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8 The Social Security Cost of Smoking

John B. Shoven, Jeffrey O. Sundberg, and John P. Bunker

8.1 Introduction

Smoking in the United States is associated with enormous costs to society. The Congressional Office of Technology Assessment has estimated the annual cost of medical care for smoking-related illness at $15 to $30 billion, and that smoking-related illness is responsible for an additional $49 to $70 billion in lost productivity. There are also substantial costs to the individual who smokes in terms of lost wages over a lifetime, primarily affecting those who die of smoking-related disease while still active wage earners in the work force. Costs to the individual also include approximately $500 to $1,000 per annum for one-pack and two-pack-a-day smokers to purchase cigarettes. An additional cost to the individual is the loss of Social Security benefits as a result of smoking-induced loss of life expectancy. The data presented herein estimate the magnitude of this loss for single and married men and women born in 1920 and 1923, respectively.

While most of the previous literature on the costs of smoking and the benefits of quitting has overlooked the implications of smoking behavior on pension plans (see, for example, Oster, Colditz, and Kelly 1984), this is by no means universal. Gori, Richter, and Yu (1984) estimated that the savings realized by Ford Motor Company if the health of their employees improved (in terms of less expensive medical

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insurance, disability insurance, and life insurance) would be much smaller than the additional pension costs due to their increased longevity. Atkinson and Townsend (1977) noted that the financial benefits the British National Health Service would enjoy if there was a 40 percent reduction in smoking in Britain would be more than offset by the increased cost of retirement pensions.

In this paper, we examine the Social Security consequences of smoking from the individual or household perspective. From that vantage point, Social Security can be thought of as a prepaid life annuity. Contributions or taxes are collected during one's work life which entitle one to an indexed life annuity beginning at age 65. The annuity can be commenced at age 62 with a roughly fair actuarial adjustment, or it can be started at an age beyond 65 with somewhat higher benefits reflecting the shorter expected remaining lifetime. In general, the system is not actuarially fair (favoring some cohorts relative to others, those with low incomes or short covered careers relative to others, and marrieds, especially one-earner couples, relative to singles).

Our point is that the system is unfair in a way very relevant to the decision of whether or not to smoke. Social Security does not have separate benefit structures for smokers and nonsmokers, even though smokers have a much lower chance of reaching retirement age and a shorter expected length of retirement conditional on reaching that age. The U.S. Office of Technology Assessment estimated that 273,000 people died in the United States in 1982 of smoking-related disease (Kronebusch 1985). Of those, 44 percent, or 121,000, died before they reached their 65th birthday. They may have never collected anything from Social Security. If they were married, their spouses may collect survivor's benefits, but it is clear that their premature deaths greatly reduce their return on their participation in Social Security.

Smoking also affects the Medicare portion of the Social Security system. While we concentrate on the old-age supplemental income (OASI) portion in this paper, it is probably worth noting that the health insurance (HI) component is similarly affected. Many estimates of the effect of smoking on the total demand for health care services in the country find that it is small in the long run. Smokers certainly experience more health problems per year of life, but this is offset by the fact that they live fewer years. With a lower incidence of smoking, there would be more elderly who require additional health care services. The reduced demand caused by the improved health status of the former smokers is offset by the extra care needed by the additional elderly. There might be some initial reduction in the demand for health care if smoking was reduced. The improvements in health status would presumably occur before the age structure was significantly altered. However, in the long run the two effects offset each other.

Despite the fact that total health care demand may be little affected by smoking, Medicare's finances are almost certainly affected. The reason is that it is a prepaid health insurance annuity for those over 65. Medicare does not bear the higher health costs of nonelderly smokers, but it benefits financially from the fewer numbers of elderly due to smoking. The other side of the coin is that smokers pay while they work for old-age health insurance, as with their retirement benefits, which they are less likely to collect or likely to collect for a shorter period than nonsmokers. Wright (1986) estimates that each person who quits smoking increases the deficit faced by the HI component of Social Security for just these reasons.

Our study is the OASI analog of Wright's (1986) HI research. We assemble separate life tables for smokers and nonsmokers and then estimate the Social Security taxes, benefits, and transfers for members of the 1920 birth cohort. We do this for those who earn median wages for their age and cohort and for those who earn 60 percent of the median, in each case beginning at age 20. The results can be previewed by saying that we find the expected loss in net Social Security benefits accompanying smoking to be very large relative to the other costs of smoking. The loss exceeds the lifetime costs of cigarettes, is large relative to the estimates of the medical costs and lost wages due to excess morbidity and mortality, and is perhaps 10 times greater than the corresponding Medicare figures of Wright.

Section 8.2 briefly reviews what is known about the effect of smoking on mortality. It discusses disease-specific effects and also our technique of using mortality ratios to yield approximate separate life tables for smokers and nonsmokers. Section 8.3 describes our simulation procedure for calculating the Social Security costs of smoking. It presents separate results for single individuals and for one-earner and two-earner couples because of their separate treatment by Social Security. We conclude the paper with an interpretation of what our findings imply about the private and social incentives to quit smoking.

8.2 Effect of Smoking on Mortality

There can be no statistical doubt that smoking is associated with increased mortality hazard rates. The overall finding of the 1979 Surgeon General's report on the subject was that the mortality of all male cigarette smokers is about 170 percent of that of male nonsmokers. For two-pack-a-day smokers, the average mortality ratio is 200 percent. For particular diseases the relative hazard is even greater. For example, two separate studies find smokers are between 9 and 15 times more likely than nonsmokers to die of lung cancer (Lubin et al. 1984; and Cowell and Hirst 1980). The risk of dying of arteriosclerotic and

degenerative heart disease and myocardial insufficiencies has been estimated at 2.7 times as great for smokers as nonsmokers (Cowell and Hirst 1980). There is further evidence that there is a significant interaction between smoking and other environmental factors, such as exposure to asbestos. The finding is that while smoking is a major cause of lung cancer, smoking combined with other assaults (such as industrial exposure) greatly increases the mortality hazards (Scheiderman and Levin 1977).

