

Table 1: Costs of Illness and NIH Support For Selected Diseases and Conditions--Part 1A

February 11, 2000

Diseases/Conditions	Death		Cost Estimate				Estimate Includes					
	Rank	Number	Ref. Year of Cost Data	\$ Billions			Direct Costs	Indirect Costs				
	Rank by 1998 Death Rates	1998* (1,000s)		Total Costs	Direct Costs	Indirect Costs		Due to Other Related Health Costs	Due to Mortality of Patient (premature death)	Due to Morbidity Of Patient (lost workdays)	Due to Morbidity of Patient (reduced productivity)	Due to Services of Unpaid Caregivers
1	2	3	4	5	6	7	8	9	10	11	12	13
Alcohol Abuse and Dependence		110.6*	1998	184.6	50.4	134.2	Yes	Yes	Yes	Yes	No	Yes
Allergic Rhinitis (Hay Fever)			1996	NA	1.9	NA	No	No	No	No	No	No
Alzheimer's Disease and Other Dementia	12	22.8	1997	100.0	15.0	85.0	Yes	Yes	Yes	No	Yes	No
Arthritis			1992	64.8	15.2	49.6	No	Yes	Yes	No	No	No
Asthma			1996	14.0	12.0	2.0	No	Yes	Yes	Yes	No	No
Atherosclerosis	14	15.4	1999	6.2	5.5	0.7	No	Yes	No	No	No	No
Cancer (Malignant neoplasms, including neoplasm of lymphatic and hematopoietic tissues) #	2	538.9	1990	96.1	27.5	68.7	No	Yes	Yes	No	No	No
Cancer--(Breast)			1990	12.7	6.6	6.2	No	Yes	Yes	No	No	No
Cancer--(Cervical)			1990	NA	0.6	NA	No	No	No	No	No	No
Cancer--(Colorectal)			1990	NA	6.5	NA	No	No	No	No	No	No
Cancer--(Lung)			1990	NA	5.1	NA	No	No	No	No	No	No
Cancer--(Ovarian)			1990	NA	0.9	NA	No	No	No	No	No	No
Cancer--(Prostate)			1990	NA	4.7	NA	No	No	No	No	No	No
Cerebrovascular Disease (Stroke)	3	158.1	1998	43.3	28.3	15.0	No	Yes	Yes	No	No	No
Chronic Liver Disease and Cirrhosis	10	24.9	1985	3.2	1.2	2.1	No	Yes	Yes	No	No	No
Chronic Obstruct. Pulmonary Diseases & Allied Conditions	4	114.4	1998	37.3	21.6	16.2	No	Yes	Yes	No	No	No
Dental/Oral Diseases			1997	NA	50.6	NA	No	No	No	No	No	No
Diabetes	7	64.6	1997	98.2	44.1	54.1	No	Yes	Yes	Yes	No	Yes
Digestive Diseases #			1985	56.2	41.5	14.7	No	Yes	Yes	No	No	No
Digest--(Gallbladder Disease)			1985	4.7	4.4	0.4	Yes	Yes	Yes	No	No	No
Digest--(Peptic Ulcer)			1989	4.9	3.6	1.4	Yes	Yes	Yes	No	No	No
Disability (Rehabilitation Research)			1986	169.4	82.1	87.3	Yes	No	Yes	No	No	No
Drug Abuse (Including AIDS due to IV Drug Use)		26.3*	1995	109.8	32.0	77.6	Yes	Yes	Yes	Yes	No	Yes
Epilepsy			1992	NA	3.0	NA	No	No	No	No	No	No
Eye Diseases and Disorders of Vision #			1991	38.4	22.3	16.1	Yes	NA	Yes	Yes	NA	NA
Eye Diseases--Diabetic Retinopathy			1992	2.8	0.6	2.2	Yes	NA	Yes	Yes	NA	NA
Heart Diseases #	1	724.3	1999	183.1	101.8	81.3	No	Yes	Yes	No	No	No
Heart Diseases--Coronary Heart Disease			1999	99.8	53.1	46.7	No	Yes	Yes	No	No	No
HIV/AIDS Infections	16	13.2	1999	28.9	13.4	15.5	No	Yes	Yes	No	No	No
Homicide and Legal Interventions	13	17.4	1989	33.7	10.4	23.3	Yes	Yes	Yes	Yes	No	Yes
Infertility			1987	NA	1.0	NA	No	No	No	No	No	No

