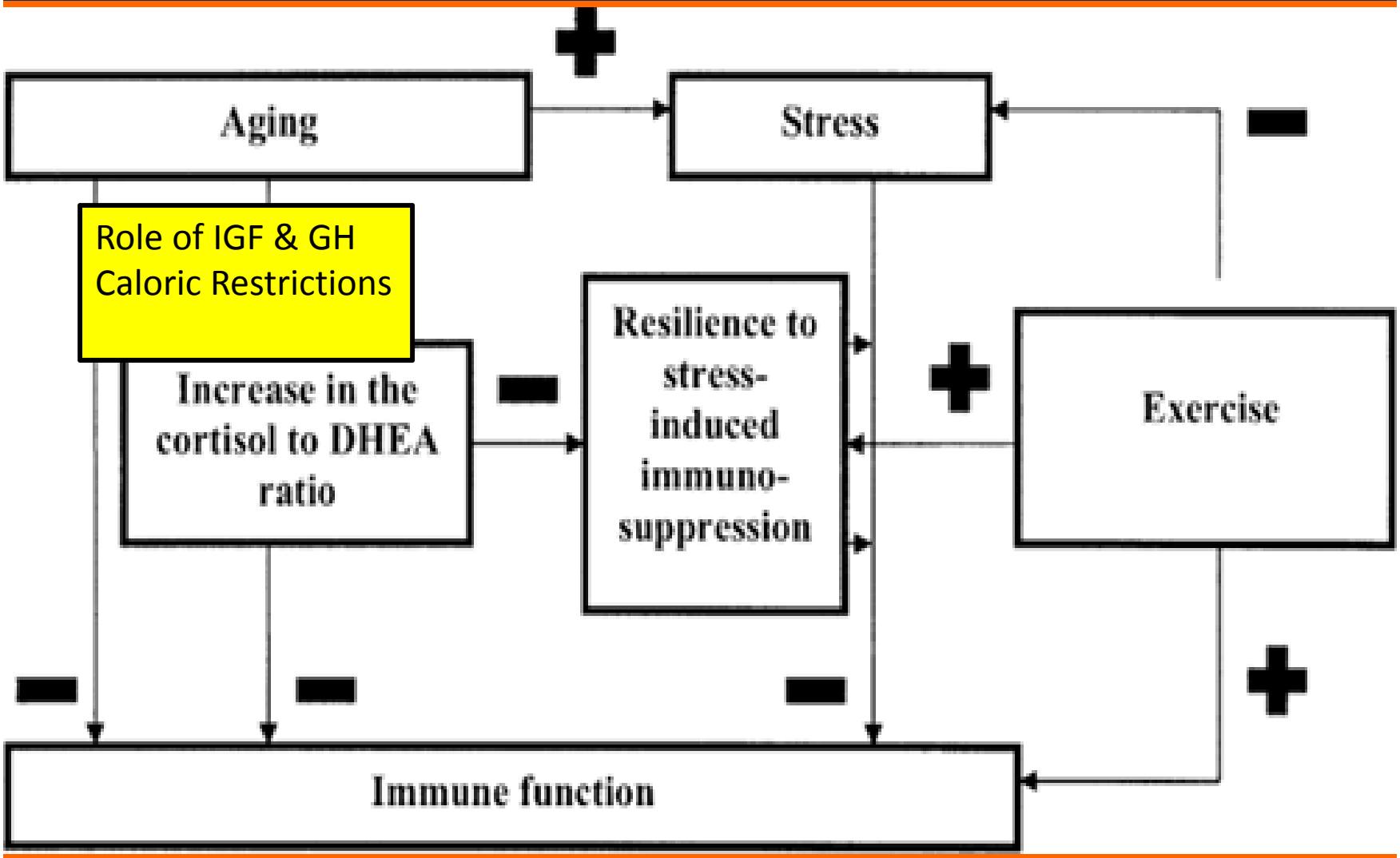
Elderly Living Alone in Canada



Source: Statistics Canada



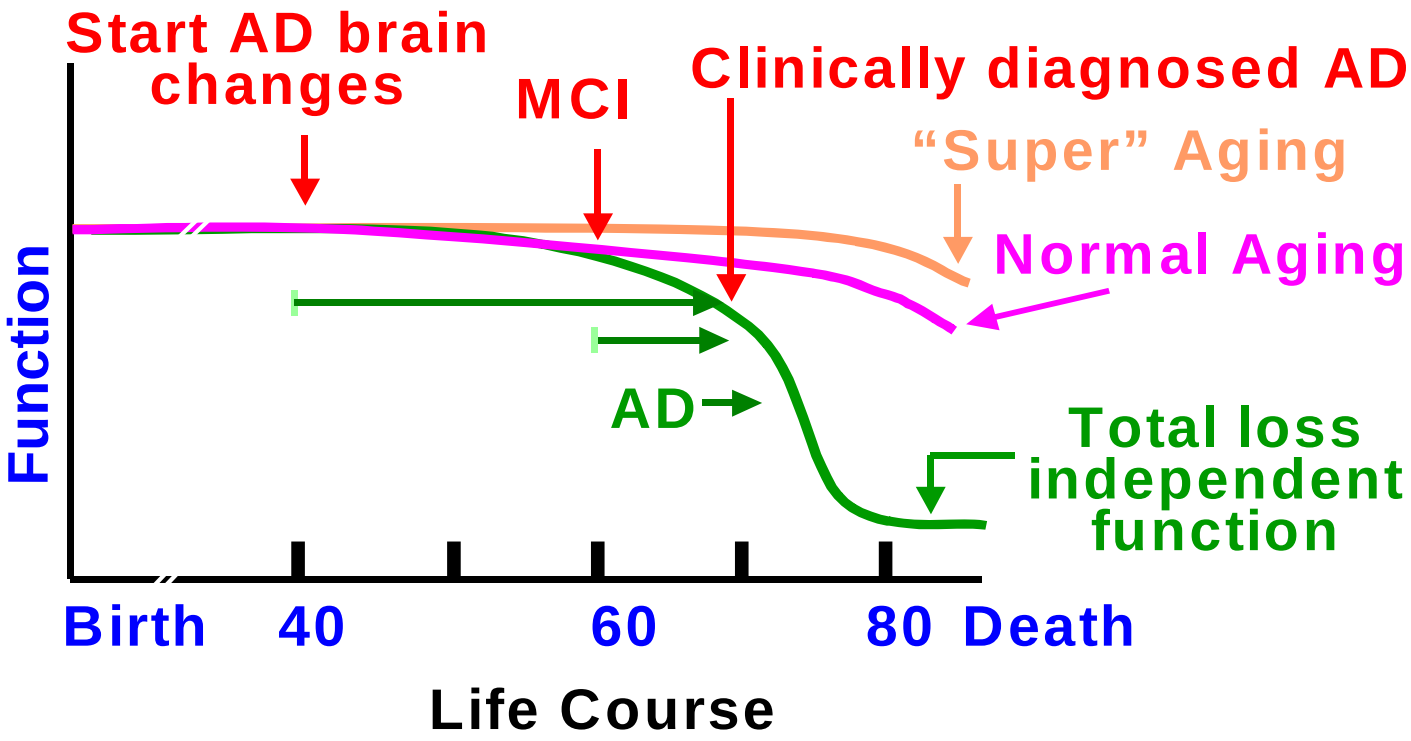
Source: Exerc Sport Sci Rev © 2007 American College of Sports Medicine

