# UNIVERSITY OF MANCHESTER NATIONAL PRIMARY CARE RESEARCH AND DEVELOPMENT CENTRE AND UNIVERSITY OF YORK HEALTH ECONOMICS CONSORTIUM (NICE EXTERNAL CONTRACTOR)

## Health economic report on piloted indicator(s)

**QOF indicator area:** Smoking (support and treatment)

**Potential output:** Recommendations for NICE Menu

## Contents

# Introduction

This briefing paper is intended to provide a summary of the economic evidence generated on the proposed pilot two smoking indicator. The format of this paper is intended to provide the QOF Advisory Committee with sufficient information upon which to make a recommendation on whether the indicator is economically justifiable.

# Piloted indicator

The percentage of patients aged 15 years and over who are recorded as current smokers who have a record of an offer of support and treatment within the preceding 27 months

# Economic rationale for the indicator

Smoking remains the main cause of preventable morbidity and premature death in England, leading to an estimated annual average of 86.5000 deaths between 1998 and 2002 [1]. Smoking increases the risk of a number of major morbidities including cardiovascular disease and cancer. Smoking is estimated to cost the NHS £1.5 billion a year [2]. This estimate does not include other costs to the government such as payment of sickness or invalidity benefits. Nor does it include the costs to industry or to individuals who smoke.

# Objective

To evaluate whether the proposed indicator represents a cost effective use of NHS resources.

# Type of health economic analysis

The net benefit approach is applied (approach one). Robust evidence is available on the health benefits (and costs) of providing brief opportunist advice alongside treatment to smokers, measured by quality-adjusted life years (QALYs).

Access was available to the model published in the Health Technology Assessment 'Relapse prevention in UK Stop Smoking Services: current practice, systematic reviews of effectiveness and cost-effectiveness analysis' [3]. This model was developed by Dr Matthew Taylor of the York Health Economics Consortium.

The HTA (2010) model [3] estimated the cost-effectiveness of interventions for preventing smokers, who have recently become abstinent, from relapsing back to smoking. The model was therefore adapted to the appropriate population under evaluation in the indicator, patients who entered as smokers and potentially become former smokers (*i.e.* quitters) following a number of smoking-cessation interventions. This analysis estimates the lifetime costs and the lifetime health outcomes (measured using QALYs) of a cohort of patients who receive brief opportunist advice in the clinic and treatment. The model was a cohort simulation model and followed a hypothetical cohort of 1,000 patients by modelling in 6-monthly cycles over the cohorts' lifetime. For more details of the model structure and specific inputs not

detailed in this document (i.e. those that remained the same, unit costs and utilities), please refer to the published Health Technology Assessment [3].

The effectiveness rates of the interventions were changed in the HTA model (2010) to reflect the population under evaluation in this analysis (i.e. abstinent rates). The effectiveness rates of the interventions have a direct impact on the estimates of lifetime costs and health outcomes.

The quit rates applied in the economic evaluation were extracted from the Health Technology Assessment (2002) [4]. This HTA evaluated a similar population to the one described in the indicator, i.e. smokers to quitters. It was conservatively assumed in our model that the 6-month and 12-month abstinent rates were equivalent to the 12-month quit rate and lifetime quit rates applied in the HTA (2002) model [4], respectively.

**Table 1: The abstinent rates of brief advice alongside treatment**

| % abstinent (months) | Nicotine Replacement Therapy | Bupropion | Varenicline |
|---|---|---|---|
| 0 | 0.00% | 0.00% | 0.00% |
| 6 | 5.50% | 7.05% | 7.05%* |
| 12 | 3.30% | 4.23% | 4.23%* |

* Data was presented for Varenicline therapy – it was therefore assumed to have similar effectiveness rates to Bupropion which is supported by the effectiveness rates presented by the Smoking NHS Information Centre, in which Varenicline therapy has the highest abstinent rates following support [5].

The Information Centre reported NRT was the most commonly used treatment, used by 65 percent of service users. Varenicline alone was used by 23 percent and Bupropion by one percent. The remaining service users received no treatment [5]. As this indicator considers offering patients treatment, the reported proportions of treatments were adjusted to equal 100%. The model also assumes an unassisted annual background quit rate of 2.0%, consistent with published sources [3, 6].