Diseases/Conditions	Discount Rate	Estimate Includes Costs			Scope of Estimate	ICD		NIH Support \$ Billions
		Of Related Conditions Beyond Primary ICD-9-CM Codes**	Attributable As A Secondary Diagnosis	Of Underlying Causes of Other Conditions		Total U.S. Population or Subset	Identifying Cost Data	
1	14	15	16	17	18	19	20	21
Alcohol Abuse and Dependence	6%	Yes	Yes	Yes	Total	NIAAA	Yes	0.3465
Allergic Rhinitis (Hay Fever)		No	No	No	Total	NIAID		0.0017
Alzheimer's Disease and Other Dementia	NA	No	Yes	Yes	Age65+	NIA,NINDS	Yes	0.4065
Arthritis	4%	No	No	No	Total	NIAMS		0.2388
Asthma	NA	No	No	No	Total	NIAID	Yes	0.1404
Atherosclerosis	6%	No	No	No	Total	NHLBI		0.2108
Cancer (Malignant neoplasms, including neoplasm of lymphatic and hematopoietic tissues) #	4%	No	No	No	Total	NCI	Yes	3.3773
Cancer--(Breast)	4%	No	No	No	Total	NCI	Yes	0.4747
Cancer--(Cervical)		No	No	No	Total	NCI	Yes	0.0752
Cancer--(Colorectal)		No	No	No	Total	NCI	Yes	0.1759
Cancer--(Lung)		No	No	No	Total	NCI	Yes	0.1631
Cancer--(Ovarian)		No	No	No	Total	NCI	Yes	0.0654
Cancer--(Prostate)		No	No	No	Total	NCI	Yes	0.1775
Cerebrovascular Disease (Stroke)	6%	No	No	No	Total	NINDS	Yes	0.1860
Chronic Liver Disease and Cirrhosis	4%	Yes	Yes	No	Total	NIDDK		0.1984
Chronic Obstruct. Pulmonary Diseases & Allied Conditions	6%	No	No	No	Total	NHLBI	Yes	0.0997
Dental/Oral Diseases		No	No	No	Total	NIDCR	Yes	0.2494
Diabetes @	4%	Yes	Yes	Yes	Total	NIDDK	Yes	0.4576
Digestive Diseases #	4%	Yes	Yes	No	Total	NIDDK	Yes	0.6485
Digest--(Gallbladder Disease)	4%	Yes	No	No	Total	NIDDK	Yes	0.0127
Digest--(Peptic Ulcer)	4%	Yes	No	No	Total	NIDDK	Yes	0.0104
Disability (Rehabilitation Research)		No	No	No	Total	NICHHD	Yes	0.1992
Drug Abuse (Including AIDS due to IV Drug Use)	6%	Yes	Yes	Yes	Total	NIDA	Yes	0.6262
Epilepsy		No	No	No	Total	NINDS	Yes	0.0817
Eye Diseases and Disorders of Vision #	NA	NA	NA	NA	Total	NEI	Yes	0.4257
Eye Diseases--Diabetic Retinopathy	6%	NA	NA	NA	Total	NEI	Yes	0.0224
Heart Diseases #	6%	No	No	No	Total	NHLBI	Yes	1.2560
Heart Diseases--Coronary Heart Disease	6%	No	No	No	Total	NHLBI	Yes	0.3136
HIV/AIDS Infections ~	3%	No	No	Yes	Total	OAR, OD	Yes	1.7927
Homicide and Legal Interventions	3%	No	No	No	Age 12+	NIMH		0.0109
Infertility		No	No	No	Total	NIEHS		0.0251

Table 1: Costs of Illness and NIH Support For Selected Diseases and Conditions--Part 2A