MORTALITY AFTER 20% OF TOTAL BODY SURFACE INJURY

- Young Adult 20%
- Old Adult 75%
- Relative to the younger

  older adults show:
  - Increase in pro-inflammatory cytokines (IL-1β, IL-6, IL-4, IL-10, TNFα, PGE2)
  - Decrease in CMI and cytokines IL-2, IFNγ

Changes in Super Aging, Normal Aging, and Neurodegenerative Diseases



Courtesy Andrew Monjan

Criteria for Diagnosis of Mild Cognitive Impairment (MCI)

1. Memory complaint
2. Abnormal memory for age
3. Normal activities of daily living (ADL)
4. Normal general cognitive function
5. Not demented

Petersen et.al, Arch Neurol, 56:305-308, 1999

Possible Environmental and Lifestyle Risk Factors

Age

Head Injury

High Blood Pressure

Cholesterol

Diet/Weight/Type 2 Diabetis

Education/Brain Reserve/Occupation

Exercise

Social Networks

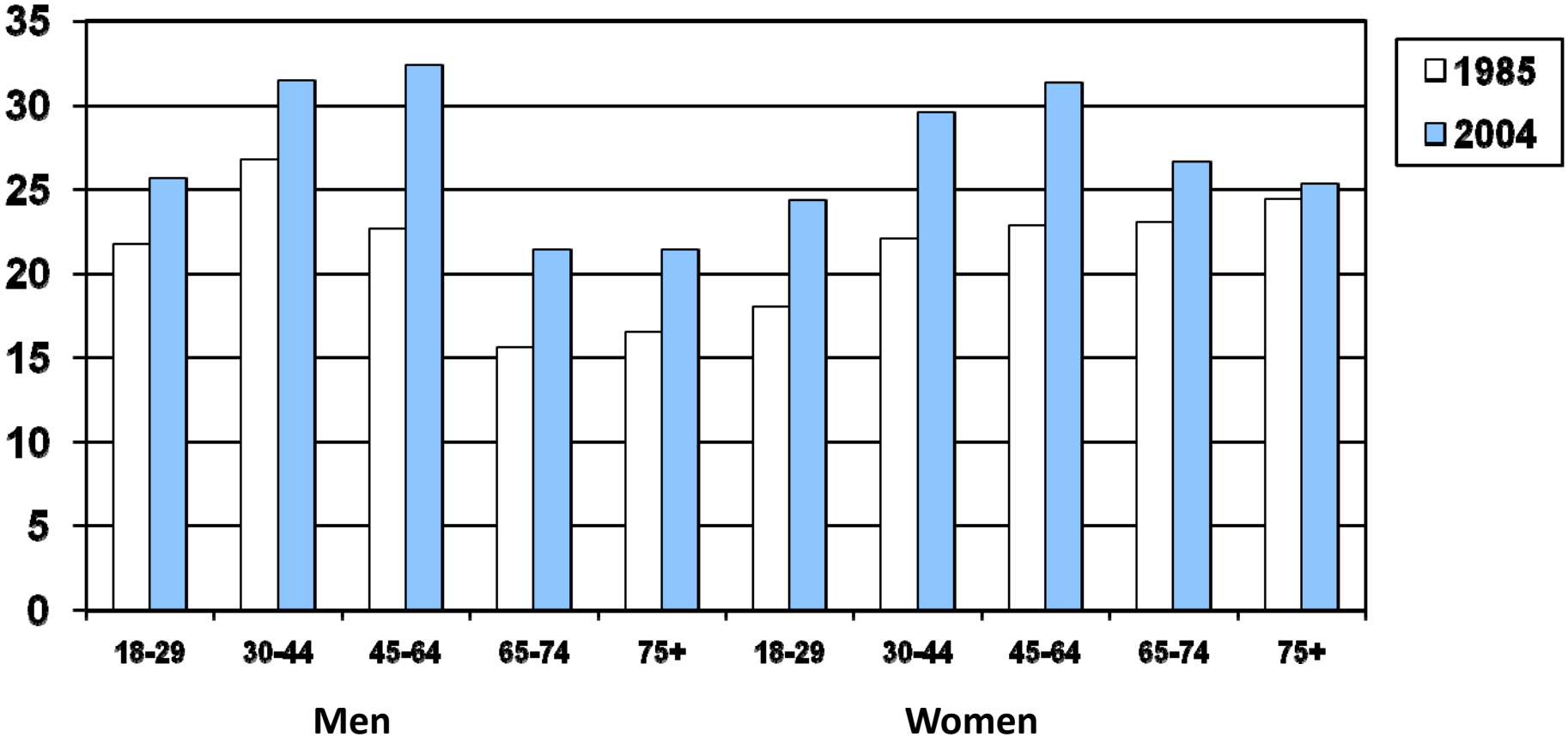
Protein Deposition in Neurodegenerative Diseases

