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THE SOCIAL SECURITY COST OF SMOKING

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ABSTRACT

Our paper is an examination of the Social Security cost of smoking from an individual point of view. It is well known that smokers have a shorter life expectancy than nonsmokers. This means that by smoking they are giving up potential Social Security benefits. We estimate this cost and consider the effects on the system as a whole.

We use mortality ratios, which relate the annual death probabilities of smokers and nonsmokers, and the percentage of smokers in each age group to break down the life tables for men and women born in 1920 into the approximate life tables for smokers and nonsmokers. We then calculate expected Social Security taxes and benefits for each group, using median earnings as a base. We find that smoking costs men about $20,000 and women about $10,000 in expected net benefits.

The implication of this for the system as a whole is that the prevalence of smoking has a direct effect on the financial viability of the system; every decrease in the number of smokers in society increases the system's liability. Changes in smoking behavior should be recognized as affecting the system.

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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 life time, 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 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 et al. (1983) estimated that the savings realized by Ford Motor Company if the health of their employees improved (in terms of less expensive medical insurance, disability insurance, and life insurance) would be much smaller than the additional pension costs due to their increased longevity. Atkinson and Townsend (1971) noted that the financial benefits the British National Health Service would enjoy if there was a forty 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, and 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 Office of Technology Assessment (1985) estimated that 273,000 people died in the United States in 1982 of smoking related disease. 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 spouse may collect widow'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 OASI, it is probably worth noting that the health insurance 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 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 benefits financially from the fewer numbers of elderly due to smoking. The other side of the coin is that smokers, as with their retirement benefits, pay while they work for old age health insurance which they are less likely to collect, or 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 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 ten times greater than the corresponding Medicare figures of Wright.

The next section of the paper 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. The third section of the paper describes our simulation procedure for calculating the Social Security costs of smoking. It presents separate results for single individuals, 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.

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 arterosclerotic 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 (Schneiderman and Levin (1974).

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 determines 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% 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 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),

Table 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	*	*	*

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

SOURCE: Hammond, p.133.

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

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

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 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 67,464 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

Table 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

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 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.

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 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 their 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 spouse. 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 Census Bureau Current Population Report P-60, No. 142 (1982). 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 Census data on mean incomes for different age groups from 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, nonworking wives entering the workforce 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 life. 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 - 1988, 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 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 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

Table 3

Present Value of Social Security Benefits and Taxes (in 1985 $)
And Internal Rate of Return to the Social Security Program
For Members of the 1920 Birth Cohort

	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

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 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 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 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. The Social Security expected cost of smoking is similar for couples in either circumstance. The net

Table 4

Present Value of Social Security Benefits and Taxes (in 1985 $)
And Internal Rate of Return to the Social Security Program
For Members of the 1920 Birth Cohort

Median Earnings Profile

	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	92,123	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.

expected present value of participation in Social Security is $29,467 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 in 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 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 $22,500. 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

Table 5

Present Value of Social Security Benefits and Taxes (in 1985 $)
And Internal Rate of Return to the Social Security Program
For Members of the 1920 Birth Cohort

Low (60% Median) Earnings Profile

	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.

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 anti-smoking program has not gone unnoticed. In 1971, the British government, in response to a recommendation by the Royal College of Physicians to mount an anti-smoking 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," 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. The increase in these revenues, however, may not equal the additional costs borne by these programs for the additional retirees." Limiting her attention to Medicare's hospital insurance fund, Wright (1986) has estimated that the individual forty-five 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% of men and 35% of women age 20 and older smoked; by 1983 the numbers fell to 35% and 30% respectively (Health United States, 1984).

This should result in an increase in the average lifespan; 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 the 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.

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 lifespans that reduced smoking offers, has sizable consequences for Social Security.

