Indicators of Disease Burden and the Burden of Obesity

NIH Council of Councils

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Introduction

- The Challenge: to support NIH decisions
  - What health-related data to collect and
  - What analytical capacity to develop

- Today
  - Background on burden of illness data
  - Impact of obesity on health-related burden

Ranking Disease by Burden of Illness and Monitoring Trends: Name that Metric

- **Premature Death—Reduced years of life**
  - most complete data: by age, sex, race, underlying cause
  - Death Counts, death rates, rates for standard population

- **Reduced function, pain and suffering, dependence** (lack of independence)
  - Incidence/Prevalence of specific diseases or conditions: incomplete data; multiple sources
  - Severity/Functional impact indicators
    - Population wide indicators not attributed to specific disease or conditions
    - Many detailed Disease-specific studies—Less Comparability between studies
    - Types of Indicators: Task performance, patient report, professional judgment
    - Patient Reported Outcomes: e.g., Physical functioning, role limitations, social functioning, bodily pain, cognitive functioning, emotional well being, general health perceptions

- **Economic Burden**
  - Medical expenditures to prevent, cure or manage diseases/conditions
  - Indirect costs: Alternative indicators of health burden
    - Value of Lost Productivity due to premature death
    - Value of Lost Productivity due to disability.

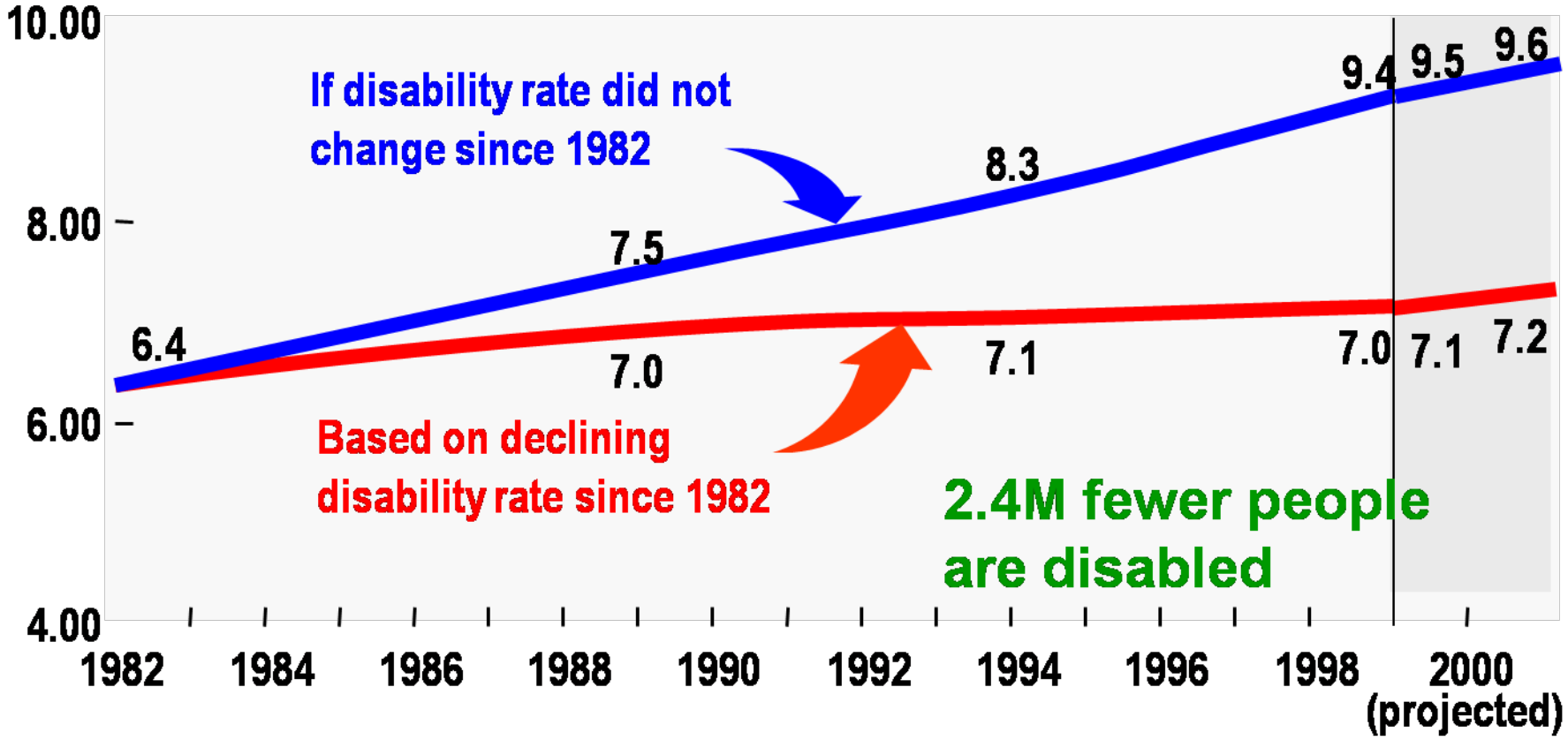
Trends in Burden Indicators

- Some Good News
- Some not-so-good News
- The contribution of NIH

Contribution of R&D to Increased Life Expectancy: Some hints

- 1960 to 2000: 7 year increase in life expectancy (from 70 to 77)
  - 70% due to cardiovascular disease
    - Identification of risk factors
    - Behavioral research—smoking prevention
    - Fundamental science for control of hypertension and cholesterol
    - Surgical interventions: devices, materials, procedures
  - 19% due to reduction in rate of death in infancy.
  - 11% everything else,
    - Including 3% due to reduction in cancer deaths.

Number of Chronically Disabled Americans Age 65 and Over (millions)

