York Health Economics Consortium

MARIE CURIE

Economic Evaluation of Marie Curie Services in the UK

Final Report

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Executive Summary

1. INTRODUCTION

Care of people at the end of their lives and helping them to die in the place of their choosing are important aspects of the health and social care service, and the Covid-19 epidemic has increased the focus on place of care. With severe financial pressures on health and social care across the UK, it is helpful to look at the value of palliative care provision from charitable services such as Marie Curie. Much of the funding of these services comes from statutory sector commissioners who are facing important pressures on budgets at both national and local levels. This document addresses the question of how much and what type of value can be ascribed to these services.

Marie Curie is a charitable organisation that provides a range of care services for people at the end of their lives and their families and carers. This includes nursing services, provided in people's place of residence, and hospice services, including inpatient and day care services. Marie Curie works in all four nations of the UK, although it does not work in every region of all nations.

York Health Economics Consortium (YHEC) was commissioned by Marie Curie to undertake an economic evaluation of their services. This analysis estimates the costs and benefits of each type of care service, from the perspective of health and social care services and from the perspective of society as a whole.

2. METHODS

A mixed methods approach was adopted for this evaluation, including interviews with key stakeholders, data gathering, evidence reviews and economic modelling and analysis. An analysis framework was developed, which set out the data and evidence used for the economic calculations, along with the assumptions to be made, where evidence was incomplete. This was then provided for Marie Curie staff to comment and offer additional information.

A literature review was carried out to identify published evidence on the benefit of services of the types provided by Marie Curie. The economic analysis is based on the costs and activities identified in the data provided to YHEC, along with this evidence of benefits. This was used to calculate the incremental cost of the services and the return on investment (ROI) for individual services, as well as for the organisation as a whole.

This analysis is based on data for the financial year 2019/20, as that was considered to be the most recent year of 'business as usual' for the organisation before the disruption caused by the Covid-19 pandemic. As a result, there are services which are now offered by Marie Curie, but which are not included in this analysis, such as the consultant-led Hospice at Home service and the IMPaCT service partnership in Liverpool.

3. IMPACT OF MARIE CURIE SERVICES

In 2019/20 Marie Curie provided care to 44,380 cases in its nursing services, across the UK. There were 3,048 admissions to its hospice inpatient units (IPUs) and 7,865 hospice day cases. In addition, there were 9,373 volunteers and the Information and Support (I&S) service had 1.7 million web page visits and 15 thousand telephone support line queries. Each of these services covers a wide range of activities and interventions, particularly the hospice day cases. The approach taken to assessing the costs and impacts of these varied services is explained fully in the main report. Only impacts to which it is possible to ascribe an economic value are included in the economic analysis described here.

The nursing service works with three main service models: Planned Variable (PVS); Multi Visit (MVS); and Rapid Response (RRS) services. The hospice IPU service has been divided into planned and unplanned admissions, as the benefits are assumed to be different for each. The activity, cost and modelled impact of each of the services are shown in Table 1. Many people were seen by more than one service, so the total number of cases does not reflect the total number of individuals.

The table shows that, at the UK level, the PVS and RRS nursing services had roughly the same level of activity, but at much higher cost and higher value of impacts than for PVS. For the hospice IPU services, an initial assumption was made that the ratio of planned to unplanned is 50:50 and this is varied in the sensitivity analyses to test the impact of altering this ratio. The table shows that costs and impact were similar when using this ratio. No robust data were available on the number of cases seen by volunteer services, so the value is based on the number of hours offered by the volunteers.

Table 1 Activity, cost and impact of Marie Curie services in 2019/20

Service	Activity (cases)	Costs	Value of total outcomes
Nursing MVS	8,692	£9,561,442	£77,633,812
Nursing PVS	17,706	£26,584,424	£226,134,990
Nursing RRS	17,983	£8,692,488	£99,323,447
Nursing Total	*44,380*	*£44,838,353*	£403,092,248
Hospice IPU planned	1,524	£22,446,429	£25,362,759
Hospice IPU unplanned	1,524	£22,446,429	£26,488,944
Hospice Day Case	7,865	£8,526,662	£5,984,391
Hospice Total	*10,913*	*£53,419,520*	£57,836,094
Volunteers	n/a	£653,000	£6,192,221
Totals		**£98,910,874**	**£467,120,564**

4. ECONOMIC ANALYSIS

The evidence of benefits and a set of assumptions based on this evidence were used to estimate the value of impacts and the incremental cost for each of the services. This was then used to calculate a return on investment (ROI) for each one. The ROI is a measure of the efficiency of a service and is calculated by taking the net benefit (benefit minus cost) and dividing by the cost. This is expressed as a percentage, such that an ROI of 50% means that each amount spent on the service produces a 50% greater amount of benefit as a result.

These calculations were carried out from various perspectives: the impact on healthcare resources; on combined health and social care resources; and on all outcomes. 'All outcomes' includes productivity, which refers to the amount of work time lost by patients or carers as a result of the patients' condition or death, and health-related quality of life (HrQOL), which relates to the impact a medical condition and/or treatment has on a person's functioning and well-being.

The ROI results are shown in Table 2. These were calculated taking into account all of the outcomes and the total cost of the services (final column), then for all the outcomes, but only in relation to the statutory funding (fourth column), which results in a higher ROI, as the benefits are the same but the input values are lower. The other two columns show the ROI for statutory funding only, with the impact in relation to health service use only (column two), or in relation to health and social care service use (column three).

Table 2 ROI for Marie Curie services for health and social care and for all outcomes

Service	ROI (healthcare resource use)	ROI (health & social care resource use)	ROI (all outcomes)	
	Statutory funding only	Statutory funding only	Statutory funding only	Total costs
Nursing MVS	98%	139%	1164%	712%
Nursing PVS	110%	152%	1286%	751%
Nursing RRS	152%	206%	1456%	1043%
Nursing Total	117%	161%	1297%	799%
Hospice IPU planned	-55%	-46%	90%	13%
Hospice IPU unplanned	-48%	-37%	99%	18%
Hospice Day Case	-55%	-55%	18%	-30%
Hospice Total	-52%	-44%	82%	8%
Volunteer Services				848%
Totals	**28%**	**54%**	**671%**	**372%**

The table shows that the nursing services have large, positive ROIs across the board. The hospice services, on the other hand, have lower ROIs, which are negative in relation to health and social care use, and for all outcomes for the Day Case services.

Sensitivity analyses were carried out to examine the effect on these results of changes to various assumptions that have been used in the calculations. This shows that changing the assumptions about the number of hospital admissions, intensive care unit (ICU) admissions and emergency department (ED) visits avoided as a result of service provision, makes a big difference to the outcomes for health and social care services. However, these do not produce large percentage changes to the total outcomes or the ROI.

In general, the other sensitivity analyses do not produce large changes to the impact or ROI, with the exception of changing the amount of benefit attributed to MVS and RRS nursing model, relative to that of the PVS. However, this change alters the total amount of benefit, not just the relative amounts, so this effect is to be expected.

5. DISCUSSION

The results of this evaluation indicate that nursing services have the biggest impact on outcomes and a higher ROI than hospice services. This may be explained, in part, by the higher cost per case of providing IPU care in hospices. The total benefits for hospices are lower than for nursing services across all domains: healthcare resource use, social care resource use, QALYs and productivity, which is driven by the lower case numbers. The economic benefits from the hospice day care services, in particular, are modest, with limited impact on healthcare resources.

The higher capital costs of hospices compared to nursing services, resulting in a much higher cost per case, are largely responsible for this difference. This will hold true unless the benefits from hospices are substantially greater than those for nursing. It may be better to consider Marie Curie as a ‘full service’ palliative care provider, in which patients are cared for in their own homes or hospices according to needs, rather than to focus attention on the differences in net benefits and ROI for different parts of the organisation.

In relation to all services, the benefits in terms of HrQOL are far greater than those for health and social care services. This is largely due to the high values place on HrQOL and improved mental health status respectively, which are taken from HM Treasury advice. These benefits will not be cash releasing for statutory sector commissioners, although will benefit society as a whole.

Different levels of benefit are attributed to the different nursing models, based on earlier research carried out on Marie Curie nursing services. However, Marie Curie staff reported that these models are not applied in the same way across the UK. In addition, there are three small nursing models, used in a few regions, which have been subsumed into the three larger models. It has not been possible to estimate the impact of this variation on the overall results of this evaluation. Furthermore, there is very little robust evidence on the quantifiable benefits of volunteer services or on the provision of I&S services. As a result, they have been excluded from the main economic analysis.

Although the assumptions underlying this analysis were shared with Marie Curie staff for advice, there is no guarantee that they are correct. The sensitivity analyses go some way to assessing the impact of changing some of these assumptions, but it is not feasible to test everything in this way.

This analysis has focused on individual services and interprets each recorded service use as a 'case'. It has not been possible to fully identify the total number of service users (people at the end of life and their families and carers), nor the extent to which some people may have used multiple services. This means that it is not possible to identify the full extent of double counting benefits, although an attempt has been made to avoid the most problematic impacts of this.

