

## 5. Discussion of Results

The population of older Americans is expected to increase rapidly over the next 50 years, and this trend presents important challenges in the area of environmental health. Several of the most prevalent and costly adverse health conditions among older Americans are known to be associated, at least in part, with environmental exposures, and older adults are often more vulnerable to environmental hazards.

The purpose of this report is to contribute to a better understanding of the cost burden imposed by environmentally related health effects among older Americans. In collaboration with EPA, we selected six general health conditions for which environmental exposures are known or suspected to be important contributing factors. Using available national data, we estimated direct and indirect costs for each of these conditions among individuals 65 and older in 2000.

Of the six conditions analyzed, chronic lung disease and ischemic heart disease are found to have the highest prevalence among the older population and to impose the largest aggregate cost. Both conditions were found to affect between 10 percent and 20 percent of the elderly population and to impose total costs of illness of over \$35 billion in 2000. The aggregate medical costs for CLD and IHD represent roughly 15 percent and 22 percent respectively of estimated *total* medical costs among individuals 65 and older in the U.S.

The estimated prevalence and aggregate costs of stroke and pneumonia were both somewhat lower, in each case affecting between 5 and 10 percent of older Americans and costing between \$10 billion and \$20 billion on aggregate in 2000. As expected lung cancer was found to have the lowest prevalence among the elderly population, affecting roughly one percent, but the aggregate costs estimates are nonetheless substantial. Even without estimates of self-administered prescription drug costs, nursing home costs, or lost household productivity due to morbidity (again due to data limitations), aggregate costs were estimated to be \$4.5 billion.

Gastrointestinal illnesses were found to impose the lowest cost burden of the six conditions. Affecting approximately two to three percent of the elderly population in 2000, we estimated aggregate costs of illness for GIs (without nursing home or indirect morbidity costs) of \$1 billion.

Although the estimates summarized above and described in detail in previous sections provide useful and important insights into the costs of illness for these six conditions, several limitations and uncertainties associated with these estimates must be recognized. Each of these issues has been discussed in previous sections; however, we reiterate them here to ensure that they are properly interpreted.

First, the cost estimates developed in this report should *not* be interpreted as those specifically attributable to environmental exposures. Unfortunately, the science and empirical evidence regarding the epidemiological links between environmental exposures and these health outcomes are not sufficiently advanced to estimate reliably this attributable fraction. Consequently, our estimates are more appropriately interpreted as upper-bound estimates of environmentally related costs of illness for these conditions.

Second, our estimates of the prevalence of each condition are based on a nationally representative sample of Medicare fee-for-service beneficiaries, using ICD-9 codes (as listed in Table 2-1) to identify the presence of each condition in 2000. These prevalence estimates are based on *claims* for services in 2000. They do not include individuals who had the underlying condition in 2000 but did not seek care; therefore, they are likely to underestimate overall prevalence. Moreover, since Medicare FFS covered roughly 75 percent of the 65 and older population in 2000, these estimates were extrapolated to the remaining 25 percent of the population. This extrapolation is likely to overestimate prevalence in the noninstitutionalized non-FFS population and underestimate prevalence in the nursing home population.

Third, portions of the direct medical cost estimates based on the CAPHS-MFFS data cannot be interpreted as being exclusively attributable to the selected conditions. Medicare claims data for inpatient, outpatient, and home care costs, include potentially more than one diagnosis code per condition; therefore, portions of the reported costs may be attributable to other co-morbid conditions. For this

reason, the direct medical cost estimates are best interpreted as providing upper-bound estimates of these costs for each condition.

Fourth, the estimates of prescription drug and nursing home costs are based on considerably smaller samples than were used for estimating medical costs; therefore, the confidence intervals for these estimates are considerably larger. Estimates based on samples smaller than 100 are reported in Section 4, but they were not included in our aggregate estimates (i.e., they were set equal to zero) due to their lack of precision. Excluding these values implies that the aggregate direct-costs estimates for stroke, lung cancer, and gastrointestinal illness are underestimated; however, the extent of underestimation is not known.

Fifth, to approximate the portion of prescription drug and nursing home costs that are specifically attributable to the selected conditions, we calculated *incremental* costs (i.e., the difference between average costs for those with and without the condition). This approach provides a rather crude approximation of attributable costs, and, in some cases, the estimated incremental costs are negative. The negative estimates for nursing home costs for IHD were assumed to be implausible and replaced with a zero value in our aggregate direct cost estimates.

Sixth, our estimates of morbidity-related productivity losses are based in part on an analysis of additional work loss and bed days using NHIS data. Due to data limitations associated with NHIS, we were not able to estimate losses for pneumonia or gastrointestinal illness, and we were able to only partially estimate losses for lung cancer. For this reason, the indirect costs for these conditions are underestimates.

Seventh, to estimate the indirect costs resulting from premature mortality, we used NSVR data that defined health conditions using slightly different ICD-9 codes. Because of these discrepancies, our estimates of mortality costs for CLD, stroke, and lung cancer are slight overestimates of mortality costs, while our estimate for gastrointestinal illness is a slight underestimate of actual mortality costs for the conditions of interest.

Finally, to estimate mortality-related costs, we also applied age-specific productivity estimates from Grosse (2003). Unfortunately, this source does not provide an estimate for expected productivity among those 85 and older. By not including productivity losses (labor or household) for deaths in the 85 and older age group, we underestimated indirect costs of illness. However, these excluded losses are expected to be small relative to the productivity losses in the younger age groups.