

## Appendix C4. Smoking cessation services model

### Smoking cessation services (SCS): Quantifying the impact of smoking cessation services on smoking cessation rates

#### Introduction

There are essentially two main approaches to help reduce the smoking prevalence among a population: 1) preventing initiation, and 2) increasing the cessation rate. For this report we focused on smoking cessation services, a means to increasing the cessation rate among a population.

Many smokers find it hard to quit smoking on will power alone (termed self-help) – many smokers make multiple attempts to quit but fail because self help appears to have at best a small effect on success (1). Various types of aided, cessation strategies exist ranging from counselling behavioural therapy to first-line and second-line medications (2), all of which are known to increase the long-term success of quit attempts (3, 4) (Table 1).

#### *Effectiveness of smoking cessation services*

The effectiveness of smoking cessation services depend on a number of factors, such as the type of medication used, the type of behavioural intervention used, the smoker's psychological state and environmental influences. The Cochrane Collaboration conducted a series of reviews which looked into the effectiveness of various smoking cessation interventions (Table 2). Of the various smoking cessation pharmacological interventions, varenicline appears to be the most effective in achieving long-term abstinence rates. Varenicline (trade name Champix) is a nicotinic receptor partial agonist. A randomised controlled trial found that the one year continuous abstinence rate was 10% for placebo, 15% for bupropion and 23% for bupropion (5). A Cochrane systematic review concluded that varenicline improved the likelihood of successfully quitting smoking by two- to three-fold relative to pharmacologically unassisted attempts. Varenicline was more efficacious than bupropion in this regard but not statistically superior to NRT (3).

**Table 1. Effectiveness of smoking cessation interventions (results from the Cochrane Collaboration review series)**

| Smoking cessation intervention                      | RR for cessation | 95% confidence interval | No. of participants |
|---|------------------|-------------------------|---------------------|
| Combined pharmacotherapy & behavioural intervention | 3.88             | 3.35 - 4.50             | 5,887 (1 study)     |

|     |  |      |             |                      |
|-----|--|------|-------------|----------------------|
| (1) | Group behavioural intervention                               | 1.98 | 1.60 - 2.46 | 4,375 (13 studies)   |
| (6) | Pharmacotherapy (nicotine replacement therapy*) intervention | 1.60 | 1.53 - 1.68 | 50,000 (117 studies) |
| (7) | Telephone counselling intervention                           | 1.37 | 1.26 - 1.50 | 24,000 (9 studies)   |
| (8) | Self-help material intervention                              | 1.32 | 1.20 - 1.42 | 28,189 (25 studies)  |
| (9) |  |      |             |                      |

RR: risk ratio for cessation; \* includes any form of NRT: gums, patches, lozenges, inhaler and nasal spray.

### *The importance of creating a national network of smoking cessation services*

In the UK, the government has already demonstrated a strong commitment to reducing smoking prevalence through the creation of a highly effective national network of smoking cessation services – known as NHS stop smoking services (10). This support is designed to be widely accessible within the local community and is provided by trained personnel. However, recently there have been decline in the number of smokers attempting to quit through the NHS stop smoking service, as well as a fall in the number of smokers successfully quitting (11). It is important to ensure that a national network of smoking cessation service continues to be easily accessible for smoker in the UK, and to ensure that such a policy intervention can be established in the other EConDA countries.

**Table 2. Various smoking cessation treatments are available**

#### **Types of smoking cessation treatments**

##### Nicotine replacement therapy (NRT)

Skin patches

Chewing gum

Inhalator

Tablets, strips, lozenges

Nasal spray

Mouth spray

##### Smoking cessation medication

Bupropion

Varenicline

Nortriptyline

##### Electronic cigarettes

##### Behaviour change techniques

Written material

Group counselling sessions

Individual counselling sessions

Telephone counselling sessions

##### Combination of the above

### *Project aim*

The project aims to make a quantitative comparison of the health and economic impact of smoking cessation service over time, by comparing the policy scenario with the 'baseline' scenario (i.e. no change as compared to the current situation).

## **Methodology**

### *EConDA model*

The intervention chosen for this study was a 12-week smoking cessation service involving the administration of varenicline alongside face-to-face counselling. This was based on the Maudsley model which is an evidence based approach to treating dependent smokers using a combination of regular meetings (with a trained advisor using structured, withdrawal-oriented behavioural therapy) combined with smoking cessation medications such as nicotine replacement therapy (NRT), bupropion or varenicline (10). Many clinical practice guidelines recommend the use of both classes of interventions for smokers who are prepared to make a quit attempt (1). This is based on the assumption that the two types of treatment have complementary modes of action, and may independently improve the chances of maintaining long-term abstinence. However, surveys suggest that the proportion of people who use both types of treatment when attempting to quit smoking is low (12).