Appendix

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

1. Males

Age (1)	Probability of Death Within One Year: Total Pop. (2)	Nonsmokers (3)	Smokers (4)	Survivors from 100,000 Births: Nonsmokers (5)	Smokers (6)	Fraction That Smoke (7)	Mortality Ratio (8)
20	.00244	.00230	.00253	85758	85758	0.60	1.10
21	.00265	.00250	.00275	85560	85540	0.60	1.10
22	.00287	.00271	.00298	85346	85305	0.60	1.10
23	.00353	.00333	.00366	85115	85051	0.60	1.10
24	.00369	.00348	.00383	84832	84739	0.60	1.10
25	.00360	.00340	.00374	84536	94415	0.60	1.10
26	.00231	.00218	.00240	84249	84100	0.60	1.10
27	.00217	.00205	.00225	84066	83898	0.60	1.10
28	.00210	.00198	.00218	83894	83709	0.60	1.10
29	.00206	.00194	.00214	83727	83527	0.60	1.10
30	.00213	.00164	.00246	83565	83348	0.60	1.50
31	.00222	.00171	.00256	83428	83143	0.60	1.50
32	.00227	.00175	.00262	83285	82930	0.60	1.50
33	.00232	.00178	.00268	83140	82713	0.60	1.50
34	.00230	.00177	.00265	82991	82492	0.60	1.50
35	.00243	.00157	.00300	82845	82273	0.60	1.91
36	.00256	.00166	.00316	82714	82026	0.60	1.91
37	.00288	.00186	.00356	82577	81766	0.60	1.91
38	.00311	.00201	.00384	82424	81475	0.60	1.91
39	.00337	.00218	.00416	82258	81162	0.60	1.91
40	.00375	.00243	.00463	82078	80824	0.60	1.91
41	.00411	.00266	.00508	81879	80450	0.60	1.91
42	.00451	.00292	.00557	81662	80041	0.60	1.91
43	.00501	.00324	.00619	81423	79595	0.60	1.91
44	.00557	.00360	.00688	81160	79103	0.60	1.91
45	.00608	.00329	.00794	80867	78558	0.60	2.41
46	.00681	.00369	.00889	80601	77935	0.60	2.41
47	.00746	.00404	.00974	80303	77242	0.60	2.41
48	.00842	.00456	.01099	79979	76490	0.60	2.41
49	.00904	.00490	.01181	79614	75649	0.60	2.41
50	.00972	.00527	.01269	79224	74756	0.60	2.41
51	.01033	.00568	.01370	78807	73807	0.58	2.41
52	.01125	.00629	.01515	78359	72797	0.56	2.41
53	.01196	.00679	.01636	77867	71694	0.54	2.41
54	.01272	.00734	.01769	77338	70521	0.52	2.41
55	.01340	.00879	.01801	76770	69273	0.50	2.05
56	.01422	.00945	.01938	76096	68025	0.48	2.05
57	.01495	.01008	.02067	75376	66707	0.46	2.05
58	.01598	.01093	.02241	74616	65328	0.44	2.05
59	.01702	.01181	.02421	73801	63865	0.42	2.05
60	.01845	.01299	.02664	72929	62318	0.40	2.05
61	.01967	.01406	.02882	71982	60658	0.38	2.05
62	.02094	.01520	.03115	70970	58910	0.36	2.05

63	.02280	.01680	.03444	69891	57075	0.34	2.05
64	.02433	.01821	.03733	68717	55109	0.32	2.05
65	.02605	.02148	.03672	67465	53051	0.30	1.71
66	.02797	.02333	.03990	66017	51103	0.28	1.71
67	.03007	.02538	.04341	64476	49064	0.26	1.71
68	.03234	.02763	.04725	62840	46935	0.24	1.71
69	.03476	.03006	.05141	61103	44717	0.22	1.71
70	.03736	.03272	.05594	59266	42418	0.20	1.71
71	.04017	.03562	.06091	57327	40045	0.18	1.71
72	.04322	.03881	.06637	55285	37606	0.16	1.71
73	.04653	.04232	.07237	53140	35110	0.14	1.71
74	.05010	.04617	.07894	50891	32569	0.12	1.71
75	.05404	.05267	.06636	48541	29998	0.10	1.26
76	.05824	.05705	.07189	45984	28007	0.08	1.26
77	.06249	.06153	.07753	43361	25994	0.06	1.26
78	.06672	.06603	.08320	40693	23978	0.04	1.26
79	.07108	.07071	.08910	38006	21983	0.02	1.26
80	.07561	.07561	.07561	35318	20025	0.00	1.00
81	.08066	.08066	.08066	32648	18511	0.00	1.00
82	.08666	.08666	.08666	30014	17017	0.00	1.00
83	.09380	.09380	.09380	27413	15543	0.00	1.00
84	.10181	.10181	.10181	24842	14085	0.00	1.00
85	.11024	.11024	.11024	22313	12651	0.00	1.00
86	.11877	.11877	.11877	19853	11256	0.00	1.00
87	.12708	.12708	.12708	17495	9919	0.00	1.00
88	.13521	.13521	.13521	15272	8659	0.00	1.00
89	.14322	.14322	.14322	13207	7488	0.00	1.00
90	.15121	.15121	.15121	11315	6415	0.00	1.00
91	.15934	.15934	.15934	9604	5445	0.00	1.00
92	.16774	.16774	.16774	8074	4577	0.00	1.00
93	.17654	.17654	.17654	6719	3810	0.00	1.00
94	.18585	.18585	.18585	5533	3137	0.00	1.00
95	.19499	.19499	.19499	4505	2554	0.00	1.00
96	.20390	.20390	.20390	3626	2056	0.00	1.00
97	.21250	.21250	.21250	2887	1636	0.00	1.00
98	.22072	.22072	.22072	2273	1289	0.00	1.00
99	.22850	.22850	.22850	1771	1004	0.00	1.00
100	.23656	.23656	.23656	1366	775	0.00	1.00
101	.24490	.24490	.24490	1043	591	0.00	1.00
102	.25354	.25354	.25354	788	446	0.00	1.00
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