## *Delivery cost of indicator*

This analysis is from the perspective of the healthcare provider, i.e. NHS. All direct costs to the NHS are considered. These include the cost of the interventions and those associated with smoking-related comorbidities [3] and one nurse consultant costed at £12, taken from the Unit Costs of Health and Social Care 2010 [7]. Costs were discounted at 3.5%.

**Table 2: Lifetime (discounted) costs of providing brief opportunist support and treatment to smokers**

| Treatment | Proportion | Lifetime cost | Weighted cost |
|---|---|---|---|
| NRT | 73.1% | £6,438 | £4,706 |
| Bupropion | 1.1% | £6,392 | £70 |
| Varenicline | 25.8% | £6,500 | £1,677 |
| Total | 100.0% | | **£6,453** |

The weighted lifetime (discounted) cost of providing brief support and treatment to smokers is estimated to be £6,453. The model [3] was also run to estimate the lifetime (discounted) cost of smokers who did not receive brief support or treatment (£6,377). **The incremental lifetime cost of providing the indicator is therefore estimated to be £76.**

## *Clinical-effectiveness of indicator*

The lifetime health outcomes, measured using quality adjusted life years (QALYs) were estimated and discounted at 3.5%.

**Table 3: Lifetime (discounted) QALYs of providing brief opportunist support and treatment to smokers**

| Treatment | Proportion | Lifetime QALYs | Weighted QALYs |
|---|---|---|---|
| NRT | 73.1% | 12.46 | 9.11 |
| Bupropion | 1.1% | 12.47 | 0.14 |
| Varenicline | 25.8% | 12.47 | 3.22 |
| Total | 100.0% | | **12.47** |

The weighted lifetime (discounted) QALYs of providing brief support and treatment to smokers is estimated to be 12.47. The model [3] was also run to estimate the lifetime (discounted) QALYs of smokers who did not receive brief support or treatment (12.43). **The incremental lifetime QALYs of providing the indicator is estimated to be 0.04.**

## *Incremental cost-effectiveness ratio*

The incremental cost effectiveness ratio of providing brief opportunistic support and treatment to smokers is estimated to be £1,900 per QALY gained. This can be considered a highly cost-effective use of NHS resources before considering the QOF payments.

**Figure 1: Incremental cost-effectiveness ratio**

$$ICER = \frac{Cost_{Treatment} - Cost_{Alternative}}{Effect_{Treatment} - Effect_{Alternative}}$$

## *Eligible population*

Estimates from the NHS Information Centre suggest the prevalence of smoking in 2008 was 21% among adults in England [5]. This will be the base case estimate in the analysis.

The pilot two sites reported practice prevalence slightly lower between 19.21% – 19.43%.

## *Baseline level of achievement*

There is significant variation in the proportion of known smokers who have been referred to NHS Stop Smoking Services or pharmacotherapy. Surveys of NHS Stop Services estimate that there were approximately 757,537 people who set a quit date with a NHS Stop Smoking Service in 2006, represented approximately 5.8% of the smoking population [5]. However, it is not known how many of these individuals were referred by a GP, due to the open access available to many stop smoking services.

Other published sources suggest that the proportion of smokers who have sought or received information on how to stop smoking from a healthcare professional each year is 16% [8]. A smaller percentage has been referred to a stop smoking group (9%).

The General Practice Research Database (GPRD) estimated the current baseline practice achievement to be 43.3% and this will be the base case value in the economic analysis.

## *Population*

In the base case, the threshold analysis of the proposed indicator was conducted based on the total practice population registered with practices in England, that is, 8,228 practices with a mean practice size of 6,297 [9].

**Table 4: Practice information for all UK members**

| Country | Number of practices | Number of patients |
|---|---|---|
| England | 8,228 | 6,297 |
| Scotland | 1,014 | 5,122 |
| Wales | 488 | 6,146 |
| Northern Ireland | 357 | 5,011 |

## *QOF Payments*

Each QOF point is assumed to result in a payment of £130.51. This is the forecast value per point in England during 2011/12 (source; Information Centre).