The following recommendations are made:

- Marie Curie should seek to clarify the definitions of the nursing service models and ensure that these definitions are adopted across the UK. This may require some redesign of local models, but the organisation will need to agree how much local variation is required to meet local needs.
- Where possible, it would be beneficial for further research to be carried out on the value of HrQOL and mental health benefits for families and carers of people using Marie Curie's services.
- Further research could be carried out on the benefits of information and support type services, which are an important part of the overall service provision for Marie Curie.
- As part of the above, it would be helpful to have greater clarity about the types of I&S service used by patients and their families and carers, as the benefits of telephone support, for example, would very probably be different from the benefits of receiving information by text, either physically or from a web page.
- The evidence on the benefits of volunteer services would also benefit from additional research, both within and beyond Marie Curie
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Abbreviations

CCG	Clinical commissioning group
ED	Emergency department
HCA	Healthcare assistant
I&S	Information and Support services
ICU	Intensive care unit
IPU	Inpatient unit in a hospice
LA	Local authority
MVS	Multi-Visit Service nursing service model
NHS	National Health Service
OOH	Out of hours
PCKZ	Palliative Care Knowledge Zone
PVS	Planned Variable Service nursing service model
QALY	Quality adjusted life year
HrQOL	Health-related Quality of life
ROI	Return on investment
RRS	Rapid Response Service nursing service model
YHEC	York Health Economics Consortium

1 Introduction

1.1 Marie Curie

Care for people at the end of their lives is a vital, but sometimes overlooked, role of the health and social care system. Palliative care services, including hospices, provide care for the patients themselves, but also a much wider group of carers and bereaved family members. In recent years, the importance of supporting people to die in the place of their choosing has become increasingly important, instead of assuming that they will end their lives in hospital. The Covid-19 pandemic has placed increasing emphasis on this re-focus on care outside of hospital.

Marie Curie is a charity that provides nursing, palliative care and other services to people at the end of their lives and to their families and carers. The organisation works throughout the UK, in each of the constituent nations, providing various direct services to people at the end of life and their families and carers, including: nursing services; hospices; helper volunteers; and information and support. In addition to these direct care services, Marie Curie also works on end of life research, policy and campaigning, and public awareness campaigns.

The nursing service works in people's place of residence, providing hands-on care and emotional support. It provides services at night and during the day, with the aim of helping people with a terminal illness to stay in their homes, or other place where they are most comfortable. There are three main nursing service models which respond in different ways to the needs of their service users: the multi-visit service (MVS); the planned variable service (PVS); and the rapid response service (RRS).

Marie Curie also operates nine hospices, with at least one in each nation of the UK, although not every region within England has a Marie Curie hospice. Hospices provide specialist care and support, both as inpatient services and as day cases. The hospice day care provision comprises a range of services including nurse-led and doctor-led clinics, for assessment, advance care planning, controlling and managing symptoms, day therapies, referrals and liaison with other services, support for families, friends and carers.

Helper volunteers are trained individuals who can offer non-clinical assistance to users of Marie Curie services. This may include help to run an errand, to get to an appointment, or just a visit to have a chat over a cup of tea. The information and support service (I&S) helps people with practical information and support on all aspects of life with terminal illness, dying and bereavement. The I&S service can be accessed via online chats, a phone line, or by consulting information on the Marie Curie website or in hard copy.

Marie Curie began as an organisation providing cancer treatment to women. Since then, it has expanded both the range of conditions and the people it works with, providing care at the end of life for all people, regardless of gender and type of illness. While the services offered across the four UK countries are broadly the same, the breadth and depth of service coverage varies. In England and Wales, there are some areas where Marie Curie's services do not operate. In contrast, Marie Curie provides services in 31 of the 32 local authority areas in Scotland, and in Northern Ireland, there is universal coverage.

In an environment of severe financial pressure on health and social care services across the UK, Marie Curie is the only charity that works in, and has hospices in, all of the nations of the UK. The organisation is funded partly by charitable donations from the public, but also receives a large part, often a majority, of its funding from public sector commissioners who face these pressures at national and local levels. Marie Curie services aim to provide the best possible palliative and end of life care, with a focus is on the best possible outcomes for patients and support for their families. There is, therefore, value in understanding the financial and economic impact of Marie Curie's services on the NHS and wider health and care systems.

Marie Curie receives some statutory funding. In 2019/20, across the UK, the Marie Curie nursing service received approximately 65% of its annual costs from the NHS and hospices received approximately 60% of their costs from the NHS, with the remainder coming largely from charitable donations/legacies, sales of purchased and donated goods, and investments.

1.2 Economic Evaluation of Marie Curie Services

Marie Curie commissioned York Health Economics Consortium (YHEC) to analyse the costs and the economic value of the services it provides for people. The aim of this work is to demonstrate to stakeholders, such as service users and funders, the economic value of the services provided by Marie Curie, based on an analysis of the value of the impact of these services on health and social care resources and on society in a wider sense, including productivity and health-related quality of life (HrQOL).

The term 'impact' is used to refer to all the results or consequences of using Marie Curie services for patients and their families or carers. This includes direct consequences on the use of alternative services (such as fewer hospital admissions), as well as indirect impacts such as less time taken off work by family or carers as a result of poor mental health due to the death of a loved one. Generally, all of these things can have an economic value ascribed to them. However, 'impact' can also include consequences to which it is not possible to assign an economic value, such as being better informed about an illness or experiencing lower anxiety. This evaluation only addresses the impacts to which it has been possible to ascribe an economic value.

Productivity benefits are a measure of the economic benefit lost to society, due to patients, family members or carers taking time off work. This may be due to either time needed to care for a loved one, or as a response to the mental health impact of illness or death. Quality of life (QOL) is a concept used to cover a broad range of aspects of a person's life, including elements as diverse as physical, social, spiritual and emotional well-being. In addition, it can touch on other areas such as a person's environment, employment, education and leisure time. Within this wide-ranging definition of QOL, HrQOL is used to refer more specifically to the impact that a medical condition and/or treatment has on the person's functioning and well-being.

The data shared by Marie Curie on the type and level of services they provided for the year 2019/20 are the basis for this analysis. From this, assumptions have been made about the impact of those services on the use of existing health and social care services. Published literature and statistical documentation were used as the basis for estimating the value of these impacts, in relation to the conditions and populations served. These elements were incorporated into an economic model, which produces an analysis of the value of the impacts and allows the result of changes to input parameters to be investigated.

The benefits of the direct care services provided (nursing and hospices) are assumed to include the avoidance of the use of other health and social care services, principally those provided by the NHS and local authorities (LAs). In such cases, Marie Curie services can be thought of as substituting for, or providing an alternative to, these services and reducing the impact on those public resources. This is based on an implicit assumption that the health and social care system has the capacity to provide the services that have been avoided by the provision of Marie Curie services.

Whether these services would actually have been provided, in the absence of Marie Curie, is not possible to test. Instead, the assumption is used as a way of quantifying the impact that these services have i.e. the Marie Curie service is the equivalent of a certain amount of NHS or social care service provision. In reality, the absence of Marie Curie services may mean that people go without care, but it is standard practice to use these kinds of assumptions in economic evaluations, in order to ascribe appropriate values.

The broader benefits for society are based on published calculations of the value of time taken off work by people caring for others at the end of life and the value of improved HrQOL. Table A1 in Appendix A provides a summary of the main findings from a focused literature search that was carried out for this evaluation. Appendix B then lists the assumptions that were made, based on the evidence from this literature (Table B1), as well as assumptions made in lieu of evidence, which do not have an impact on the values of benefits, but are necessary to analyse the activity and cost data (Table B2). Appendix C then shows the values that were ascribed to the benefits, from published sources such as NHS costing tables (Table C1) and then provides a full list of all the values of assumptions used in the base case for the analysis (Table C2). These have been shared and discussed with staff in Marie Curie.

The agreed objectives of the work were:

- For England, Scotland, Wales and Northern Ireland, categorise the interventions, develop an analysis framework, including an understanding of the benefits of the services currently provided.
- Obtain data to identify the costs of providing the various services and the levels of activity in the financial year 2019/20 in each nation and across the UK as a whole.
- Conduct a pragmatic literature review to seek up-to-date evidence on the economic impacts of palliative or end-of-life care services for adults.
- Develop a set of modelling assumptions and model the economic results, using sensitivity analyses to understand the impact on the results of major areas of uncertainty in the assumptions.

- Produce a separate report for each nation, summarising the evidence for, and the economic benefits of, Marie Curie services, as well as for two English regions with different service profiles.
- Produce an overarching summary report for the UK, including aggregated results at UK level.

This document presents the results of the evaluation for the UK as a whole. Separate documents present the results for each of the nations in the UK and the sub-national analysis of two regions in England: Eastern Region and North East Region.

2 Methods

A mixed-methods approach has been used to gather and analyse evidence for this project, including interviews with key stakeholders and data extraction from the organisation's systems, in order to understand the types of services provided and the levels of activity. Published evidence was reviewed, in order to establish the potential value of impacts of Marie Curie's services. These parameters were combined in an economic model which permits variation to specific values and assumptions, to test the impact of making changes where evidence is incomplete and/or there is uncertainty.

The first step of the approach was to develop an analysis framework, which set out the data and evidence used for the economic calculations, along with the assumptions that have been made.

2.1 Development of an Analysis Framework

The analysis framework describes the interventions provided by Marie Curie, the activity carried out in the year of analysis, and the costs and benefits of each service. It then proposes how the information will be used in the calculations, including any assumptions required. The year chosen for analysis is 2019/20, which was agreed to be the latest year that reflects 'business as usual', before the impact of the Covid-19 pandemic. This means that there are elements of the current service profile that were not operating in the year used for this analysis. The IMPaCT service partnership in Liverpool and consultant-led Hospice at Home are two examples, as well as service adaptations which were developed to deal specifically with the circumstances arising from Covid-19 and the resulting lockdowns.

