Kent Surrey Sussex
Academic Health Science
Network

Cost benefit analysis of the Mouth Care Matters programme

June 2017

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Executive Summary

Introduction

Mouth Care Matters (MCM) is a training initiative aimed at improving the oral health in Kent, Surrey and Sussex. This report focuses on the acute part of the programme.

There is evidence to show that poor oral health can lead to deterioration in general health. Hospitalisation changes an individual's routine, causing stress and anxiety due to discomfort, with pathological changes making the body more fragile (Sousa et al. 2014). Patients can lose motivation to carry out routine oral hygiene habits, such as tooth brushing (Carrilho Neto et al. 2011). Where a patient has a cognitive or physical limitation, or the hospital environment creates barriers or difficulties that interfere with the adoption of healthy oral health habits, these issues can be exacerbated (Zhu et al. 2008). Poor oral hygiene contributes to the development and maturation of dental biofilm. Pathogenic microorganisms in this biofilm have been implicated in infectious and/or inflammatory processes that compromise the function of organs and systems, contributing to increased morbidity and mortality (Seneviratne et al. 2011). Consequently, pre-existing oral conditions of hospitalised patients can deteriorate or new conditions can develop (Needleman et al. 2012).

The MCM programme was developed and piloted at East Surrey Hospital, an acute hospital with approximately 650 beds and part of Surrey and Sussex Healthcare NHS Trust (SaSH). Whilst the MCM programme was being developed, the Care Quality Commission inspection report (CQC, 2014) complimented the standard of care at the trust, however, it highlighted mouth care as an improvement point. The inspection found patients had dry mouths and there was no evidence of oral health assessments in the nursing notes.

MCM is based on 4 simple principles.

- Providing staff with the knowledge of the importance of mouth care
- Ensure staff are skilled to provide good mouthcare
- Patients have access to effective mouth care products
- Ward staff have support from staff with enhanced oral health skills

Following the success of the pilot, HEE funded an upscaling of the pilot to other trusts within the Kent, Surrey and Sussex (KSS) region.

Purpose of report

With the ever-increasing pressures placed upon our health and social care systems, any interventions made ideally need to improve outcomes, increase safety and/or provide better value. The ideal scenario is all three are achieved by implementing the intervention. This report has been conducted to understand the value impact

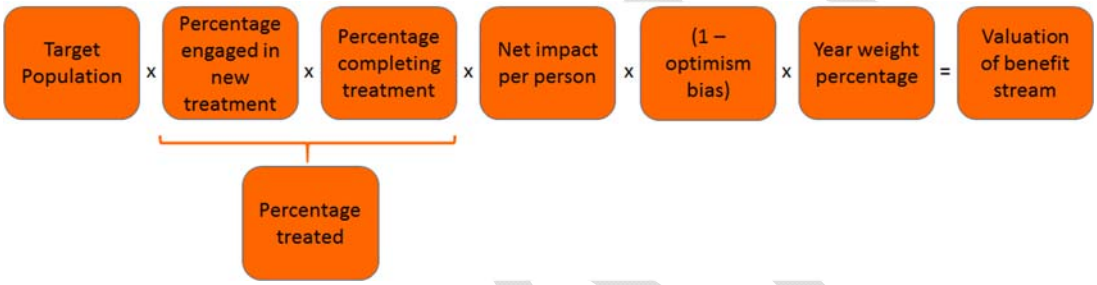
achieved through the Mouth Care Matters programme to understand the return on investment and opportunity for wider rollout. It may also help focus decision making on the scale and which elements of the MCM programme are most suitable for further spread.

Methodology

This study produces a current and an ex-ante appraisal of the impact of the MCM programme. It estimates the impact of the value produced using the best available evidence from the pilot at SaSH and other literature. This assessment is in line with HM Treasury 'The Green Book: appraisal and evaluation in central government' (HM Treasury, 2016).

The following core process is applied to the estimation of these benefits:

Figure 1 Probability of total net present benefit value



This process takes a standard approach of working out the number receiving the treatment, multiplied by the net benefit or impact per person, multiplied by a factor to remove an optimism bias, to give a total net benefit of the benefit stream, over and above the counterfactual.

The counterfactual is the treatment that patients would have received in the absence of the MCM programme. This is captured through the 'year-weight' which accounts for relative delivery vis-à-vis other areas attempting to deliver treatment without the presence of the mouth care team.

The report takes a five-year view of the programme. While further time horizons are possible, there is a consequent increase in uncertainly as to the results. For this report, in addition to the period in which the programme received HEE funding, we have included the assumption that the MCM programme will be funded to deliver the same level of support as is currently delivered. Were the funding of the roles to end, the benefits would be seen to diminish over a period as learning points from the training received is forgotten and the workforce changes.

Results

Headline results

Table 1 lays out the headline findings for the six years to 2020/21 financial year, modelled using a combination of actual results, recorded by the MCM team and academic studies conducted into relevant research areas. This table shows the costs and benefits at the SaSH pilot site only, whilst table 2 shows the results of modelling of the roll out across KSS. Table 3 shows an indicative cost benefit analysis, were the programme to be rolled out across England in the same manner as with KSS.

Table 1 Base-case headline results by year – MCM at SaSH (report scenario 1)

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Total
Healthcare system cash releasing savings	£10.7k	£16.3k	£17.1k	£18.0k	£18.9k	£19.8k	**£100.8k**
Healthcare system non-cash releasing savings	£238.4k	£336.4k	£354.9k	£367.9k	£381.9k	£396.7k	**£2.1m**
Societal benefits	£2.7m	£3.9m	£4.1m	£4.3m	£4.5m	£4.7m	**£24.3m**
Total Benefits	**£3.0m**	**£4.2m**	**£4.5m**	**£4.7m**	**£4.9m**	**£5.1m**	**£26.4m**
Total costs	**£180.4k**	**£204.7k**	**£207.3k**	**£128.8k**	**£131.8k**	**£135.0k**	**£988.0k**
Net present value (benefits – costs)	**£2.8m**	**£4.0m**	**£4.3m**	**£4.6m**	**£4.8m**	**£5.0m**	**£25.5m**
Benefit to cost ratio	**16.6 : 1**	**20.5 : 1**	**21.7 : 1**	**36.5 : 1**	**37.2: 1**	**37.8 : 1**	**26.7 : 1**

Table 2 Base-case headline results by year – MCM across KSS (report scenario 2)

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Total
Healthcare system cash releasing savings	£5.6k	£15.7k	£102.0k	£146.5k	£158.0k	£170.5k	**£598.5k**
Healthcare system non-cash releasing savings	£114.6k	£313.2k	£2.0m	£2.9m	£3.1m	£3.4m	**£11.9m**
Societal benefits	£740.8k	£2.0m	£13.4m	£19.4m	£21.1m	£23.0m	**£79.6m**
Total Benefits	**£861.0k**	**£2.4m**	**£15.5m**	**£22.5m**	**£24.4m**	**£26.5m**	**£92.1m**
Total costs	**£198.4k**	**£268.3k**	**£886.0k**	**£1.1m**	**£1.1m**	**£1.1m**	**£4.7m**
Net present value (benefits – costs)	**£662.6k**	**£2.1m**	**£14.6m**	**£21.4m**	**£23.3m**	**£25.4m**	**£87.5m**
Benefit to cost ratio	**4.3 : 1**	**8.9 : 1**	**17.5 : 1**	**20.5 : 1**	**22.2 : 1**	**24.1 : 1**	**19.6 : 1**

Table 3 Base-case headline results by year – MCM across England (report scenario 3)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
Healthcare system cash releasing savings	£61.9k	£162.0k	£1.0m	£1.4m	£1.4m	£1.5m	**£5.6m**
Healthcare system non-cash releasing savings	£1.0m	£2.6m	£15.9m	£21.5m	£21.9m	£22.2m	**£85.1m**
Societal benefits	£7.0m	£18.1m	£111.6m	£152.5m	£156.4m	£160.4m	**£605.9m**
Total Benefits	**£8.0m**	**£20.9m**	**£128.5m**	**£175.4m**	**£179.6m**	**£184.0m**	**£696.6m**
Total costs	**£658k**	**£1.5m**	**£8.7m**	**£11.8m**	**£11.8m**	**£11.9m**	**£46.4m**
Net present value (benefits – costs)	**£7.4m**	**£19.4m**	**£119.8m**	**£163.6m**	**£167.8m**	**£172.2m**	**£650.2m**
Benefit to cost ratio	**12.2 : 1**	**13.9 : 1**	**14.8 : 1**	**14.9 : 1**	**15.2 : 1**	**14.5 : 1**	**15.0 : 1**

Sensitivity testing

Figure 2 presents the probability distribution for total net present benefits calculated using the Monte Carlo method to predict sensitivity of the outcome to variation in underlying assumptions as explained in section 1. This graph shows the costs and benefits at the SaSH pilot site only, whilst figure 3 shows the probability distribution results of modelling of the roll out across KSS and figure 4 does the same for a roll out across England.

Figure 2 Probability of total net present benefit value – MCM at SaSH (scenario 1)

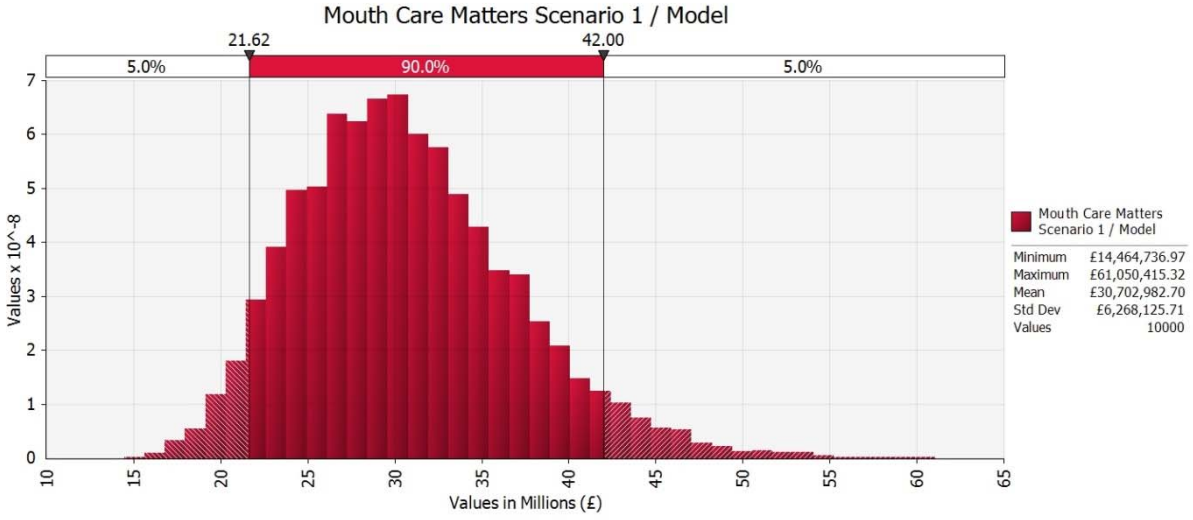


Figure 3 Probability of total net present benefit value – MCM across KSS (scenario 2)