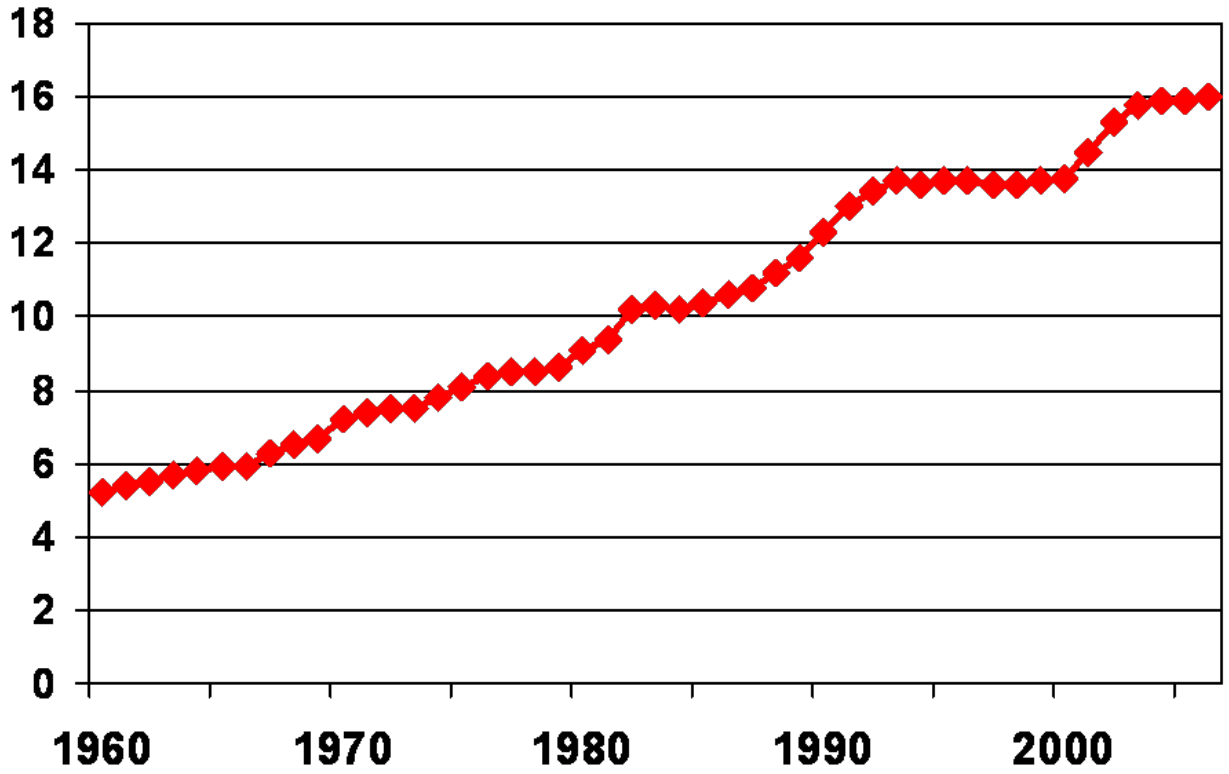


Source: *National Long Term Care Survey 1982-1999* (Kenneth Manton, Ph.D.)

Disability Trends

- Implications
  - Living better as well as longer
  - Lower annual health expenditures
- Causes of the decline—subject of ongoing investigation
- Future trends: Will it continue or reverse?
  - Obesity
  - Other risk factors

U.S. Health Care Expenditures Percentage of GDP



Summary Measures of Health

- Combine multiple dimensions of functioning and well being with survival.
- Quality-Adjusted Life Years (QALYs)
  - Value multiple-dimensional health states vs. perfect health (=1)
  - But how link health state with specific disease(s)/condition(s)?
- Disability-Adjusted Life Years (DALYs)
  - Assign Disability Score to living with a specific disease or condition relative to perfect health (=0)
  - But how recognize
    - Multiple health states associated with each disease/condition?
    - Effect of comorbidity?

Disability-Adjusted Life Years

- Introduced by WHO/World Bank to Measure Global Burden of Disease (1996)
- Adopted by CDC for U.S.: 1996 data available; 2002 in process; more recent years eventually?
- DALY =YLL + YLD
  - YLL = Life expectancy – Age at death
  - YLD = Prevalence **x** Duration **x** Disability Score

Disease/Condition Ranking Varies by Dimension of Burden

	Deaths, YLL, YLD and DALYs by cause for all ages, races and both sexes				Health Care