An economic analysis of health and social care service provision normally incorporates long-term impacts on people's health and well-being, and the impacts on service use that are a consequence of this. This requires discounting the value of costs and impacts that occur in the future, so that their present value can be used. However, this analysis is restricted to one year of service provision in relation to the activity and costs of Marie Curie's services. As the services are provided to people at the end of life and their families and carers, it is also appropriate to consider the impacts of services within a single year.

Documentation on the structure and performance of Marie Curie services was obtained from annual reports, quality accounts, individual service descriptions (including on web pages), previous internal service evaluations and external evaluations. Data on the activity and finances of the services were provided by the finance and information teams within Marie Curie.

The data and information taken from these sources were discussed with various people in the organisation in order to clarify and complete the information provided. This included conversations with information service and finance specialists, regional service managers and heads of service for individual areas of provision, including volunteering, information and support, nursing and local hospice staff.

The analysis framework used this information as well as evidence from a literature review and assumptions about outcomes, to show how the economic analysis would be undertaken and to give the relevant staff in Marie Curie a chance to correct any misunderstandings and challenge any assumptions, before the analysis was carried out. Comments were provided to YHEC by Marie Curie staff and the analysis framework was modified to take these into account.

2.2 Economic Analysis

The economic analysis combined the costs of providing the services with the activity data for each service and the value of the proposed outcomes, informed by the assumptions agreed in the analysis framework. The values for activity and outcomes were derived as set out in the following sub-sections.

The economic analysis was designed to include the following parameters, both in total and for individual services:

- Cost of the services provided
- Value of the economic benefits
- Incremental cost
- Return on investment (ROI) from different perspectives, including the NHS, the social care system, family and societal perspectives.

Benefits were calculated and compared to the overall costs of delivering Marie Curie services, and specifically to the statutory funding Marie Curie receives from NHS and local authority bodies.

2.2.1 Costs of services

The cost of providing Marie Curie services were provided for the nursing services, hospice services, volunteers and I&S services separately. The costs were taken from reports and data provided by the organisation. In particular, the annual report and accounts for 2019/20 were used as a source of information on the services provided. More detailed financial data were provided by the organisation specifically for this work. The costs of the different service models provided by the nursing services were detailed in the data provided. For the hospice services, it was necessary to make some assumptions as to the relative proportions of the service that relate to planned and unplanned care, as the benefits from these types of care are assumed to be different, but the different types of care were not routinely identified in the data.

In addition, an indication of how Marie Curie estimates corporate overheads was provided by finance staff and that has been used in the analysis. This includes administration, property/facilities, IT, staff training, governance and also the cost of generating funds via publicity, fundraising activities and investments.

2.2.2 Literature review

A focussed literature review was carried out to identify evidence on the benefits that can be attributed to the types of service provided by Marie Curie. Previous work by YHEC had focussed on the evidence of benefits of hospice services, up to the year 2015. As a result, the literature review carried out for the present work was focussed on the benefits of community-based nursing services for people at the end of life and/or requiring palliative care, and any further evidence on hospices, published since the previous literature search.

Published academic literature was searched for relevant articles, in English, for the years 2015 to the present. Papers that had already been identified from previous years, and that were pertinent to this evaluation, were also included in the review. In order to minimise the impact of including studies that are based in countries with very different health and social care systems, priority was given to papers describing studies in countries in the following order: the UK; Ireland; Canada/Australia/New Zealand; Continental Europe; the USA. Although there is far higher use of private health insurance and private providers in the USA in the total population, many people at the end of life will be part of the Medicare insurance programme, which has similarities to social insurance programmes in Europe and elsewhere. Full details of the literature review are provided in Appendix A.

2.2.3 Proxy values for outcomes and assumptions

The values of avoided use of health and social care services were taken from publications presenting estimates of these values in each nation. These include: National Cost Collection data compiled by the English NHS; data from the Department of Health in Northern Ireland and Public Health Scotland; and the annual calculations published by the Personal Social Services Research Unit at the University of Kent [25].

Estimates of the value of improved mental health and of HrQOL are based on standard government advice on how to cost these elements in evaluations, published in a document known as the ‘Green Book’ [14]. Other sources of economic values, where not covered by these sources, were taken from government publications, such as the Office for National Statistics or published academic research.

The evidence gleaned from the literature review was incomplete, in that it did not relate to the full range of services provided by Marie Curie and, in many cases, the evidence related to similar, but not identical services. These variances are due to the heterogeneity of service models, implementation in different health and social care environments in different countries and different levels of maturity among services, amongst other reasons.

As a result, it was necessary to make various assumptions about what the evidence implies for the services Marie Curie provides. For example, there are various different levels of impact reported for community-based palliative care services. Assumptions were made, therefore, as to the level of impact to be applied in the economic analysis, by determining reasonable, but relatively conservative values, from the literature reviewed.

The assumptions were shared with Marie Curie in the analysis framework, so that they could offer their informed view on appropriateness and relevance. In addition to the base case analysis, several sensitivity analyses were agreed in order to assess the impact of varying the most important assumptions on the results of this evaluation. The assumptions used for the analysis are listed in Appendix B. The values ascribed to the benefits, referred to as 'outcome proxy values' are listed in Appendix C.

2.2.4 Return on investment

The ROI is a measure of the efficiency of a service and is calculated by taking the net benefit (benefit minus cost) and dividing by the cost. This is expressed as a percentage, such that an ROI of 50% means that each amount spent on the service produces a 50% greater amount of benefit as a result.

The ROI of Marie Curie services was calculated using the following formula:

$$\frac{\sum \text{Total benefits} - \sum \text{costs}}{\sum \text{Total costs}}$$

The ROI results were modelled for the following four scenarios:

- Value of healthcare outcomes only and statutory funding only.
- Value of health and social care outcomes and statutory funding only.
- Value of all outcomes and statutory funding only.
- Value of all outcomes and total running costs.

Marie Curie receives a substantial element of funding from statutory services. The element that is non-statutory comes from direct donations and legacies, from the sale of donated goods (through physical stores) and from interest earned from investments. As a result, it is not possible to identify a return from donations specifically.

3 Impact of Marie Curie Services

3.1 Marie Curie Services

Marie Curie is an end of life charitable organisation that provides direct care services in hospices and through nursing services delivered in peoples' normal place of residence. It also provides information and support to people at the end of life and their carers and families through telephone, on-line and physical documents, covering all aspects of dying, death and bereavement.

As well as direct care services, Marie Curie funds research and undertakes policy and campaigning work. The research funded by Marie Curie is focused on topics related to end of life care, such as out-of-hours care. The policy and campaigning work seeks to influence governments and administrations across the UK to find ways to promote the support of dying people, and their families and carers.

Not all of these services are expected to have a direct, measurable impact on patients and carers, to which an economic value can be attributed. The following services are included in the economic analysis in this report:

- Nursing services
- Hospice services: Planned admissions
- Hospices services: Unplanned admissions
- Hospice services: Day care

Other services, including the volunteer services and the I&S services are not fully modelled, due to the lack of evidence on quantifiable benefits, available from the published literature. However, these services are described and reference is made to the potential benefits that arise from them.

3.2 Nursing Services

3.2.1 Service description and activity: Nursing services

The Nursing Service is provided by registered nurses and healthcare assistants (HCAs). Marie Curie provides care to people at the end of life in their places of residence under various service models. There are three larger service models, in relation to the number of people seen, the resources used and the widespread recording of activity. These are: Planned Variable (PVS); Multi Visit (MVS); and Rapid Response (RRS). In addition, there are three smaller services recorded in activity data from a few areas only: Planned Guaranteed; Discharge Liaison; Reactive.

There is little evidence for differences in the benefits of the different nursing service models. Partly this is due to the fact that these distinctions are specific to Marie Curie and so have not been widely researched. Where research has been carried out on these service models, it has been difficult to identify differences in impacts for the different service models, not least because many people receive care under more than one model [22]. The nursing models are not designed to have exclusive caseloads, rather they provide the appropriate type of response to a person's changing needs. As a result, no distinction is made here in the type of benefits associated with the different models, but the size of impact varies according to the evidence in a detailed economic evaluation carried out by the Nuffield Trust [22].

The three larger service models are:

- PVS: Primarily provides planned overnight care, between 10pm and 7am for a single person per shift, following referral and an assessment of the person's needs. Care is provided in a person's normal place of residence. The service can include small volumes of day activity.

- MVS: Provides shorter episodes of care, typically with multiple visits per nursing shift which can include multiple visits to one person. MVS tends to have fixed shift hours. It can operate from multiple bases and is provided by specialist teams of HCAs.

- RRS: Provides nursing care and advice at short notice, to people in their place of residence. It is designed to support people and their families with unscheduled needs through interventions that provide immediate care. The teams work in conjunction with the local primary care/out of hours (OOH) teams and the model may be nursing only or combined nursing and HCA teams.

We understand, as a result of conversations with Marie Curie staff, that the differences in service model names can relate to differences in how things are described, rather than being a substantive difference in how care is provided. As a result, we have incorporated the three smaller service models into the larger ones as follows: the 'planned guaranteed' model is incorporated into PVS; the 'reactive' model is incorporated into RRS; the 'discharge liaison' model is incorporated into MVS.

We also understand that there are differences in the interpretation of how the different service models function. A consequence of this is that apparent differences in the balance of service models in different regions, from activity data, may not reflect real differences in how the services are provided. This is important for the economic analysis because, as the different service models are understood to have different levels of benefits, a difference in the proportion of each service model in each region will have an effect on the total estimated benefit. Despite attempts to resolve this, and to uncover the 'true' proportions of each service model in each region, it has not been possible to do so.