Disease	Protein	Aggregate
Prion diseases	PrP^{sc}	PrP amyloid
Alzheimer's disease	A-beta	A-beta amyloid
	tau	paired helical fragments in neurofibrillary tangles
Parkinson disease	alpha-synuclein	Lewy bodies
Frontotemporal dementia	tau	straight filaments and paired helical fragments
Pick's disease	tau	Pick bodies
Progressive supranuclear palsy	tau	straight filaments in neurofibrillary tangles
Amytrophic lateral sclerosis	neurofilament	neuronal aggregates
Huntington's disease	huntingtin	nuclear inclusions
Spinocerebellar ataxia 1	ataxin 1	nuclear inclusions
Spinocerebellar ataxia 2	ataxin 2	cytoplasmic inclusions
Machado-Joseph disease	ataxin 3	nuclear inclusions

Prusiner, 2004

Courtesy Andrew Monjan)

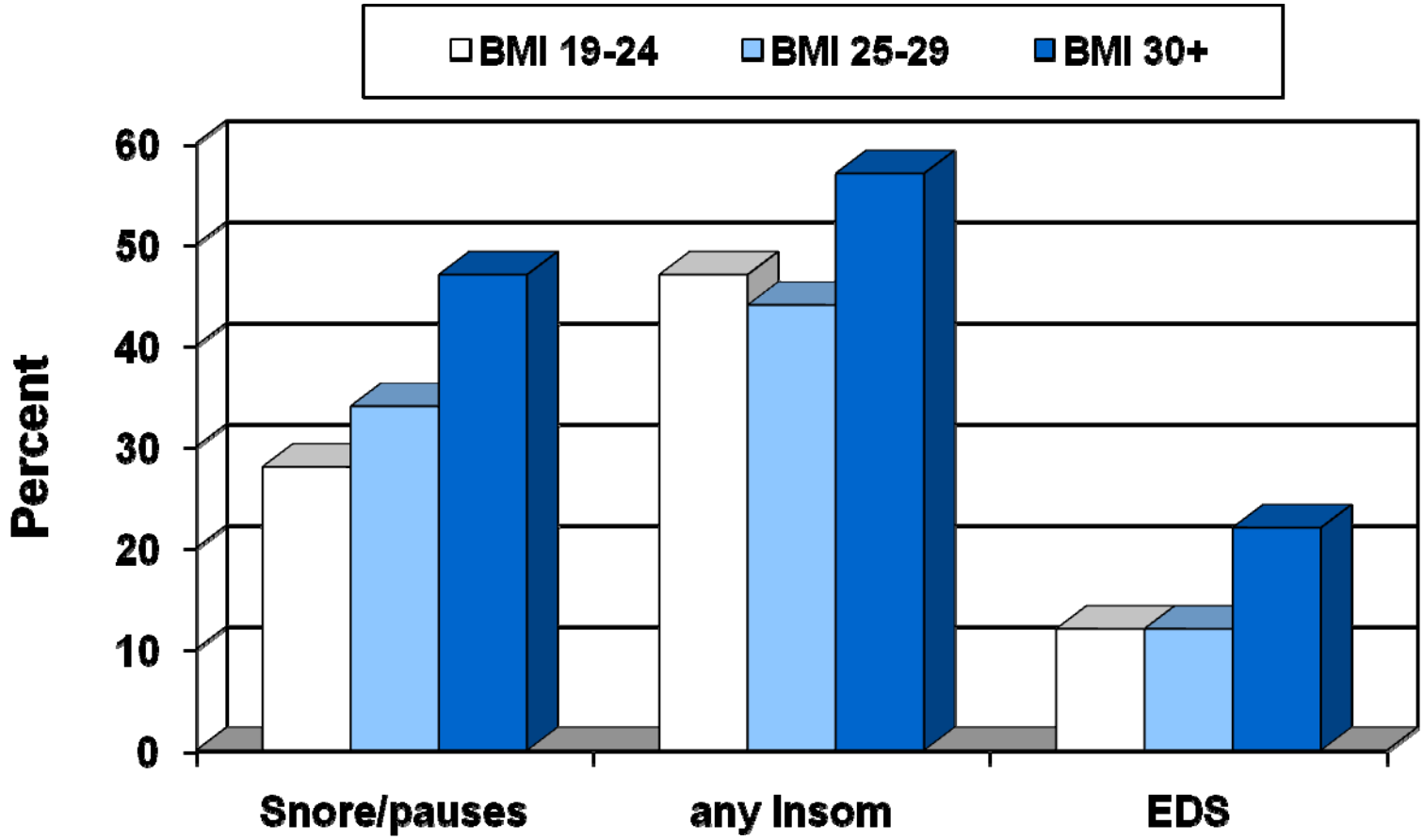
Percent of Adults Who Usually Slept 6 Hours or Less a Night, by Sex and Age: United States, 1985 and 2004



National Health Interview Survey

Courtesy Andrew Monjan

Sleep Problems and Overweight (Body Mass Index)



Courtesy Andrew Monjan

National Sleep Foundation, 2003

SOME CONSEQUENCES OF DISORDERED SLEEP IN THE AGING POPULATION

- Excessive daytime sleepiness
- Attention and memory problems (Safety & health in the workplace and at home)
- Depressed mood
- Nighttime falls
- Overuse of hypnotic drugs and OTC medications
- Possible adverse interactions with co-morbid conditions, e.g. sleep apnea and CVD
- Lowered quality of life

Falls: A Major Geriatric Syndrome

Could Disturbed Sleep Play a Role?