Our development of separate life tables for smokers and nonsmokers utilizes the findings of E. C. Hammond (1966) regarding the effect of smoking on mortality. Working for the American Cancer Society, he conducted a comprehensive four-year study tracking a population of over one million subjects. He determined the death rates and the prevalence of certain causes of death for smokers and nonsmokers of many different characteristics. The technique was to examine death certificates for the cause of death and to request information from the attending doctor whenever cancer was mentioned on the death certificate. Hammond's results are a very detailed set of mortality ratios[1] for different types of smokers and for several different causes of death.

In 1959 and 1960, Hammond enrolled over one million volunteers from twenty-five different states to provide data on mortality. Subjects were classified by sex, age, type of tobacco smoked (cigarette, cigar, pipe, or none), age at which subject began smoking, daily amount of smoking, and degree of smoke inhalation. Each subject was contacted annually for four years to track the number and timing of fatalities in each group. Death certificates were received for over 97 percent of reported deaths to provide better information as to causes of death.

Using the accumulated data, Hammond combined subjects with similar characteristics into five-year and ten-year age cohorts and divided the number of deaths in each cohort during the study period by the number of "person-years" experienced in each cohort. This provided cohort death rates over the period for groups of similar age and sex and varying smoking habits. This allowed Hammond to calculate mortality ratios for different groups. A sample of his findings is shown in table 8.1

The separate mortality tables that we have produced are contained in the appendix to this paper. The basic life tables used are the cohort life tables for men and women born in 1920, as estimated by the Social Security Administration. The mortality hazards are shown in column (8) of the appendix table for men and women. If we let $Q_A^m(a)$ represent the one-year death probability for males as a function of age (similarly $Q_A^w(a)$ for females), let $f^m(a)$ represent the fraction of men who smoke as a function of age, and $M^m(a)$ represent the mortality ratio of male smoker to nonsmoker as a function of age, then

Table 8.1 **Mortality Ratios for Smokers as Determined by E. C. Hammond**

Current Number Per Day	Age				
	35–44	45–54	55–64	65–74	75–84
	Men with History of Only Cigarette Smoking				
1–9	*	1.84	1.53	1.50	1.36
10–19	1.36	2.26	1.92	1.65	1.55
20–39	1.91	2.41	2.05	1.71	1.26
40+	2.59	2.76	2.26	1.81	*
	Women with History of Only Cigarette Smoking				
1–9	0.90	0.95	0.99	1.09	1.07
10–19	0.97	1.22	1.31	1.18	1.21
20–39	1.35	1.54	1.46	1.51	*
40+	*	1.96	*	*	*

Source: Hammond (1966), p. 133.

*Signifies a very low number of expected deaths (small sample or low death rate).

$$Q^m_{NS}(a) = \frac{Q^m_A(a)}{1 - f^m(a)[1 - M^m(a)]}$$

and

$$Q^m_S(a) = M^m(a) \times Q^m_{NS}(a),$$

where $Q^m_{NS}(a)$ is the annual death probability of male nonsmokers as a function of age and $Q^m_S(a)$ is the annual death probability for male smokers. The formulas for women are identical with all the superscripts changed to w's.

The appendix tables display the assumptions for $M^m(a)$ and $M^w(a)$ derived from Hammond (1966), and for $f^m(a)$ and $f^w(a)$ for the 1920 cohort derived from Harris (1983). They also show the results for $Q^m_{NS}(a)$, $Q^m_S(a)$, $Q^w_{NS}(a)$, and $Q^w_S(a)$. Table 8.2 offers some summary statistics based on these derived life tables.

Our life tables for the 1920 birth cohort show that 85,758 males and 88,787 females out of 100,000 births live to age 20. It is well known that smoking affects the mortality of women less than men. That is partially due to the fact that women smokers smoke less, inhale less, and are more likely to smoke filter cigarettes. Again, out of 100,000 births, 53,051 male smokers (who began smoking at age 20) survive until age 65, whereas 67,465 male nonsmokers survive until that traditional retirement age. Conditional on living to age 20, almost 79 percent of nonsmokers make it to 65, whereas slightly less than 62 percent of smokers do so. At age 20, male smokers have a life expectancy 6.4 years shorter than male nonsmokers, and a median age of death 7 years younger. Conditional on surviving to 65, male smokers have a remaining

Table 8.2 **Life Expectancy, Median Age at Death, And Surviving Population at Ages 20 and 65 for 1920 Birth Cohort**

	Survivors at Age 20 out of 100,000 Births	Survivors at Age 65 out of 100,000 Births	Life Expectancy Conditional on Age 20	Life Expectancy Conditional on Age 65	Median Age of Death Conditional on Age 20	Median Age of Death Conditional on Age 65
Men						
Smokers	85,758	53,051	68.7	78.8	70	77
Nonsmokers	85,758	67,465	75.1	81.5	77	81
Women						
Smokers	88,787	69,303	77.2	84.6	79	84
Nonsmokers	88,787	74,461	80.5	86.6	84	86

life expectancy which is 2.7 years less than their nonsmoking cohort members. The figures for women show that the life expectancy difference at age 20 is 3.3 years, while the difference at age 65 is 2 years.

Our life tables cannot sort out causality and correlation. It is certainly true that smokers would not become identical to nonsmokers if they stopped smoking. Smokers drink more alcohol than nonsmokers, have a higher incidence of suicide, and, in general, may face higher mortality risks than nonsmokers for reasons correlated with smoking but not caused by smoking per se. We have not been able to separate these effects, although it is our belief that most of the higher mortality risks faced by smokers are due directly to the cigarette consumption. However, it should be kept in mind when interpreting our results that we have attributed all of the mortality difference to the cigarette consumption.