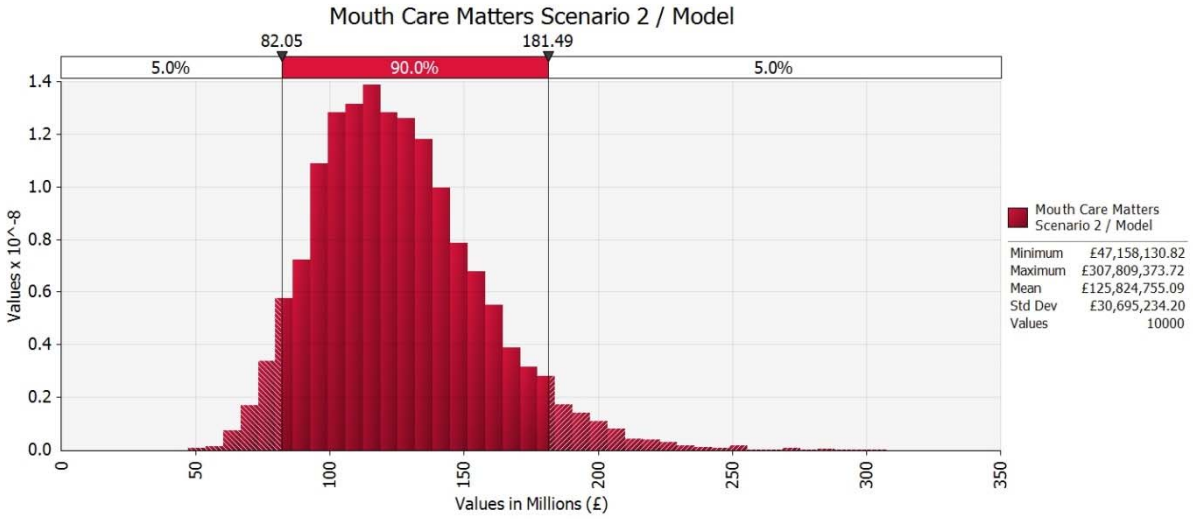
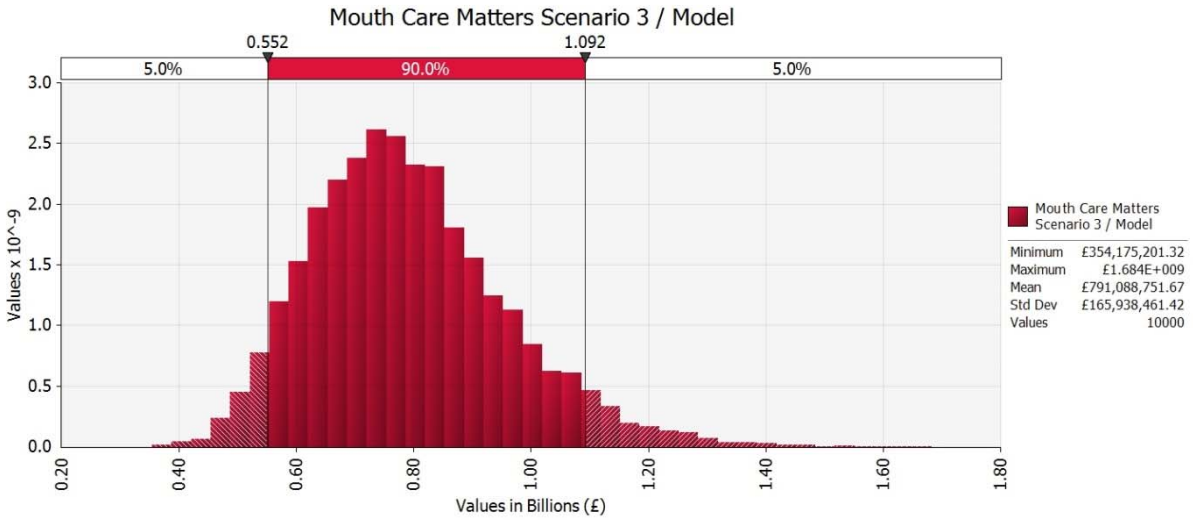


Figure 4 Probability of total net present benefit value – MCM across England (scenario 3)



Conclusions

This study's purpose is to understand the impact the Mouth Care Matters programme is having based on the investment it has been provided with. The economic analysis that has been conducted was designed to answer one primary question; could robust estimates of the total health and social economic benefits that MCM is contributing be generated via a desk-based study, augmented by targeted interviews, standardised data and published sources.

Ability to deliver robust results

This study's primary findings are:

- It is possible for a desk-based study to generate estimates of the value produced that are sufficiently robust to be useful for policy-making, but there

are areas where we have applied some caution in the application of the results in terms of estimating an overall net present value of the programme;

- Several of the benefit streams identified have information gathered from older research studies. As such there is little means to verify that benefits identified within these studies remain applicable to the present-day value attributed. To guard against over estimating on this basis, prudent application of a variable optimism bias attempts to control for this effect.
- The study has been compelled to use a number of assumptions in the absence of project data:
- As a result of the absence of some data, whilst it is possible to identify potential benefit streams, it is not necessarily the case that we can quantify these. Data is not necessarily available, or there is insufficient evidence that in practical terms all the streams come to fruition. Where this is the case, the potential benefit has been explained, but has not been assigned an economic value.

Results of the study

The conclusions of this study, which has looked to identify the costs and benefits of the MCM programme:

- **Across Kent, Surrey and Sussex, the Mouth Care Matters programme is estimated to deliver tangible value in the order of £2.66 of benefit within the health care system for every £1 invested in the project.** This is based on cautious and prudent adjustments for optimism bias on both the benefits and the costs.
- **A further £17 is identified in social benefits for every £1 invested.**
- Sensitivity testing around the base-case indicates that the overall **benefits generated per £1 invested range between £17.46 and £38.61.** At the 90% confidence level, we do not observe a scenario where costs exceed benefits.

External validation of model

The model and this report have been subject to external validation by Richard Heys, a professional economist. Richard has degrees in economics from the University of Oxford and UCL. He has worked as a professional economist, both for government and in the private sector for sixteen years. He has worked in partnership with the KSS AHSN for three years, validating economic analyses of health projects.

> "Although the final estimates present what appear to be relatively high benefit-cost ratios, I am content the approach taken within this model represents a robust estimation of the potential costs and benefits arising from the project based on the available evidence, and standard cost benefit techniques, and that prudent levels of optimism bias have been applied."
>
> Richard Heys, June 2017

1 Introduction

Research has shown that many patients who are admitted to hospital have existing oral problems such as caries (tooth decay) and broken dentures (Hanne et al., 2012). Admission to hospital presents an excellent opportunity to screen patients for undetected disease and to provide relevant dental treatment and health promotion advice. A study of the oral health of hospitalised patients found that hospitals had no policies in place for routine oral health practices and that patients' oral health was not being assessed (Sousa et al., 2014). Similarly, a study carried out in Ireland has shown that only 31% of nurses assessed patients' mouths on admissions and only 4% had used an oral assessment tool (Stout, Goulding and Powell, 2009). Additionally, there was no standardisation in the delivery of oral care and a lack of equipment such as toothbrush and toothpaste meant that nurses were improvising with forceps and gauze (Stout, Goulding and Powell, 2009).

Such issues within hospital are particularly pertinent as patients' oral health care routine often changes a lot while hospitalised. Hospitalisation causes stress and anxiety due to the imminence of pain and discomfort and because pathological changes make the body more fragile (Sousa et al. 2014). It also tends to reduce patients' self-esteem and they often neglect to care properly for themselves. They lose motivation to carry out routine oral hygiene habits, such as tooth brushing (Carrilho Neto et al. 2011). The scenario is worse when a patient has a physical limitation and/or the hospital environment creates barriers or difficulties that interfere with the adoption of healthy oral health habits (Zhu et al. 2008).

Barriers that have been reported by nurses, preventing the provision of oral care have been researched (Adams, 1996; Preston et al., 2006). These include:

- Lack of knowledge
- Lack of training
- Lack of time
- Lack of equipment
- Lack of oral assessment tools
- A disagreeable attitude towards the mouth
- Attitude towards own dental health

The MCM programme challenges all of these issues through a training programme, recommendations on changes of practice and equipment needs and the presence of a Mouth Care lead to ensure a patient's oral health issues are correctly identified and treated. Mouth Care leads also raise the profile of the project by improving staff awareness of the link between mouth care and general health. Support is particularly

important for patients who present with additional challenges (e.g. frequently refusing mouth care), and/or for patients who nursing staff have specific concerns about.

MCM training for hospital staff comes in various formats and includes:

- Small group classroom teaching sessions
- Ward-based, hands-on training
- Sessions tailored to specific groups, for example the speech and language team, palliative care, chemotherapy, oncology, doctors, dieticians and pharmaceutical team
- E-Learning
- MCM guide
- MCM resources (posters, newsletters etc.)
- MCM website

The programme, which is part of continuing professional development, was developed and piloted at SaSH, and has recently begun to be rolled out across Kent, Surrey and Sussex.

2 General Methodology

2.1 Standard Framework

This study produces a to-date current and an ex-ante appraisal of the prospective impact of the Mouth Care Matters programme, estimated using the best available evidence from emerging project data and academic research. The project is assessed in line with the standard HM Treasury guidance. This guidance, 'The Green Book' (HM Treasury, 2016) applies throughout the public sector to ensure consistent estimation of costs and benefits in cost-benefit appraisals. In recent years this has been supplemented by a number of Departmental or sectorial 'supplementary guidance' documents. This study attempts to retain consistency with this landscape, except where the supplementary guidance documents contradict each other. In these cases the study takes a 'first principles' approach to identifying an appropriate methodology based on economic fundamentals.

The supplementary guidance documents of most relevance are:

- Health (DoH, 2004)
- Public Service Transformation (HM Treasury 2014)
- Risk (HM Treasury, 2013)
- Technology Appraisal in Health (NICE, 2013)

In addition to this supplementary guidance, there is also relevant technical research we have drawn upon, specifically in relation to the value of a preventable fatality, where we refer to Deloitte (2009) and Woolf & Orr (2009).

It is worth noting that the assessment is a socio-economic assessment of the costs and benefits of the MCM programme to the UK as a whole. It therefore captures costs and benefits that accrue outside the health and social care sectors and so is consistent with the 'Green Book'. Consequently, it is not produced purely to align with NICE guidance (NICE, 2013). The key difference between this study and the NICE approach[1] are:

- **Costs:** NICE is only concerned with those costs which fall on the NHS and personal social services (PSS)[2]. For example, this study also captures the private costs of social care and costs falling on volunteers.
- **Outcomes:** NICE is only concerned with '*all direct health effects, whether for patients or, when relevant, carers.'* Whilst the study has not identified any non-health effects (taking the human costs of illness, including lost earnings as a 'health effect'), the study is not restricted from doing so.
- **Productivity:** NHS-NICE (2013) states that *'productivity costs are not included in either the reference-case or non-reference case'*[3]. In general, if the study identifies an impact on productivity, the analysis will attempt to capture it.

2.2 Standardised data sources

In addition to the framework described above, HM Government has also looked to enable quicker and more efficient delivery of cost benefit appraisals, particularly by local government, through the funding and development of three sets of standardised unit cost databases, from which we will look to draw data as standard. These are:

- Department for Transport's **WebTAG** data book
- **PSSRU**'s 'Unit Costs of Health and Social Care 2016' and
- **New Economy** 'Unit Cost Database' (2015) which divides costs into financial costs and economic costs. These terms broadly equate to 'public sector delivery costs' and 'all other socio-economic costs'.

[1] Summarised in Table 5.1 (p34) of NHS – NICE (2013)
[2] Whilst non-NHS/PSS benefits and costs should be quantified, they should be '*presented separately from the reference-case analysis.' (para5.1.10)*
[3] Para 5.1.10, NHS-NICE (2013)

These sources present an efficient but effective mechanism for identifying values for many costs and outcome benefits. They are broadly consistent with one another but where they are not we will look to identify the original source data where possible to identify the most relevant source.

Optimism bias

It has previously been reported that commissioners and practitioners are often overly optimistic about the outcomes that will be achieved by the project or programme and the amount of money that will be needed to deliver these outcomes (New Economy, 2015). It seems reasonable to assume that the degree of over optimism will be greater when the data and evidence upon which the cost effectiveness model is based are uneven, old or incomplete. Therefore, the model applies optimism bias correction factors in response to the level of uncertainty in the data or assumptions used. The optimism bias approach used is based on the confidence grade definitions shown in table 4.