- Falls are costly
  - Estimated at $10 billion annually
- Falls are common
  - In community: 217-1630 per 1000 persons
  - In LTC: 1.5 falls per bed per year
- Falls are injurious
  - 4-6% hip fractures
  - 2-10% major injuries requiring hospitalization
  - 30-55% minor injuries

Falls: A Major Geriatric Syndrome

Could Disturbed Sleep Play a Role? (con't)

- **Falls can be fatal**
  - **2-3% are fatal**
- **Falls are multi-factorial**
  - **Balance, gait, syncope, cardiac, TIA, carotid sinus syndrome, medications, specific diseases (Parkinson's), arthritis, environmental factors**

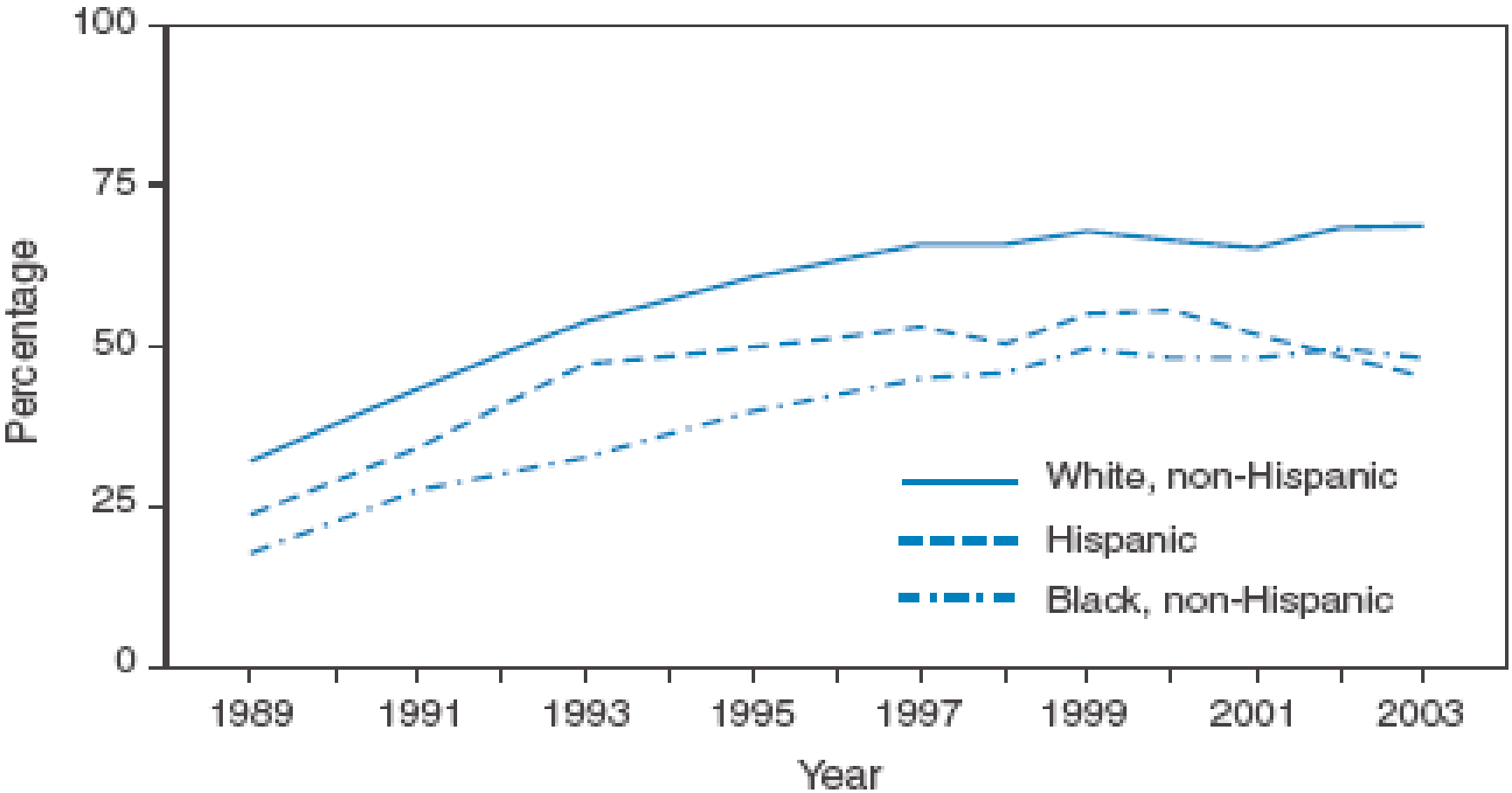
Source: King & Tinetti, JAGS 1995:43, 1146-1154

