## Table 5.—MEDICAL COSTS AND PRODUCTIVITY LOSSES ESTIMATED FOR SELECTED HUMAN PATHOGENS, 1993— Continued

Pathogen	Foodborne illness cases (#)	Foodborne* costs (bil. \$)	Percent from meat/ poultry (%)	Total costs* meat/poultry (bil. \$)
Total	3,641,672–6,952,730	5.6–9.4	N/A	4.5–7.5

Source: Economic Research Service and Centers for Disease Control and Prevention, 1993.

\*Column rounded to one decimal place.

\*\*Roberts' rough approximation of costs in "Human Illness Costs of Foodborne Bacteria", *Amer. J. of Agricultural Economics*, vol. 71, no. 2 (May 1989) pp. 468–474 were updated to 1993 dollars using the Consumer Price Index (all items, annual average). Cost estimates for other pathogens are more detailed, see the following for a discussion of the methodology: listeriosis—Roberts, Tanya and Robert Pinner, "Economic Impact of Disease Caused by *Listeria monocytogenes*" in *Foodborne Listeriosis* ed. by A.J. Miller, J.L. Smith, and G.A. Somkuti. Elsevier Science: Amsterdam, The Netherlands, 1990, pp. 137–149, *E. coli* O157:H7—Roberts, T. and Marks, S., "*E. coli* O157:H7 Ranks as the Fourth Most Costly Foodborne Disease," *FoodReview*, USDA/ERS, Sept-Dec 1993, pp. 51–59, salmonellosis—Roberts, Tanya, "Salmonellosis Control: Estimated Economic Costs," *Poultry Science*. Vol. 67 (June 1988) pp. 936–943, campylobacteriosis—Morrison, Rosanna Mentzer, Tanya Roberts, and Lawrence Witucki, "Irradiation of U.S. Poultry—Benefits, Costs, and Export Potential, *FoodReview*, Vol. 15, No. 3, October-December 1992, pp. 16–21, congenital toxoplasmosis—Roberts, T., K.D. Murrell, and S. Marks. 1944. "Economic Losses Caused by Foodborne Parasitic Diseases," *Parasitology Today*. vol. 10, no. 11: 419–423; and Roberts, Tanya and J.K. Frenkel, "Estimating Income Losses and Other Preventable Costs Caused by Congenital Toxoplasmosis in People in the United States," *J. of the Amer. Veterinary Medical Assoc.*, vol. 196, no. 2 (January 15, 1990) pages 249–256.

N/A indicates item is not-applicable.

Other taxpayer costs include public health sector expenses to operate a disease surveillance system and to investigate and eliminate disease outbreaks. Approximately \$300 million is spent for this annually by the Federal public health sector. Government costs in the United States, Canada, and other countries, average about \$200,000 per foodborne illness outbreak.

## Cost Computation Methodology

The costs of foodborne disease associated with meat and poultry pathogens were estimated using a traditional "cost of illness" method which includes medical costs, productivity losses, and special educational or residential care associated with some chronic conditions. Disease frequencies reflect CDC's "best estimate" of the actual number of foodborne illness cases each year.

The present value of lifetime medical costs for those becoming ill in 1993 was estimated using nationwide databases, such as published Medicare reimbursement rates and per-capita expenditures on physicians' services from the Health Care Financing Administration, the National Center for Health Statistics' National Hospital Discharge Survey, the American Hospital Association's Hospital Statistics, or Blue Cross/Blue Shield charges. The average cost to community hospital per patient was used to compute hospitalization costs.

Productivity losses occur because workers are ill and miss work. These have been approximated by the Average Weekly Earnings for non supervisory production workers in private nonagricultural jobs, published by the Bureau of Labor Statistics (BLS) of the U.S. Department of Labor, plus estimated fringe benefits. For illness in subsequent years, a present value of the reduced stream of earnings is calculated. For deaths, Landefeld and Seskin's human capital/willingness to pay method was used. It combines elements of both methods to generate the present value of expected lifetime after-tax income and housekeeping services at a 3-percent real rate of return, adjusted for an annual 1-percent increase in labor productivity and a risk-aversion premium that increases the estimates by 60 percent.

These cost estimates are based on the annual incidence of disease, rather than the prevalence, to help us estimate *preventable* illness. Incidence estimates are the annual increase in cases and associated disease costs. Interventions today which prevent future costs will eliminate all the medical, productivity, and special care costs of prevented cases, and so represents one component of the overall economic benefit of disease prevention.

*C.* The Relationship Between Foodborne Illness and Consumer Knowledge and Behavior

The National Academy of Science's Cattle Inspection: Committee on Evaluation of USDA Streamlined Inspection System for Cattle (SIS-C) (1990) repeated the theme of numerous other studies, stating "... the public expects the government to ensure zero risk of meat-borne disease through inspection. The [NAS] committee heard little evidence that the public is aware that some bacterial contamination of raw meat is inevitable and no mention of the crucial role of food handling, preparation, and serving methods in limiting foodborne diseases." The disturbing but real fact that consumers fail to make a connection between their

food handling behavior and safe food recurs throughout the literature on the subject.

Behavioral research shows that food habits are the most difficult of all forms of human behavior to change. This finding is supported by research of consumer knowledge and practices, which indicate that a large portion of the U.S. population lacks basic food safety information and skills and engages in food handling and preparation practices that epidemiological studies have linked with a significant number of foodborne illness outbreaks. Moreover, little correlation exists between consumers' food safety knowledge and their food handling and preparation practices. Even people who characterize themselves as "knowledgeable" do not necessarily follow good food safety procedures. The CDC estimates that 20-30 percent of foodborne illness is due in part to consumer mishandling of food.

Available evidence concerning consumer behavior related to safe food handling and preparation supports the need for a comprehensive pathogen reduction effort. Food safety can best be assured by establishing a "chain of responsibility," with each participant in the food system, from the producer all the way through to the consumerunderstanding, accepting, and acting on its responsibility for food safety. While FSIS will pursue and support all possible means of consumer education and outreach, the Agency realizes that consumer education alone will not control pathogen-related foodborne illness. This is even more true today than ever before, as more people in our society are assuming responsibility for food handling and preparation in the home and elsewhere, without