8.3 Simulation of the Social Security Costs of Smoking

We examine the Social Security consequences of smoking for 100,000 men born in 1920 and 100,000 women born in 1923. The three-year difference approximates the average age gap in marriage for this cohort. The 1920 cohort life tables compiled by Social Security are taken to be applicable to the men and women in our study. We calculate the Social Security outcomes separately for single men, single women, and one-earner and two-earner couples. We assume that each person's probability of death is given by the life tables and, therefore, is independent of the status of the spouse. The number of women who become widowed in each year until the husbands retire is noted, and each "widow cohort" is then tracked as a separate population. This is necessary because at retirement widows must choose between a benefit based on their own work record and one based on that of their spouses.

In the case of the one-earner couples, we assume that the husband is employed until retirement or death. If the husband should die before retirement, the widow is assumed to work until retirement or death.

We have not been very sophisticated in developing our earnings profiles. The earnings series used are median earnings for men and women working full-time year-round, taken from the 1982 Census Bureau Current Population Report P-60, no. 142. Earnings before 1955 and 1982 are estimated using a related series from the Department of Labor's Employment, Hours, and Earnings Report. The earnings series are then adjusted to reflect a life-cycle pattern of lifetime earnings, using 1982 Census data on mean incomes for different age groups from Current Population Report P-60, no. 137. Our analysis for low-wage earners examines those who earn 60 percent of the median earnings profiles.

There are several factors which could be added to our earnings series. First, we do not take into account the effect of the increased morbidity of smokers on their earnings pattern. This is probably a relatively minor adjustment, but one which is conceptually desirable. Second, non-working wives entering the work force when widowed are assumed to immediately earn the median (or 60 percent of the median) amount for their age. This is certainly optimistic regarding their prospects. Finally, we do not take into account spells of unemployment, employment in the uncovered sector, or disability.

The surviving members of the cohort are assumed to retire at age 65 and begin to receive benefits based on the 1985 Social Security law. We assume that the initial benefit received is fully indexed for inflation for their remaining lives. The women in the simulations retire three years later, simply reflecting that they are three years younger than the men. Because the median earnings of men exceed those for women, the Social Security OASI benefit based on a man's earnings history exceeds the benefit based on a woman's work record. As a result, husbands and widowers will always elect to take their own benefit. Wives choose between their own benefit and one-half of their husband's, while widows may elect to receive their own benefit or the benefit which their husband would receive were he alive and had not worked since the year he actually died. In other words, a woman whose husband died in 1965 could take the benefit he would be receiving had he stopped working in 1965 and lived to receive his benefit, or she could take her own benefit. In the two-earner cohort, her benefit is based on her earnings from 1940 to her retirement in 1988, while in the one-earner cohort her benefit is based on a shorter work history, 1965–88, since we assume she only begins work upon her husband's death. This means that a widow's benefit may depend on when her husband died (and in the one-earner case must depend on it), necessitating our keeping track of the "widow cohorts" mentioned above.

Wives over the age of 65 whose husbands are still alive will always receive one-half of their husband's benefit in the one-earner family, since they have no earnings history of their own. In the two-earner family, since they have no earnings history of their own. In the two-earner case, wives will take their own benefit since their benefit exceeds half their husband's, given our earnings series. All benefits are calculated in real dollars, so comparison of 1985 and 1988 benefits is valid.

The results for singles are shown in table 8.3. All figures are stated in 1985 dollars, and the real discount rate used for cash flows occurring at other times is 3 percent. With those assumptions, the figures in the upper portion of the table for single men with median wage profiles in this cohort show that nonsmokers can expect to receive a net transfer from Social Security of $3,436, while the expected benefits received by smokers fall $17,782 short of the expected contributions. All of these figures are conditional on having survived to age 20. The Social Security cost of smoking for single men with median earnings patterns thus exceeds $21,000. The internal rate of return, which equates the expected value of payouts and payins, is 1.87 percent real for smokers and 3.17 percent for nonsmokers. If one only looked at those who survived until 65, the rates of return would naturally be higher. In that case, the real internal rate of return for median wage male smokers in this cohort is 3.18 percent, whereas the rate for nonsmokers is 3.78 percent. The dollar difference in the net transfer between male smokers and nonsmokers, conditional on surviving to 65, is still about $14,500.

Table 8.3 indicates that the Social Security cost of smoking is smaller for single women than for single men. In general single women get a higher rate of return from Social Security for two reasons. First, they have longer life expectancies, and, second, they have lower earnings and the system is progressive. Conditional on age 20, the difference in the net transfer to median wage women nonsmokers and smokers is slightly more than $9,000. The real internal rate of return for smoking women is 3.45 percent, while the figure is 3.87 percent for nonsmokers. Conditional on reaching age 65, the dollar difference between smoking and not is about $6500 for median wage single women.

The lower portion of table 8.3 shows the results for single individuals with earnings 60 percent of the median for their age and cohort. The loss due to smoking in the expected transfer from Social Security is almost $17,000 for men and $7,000 for women at this earnings level. We conclude that the Social Security cost of smoking is not terribly sensitive to earnings levels.

The corresponding results for one- and two-earner married couples with median earnings profiles are shown in table 8.4. One-earner couples receive larger transfers and a higher rate of return from Social Security because of the benefits received by the nonworking spouse.

Table 8.3 **Present Value of Social Security Benefits and Taxes (in 1985 dollars) and Internal Rate of Return to the Social Security Program for Members of the 1920 Birth Cohort, Single Men and Women**

	Expected Present Value of OASI Benefits	Expected Present Value of OASI Taxes	Net Expected Present Value	Net Present Value Conditional on Surviving until Age 65	Real Internal Rate of Return	Real Internal Rate of Return Conditional on Surviving until Age 65
			Median Earnings Profile			
Men						
Smokers	53,497	71,279	−17,782	3,721	1.87	3.18
Nonsmokers	79,436	76,000	3,436	18,218	3.17	3.78
Women						
Smokers	65,512	57,386	8,126	21,843	3.45	4.03
Nonsmokers	75,788	58,395	17,394	28,283	3.87	4.27
			Low (60% Median) Earnings Profile			
Men						
Smokers	41,378	50,342	8,964	8,918	2.25	3.57
Nonsmokers	61,441	53,433	8,008	20,130	3.53	4.15
Women						
Smokers	47,159	34,431	12,728	23,166	4.06	4.65
Nonsmokers	54,556	35,036	19,520	27,801	4.47	4.88