The total number of cases seen by the nursing service models in 2019/20 across the UK were:

- MVS: 8,692

- PVS: 17,706

- RRS: 17,983

3.2.2 Modelled outcome benefits: Nursing services

The benefits attributed to nursing services apply to each of the nursing service models, but to different degrees. The benefits attributed to nursing services are from both the health and social care perspective, including avoided hospital admission of various types and avoided bed nights in local authority (LA) respite care. In addition, there are benefits from a societal perspective, in in the form of longer and improved health-related quality of life and increases in productivity through people avoiding time off work.

End of life or palliative care nursing services in the community have been reported to reduce hospital admissions by between 0% and 36% [17, 18, 22, 28, 31]. They have been reported to reduce emergency department (ED) visits by between 0% and 50% [13, 17, 18, 22, 28, 32] and ICU admissions by 22% [18]. The economic impact of these service on costs of hospital use has been reported as £1,140 [21] or €1617 per person [18], or by $1,539 per hospitalisation [20]. The relative benefits assumed for the different nursing models were based on the study by the Nuffield Trust, which considered this issue in detail [22]. A detailed account of these benefits, and the assumptions used in the analysis, is presented in Appendix B. The economic value of the benefits is described in Appendix C.

The total value of benefits for the nursing services for the year 2019/20 is £403,092,248. The calculations are shown in Appendix D for all the services included in the analysis. This is broken down by service model and type of benefit as follows:

MVS:

- Avoided healthcare resource use - £12,138,792
- Avoided social care resource use - £2,520,850
- Health-related quality of life gains - £62,260,562
- Productivity gains - £713,607

PVS:

- Avoided healthcare resource use - £34,314,339
- Avoided social care resource use - £6,846,834
- Health-related quality of life gains - £182,389,529
- Productivity gains - £2,584,288

RRS:

- Avoided healthcare resource use - £16,060,368
- Avoided social care resource use - £3,477,020
- Health-related quality of life gains - £79,129,871
- Productivity gains - £656,188

3.3 Hospice Services

There are nine hospices run by Marie Curie, with at least one hospice in each of the four UK nations. The hospice services are divided into inpatient units (IPUs), in which a person stays overnight, for one or more nights, and day care services, which are provided on a single day, or as an outpatient service. The day care services are given various different names in different regions and cover a wide range of activities. It is not possible to identify the specific resources and benefits for each of the individual types of day care services and as a result they are treated in a similar way in the analysis.

The Marie Curie hospice IPUs provide specialist 24-hour palliative care including complex symptom control and end of life care. For the purposes of the analysis, the services provided within the hospice IPUs are split into planned and unplanned care. This is because the benefits arising from a planned stay in a hospice are expected to be different from those arising from an unplanned stay, based on evidence from organisations that provide both types of inpatient care. It has not been possible to identify the exact proportion of planned and unplanned admissions, so the assumption of a 50/50 split is made, based on advice from Marie Curie staff. The consequence of varying this assumption is considered in the sensitivity analysis.

3.3.1 Service description and activity: Hospice-based planned care

The planned care in hospices includes all cases for which a person has an overnight stay which is expected and planned in advance, which is understood to mean having one or two days advance warning.

In 2019/20 the total number of planned admissions in hospices was 1,524.

3.3.2 Modelled outcome benefits: Hospice-based planned care

Inpatient hospice care has been reported to reduce total care costs by between 13% and 20% in the last year of life, with a monetary value of between $1,479 and $44,155 per person [7, 24, 29]. Inpatient hospice care has been reported to reduce ED visits by 50%. It has been reported to reduce use of intensive care unit (ICU) beds by 3.5 days per person [15]. The impact on inpatient stays has been reported as a reduction of 2.9 days per month per person, with outpatient visits reduced by 0.5 per month [24]. A detailed account of these benefits, and the assumptions used in the analysis, is presented in Appendix B. The economic value of the benefits is described in Appendix C.

The total value of benefits for hospice-based planned care is £25,362,759. This is broken down as follows:

- Avoided healthcare resource use - £5,962,995
- Avoided social care resource use - £1,268,782
- Health-related quality of life gains - £17,805,906
- Productivity gains - £325,077

3.3.3 Service description and activity: Hospice-based unplanned care

The unplanned care in hospices includes all cases for which a person has an overnight stay which is not planned in advance, understood as meaning less than one or two days advance warning. As described above, the assumption is made that 50% of admissions are unplanned.

In 2019/20 the total number of unplanned admissions in hospices was 1,524.

3.3.4 Modelled outcome benefits: Hospice-based unplanned care

The benefits attributed to unplanned care in hospices are from the same sources as for planned care. However, given the nature of unplanned care, more emphasis in the assumptions is put on avoidance of urgent and emergency care. A detailed account of these benefits, and the assumptions used in the analysis, is presented in Appendix B. The economic value of the benefits is described in Appendix C.

The total value of benefits for hospice-based unplanned care is £26,488,944. This is broken down as follows:

- Avoided healthcare resource use - £6,907,925
- Avoided social care resource use - £1,450,036
- Health-related quality of life gains - £17,805,906
- Productivity gains - £325,077

3.3.5 Service description and activity: Day care

'Day care' is used in this report to include single-professional appointments (which may be called 'outpatient' cases in some hospices) and longer visits, seeing more than one professional (but not staying overnight). The range of non-IPU, or day care, services provided in the hospices varies greatly from one hospice to another. These appear to reflect wide variation in resource use, as measured in terms of professional involvement and time spent per visit.

Day care services in the hospices comprise a range of services including nurse-led and doctor-led clinics, assessment visits, advance care planning, controlling and managing symptoms, day therapies, referrals and liaison with other services, support for families, friends and carers. Bereavement support is available for families and carers before and after the death of a person, both as individual and group support.

The reported day care services include:

- Doctor- and nurse-led outpatient clinics
- Fatigue, anxiety & breathing clinic
- Art and Music Therapies
- Liver clinic

- Relaxation therapy
- Complementary therapy
- Spiritual support
- Bereavement counselling- adults and children/ young people
- Occupational therapy
- Physiotherapy
- Social work
- Men Shed Group
- Carers' Clinic
- Social bereavement group

The total number of day cases recorded for 2019/20 was 7,865.

3.3.6 Modelled outcome benefits: Day cases

With this variety of services, it is not possible within the scope of this analysis to differentiate between the resource levels for each type of service, nor is there sufficient evidence in the literature to identify different types and levels of benefit from the different types of service. As a result, 'day care' services are treated in a similar way, using average cost and benefit estimates. This means that the results for day care service should be treated with particular caution as they summarise a wide range of inputs and impacts.

The benefits of day care are based on those for IPU, but at a greatly reduced level and, in general, excluding urgent and emergency care. A detailed account of these benefits, and the assumptions used in the analysis, is presented in Appendix B. The economic value of the benefits is described in Appendix C.

The total value of benefits for hospice-based planned care is £5,984,391. This is broken down as follows:

- Avoided healthcare resource use - £2,299,090
- Health-related quality of life gains - £3,514,388
- Productivity gains - £170,913

3.4 Volunteer Services

Marie Curie has trained volunteers who can provide flexible support and companionship for someone who is living with or caring for someone with a terminal illness. Volunteers allow carers to take a break, and help the person who is ill to complete the everyday tasks which can make a difference to their quality of life.

There are various volunteer services run by Marie Curie and some of the services are designed around particular needs that have been identified in a specific area. It is not possible, however, to identify the resource use and benefit of each volunteering approach separately. As a result, the analysis treats all volunteering services as equivalent. Furthermore, there is little good quality, published evidence on the benefits of volunteer services to which an economic value can be ascribed.

Volunteer services may help to mitigate the negative impacts of social isolation for people and their carers (e.g. enabling them to go out, having someone to talk to), and help support carers to sustain their caring roles. The act of volunteering may also have benefits for those who volunteer, improving their mental health by giving a sense of purpose and of 'giving back'.

A number of current volunteer services, including the 'Bereavement Service' (which is part of the I&S service) and the 'Check-in and Chat' service, began at or after the end of the financial year 2019/20 and are, therefore, not included in this analysis. For the volunteer services that are relevant, it has been challenging to get robust data on activity. The total number of volunteers was 9,373 across the UK [19]. The Head of Volunteer Services reported that the total number of households that were supported in 2019/20 was 1,474. This involved a total of 12,283 visits.

The estimate of the value of volunteering is based on the average value per hour of volunteering in the UK, calculated by the Office of National Statistics (see Appendix C). Using this, the total benefit derived from the volunteer services, from a societal perspective, is £6,192,221.

3.5 Other Services

There are further services provided by Marie Curie for which there are insufficient data on the services, and/or insufficient evidence of economic benefits. Those services are reported here, but are not part of the economic analysis.

3.5.1 Information and support services

Marie Curie provides several kinds of service under the heading of I&S. There is a Support Line service, responding to queries from the general public, by telephone, email, web chat and social media. There is information material available online and in hard copies that can be sent out on request. There is also an information service for health care professionals called the Palliative Care Knowledge Zone (PCKZ).

It is possible that people at the end of life and carers who use the I&S services are also receiving other Marie Curie services. In these cases, ascribing benefits from the use of I&S services could result in double-counting of benefits.