Varenicline was used for all of the EConDA countries except for the Netherlands whereby bupropion was used as the pharmacological intervention of choice (due to availability of data). Varenicline, a relatively new drug (approved by the FDA and EMA in 2006), was evaluated instead of bupropion as it is known to deliver higher smoking cessation rates, be more cost effective and is relatively safe and well tolerated (13, 14) – hallmarks of a pharmacological intervention that would make it ideal for rolling out nationwide. The EConDA model requires three types of input data:

- Effectiveness of the intervention
- Reach of the intervention
- Cost of the intervention

### *Effectiveness of the intervention*

Effectiveness of the intervention in terms of cessation rates was expressed as 12-months continuous abstinence. Only cessation rates that were biochemically validated through the measurement of the smoker's carbon monoxide levels (as opposed to self-reported data) were included in the model. Given that these type of data were not available for most countries, proxy data from other countries were used (Table 4). It was deemed appropriate to use proxy data where necessary based on the assumption that the pure biological effect of a drug can be expected to be the same, irrespective of the country (15). Studies by West et al. found that the first 28 days since quitting is the most crucial period for likelihood of relapse. Thus it was deemed appropriate for this model that the rate of relapse was negligible following the use of 12-months continuous abstinence rates.

### *'Reach' of the intervention*

Typically, various demand- and supply-side constraints contribute to the overall 'reach' of a public health intervention within a given population. This means that even if an intervention is rolled-out on a national scale, the intervention may only go on to be taken up by a fraction of the target population.

Whereas fiscal smoking policies can be imposed on an entire population (i.e. a population reach of 100%), non-mandatory interventions have a smaller reach since their demands are affected by, for example, the smokers' willingness to quit smoking and their desire to reach out for professional support. Data on 'willingness to quit smoking' was publicly available from four of the EConDA countries (Table 3) – these figures were then incorporated into the model to reflect the demand-side constraint of the 'reach' of the intervention. In some countries, smoking cessation drugs have to be paid for by the service user through the purchase of a prescription. Table 5 lays out which of the smoking cessation drugs are free a country-by-country basis. For simplicity, however, in the model, the cost of the service at the point of delivery was assumed to not act as a barrier to the uptake of the SCS by the target population (i.e. service would be free for any smoker taking up the service), given that data on the relationship between the cost and demands of the SCS were not available. In the model, the SCS was free for all patients, in that the payer (National Health Service or national/federal health insurance) covered the total cost of the service (16), keeping in line with making the economic case for providing public health interventions that are free at the point of delivery.

It was assumed that only 50% of those wanting to quit smoking would actually participate in the intervention owing to supply-side constraints, such as the supply of healthcare professionals and current availability of intervention infrastructure (17). This figure was applied across all of the eight EConDA countries (Table 3), since country-specific data in this area was lacking.

### *Cost of the intervention*

The intervention cost, expressed as total cost per quit attempt, was based on estimates of real resource use. Unless otherwise stated, the price typically covered the duration of a 12-week course of varenicline tablets as well as the administrative costs incurred by healthcare professionals leading the counselling sessions. Costs of adverse effects were assumed to be negligible. Costs varied considerably between the EConDA countries (Table 3) – in countries where cost data were not available, proxy data from another country were used in its place (Table 4).

### *Model assumptions*

The following assumptions in the model were made:

- An individual eligible for the intervention is selected at random from the entire population distribution of smokers. To determine whether or not the intervention takes place, an

application-generated random number assigned to an individual in the simulation is compared against the threshold probability (composed of the 'reach' and 'abstinence' rates)