February 11, 2000

Diseases/Conditions	Death		Cost Estimate				Estimate Includes					
	Rank			\$ Billions			Direct Costs	Indirect Costs				
	Rank by 1998 Death Rates	1998 (1,000s)	Ref. Year of Cost Data	Total Costs	Direct Costs	Indirect Costs	Due to Other Related Non-Health Costs	Due to Mortality of Patient (premature death)	Due to Morbidity Of Patient (lost workdays)	Due to Morbidity of Patient (reduced productivity)	Due to Services of Unpaid Caregivers	Due to Other Related Non-Health Costs
1	2	3	4	5	6	7	8	9	10	11	12	13
Injury (Total), including Accidents and Adverse Effects #	6	93.2	1995	338.0	89.0	248.0	Yes	Yes	Yes	Yes	No	No
Injury--Childhood injuries			1995	69.6	19.2	50.3	Yes	Yes	Yes	Yes	No	No
Injury--Lead Poisoning			1994	17.2	11.5	5.7	Yes	Yes	Yes	Yes	No	No
Injury--Trauma, Central Nervous System (Head and Spine)			1992	35.0	10.0	25.0	No	No	No	No	No	No
Kidney & Urology Diseases, including nephritis, nephritic syndromes, and nephrosis #	9	26.3	1985	40.3	26.2	14.1	No	Yes	Yes	Yes	No	No
Kid & Urology--End Stage Renal Diseases			1997	NA	15.6	NA	No	NA	NA	NA	NA	NA
Kid & Urology--Incontinence			1995	26.3	12.5	13.8	No	No	No	No	No	Yes
Kid & Urology--Kidney Stones			1985	NA	1.4	NA	No	No	No	No	No	No
Kid & Urology-- Prostate Diseases			1985	NA	3.1	NA	No	NA	NA	NA	NA	NA
Kid & Urology--Urinary Infect.(Kid, cystitis, urethritis)			1985	NA	4.4	NA	No	NA	NA	NA	NA	NA
Mental Disorders			1992	160.8	66.8	94.0	Yes	Yes	Yes	Yes	Yes	Yes
Multiple Sclerosis			1991	5.0	2.5	2.5	No	No	Yes	Yes	No	No
Obesity			1995	99.2	51.6	47.6	No	Yes	Yes	No	No	No
Osteoporosis			1995	NA	13.8	NA	No	No	No	No	No	No
Otitis Media			1993	5.0	2.9	2.1	No	No	No	No	Yes	Yes
Pain Conditions, Chronic			1986	79.0	45.0	34.0	No	No	Yes	No	No	Yes
Parkinson's Disease			1992	6.0	2.0	4.0	No	No	No	No	No	No
Pelvic inflammatory Disease			1996	6.8	NA	NA	No	Yes	Yes	No	No	Yes
Perinatal Period, Conditions Originating in the # ^	15	13.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perinatal Period-- Births, Preterm and Low Weight			1994	NA	2.0	NA	No	No	No	No	No	No
Perinatal Period-- Neonatal Resp. Distress Syndrome			1997	1.1	0.7	0.4	No	Yes	No	No	No	No
Perinatal Period-- Sudden Infant Death Syndrome (SIDS)			1995	NA	NA	1.0	No	Yes	No	No	No	No
Pneumonia and influenza	5	94.8	1999	25.6	18.6	7.0	No	Yes	No	No	No	No
Psoriasis			1994	NA	3.0	NA	No	No	No	No	No	No
Respiratory Distress Syndrome, Acute			1999	4.1	3.2	0.9	No	Yes	No	No	No	No
Septicemia	11	23.6	1998	7.2	4.9	2.3	No	Yes	No	No	No	No
Sickle Cell Anemia			1995	0.9	0.6	0.3	No	Yes	No	No	No	No
Smoking		422.1*	1995	138.0	80.0	58.0	No	Yes	Yes	No	No	No
Suicide	8	29.3	1985	NA	NA	10.2	No	Yes	NA	NA	NA	NA
Tuberculosis			1991	NA	0.7	NA	Yes	No	No	No	No	No

Table 1: Costs of Illness and NIH Support For Selected Diseases and Conditions--Part 2B