	US total, 1996				Expend
		Deaths	YLL	YLD	DALYs	For 1995
ICD-9 Code	Condition	Total	Total	Total	Total	(Millions)
	All Causes	2,314,689	18,066,099	15,024,113	33,090,212	$757,830
001-139, 243, 260-269, 280-285, 320-322, 381-382, 460-465, 466, 480-487, 614-616, 630-676, 760-779	***I. Communicable, maternal, perinatal and nutritional conditions***	7.5%	10.9%	7.1%	9.2%	
001-41,45-139, 320-322,614-616	**A. Infectious and parasitic diseases Excluding HIV/AIDS**	1.5%	1.8%	2.8%	2.3%	
042-044	3. HIV/AIDS	1.3%	4.0%	1.6%	2.9%	
140-242, 244-259, 270-279, 286-319, 323-380, 383-459, 467-479, 488-613, 617-629, 680-759	***II. Noncommunicable diseases***	86.0%	72.0%	86.7%	78.7%	
140-239	**Neoplasms (A. Malignant + B. NonMalig)**	23.9%	24.1%	4.3%	15.1%	5.4%
250	**C. Diabetes mellitus**	2.7%	2.5%	3.3%	2.9%	
290-319, 323-359	**E. Neuro-psychiatric conditions**	4.2%	3.4%	37.5%	18.9%	
390-459	**G. Cardiovascular diseases**	41.7%	28.6%	8.8%	19.6%	16.9%
470-478, 490-519	**H. Respiratory diseases**	5.9%	4.3%	10.5%	7.1%	
493	2. Asthma	0.3%	0.4%	3.9%	2.0%	
E800-999; plus E922, 950-979, 990-999	***III. Injuries***	6.5%	17.2%	6.2%	12.2%	9.1%

The Impact of Overweight and Obesity

- On excess deaths
  - High and rising
  - High and falling
  - Not so high as we thought, but still important
- On annual health care expenditures
  - Increase level
  - Increase annual rate of growth
- Lifetime health care expenditures
  - Maybe up
  - Maybe down

