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EDITORIAL



ADDICTION

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The price of a cigarette: 20 minutes of life?

Most smokers realise that smoking could shorten their life but not the impact of each cigarette they smoke. Britain has some of the best data available worldwide to estimate the average loss of life per cigarette smoked, which is approximately 20 minutes: 17 for men and 22 for women.

Tobacco smoking is one of the largest preventable causes of disease, disability, and premature death globally [1]. Epidemiological studies report the harms associated with smoking using a range of metrics, including absolute risks, odds ratios, risk ratios, hazard ratios, population attributable fractions, and quality-adjusted life years. Conveying these harms in a clear and accessible way that resonates with smokers can be challenging. One potentially impactful way to express the harm caused by smoking is to estimate the average loss of life expectancy for each cigarette smoked.

In 2000, the BMJ published an estimate suggesting that each cigarette smoked in Britain shortens a smoker's life by an average of 11 minutes [2]. As the authors acknowledged, their estimate made some important assumptions, for which we now have better and more up-to-date data. Their mortality estimate relied solely on epidemiological data from British male doctors followed up for 40 years to 1991 [3]. Their estimate of lifetime cigarette consumption was based on a figure for men of 15.8 per day from age 17 to 71 years, as assessed in 1996 [4].

Data are now available on male mortality outcomes from the British Doctors Study at 50-year follow-up to 2001 [5] and on female mortality outcomes from the Million Women Study, also carried out in Britain, to 2011 [6]. These studies found that after adjusting for important confounders (e.g., socioeconomic position), smokers who did not stop lost approximately 10 (men) to 11 (women) years of life expectancy [5, 6] compared with the earlier estimate of 6.5 years [2]. Women in 1996 smoked an average of 13.6 cigarettes per day [4]. Therefore, other things being equal, this would lead to an increase in the estimated loss of life expectancy per cigarette to 20 minutes overall: 17 minutes for men (11*10/6.5) and 22 minutes for women ((11*11/6.5)*(15.8/13.6); see supplementary file for a more detailed explanation of the calculation).

Since the original estimate was published in the BMJ, average daily cigarette consumption has reduced from 15.8 to 11.5 per day for men and from 13.6 to 9.5 per day for women [7]. If the reduction in daily cigarette consumption had been matched by a reduction in toxicant intake, the loss of life expectancy per cigarette would remain unchanged. However, it is possible that smokers nowadays smoke each cigarette more intensively than they did in

1996 to compensate for smoking fewer cigarettes [8-10]. If so, then the loss of life expectancy per cigarette might be greater than it was 25 years ago. The best available measure we have of toxicant exposure over the period of interest is the concentration of the nicotine metabolite, cotinine, in the saliva of smokers [11]. Nicotine itself is not particularly harmful, but it can serve as a surrogate marker for exposure to tar and other harmful compounds [11, 12]. The Health Survey for England has gathered cotinine data from representative samples of adult smokers almost every other year from 1993 to 2019 [13]. These data show only a modest change in cotinine concentration per cigarette as cigarette consumption has declined [14]. Therefore, it seems reasonable to assume that there has not been a substantial increase in toxicant exposure per cigarette, so the figures of 17 minutes loss of life expectancy per cigarette for men and 22 minutes for women remain the best estimates.

Epidemiological data indicate that the harm caused by smoking is cumulative and the sooner the person stops, and the more cigarettes they avoid smoking, the longer they live [5, 6]. Thus, a person smoking 10 cigarettes per day who quits smoking on the 1st of January 2025 could prevent loss of a full day of life by the 8th of January, a week of life by the 20th of February, and a month by the 5th of August. By the end of the year, they could have avoided losing 50 days of life.

Studies suggest that smokers typically lose about the same number of healthy years as they do total years of life [15]. Thus smoking primarily eats into the relatively healthy middle years rather than shortening the period at the end of life, which is often marked by chronic illness or disability. So a 60-year-old smoker will typically have the health profile of a 70-year-old non-smoker [5, 6].

As with the BMJ 2000 estimate, our updated figure comes with some important caveats. First of all, these are averages across the population and across ages. Some smokers live long and healthy lives while others succumb to smoking-related diseases and even death in their 40s [16]. This variation will be due to differences in smoking patterns (the number of puffs, depth of inhalation, etc.), the type of cigarette smoked, and individual susceptibility to the toxicants in cigarette smoke. In addition, the harm caused will not be the same for every cigarette smoked across the life span. The health risks of smoking are not linear [17] and it is not enough just to reduce consumption – total cessation is required to achieve the maximum benefits for health and life [1]. Within individuals, any potential benefits from reduced consumption may be completely offset by increased puffing and inhalation of the remaining cigarettes. Age of initiation may also play a role, with people starting to smoke

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at a younger age being potentially more vulnerable to smokingrelated diseases [18]. Evidence from the mortality studies shows the benefits of stopping smoking for life expectancy are greater the sooner a person quits [5, 6]. Another caveat is that we assumed the number of cigarettes per day was constant over the lifetime. In addition, tar-to-nicotine ratios have declined over the decades [19] and given that most of the harm from smoking comes from the tar, it is possible that exposure to toxicants per cigarette may have reduced. If so, then our estimates of loss of life years per cigarette would be somewhat high, but the true figure would still most likely be considerably higher than the BMJ 2000 estimate.

In conclusion, we estimate that on average, smokers in Britain who do not quit lose approximately 20 minutes of life expectancy for each cigarette they smoke. This is time that would likely be spent in relatively good health. Stopping smoking at every age is beneficial but the sooner smokers get off this escalator of death the longer and healthier they can expect their lives to be.

AUTHOR CONTRIBUTIONS

ADDICTION

Sarah E. Jackson: Conceptualization (equal); data curation (equal); formal analysis (equal); investigation (equal); methodology (equal); visualization (equal); writing—original draft (equal). Martin J. Jarvis: Data curation (equal); formal analysis (equal); investigation (equal); methodology (equal); visualization (equal). Robert West: Conceptualization (equal); data curation (equal); formal analysis (equal); investigation (equal); methodology (equal); writing—original draft (equal).

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DECLARATION OF INTERESTS

SEJ received payment from Freuds+ communications agency for undertaking this work. MJJ declares no competing interests. RW undertakes paid training for Everyone Health, a company that supports smokers with quitting, and is a paid advisor to the Freuds+ communications agency that runs antismoking campaigns for the English Office for Health Improvement and Disparities. He is a paid advisor to QNovia, a company that is developing a therapeutic inhaled nicotine delivery device. He is an unpaid director of the Unlocking Behaviour Change Community Interest Company and an unpaid advisor to company producing the Smoke Free mobile application. All authors declare no financial links with tobacco companies, e-cigarette manufacturers, or their representatives.

DATA AVAILABILITY STATEMENT

All data used are publicly available and referenced appropriately.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.