February 11, 2000

Diseases/Conditions	Discount Rate	Estimate Includes Costs			Scope of Estimate	ICD		NIH Support \$ Billions
		Of Related Conditions Beyond Primary ICD-9-CM Codes**	Attributable As A Secondary Diagnosis	Of Underlying Causes of Other Conditions	Total U.S. Population or Subset	Identifying Cost Data	Quoted By ICD	FY 1999 Spending***
1	14	15	16	17	18	19	20	21
Injury (Total), including Accidents and Adverse Effects #	2.5%	No	No	No	Total	NICHD		0.2385
Injury--Childhood injuries	2.5%	No	No	No	Age<20	NICHD	Yes	0.0131
Injury--Lead Poisoning		No	No	No	Total	NIEHS		0.0167
Injury--Trauma, Central Nervous System (Head and Spine)		No	No	No	Total	NINDS	Yes	0.1588
Kidney & Urology Diseases, including nephritis, nephritic syndromes, and nephrosis #	4%	Yes	Yes	Yes	Total	NIDDK	Yes	0.3100
Kid & Urology--End Stage Renal Diseases		No	No	No	Total	NIDDK	Yes	0.0230
Kid & Urology--Incontinence		No	Yes	Yes	Age65+	NIA	Yes	0.0069
Kid & Urology--Kidney Stones		No	Yes	Yes	Total	NIDDK	Yes	0.0056
Kid & Urology-- Prostate Diseases	4%	No	Yes	Yes	Total	NIDDK	Yes	0.1791
Kid & Urology--Urinary Infect.(Kid, cystitis, urethritis)	4%	No	Yes	Yes	Total	NIDDK	Yes	0.0120
Mental Disorders #	6%	Yes	Yes	No	Total	NIMH	Yes	0.7487
Multiple Sclerosis		No	No	No	Total	NINDS	Yes	0.0965
Obesity	4%	Yes	No	Yes	Total	NIDDK		0.1616
Osteoporosis		No	No	No	Total	NIAMS	Yes	0.1367
Otitis Media		No	No	No	Total	NIDCD		0.0081
Pain Conditions, Chronic		NA	NA	NA	Total	NIDCR,NINDS	Yes	0.1044
Parkinson's Disease		No	No	No	Total	NINDS	Yes	0.1323
Pelvic inflammatory Disease	4%	Yes	No	Yes	Age15-44,wome	NIAID	Yes	0.0045
Perinatal Period, Conditions Originating in the # ^	NA	NA	NA	NA	NA			0.3170
Perinatal Period-- Births, Preterm and Low Weight		No	No	No	Total	NICHD	Yes	0.2924
Perinatal Period-- Neonatal Resp. Distress Syndrome	6%	No	No	No	Total	NHLBI		0.0073
Perinatal Period-- Sudden Infant Death Syndrome (SIDS)	6%	No	No	No	Total	NHLBI		0.0493
Pneumonia and influenza	6%	No	No	No	Total	NHLBI		0.0744
Psoriasis		No	No	No	Total	NIAMS		0.0052
Respiratory Distress Syndrome, Acute	6%	No	No	No	Total	NHLBI		0.0308
Septicemia	6%	No	No	No	Total	NHLBI		0.0165
Sickle Cell Anemia	6%	No	No	No	Total	NHLBI		0.0505
Smoking	4%	No	No	Yes	Total	NIDA	Yes	0.3539
Suicide	6%	No	No	No	Total	NIMH		0.0251
Tuberculosis		No	No	No	Total	NIAID	Yes	0.0729

Table: Costs of Illness and NIH Support for Selected Diseases and Conditions

GENERAL CONSIDERATIONS IN REVIEWING COST OF ILLNESS DATA

Cost of illness (COI) estimates provide order of magnitude indicators for the economic burden of disease and should be interpreted with caution. They neglect other equally important but difficult to measure dimensions -- such as the prevalence of disease, and the effect on the quality of life and daily functioning -- in considering and understanding the true cost of illness to society. Although only a single point estimate is provided for each disease and condition listed in the table, a range of uncertainty should be attached to each estimate. The cost estimates are based on a series of parameters, each of which is, at best, estimated from survey data with implicit sampling error. Judgments regarding selection and interpretation of proxies for missing or incomplete data influence the derivation of the final value and add further uncertainty. Finally, the published literature on cost of illness studies documents significant variations in methods and data (see report text and related references) which result in the incomparability of results from different studies.

Any attempt to compare cost data across disease categories must consider in depth the many conceptual and methodological issues that may lead to variations in cost estimates. Major considerations for interpreting and comparing the cost estimates in the table with each other and with estimates from other sources include the following: definition of disease; cost components; discount rate; reference year; and method, approach, and scope and perspective of the estimation. Some of these variations are summarized by the columns in the table. More detailed information, including related measures of disease burden and references to the underlying cost reports for each disease, are included in the attached *Table Notes*, the *Presentation of the Data* section of the report, and the documentation summaries in the *Appendix*.

Table Legend

- # The cost estimates and the NIH support for disease subcategories do not add up to the values displayed for the corresponding major categories. Not all subcategories are included, and the cost estimates for the subcategories are frequently obtained from several different studies that use different methods and data sources.
- ^ No cost estimate could be located by the NIH Institutes and Centers for Conditions Originating in the Perinatal Period. Please refer to the *Appendix* for further relevant information and comments.
- * Deaths for these 3 major external factors that contribute to death refer to 1996 and are based on a methodology explained in the McGinnis and Foege paper. Please refer to the attached table Notes and to the text of this report for additional explanation. See appendix pages for sources.
- ** ICD-9-CM code = *International Classification of Diseases, 9th Revision, Clinical Modifications*
- *** Figures for NIH support reflect NIH-wide spending on the listed diseases. In most cases, these support figures include spending from several Institutes and Centers.
- NA Not available