Table 8.4 **Present Value of Social Security Benefits and Taxes (in 1985 dollars) and Internal Rate of Return to the Social Security Program for Members of the 1920 Birth Cohort, Median Earnings Profile, One-Earner and Two-Earner Couples**

	Expected Present Value of OASI Benefits	Expected Present Value of OASI Taxes	Net Expected Present Value	Net Present Value Conditional on Surviving until Age 65	Real Internal Rate of Return	Real Internal Rate of Return Conditional on Surviving until Age 65
Married (one earner)						
Both smoke	118,223	79,466	38,757	81,270	4.40	5.41
Nonsmokers	149,229	81,004	68,225	95,872	5.14	5.63
Male smoker, female nonsmoker	128,748	79,722	49,026	95,123	4.67	5.67
Female smoker, male nonsmoker	139,353	80,860	58,493	87,010	4.93	5.43
Married (two earners)						
Both smoke	126,687	128,664	−1,977	38,639	2.95	3.87
Nonsmokers	162,985	134,395	28,590	56,371	3.68	4.18
Male smoker, female nonsmoker	138,313	129,673	8,640	48,103	3.22	4.04
Female smoker, male nonsmoker	151,494	133,386	18,108	48,402	3.46	4.05

Note: Figures are per household.

The Social Security expected cost of smoking is similar for couples in either circumstance. The net expected present value of participation in Social Security is $29,468 lower for one-earner couples who both smoke relative to one-earner couples where neither spouse smokes. If only the man smokes, the loss in the expected transfer from the system is $19,199, whereas if only the wife smokes the loss is $9,732, relative to a one-earner couple in which neither smokes. To put these figures in perspective, one might note that the median earnings of 64-year-old men in this cohort were $20,315. Thus, the Social Security loss for both smoking amounts to almost 1.5 years labor income. In fact, the loss is slightly greater than that given that Social Security benefits are taxed more favorably than labor income.

The numbers for two-earner couples are that their expected net Social Security transfer is $30,567 less if both spouses smoke than if neither does. The real internal rate of return for two-earner couples in which both smoke is 2.95 percent, whereas it is 3.68 percent if neither smokes. The cost of the husband only smoking is $19,950, and the cost of the wife only smoking is $10,482. For reference, the median annual earnings of women is about $12,500, so the loss if they both smoke is roughly equivalent to 2.4 years of the wife's earnings.

Table 8.5 contains the results for low-wage one- and two-earner couples. For one-earner couples, we find that the cost of both smoking is roughly $22,600. For two-earner couples, the cost of both smoking is $23,500. Once again, the cost is roughly twice as large for men as it is for women. The dollar costs to smoking are greater relative to earnings for low-wage households than for median earners.

The gain in Social Security benefits that accrue to the nonsmoker, or to the smoker who quits, represents an equal and opposite drain on Social Security funds. This drain is only partially offset by the increase in preretirement taxes paid by nonsmokers and ex-smokers in comparison with smokers, a substantially greater number of whom die prematurely. The potential cost to society, including the government, of a successful antismoking program has not gone unnoticed. In 1971, the British government, in response to a recommendation by the Royal College of Physicians to mount an antismoking campaign, estimated that such a campaign would save money in the short run. However, by the year 2000, they forecasted that a 40 percent reduction in cigarette smoking would result in a net loss to the government of 29 million pounds due to additional benefits received by surviving ex-smokers. The Congressional Office of Technology Assessment, in its recent report "Smoking-Related Death and Financial Costs" (Kronebusch 1985), indicated that, in the event of a reduction of smoking, "there will be some increase in revenues to the government and the Social Security and Medicare trust funds because people will be working more years.

Table 8.5 **Present Value of Social Security Benefits and Taxes (in 1985 dollars) and Internal Rate of Return to the Social Security Program for Members of the 1920 Birth Cohort, Low (60% Median) Earnings Profile, One-Earner and Two-Earner Couples**

	Expected Present Value of OASI Benefits	Expected Present Value of OASI Taxes	Net Expected Present Value	Net Present Value Conditional on Surviving until Age 65	Real Internal Rate of Return	Real Internal Rate of Return Conditional on Surviving until Age 65
Married (one earner)						
Both Smoke	91,761	55,146	36,614	70,896	4.78	5.81
Nonsmokers	115,531	56,327	59,204	81,313	5.50	5.99
Male smoker, female nonsmoker	99,952	55,300	44,652	79,101	5.05	6.07
Female smoker, male nonsmoker	107,878	56,241	51,637	74,672	5.29	5.79
Married (two earners)						
Both Smoke	96,843	84,772	12,071	45,609	3.47	4.43
Nonsmokers	124,085	88,469	35,616	58,131	4.18	4.70
Male smoker, female nonsmoker	105,689	85,378	20,311	52,959	3.74	4.61
Female smoker, male nonsmoker	115,429	87,864	27,566	52,003	3.97	4.56

Note: Figures are per household.

The increase in these revenues, however, may not equal the additional costs borne by these programs for the additional retirees" (p. 33). Limiting her attention to Medicare's hospital insurance fund, Wright (1986) has estimated that the individual 45-year-old male who quits smoking will cost the fund between $204 and $2,745.

We have emphasized the extent to which smoking reduces the expected value of Social Security payments below that of nonsmokers. We need to remember that because of the nature of the system, a drop in the number of smokers will provide a cost; every person who begins to smoke implicitly decreases the future liability of the system. The prevalence of smoking is an important factor in determining the financial viability of the system.