Table 4 Optimism bias correction grading

Confidence grade	Colour coding in model	Data Source	Age of data	Known data error	Optimism bias correction
1		Formal service delivery contract costs Figures derived from local stats / RCT trials	1-2 years old	+/- 5%	5%
2		Practitioner monitored costs Figures based on national analysis in similar areas	2-3 years old	+/- 10%	10%
3		Costs developed from ready reckoners Figures based on generic national analysis	3-4 years old	+/- 15	15%
4		Costs from similar interventions elsewhere Figures based on international analysis	4-5 years old	+/-20%	25%
5		Cost from uncorroborated expert judgement Benefit from uncorroborated expert judgement	>5 years old	+-25%	40%

The optimism bias correction factor for the data is then determined based on the lowest confidence grade found in relation to each individual outcome and costs are increased by the corresponding percentage factor.

2.3 Methodological process

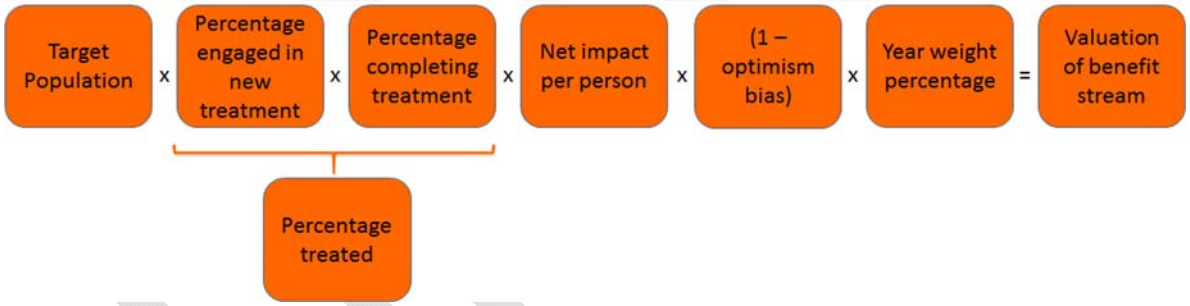
This study deploys a tried and tested approach to estimate the impact of MCM programme. The approach has the following major stages:

For each outcome, data are needed to determine inputs for the model. The input data required are the:

- total population in the project area (e.g. the number of inpatients at the trust);
- population at risk (e.g. number of patients with dentures);
- level of engagement with the target population (e.g. the percentage of mouth care recording packs completed);
- scale of impact in changing the outcome (percentage success at achieving the desired outcomes - e.g. shortening the length of hospital stay).

This process takes a standard approach of working out the number receiving the treatment, multiplied by the net benefit or impact per person, multiplied by a factor to remove the optimism bias, to give a total net benefit of the benefit stream, over and above the counterfactual.

Figure 5 Probability of total net present benefit value



Gathering evidence from existing sources using a targeted literature review to populate the indicative formula outlined in Figure 3, sourcing materials through interviews with subject matter experts and more general literature review techniques to identify the best evidence and mechanism for estimating benefits. Key sources will be:

- ***Evaluations of similar delivery models*** to identify effectiveness rates and the best ways of measuring these.
- ***Indirect benefit estimation methods*** – using alternative methods to assess benefit streams if direct estimation methods are not applicable. Examples may be, 'willingness to pay' surveys of consumers of a service to identify what they would be willing to pay to receive this service.
- ***Limited estimation methods*** – in some cases there may not be sufficient data to capture the full range of benefits from an intervention. In these cases

we will look to identify all benefit streams and quantify those where we can. In particular we have discovered it is normally possible to identify avoided costs, which whilst they may fail to capture the wider social benefits provides a starting point for an assessment.

Applying a discount to future costs and benefits. To determine the present value of the costs and benefits for use in calculations of benefit cost ratios, the values of future costs and benefits are discounted to current prices. The discount rate is used to convert all costs and benefits to 'present values', so that they can be compared. The model uses a standard discount factor of 3.5%, following HM Treasury (2014) guidance[4]. The discount calculation can be expressed mathematically as:

$$D_n = \frac{1}{(1+r)^n}$$

For example, a payment of £150 at the middle of year 5 has a present value at the middle of year 0 of £126.30, with the following working:

$$£150 \times \frac{1}{1.035^n} = £150 \times 0.8420 = £126.30$$

The authors are aware of recent debate on whether to apply different discount rates on costs and benefits, but this report continues to treat both equally.

Applying the existing estimates of effectiveness to data on the size of the treatment groups in the area modelled, including any steps in roll-out.

The following chapters take each benefit stream in turn and describe the methodology used to estimate the value of the project for the scenario. Later chapters look at changes to the assumptions for other scenarios and the resultant benefits and costs.

Net present value

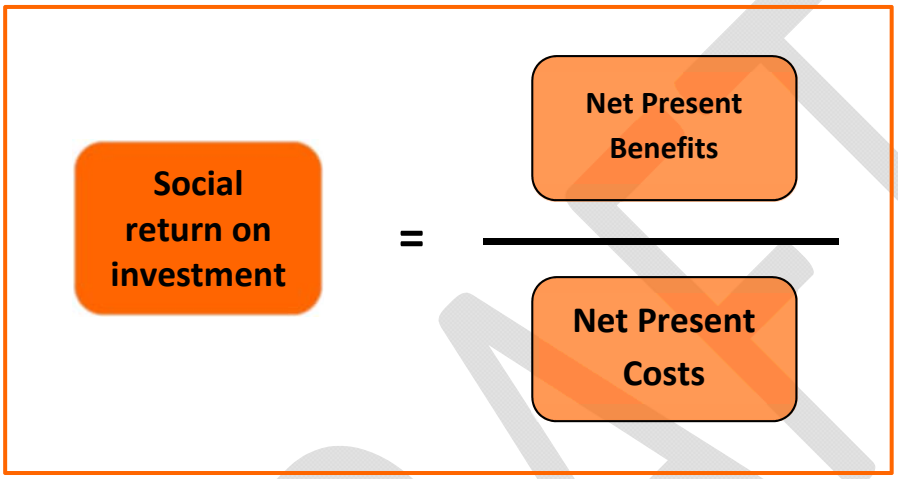
[4] For more information and further examples, refer to https://data.gov.uk/sib_knowledge_box/discount-rates-and-net-present-value. In 2004, NICE (NICE, 2004), required that costs and health effects should both be discounted at the 3.5% STPR specified in the Treasury Green Book. The NICE policy of common discounting of costs and health effects at 3x5% was maintained in subsequent guidance (NICE 2008). NICE later amended this guidance indicating that a lower common rate of 1.5% could also be considered when there are long term and substantial health benefits, which are 'highly likely' to be achieved, and where introduction of the technology does not commit the NHS to significant irrecoverable costs (section 6.2.19, NICE 2013). IN this instance we have used the 3.5% rate as a prudent attempt to prevent over-valuation of the benefits, which relatively accrue later in the assessment period.

The net present value (NPV) is a measure of the additional value created by implementing the project. To provide a consistent measure of costs and benefits now and into the future, future costs and benefits are discounted to produce present values. These present values are then used in the NPV calculation as follows: Net present value = Present value of the benefits – Present value of the costs

Cost benefit ratio

The financial return on investment. This is calculated by dividing the present value of the budgetary savings by the upfront budgetary cost of the intervention as shown in figure 4.

Figure 6 Cost benefit ratio calculation



Monetisation

To turn outcomes from the programme into a financial benefit, each outcome needs to be monetised. There are two overall benefit categories, one of which is further divided to allow a prudent understanding of how the benefit can be realised:

Efficiency Savings, either to the health care sector or others. How these benefits are realised depends of the cashability of the saving. Cashability refers to the extent to which a change in an outcome will result in a reduction in fiscal expenditure. The ability to cash depends on the type of benefit, scale, timing and the leadership in place to realise the savings. This report takes a prudent approach to identify benefits where the fiscal saving can be easily realised by dividing the fiscal savings into the following benefit streams:

- **NHS related cash releasing benefits:** These benefits produce immediate cashable savings to the provider. An example of this benefit would be the deprescribing of a drug, following intervention by the MCM team.
- **NHS related non-cash releasing benefits:** These benefits are important to reducing demand and strain on services, but a fiscal value cannot be realised without decommissioning of services, which is often difficult due to factors of scale (e.g. shutting one bed on a ward has a small impact on spending, whereas shutting a whole ward allows for fixed costs to be saved). Benefits

which can be described as non-cash releasing include reduced hospital length of stay and reduced re-admissions where the scale of the effect on any one institution is unlikely to release savings of a magnitude which can result in a change in behaviour by the institution.

Social value – The overall benefit to the public, including, but not limited to, employment related benefits, such as fewer sick days and improved health and wellbeing. A key element of understanding these benefits is the approach the model takes in calculating quality of life changes. Quality of life related benefits use a Quality Adjusted Life Year (QALY) calculation. The basic construction of a QALY valuation for a particular health state is the number of years of life spent in that state multiplied by a health state utility based weighting (cf. Williams, 1985). So, for example, a health state which lasts 10 years and is valued at 0.9 in terms of health state utility would give 9 QALYs. The QALY provides a single index allowing a measurement of the effects of health interventions on mortality and morbidity.

This QALY is then given a financial value using the willingness to pay threshold value used by NICE on behalf of the NHS. NICE methods guides refer to a threshold of £20 000-£30 000 per QALY. A sensitivity range is used to reflect the range within which this threshold is applied, with the lower value (£20,000) taken as the modal value.

Other benefits – Although this report is primarily concerned with the fiscal benefits associated with the MCM programme, it is important to acknowledge the other benefits for which there is evidence, for which an accurate value cannot be attributed. These benefits include reputational value and staff confidence and satisfaction levels.

2.4 Sensitivity analysis

Monte Carlo analysis is a modelling technique which simulates the impact of the expected variance in key variables on the output of interest, in this case the net present value. The approach is best described using an example.

Step One: Allocation of ranges:

Variables whose impact is of interest are given base-case values (or mean estimates), and an expected range. In the example below we look at quality of life adjustment factor and expected life expectancy:

Step One example

Variable	Lower range estimate	Base-case / mean estimate	Upper range estimate

Quality of life adjustment factor	0.420	0.565	0.710
Life expectancy (years)	4.73	6.30	7.88

Step Two: Allocation of a distribution shape

All data has a shape to its distribution. If there is equal likelihood of any value within a range being drawn, then a rectangular distribution can be used (so called because a graph of the probability of any specific value being drawn would appear to be a rectangle). If there is a lower likelihood of a value at the extreme ends of the range being drawn, then a triangular distribution could be used.

If there is reason to believe the distribution meets the statistical qualities required to be defined as normal, Poisson, etc, then these can be applied. In this study, we have generally applied triangular distributions as this best reflects the ranges used and diminishing probabilities of more extreme ends. Where a different distribution has been used, it is expressly noted in the text.

Step Three: Random selection of values within the range

The model selects at random a value for each variable from within the range between the upper and lower estimate and calculates the outcome from each draw, considering the distribution shape selected and therefore the probability of any value being drawn.

Step Four: Repetition

Variable	Draw 1	Draw 2	Draw 3	Draw 4	Draw 5
Quality of life adjustment factor	0.45	0.50	0.55	0.60	0.75
Life expectancy (years)	4.5	5.0	5.5	6.0	7.5
Quality of Life Year monetary value	£20,000	£20,000	£20,000	£20,000	£20,000
Benefit (lives saved x value of lives saved)	£40,500	£50,000	£60,500	£72,000	£112,500

Five draws are given above, using a rectangular distribution. These deliver estimates lying between £40,500 and £112,500. The draw is repeated thousands of times. In this study, we use 10,000 runs as standard.