Estimates of Deaths Due to Overweight and Obesity

Year	Estimate	Range	Source
1990	300,000 due to diet and inactivity	309,000 to 582,000	McGinnis, Foege, “Actual causes of death in the United States,” *JAMA* 1993
1991	280,184	236,111 to 341,153	Allison, et al. “Annual deaths Attributable toObesity in the United States,” *JAMA* 1993
2000	385,000 OW/OB 15,000 poor diet/inactivity		Mokdad;Marks;Stroup;Gerberding, “Actual causes of death in the United States, 2000,” *JAMA* 2004
2000	350,000 OW/OB 15,000 poor diet/inactivity		Mokdad;Marks;Stroup;Gerberding, “Correction: Actual causes of death in the United States, 2000,” *JAMA* 2005
2000	111,909 Obesity not over weight	53,759 to 170,064	Flegal,Graubard, Williamson,Gail. “Excess Deaths associated with Underweight, Overweight and Obesity,” *JAMA* 2005

Trends in Deaths Due to Obesity?

Baseline Data	Estimate	Range	Source
NHANES I (1971-1975)	298,808 Obesity not over weight		Flegal,Graubard, Williamson,Gail. "Excess Deaths associated with Underweight, Overweight and Obesity," *JAMA* 2005
NHANES II (1976-1980)	26,917 Obesity not over weight		Flegal, et al.
NHANES III (1988-1994)	43,650 Obesity not over weight		Flegal, et al.
Total (Three NHANES Waves Combined)	111,909 Obesity not over weight	53,759 to 170,064	Flegal, et al.

Underweight, Overweight, Obese Persons Spend more for Health Care

	1987		2001	
	Spending Per Capita (2001 Dollars)	Spending Relative to Normal	Spending Per Capita (2001 Dollars)	Spending Relative to Normal
Underweight	$2,437	1.15	$3,255	1.12
Normal	$2,117	1.00	$2,907	1.00
Overweight	$2,154	1.02	$3,247	1.12
Obese	$2,438	1.15	$3,976	1.37

Obesity Accelerates Growth in Per Capita Health Expenditures

Growth in Per Capita Spending
by Weight Group
1987-2001
(Inflation Adjusted)

Underweight	34%
Normal	37%
Overweight	51%
Obese	63%

Growth in National Average Per Capita Spending
by Cause
1987-2001
(Inflation Adjusted)

		Share of Total
All Causes	50%	100%
Non-Weight Causes	37%	74%
Due to Obese/OverWeight	13%	26%
Due to Increased Prev	1%	2%
Due to Higher Relative	12%	24%

Effect of Obesity on Lifetime Health Expenditures

- Life Expectancy ↓
- Annual Health Care Expenditures ↑
- Life time Expenditures ?

Lifetime Health Care Expenditures due to Obesity

- USA Estimate: Lifetime Costs Attributable to Obesity for a 20 year Old (Discounted)
  - Additional $5,340 - $29,460 over remaining lifetime, depending on sex and race
  - Expenditures realized after age 65: 3% to 28%
  - Finkelstein, EA, et al. The Lifetime Medical Cost Burden of Overweight and Obesity: Implications for Obesity Prevention. Obesity. May 2008
- Dutch Estimate: Lifetime Costs Attributable to Obesity for a 20 year Old (Discounted)
  - Live 4.5 years less than "Healthy Living" Cohort (64.4-59.4)
  - Spend 11 Percent less than "Healthy Living" Cohort
  - Van Baal, PH, et al. "Lifetime Medical Costs of Obesity: Prevention No Cure for Increasing Health Expenditures" PLOS Medicine, Feb. 2008; vol. 5, Issue 242-249.

Challenges for Detecting and Responding to Emerging Threats

- Time required to verify trends
- Reliable data on prevalence and burden of emerging threat (Information to Noise Ratio)
- Public Reaction to Crying Wolf multiple times
  - When the wolf isn't there—false positives
  - When the wolf was there and was successfully deterred
- R&D response: Additional funding or reprogrammed