**Table 5: Value per point for all UK members (most recently available)**

| Country | Value per point |
|---|---|
| England | £130.51 |
| Scotland | £127.29 |
| Wales | £130.47 |
| Northern Ireland | £122.00 |

### *Societal value of a QALY*

The expected increase in quality adjusted life year (QALY) will be costed at £25,000 per QALY. This is based on the middle of the range £20,000 - £30,000, below which NICE generally considers something to be cost effective.

### *QOF Points*

The economic analysis considers the cost-effectiveness of incentivising the proposed activity over a range of QOF points. The range of QOF points evaluated were agreed by NICE, YHEC and the economic sub-group to justify the practice successfully completing the activity.

In the base case analysis, 10 points were allocated to the proposed smoking indicators. Sensitivity analysis will be followed out between the agreed lower and upper bounds of 6 and 13 points (i.e. the range evaluated).

### *Thresholds*

The minimum threshold is set to 40% and the incentivised payments increase linearly up to the maximum threshold of 90%.

## Results

The net benefit analysis suggests that the indicator is highly cost effective, with QOF payments up to the upper bound of 13 points being warranted on economic grounds. This is largely a result of the relatively low levels of baseline achievement and the significant increase in health outcome at a modest cost.

Sensitivity analysis shows that the findings are relatively insensitive to changes in any of the inputs, most importantly the estimates of incremental cost and effectiveness. The indicator is still highly cost effective at 13 points when the incremental cost of the indicator is increased by approximately 100%. Similarly, the net benefit is insensitive to changes in the incremental effectiveness associated with the indicator. The indicator remains highly cost effective at 13 points when the QALY gain associated with providing brief support and treatment to smokers reduces from 0.04 to 0.01.

## Discussion

Interventions to help smoking are recognised as being amongst the most cost effective use of healthcare resources. This evaluation of the pilot two smoking indicator supports the previous findings.

It is important to acknowledge as this indicator evaluates the general smoking population, it is anticipated if this analysis was run for patients with any or multiple comorbidities the likelihood of the indicator being cost effective would be even greater.

# References

[1] Twigg L, Moon G, Walker S. The Smoking Epidemic in England. Health Development Agency, 2004.

[2] Parrott S, Godfrey C, Raw M, West R, McNeil A. Guidance for commissioners on the cost effectiveness of smoking cessation interventions. Health Educational Authority. *Thorax*. 1998; **53(5)** Pt 2, 1-38.

[3] Coleman T, Agboola S, Leonardi-Bee J, Taylor M, McEwen A, McNeil A (2010). Relapse prevention in UK Stop Smoking Services: current practice, systematic reviews of effectiveness and cost-effectiveness analysis. Health Technology Assessment; **14(49)**.

[4] Woolacott NF, Jones L, Forbes CA, Mather LC, Sowden AJ, Song FJ, Rafferty JP, Aveyard PN, Hyde CJ, Barton PM (2002). The clinical effectiveness and cost effectiveness of bupropion and nicotine replacement therapy for smoking cessation: a systematic review and economic evaluation. Health Technology Assessment; **6(16)**.

[5] Statistics on NHS Stop Smoking Services: England, April 2009 – March 2010. NHS Information Centre. Published 19 August 2010.

[6] Stead LF, Bergson G, Lancaster T (2008). Physician advice for smoking cessation (review). The Cochrane Collaboration.

[7] Unit Costs of Health & Social Care 2010. Personal Social Services Research Unit (PSSRU). Complied by Lesley Curtis. University of Kent.

[8] Ladder D. Smoking-related behaviour and attitudes, 2007. Office of National Statistics.

[9] General Practice Trends in the UK. NHS Information Centre. Published 22 March 2011.