Creating 10,000 estimates allows the creation of a distribution of possible outcomes from the draws made. From this distribution, we can then compute the range within which we expect 90% of the observations from the draws to fall. This is called the 90% confidence interval.

Modelled scenarios

The data available has been deployed to measure the impact of three scenarios; pilot of the project at SaSH; rollout to KSS and rollout across England.

The first scenario covers implementation of the MCM programme at SaSH only, this scenario has been included because, being the trust with the longest period of implementation, this provides the richest source of data from the project. Other scenarios can only model this data, with a consequent higher level of uncertainty as to the accuracy. This report has modelled the two stages of implementation that have occurred at SaSH, with training only from April 2015 and the introduction of the MCM team from September 2015. Cost and benefits are modelled from this period forward.

The second scenario simulates the roll out of MCM across Kent, Surrey and Sussex. Given the point at which this analysis is being conducted, roll out to the Kent, Surrey and Sussex region has not been completed and data to allow the impact of the project to be evaluated is not currently available. To control for this uncertainty, where the data used for the assumptions comes from the results at SaSH, or is based on academic evidence, an additional optimism bias is applied to model the variability of implementation at scale.

Finally, a third scenario is included to give an indication of the impact the project could have were the MCM programme to be rolled out across all acute trusts in England.

3 Scenario 1 – Pilot of programme at SASH

3.1 Scenario description

This scenario aims to present the impact the project has had within the pilot site, Surrey and Sussex Healthcare NHS Trust (SaSH).

Being a pilot site, with a strong driver for commencing the programme following the recommendations of a CQC inspection and significant executive support, it is expected that implementation will be at a higher level than seen within some other trusts. Modelling the results at SaSH provides a case study to show what realistic maximum implementation looks like.

3.2 Key assumptions

The results of the individual benefit streams detail where the data regarding impact and cost information is sourced from. Where local data is not available, the following data, in order of preference, will be; national trust specific data (e.g. HRG), with market forces factors applied; UK focussed academic research; international

academic research. Where academic research is used, preference is given to the most recent or relevant study evidence available. Any historical costing data used will be uplifted to current estimates using an inflation rate derived from The Hospital & Community Health Services (HCHS) index.

3.3 Overall benefits

In total, 14 significant monetised benefits of the programme are identified, across the three benefit streams. Identified benefits are based on the programme being funded for the period analysed by the model, with initial funding from HEE, with the local trust assuming responsibility from 2018.

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	**Total**
Healthcare system cash releasing savings	£10.7k	£16.3k	£17.1k	£18.0k	£18.9k	£19.8k	**£100.8k**
Healthcare system non-cash releasing savings	£238.5k	£336.4k	£354.9k	£367.9k	£381.9k	£396.7k	**£2.1m**
Societal benefits	£2.7m	£3.9m	£4.1m	£4.3m	£4.5m	£4.7m	**£24.3m**
Total	**£3.0m**	**£4.2m**	**£4.5m**	**£4.7m**	**£4.9m**	**£5.1m**	**£26.4m**

Related back to system demand and patient quality of life figures, the economic benefits identified above result in the following totals:

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	**Total**
Additional bed days avoided	408	574	605	637	672	708	**3,604**
Decreased GP visits	1,193	1,673	1,760	1,852	1,948	2,050	**10,476**
Prescription costs avoided	£9,787	£13,764	£14,505	£15,239	£16,012	£16,827	**£86,134**
Additional years of quality adjusted life	137	192	202	213	224	236	**1,204**

3.4 Overall costs

The costs included within the model are a combination of project costs and costs resulting from the implementation of project. Project costs include the funding HEE have invested into the project, with additional costs resulting from items such as oral care related consumables used on wards and a cost for time spent by staff receiving MCM training. Finally, there is a cost included for additional length of stay resulting from patients who survive in hospital because mortality has fallen.

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	**Total**
HEE invested project costs	£149.0k	£149.0k	£149.0k	-	-	-	**£447.0k**
Hospital mouth care materials	£18.6k	£25.1k	£24.9k	£24.7k	£24.5k	£24.3k	**£142.0k**
Local MCM lead	-	-	-	£68.0k	£68.0k	£68.0k	**£204.0k**
Staff time for training	£10.2k	£27.0k	£29.4k	£32.1k	£35.0k	£38.2k	**£171.8k**
Increased length of stay for patients surviving	£2.6k	£3.6k	£3.8k	£4.1k	£4.3k	£4.6k	**£23.0k**
Total	**£180.4k**	**£204.7k**	**£207.3k**	**£128.8k**	**£131.8k**	**£135.0k**	**£988.1k**

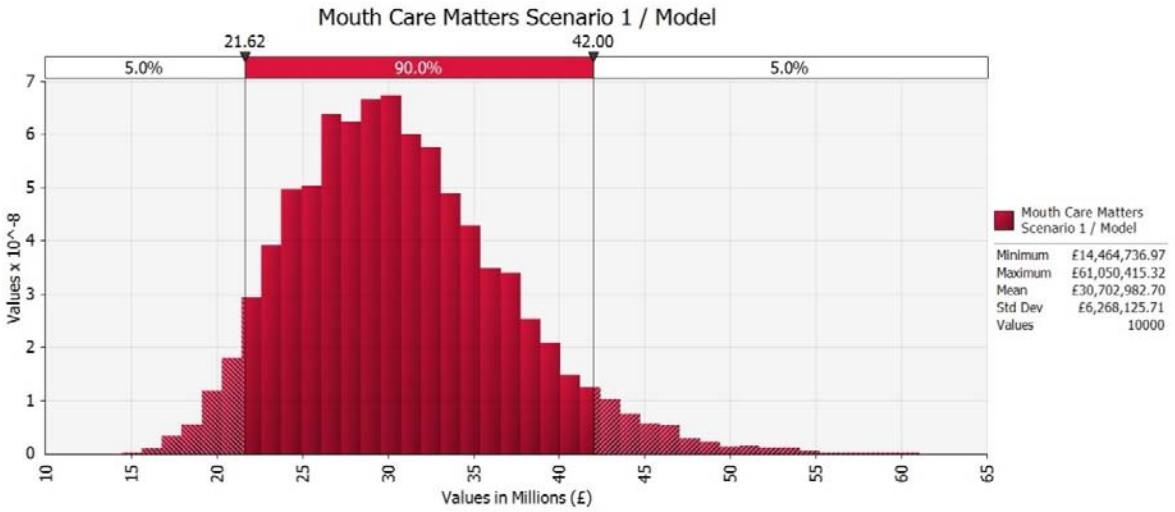
3.5 Overall scenario results

Taking the costs and benefits specified above into account, the following return on overall investment can be seen:

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Total
Costs	£180.4k	£204.7k	£207.3k	£128.8k	£131.8k	£135.0k	£988.1k
Benefits	£3.0m	£4.2m	£4.5m	£4.7m	£4.9m	£5.1m	£26.4m
Net Present Value (benefits - costs)	£2.8m	£4.0m	£4.3m	£4.6m	£4.8m	£5.0m	£25.5m
Benefits Cost Ratio	16.6 : 1	20.5 : 1	21.7 : 1	36.5 : 1	37.2: 1	37.8 : 1	26.7 : 1

We also provide a sensitivity analysis to investigate the net present benefits to 2020 which this analysis presents. This shows that overall benefits could vary between £21.62m and £42.00m at the 90% confidence level. At the lower end of this range, the benefit cost ratio (BCR) would reduce to 20.8:1, assuming costs

remain constant. The benefits presented in the table above, however, are the most likely scenario.



3.6 Nutrition

Introduction

Undernutrition poses a significant clinical and public health problem, adversely affecting physical and psycho-social well-being, as well as reducing the likelihood of independence. Malnutrition is both a cause and consequence of a range of diseases arising from a deficiency, excess or imbalance of nutrients. It is estimated that across the UK, as many as 20 million people may be at risk of malnutrition (Ljungqvist, 2009).

By completing a mouth care recording pack, staff can assess the risk of oral health issues and identify potential patients where their oral health is affecting their diet. Evidence of completion of a mouth care recording pack is therefore essential, as it must be assumed that without a pack being completed, no oral health assessment has been made.

Two audits have been conducted at SaSH assessing the level of compliance in completion of mouth care recording packs. These audits found 61% completion in December 2015 and 79% completion in May 2016. Although a clear increase is observed between the two periods, with only two data points available, it is felt that a prudent estimation of implementation is to take the mean of the two values and a value of 70% is therefore used within the model.

The MCM team undertook an inpatient questionnaire, asking 120 inpatients at SaSH the 5 item Oral Health Impact Profile (OHIP-5) (see appendix A for full details). In this survey 3.4% of patients reported that their diet has been unsatisfactory because of problems with their teeth, mouth or dentures, either very or fairly often. Moynihan, et al (2009) shows that amongst edentulous people, the percentage self-reporting

their diet as unsatisfactory may well be an underestimate. Despite this, it is felt that using the numbers from the SaSH questionnaire is the most prudent approach, particularly as Moynihan does not quantify the expected number.

A further inpatient questionnaire, asked to 199 patients across 12 trusts investigated the impact of the provision of mouth care on their eating and drinking. In total, 80% of patients reported a positive effect. Due to the relative low numbers taking the survey, and the risk of bias in the results, a 15% optimism bias correction was applied to this data, giving an impact by the MCM programme of 68%.

These assumptions are applied to the inpatient population at SaSH, taken from HES (Digital, 2017). With the majority of studies suggesting malnourishment primarily affects older people (cf. Gil-Montoya, 2015), the population figures used within the model are over 74 year olds. Analysis of HES shows 31.9% of patient admissions in 2015/16 at SASH were >74. This percentage has been applied to the total number of admissions, minus the total number of day cases to estimate the at risk group that should receive a mouth care recording pack screening.

Results of benefit

Three benefit steams are seen from the research conducted. Guest et al, followed 1,000 randomly selected patients over a 6 month period. Those identified as malnourished experienced a greater consumption of NHS resources, totalling an incremental cost of £1,003 per patient. The main drivers of cost were the following health care interventions:

- More than twice as many GP visits (18.9 vs 9.12);
- 13% vs 5% hospitalisation;
- An increased length of stay of 2.98 days (6.24 vs 3.26 days)
- Drug prescriptions were increased by £80.24 between the two study groups

In addition, a 13% mortality rate, compared to 2% in the control group was found over the study period. A reduction in this figure towards the mortality rate of non-malnourished patients results in significant social value.

Although a quality source, from a large randomised cohort, the age of the data used as evidence means a 40% optimism bias correction is applied to the potential benefits arising from the benefits suggested by this source.

Applied to the population, the model suggests the following benefits from the programme.

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	**Total**
Healthcare system cash releasing savings	£9.8k	£13.7k	£14.4k	£15.2k	£16.0k	£16.8k	**£86.0k**

Healthcare system non-cash releasing savings	£216.4k	£300.8k	£314.1k	£327.3k	£341.5k	£356.2k	**£1.9m**
Societal benefits	£2.3m	£3.3m	£3.4m	£3.6m	£3.8m	£4.0m	**£20.4m**
Total	**£2.6m**	**£3.6m**	**£3.8m**	**£3.9m**	**£4.1m**	**£4.4m**	**£22.3m**

3.7 Lower incidence of Hospital Acquired and ventilator associated pneumonia

Pneumonia, an acute illness, is defined by the Centers for Disease Control and Prevention (2014) as ‘‘an infection of the lungs that can cause mild to severe illness in people of all ages’’. Hospital Acquired Pneumonia (HAP), reported to be responsible for approximately 15% of all hospital-acquired infections, is the second most common nosocomial infection, and accounts for 20–33% attributable mortality rates (Coffin et al., 2008; Healthcare Infection Control Practices Advisory Committee, 2004). As with most nosocomial infections, hospital-acquired pneumonia is reported to occur more frequently among high-risk individuals including patients within the extremes of age and those who have a severe underlying disease (Healthcare Infection Control Practices Advisory Committee, 2004).