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2. Females

Age (1)	Probability of Death Within One Year: Total Pop. (2)	Nonsmokers (3)	Smokers (4)	Survivors from 100,000 Births: Nonsmokers (5)	Smokers (6)	Fraction That Smoke (7)	Mortality Ratio (8)
17	.00195	.00191	.00201	88787	88787	0.40	1.05
18	.00191	.00187	.00197	88617	88608	0.40	1.05
19	.00187	.00183	.00193	88451	88434	0.40	1.05
20	.00191	.00187	.00197	88289	88264	0.40	1.05
21	.00192	.00188	.00198	88123	88090	0.40	1.05
22	.00190	.00186	.00196	87957	87916	0.40	1.05
23	.00190	.00186	.00196	87794	87744	0.40	1.05
24	.00182	.00178	.00187	87630	87573	0.40	1.05
25	.00171	.00168	.00176	87474	87409	0.40	1.05
26	.00163	.00160	.00168	87327	87255	0.40	1.05
27	.00156	.00153	.00161	87188	87108	0.40	1.05
28	.00145	.00142	.00149	87054	86968	0.40	1.05
29	.00143	.00140	.00147	86930	86839	0.40	1.05
30	.00143	.00130	.00163	86809	86711	0.40	1.25
31	.00146	.00133	.00166	86696	86570	0.40	1.25
32	.00148	.00135	.00168	86581	86426	0.40	1.25
33	.00149	.00135	.00169	86464	86281	0.40	1.25
34	.00149	.00135	.00169	86347	86135	0.40	1.25
35	.00158	.00139	.00187	86230	85989	0.40	1.35
36	.00166	.00146	.00197	86111	85828	0.40	1.35
37	.00188	.00165	.00223	85985	85659	0.40	1.35
38	.00196	.00172	.00232	85843	85469	0.40	1.35
39	.00208	.00182	.00246	85696	85270	0.40	1.35
40	.00235	.00206	.00278	85539	85060	0.40	1.35
41	.00246	.00216	.00291	85363	84823	0.40	1.35
42	.00273	.00239	.00323	85179	84576	0.40	1.35
43	.00301	.00264	.00356	84975	84303	0.40	1.35
44	.00324	.00284	.00384	84750	84002	0.40	1.35
45	.00359	.00295	.00455	84510	83680	0.40	1.54
46	.00393	.00323	.00498	84260	83300	0.40	1.54
47	.00422	.00347	.00534	83988	82885	0.40	1.54
48	.00467	.00384	.00591	83696	82442	0.40	1.54
49	.00487	.00400	.00617	83375	81954	0.40	1.54
50	.00528	.00434	.00669	83041	81449	0.40	1.54
51	.00556	.00459	.00707	82680	80904	0.39	1.54
52	.00577	.00481	.00741	82301	80332	0.37	1.54
53	.00624	.00522	.00805	81905	79737	0.36	1.54
54	.00652	.00548	.00844	81477	79096	0.35	1.54
55	.00686	.00596	.00870	81030	78428	0.33	1.46
56	.00726	.00633	.00924	80548	77746	0.32	1.46
57	.00760	.00665	.00971	80038	77027	0.31	1.46
58	.00813	.00717	.01047	79505	76279	0.29	1.46