- A smoker is defined as an individual who has smoked for at least a year
- All smokers in the model are eligible for the intervention (but in reality, for example, smokers who present with a known history of epileptic seizures, brain tumour, renal disease, hepatopathy, severe hypertension or suicidal ideation would be ineligible for a course of bupropion medication)
- The willingness to quit and the effectiveness of the intervention are the same across age, sex, severity of addiction and socioeconomic gradients
- A smoker's willingness to quit smoking stays the same throughout the entire simulation period i.e. no other changes in cultural or political trends would occur that might alter the smoker's willingness to quit smoking over time
- The 'reach' of the intervention stays the same throughout the entire simulation period i.e. no other changes in the supply or demand of the intervention is expected to occur within the time horizon
- The 'reach' of the intervention is the same across age, sex, socioeconomic gradients and geographical areas
- Once a smoker quits smoking as a result of the intervention, the smoker stays an ex-smoker throughout the rest of the time horizon (the relapse rate is captured within the 12-month continuous abstinence rate)
- For both the baseline and the policy intervention scenario, smokers can also quit smoking by means other than that of the intervention e.g. unassisted attempt to quit (smokers who quit smoking via these routes may still relapse and become a smoker again at some point in the future)
- The cost of the intervention is free at the point of delivery i.e. it is paid in full by the national health service, local government or national/federal health insurance
- A smoker cannot use the intervention more than once in any given year, but has the potential to use the SCS at the start of each new year within his/her lifetime regardless of the number of times he/she has had the intervention

#### *Limitation of the model assumptions*

Cessation of smoking is known to slow the progression of COPD in patients who had been smoking (18), and thus this intervention scenario could possibly reduce the number of patients with severe stage COPD and reduce direct healthcare costs associated with COPD – this effect was not factored into the model

**Table 3. Summary input data for the smoking cessation service intervention**

|                                       | Bulgaria    | Finland     | Greece      | Lithuania   | Netherlands | Poland      | Portugal    | UK          |
|---------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>Reach</b>                          |             |             |             |             |             |             |             |             |
| Willingness to quit smoking (%)       | 59%         | 59%         | 65%         | 59%         | 40%         | 59%         | 59%         | 68%         |
| Accessibility of the intervention (%) | 50%         | 50%         | 50%         | 50%         | 50%         | 50%         | 50%         | 50%         |
| Overall reach (%)                     | 30%         | 30%         | 33%         | 30%         | 20%         | 30%         | 30%         | 34%         |
| <b>Impact of the intervention</b>     |             |             |             |             |             |             |             |             |
| Type of pharmacological drug          | Varenicline | Varenicline | Varenicline | Varenicline | Bupropion   | Varenicline | Varenicline | Varenicline |
| 12-month abstinence rate (%) *        | 34%         | 34%         | 22%         | 34%         | 17%         | 34%         | 34%         | 34%         |
| Long-term relapse rate (%) **         | 0%          | 0%          | 0%          | 0%          | 0%          | 0%          | 0%          | 0%          |
| Outcome criteria ‡                    | Continuous  | Continuous  | Continuous  | Continuous  | Continuous  | Continuous  | Continuous  | Continuous  |
| Validation method ¶                   | Biochemical | Biochemical | Biochemical | Biochemical | Biochemical | Biochemical | Biochemical | Biochemical |
| <b>Cost</b>                           |             |             |             |             |             |             |             |             |
| Cost (cost/quit-attempt)              | 429 лв      | € 248       | € 220       | € 621       | € 282       | 621 zł      | € 209       | £ 164       |

Grey shading indicates the use of proxy data (more information available in appendix A1 to A4 and A6 to A8) \* as a % of the service users; \*\* as a % of the service users (>1 and <5 years post cessation); ‡ either point prevalence or continuous abstinence; ¶ either self-reported or validated by biochemical testing

**Table 4. Data sources for the smoking cessation service intervention model**

|                                       | Bulgaria | Finland      | Greece   | Lithuania | Netherlands | Poland   | Portugal | UK       |
|---------------------------------------|----------|--------------|----------|-----------|-------------|----------|----------|----------|
| <b>Reach</b>                          |          |              |          |           |             |          |          |          |
| Willingness to quit smoking (%)       | FL proxy | (19)         | (20)     | FL proxy  | (21, 22)    | FL proxy | FL proxy | (23, 24) |
| Accessibility of the intervention (%) | NL proxy | NL proxy     | NL proxy | NL proxy  | (17)        | NL proxy | NL proxy | NL proxy |
| Overall reach (%)                     | N/A      | N/A          | N/A      | N/A       | N/A         | N/A      | N/A      | N/A      |
| <b>Impact of the intervention</b>     |          |              |          |           |             |          |          |          |
| Type of pharmacological drug          | N/A      | N/A          | N/A      | N/A       | N/A         | N/A      | N/A      | N/A      |
| 12-month abstinence rate (%) *        | UK proxy | UK proxy     | (25)     | UK proxy  | (26)        | UK proxy | UK proxy | (27)     |
| Long-term relapse rate (%) **         | N/A      | N/A          | N/A      | N/A       | N/A         | N/A      | N/A      | N/A      |
| Outcome criteria †                    | N/A      | N/A          | N/A      | N/A       | N/A         | N/A      | N/A      | N/A      |
| Validation method ††                  | N/A      | N/A          | N/A      | N/A       | N/A         | N/A      | N/A      | N/A      |
| <b>Cost</b>                           |          |              |          |           |             |          |          |          |
| Cost (cost/quit-attempt)              | NL proxy | Norway proxy | NL proxy | NL proxy  | (26)        | NL proxy | NL proxy | (27)     |