Aspiration of colonised secretions from the oropharynx into the upper airway remains the primary mechanism by which microorganisms (such as Streptococcus pneumoniae, Haemophilus influenzae, Staphylococcus aureus and Enterobacter) enter the lungs (Amin et al., 2004; Marik, 2001). Poor oral hygiene and periodontal inflammation may foster oropharyngeal colonization with respiratory pathogens.

Until recently, recommended care included the use of chlorhexidine, and therefore most studies into the effect of oral care included this as part of the intervention, either alone, or in combination with treatment regimes. Studies investigating the sole use of oral care remain scarce and “methodologically weak”. (El-Rabbany et al.,2015). Therefore, the available evidence linking reduction in incidence of HAP to oral care alone is currently weak and this report is unable to include such benefits against the general risk of HAP.

Significantly more research has been conducted into the relationship between oral health, oral care and ventilator associated pneumonia (VAP). Patients within an Intensive Care Unit who require mechanical ventilation are especially susceptible to acquiring pneumonia (Leroy and Soubrier, 2004). Even with adequate treatment, ventilator-associated pneumonia is associated with high morbidity and mortality rates, conferring mortality rates of over 10% (Coffin et al., 2008).

Sjögren, et al. (2008)**, i**n conducting a systematic review of published RCT studies revealed positive preventive effects of oral hygiene on pneumonia and respiratory tract infection in hospitalised older people. He found mechanical oral hygiene has a

preventive effect on mortality from pneumonia. Sjögren concluded that one in ten cases of death from pneumonia in the elderly may be prevented by improving oral hygiene.

The role of the MCM programme is to highlight the importance of the mouth and oral care for quality patient care. The presence of a dedicated Mouth Care team to which ward based staff can refer patients, together with training of staff to identify and address oral health care issues in patients allows for the risk posed by oral health issues to be controlled.

Benefits calculation

The number of patients coded as having received invasive ventilation, under OPCS4 code E85.1s (NHS Digital, 2017) were taken as the population potentially affected by the intervention. To this number of patients, the baseline risk of developing VAP, 15%, was applied (Koeman, et al., 2006). McLellan (2007) found that, once the model had applied an optimism bias, a daily oral regime results in a 41% reduction in the incidence of VAP amongst ventilated patients.

Researched savings resulting from reduced incidence of nosocomial pneumonia have only been conducted in the USA. In a NICE innovation briefing (NICE, 2015), the costs and resource consequences used research by Gopal, et al. put the cost of found estimates of between $10,019 and $40,000 per patient. Given the differences between the respective healthcare systems, together with the possible range of calculations for assessing purchasing power parity between currencies, direct comparisons of cost are problematic. Consequently, this study focuses on individual benefit streams, with, where possible, localised valuations to produce a more realistic picture of the potential costs and benefits associate with the project.

This study has identified the following benefit streams resulting from this reduced incidence of VAP.

Reduced length of stay

Analysis of Healthcare Resource Groups codes for 2014/15 (NHS Digital, 2016) relating to pneumonia showed an increase of 5.96 days for these patients, compared to the mean trust length of stay, taken from HES (NHS Digital, 2017). This increased length of stay is consistent with academic research into the potential benefits (cf. Fields, 2008, Daubin, 2005).

This was applied to the mean cost per day of an inpatient within SaSH, of £492.80 (2015 values). This value has been calculated from the total tariff received for spells of one day length or over, divided by the total length of stay for these spells (Quality Observatory, 2016). This includes a market forces factor adjustment, taken from the NHS National tariff payment system (NHS England, 2017).

Reduced mortality

Research conducted by Fields (2008) shows that mortality amongst patients with VAP is 97% higher than the 10.3% baseline. By avoiding the development of VAP, this increased mortality is avoided.

To calculate the number of life years gained, the mean inpatient age (75) is taken from an inpatient survey, conducted by the MCM team at SaSH. The mean life expectancy, between male and female, of a 75 year old in the UK is 12.13 years (ONS, 2016). Once optimism bias is removed and a 25% adjustment applied to reflect the expected reduced quality of life, each life not lost is equivalent to 8.64 quality adjusted life years.

Other benefits

The model included the hypothesis that a reduced incidence of VAP would result in a reduced prescribing of antibiotics and other drugs associated with treating pneumonia. However, confirming the research of Koeman, et al (2006), no such benefit could be included.

Results of benefit

Taken as a whole, these benefits contribute the following economic results to the programme. Note that the length of the programme has been set to finish in March 2018, with subsequent benefits arising from a 'fade out' (see methodology for further details):

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	**Total**
Healthcare system cash releasing savings	£0k	£0k	£0k	£0k	£0k	£0k	**£0k**
Healthcare system non-cash releasing savings	£22.1k	£31.2k	£33.1k	£35.0k	£37.1k	£39.4k	**£197.8k**
Societal benefits	£173.6k	£247.5k	£264.6k	£283.0k	£302.6k	£323.5k	**£1.6m**
Total	**£195.6k**	**£278.6k**	**£297.7k**	**£318.0**	**£339.7l**	**£362.9**	**£1.8m**

Lost dentures

Often a consequence of dementia, lost or mislaid dentures are a common problem in hospital. Losing dentures can have serious consequences to the patient. Frail older people can find it distressing, even traumatic, to go through the process of having new dentures made and many are unable to adjust to new dentures, which impacts negatively on their nutritional status and sense of well-being.

In a study of denture loss within a community setting (Michaeli, et al., 2007), 24 of the 26 participants in the study wore their dentures either all day, or all the time. There is therefore the potential for a large impact on patient quality of life if one's dentures are lost. This study also found that a hospital setting was the most common site of denture loss, with 21 losses occurring there.

As well as reduced quality of life for patients, losing dentures in hospital results in compensation payments. The amount relating to lost dentures accounted in the Losses and Special payments section of the NHS 2012/13 annual accounts amounted to £301,000 across England (Mirror, 2013).

Explanation of MCM work

As part of the mouth care screening, the requirement of a denture pot to securely store dentures when not in use is made. By providing a pot to place the dentures, the risk of patients losing their dentures is diminished.

To try and reduce the number of dentures being lost in hospital, Mouth Care Matters have devised a simple solution. When a patient is hospitalised and has a denture(s), the nursing staff asks them if a sunflower sign can be placed above their bed. This symbolises to staff, without affecting the patient's dignity, that they have a denture. The symbol will act as a visual aid for nursing and hostess staff to check for dentures wrapped up in tissues on a meal tray or hidden in bed linen to reduce the risk of them being accidently disposed of. Ward based training and visual reminders are used to alert all staff to the need for vigilance when changing bedding, or clearing food and drink away. Staff are also trained to advise patients and carers to leave their dentures in a secure place such as a denture pot and not to wrap in tissues and to ensure that on discharge, patients who are not wearing their dentures at the time, remember to take them home.

Benefits calculation

Patients who lose their dentures suffer a reduced quality of life for the duration of the time taken to make new sets. Once made and fitted, patients continue to experience a diminished quality of life compared to patients who had old dentures before receiving the new ones (Hadzipasic-Nazdrajic, 2011), due to the practise of basing new dentures on old sets. Without an old set as reference, the likelihood of a good fit diminishes.

The data on the number of dentures lost is reliant on the incident being recorded in the Datix incident recording system. The system was queried against incidences of the use of key words of "denture", "lost" "plate" and "false teeth". Between 2009 and 2015, SaSH had a low number of lost dentures recorded, at a mean average of 4.7 per year. In 2016, the number of lost dentures recorded was 20. While this evaluation is obliged to use the data as it is recorded, in the opinion of the MCM clinical lead, the recorded figure represents an underestimation of the true number of

dentures lost within the trust. Where a patient is unable to articulate their loss, does not have relatives to speak for them, or does not want to be “making a fuss”, the loss may go unrecorded. To counter the uncertainty of the data, a large range has been included within the sensitivity analysis to allow for the potential of a much higher number of dentures to be lost, should the increased awareness of denture users resulting from the MCM programme.

Due to the number of variables influencing the number of dentures being reported as lost, it is difficult to infer the effect the MCM programme has had on the number of dentures lost. The opinion of the MCM clinical lead was that up to 80% reduction was possible once wards were trained, reminders were posted, and denture pots were in full use. To control for optimism bias, a 40% correction has been included bringing the impact of the programme on the number of lost dentures to 48%. As with all benefits, the overall proportion of mouth care recording packs completed was also applied to the number, as without this, staff would potentially be unaware of a patient’s use of dentures.

Reimbursement costs

Where a set of dentures are lost within hospital, and the patient is not directly responsible, the trust will cover the financial cost of replacement. The approach taken by trusts in respect of this requirement differs, with some meeting an unlimited cost, allowing a patient to choose a private dentist if they wish, with others reimbursing Band 3 NHS dentist costs and associated expenses, such as travel.

Uniquely at SaSH there is an on-site dentistry department, where patients requiring replacement sets are sent. Consequently, the reimbursement costs provided to the MCM team by SaSH finance department are lower than within other trusts in the region.

Quality of life

Significant study has been made of the effects of edentulism on quality of life. In researching the emotional effect of tooth loss, Fiske and colleagues (1998) found that themes identified in reaction to tooth loss included lowered self-confidence, dislike of appearance, altered behaviour in socialising and forming close relationships and premature ageing. It can be expected that if a patient’s dentures are lost, then a significant amount of this disbenefit would return whilst the patient is without their dentures.

Similarly, Shah (2015) found that appearance, confidence and social life had improved by between 75% and 84.4% (mean 79.2%) amongst endentued patients once fitted with dentures.

These differences to oral health related quality of life are translated to overall quality of life measures, necessary to calculate a QALY figure to which can be applied a

value based on the NICE willingness to pay threshold. The model uses a methodology described in Brennan (2006) to achieve this, resulting in a 20% difference in the quality of a patient's life, once optimism bias is removed. This is multiplied by the fraction of a year that patients on average can expect to wait for dentures to be made, taken from expert opinion, with appropriate optimism bias applied. Multiplying this value by the NICE willingness to pay threshold value gives a realistic estimation of the NHS specific economic cost of reduced quality of life.

Other benefits

There are further quality of life benefits that relate to the reduced loss of dentures. The Alzheimer's Society (2015), in a fact sheet about dental care and oral health identified that dementia patients, if without their dentures for any length of time, can forget how to wear them, and may also be unable to co-operate with the dentist during the several visits required to make the new dentures. In this case, the disbenefits of being without dentures is prolonged, potentially for the rest of the person's life.

Unfortunately, the absence of quantitative analysis on the scale and impact of this issue means that this potential benefit was not able to be included within the model.

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	**Total**
Healthcare system cash releasing savings	£0.9k	£1.3k	£1.3k	£1.3k	£1.3k	£1.3k	**£7.2k**
Healthcare system non-cash releasing savings	£0k	£0k	£0k	£0k	£0k	£0k	**£0k**
Societal benefits	£1.2k	£1.6k	£1.6k	£1.6k	£1.6k	£1.6k	**£9.3k**
Total	**£2.1k**	**£2.9k**	**£2.9k**	**£2.9k**	**£2.9k**	**£2.9k**	**£16.6k**

3.8 Xerostomia (Dry mouth)

Introduction

A dry mouth is caused by a lack of saliva in the mouth. Dry mouth or xerostomia is a common side effect of over 400 medications. Having a dry mouth can have a significant negative effect on oral health, causing pain, difficulty in eating, speaking and an increase in dental disease such as dental decay, gum disease and thrush. Steroids and antibiotics can also lead to changes in our immune system and make patients more susceptible to fungal infections (oral thrush).

