

Some notes on loss of expectation of life

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Expectation of life as a concept

Estimates of expectation of life are commonly used by insurance companies. The estimate tries to answer the question "How long on average will a person of age x today live to?" To do this involves predicting the future from past knowledge. A commonly used estimate is calculated by applying in turn current age-specific mortality rates for each successive age from x onwards. However this assumes, for example, that an estimate of dying at the age of 80 taken from current figures, say 1975, i.e. an estimate related to the cohort born in 1895, is applicable to later cohorts, born at any time up to age 1975. Clearly, one might expect the later cohorts to be better off. If this is so, then the estimates will be under-estimates. The insurance companies will be alright as people will pay premiums for longer but the possibility of bias in comparing smokers and non-smokers should be borne in mind.

Source of mortality rate information on smokers and non-smokers

The most extensive study of mortality is Hammond's, and there are in fact no reliable English estimates comparing the mortality of smokers and non-smokers by age group. The Doll and Hill study deals with doctors and therefore is of doubtful validity for the population at large. Although Hammond's study population was not completely typical of the U.S. population; he was able to produce corrected estimates by age of the death rate of non-smokers and smokers by amount smoked adjusted to the 1959-61 U.S. life table for all males. Most workers quoting loss of life-expectation have used Hammond's figures, though clearly the real answer for England may be different.

Traps to be avoided

One knows, from Hammond, the mortality rate by age group for smokers and non-smokers separately. One also knows, from R.P.1, numbers of smokers and non-smokers by age group. It might be thought that, from these figures, one could multiply the numbers of smokers and non-smokers by the mortality rates to get estimated numbers of deaths by age group for smokers and non-smokers separately, and then compute the average age at death of smokers and non-smokers. The differences between these estimates would not be a

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valid estimate of loss of life expectation. Smokers are younger on average than non-smokers due mainly to the fact that many smokers give up in later life and it can be shown (N833) that, even if smoking had no effect on mortality at all, the average age at death of smokers and non-smokers would differ.

For similar reasons retrospective studies of decedents give unhelpful answers.

Another unhelpful method is to look at deaths of smokers dying from smoking-associated diseases, take their expectation of life remaining based on total figures, and to average this. The answer one gets as shown in N833 is very difficult to interpret. Lung cancer decedents when they die have an average expectation of life of 11 years or so. But so approximately does the average person dying of all causes.

The soundest method

The best method to employ is to construct a life-table for smokers and non-smokers separately based on their age-specific mortality rate estimates. Hammond has done this and finds that men aged 25, the following estimates of expectation of life:

<u>Smoking group</u>	<u>Estimation of life exp.</u>	<u>Loss of life exp.</u>
A. Never smoked regularly	48.6 years	
B. 1-9 a day	44.0 years	4.6 years
C. 10-19 a day	43.1 years	5.5 years
D. 20-39 a day	42.4 years	6.2 years
E. 40+ a day	40.3 years	8.3 years

These are probably the best figures available. In Chapter 2 of the draft R.C.P. report, Rose and Holland, converted these figures into loss of life expectation. Assuming, very approximately, that smokers smoke for 50 years, and that groups B, C and D have average consumptions of 5, 15 and 30 a day, they produced the following estimates:

<u>Cigs. per day</u>	<u>Estimated lifetime no. of cigarettes</u>	<u>Loss of life expectation (years)</u>	<u>Loss of life exp. (mins/cig)</u>
5	91,000	4.6	26.5
15	274,000	5.5	10.6
30	548,000	6.2	6.0

These figures give no real extra information, they only attempt to give emotive

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Weaknesses in even these estimates

On looking at these last figures, one point springs at once to mind. This is the difference in the estimates per cigarette depending on the number of cigarettes smoked. This is due to the observed fact that smokers of 1-9 a day have markedly higher death rates from total mortality than non-smokers, but that at higher levels of consumption the risk of mortality rises relatively slowly. Why should this be so?

One very likely reason is that, as people approach death, they cut down consumption due to associated symptoms. In other words, the estimates of mortality for 1-9 a day smokers are in each age group likely to be based to a significant extent on people who quitted to smoke more previously. The actual results gained from a 50 year (or more) prospective study comparing mortality of never-smokers and continuing 1-9 a day smokers may be quite different. Similar arguments apply to the heavier smokers. It is well known that mortality ratios of heavy smokers/non-smokers reduce markedly with age. Is this because smoking has more effect on the young? Or is it because those heavy smokers who survive to older ages are untypical not only of non-smokers in physical make-up but also even of young heavy smokers? The extent of the effect of these considerations on estimates of loss of life expectation is difficult to estimate.

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