Kenny, Oxford Textbook of Geriatric Medicine 2000, 111-124

Protection of the Aging Population Against Influenza

- **The influenza epidemic is an annual event, which was estimated during the 1990s to have caused an average of approximately 36,000 deaths annually and 114,000 hospitalizations in the United States with 90% of the mortality occurring in adults aged 65 years of age and older.**
- **Data analyzed from the Behavioral Risk Factor Surveillance System (BRFSS) in 1993 indicated that 50% of respondents reported having received influenza vaccine compared to 66% in 2002.**
- **This represents significant progress but is still below the 90% goal set for non-institutionalized adults in the Healthy People 2010 Objectives and has remained level since 1997.**
- **The majority of the population 65 years of age and older receive vaccine from their primary health care provider and therefore ensuring incentives are in place for providers to actively immunize patients is important.**
- **Despite the universal recommendation being in place for several seasons only 36% of respondents between 50-64 years of age in the 2002 BRFSS reported having received influenza vaccine during the previous 12 months, well below the level of respondents above 65 years of age.**

FIGURE. Percentage of persons aged ≥65 years who reported receiving influenza vaccination during the preceding 12 months, by race/ethnicity and year — National Health Interview Survey, United States, 1989–2003



CDC MMWR October 21, 2005 / 54(41);1045-1049

The Aging Work Force

From 2003 Towers Perrin Talent Report (Age>55)

- Highest motivation scores for all Industries
- Health Care Scores the highest from all Industries
- Higher Medical Claim Costs

Deals for Today's Workforce: Towers Perrin Survey 2005

- High engagement score
- Lower Score for Contribution to the Business

Health and Safety needs of Older Workers (NA 2004)

1. Older Americans live their daily lives embedded in a larger social context.
2. Their health and safety needs as workers reflect not only their individual life course histories, but also factors related to socioeconomic status, gender, race, ethnicity, and recent changes in the labor market and nature of work.
3. The effects of these factors are intertwined in a complex web (Dressel et al., 1997; Moen, 2001), making them challenging to study; the implications for older workers have been underresearched.

Health and Safety needs of Older Workers (NA 2004)

- Studies of the health and safety needs of older workers stand to benefit greatly from a better understanding of the
  - ***social factors*** influencing older workers' work opportunities,
  - **patterns of employment**,
  - ***access to health care*** and
  - ***other health-relevant resources***

Workforce Skills Retention Strategies

- Flexible work schedules
- Part-time positions
- Job-sharing opportunities
- Flexible benefits
- Seasonal work
- Telecommuting
- Compressed workweeks
- Expanded or reduced shifts
- Voluntary demotions
- Job rotation
- Job redesign
- Continued education and development
- Accommodations of workers with physical limitations

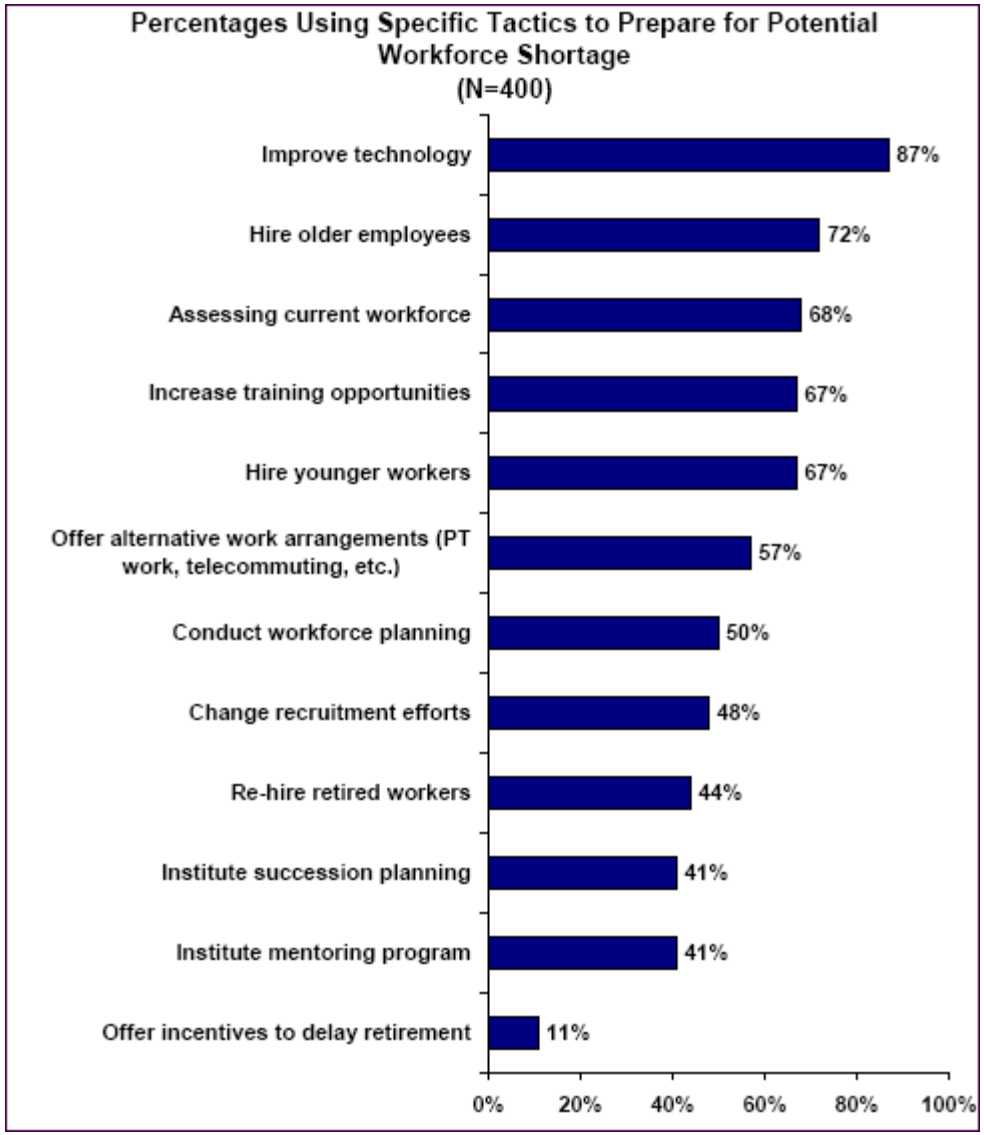
Workforce Skills Retention Strategies

Incentives

- **Paid leave banks**: A structured program that combines vacation, short-term sick leave, personal days and emergency leave is a way to reward and motivate employees. The costs remain the same for the company, while participants perceive greater control and are more likely to remain contented in the long term" (Hoffman, October 1999).
- **Developmental opportunities and career planning**: Many individuals express frustration in performing the same responsibilities over and over. Opportunity and recognition of accomplishments can prove to be a much more lucrative incentive than any financial considerations a company may offer" (Hoffman, October999)