An audit carried out at East Surrey Hospital looked at the incidence and severity of dry mouth using a dry mouth scale (Challacombe scale[5]). This scale identifies 10 signs of oral dryness and produces a score of 0-10.

The mouths of 50 patients at random from a variety of wards were examined for dryness. It was found that over 85% of patients had some form of dry mouth, with the majority having a mild xerostomia exhibiting 1-3 signs of dryness.

Quality of life

The calculation of quality of life follows the same methodology as with the lost denture quality of life benefit. The difference in oral health related quality of life is translated to overall quality of life following the methods described in Brennan (2006). Hahnel, et al (2014) have conducted the most in depth research into the effects of xerostomia on quality of life. Their research found the overall prevalence to range between 7% and 29% of patients over 60 years old. This corresponds with the findings of the patient audit carried out by the MCM team at SaSH, where 28% of patients were identified as having dry mouth. The trust specific value has been used for the base case benefit calculation, with the range given by Hahnel, et al used for the sensitivity calculation.

The successful treatment of xerostomia is difficult to achieve and often unsatisfactory (Chi, et al, 2008). In many cases, it is not possible to correct the xerostomia itself, and treatment is symptomatic. Where the symptom is caused by hyposalivation secondary to underlying chronic disease, xerostomia can be considered permanent or even progressive (Furness, 2011). Given the difficulty in correcting xerostomia, the period used to calculate the quality of life gain is the average length of stay from patients at the trust.

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	**Total**
Healthcare system cash releasing savings	£0k	£0k	£0k	£0k	£0k	£0k	**£0k**
Healthcare system non-cash releasing savings	£0k	£0k	£0k	£0k	£0k	£0k	**£0k**
Societal benefits	£245.8k	£341.6k	£356.0k	£371.0k	£386.6k	£402.9k	**£2.1m**
Total	**£245.8k**	**£341.6k**	**£356.0k**	**£371.0k**	**£386.6k**	**£402.9k**	**£2.1m**

[5] Challacombe scale. Available at: http://www.challacombescale.co.uk/index.html (Accessed 21st August, 2015).

3.9 Early identification of oral issues

Introduction

Following the success of the training of nursing and assistant staff, a doctors training programme was launched, again piloting at SaSH.

This revealed a similar level of unawareness amongst doctors regarding oral health issues as with the nursing training. Most significant was a failure by 74% of doctors to correctly diagnose a clear case of oral cancer, and only 33% would recommend referral to a maxillofacial specialist. As with all cancers, early diagnosis and treatment of oral cancer is associated with increased survival and less aggressive treatment (cf. van der Waal, 2013).

The requirement to complete a mouth care recording pack for patients with a length of stay of more than one day ensures that the mouths of patients receive the same care and attention that other parts of the body do. With a dedicated oral care specialist team on site, referrals can be made to assist in the correct diagnosis of oral health conditions.

As a result of MCM, mouth care training for doctors at SaSH is now on the educational programme for junior doctors.

Unfortunately, the level of interest and engagement from doctors beyond SaSH in regards to attendance at training sessions was disappointing. As a result, the timescale of this project differs between scenario 1, where the standard time scale is used and scenarios 2 and 3, where the time line of the project has been adjusted to reflect one year of activity, with a fade out of benefits applied to reflect the deleterious effect of time on training received.

Benefits calculation

Despite the results of the training indicating a very poor identification rate, it is felt that as a small scale general training programme, without a focus on oral cancer, these results are not generalizable at present. McGurk, et al (2005) found that 51% of patients with head and neck cancer experience a delay in diagnosis. Whilst in the majority of cases, this was due to patient delay in coming forward for diagnosis, it was found that in 20% of delayed cases, the patient was not responsible. Given the experiences found by the MCM team, this is felt to be a prudent representation of the scale of the issue that could be addressed by the project.

Mortality

The difference in 5 year survival rates between patients diagnosed when at stage I of the cancer, 80%, is compared the survival rate for Stage III, 20% (van der Waal, 2013). This difference is taken to be the potential benefit for the patients experiencing a delay in diagnosis. Without knowledge as to overall life expectancy of these patients, this study multiplies the difference in survival by the 5 year period to produce a number of QALYs that can be combined with the willingness to pay threshold figure.

Health costs

Zavras, et al (2002), looked at the difference in treatment costs for a patient with stage I oral cancer, compared to a stage III patient. This study found, once uprated to present day values following the health specific HCHS index (PSSRU, 2016), a difference of £4,513 in favour of early diagnosis. Despite the age of the study making its use suboptimal, as this report is only using the difference between the two figures to calculate the potential benefit of early diagnosis, we feel this is judicious. The optimism bias correction used throughout the calculation also acts to offset the difficulties of using a study of this age.

Misprescribed medicine

The training programme run by the MCM team also asked the attendees to recommend a course of treatment to accompany the case diagnosis made. Where the treatment was a drug that would not be appropriate for the correct diagnosis, the percentage of trainees misprescribing is multiplied by the value of the drug (NICE, 2017). In the oral cancer example cited above, 14% of trainees would incorrectly prescribe Nystatin, an antifungal medication in error.

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	**Total**
Healthcare system cash releasing savings	£0k	<£0.1k	£0.1k	<£0.1k	<£0.1k	<£0.1k	**£0.2k**
Healthcare system non-cash releasing savings	£0k	£4.4k	£7.8k	£5.6k	£3.3k	£1.1k	**£22.2k**
Societal benefits	£0k	£37.6k	£66.4k	£47.8k	£28.9k	£9.7k	**£190.4k**
Total	**£0k**	**£42.1k**	**£74.2k**	**£53.4k**	**£32.2k**	**£10.8k**	**£212.7k**

3.10 Improved oral health of staff

Introduction

It is not only patients who can benefit from additional training provided to staff and the advice and support of the Mouth Care team. By expanding their understanding on oral health care, staff who receive training can apply the learning to themselves, resulting in fewer days lost to sickness.

In qualitative feedback following training, many staff expressed surprise at several of the learning points, stating that they would implement these in their own, and their family's oral health care. This led the report authors to commission a questionnaire to staff who had been trained as part of the MCM programme, asking whether they had changed their oral health habits because of the training.

Benefits calculation

In total, 179 staff who received training had responded, with 72% stating that they changed their oral health habits as result of training. This report has used the recommendation to not rinse after brushing teeth as a proxy for wider oral health changes. It is accepted that there will be various and potentially multiple changes made by staff, but concentrating on one would provide a sensible estimation of the benefit produced. The proportion of staff making changes is also broadly in line with a national survey that found 62% of the population rinse their mouth after brushing.

To translate this to an effect that can be measured as a benefit, the results of a Scottish study (Chestnutt, et al., 1995) was used that found that rinsing after brushing proved to be associated with recurrent caries. With the oral health foundation (2017) finding that 5% of working time lost was due to oral health issues this can be translated to the cost of an average working day for a hospital based nurse (New Economy, 2015), which is the group who have received the most instances of MCM training.

There are further benefits resulting in fewer sick days lost beyond the direct cost to the trust. Although the authors were not able to find specific evidence to apply an economic value on the other research, Clarke and Donaldson (2008) show the importance of an established nursing team on the quality of patient care.

Further to this, it should also be noted that 71% of staff had made changes to their family's oral health, potentially widening the benefit significantly further. Again, in the absence of further evidence as to the number affected and the changes made, this benefit does not meet the criteria for inclusion within the model.

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	**Total**
Healthcare system cash releasing savings	£0.5k	£1.2k	£1.4k	£1.5k	£1.6k	£1.8k	**£7.5k**
Healthcare system non-cash releasing savings	£0k	£0k	£0k	£0k	£0k	£0k	**£0k**
Societal benefits	£0k	£0k	£0k	£0k	£0k	£0k	**£0k**
Total	**£0.5k**	**£1.2k**	**£1.4k**	**£1.5k**	**£1.6k**	**£1.8k**	**£7.5k**

3.11 Reduced incidence of systemic disease

In recent years, there has been considerable interest in possible links between periodontal disease and systemic diseases.

Evidence has begun to emerge of linkages between chronic periodontal disease and other systemic disease, particularly atherosclerotic cardiovascular disease (CVD) (cf. Tonetti and Van Dyke, 2013) and diabetes (cf. Chapple and Genco, 2013). Winning and Linden (2015) describe two mechanisms with which to explain the link between the two issues. Firstly, a direct mechanism, where, as chronic periodontitis progresses, the ulcerated pockets provide a direct entry point for periodontal bacteria into the systemic circulation. Alternatively, the inflammatory response to periodontal bacteria or their by-products may have indirect systemic effects.

Despite this evidence as to the link between periodontal and systemic disease, the inclusion of benefits arising from the tackling of oral health care on long term conditions such as diabetes and CVD within the model is difficult for two reasons:

- Whilst there is clear evidence of a relationship between systemic disease and oral health, there has been no research into the effect of a hospital based intervention in prevention or treatment of systemic disease that can take a significant time to develop.
- Such systemic conditions can take a very long time to develop or manifest. The requirement of the model to discount future benefits to reflect commissioning preference for benefits realised sooner would greatly erode the potential benefit gain.

Taking these two issues together, it is felt that to attempt to claim a significant benefit within this report is not currently possible. That is not to say that with good links between hospital based teams, MCM and community based practice, such benefits do not arise.

While this study has been unable to include a reduction in long term conditions resulting from increased care during hospitalisation, the evidence suggests a strong link between oral hygiene and a positive effect on the development of diabetes and CVD. With greater research, such as longitudinal studies, into the direct association, the authors feel a benefit could, in future, be included, showing significant potential benefits.

3.12 Other benefits

In addition to the economic and patient quality of life benefits described above, other benefits relate to the MCM programme which can be seen to accrue over time. It is not prudent to attempt to attach an economic value to these benefits, due either to insufficient evidence, or no realistic way to monetise the benefit.

These benefits have been grouped under the type of benefit that they fall under.

Training and awareness

Adequate training can improve the morale and retention of staff. In a nursing survey of 476 staff across KSS, 98% of those responding agreed that providing or assisting with mouth care was important to general health and 97% thought providing mouth care was a part of a nurses role, however 52% had never received training in providing mouth care.

Following training, analysis of feedback shows that 100% of staff would recommend this training to others, and 83% of staff believed that training would be useful for their work.

Trust reputation

Patient relatives in particular are often very conscious of the care received, with oral health being a particularly visible sign of care. Giving staff the tools and knowledge to address mouth care properly can lead to fewer complaints. At the extreme end, this may reduce the possibility of CQC inspection failure and Reports to Prevent Future Deaths (Rule 28).

Trusts implementing MCM can help to improve the knowledge of mouth care on a national level, adding to the body of research available and becoming a centre of excellence. The presence of a mouth care lead, with specialist knowledge can raise the profile of the trust at various events.

4 Scenario 2 – Implementation of MCM across Kent, Surrey and Sussex

4.1 Scenario description

The second scenario included within modelling and assessed within this report is a simulation of the roll out of MCM across Kent, Surrey and Sussex. The scale up to KSS is part of the project and is already under way. Modelling this provides evidence of the possible impact of the project as it is currently envisioned at an ambitious but realistic level.

The benefit streams remain the same as for those identified within scenario 1.

It should be noted that this scenario includes the results of the implementation at SaSH, and so these results should not be additive to those within the first scenario.

4.2 Key assumptions

The rollout of the programme is now underway and some data is becoming available. Where data are available, and where it differs from the information collected within SaSH, the new data is used. Where new data is not available, the model uses the same assumptions as within scenario 1.

There are two key changes to the inputs to the model made within this scenario, compared to scenario 1; population and year weighting. With the involvement of all NHS trusts within Kent, Surrey and Sussex, the population reflects the much larger cohort of potential patients. Secondly, the rollout across KSS began after the programme was launched at SaSH. The year weighting, control when costs and benefits are seen, reflects this.