In 2019/20 there were the following levels of activity:

- Telephone support line: 15,078 enquiries
- Online public information: 1,684,579 web page users
- PCKZ: 720,704 web page users

- Hard copies publications: 115,614 copies issued (estimate based on proportions of other I&S activities by region)

A search was made for evidence of economic benefits of I&S services. Some evidence was found of positive impacts from telephone-based support services. These include benefits from reducing distress and increasing positive adjustment among care givers [12] and, potentially, for symptom management for adults with cancer [26]. However, the quality of evidence was poor. Furthermore, no evidence was found that quantified the economic impact of these benefits.

It may be feasible to undertake a larger evaluation of the benefits of I&S services, with an extensive literature search. This could provide useful information for future understanding of the benefits of this type of service, within Marie Curie and beyond. It is notable, however, that the terms 'information and support' cover a wide range of different services, and these are likely to have impacts that vary in both type and quantity. For example, we would expect the impact of a telephone support line, offered to carers of people at the end of life, to be different from the impact of web page views providing information about conditions and services. As a result, it would be necessary to have more detailed information on the characteristics of service use, including the types of services accessed, in order to be able to use the evidence to make robust estimations of impacts.

3.5.2 Telephone bereavement service

Marie Curie developed a national telephone bereavement service in March 2020. The Telephone Bereavement Support Service provides a range of services which support people affected by the death of a loved one, whether or not the bereavement happened recently and whether or not their loved one received care from Marie Curie. Weekly telephone-based sessions are run by trained volunteers, providing a service across the UK. While out of scope for analysis in this report, the new service is acknowledged as an important contribution to care, especially during the Covid-19 pandemic.

3.5.3 Non-patient care

Marie Curie also undertakes a number of activities that do not provide direct care for people and their families and carers. These include providing funding for research and development and work on influencing public policy and providing general information and awareness. These activities have a cost to the organisation and may have positive benefits in the long term, particularly at a societal level. However, it is not feasible to associate these activities with specific, identifiable benefits that can be attributed to individuals. As a result, benefits from these areas of work are not included in the economic analysis.

As a result of these kinds of activities, the income and expenditure for the whole organisation, as reported in Marie Curie's annual reports and accounts, do not match the aggregate costs of service provision, which are used in the rest of this report.

4 Economic Analysis

4.1 Service Costs

Marie Curie's total reported expenditure for 2019/20 was £157.0 million, which was an increase of £4.3 million on the previous year [19]. Expenditure increased across the board, on fundraising and charitable activities, with the exception of a small drop in expenditure on research and development and on policy, information and awareness activities. Table 4.1 summarises the expenditure on all activities for the year, for the UK as a whole.

Table 4.1: Marie Curie resource expenditure 2019/20 for the UK

Expenditure	**Total funds 2019/20**
Expenditure on raising funds:	
Cost of generating voluntary income	£31,320,000
Publicity	£3,526,000
Fundraising trading: Cost of goods sold	£18,140,000
Investment management costs	£363,000
Sub-total	*£53,349,000*
Expenditure on charitable activities:	
Hospices	£50,993,000
Nursing	£45,252,000
Volunteers	£653,000
I&S	£1,502,000
Research and development	£1,682,000
Policy, information and awareness	£3,575,000
Sub-total	*£103,657,000*
Total expenditure	**£157,006,000**

The costs of all 'support' activities, including overheads, have been apportioned to the charitable activities for the economic analysis, based on the approach described by the Marie Curie finance team.

4.2 Funding

In 2019/20 Marie Curie received £165.6 million of funding. Table 4.2 shows the sources of income for the UK as a whole.

Table 4.2: Marie Curie income received 2019/20 for the UK

Income source	**Total funds 2019/20**
Generated funds	
Donations and legacies	£102,363,000
Retail sales of donated and purchased goods	£16,362,000
Investments	£1,403,000
Sub-total	*£120,128,000*
Charitable activities	£45,132,000
Other income	£344,000
Total income	**£165,604,000**

The 'income from charitable activities' includes income from the NHS for nursing and hospice services (£44.5 million) as well as other NHS funding and income from the National Lottery Community Fund.

4.3 Value of Benefits

The assumptions described in Appendix B and the values ascribed to benefits in Appendix C are based on the evidence derived from the literature review described in Appendix A. These were used to estimate the value of the benefits produced by Marie Curie services and this was multiplied by the relevant activity numbers to give a total value of benefits for each service (shown in the tables in Appendix D).

As an example, the benefits of the PVS nursing service include an elective hospital admission avoided for 20% of patients (assumption in Appendix B). The average value of an elective hospital admission in the English and Welsh NHS in 2019/20 was £4,186 (Appendix C). The PVS nursing service had 17,706 cases in that year.[1] So 3,541 (20%) elective hospital admissions were avoided at a total cost of £14,823,073. Taking the sum of the calculations for all the benefits gives the total benefit value for the PVS nursing service.

The total value of these benefits for Marie Curie services in 2019/20 was just under £470 million. A number of different perspectives are considered in the analysis, including the perspective of the NHS and social care and the societal perspective, in the form of longer and improved quality of life and increases in productivity. Based on these assumptions, the estimated total benefits of Marie Cure services over the year are as shown in Table 4.3, from these different perspectives.

[1] Some patients may have had more than one treatment episode, so this does not equate to patient numbers.

Table 4.3: Value of benefits of Marie Curie services

Economic perspective	Element	Value
NHS perspective	Avoided healthcare resource use	£77,683,509
Social care perspective	Avoided social care resource use	£15,563,522
Societal perspective	Health-related quality of life gains	£362,906,162
	Productivity gains	£10,967,372
TOTAL		**£467,120,564**

Table 4.4 shows the costs, estimated value of the outcomes and the net position (benefits minus costs) for each individual service. These benefits are expressed in terms of healthcare resource use (reduced use of healthcare services), social care use (reduced use of social care services), productivity (time off work) and HrQOL, which is measured in quality adjusted life years (QALYs). QALYs are a measure designed to combine the impact of gains in the quality of life as well as in the quantity of life (i.e. life expectancy).

Table 4.4: Costs, value of outcomes and net benefit of Marie Curie services

Service	Costs	Value of outcomes					Incremental value
		Healthcare resource use	Social care resource use	QALY	Productivity	TOTAL	
Nursing MVS	£9,561,442	£12,138,792	£2,520,850	£62,260,562	£713,607	£77,633,812	£68,072,370
Nursing PVS	£26,584,424	£34,314,339	£6,846,834	£182,389,529	£2,584,288	£226,134,990	£199,550,566
Nursing RRS	£8,692,488	£16,060,368	£3,477,020	£79,129,871	£656,188	£99,323,447	£90,630,959
Nursing Total	£44,838,353	£62,513,500	£12,844,704	£323,779,962	£3,954,083	£403,092,248	£358,253,895
Hospice IPU planned	£22,446,429	£5,962,995	£1,268,782	£17,805,906	£325,077	£25,362,759	£2,916,330
Hospice IPU unplanned	£22,446,429	£6,907,925	£1,450,036	£17,805,906	£325,077	£26,488,944	£4,042,515
Hospice Day Case	£8,526,662	£2,299,090		£3,514,388	£170,913	£5,984,391	-£2,542,271
Hospice Total	£53,419,520	£15,170,010	£2,718,818	£39,126,200	£821,067	£57,836,094	£4,416,574
Volunteer Services	£653,000				£6,192,221	£6,192,221	£5,539,221
Totals	£98,910,874	£77,683,509	£15,563,522	£362,906,162	£10,967,372	£467,120,564	£368,209,690

4.4 Return on Investment

Return on investment (ROI) is calculated by the formula:

$$\frac{\sum \text{Total discounted benefits} - \sum \text{discounted costs}}{\sum \text{Total discounted costs}}$$

In this instance the costs and benefits only relate to a single year, so they are not discounted. Using this formula, the results of the ROI calculations for Marie Curie services are shown in Table 4.5. This shows the ROI for each individual service and the total of all services, in four ROI scenarios:

- Value of health care resource use outcomes in relation to statutory funding only.
- Value of health and social care resource use outcomes in relation to statutory funding only.
- Value of all outcomes in relation to statutory funding only.
- Value of all outcomes in relation to total running costs.

Table 4.5: Estimated return on investment of Marie Curie services

Service	**ROI (Healthcare resource use only)**	**ROI (Healthcare and social care resource use)**	**ROI (All outcomes)**	
	Statutory funding only	**Statutory funding only**	**Statutory funding only**	**Total costs**
Nursing MVS	98%	139%	1,164%	712%
Nursing PVS	110%	152%	1,286%	751%
Nursing RRS	152%	206%	1,456%	1,043%
Nursing Total	117%	161%	1,297%	799%
Hospice IPU planned	-55%	-46%	90%	13%
Hospice IPU unplanned	-48%	-37%	99%	18%
Hospice Day Case	-55%	-55%	18%	-30%
Hospice Total	*-52%*	*-44%*	*82%*	*8%*
Volunteer Services				848%
Totals	28%	54%	671%	372%

The ROI from statutory funding shows high levels of return for the nursing services, particularly when benefits relating to social care resource use are included. The ROI for all outcomes is higher still, as benefits to productivity and quality of life are included. When considering the impact on healthcare resource use, the ROI for nursing services is 117%. Including the impact on social care services increases this to 161%. Using the statutory costs only, the ROI for all outcomes rises to 1,297% for the Nursing Services.

For hospices, the picture is quite different. The ROI is less than zero when considering the health and social care resources (-52% for healthcare resources only, -44% for health and social care resources). This reflects the net cost shown in the final column of Table 4.4. When considering all outcomes, including societal outcomes, the ROI for hospices increases to 82%, incorporating statutory funding only. When total funding is used, the ROI is 8%.