Targeting Older Employees

- ***Active recruitment of older workers***
- ***Incentives that appeal to older workers, such as longer vacation time***


Percentages Using Specific Tactics to Prepare for Potential Workforce Shortage
(N=400)
Improve technology
87%
Hire older employees
72%
Assessing current workforce
68%
Increase training opportunities
67%
Hire younger workers
67%
Offer alternative work arrangements (PT work, telecommuting, etc.)
57%
Conduct workforce planning
50%
Change recruitment efforts
48%
Re-hire retired workers
44%
Institute succession planning
41%
Institute mentoring program
41%
Offer incentives to delay retirement
11%
0%
20%
40%
60%
80%
100%

NASA Demographics: Testimony by Gregory J. Junemann IFPTE, AFL-CIO & CLC; April 22, 2009

- Crisis from failure to hire since 1990 new generations of technical employees and the practice of hiring term employees
- Undermining expert technical capacity by

  32 % shrinking of full time employees during the last 2 decades
- Deep cuts in R & D especially in exploration and damage to the life and microgravity sciences

Survey of Managers Opinions of older workforce (M.C. Barth 2000)

Positive

- Experience
- Commitment to quality
- Low turnover
- Attendance/punctuality
- Judgment

Negative

- Flexibility
- Acceptance of new technology
- Ability to learn new skills
- Physical ability to perform strenuous jobs
- Contribution to health care costs

(AARP, 1985; AARP/DYG, 1989; Mirvis, 1993; SHRM/AARP, 1998)

US and NASA Workforce

Globalizing World

- *More competition. Since many products can be produced almost anywhere,*
- *Rapid change. Since information and investments move with great* speed, change is a constant. Where change is a constant, there is a premium on adaptability.
- *Emphasis on entrepreneurship. Change yields openings for new ideas.*
- *Internationalization of production. The last 15 years move toward offshore outsourcing*
- *US will retain tech skills industries and low tech skills will move elsewhere*.

NASA Workforce

- Very Competitive in engineering
- Highly specialized
- Significant national investment in training and development of skills
- Less opportunity for promotion
- Less competitive salaries than the private sector

