Making Sense of Recent Cost-of-Foodborne-Illness Estimates

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What Is the Issue?

Estimates of the cost of foodborne illness play an important role in guiding Federal efforts to prevent foodborne illness in the United States. In 2000, the U.S. Department of Agriculture's Economic Research Service (ERS) estimated that the cost of illness from five major foodborne pathogens was $6.9 billion per year. In 2010 and 2012, new comprehensive cost-of-illness estimates were published for the first time in a decade. Scharff (2010; 2012) estimated the cost of foodborne illness in the United States to be as high as $152 billion, while Hoffmann et al. (2012) estimated that illness from 14 major pathogens in the United States cost $14.1 billion. The difference between these recent estimates could lead to confusion about the total economic burden of foodborne illnesses. This report examines these cost-of-illness estimates with a focus on analyzing the factors that drive differences between them. In this report, "cost of illness" is defined as the sum of treatment costs, the value of time lost to illness, and willingness to pay to prevent death. The studies we discuss estimated cost of illness in slightly different ways.

What Did the Study Find?

The apparently large differences between these cost-of-foodborne-illness estimates are due to basic choices in study design.

- The difference between Scharff's two estimates for the cost of all foodborne illness in the United States—$152 billion (2010) and $77.7 billion (2012)—is due primarily to changes in disease-incidence estimates from the Centers for Disease Control and Prevention (CDC). Estimation of the incidence of foodborne disease is a relatively new and rapidly evolving area of research. CDC notes that there is considerable uncertainty around its incidence estimates and advises that the difference between its 1999 and 2011 estimates not be viewed simply as a change in incidence.

- The difference between Scharff's 2012 estimates and Hoffmann et al.'s (2012) estimates is primarily driven by two factors.

    - **Number of pathogens included.** Scharff (2012) included estimates for foodborne illnesses caused by 30 of 31 identifiable pathogens plus foodborne illnesses for which no pathogen source can be identified in CDC's recent foodborne-disease-incidence estimates. By contrast, Hoffmann et al. (2012) included estimates for foodborne illness caused by only 14 identifiable pathogens that account for over 95 percent of

the illnesses, hospitalizations, and deaths caused by all 31 identifiable pathogens (Scharff dropped 1 pathogen from his studies, thus the 30 for Scharff versus 31 for Hoffmann).

- **Valuation method.** Scharff's estimate of $152 billion included monetized quality-adjusted life years (QALYs) to account for pain and suffering caused by foodborne illness as well as the illnesses' impact on daily activities, such as employment. Hoffmann et al. (2012) did not use monetized QALYs. Instead, they used a cost-of-illness estimate for nonfatal outcomes and a willingness-to-pay (for reducing deaths) measure for fatal outcomes. Scharff also produced estimates that do not include monetized QALYs and are methodologically more comparable to Hoffmann et al. (2012). Two National Academy of Sciences committees and the U.S. Environmental Protection Agency's Scientific Advisory Board have found that current approaches to monetizing QALY loss are not reliable economic measures and advised against this practice. Cost of illness is an established practice recognized to be a reliable, though conservative, economic estimate of the burden of nonfatal illness.

Once these differences in study design are controlled for, the difference between Hoffmann et al. (2012) and Scharff (2012) is considerably smaller: $14.1 billion compared to $16.3 billion, respectively.

Methodological differences between Scharff (2012) and Hoffmann et al. (2012) have little impact on how pathogens rank by cost. When monetized QALYs are not included and the same 14 pathogens are considered, there is little difference in pathogen ranking. *Salmonella* (nontyphoidal) and *Toxoplasma gondii* are the first and second most costly foodborne pathogens in the United States.

How Was the Study Conducted?

This analysis is a synthesis and comparison of two prior cost-of-foodborne-illness studies (Scharff, 2012; Hoffmann et al., 2012). It includes a brief discussion of how these two studies compare to prior research based on earlier CDC estimates of the incidence of foodborne illness. The analysis compares published results and recalculates the mean cost of illness for comparable sets of pathogens to allow for more direct comparison of aggregate estimates across studies. It examines the impact of differences in the number of pathogens included in the studies, underlying disease-incidence estimates, valuation methodology, and uncertainty around estimates of disease burden on relative rankings of pathogens.

The studies that are central to this report's research are:

- Hoffmann, Sandra, Michael Batz, and J. Glenn Morris Jr. 2012. "Annual Cost of Illness and Quality-Adjusted Life Year Losses in the United States Due to 14 Foodborne Pathogens," *Journal of Food Protection* 75(7): 1291-1302.

- Scharff, Robert. 2010. *Health-related Costs from Foodborne Illness in the United States.* Produce Safety Project, Georgetown University, Washington, DC.

- Scharff, Robert. 2012. "Economic Burden from Health Losses Due to Foodborne Illness in the United States," *Journal of Food Protection* 75(1): 123-31.