

# **Discussion of Prevalence and Incidence Approaches to Estimating Costs and Attributable Costs**

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# Prevalence estimates

- Prevalence cost estimates may be more useful for planning expenditures
  1. Interested in the overall burden of disease during a particular time period
  2. Relevant to the payer
  
- Not as useful for policy decisions about controlling costs or about planning interventions
  1. Heterogeneous population of newly diagnosed cases mixed with long-term survivors
  2. Needs for care are very different

# Incidence estimates

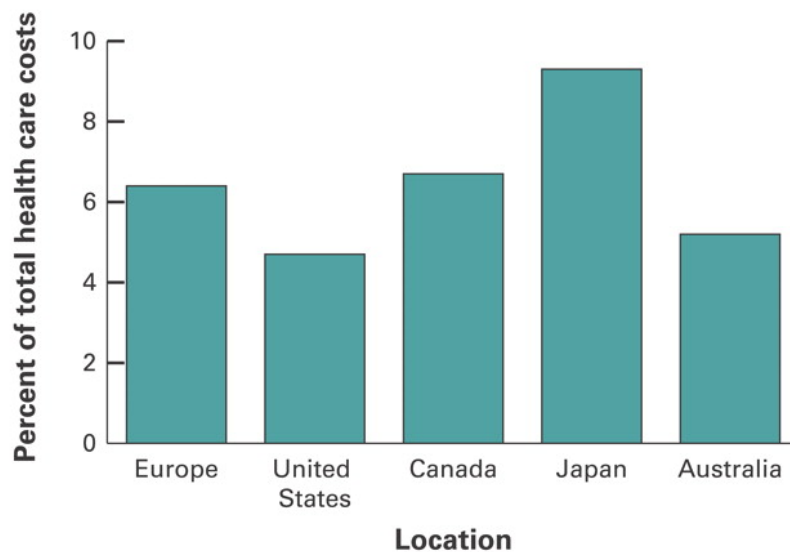
- May be more useful for measuring cost effectiveness of screening strategies, preventive interventions, treatment benefits
  1. Focus on the individual or groups of individuals with similar characteristics
  2. Both mean costs and variability in costs are important
  3. Allows for segmentation of the disease process (e.g. diagnosis, initial treatment, continuing care, terminal care)
  4. Compatibility with cancer registry data

# Relative versus Absolute Cost Analysis

- Relative cost comparisons (e.g. percent changes in cost over time)
  - Useful for measuring effectiveness of screening strategies, preventive interventions, treatment benefits
    1. Ratios are not as susceptible to temporal trends
    2. May mask small absolute differences with large ratios and vice-versa
    3. Denominator dependent (assumption of comparable denominators)