NASA Unique Skills

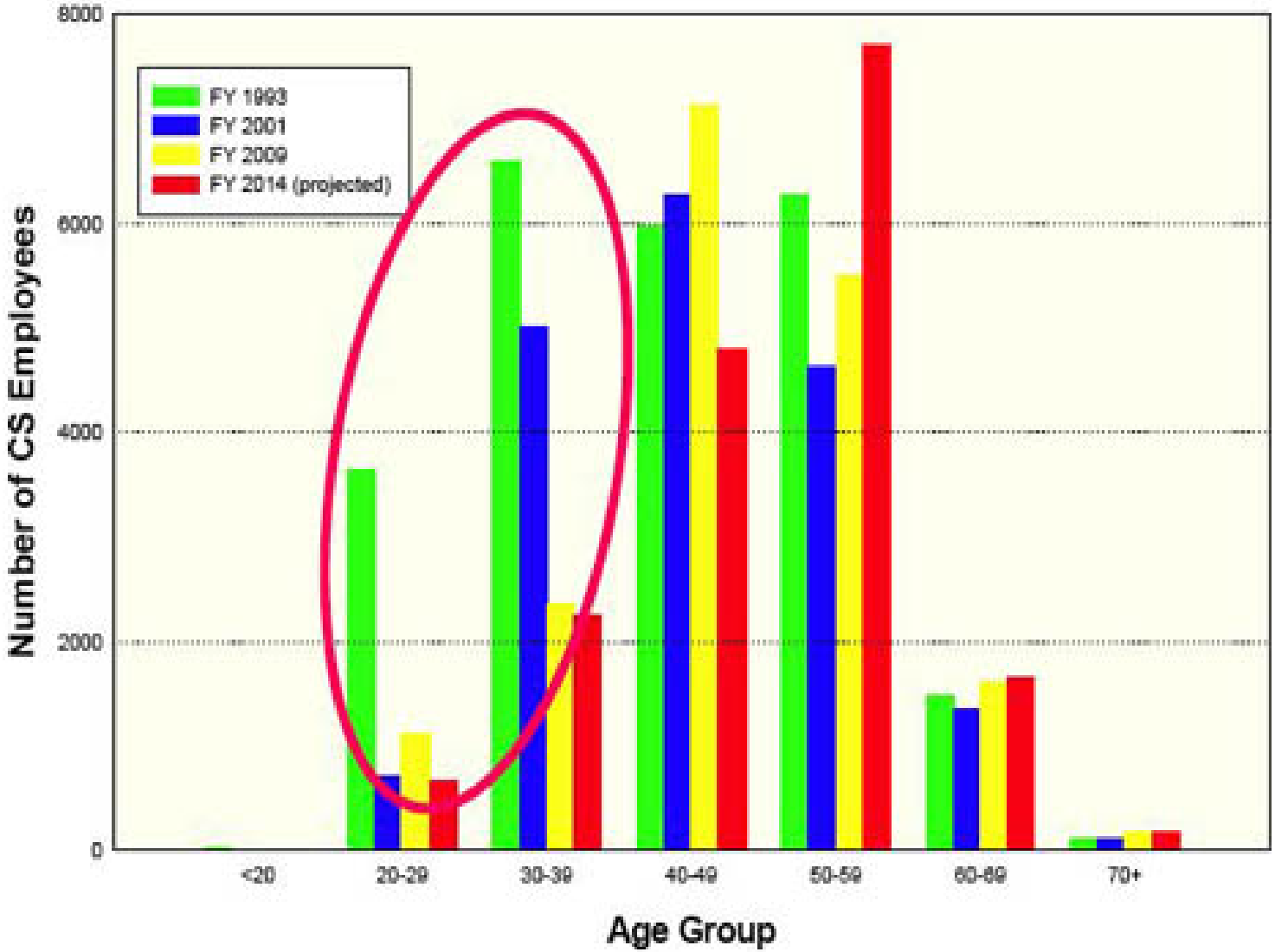
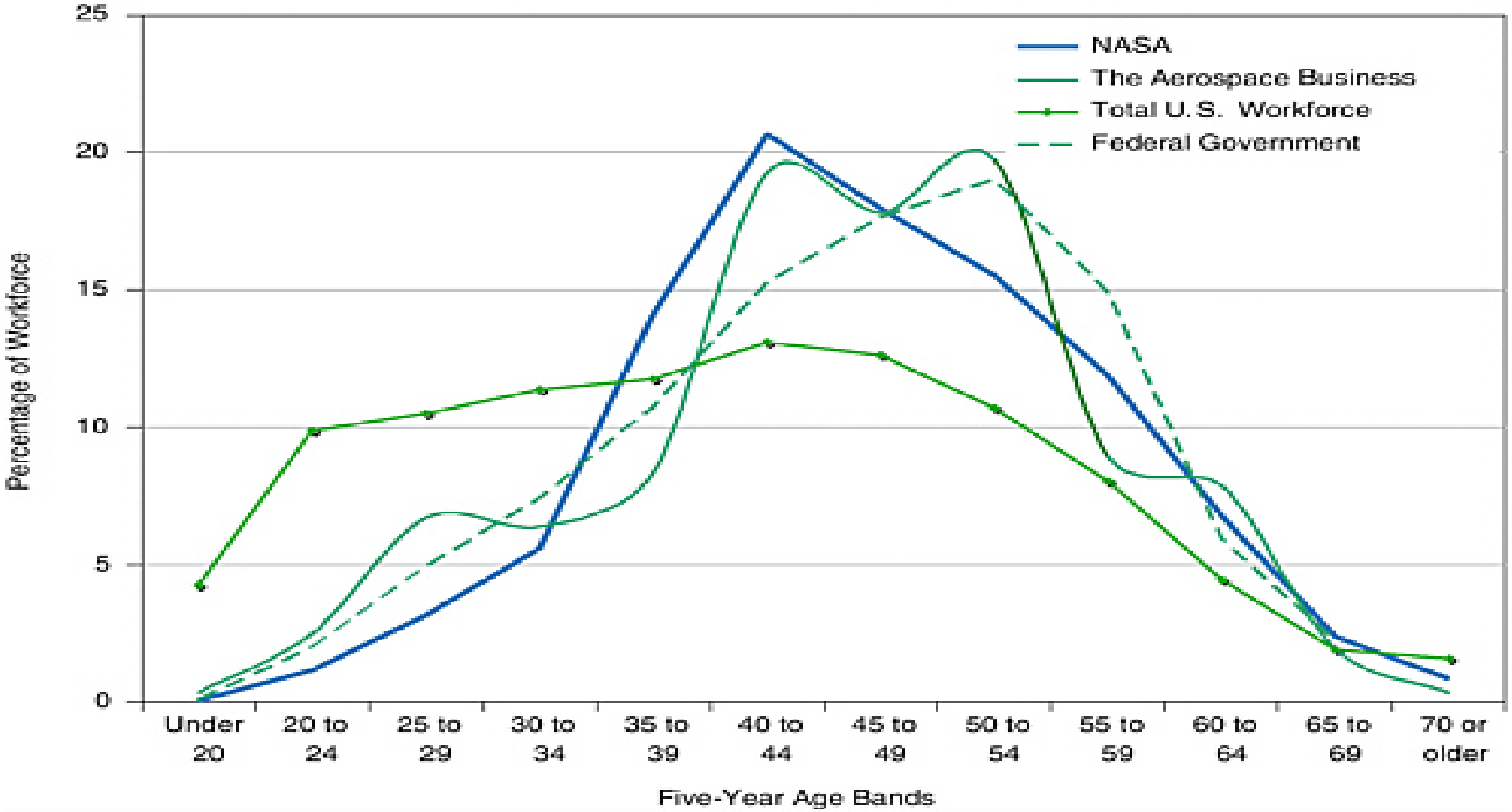


Figure 1. NASA's slow march off the demographic cliff. (Actual numbers from wicn.nssc.nasa.gov/generic.html; projected numbers estimated by IFPTE)

The age distribution of NASA's current workforce compared to the age distributions for the aerospace sector, the federal government, and the total U.S. workforce. NOTE: The line for aerospace business is based on very imprecise data. SOURCE: Garth Henning and Richard Leshner, NASA, presentation to the Committee on Meeting the Workforce Needs for the National Vision for Space Exploration, February 22, 2005. Courtesy of NASA.



Aging Workforce and Legislation

- ***The Age Discrimination in Employment Act of 1967 (ADEA)***
  - Protects certain applicants and employees 40 years of age and older from discrimination on the basis of age in hiring, promotion, discharge, compensation, or terms, conditions or privileges of employment.
  - The ADEA is enforced by the **Equal Employment Opportunity Commission (EEOC)**.