Grey shading indicates the use of proxy data; \* as a % of the service users; \*\* as a % of the service users (>1 and <5 years post cessation); † either point prevalence or continuous abstinence; †† either self-reported or validated by biochemical testing





|   | Where and how can this product be legally purchased in your country?                                      | In a pharmacy with a prescription | In a pharmacy with a prescription | In a pharmacy with a prescription | In a pharmacy with a prescription | In a pharmacy with a prescription | In a pharmacy with a prescription | In a pharmacy with a prescription | In a pharmacy with a prescription |
|---|---|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
|   | Does the national/federal health insurance or the national health service cover the cost of this product? | No                                | No                                | Partially                         | No                                | No                                | No                                | No                                | Fully                             |
| Is smoking cessation support available in the following places in your country?                           | Health clinics or other primary care facilities   | Yes in some                       | Yes in most                       | Yes in some                       | Yes in some                       | Yes in most                       | Yes in some                       | Yes in some                       | Yes in most                       |
|   | Hospitals   | Yes in some                       | Yes in most                       | Yes in some                       | Yes in some                       | Yes in most                       | Yes in some                       | Yes in some                       | Yes in most                       |
|   | Office of a health professional   | Yes in some                       | Yes in some                       | Yes in some                       | Yes in some                       | Yes in most                       | Yes in some                       | Yes in some                       | Yes in most                       |
|   | In the community  | Yes in some                       | Yes in some                       | No                                | ...                               | ...                               | Yes in some                       | Yes in some                       | Yes in most                       |
|   | Other   | Yes in some                       | Yes in some                       | Yes in some                       | Yes in some                       | Yes in some                       | Yes in some                       | Yes in some                       | Yes in some                       |
| Does the national/federal health insurance or the national health service cover the cost of this support? | Health clinics or other primary care facilities   | Partially                         | Partially                         | Partially                         | Fully                             | Fully                             | Partially                         | Fully                             | Fully                             |
|   | Hospitals   | Partially                         | Partially                         | Partially                         | Fully                             | Fully                             | Partially                         | Fully                             | Fully                             |
|   | Office of a health professional   | Partially                         | Partially                         | Partially                         | Partially                         | Fully                             | Partially                         | Fully                             | Fully                             |
|   | In the community  | Partially                         | ...                               | ...                               | ...                               | ...                               | No                                | ...                               | Fully                             |
|   | Other   | Partially                         | Partially                         | Partially                         | No                                | Fully                             | Fully                             | Partially                         | Fully                             |

