

## Estimating the population impact of e-cigarettes on smoking cessation in England

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An important consideration when assessing the public health impact of e-cigarettes is how far they contribute to, or detract from, smoking cessation in the population. There has been speculation about this (1), but without engaging appropriately with the relevant data and based on unreliable assumptions. England has data that can help to address this question, at least so far. Addiction's readers may be interested in the following analysis. It focuses on 2014, the most recent year for which full data are available. It leads to an estimate of 16K-22K as the number of additional long-term quitters generated by e-cigarettes in that year.

### Estimation

1. At the start of 2014 there were approximately 8.46 million adult smokers in England (19.3% of 43.83 million people aged 16+) (2)
2. The percentage of smokers in 2014 who reported that they had tried to stop at least once is estimated at 37.3% (3.16 million people) (3)
3. The percentage of those who tried to quit who used an e-cigarette (and not a prescription medicine or behavioural support) in 2014 was 28.2% (891K people) (3)
4. The expected long-term (1 year) success rates of a quit attempt made without assistance or using a licensed nicotine product (LNP) bought from a shop is approximately 5% (4, 5). Note that in England no benefit has been found for LNPs bought from a shop whereas they have been associated with increased success rates when accompanied by at least some professional support (5, 6).
5. Evidence from RCTs and from surveys in England indicate that using an e-cigarette in a *quit attempt* increases the probability of success on average by approximately 50% compared with using no aid or LNP bought from a shop – similar to use of a licensed medicine with limited behavioural support but less than medication plus specialist behavioural support (6, 7).
6. Therefore it is estimated that 2.5% of the smokers who used an e-cigarette in their quit attempt in England (**22K** people) succeeded who would have failed if they had used nothing or LNP bought from a shop.
7. As e-cigarette usage has increased, use of prescription stop-smoking medications and specialist behavioural support has decreased (3). The decline in these methods of stopping

since e-cigarettes started to become popular is approximately 10% of quit attempts which represent 3.7% of smokers in 2014 (313K smokers). The trajectories of the declines have not mirrored the increase in e-cigarette use so there may be no connection. However, we consider that an upper estimate for the contribution of e-cigarettes to that decline is 80%, which represents 250,000 smokers (313K×0.8).

8. Therefore, if e-cigarettes have detracted from the use of methods of stopping that are equally effective or more effective, the net increase in smokers using a method of stopping yielding an approximately 50% increase in long-term success is approximately 630K people (880K-250K). The net number estimated to have quit in England during 2014 who would not have quit if e-cigarettes had not been available would therefore be **16K** (630K\*0.025).

### Comments and caveats

1. Estimated prevalence of e-cigarette use in a quit attempt as a proportion of all smokers is subject to 95% confidence intervals of ±1%.
2. There have been highly publicised studies purporting to have found that e-cigarettes promote uptake of cigarettes, or are taken up in substantial numbers by, people who would not have smoked and that this outweighs any impact of e-cigarettes on quitting. These claims are undermined by highly plausible alternative explanations (8). In England and the US, the evidence thus far contradicts the hypothesis: regular use of e-cigarettes by never smokers is extremely rare and the decline in smoking prevalence in young people has been as great or greater than in previous years (8).
3. Our estimate does not take account of any effect of e-cigarettes on the incidence of quit attempts. Since e-cigarettes became popular the incidence of quit attempts has risen and then fallen again (3) so a causal connection is unlikely.
4. It has been proposed that using an e-cigarette while continuing to smoke may reduce subsequent quitting so that, even if using an e-cigarette in a quit attempt increased the chances of success of that attempt, the net effect of having e-cigarettes on the market has reduced quitting (9). However, smokers who use e-cigarettes may have a lower pre-existing ability to stop smoking (10). If the proposal were correct, one would expect a reduction in population quitting rates as dual use of e-cigarettes among smokers increased, whereas in England the overall rate of smoking cessation in 2014 was *higher* than in any of the previous 7 years (3).
5. It is possible that smokers who quit with the aid of an e-cigarette may be at greater risk of longer term relapse to smoking. However, it is also possible that they are at lower risk, or similar risk. This is an issue that requires further study.
6. The figures relate to the population as a whole, not individual smokers.
7. No differentiation can be made between different types of e-cigarette because of the lack of trial and population level data on relative effectiveness and usage.
8. For smokers who used more than one method of quitting in their quit attempt, we counted the method that evidence indicated would be most effective (6).
9. The figure of approximately 16K-22K is much lower than the population estimates of e-cigarette users who have stopped smoking (approximately 560K in England at the last count according to the Smoking Toolkit Study). However, the reason for this can be understood from the following:
  - a. Only some e-cigarette users who have stopped smoking will have done so in the past year; 3.6% (252K) of the 7.01 million long-term ex-smokers (16% of adult population in 2014) used e-cigarettes according to the Smoking Toolkit Study (leaving 308K).

- b. Some 9% (28K) of the 3.11 million recent ex-smokers (according to Smoking Toolkit Study) started their e-cigarette use after they stopped smoking, possibly to avoid relapse to smoking (leaving 280K).
- c. It has to be assumed on the basis of the evidence (6, 7) that only a third of e-cigarette users who stopped smoking would not have succeeded had they used no cessation aid (leaving 93K).
- d. It is assumed that, as with other smoking cessation aids, 70% of those recent ex-smokers who use e-cigarettes will relapse to smoking in the long term (11) (leaving 28K).
- e. Some people (estimated at 6K based on the calculations in 7. and 8. of our estimate) who stopped smoking with the aid of an e-cigarette may otherwise have used a prescription medicine and/or behavioural support (leaving 22K).
- f. So by this alternative method the range is 22K-28K which is only slightly higher than the 16K-22K estimated earlier.
- g. It is, of course, important to appreciate that estimates of the numbers of e-cigarette users are subject to quite wide margins of error. Nevertheless, the population figure for numbers of additional ex-smokers generated by e-cigarettes in 2014 in England looks to be in the tens of thousands.

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