The percentage of U.S. adults who smoke has fallen drastically in the last 20 years. In 1965, 52 percent of men and 35 percent of women age 20 and older smoked; by 1983 the numbers fell to 35 percent and 30 percent, respectively (*Health United States* 1984). This should result in an increase in the average life span; since the majority of these people are below retirement age, we should expect retirees in the future to live longer on average than current retirees, who are already living longer than previous retirees due to the reduced use of cigarettes. A higher percentage of all workers will live to retirement; those who do will collect benefits for a longer period. This should be reflected in the demographic projections upon which Social Security taxes and benefits are based.

The trend toward fewer smokers has been a long one, especially among men. Unless that trend was adequately projected, we expect Social Security demographic projections to be too low. While the 1958 and 1966 Actuarial Studies by the Social Security Administration do a good job of predicting 1980 total population levels, they predict too high a number of young people and too low a number of retired persons. This implies offsetting errors, perhaps forecasting a longer "baby boom" than actually occurred and underestimating the additions to life expectancy, some of which can be attributed to lower smoking levels. This hurts the system twice; more retirees are currently drawing benefits than projected, and fewer workers will be paying taxes in the future than projected.

Our simulations suggest that each median-wage male smoker in the 1920 birth cohort roughly "saves" the Social Security system $20,000, and each median-wage female smoker saves $10,000. To get an approximate idea of the aggregate effect of smoking by members of this cohort on Social Security, we can multiply these saving figures by the number of smokers born in 1920. The result indicates that if no one had smoked in this cohort, the net transfer to this population from Social Security would have been $14.5 billion greater. As this reflects

only the change for those born in one year, one can easily see that the total impact of smoking on the financial circumstances of Social Security amounts to hundreds of billions of dollars.

While we by no means claim that reduction in smoking is responsible for all the gains in life expectancy achieved in recent years, we have demonstrated the enormous potential impact on the system of reductions in smoking rates. Changes in the prevalence of smoking should be included in the system's attempts to model future populations.

8.4 Conclusion

The body of literature discussing the economic costs of smoking has largely ignored private and social costs with regard to Social Security. Our analysis is a first step in estimating these costs, both in terms of net benefits to smokers and reduced payments by the system. We find that the expected loss caused by smoking from participation in Social Security is a large one from the individual's perspective. The loss for a median-wage male smoker is about $20,000, or about 11 months of earnings. The loss for median-wage women is approximately $10,000 or about 10 months of earnings. These losses are quite significant even compared to the health cost consequences of smoking. We also found that these losses are not very different for workers with lower wages.

The aggregate implications of our results are that smokers "save" the Social Security system hundreds of billions of dollars. Certainly this does not mean that decreased smoking would not be socially beneficial. In fact, it is probably one of the most cost-effective ways of increasing average longevity. It does indicate, however, that if people alter their behavior in a manner which extends life expectancy, then this must be recognized by our national retirement program. Looked at in this way, it is not surprising that the large potential for increasing life spans that reduced smoking offers has sizeable consequences for Social Security.

Appendix

Life Tables, by Sex and Smoking Status, for the 1920 Birth Cohort

Age (1)	Probability of Death within One Year: Total Pop. (2)	Probability of Death within One Year: Non-smokers (3)	Probability of Death within One Year: Smokers (4)	Survivors from 100,000 Births: Non-smokers (5)	Survivors from 100,000 Births: Smokers (6)	Fraction that Smoke (7)	Mortality Ratio (8)
A. Males							
20	.00244	.00230	.00253	85,758	85,758	0.60	1.10
21	.00265	.00250	.00275	85,560	85,540	0.60	1.10
22	.00287	.00271	.00298	85,346	85,305	0.60	1.10
23	.00353	.00333	.00366	85,115	85,051	0.60	1.10
24	.00369	.00348	.00383	84,832	84,739	0.60	1.10
25	.00360	.00340	.00374	84,536	94,415	0.60	1.10
26	.00231	.00218	.00240	84,249	84,100	0.60	1.10
27	.00217	.00205	.00225	84,066	83,898	0.60	1.10
28	.00210	.00198	.00218	83,894	83,709	0.60	1.10
29	.00206	.00194	.00214	83,727	83,527	0.60	1.10
30	.00213	.00164	.00246	83,565	83,348	0.60	1.50
31	.00222	.00171	.00256	83,428	83,143	0.60	1.50
32	.00227	.00175	.00262	83,285	82,930	0.60	1.50
33	.00232	.00178	.00268	83,140	82,713	0.60	1.50
34	.00230	.00177	.00265	82,991	82,492	0.60	1.50
35	.00243	.00157	.00300	82,845	82,273	0.60	1.91
36	.00256	.00166	.00316	82,714	82,026	0.60	1.91
37	.00288	.00186	.00356	82,577	81,766	0.60	1.91
38	.00311	.00201	.00384	82,424	81,475	0.60	1.91
39	.00337	.00218	.00416	82,258	81,162	0.60	1.91
40	.00375	.00243	.00463	82,078	80,824	0.60	1.91
41	.00411	.00266	.00508	81,879	80,450	0.60	1.91
42	.00451	.00292	.00557	81,662	80,041	0.60	1.91
43	.00501	.00324	.00619	81,423	79,595	0.60	1.91
44	.00557	.00360	.00688	81,160	79,103	0.60	1.91
45	.00608	.00329	.00794	80,867	78,558	0.60	2.41
46	.00681	.00369	.00889	80,601	77,935	0.60	2.41
47	.00746	.00404	.00974	80,303	77,242	0.60	2.41
48	.00842	.00456	.01099	79,979	76,490	0.60	2.41
49	.00904	.00490	.01181	79,614	75,649	0.60	2.41
50	.00972	.00527	.01269	79,224	74,756	0.60	2.41
51	.01033	.00568	.01370	78,807	73,807	0.58	2.41
52	.01125	.00629	.01515	78,359	72,797	0.56	2.41
53	.01196	.00679	.01636	77,867	71,694	0.54	2.41
54	.01272	.00734	.01769	77,338	70,521	0.52	2.41
55	.01340	.00879	.01801	76,770	69,273	0.50	2.05
56	.01422	.00945	.01938	76,096	68,025	0.48	2.05
57	.01495	.01008	.02067	75,376	66,707	0.46	2.05
58	.01598	.01093	.02241	74,616	65,328	0.44	2.05
59	.01702	.01181	.02421	73,801	63,865	0.42	2.05
60	.01845	.01299	.02664	72,929	62,318	0.40	2.05