## International Costs of Cancer Care

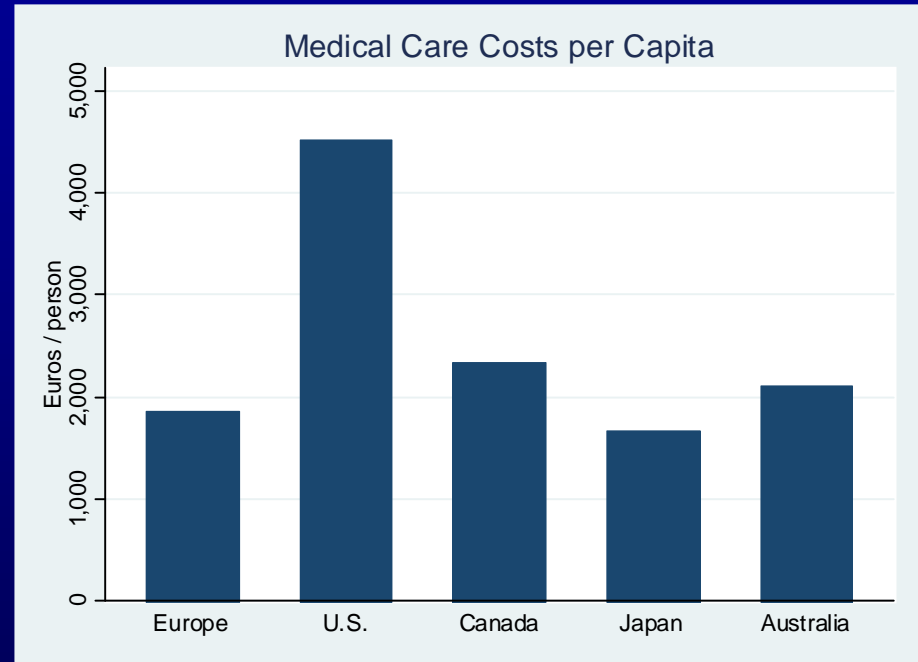
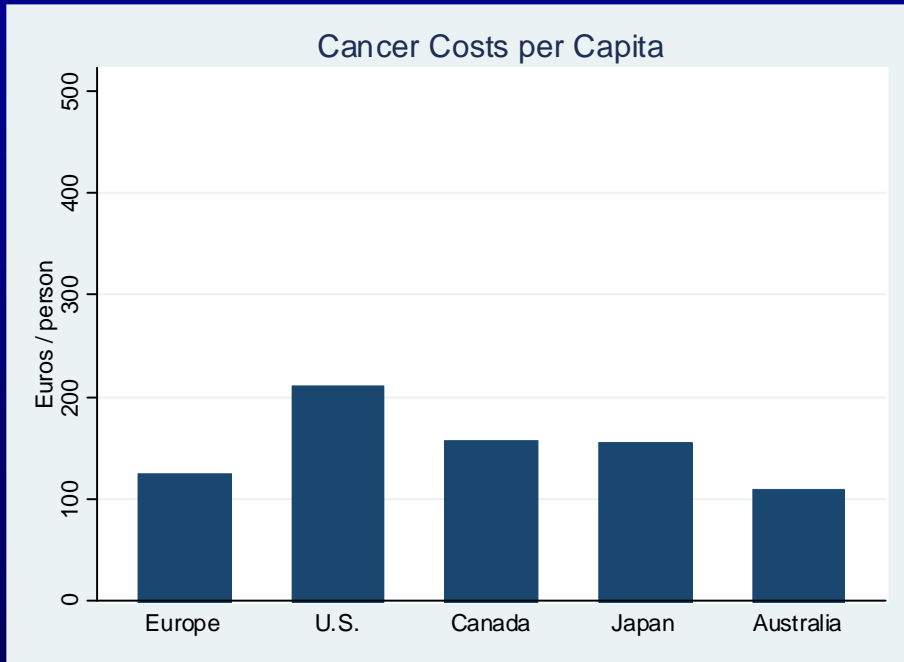
Cancer incidence is increasing throughout the world, for reasons that include an aging population and increased cancer screening. Along with this increased incidence—and expensive new biologic drugs—comes increased cancer costs. Cancer currently accounts for an average of 4%–7% of health care costs, but it accounts for 13%–17% of the disease burden.



Citation: The burden and cost of cancer, *Annals of Oncology*, vol. 18, supplement 3, pp iii8-iii22, 2007. Available at: [http://annonc.oxfordjournals.org/cgi/reprint/18/suppl\\_3/iii8](http://annonc.oxfordjournals.org/cgi/reprint/18/suppl_3/iii8).

© Oxford University Press 2007. DOI: 10.1093/jnci/djm021

## Annals of Oncology 2007



Costs in 2004 in Euros adjusted for purchasing power

# Relative or Absolute Cost Analysis

- Absolute cost comparisons  
(e.g. costs of treatment)
- Useful for measuring actual observed or expected costs of screening strategies, preventive interventions, treatment benefits
  1. More sensitive to data sources (e.g. single cohort)
  2. Out of date as soon as published

# Cost Comparison of Mastectomy Versus Breast-Conserving Therapy for Early-Stage Breast Cancer

William E. Barlow, Stephen H. Taplin, Cathleen K. Yoshida, Diana S. Buist, Deborah Seger, Martin Brown