Aging Workforce and Legislation

The Age Discrimination Act of 1975

1. Prohibits discrimination on the basis of age in programs and activities receiving federal financial assistance
2. Applies to all ages and permits the use of certain age distinctions and factors other than age that meet the Act's requirements
3. Is enforced by the Civil Rights Center

Aging Workforce and Legislation

Section 188 of the Workforce Investment Act of 1998 (WIA)

1. Prohibits discrimination against applicants, employees and participants in WIA Title I-financially assisted programs and activities, and programs that are part of the One-Stop system, on the ground of age
2. Prohibits discrimination on the grounds of race, color, religion, sex, national origin, disability, political affiliation or belief, and for beneficiaries only, citizenship or participation in a WIA Title I-financially assisted program or activity.
3. Section 188 of WIA is enforced by the Civil Rights Center.

Economic & Social Implications of an Aging Workforce

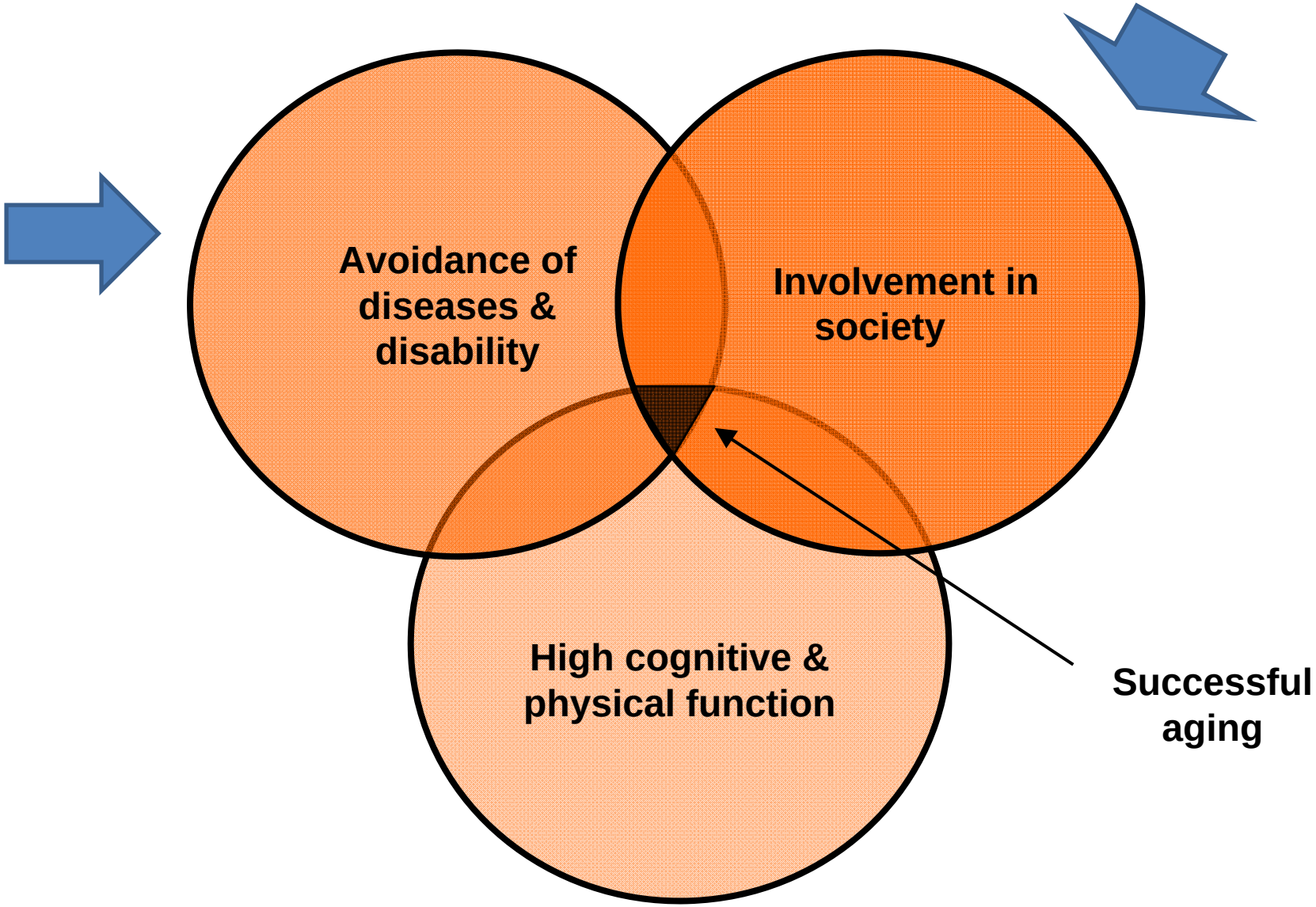
- Post 1970 gains in life expectancy added $3.2 trillions/year to US economy ≈ 5)5 of GDP (Murray & Topel 2006)
- Extra years of life will pose an additional economic burden
- Solutions: delaying retirement age, additional taxes, encouraging immigration, increasing productivity, reducing consumption of good with aging, volunteering.
- Investment in health promotions to improve cognition and physical health and reduce disability
- Addressing quantity in the context of quality of life

Economic & Social Implications of an Aging Workforce

(Sierra &al; Prospects for Life Span Extension, Ann. Rev. Med 2009)

- Changes in property inheritance
- High value of future oriented (50 to 60 years delays in gratification)
- Slowing aging rate and reproduction: future generations
- Change in paradigm from age and wealth to longevity and poverty? (accelerated growth of aging population in developing countries)

A Model of Successful Aging



Source: Adapted from Rowe and Kahn, 1998.

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