(*continued*)

Life Tables, by Sex and Smoking Status, for the 1920 Birth Cohort

Age (1)	Probability of Death within One Year: Total Pop. (2)	Probability of Death within One Year: Non-smokers (3)	Probability of Death within One Year: Smokers (4)	Survivors from 100,000 Births: Non-smokers (5)	Survivors from 100,000 Births: Smokers (6)	Fraction that Smoke (7)	Mortality Ratio (8)
A. Males							
61	.01967	.01406	.02882	71,982	60,658	0.38	2.05
62	.02094	.01520	.03115	70,970	58,910	0.36	2.05
63	.02280	.01680	.03444	69,891	57,075	0.34	2.05
64	.02433	.01821	.03733	68,717	55,109	0.32	2.05
65	.02605	.02148	.03672	67,465	53,051	0.30	1.71
66	.02797	.02333	.03990	66,017	51,103	0.28	1.71
67	.03007	.02538	.04341	64,476	49,064	0.26	1.71
68	.03234	.02763	.04725	62,840	46,935	0.24	1.71
69	.03476	.03006	.05141	61,103	44,717	0.22	1.71
70	.03736	.03272	.05594	59,266	42,418	0.20	1.71
71	.04017	.03562	.06091	57,327	40,045	0.18	1.71
72	.04322	.03881	.06637	55,285	37,606	0.16	1.71
73	.04653	.04232	.07237	53,140	35,110	0.14	1.71
74	.05010	.04617	.07894	50,891	32,569	0.12	1.71
75	.05404	.05267	.06636	48,541	29,998	0.10	1.26
76	.05824	.05705	.07189	45,984	28,007	0.08	1.26
77	.06249	.06153	.07753	43,361	25,994	0.06	1.26
78	.06672	.06603	.08320	40,693	23,978	0.04	1.26
79	.07108	.07071	.08910	38,006	21,983	0.02	1.26
80	.07561	.07561	.07561	35,318	20,025	0.00	1.00
81	.08066	.08066	.08066	32,648	18,511	0.00	1.00
82	.08666	.08666	.08666	30,014	17,017	0.00	1.00
83	.09380	.09380	.09380	27,413	15,543	0.00	1.00
84	.10181	.10181	.10181	24,842	14,085	0.00	1.00
85	.11024	.11024	.11024	22,313	12,651	0.00	1.00
86	.11877	.11877	.11877	19,853	11,256	0.00	1.00
87	.12708	.12708	.12708	17,495	9,919	0.00	1.00
88	.13521	.13521	.13521	15,272	8,659	0.00	1.00
89	.14322	.14322	.14322	13,207	7,488	0.00	1.00
90	.15121	.15121	.15121	11,315	6,415	0.00	1.00
91	.15934	.15934	.15934	9,604	5,445	0.00	1.00
92	.16774	.16774	.16774	8,074	4,577	0.00	1.00
93	.17654	.17654	.17654	6,719	3,810	0.00	1.00
94	.18585	.18585	.18585	5,533	3,137	0.00	1.00
95	.19499	.19499	.19499	4,505	2,554	0.00	1.00
96	.20390	.20390	.20390	3,626	2,056	0.00	1.00
97	.21250	.21250	.21250	2,887	1,636	0.00	1.00
98	.22072	.22072	.22072	2,273	1,289	0.00	1.00
99	.22850	.22850	.22850	1,771	1,004	0.00	1.00
100	.23656	.23656	.23656	1,366	775	0.00	1.00
101	.24490	.24490	.24490	1,043	591	0.00	1.00
102	.25354	.25354	.25354	788	446	0.00	1.00

Life Tables, by Sex and Smoking Status, for the 1920 Birth Cohort

Age (1)	Probability of Death within One Year: Total Pop. (2)	Probability of Death within One Year: Non-smokers (3)	Probability of Death within One Year: Smokers (4)	Survivors from 100,000 Births: Non-smokers (5)	Survivors from 100,000 Births: Smokers (6)	Fraction that Smoke (7)	Mortality Ratio (8)
A. Males							
103	.26248	.26248	.26248	588	333	0.00	1.00
104	.27174	.27174	.27174	433	245	0.00	1.00
105	.28132	.28132	.28132	315	179	0.00	1.00
106	.29125	.29125	.29125	227	128	0.00	1.00
107	.30154	.30154	.30154	160	91	0.00	1.00
108	.31218	.31218	.31218	112	63	0.00	1.00
109	.32320	.32320	.32320	77	43	0.00	1.00
110	.33461	.33461	.33461	52	29	0.00	1.00
111	.34643	.34643	.34643	34	19	0.00	1.00
112	.35867	.35867	.35867	22	12	0.00	1.00
113	.37135	.37135	.37135	14	8	0.00	1.00
114	.38448	.38448	.38448	9	5	0.00	1.00
115	.39806	.39806	.39806	5	3	0.00	1.00
116	.41213	.41213	.41213	3	1	0.00	1.00
117	.42671	.42671	.42671	1	1	0.00	1.00
118	.44180	.44180	.44180	1	0	0.00	1.00
119	.45743	.45743	.45743	0	0	0.00	1.00
120	.50000	.50000	.50000	0	0	0.00	1.00
B. Females							
17	.00195	.00191	.00201	88,787	88,787	0.40	1.05
18	.00191	.00187	.00197	88,617	88,608	0.40	1.05
19	.00187	.00183	.00193	88,451	88,434	0.40	1.05
20	.00191	.00187	.00197	88,289	88,264	0.40	1.05
21	.00192	.00188	.00198	88,123	88,090	0.40	1.05
22	.00190	.00186	.00196	87,957	87,916	0.40	1.05
23	.00190	.00186	.00196	87,794	87,744	0.40	1.05
24	.00182	.00178	.00187	87,630	87,573	0.40	1.05
25	.00171	.00168	.00176	87,474	87,409	0.40	1.05
26	.00163	.00160	.00168	87,327	87,255	0.40	1.05
27	.00156	.00153	.00161	87,188	87,108	0.40	1.05
28	.00145	.00142	.00149	87,054	86,968	0.40	1.05
29	.00143	.00140	.00147	86,930	86,839	0.40	1.05
30	.00143	.00130	.00163	86,809	86,711	0.40	1.25
31	.00146	.00133	.00166	86,696	86,570	0.40	1.25
32	.00148	.00135	.00168	86,581	86,426	0.40	1.25
33	.00149	.00135	.00169	86,464	86,281	0.40	1.25
34	.00149	.00135	.00169	86,347	86,135	0.40	1.25
35	.00158	.00139	.00187	86,230	85,989	0.40	1.35
36	.00166	.00146	.00197	86,111	85,828	0.40	1.35
37	.00188	.00165	.00223	85,985	85,659	0.40	1.35
38	.00196	.00172	.00232	85,843	85,469	0.40	1.35