When monetising the benefits, values are updated to reflect the different costings where applicable. For example, while the cost of a bed day is SaSH specific within scenario 1, an average value for the whole of KSS is taken for scenario 2. This has been weighted to account for differing trust size.

Finally, it should be noted that there is considerable uncertainty regarding how well implemented the roll out across the trusts in KSS will be. To control for this uncertainly, and to ensure that the estimation of benefits and costs is a prudent one, an additional 15% optimism bias is applied to all assumptions used for this scenario where the source is either academic literature, or based on results seen at the SaSH pilot site.

4.3 Overall benefits

As with scenario 1, 14 significant monetised benefits of the programme are identified, across the three benefit streams of cash releasing and non-cash releasing healthcare system savings and societal benefits.

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	**Total**
Healthcare system cash releasing savings	£5.6k	£15.8k	£102.0k	£146.5k	£158.0k	£170.5k	**£598.5k**
Healthcare system non-cash releasing savings	£114.6k	£313.2k	£2.0m	£2.9m	£3.1m	£3.4m	**£11.9m**
Societal benefits	£740.8k	£2.0m	£13.4m	£19.4m	£21.1m	£23.0m	**£79.6m**
Total	**£861.0k**	**£2.4m**	**£15.5m**	**£22.5m**	**£24.4m**	**£26.5m**	**£92.1m**

Related back to system demand and patient quality of life figures, the economic benefits identified above result in the following totals:

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	**Total**
Additional bed days avoided	189	523	3,425	4,975	5,419	5,904	**20,435**
Decreased GP visits	555	1,538	10,102	14,74	16,051	17,522	**60,474**
Prescription costs avoided	£1,024	£2,842	£18,476	£26,181	£27,853	£29,634	**£106,011**
Additional years of quality adjusted life	36	99	649	944	1,029	1,122	**3,878**

4.4 Overall costs

The costs included within the model are a combination of project costs and costs resulting from the implementation of project. Project costs include the funding HEE have invested into the project, with additional costs resulting from items such as oral care related consumables used on wards and a cost for time spent by staff receiving MCM training. Finally, there is a cost included for additional length of stay resulting from patients who survive in hospital because mortality has fallen.

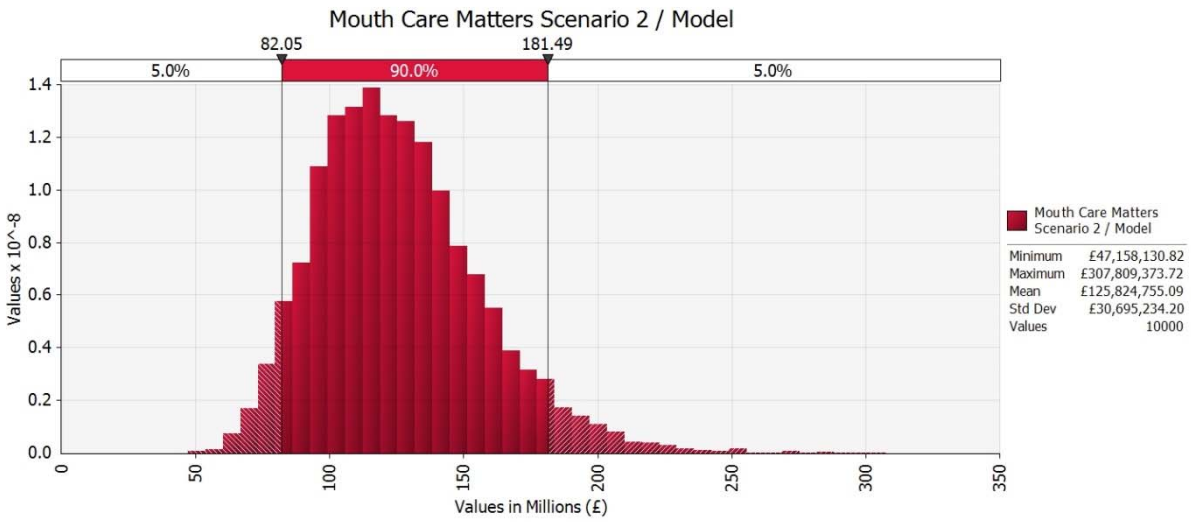
	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	**Total**
HEE invested project costs (SaSH from 2018/19)	£149.0k	£149.0k	£149.0k	£68.0k	£68.0k	£68.0k	**£651.0k**
Hospital mouth care materials	£18.5k	£49.8k	£311.4k	£430.8k	£447.5k	£464.8k	**£1.7m**
Local MCM lead	£20.0k	£51.5k	£307.6k	£406.2k	£402.8k	£399.4k	**£1.6m**
Staff time for training	£10.2k	£16.3k	£107.3k	£155.9k	£170.0k	£185.4k	**£645.1k**
Increased length of stay for patients surviving	£0.6k	£1.7k	£10.7k	£15.1k	£16.1k	£17.0k	**£61.3k**
Total	**£198.4k**	**£268.3k**	**£886.0k**	**£1.1m**	**£1.1m**	**£1.1m**	**£4.7m**

4.5 Overall scenario results

Taking the costs and benefits specified above into account, return on overall investment is as follows:

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Total
Costs (£000s)	£198.4k	£268.3k	£886.0k	£1.1m	£1.1m	£1.1m	£4.7m
Benefits (£000s)	£861.0k	£2.4m	£15.5m	£22.5m	£24.4m	£26.5m	£92.1m
Net present value (benefits – costs)	£662.6k	£2.1m	£4.6m	£21.4m	£23.3m	£25.4m	£87.5m
Benefits Cost Ratio	4.3 : 1	8.9 : 1	17.5 : 1	20.5 : 1	22.2 : 1	24.1 : 1	19.6 : 1

The sensitivity analysis shows that benefits could vary between £82.1m and £181.5m at the 90% confidence level. At the lower end of this range, the benefit cost ratio (BCR) would reduce to 17.5 : 1, assuming costs remain constant. The benefits presented in the table above, however, are the most likely scenario.



5 Scenario 3 – Implementation of MCM across England

5.1 Scenario description

The final scenario modelled is to assess the potential benefits that might accrue, together with costs, were the MCM programme to be extended across all acute trusts in England. Modelling this scenario provides evidence of the possible impact of the project were it to be adopted to the widest possible extent.

The benefit streams remain the same as for those identified within scenario 1.

5.2 Key assumptions

Given that this is an indicative scenario showing the potential benefits and costs were the programme to be rolled out further, rather than reflecting any actual programme results, this scenario builds on the assumptions made within scenario 2, adjusting the inputs where necessary to reflect the much larger populations and spread of the programme.

There are two key changes to the inputs to the model made within this scenario, compared to scenario 1 and 2; population and optimism bias control. With the involvement of all NHS trusts across England, the population reflects the much larger cohort of potential patients.

Further to the controls discussed in the previous chapters regarding scenario 2, when considering a potential roll out across England an additional uncertainty needs to be considered and mitigated. For scenarios 1 and 2 the current activities regarding mouth care were well known, and the counterfactual, the treatment that patients would have received in the absence of the MCM programme, is understood. This makes calculation of the marginal difference of the MCM programme more

straightforward. When rolling out across England, the current level of oral health care at the various trusts is a lesser known variable and may differ considerably amongst the cohort. To control for this uncertainly, and ensure the estimation of benefits and costs is a prudent one, an additional 25% duplicate intervention bias correction is applied to the benefit calculations, over and above the optimism bias correction used in scenario 2.

Finally, given that there are no current plans for rollout across England, the year markers have been removed, replacing with Years 1 through 6 and with a staged roll out included. Although this is almost certainly a much faster roll out than would be achieved in reality, it is felt that it is important to give an indication of costs and benefits that can be achieved at full implementation. This is achieved at the fourth year of the model.

When monetising the benefits, values are updated to reflect the different costings where applicable. For example, while the cost of a bed day is SaSH specific within scenario 1, an average value for the whole of England is taken for scenario 3. This has been weighted to account for differing trust size.

5.3 Overall benefits

As with scenario 1, 14 significant monetised benefits of the programme are identified, across the three benefit streams of cash releasing and non-cash releasing healthcare system savings and societal benefits.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	**Total**
Healthcare system cash releasing savings	£61.9k	£162.0k	£1.0m	£1.4m	£1.4m	£1.5m	£5.6m
Healthcare system non-cash releasing savings	£1.0m	£2.6m	£15.9m	£21.5m	£21.9m	£22.2m	**£85.1m**
Societal benefits	£7.0m	£18.1m	£111.6m	£152.5m	£156.4	£160.4m	**£605.9m**
Total	**£8.0m**	**£20.9m**	**£128.5m**	**£175.4m**	**£179.6m**	**184.0m**	**£696.6m**

Related back to system demand and patient quality of life figures, the economic benefits identified above result in the following totals:

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	**Total**
Additional bed days avoided	1,650	4,292	26,489	36,241	37,202	38,206	**144,080**

Decreased GP visits	4,458	11,490	70,225	95,116	96,621	98,150	**376,060**
Prescription costs avoided	£14,781	£40,737	£263,042	£370,093	£413,095	£327,405	**£1,820,126**
Additional years of quality adjusted life	330	859	5,297	7,245	7,435	7,633	**28,798**

5.4 Overall costs

The costs included within the model are a combination of project costs and costs resulting from the implementation of project. Project costs include the funding HEE have invested into the KSS wide project, but do not include any additional costs which may be required for further roll out across England. Costs resulting from implementation of the project include items such as oral care related consumables used on wards and a cost for time spent by staff receiving MCM training. Finally, there is a cost included for additional length of stay resulting from patients who survive in hospital because mortality has fallen.

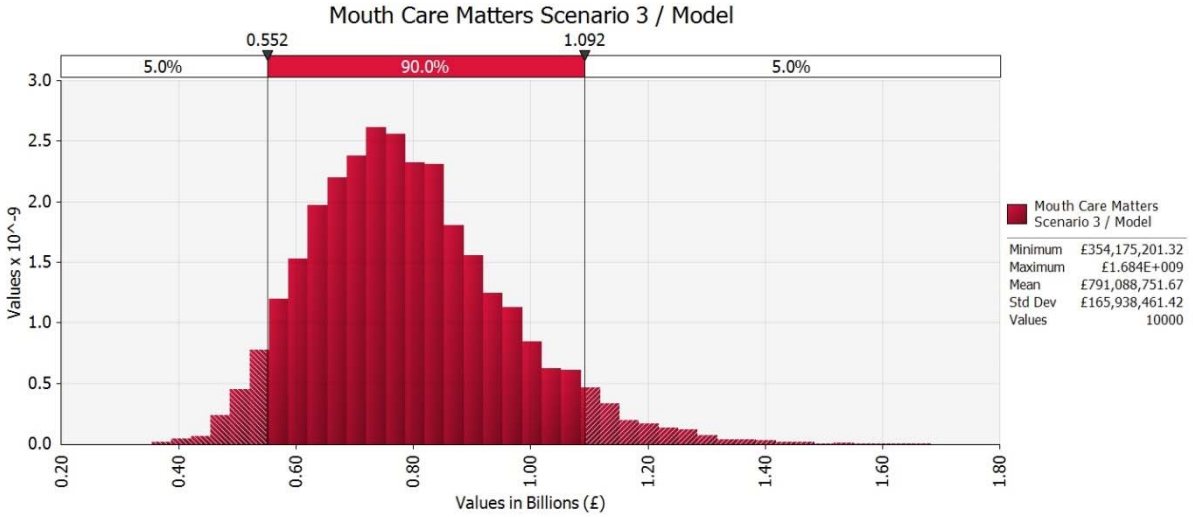
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	**Total**
Project costs	£149k	£149k	£149k	£68k	£68k	£68k	**£651.2k**
Hospital mouth care materials	£224.0k	£561.4k	£3.3m	£4.2m	£4.1m	£3.9m	**£16.3m**
Local MCM lead	£258.7k	£665.2k	£4.0m	£5.2m	£5.2m	£5.2m	**£20.5m**
Staff time for training	£3.3k	£23.0k	£907.9k	£1.8m	£1.9m	£2.1m	**£6.7m**
Increased length of stay for patients surviving	£23.0k	£62.0k	£396.1k	£559.5k	£593.2k	£629.0k	**£2.3m**
Total	**£658.1k**	**£1.5m**	**£8.7m**	**£11.8m**	**£11.8m**	**£11.9m**	**£46.4m**

5.5 Overall scenario results

Taking the costs and benefits specified above into account, the following return on overall investment is as follows:

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Total
Costs	£658k	£1.5m	£8.7m	£11.8m	£11.8m	£11.9m	£46.4m
Benefits	£8.0m	£20.9m	£128.5m	£175.4m	£179.6m	£184.0m	£696.6m
Net present value (benefits – costs)	£7.4m	£19.4m	£119.8m	£163.6m	£167.8m	£172.2m	£650.1m
Benefits Cost Ratio	12.2 : 1	13.9 : 1	14.8 : 1	14.9 : 1	15.2 : 1	14.5 : 1	15.0 : 1

The sensitivity analysis shows that benefits could vary between £552m and £1,092m at the 90% confidence level. At the lower end of this range, the benefit cost ratio (BCR) would reduce to 11.9:1, assuming costs remain constant. The benefits presented in the table above, however, is the most likely scenario.