## References

1. Stead LF, Lancaster T. Combined pharmacotherapy and behavioural interventions for smoking cessation. *Cochrane Database Syst Rev.* 2012;10:CD008286.
2. Ranney L, Melvin C, Lux L, McClain E, Lohr KN. Systematic review: smoking cessation intervention strategies for adults and adults in special populations. *Ann Intern Med.* 2006;145(11):845-56.
3. Cahill K, Stead LF, Lancaster T. Nicotine receptor partial agonists for smoking cessation. *Cochrane Database Syst Rev.* 2012;4:CD006103.
4. Stead LF, Perera R, Bullen C, Mant D, Lancaster T. Nicotine replacement therapy for smoking cessation. *Cochrane Database Syst Rev.* 2008(1):CD000146.
5. Gonzales D, Rennard SI, Nides M, Oncken C, Azoulay S, Billing CB, et al. Varenicline, an alpha4beta2 nicotinic acetylcholine receptor partial agonist, vs sustained-release bupropion and placebo for smoking cessation: a randomized controlled trial. *JAMA.* 2006;296(1):47-55.
6. Stead LF, Lancaster T. Group behaviour therapy programmes for smoking cessation. *Cochrane Database Syst Rev.* 2005(2):CD001007.
7. Stead LF, Perera R, Bullen C, Mant D, Hartmann-Boyce J, Cahill K, et al. Nicotine replacement therapy for smoking cessation. *Cochrane Database Syst Rev.* 2012;11:CD000146.
8. Stead LF, Perera R, Lancaster T. Telephone counselling for smoking cessation. *Cochrane Database Syst Rev.* 2006(3):CD002850.
9. Lancaster T, Stead LF. Self-help interventions for smoking cessation. *Cochrane Database Syst Rev.* 2002(3):CD001118.
10. Bauld L, Bell K, McCullough L, Richardson L, Greaves L. The effectiveness of NHS smoking cessation services: a systematic review. *J Public Health (Oxf).* 2010;32(1):71-82.
11. Paul Niblett SH. Statistics on NHS Stop Smoking Services in England. *Lifestyles Statistics Team, Health and Social Care Information Centre.* 2014;V1.0.
12. Shiffman S, Brockwell SE, Pillitteri JL, Gitchell JG. Use of smoking-cessation treatments in the United States. *Am J Prev Med.* 2008;34(2):102-11.
13. Hoogendoorn M, Welsing P, Rutten-van Molken MP. Cost-effectiveness of varenicline compared with bupropion, NRT, and nortriptyline for smoking cessation in the Netherlands. *Curr Med Res Opin.* 2008;24(1):51-61.
14. Nakamura M, Oshima A, Fujimoto Y, Maruyama N, Ishibashi T, Reeves KR. Efficacy and tolerability of varenicline, an alpha4beta2 nicotinic acetylcholine receptor partial agonist, in a 12-week, randomized, placebo-controlled, dose-response study with 40-week follow-up for smoking cessation in Japanese smokers. *Clin Ther.* 2007;29(6):1040-56.
15. Vemer P, Rutten-van Molken MP. Crossing borders: factors affecting differences in cost-effectiveness of smoking cessation interventions between European countries. *Value Health.* 2010;13(2):230-41.
16. Organisation WH. WHO Report on the Global Tobacco Epidemic, 2015: United Kingdom of Great Britain and Northern Ireland. *WHO Report on the Global Tobacco Epidemic.* 2015.
17. Kulik MC, Nusselder WJ, Boshuizen HC, Lhachimi SK, Fernandez E, Baili P, et al. Comparison of tobacco control scenarios: quantifying estimates of long-term health impact using the DYNAMO-HIA modeling tool. *PLoS One.* 2012;7(2):e32363.
18. Hoogendoorn M, Feenstra TL, Hoogenveen RT, Rutten-van Molken MPMH. Long-term effectiveness and cost-effectiveness of smoking cessation interventions in patients with COPD. *Thorax.* 2010;65(8):711-8.
19. EQUIPP. EQUIPPING Finland to combat tobacco dependence. 2011.
20. Thyrian JR, Panagiotakos DB, Polychronopoulos E, West R, Zatonski W, John U. The relationship between smokers' motivation to quit and intensity of tobacco control at the population level: a comparison of five European countries. *BMC Public Health.* 2008;8:2.
21. Instituut T. Smoking info 2015 [cited 2015]. Available from: <http://www.rokeninfo.nl/publiek/cijfers/hoeveel-mensen-roken>.

22. Tabaksontmoediging NE. FACTSHEET CONTINU ONDERZOEK ROOKGEWOONTEN 2014. 2015.
23. Stopping smoking: The benefits and aids to quitting [press release]. 2014.
24. Simon Robinson HH. Smoking and drinking among adults: A report on the General Lifestyle Survey. Office for National Statistics, 2009.
25. Athanasakis K, Igoumenidis M, Karampli E, Vitsou E, Sykara G, Kyriopoulos J. Cost-effectiveness of varenicline versus bupropion, nicotine-replacement therapy, and unaided cessation in Greece. *Clin Ther.* 2012;34(8):1803-14.
26. Feenstra TL, Hamberg-van Reenen HH, Hoogenveen RT, Rutten-van Molken MP. Cost-effectiveness of face-to-face smoking cessation interventions: a dynamic modeling study. *Value Health.* 2005;8(3):178-90.
27. Leaviss J, Sullivan W, Ren S, Everson-Hock E, Stevenson M, Stevens JW, et al. What is the clinical effectiveness and cost-effectiveness of cytisine compared with varenicline for smoking cessation? A systematic review and economic evaluation. *Health Technol Assess.* 2014;18(33):1-120.