(continued)

Life Tables, by Sex and Smoking Status, for the 1920 Birth Cohort

Age (1)	Probability of Death within One Year: Total Pop. (2)	Probability of Death within One Year: Non-smokers (3)	Probability of Death within One Year: Smokers (4)	Survivors from 100,000 Births: Non-smokers (5)	Survivors from 100,000 Births: Smokers (6)	Fraction that Smoke (7)	Mortality Ratio (8)
B. Females							
39	.00208	.00182	.00246	85,696	85,270	0.40	1.35
40	.00235	.00206	.00278	85,539	85,060	0.40	1.35
41	.00246	.00216	.00291	85,363	84,823	0.40	1.35
42	.00273	.00239	.00323	85,179	84,576	0.40	1.35
43	.00301	.00264	.00356	84,975	84,303	0.40	1.35
44	.00324	.00284	.00384	84,750	84,002	0.40	1.35
45	.00359	.00295	.00455	84,510	83,680	0.40	1.54
46	.00393	.00323	.00498	84,260	83,300	0.40	1.54
47	.00422	.00347	.00534	83,988	82,885	0.40	1.54
48	.00467	.00384	.00591	83,696	82,442	0.40	1.54
49	.00487	.00400	.00617	83,375	81,954	0.40	1.54
50	.00528	.00434	.00669	83,041	81,449	0.40	1.54
51	.00556	.00459	.00707	82,680	80,904	0.39	1.54
52	.00577	.00481	.00741	82,301	80,332	0.37	1.54
53	.00624	.00522	.00805	81,905	79,737	0.36	1.54
54	.00652	.00548	.00844	81,477	79,096	0.35	1.54
55	.00686	.00596	.00870	81,030	78,428	0.33	1.46
56	.00726	.00633	.00924	80,548	77,746	0.32	1.46
57	.00760	.00665	.00971	80,038	77,027	0.31	1.46
58	.00813	.00717	.01047	79,505	76,279	0.29	1.46
59	.00862	.00764	.01115	78,935	75,481	0.28	1.46
60	.00954	.00849	.01239	78,332	74,639	0.27	1.46
61	.01030	.00924	.01349	77,668	73,714	0.25	1.46
62	.01099	.00990	.01445	76,950	72,720	0.24	1.46
63	.01214	.01098	.01603	76,189	71,669	0.23	1.46
64	.01297	.01183	.01727	75,352	70,520	0.21	1.46
65	.01393	.01264	.01909	74,461	69,303	0.20	1.51
66	.01499	.01367	.02064	73,520	67,980	0.19	1.51
67	.01609	.01481	.02236	72,515	66,577	0.17	1.51
68	.01719	.01589	.02400	71,441	65,089	0.16	1.51
69	.01829	.01699	.02566	70,306	63,527	0.15	1.51
70	.01948	.01827	.02759	69,111	61,897	0.13	1.51
71	.02079	.01959	.02958	67,849	60,189	0.12	1.51
72	.02219	.02101	.03173	66,519	58,409	0.11	1.51
73	.02368	.02264	.03419	65,122	56,556	0.09	1.51
74	.02532	.02433	.03673	63,647	54,622	0.08	1.51
75	.02723	.02676	.03345	62,099	52,615	0.07	1.25
76	.02938	.02902	.03627	60,437	50,855	0.05	1.25
77	.03167	.03136	.03920	58,683	49,011	0.04	1.25
78	.03407	.03390	.04238	56,843	47,090	0.02	1.25
79	.03672	.03663	.04579	54,916	45,094	0.01	1.25
80	.03969	.03969	.03969	52,905	43,030	0.00	1.00

