fewer tobacco-related illnesses. In addition, since productivity measures do not adequately value the avoidance of premature death, FDA has adopted a willingness-to-pay approach to value the benefits of reduced tobacco-related fatalities.

8. Reduced Medical Costs

On average, at any given age, smokers incur higher medical costs than nonsmokers. However, nonsmokers live longer and therefore continue to incur medical costs over more years. Several analysts have reported conflicting estimates of the net outcome of these factors, but the most recent research is the incidence-based study by Hodgson,²² who found that lifetime medical costs for male smokers were 32 percent higher than for male neversmokers and lifetime medical costs for female smokers were 24 percent higher than for female neversmokers. Hodgson determined that the present value of the lifetime excess costs were about \$9,400 in 1990 dollars (future costs discounted at 3 percent).23 As noted earlier, the incidence-based study by Manning et al., implies that about 13 percent of the excess medical costs are attributable to factors other than smoking. Accounting for this reduction and adjusting by the consumer price index (CPI) for medical care raises the present value of Hodgson's excess medical cost per new smoker to \$10,590 in 1994 dollars. Thus, those 1,000,000 young people under the age of 18, who currently become new smokers each year, are responsible for excess lifetime medical costs measured at a present value of \$10.6 billion (1,000,000 x \$10,590). Since FDA projects that the proposed regulation would prevent 250,000 of these individuals from smoking as adults, the medical cost savings attributable to the proposed regulation is estimated at \$2.6 billion per year.

9. Reduced Morbidity Costs

An important cost of tobacco-related illness is the value of the economic output that is lost while individuals are unable to work. Thus, any future reduction in such lost work days contributes to the economic benefits of the proposed regulation. Several studies have calculated prevalence-based estimates of U.S. productivity losses due to smoking-related morbidity, but FDA knows of no incidence-based estimates. Hodgson, however, has shown that in certain situations, incidence measures can be derived from available prevalence measures. For example, he demonstrates that in a steady-state model, the only difference between

prevalence and incidence-based costs are due to discounting.²⁴ Consequently, FDA has adopted Hodgson's method to develop a rough approximation of incidence-based costs from an available prevalence-based estimate of morbidity costs.

Rice et al. 25 found that lost wages due to tobacco-related work absences in the United States amounted to \$9.3 billion in 1984. This equates to \$12.3 billion in 1994 dollars when adjusted by the percentage change in average employee earnings since 1984. Although FDA does not have a precise estimate of the life-cycle timing of these morbidity effects, the relevant latency periods would certainly be shorter than for mortality effects. Thus, to account for the deferred manifestation of smokingrelated morbidity effects, FDA assumed that they would occur over a time horizon equal to 80 percent of that previously measured for mortality effects. Further, because the long-term decline in smoking prevalence has exceeded the growth in population, the estimated incidence-based costs were reduced by another 20 percent. At a 3 percent discount rate, this methodology implies that the incidence-based cost of smoking-related morbidity, or the present value of the future costs to one year's cohort of 1,000,000 new smokers, is about \$3.5 billion. Based on FDA's estimate that the proposed regulation would prevent 250,000 youths per year from smoking as adults, the estimated annual benefits from reduced morbidity amount to about \$879 million.

10. Benefits of Reduced Mortality Rates

From a societal welfare perspective, OMB advises that the best means of valuing benefits of reduced fatalities is to measure the affected group's willingness-to-pay to avoid fatal risks. Unfortunately, the specific willingnessto-pay of smokers is unknown, because institutional arrangements in the markets for medical care obscure direct measurement techniques.²⁶ Nevertheless, many studies have examined the public's willingness-topay to avoid other kinds of lifethreatening risks, especially workplace and transportation hazards. An EPAsupported study 27 found that most empirical results support a range of \$1.6 to \$8.5 million (in 1986 dollars) per statistical life saved, which translates to \$2.2 to \$11.6 million in 1994 dollars. However, the uncertainty surrounding such estimates is substantial. Moreover, Viscusi has shown that smokers, on average, may be willing to accept greater risks than nonsmokers. For example, smokers may accept about one-half the average compensation paid to face onthe-job-injury risks.²⁸ FDA therefore has conservatively used \$2.5 million per statistical life, which is towards the low end of the research findings, to estimate society's willingness-to-pay to avert a fatal smoking-related illness. Thus, the annual benefits of avoiding the discounted number of 15,863 premature fatalities would be \$39.7 billion.

An alternative method of measuring willingness-to-pay is to calculate a value for each life-year saved. This approach, which is intuitively appealing because it places a greater value on the avoidance of death at a younger than at an older age, is the traditional means of assessing the cost-effectiveness of medical interventions. Nevertheless, there have been few attempts to determine the appropriate value of a life-year saved. OMB suggests several approaches, including annualizing with an appropriate discount rate the estimated value of a statistical life over the average expected life-years remaining. For example, at a 3 percent discount rate, a \$2.5 million value per statistical life for an individual with 35 years of remaining life-expectancy translates to about \$116,500 per life year. Since the proposed regulation would save 211,391 discounted life-years annually, this approach yields annual benefits of \$24.6 billion. FDA notes that this approach does not attribute any value to lost consumer utility from tobacco product consumption and solicits public comment on this methodology.

11. Reduced Fire Costs

Every year lighted tobacco products are responsible for starting fires which cause millions of dollars in property damage and thousands of casualties. In 1992, fires started by lighted tobacco products caused 1,075 deaths and \$318 million in direct property damage.²⁹ A reduction in the number of smokers, and the coinciding number of cigarettes smoked, would result in a drop in the number of fires over the years. If the number of fires fell by the same percentage as the expected reduction in cigarette sales, this would imply present value savings due to fewer fires of \$203 million for the value of lives saved and \$24 million for the value of averted property damage, totaling \$227 million annually over a 40-year period. Moreover, these estimates do not include costs for nonfatal injuries or for providing temporary housing.

Summary of Benefits

The discussion above demonstrates the formidable magnitude of plausible estimates of the economic benefits available from smoking reduction efforts. As described, FDA forecasts