59	.00862	.00764	.01115	78935	75481	0.28	1.46
60	.00954	.00849	.01239	78332	74639	0.27	1.46
61	.01030	.00924	.01349	77668	73714	0.25	1.46
62	.01099	.00990	.01445	76950	72720	0.24	1.46
63	.01214	.01098	.01603	76189	71669	0.23	1.46
64	.01297	.01183	.01727	75352	70520	0.21	1.46
65	.01393	.01264	.01909	74461	69303	0.20	1.51
66	.01499	.01367	.02064	73520	67980	0.19	1.51
67	.01609	.01481	.02236	72515	66577	0.17	1.51
68	.01719	.01589	.02400	71441	65089	0.16	1.51
69	.01829	.01699	.02566	70306	63527	0.15	1.51
70	.01948	.01827	.02759	69111	61897	0.13	1.51
71	.02079	.01959	.02958	67849	60189	0.12	1.51
72	.02219	.02101	.03173	66519	58409	0.11	1.51
73	.02368	.02264	.03419	65122	56556	0.09	1.51
74	.02532	.02433	.03673	63647	54622	0.08	1.51
75	.02723	.02676	.03345	62099	52615	0.07	1.25
76	.02938	.02902	.03627	60437	50855	0.05	1.25
77	.03167	.03136	.03920	58683	49011	0.04	1.25
78	.03407	.03390	.04238	56843	47090	0.02	1.25
79	.03672	.03663	.04579	54916	45094	0.01	1.25
80	.03969	.03969	.03969	52905	43030	0.00	1.00
81	.04321	.04321	.04321	50805	41322	0.00	1.00
82	.04750	.04750	.04750	48610	39536	0.00	1.00
83	.05268	.05268	.05268	46301	37658	0.00	1.00
84	.05866	.05866	.05866	43861	35674	0.00	1.00
85	.06522	.06522	.06522	41289	33582	0.00	1.00
86	.07222	.07222	.07222	38596	31391	0.00	1.00
87	.07956	.07956	.07956	35808	29124	0.00	1.00
88	.08723	.08723	.08723	32959	26807	0.00	1.00
89	.09529	.09529	.09529	30084	24469	0.00	1.00
90	.10380	.10380	.10380	27217	22137	0.00	1.00
91	.11285	.11285	.11285	24392	19839	0.00	1.00
92	.12251	.12251	.12251	21640	17600	0.00	1.00
93	.13285	.13285	.13285	18988	15444	0.00	1.00
94	.14392	.14392	.14392	16466	13392	0.00	1.00
95	.15480	.15480	.15480	14096	11465	0.00	1.00
96	.16527	.16527	.16527	11914	9690	0.00	1.00
97	.17517	.17517	.17517	9945	8088	0.00	1.00
98	.18429	.18429	.18429	8203	6671	0.00	1.00
99	.19243	.19243	.19243	6691	5442	0.00	1.00
100	.20095	.20095	.20095	5403	4395	0.00	1.00
101	.20984	.20984	.20984	4317	3511	0.00	1.00
102	.21912	.21912	.21912	3411	2774	0.00	1.00
103	.22881	.22881	.22881	2664	2166	0.00	1.00
104	.23893	.23893	.23893	2054	1671	0.00	1.00
105	.24949	.24949	.24949	1563	1271	0.00	1.00
106	.26054	.26054	.26054	1173	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

Footnotes

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

References

Atkinson, A. and Townsend, J. 1977. "Economic Aspects of Reduced Smoking," Lancet, 492-495 (September 3).

Census Bureau 1982. Current Population Report P-60 No. 137.

Census Bureau 1982. Current Population Report P-60 No. 142.

Cowell, M. and Hirst, B. 1980. "Mortality Differences Between Smokers and Nonsmokers," Soc. Actuaries Transact. 32:185-213.

Gori, G. and B. Richter 1978. "Macroeconomics of Disease Prevention in the United States," Science 200:1124-1130, June 9.

Gori, G., B. Richter, and W. Yu 1984. "Economics and Extended Longevity - A Case Study," Preventive Medicine 13(4):396-410.

Hammond, E. C. 1966. "Smoking in Relation to the Death Rates of One Million Men and Women," In Epidemiological Study of Cancer and Other Chronic Diseases. National Cancer Institute Monograph 19, 127-204.

Harris, Jeffrey 1983. "Cigarette Smoking Among Successive Birth Cohorts of Men and Women in the United States During 1900-80, Journal of the National Cancer Institute, 71(3):473-479 (September).

Kronebusch, Karl 1985. Smoking-Related Death and Financial Costs, Preliminary Draft, Office of Technology Assessment.

Lubin, Blot, Berrino, Flamant, Gillis, Kunze, Schmahl, and Visco 1984. "Patterns of Lung Cancer Risk According to Type of Cigarette Smoked," International Journal of Cancer 33:569-576.

Oster, Colditz, and Kelly 1984. The Economic Costs of Smoking and Benefits of Quitting, Lexington Books, D. C. Heath & Co., Lexington, MA.

Rogot, Eugene 1974. "Smoking and Mortality Among U.S. Veterans, Journal of Chronic Disability 27:189-203.

Scheiderman, M. and D. Levin 1972. "Trends in Lung Cancer," Cancer 30(5):1320-1325 (November).

Warner, K. and H. Murt 1984. "Economic Incentives for Health," Ann. Rev. Public Health 5:107-133.

Wright, Virginia 1986. "Will Quitting Smoking Help Medicare Solve Its Financial Problems?" Inquiry 23:76-82 (Spring).