# Appendix A: Net Benefit Analysis

## Pilot 2 - Smoking Support & Treatment Indicator: Net Benefit Analysis

| | | | |
|---|---|---|---|
| Value per point achieved | £130.51 | Societal value of a QALY | £25,000 |
| Number of practices | 8,228 | | |
| Mean practice population | 6,297 | | |
| | | **Basline achievement** | |
| Minimum threshold | 40% | Eligible population (mean % of practice population) | 21.00% |
| Maximum threshold | 90% | Baseline achievement (mean % of eligible patients) | 43.3% |

**Cost-effectiveness estimates**

| | |
|---|---|
| Incremental cost (£ per patient) | £76 |
| Incremental effect (QALYs per patient) | 0.040 |

| Points | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|

**National totals**

| Expected Achievement | QOF payments (£000s) | | | | | | | | | | | Change in treatment cost (£) | Change in QALYs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30% | £0 | £0 | £0 | £0 | £0 | £0 | £0 | £0 | £0 | £0 | £0 | -£109,979,693 | -57884 |
| 35% | £0 | £0 | £0 | £0 | £0 | £0 | £0 | £0 | £0 | £0 | £0 | -£68,633,944 | -36123 |
| 40% | £0 | £0 | £0 | £0 | £0 | £0 | £0 | £0 | £0 | £0 | £0 | -£27,288,195 | -14362 |
| 45% | £322 | £430 | £537 | £644 | £752 | £859 | £966 | £1,074 | £1,181 | £1,289 | £1,396 | £14,057,555 | 7399 |
| 50% | £644 | £859 | £1,074 | £1,289 | £1,503 | £1,718 | £1,933 | £2,148 | £2,362 | £2,577 | £2,792 | £55,403,304 | 29160 |
| 55% | £966 | £1,289 | £1,611 | £1,933 | £2,255 | £2,577 | £2,899 | £3,222 | £3,544 | £3,866 | £4,188 | £96,749,054 | 50921 |
| 60% | £1,289 | £1,718 | £2,148 | £2,577 | £3,007 | £3,436 | £3,866 | £4,295 | £4,725 | £5,154 | £5,584 | £138,094,803 | 72681 |
| 65% | £1,611 | £2,148 | £2,685 | £3,222 | £3,758 | £4,295 | £4,832 | £5,369 | £5,906 | £6,443 | £6,980 | £179,440,552 | 94442 |
| 70% | £1,933 | £2,577 | £3,222 | £3,866 | £4,510 | £5,154 | £5,799 | £6,443 | £7,087 | £7,732 | £8,376 | £220,786,302 | 116203 |
| 75% | £2,255 | £3,007 | £3,758 | £4,510 | £5,262 | £6,013 | £6,765 | £7,517 | £8,269 | £9,020 | £9,772 | £262,132,051 | 137964 |
| 80% | £2,577 | £3,436 | £4,295 | £5,154 | £6,013 | £6,873 | £7,732 | £8,591 | £9,450 | £10,309 | £11,168 | £303,477,800 | 159725 |
| 85% | £2,899 | £3,866 | £4,832 | £5,799 | £6,765 | £7,732 | £8,698 | £9,665 | £10,631 | £11,597 | £12,564 | £344,823,550 | 181486 |
| 90% | £3,222 | £4,295 | £5,369 | £6,443 | £7,517 | £8,591 | £9,665 | £10,738 | £11,812 | £12,886 | £13,960 | £386,169,299 | 203247 |
| 95% | £3,222 | £4,295 | £5,369 | £6,443 | £7,517 | £8,591 | £9,665 | £10,738 | £11,812 | £12,886 | £13,960 | £427,515,048 | 225008 |
| 100% | £3,222 | £4,295 | £5,369 | £6,443 | £7,517 | £8,591 | £9,665 | £10,738 | £11,812 | £12,886 | £13,960 | £468,860,798 | 246769 |