6 Discussion

This report was commissioned to analyse the impact of the Mouth Care Matters programme as implemented at Surrey and Sussex Healthcare NHS trust's main acute site at East Surrey Hospital, and as the programme is due to be rolled out across Kent, Surrey and Sussex.

Through robust research of the costs and benefits arising from the project and appropriate application of these results within a model, we can show that the MCM programme makes a significant positive impact on the health economy and patient quality of life.

The conclusions of this study, which has looked to identify the costs and benefits of the MCM programme show that:

- **Across Kent, Surrey and Sussex, the Mouth Care Matters programme is estimated to deliver tangible value in the order of £2.66 of benefit within the health care system for every £1 invested in the project.** This is based on cautious and prudent adjustments for optimism bias applied to both the benefits and the costs.
- **A further £17 is identified in social benefits for every £1 invested.**
- Sensitivity testing around the base-case indicates that the overall **benefits generated per £1 invested range between £17.46 and £38.61.** At the 90% confidence level, we do not observe a scenario where costs exceed benefits.

When fully rolled out across Kent, Surrey and Sussex as presently planned, the programme can be expected to produce benefits to trusts in line with the figures in the following table.

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	**Total**
Additional bed days avoided	189	522	3,425	4,975	5,419	5,904	**20,435**
Decreased GP visits	555	1,538	10,102	14,704	16,051	17,522	**60,474**
Prescription costs avoided	£1,024	£2,842	£18,476	£26,181	£27,853	£29,664	**£106,010**
Additional years of quality adjusted life	36	99	649	944	1,029	1,122	**3,879**

Again, once fully rolled out across KSS, this equates to annual health system savings in line with the following table (based on 2018/19 nominal values).

Benefit stream	**Annual value across KSS when fully implemented**	**Approximate Fiscal value to health system**
Additional bed days avoided	4,975	£2,736,250
Decreased GP visits	14,704	£455,824
Prescription costs avoided	£26,181	£26,181
Additional years of quality adjusted patient life	944	N/A

The future benefits rely on MCM programme being implemented, in scope, scale and speed, in line with current plans, including both frontline staff training and a MCM specialist for referral support and to keep the momentum going in each trust. Without

continued focus, the benefits gained in future years can be expected to 'fade out' as training is forgotten, and workforce changes occur.

The authors encountered several limitations. The need to rely on academic sources for many of the benefits often resulted in the need to apply higher optimism bias correction, reducing the benefit within the model. With consistently collected, baselined evidence from SaSH and other trusts implementing MCM, localised data could be used. As well as reflecting better the implementation of this intervention, with reduced need for higher optimism bias correction, the benefits may well be higher. Utilising an informatics partner (such as the AHSN) to assist in the definition, collection and analysis of data to monitor and evaluate the project as it is rolled out further would significantly improve uncertainty associated with less evidence based assumptions. Wrapping this around rigorous programme management in the rollout would also potentially help achieve improved uptake levels across the board comparable to those seen at SaSH.

It should also be noted that some potential benefit streams were unable to be included within the report. In particular, a benefit for hospital acquired pneumonia was not included due to a paucity of both academic research and local data.

Again, it is recommended that advice is sought from an informatics specialist to ensure that the right data is collected in the future by the MCM programme to allow such benefits to be included. In addition, by improving the data recording around this area, there is the opportunity to add to the available evidence, raising the profile of the programme nationally.

Even where potential benefits were able to be estimated, these would be improved by rigorous recording of data, including linking of oral care processes with outcomes, such as length of stay, development of complications, and in-hospital mortality.

Economic modelling is not an exact science and its outputs should be seen as a guide to decision-making and not a substitute for experienced local knowledge. There will always be some need for assumptions or reliance on secondary data, which limits the ability to generalise and draw broad policy lessons from an individual project or programme review. All outputs from the model are subjected to a range of risk and sensitivity tests to understand more about the degree of confidence with which the outputs from our model should be treated. As further evidence is made available, particularly from actual results at SaSH and elsewhere in KSS, the model should be reviewed and amended accordingly. This will act to further enhance the accuracy of the model and the ability to draw wider conclusions.

Second, when partners commission and evaluate interventions they should be advised to consider more than just the benefit-cost ratio of the project. They should consider interventions from a range of perspectives, including qualitative feedback, strategic contribution and capacity to deliver, alongside the Net Present Value or Benefit Cost Ratio.

Despite these limitations, this report has demonstrated a significant return on investment, in addition to the clear patient care benefits provided by the Mouth Care Matters programme. With improved data collection as the programme rolls out across Kent, Surrey and Sussex, the demonstrable benefits of the project can be expected to increase.

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Appendix A – Inpatient PROMS questionnaire

Detailed results of the SaSH inpatient PROMS questionnaire asked to a random sample of patients in hospital for more than 1 day.

Questions taken from the Oral Health Impact Profile OHIP-5.

	Very often	Fairly often	Occasionally	Hardly ever	Never	Don't know	Total
Have you had trouble pronouncing any words because of problems with your teeth, mouth or dentures?	6	7	18	8	81		120
Have you had painful aching in your mouth?	3	6	6	18	89		122
Have you found it uncomfortable to eat any foods because of problems with your teeth, mouth or dentures?	7	7	14	11	81		120
Have you been self-conscious because of your teeth, mouth or dentures?	4	5	14	6	91		120
Has your diet been unsatisfactory because of problems with your teeth, mouth or dentures?	3	1	11	13	90	1	119

Appendix B - Benefits breakdown by stream

The following tables provide nominal benefits identified for the MCM programme detailed in the report by scenario.

Benefits listed in these tables are 5-year sum totals, following the year weighting and roll out profile as detailed in the relevant scenario section.

Scenario 1 – Pilot in SaSH

Benefit stream	Benefit value
Nutrition - Decreased GP visits	£319,770
Nutrition - LoS & Avoided admissions	£1,536,514
Improved nutrition - Lower prescribing rates	£85,958
Improved nutrition - Quality of life benefits	£20,368,631
Ventilator Associated Pneumonia (VAP) - LoS	£197,821
Ventilator Associated Pneumonia (VAP) - Prescribing	£0.0
Ventilator Associated Pneumonia (VAP) - Mortality	£1,594,698
Losing dentures - denture replacement costs	£7,238
Losing dentures - Patient QoL	£9,325
Dry mouth - Quality of life	£2,103,857
Early ID of oral cancer - reduced mortality	£190,358
Early ID of oral cancer - reduced treatment costs	£22,218
Early ID of oral cancer - Mistaken prescribing	£177
Oral health of staff - Fewer sick days	£7,452

Scenario 2 – Implementation of MCM across Kent, Surrey and Sussex

Benefit stream	Benefit value
Nutrition - Decreased GP visits	£1,832,306
Nutrition - LoS & Avoided admissions	£8,804,327
Improved nutrition - Lower prescribing rates	£496,157
Improved nutrition - Quality of life benefits	£60,744,499
Ventilator Associated Pneumonia (VAP) - LoS	£959,689
Ventilator Associated Pneumonia (VAP) - Prescribing	£0.0
Ventilator Associated Pneumonia (VAP) - Mortality	£4,949,376
Losing dentures - denture replacement costs	£81,694
Losing dentures - Patient QoL	£56,370
Dry mouth - Quality of life	£11,816,665
Early ID of oral cancer - reduced mortality	£2,039,198
Early ID of oral cancer - reduced treatment costs	£326,686
Early ID of oral cancer - Mistaken prescribing	£2,610
Oral health of staff - Fewer sick days	£17,995

Scenario 3 – Implementation of MCM across England

Benefit stream	Benefit value
Nutrition - Decreased GP visits	£11,404,589
Nutrition - LoS & Avoided admissions	£54,799,644
Improved nutrition - Lower prescribing rates	£3,085,384
Improved nutrition - Quality of life benefits	£377,743,633
Ventilator Associated Pneumonia (VAP) - LoS	£14,095,846
Ventilator Associated Pneumonia (VAP) - Prescribing	£1,378,996
Ventilator Associated Pneumonia (VAP) - Mortality	£114,391,630
Losing dentures - denture replacement costs	£905,513
Losing dentures - Patient QoL	£624,815
Dry mouth - Quality of life	£83,197,572
Early ID of oral cancer - reduced mortality	£29,951,587
Early ID of oral cancer - reduced treatment costs	£4,798,340
Early ID of oral cancer - Mistaken prescribing	£38,329
Oral health of staff - Fewer sick days	£142,346

Appendix C QALY values

There are two approaches to estimating the value of a QALY. The first is to divide the VPF by an average expected number of years of life saved in a preventable fatality (39 years – half the average life expectancy), which generates estimates in the order of £44,460 in 2015 prices. The alternative is laid out in NHS – NICE (2013), which is that 'expected net monetary or health benefits can be presented using values placed on a QALY gained of £20,000 and £30,000.' This figure appears to be unsupported by evidence, and acts as a cost-effectiveness threshold, i.e. if you spend more than this on a new drug then you could achieve more QALYs by investing the resources elsewhere.

Some recent research suggests this threshold is too high[6], although NICE counter-argue against this[7]. The cost-effectiveness threshold is not the same as a value of a QALY – the value is about the benefit the recipient gets from the additional QALY, whereas the NICE threshold is just about whether the system could get more QALYs through a different health intervention. In the light of this, and to preserve the prudent approach taken, the study takes the lower end of the NICE range and uses a value of £20,000 as the basis for calculations. Again, in the base-case we work from the ethical position that all QALY's are worth the same, or to quote NHS-NICE (2013) that an additional quality adjusted life year (QALY) 'has the same weight regardless of the other characteristics of the individual receiving the health benefit'. In an attempt to produce an even more prudent estimation of value, QALY calculations used for the report have been adjusted to account for a reduced quality of life experienced by a person following an intervention. Where academic evidence is unavailable to allow an estimate tailored to the morbidity, a flat 20% reduction has been applied.

Fujiwara and Dolan (2013) also deliver a strong critique of some of the mechanisms used to identify how many QALYs equate to changes in particular health states, whilst King et al (2005) and Ryan and Svensson (2014) have delivered a further review of the value of a QALY.

[6] See https://www.york.ac.uk/news-and-events/news/2013/research/nhs-spending-research/
[7] See https://www.nice.org.uk/news/blog/carrying-nice-over-the-threshold