4.5 Sensitivity Analysis

A number of sensitivity analyses were carried out to examine the effect on the results of changing the assumptions or activity levels used in the original analysis. Table 4.6 shows the outcomes in relation to health and social care outcomes, and in relation to all outcomes (including productivity and HrQOL). It also shows the ROIs in relation to health and social care outcomes, and in relation to all outcomes, based on statutory funding only.

The results show that there is a big difference in the outcomes for health and social care services when the assumptions about the number of hospital admissions, ICU admissions and ED visits are changed. However, this does not have a big impact, proportionally, on the value of total outcomes or the ROI. In the latter case, as in the overall results of the analysis, the impacts on health and social care are overshadowed by the impacts on HrQOL.

The high value placed on measures of HrQOL is also behind the large impact on the value of all outcomes, when the average number of family members who experience improvements in their mental health is changed. On the other hand, changing the assumption about the number of family members with potential to gain mental health benefits from hospice services, by reducing it to zero, does not have a very large effect.

Changing the balance of the split between planned and unplanned IPU cases in hospices does not have a big effect on the outcomes, contrary to initial expectations. However, increasing the proportion of benefits attributed to the nursing models MVS and RRS, relative to PVS, does have a relatively large impact on the ROI, both for health and social care outcomes and for all outcomes.

Overall, the sensitivity analyses indicate that most of the results are not affected by modest changes to the assumptions about the impacts of services.

Table 4.6: Value of outcomes and ROIs for health and social care resources and for all outcomes under sensitivity analyses

Scenario	Value of outcomes		ROI (statutory funding only)	
	Health & social care resource outcomes	All outcomes	Health & social care resource outcomes	All outcomes
Base case	*£93,247,031*	*£467,120,564*	*54%*	*671%*
The number of hospital admissions, ICU admissions and ED visits avoided are reduced by 50%.	£67,289,047	£441,162,580	11%	628%
The number of hospital admissions, ICU admissions and ED visits avoided are increased by 20%.	£103,630,225	£477,503,758	71%	688%
The proportion of care provided in the hospice which is planned vs unplanned will be varied to 60%:40%	£93,021,794	£466,895,327	54%	671%
The proportion of care provided in the hospice which is planned vs unplanned will be varied to 80%:20%.	£92,571,320	£466,444,853	53%	670%
The proportion of hospice patients admitted from hospital who have a reduced inpatient LoS is increased to 50%	£95,971,049	£469,844,582	58%	676%
The proportion of hospice patients admitted from hospital who have a reduced inpatient LoS is increased to 70%	£98,695,067	£472,568,600	63%	680%
The proportion of benefits accrued by MVS and RRS are varied to 90% and 75% of the benefits of PVS, respectively.	£107,328,118	£547,994,149	77%	805%
In the absence of Marie Curie nursing services, the proportion of patients who have bed nights in local authority respite care or hospital is reduced to 50%.	£90,282,868	£464,156,402	49%	666%
For hospice patients who had a hospital admission prevented, the proportion who have a health and social care package is reduced to 50%.	£91,434,486	£465,308,019	51%	668%
The average number of family members experiencing improvements in mental health quality of life be decreased to one per patient cared for by Marie Curie.	£86,622,714	£391,853,813	43%	547%
The average number of family members with potential to gain mental health benefits from Hospice services be decreased to zero.	£91,538,496	£447,707,862	51%	639%
The benefits of volunteering are removed.	£93,247,031	£460,928,343	54%	661%

5 Discussion

5.1 Overall Conclusions

Marie Curie provides services to people at the end of life and their families and carers, working in all nations in the UK. The services include nursing provided in people's place of residence and hospice services offering IPU and day care facilities. In addition, there are volunteer services and I&S services provided for users, as well as work in end of life research, policy and campaigning, and public awareness campaigns. YHEC has performed this analysis to demonstrate the economic consequences of the services provided by Marie Curie, based on data from the financial year 2019/20. This year was chosen as the most recent year that will not have been affected by the Covid-19 pandemic.

In 2019/20, the total reported expenditure for Marie Curie was £157 million, of which £45 million was on nursing services and £51 million was on hospices, £0.7 million on volunteer services and £1.5 million on I&S. In this year, the nursing services provided care for 44,380 cases; hospices provided care for 3,048 IPU cases and 7,865 day care episodes. There were 9,373 volunteers and the I&S service had 1.2 million web page visits and 6,561 telephone support line queries.

Adopting a relatively conservative approach to assumptions, and accepting the limitations of the analysis detailed in Sub-section 5.3 (below), the base case economic analysis has found that Marie Curie services continue to generate substantial net benefits. Total costs of delivering Marie Curie's services are calculated to be just under £99 million per year, while generating an estimated benefits value of around £470 million per year.

The ROI across the whole of Marie Curie's services was calculated to be 28% for healthcare resource use, based on statutory funding only and 54% for health and social care resource use, also considering only statutory funding. When considering all outcomes, including productivity and HrQOL, the ROI for statutory funding is 671% and for total costs the ROI is 372%.

Taking into account the cost of the services, this translates into £368 million of net benefits value. Within this, the nursing services produce higher total benefits and net benefits than the hospice services, reflected in a higher ROI. The analysis for hospice services in fact produced a result of a net cost rather than a net benefit when considering healthcare and social care resource use. It produced a small positive ROI when total costs are considered, rather than only statutory funding.

The benefits for hospices are lower than for nursing services across all domains: healthcare resource use, social care resource use, QALYs and productivity, which is driven by the much lower case numbers. The economic benefits from the hospice day care services, in particular, are modest, based on the evidence available for the analysis. The day care services can help patients with symptom control and mental health benefits. However, these should be captured in the other benefits included, as they are expected to lead to lower use of other health and social care services.

The difference in impacts and ROI can largely be explained by the higher costs of providing inpatient care in a hospice, relative to the benefits. The cost per case of the hospice IPU is £14,733, whereas for the nursing services overall it is £1,010. The capital costs for a hospice will clearly be a large part of this difference. This is also based on the assumptions of only moderately higher impacts of hospice services compared to nursing services (with variation in the level of impact rather than in the type). This is in keeping with the idea that the nursing service provides a good quality palliative care service, equivalent to that of hospices, but enabling people to stay in their homes. In this respect, it is better to consider Marie Curie as providing a comprehensive service in which people will only be brought into a hospice if there is a specific need to do so, rather than considering the impacts of the constituent parts of the service separately.

It is important to recognise that the hospice services are not assumed to avoid use of alternative hospice care. Instead, they are assumed to avoid alterative service uses, such as hospital admissions and ED visits. These alternatives are, in each case, considerably lower cost that the cost of a Marie Curie IPU admission (e.g. £4,186 on average for an elective hospital admission in England and Wales and £182 on average for an ED visit).

It is also the case that there are variations in the proportions of different models of nursing services around the UK and different proportions of urgent hospice admissions. These are a result of differences in local commissioning specifications.

Across the board, the benefits in terms of HrQOL are far greater than those for health and social care services. This is largely due to the high values placed on HrQOL and improved mental health status £9,600 and £11,700 per person, respectively, which are derived from HM Treasury advice on appraisal and evaluation [14]. These benefits do not have an impact on costs for health and social care services and, in particular, will not release funds for the statutory sector commissioners of Marie Curie services, although they will benefit society as a whole.

The sensitivity analysis shows that changing the assumptions about the number of hospital admissions, ICU admissions and ED visits avoided makes a relatively big difference to the outcomes for health and social care services. This is as expected, given it reflects the focus of these assumptions. However, these changes do not have a big, proportional impact on total outcomes or the ROI. At the same time, changing the assumptions on the split between planned and unplanned IPU cases in hospices does not have a big effect on the outcomes of the analysis.

5.2 Individual Services

The nursing services had a cost of £44.8 million, with benefits of £62.5 million for healthcare resources, £12.8 million for social care resource use and £403 million total benefits, including productivity and HrQOL. This results in a £358 million net benefit from a societal perspective. Based on statutory funding only, this produces a ROI of 117% for healthcare resources, 161% for health and social care resources and 1297% for all outcomes. Taking into account total costs, for all outcomes the ROI was 799%.

For the hospice IPU services, the cost was £22.4 million each for planned and unplanned care. The benefits for healthcare resources were £6.0 million for planned care and £6.9 million for unplanned care. For social care resources the benefits were £1.3 million for planned care and £1.5 million for unplanned care. The total benefits, including productivity and HrQOL were £25.4 million for planned care and £26.5 million for unplanned care. This results in a net benefit of £2.9 million for planned care and £4.0 million for unplanned care.

Based on statutory funding only, the ROI for hospice based planned care was -55% for healthcare resources, -46% for health and social care resources and 90% for all outcomes. Taking into account total costs, for all outcomes the ROI is 13%. Based on statutory funding only, the ROI for unplanned care was -48% for healthcare resources, -37% for health and social care resources and 99% for all outcomes. Taking into account total costs, for all outcomes the ROI was 18%.

For the hospice day care services, the cost was £8.5 million. The benefits for healthcare resources were £2.3 million and no benefits were attributed to social care. The total benefits including productivity and HrQOL were £6.0 million, with a net cost of -£2.5 million. Based on statutory funding only, the ROI for day care was -55% for healthcare resources and 18% for all outcomes. Taking into account total costs, for all outcomes, the ROI was -30%.