**Net Benefit (£000s)**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 30% | -£1,337,122 | -£1,337,122 | -£1,337,122 | -£1,337,122 | -£1,337,122 | -£1,337,122 | -£1,337,122 | -£1,337,122 | -£1,337,122 | -£1,337,122 | -£1,337,122 |
| 35% | -£834,444 | -£834,444 | -£834,444 | -£834,444 | -£834,444 | -£834,444 | -£834,444 | -£834,444 | -£834,444 | -£834,444 | -£834,444 |
| 40% | -£331,767 | -£331,767 | -£331,767 | -£331,767 | -£331,767 | -£331,767 | -£331,767 | -£331,767 | -£331,767 | -£331,767 | -£331,767 |
| 45% | £170,588 | £170,481 | £170,373 | £170,266 | £170,159 | £170,051 | £169,944 | £169,836 | £169,729 | £169,622 | £169,514 |
| 50% | £672,943 | £672,728 | £672,514 | £672,299 | £672,084 | £671,869 | £671,655 | £671,440 | £671,225 | £671,010 | £670,796 |
| 55% | £1,175,298 | £1,174,976 | £1,174,654 | £1,174,332 | £1,174,010 | £1,173,688 | £1,173,365 | £1,173,043 | £1,172,721 | £1,172,399 | £1,172,077 |
| 60% | £1,677,653 | £1,677,224 | £1,676,794 | £1,676,365 | £1,675,935 | £1,675,506 | £1,675,076 | £1,674,647 | £1,674,217 | £1,673,788 | £1,673,358 |
| 65% | £2,180,009 | £2,179,472 | £2,178,935 | £2,178,398 | £2,177,861 | £2,177,324 | £2,176,787 | £2,176,250 | £2,175,713 | £2,175,176 | £2,174,639 |
| 70% | £2,682,364 | £2,681,719 | £2,681,075 | £2,680,431 | £2,679,787 | £2,679,142 | £2,678,498 | £2,677,854 | £2,677,209 | £2,676,565 | £2,675,921 |
| 75% | £3,184,719 | £3,183,967 | £3,183,215 | £3,182,464 | £3,181,712 | £3,180,960 | £3,180,209 | £3,179,457 | £3,178,705 | £3,177,954 | £3,177,202 |
| 80% | £3,687,074 | £3,686,215 | £3,685,356 | £3,684,497 | £3,683,638 | £3,682,779 | £3,681,920 | £3,681,060 | £3,680,201 | £3,679,342 | £3,678,483 |
| 85% | £4,189,429 | £4,188,463 | £4,187,496 | £4,186,530 | £4,185,563 | £4,184,597 | £4,183,630 | £4,182,664 | £4,181,697 | £4,180,731 | £4,179,765 |
| 90% | £4,691,784 | £4,690,710 | £4,689,637 | £4,688,563 | £4,687,489 | £4,686,415 | £4,685,341 | £4,684,267 | £4,683,193 | £4,682,120 | £4,681,046 |
| 95% | £5,194,461 | £5,193,388 | £5,192,314 | £5,191,240 | £5,190,166 | £5,189,092 | £5,188,018 | £5,186,945 | £5,185,871 | £5,184,797 | £5,183,723 |
| 100% | £5,697,139 | £5,696,065 | £5,694,991 | £5,693,917 | £5,692,843 | £5,691,770 | £5,690,696 | £5,689,622 | £5,688,548 | £5,687,474 | £5,686,400 |

Where the net benefit produces a non-negative outcome then it is cost effective for the NHS to adopt the indicator.

When this is the case, the cells are highlighted with a yellow background.

# Appendix B: Background to cost-effectiveness evidence (QOF)

This appendix provides background information to the approach used for evaluating the economic implications of existing and potential new indicators for the QOF. The approach has been developed by economists at the Universities of York and East Anglia, and presented previously to the QOF Advisory Committee.

The approach to cost effectiveness considers two issues:

1. Is the activity/intervention described by the indicator cost effective?
2. What level of payment is economically justifiable to increase the activity?

The first question seeks to determine whether an activity or intervention will result in benefits which are greater than the costs of undertaking the activity. In this analysis, health benefits are assumed to be measured in Quality Adjusted Life Years (QALYs) which can be valued in monetary terms at £25,000 each. The net benefit calculation subtracts the delivery costs and the QOF payments from the monetarised health benefits

**Net benefit = (monetised benefit – delivery cost) – QOF payment**

The second question relates to the level of QOF payments which can be justified to increase levels of desired activities whilst retaining net benefits to the NHS. This is directly relevant to negotiations relating to the implementation of indicators and decisions on the number of QOF points to be allocated to a particular indicator. Where sufficient data are available, detailed sensitivity analysis on QOF points and uptake levels can be undertaken within the cost-effectiveness model. This paper provides information on the cost-effectiveness of the pilot indicators, to inform the decisions of the QOF Advisory Committee.