Life Tables, by Sex and Smoking Status, for the 1920 Birth Cohort

Age (1)	Probability of Death within One Year: Total Pop. (2)	Non-smokers (3)	Smokers (4)	Survivors from 100,000 Births: Non-smokers (5)	Smokers (6)	Fraction that Smoke (7)	Mortality Ratio (8)
B. Females							
81	.04321	.04321	.04321	50,805	41,322	0.00	1.00
82	.04750	.04750	.04750	48,610	39,536	0.00	1.00
83	.05268	.05268	.05268	46,301	37,658	0.00	1.00
84	.05866	.05866	.05866	43,861	35,674	0.00	1.00
85	.06522	.06522	.06522	41,289	33,582	0.00	1.00
86	.07222	.07222	.07222	38,596	31,391	0.00	1.00
87	.07956	.07956	.07956	35,808	29,124	0.00	1.00
88	.08723	.08723	.08723	32,959	26,807	0.00	1.00
89	.09529	.09529	.09529	30,084	24,469	0.00	1.00
90	.10380	.10380	.10380	27,217	22,137	0.00	1.00
91	.11285	.11285	.11285	24,392	19,839	0.00	1.00
92	.12251	.12251	.12251	21,640	17,600	0.00	1.00
93	.13285	.13285	.13285	18,988	15,444	0.00	1.00
94	.14392	.14392	.14392	16,466	13,392	0.00	1.00
95	.15480	.15480	.15480	14,096	11,465	0.00	1.00
96	.16527	.16527	.16527	11,914	9,690	0.00	1.00
97	.17517	.17517	.17517	9,945	8,088	0.00	1.00
98	.18429	.18429	.18429	8,203	6,671	0.00	1.00
99	.19243	.19243	.19243	6,691	5,442	0.00	1.00
100	.20095	.20095	.20095	5,403	4,395	0.00	1.00
101	.20984	.20984	.20984	4,317	3,511	0.00	1.00
102	.21912	.21912	.21912	3,411	2,774	0.00	1.00
103	.22881	.22881	.22881	2,664	2,166	0.00	1.00
104	.23893	.23893	.23893	2,054	1,671	0.00	1.00
105	.24949	.24949	.24949	1,563	1,271	0.00	1.00
106	.26054	.26054	.26054	1,173	954	0.00	1.00
107	.27207	.27207	.27207	867	705	0.00	1.00
108	.28411	.28411	.28411	631	513	0.00	1.00
109	.29668	.29668	.29668	452	367	0.00	1.00
110	.30981	.30981	.30981	318	258	0.00	1.00
111	.32353	.32353	.32353	219	178	0.00	1.00
112	.33785	.33785	.33785	148	120	0.00	1.00
113	.35281	.35281	.35281	98	79	0.00	1.00
114	.36842	.36842	.36842	63	51	0.00	1.00
115	.38474	.38474	.38474	40	32	0.00	1.00
116	.40178	.40178	.40178	24	20	0.00	1.00
117	.41958	.41958	.41958	14	12	0.00	1.00
118	.43816	.43816	.43816	8	6	0.00	1.00
119	.45743	.45743	.45743	4	3	0.00	1.00
120	.50000	.50000	.50000	2	2	0.00	1.00

Note

1. A mortality ratio is the death rate of smokers divided by the death rate of nonsmokers of similar age and sex.

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Comment Paul Taubman

Shoven, Sundberg, and Bunker have opened up a new area of study by examining the cost to smokers of being enrolled in the Social Security system. The cost arises because Social Security stops paying

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you when you die (though your spouse may still draw some of your benefits), and smokers die earlier. That smokers die earlier is well documented,[1] though it is an open question whether cigarette smoking *causes* the earlier death.

My comments will address the issue of how we might improve Shoven et al.'s estimates and also whether we should be "taxing" smokers. Their estimates essentially use previously collected information on (1) life tables of smokers and nonsmokers and (2) typical earnings of individuals to (3) calculate the expected Social Security benefits of smokers and nonsmokers. Both of the two pieces of information have some loose ends associated with them.

The life table for smokers and nonsmokers is based on Hammond's 1966 study which calculates death rates by age in the early 1960s. Let us accept the proposition that Hammond's results provide good estimates for the early 1960s. Since then age-specific death rates have declined markedly, and his relative death rates need not apply in the 1980s when the authors make their calculations. To illustrate this point, consider the effect of education on death rates among older males. Using death data matched to the 1960 Census, Kitagawa and Hauser (1973) found no difference among the variously educated groups. Using the 1973 CPS–Social Security Exact Match sample, which takes death information from Social Security records, Rosen and Taubman (1984) found the more educated had a 20–25 percent advantage over the least educated and that this differential persisted amoung those aged 78 and over, which is the remainder of the group studied by Kitagawa and Hauser. A more recent set of life tables based on smoking might yield different results than Hammond's, especially since work by Behrman, Sickles, and Taubman (1987) using time-series data for the period 1954–69 finds a life expectancy differential for smokers only about one-half as large as those found in Hammond, though Behrman, Sickles, and Taubman's work is based on a nonrandom sample.

The earnings data used may also be inappropriate given the structure of Social Security's benefit plan and the possibility that smoking affects labor market supply via morbidity. Some estimates that were based on actual earnings data of smokers and nonsmokers would be helpful. In any event, to sharpen the estimates by marital status which is related to labor supply, information on actual earnings histories or on benefits paid would be useful. Such information exists, though the smoking information may be suspect.

Next, let us turn to the question: Is it fair to tax cigarette smokers? Of course, a cigarette excise tax already exists which is often justified on the grounds of improving health, presumably a public policy based on the grounds that smokers are myopic. There are reasons to tax smokers. We, as taxpayers, help pay some of the medical bills of cigarette

smokers if they are sicker than the rest of the population or if they are hospitalized at younger ages, both of which seem plausible. Finally, if passive smoking harms the nonsmoker, a still open question, then there is a market failure, which could be corrected by a "tax." Is the tax contained in the Social Security system optimal for this purpose? I don't know.

There is also a question of whether the Social Security system should be thought of as an annuity as the authors do in their analysis. There is no question that Social Security looks like an annuity, though the premium and benefit schedules are much different than the private one I invest in for retirement. Congress, however, now seems mostly concerned with using the Social Security system to provide a socially adequate standard of living to the elderly. Surely we can find a social welfare function consistent with this notion, and then the fact that smokers are penalized as annuitants doesn't matter as long as they receive a socially adequate income while alive. Perhaps this income level varies by smoking status, but I don't know if smoking costs are greater than substitutes such as candy used by nonsmokers.

Finally, one may ask whether the mandatory nature of Social Security is important or whether we could get to a voluntary first-best solution with private markets allowing for different life expectancies. Work by Rothschild and Stiglitz (1976) suggests a stable voluntary equilibrium may not be possible, though I hasten to add that some current life insurance policies take not smoking into account, and that insurance market seems to be functioning. But it may be that a voluntary annuity market with different life expectancies wouldn't work. We may need to have policies with one life expectancy used and force some people to make a bad buy.

Note

1. See the references given by Shoven, Sundberg, and Bunker in this paper and those in Behrman, Sickles, and Taubman (1987).

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