No statutory funding was provided for the volunteer services, but the costs to Marie Curie of providing them were £653,000, with total benefits of £6.2 million, resulting in net benefits value of £5.5 million. The ROI for all outcomes (with total costs) was 848%.

Different levels of benefits are attributed to the different nursing models in this analysis (although not different types of benefit). This is based on the results of a previous evaluation of Marie Curie nursing services [22]. It is not certain, however, that the different nursing models are applied in the same way across the UK. This may be part of the reason that the relative proportions of nursing service under each model changes between the UK nations. In addition, we have been told that some differences may be in terms of service descriptions, rather than real differences in how care is provided. We were not able to clarify these issues within the scope of this work, however.

Changing the assumption relating to the average number of family members who experience improvements in their mental health, as a result of Marie Curie services has a fairly big impact on the value of all outcomes. This is as a result of the value placed on HrQOL measures, as described above. However, changing the assumption about the number of family members with potential to gain mental health benefits from hospice services, by reducing it to zero, does not have such a large effect.

Little robust evidence on the benefits of volunteering services was found in the published literature. However, removing the assumption of benefits from volunteering has little effect on the total outcomes and the ROI, so this may not have an important overall effect on the impact of Marie Curie services. Furthermore, a number of new services were established in response to Covid-19. These include the ‘Bereavement Service’ and the ‘Check-in and Chat’ service, both provided by volunteers.

It has been disappointing that little to no robust evidence was discovered on the impacts of I&S services. This is largely due to the difficulties of identifying specific benefits of these type of service, which can be associated with individual users.

5.3 Limitations of the Analysis

The analysis has had to use assumptions about the extent of the economic benefits resulting from Marie Curie's services and there is no guarantee that these are an exact reflection of reality. The assumptions are based on evidence from published literature evidence, which have been modified in some cases by informed opinion from Marie Curie staff. The assumptions used in the economic model are generally conservative.

Marie Curie offers various types of service to people at the end of life; most obviously nursing and hospice services. People may make use of more than one type of service, which creates a risk of double counting some of the benefits. Some assumptions have been made to mitigate this, and as a result, the total benefits, as well as the apportioning of benefits between services, may be imprecise.

In ascribing economic values to the benefits, there is an implicit assumption that the health and social care system has the capacity to provide the services that have been potentially avoided by the provision of Marie Curie services. For example, the avoidance of hospital admissions and social care packages. In reality, the absence of Marie Curie service may mean that people go without care. In this case, the benefits described here represent proxy values for the benefits the people gain from these services.

Based on the information received, a relatively simple apportioning of costs, including corporate overheads, has been carried out. It may be that there are regional or local variations that affect the amount of overheads that should be attributed to each service in each region. This may result in some imprecision regarding the true costs of providing some services.

5.4 Recommendations

There is a lack of clarity on how the definitions of the different nursing services are used around the UK. Marie Curie should work to clarify the descriptions of their nursing services and ensure consistency throughout. Further work to identify the specific benefits that can be attributed to the different service models would also be helpful in developing a more precise understanding of the value of Marie Curie's services.

Marie Curie should review the impact and viability of its current clinical service models, to inform future short, medium and long term clinical service planning, in order to appropriately reflect population needs, and appropriate to geographical location.

There has been no clear way of identifying where people have used multiple services, such as hospices, different nursing services and volunteer services. It would be beneficial, in order to develop a better understanding of Marie Curie's work, to be able to easily identify where a person, or their family and carers, have used multiple services, and which ones.

Different levels of benefit have been attributed here to planned and unplanned IPU admissions. This was done on the basis that unplanned, or emergency admissions may be more likely to prevent the use of ED visits and hospital admissions more generally. However, it was not clear how many IPU admission were planned/unplanned. As a result, it would be helpful if a way of identifying these categories were developed for the hospice services.

It has not been possible to find robust evidence on the economic benefits of I&S services. Further research on this would be helpful to show the role played by the I&S services in the overall service provision for Marie Curie. As part of this, it would be helpful to have greater clarity about the types of I&S service used by patients and their families and carers. The benefits of different elements of the I&S services, such as telephone support, for example, would very probably be different from the benefits of receiving information by text, either physically or from a web page.

Further work in testing the assumptions relating to benefits that have been made would be helpful. In particular, the HrQOL and mental health benefits for families and carers are based on evidence taken from relatively few published papers. This would benefit from further research, to make these assumptions more robust.

It has been very challenging to identify evidence on the benefits related to volunteer services. In general, these services have not been the focus of robust evaluation attempts, or if they have, the results have not been published. Further work on this would also be very useful for Marie Curie and beyond.

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Appendix A: Literature Review

A pragmatic, targeted literature search was designed and run in MEDLINE (Ovid) in order to identify studies reporting on community and/or home-based palliative or end of life care interventions (Figure 1). The search was not intended to be exhaustive or highly sensitive. It was instead designed to retrieve a selection of the most explicitly relevant studies.

In order ensure that the strategy retrieved a manageable number of records, which could be screened within the timelines and budget available, the search focused on two types of evidence thought most likely to be relevant to this project:

- Economic evaluations or studies reporting healthcare utilisation outcomes and/or
- Studies with a UK setting

An additional, highly focused section of the search was included to retrieve any studies that very explicitly used key terms for community and/or home-based palliative or end of life care in the title field, or were indexed with highly relevant subject headings as Major Descriptors.

The search terms used to identify economic evaluations comprise the filter developed by the Centre for Reviews and Dissemination (CRD) for identification of economic evaluations to include in NHS Economic Evaluation Database (NHS EED).[2] The search terms used to identify studies with a UK setting comprise the National Institute for Health and Care Excellence (NICE) geographic search filter to retrieve research about the UK.[3]

The strategy excluded animal studies using a standard algorithm. In addition, the strategy excluded records that contained the phrase “case report” in the title field or that were indexed as the following publication types: Comments, editorials, letters, or case reports.

The search strategy was limited to English language studies published 2015 to current.

Figure A1 Search strategy: Ovid MEDLINE ALL

1	Palliative Care/ or Palliative Medicine/ (57536)
2	"Hospice and Palliative Care Nursing"/ (1328)
3	Terminal Care/ or Terminally Ill/ (34555)
4	1 or 2 or 3 (83323)
5	Home Care Services/ or Home Care Services, Hospital-Based/ or Home Health Nursing/ (36828)
6	Community Health Nursing/ (19676)
7	Outpatients/ (17697)
8	or/5-7 (69823)
9	4 and 8 (3720)
10	((outpatient$ or ambulatory or domiciliary or community or community led or community based or home or inhome or in-home or at home or home based or homebased) adj4 (end of life or last year of life or last month of life or final year of life or final month of life or palliative or terminal$ or dying) adj4 (care or caring or nurse$ or nursing or

[2] https://www.crd.york.ac.uk/crdweb/searchstrategies.asp#nhseedmedline
[3] https://doi.org/10.1111/hir.12187

team or teams or service$1 or model or models or intervention$1 or pilot$1 or program$ or approach$ or evaluat$ or initiative$)).ti,ab. (3928)

11 (home adj2 hospice$).ti,ab. (1229)

12 ((home hospital$1 or hospital$1 at home) and (end of life or last year of life or last month of life or final year of life or final month of life or palliative or terminal$ or dying)).ti,ab,kf. (103)

13 9 or 10 or 11 or 12 (7232)

14 Economics/ (27348)

15 exp "costs and cost analysis"/ (247415)

16 Economics, Dental/ (1918)

17 exp economics, hospital/ (25220)

18 Economics, Medical/ (9139)

19 Economics, Nursing/ (4005)

20 Economics, Pharmaceutical/ (3002)

21 (economic$ or cost or costs or costly or costing or price or prices or pricing or pharmacoeconomic$).ti,ab. (876229)

22 (expenditure$ not energy).ti,ab. (32271)

23 value for money.ti,ab. (1845)

24 budget$.ti,ab. (31393)

25 or/14-24 (1032790)

26 ((energy or oxygen) adj cost).ti,ab. (4320)

27 (metabolic adj cost).ti,ab. (1520)

28 ((energy or oxygen) adj expenditure).ti,ab. (26472)

29 or/26-28 (31302)

30 25 not 29 (1025598)

31 ec.fs. (436062)

32 Health Resources/ (14315)

33 (burden$ or resource$1).ti. (81199)

34 hcru.ti,ab,kf. (345)

35 (resource$1 adj4 (use$1 or usage or utilisation or utilization or utilise$ or utilize$ or utilising or utilizing or consumption or consuming or consume$1)).ti,ab,kf. (56051)

36 ((health-care or healthcare or care or health or service) adj4 (use$1 or usage or utilisation or utilization or utilise$ or utilize$ or utilising or utilizing or consumption or consuming or consume$)).ti,ab,kf. (203805)

37 or/30-36 (1441759)

38 13 and 37 (1567)

39 exp Great Britain/ (376762)

40 (national health service* or nhs*).ti,ab. (45826)

41 (english not ((published or publication* or translat* or written or language* or speak* or literature or citation*) adj5 english)).ti,ab. (41172)

42 (gb or "g.b." or britain* or (british* not "british columbia") or uk or "u.k." or united kingdom* or (england* not "new england") or northern ireland* or northern irish* or scotland* or scottish* or ((wales or "south wales") not "new south wales") or welsh*).ti,ab,jw. (794039)