Journal of the National Cancer Institute, Vol. 93, No. 6, March 21, 2001

**Table 2.** Total mean cost of all medical care at 6 months, 1 year, and 5 years after diagnosis by treatment and age group in 1998 dollars\*

	6 mo	1 y	5 y, no discount	5 y, 3% discount†
<b>Mastectomy</b>				
Mean	12 454	16 462	41 286	39 064
SD	6893	11 738	37 457	34 968
95% CI	11 426 to 13 483	14 674 to 18 249	32 355 to 50 217	30 726 to 47 402
No.	175	168	70	70
<b>Mastectomy + adjuvant therapy</b>				
Mean	14 761	20 269	45 717	43 376
SD	7596	14 763	27 040	25 130
95% CI	14 023 to 15 498	18 821 to 21 716	41 262 to 50 171	39 236 to 47 515
No.	410	402	144	144
<b>BCT + radiation therapy</b>				
Mean	14 443	16 506	33 784	32 246
SD	4686	6073	21 046	19 417
95% CI	13 979 to 14 908	15 899 to 17 113	30 466 to 37 102	29 185 to 35 307
No.	393	387	157	157
<b>BCT + radiation therapy + adjuvant therapy</b>				
Mean	15 924	20 236	39 274	37 421
SD	6995	9964	24 763	22 713
95% CI	15 389 to 16 458	19 468 to 21 005	36 118 to 42 429	34 527 to 40 315
No.	661	648	239	239
<i>P</i> value‡	.0001	.0001	.0001	.0001

\*Table includes only those women who had complete costs over the time period indicated. SD = standard deviation; CI = confidence interval; BCT = breast-conserving therapy.



McNeil C, “Sticker shock sharpens focus on biologics”, JNCI, June 20, 2007

Approximate monthly costs of cancer biologic drugs, from company and media sources

Drug	Cancer	Cost / month
Avastin (bevacizumab)	Colorectal	\$4,400
	Non–small-cell lung	\$8,800
Erbitux (cetuximab)	Colorectal	\$10,000
Herceptin (trastuzumab)	Breast	\$3,000
Tarceva (erlotinib)	Non–small-cell lung	\$2,600
Thalidomid (thalidomide)	Multiple myeloma	\$2,000
Tykerb (lapatinib)	Breast	\$2,900
Vectibix (panitumumab)	Colorectal	\$8,000

# Attributable Costs

- Costs of cancer related care (attributable costs)
- Medical costs of having cancer at the patient level (net costs)
  - Patients with cancer
    1. Have direct care related to their cancer
    2. May have less non-cancer care due to comorbidity of cancer
  - Net cost = Cancer patient total medical costs – matched non-cancer patient total medical care costs

## Stage, Age, Co-Morbidity, and Direct Costs of Colon, Prostate, and Breast Cancer Care

Stephen H. Taplin, William Barlow, Nicole Urban, Margaret Mandelson, Deborah Timlin, Laura Ichikawa, Pauline Nefcy, Journal of the National Cancer Institute, Vol. 87, No. 6, March 15, 1995