Notes for Table: Costs of Illness and NIH Support for Selected Diseases and Conditions

Top 15 causes of mortality. The annual deaths for each of the top 15 causes of mortality in 1998 as identified by the Centers for Disease Control and Prevention National Vital Statistics Reports, Vol 47, No. 25, October 5, 1999. Estimates for the deaths due to Alcohol Abuse and Dependence, due to Drug Abuse, and due to Smoking (for tobacco use) in 1996 are identified with an asterisk (*) in column 3. These three conditions were listed among the top 9 major external (non-genetic) factors that contribute to death in the United States in 1990 (J. Michael McGinnis and William H. Foege, "Actual Causes of Death in the United States," JAMA, Nov. 10, 1993, Vol. 270, No. 18, pp. 2207-2212). Four sources see the appendix pages for Alcohol Abuse and Dependence, for Drug Abuse, and for Smoking.

Unavailability of estimates. No agreed upon cost estimates were located by the NIH Institutes and Centers for two of the top causes of mortality – Conditions Originating in the Perinatal Period; and, Nephritis, Nephrotic Syndromes and nephrosis. A cost estimate for Kidney and Urologic Diseases (which include nephritis, nephrotic syndromes, and nephrosis) was substituted for the more specific Nephritis, Nephrotic Syndromes and Nephrosis category. The time and effort required to generate an estimate for perinatal conditions was beyond the scope of the Senate's request for this report (see *Appendix*).

Major considerations for interpreting and comparing the cost estimates in the table with each other and with estimates from other sources include the following:

- *Reference Year (Column 4).* The estimates are each expressed in dollars for a particular reference year. To express all estimates in a common reference year, it would be necessary to adjust for changes in the disease burden over time, patterns of treatment and care, and the purchasing power of the dollar for health care services.
- *Cost components (Columns 5-13).* COI studies include direct and indirect cost components. The comprehensiveness of the estimates of direct and indirect costs differs across diseases because of the difficulty and cost required to estimate the non-health related costs, and the indirect costs related to reduced productivity after returning to the job and the value of services of unpaid care givers.

Discount Rate (Column 14). The stream of lost earnings over future years are converted to base or reference year values using a discount rate intended to reflect the tradeoff between the values of a dollar received today versus one received next year. Valid comparison of estimates requires adjustment of discount rates to a common value.

Definition of disease (Columns 15-17). Because the interrelationships between disease categories or causal agents are complex and patients often present with more than one disease or condition, it is not always feasible or appropriate to construct mutually exclusive disease categories and associated cost estimates. Cost estimates depend on how narrowly or broadly the disease is defined, whether it includes related conditions beyond its narrowly defined or primary ICD-9-CM code (col.15); whether the estimates includes identifiable extra costs attributable when the disease is listed as a secondary diagnosis or comorbidity (col.16); and whether the estimate includes costs attributable to the disease or condition as an underlying cause or risk factors of other diseases (col.17).

Method and Approach of Estimation. All of the COI estimates in this table are based on the conventional human capital method rather than the less common willingness-to-pay approach. Because the human capital approach values the indirect costs of illness in terms of market earnings, it yields very low values for the retired elderly and for children. It also ignores certain dimensions of illness and death, such as pain and suffering. Two approaches can be used to determine COI estimates: 1) prevalence-based (annual) cost provides an estimate of the direct and indirect burden incurred by all cases that existed during a specified period of time (year); and 2) incidence-based (lifetime) cost represents the lifetime cost resulting from the illness of all cases that began during a specified year. All of the COI estimates in this table used the prevalence-base approach, except for accidents and adverse effects; homicide and legal intervention; several injury subcategories; and an eye subcategory - diabetic retinopathy.

Scope and Perspective of Estimation (Column 18). Most estimates address the total U.S. resident population; they are not specific to particular geographic area or ethnic groups. However, a few are limited by the age of the patients. Similarly, most of the studies estimate costs to the total society, regardless of who bear the costs. In this table, the only exceptions are end stage renal disease, which is limited to federal payments for Medicare claims, and infertility, which includes only payments by insurance companies.

NIH Support (Column 21). This column contains the NIH spending for each disease from all Institutes and Centers. The support figures contain overlaps. Since overlaps in cost estimates could not be removed, no attempt was made to eliminate overlaps in the corresponding support figures.