## *Nature of cost-effectiveness evidence*

A couple of conditions must hold for an indicator to be deemed cost-effective:

1. The intervention/activity itself must be cost-effective. In the UK, NICE use an implicit threshold of £20,000 to £30,000 per QALY gained.
2. The intervention/activity must lead to an increase in the number of eligible patients receiving the intervention/activity.

The main challenge associated with cost-effectiveness analyses of the indicators is the availability of data on the costs and health benefits of implementing the targeted activities. The main source of this has been the review of NICE clinical guidelines and published literature. For several indicators there is the additional problem of linking them directly to changes in patient outcomes so that net health benefits can be assessed.

Many of the indicators relate to areas of clinical management which have been shown to be cost-effective if correctly carried out. However, the indicators themselves do not always measure the delivery of treatment; they frequently require the assessment and documentation of a patient's disease status, or whether they have had a particular diagnostic test. These types of indicators may lead to changes

in treatment and improvement in patient outcomes, but it is not certain to happen. In reviewing the piloted indicators we have applied a three-way classification:

i. Indicators which relate directly to a change in treatment;

ii. Indicators which change the availability of information available to the treating clinician in a disease where there is a proven therapy;

iii. Indicators which change the availability of information but which do not directly inform a treatment decision.

Indicators in category (i) are most amenable to cost-effectiveness analysis as they can lead directly to a change in outcome. Those in category (ii) may also lead to a change in outcomes if the new information is acted upon. To carry out the cost-effectiveness an assumption must be made on the likelihood of such a change in management taking place. The third category is least amenable to cost-effectiveness analysis as improvement in the process of information collection is unlikely to change the patient outcome.

The main challenge associated with the analyses outlined above, is the availability of evidence on the costs and health benefits of existing and new clinical indicators. Two economic approaches have been derived:

## *Approach one – Net benefit analysis*

A net benefit approach has been recommended as the most appropriate means of evaluating whether an indicator can be considered cost effective. Cost effectiveness is intended to consider whether the costs associated with an indicator are outweighed by the benefits accrued by the health service. When a robust evidence base is available for an indicator, they can be identified as a category (i) indicator. When an indicative evidence base is available for category (ii) indicators it is possible to apply the net benefit approach.

## *Approach two – Threshold analysis*

Threshold analysis has been identified as the approach when considering indicators with a thin evidence base, i.e. missing data. For example, where the costs of delivering an indicator are known or can be easily estimated, but the effectiveness is unknown, then it is possible to identify the minimum level of effectiveness necessary for an indicator to be considered cost effective, in terms of quality-adjusted life years (QALYs) per patient per annum. This can also be expressed in terms of a minimum cost-saving (£) per patient per annum. This approach is applied to the category (ii) indicators with a thin evidence base.

Data on costs of implementation can be estimated from descriptions of the actions required to meet the potential indicator targets. The nature and extent of any QOF payment is unknown at this stage. Judgement can be made on the potential cost-effectiveness of an indicator if the difference between the costs and benefits of implementation is known. If this is relatively small, then there will be little scope for incentive payments if positive net benefits are to be achieved.

Piloted indicators are reviewed to determine which are associated with a therapeutic benefit that can be measured in QALY terms. Indicators which do not have a direct link to therapeutic benefit (process indicators) are subject to a preliminary economic

appraisal. The danger of attributing a therapeutic benefit to a process indicator is that the necessary assumptions may be seen, in some cases, as tenuous.

Although the cost-effectiveness of indicators that do not have a direct link to therapeutic benefit may be unclear, this does not mean that they are poor value for money, but rather that new studies are required to produce the data needed to determine their cost-effectiveness (Walker *et al*. 2010).

# References

Walker S, Mason AR, Claxton K, Cookson R et al. (2010) Value for money and the Quality and Outcomes Framework in primary care in the UK NHS. British Journal of General Practice; May 2010, e213-220.