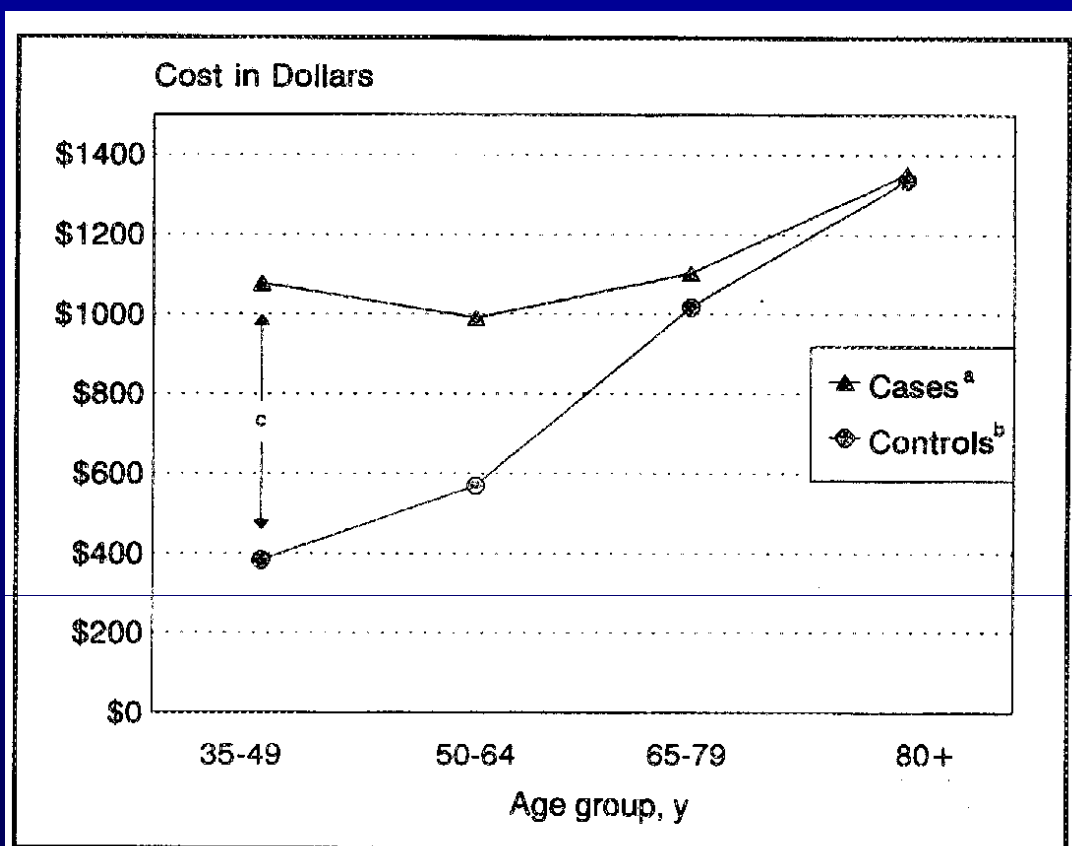


Fig. 4. Breast cancer: total quarterly costs for continuing care by age group. a = all cases of breast cancer in the continuing care phase of treatment; b = all individuals without the cancer of interest, matched to each case subject by 5-year age group and sex; c = net costs are the difference between the case and control costs. Net costs decrease significantly ( $P < .001$ ) between the age group 35-49 and the  $\geq 80$  age group, using multivariate regression.

# Phases of Care

- Initial, Continuing, and Terminal Care
  - Useful for conceptualizing the costs of care
    1. Initial costs (6-12 months post-diagnosis)  
(surgery; chemotherapy)
    2. Continuing care (variable duration)
    3. Terminal care ( only applies to those that die )
  - Distinction between initial and continuing care may become blurred
    1. Hormone therapy for breast cancer (5 years)
    2. Biologic agents may be given for very long durations

# Statistical Models

- Linear models for phase mean costs
  - Summed over time periods within phase
    1. Account for correlation within person over time within a phase
    2. Can get an estimate with standard errors
- Survival models for total costs
  1. Lin, Feuer, Etzioni, and Wax (Biometrics, 1997)
  2. Zhao, Bang, Wang, and Pfeifer (Stat in Med, 2007)

# Zhao-Tian (Biometrics, 2001) estimator

- Recast by Pfeifer and Bang (2005)

$$\hat{\mu} = \frac{1}{n} \sum_{i=1}^n \frac{\Delta_i M_i}{\hat{K}(T_i)} + \frac{1}{m} \sum_{i=1}^m \frac{(1 - \Delta_i) (M_i - \overline{M(C_i)})}{\hat{K}(C_i)}$$

- Includes standard errors so comparison of two or more treatments are possible
- Could be extended to include covariate adjusters

# Summary

- Extensive development of methods to assess prevalence and incidence costs
- Costs of “usual care” can be considered using net costs (indirect method compared to the direct method for attributable costs)
- Models of phases of care have been useful in the past
- Comprehensive total costs models with measures of variability and adjustment for potential confounders are the way forward