43 (bath or "bath's" or ((birmingham not alabama*) or ("birmingham's" not alabama*) or bradford or "bradford's" or brighton or "brighton's" or bristol or "bristol's" or carlisle* or "carlisle's" or (cambridge not (massachusetts* or boston* or harvard*)) or ("cambridge's" not (massachusetts* or boston* or harvard*)) or (canterbury not zealand*) or ("canterbury's" not zealand*) or chelmsford or "chelmsford's" or chester or "chester's" or chichester or "chichester's" or coventry or "coventry's" or derby or "derby's" or (durham not (carolina* or nc)) or ("durham's" not (carolina* or nc)) or ely or "ely's" or exeter or "exeter's" or gloucester or "gloucester's" or hereford or "hereford's" or hull or "hull's" or lancaster or "lancaster's" or leeds* or leicester or "leicester's" or (lincoln not nebraska*) or ("lincoln's" not nebraska*) or (liverpool not (new south wales* or nsw)) or ("liverpool's" not (new south wales* or nsw)) or ((london not (ontario* or ont or toronto*)) or ("london's" not (ontario* or ont or toronto*)) or manchester or "manchester's" or (newcastle not (new south wales* or nsw)) or ("newcastle's" not (new south wales* or nsw)) or norwich or "norwich's" or nottingham or "nottingham's" or oxford or "oxford's" or peterborough or "peterborough's" or plymouth or "plymouth's" or portsmouth or "portsmouth's" or preston or "preston's" or ripon or "ripon's" or salford or "salford's" or salisbury or "salisbury's" or sheffield or "sheffield's" or southampton or "southampton's" or st albans or stoke or "stoke's" or sunderland or "sunderland's" or truro or "truro's" or wakefield or "wakefield's" or wells or westminster or "westminster's" or winchester or "winchester's" or wolverhampton or "wolverhampton's" or (worcester not (massachusetts* or boston* or harvard*)) or ("worcester's" not (massachusetts* or boston* or harvard*)) or (york not ("new york*" or ny or ontario* or ont or toronto*)) or ("york's" not ("new york*" or ny or ontario* or ont or toronto*))))).ti,ab. (191639)

44 (bangor or "bangor's" or cardiff or "cardiff's" or newport or "newport's" or st asaph or "st asaph's" or st davids or swansea or "swansea's").ti,ab. (3161)

45 (aberdeen or "aberdeen's" or dundee or "dundee's" or edinburgh or "edinburgh's" or glasgow or "glasgow's" or inverness or (perth not australia*) or ("perth's" not australia*) or stirling or "stirling's").ti,ab. (36628)

46 (armagh or "armagh's" or belfast or "belfast's" or lisburn or "lisburn's" or londonderry or "londonderry's" or derry or "derry's" or newry or "newry's").ti,ab. (1493)

47 or/39-46 (1226708)

48 (exp africa/ or exp americas/ or exp antarctic regions/ or exp arctic regions/ or exp asia/ or exp oceania/) not (exp great britain/ or europe/) (3049821)

49 47 not 48 (1175874)

50 13 and 49 (891)

51 38 or 50 (2306)

52 exp animals/ not humans/ (4864720)

53 (editorial or comment or case reports or letter or case report).pt. (3955144)

54 51 not (52 or 53) (2186)

55 limit 54 to (english language and yr="2015 -Current") (824)

56 (*Palliative Care/ or *Terminal Care/ or *"Hospice and Palliative Care Nursing"/) and *Home Care Services/ (1552)

57 ((outpatient$ or ambulatory or domiciliary or community or community based or community led or home or inhome or in-home or at home or home based or homebased) adj4 (end of life or last year of life or last month of life or final year of life or final month of life or palliative or terminal$ or dying) adj4 (care or caring or nurse$ or nursing or team or teams or service$1 or model or models or intervention$1 or pilot$1 or program$ or approach$ or evaluat$ or initiative$)).ti. (1755)

58 (home adj2 hospice$).ti. (407)

59 (home hospital$1 or hospital$1 at home).ti. (356)

60 56 or 57 or 58 or 59 (3356)

61 60 not (52 or 53) (2933)

62 limit 61 to (english language and yr="2015 -Current") (1057)

63 55 or 62 (1551)

The MEDLINE search was supplemented with targeted searches of the webpages of key UK organisations involved in palliative and/or end of life care in order to identify grey literature such as reports:

- The King's Fund https://www.kingsfund.org.uk/
- The Nuffield Trust https://www.nuffieldtrust.org.uk/
- Macmillan https://www.macmillan.org.uk/
- Marie Curie https://www.mariecurie.org.uk/
- Sue Ryder https://www.sueryder.org/
- Hospice UK https://www.hospiceuk.org/
- National Institute for Health and Care Excellence https://www.nice.org.uk/

We also checked reference lists of highly relevant studies, and undertook focused web searches using Google, to identify additional studies not retrieved via MEDLINE or the organisational websites above.

Search results

The search of MEDLINE ALL identified 1551 records. An additional 37 records were identified by the searches of key websites. After screening by a single reviewer, 420 of these in total were retained for further assessment. A first selection, based on titles and abstracts, selected 123 records. Of these, 9 were judged to be directly applicable to this analysis and 55 were partially applicable. A further 17 applicable records were identified from citations within these records, with a total of 81 records extracted for review.

The table below contains the summary of the key evidence found.

Table A1: Summary of key evidence from literature review

Service	Evidence of benefits	Ref.
Nursing	Multidisciplinary, community-based specialist palliative care was associated with an average 27% reduction in hospital costs over the last year of life. This varied with patients' conditions and the average cost per day varied with closeness to death.	29
	An Australian study using data for 2009–2010 looked at community-based multidisciplinary palliative care. During periods receiving palliative care in the last year of life, acute hospital admissions were reduced by 34% compared to periods not receiving palliative care, and the mean length of stay reduced 6%. The effects were most notable in the last five months and last month of life, respectively.	30
	In the Australian study, the rate of ED visits was reduced 50% during periods of receipt of community-based palliative care. This varied by patient factors, including: Age; living in disadvantaged areas; ED visit history; partner status; and region of residence.	31
	A Canadian study using data for 2009–2011 comparing inter-disciplinary, community-based palliative care teams (with various service models but the same core team members and roles), found that there was an average reduction in the cost of hospital care during the last 30 days of life, which was lower for the study group than the comparator group by an average of $733 per person, whilst costs of home care were higher for the study group by an average of $189.	26
	This Canadian study showed that hospital admissions for patients in the last 2 weeks of life was 31.2% for palliative care patients vs 39.3% for comparators. The percentages with an ED visit in the last two weeks of life was 28.9% vs 34.5% and the percentages dying in hospital were 16.2% vs 28.6%.	27
	A Canadian study using data from 2004 to 2009, found that having palliative homecare nursing was associated with a reduction in the rate of high-acuity ED visits, which dropped from 2.35 per 100 person-days to 0.33. The rate of low-acuity ED visits dropped from 0.531 per 100 person-days to 0.0831. High-acuity ED visits are categorized as resuscitation, emergent, and urgent patients and low-acuity ED visits are defined as semi-urgent and non-urgent, based on the Canadian Triage and Acuity Scale.	32
	A Canadian retrospective study covering 2014 to 2016 assessed use of health care services in the last 30 days of life for patients as a result of an intervention to identify patients eligible for palliative care. There was no difference between the intervention and comparator groups regarding ED visits, intensive care unit admissions, or inpatient hospitalisations. Patients in the study group had greater use of palliative physician encounters, community home care visits, and/or physician home visits and more underwent chemotherapy.	16
	A study from the North of England found that 84.4% of palliative care patients who present to ED are conveyed there by ambulance	34
	In a Belgian study of people who received palliative home care support between the last 720 (2 years) and 15 days of life, with matched controls, in 2012, 39% per cent of the study group died in the hospital, vs 74.8% of controls; 27.4% vs 60.8% were admitted to hospital; 18.3% vs 40.4% were admitted to an intensive care unit; 15.2% vs 28.1% were admitted to an ED in the last 2 weeks of life. Total hospital costs were €1,617 lower for the study group, based on lower inpatient costs (€1,766 vs €4,222) and higher outpatient costs (€1,314 vs €476).	17
	A study of the Marie Curie Nursing Service using data from 2009 to 2011, found that 76.7% of patients of MCNS died at home, vs 35.0% of controls; 11.7% of MCNS patients had an emergency admission vs 35% of controls; 7.9% vs 28.7% had an A&E attendance. Total hospital costs for MCNS patients were £1,140 per person less than for controls (£610 vs £1,750) (from time of first visit by MCNS). The impact was greatest for people with no history of cancer. There was a smaller impact for patients receiving only RRS or MVS compared to those receiving PVS (which was the large majority of cases) with overall cost reduction of: PVS £1,100, MVS £900 and RRS £500.	21
	The Nuffield Trust attempted to estimate whether reduced hospital activity and costs at the end of life would be offset by increased care costs in other health and social care sectors. They suggested that the scale of likely changes in non- hospital costs would be relatively small, resulting in an overall net saving around £487 per person. The costs included: Primary care (limited to GP	20

Service	Evidence of benefits	Ref.
	consultations); community care (limited to district nursing care); local authority-funded social care; inpatient hospice care; secondary (acute hospital) care and also the costs of the Marie Curie service itself.	
	A systematic review and meta-analysis exploring factors associated with ED attendance by cancer patients in their last month of life found that patients receiving palliative care services had, on average, a 50% reduction in their odds of ED attendance in their last month of life compared with those not receiving palliative care. The model of palliative care was not specified. Other factors associated with higher risk of ED attendance were: Being male; black race; having lung cancer (as opposed to other cancers); low socioeconomic status	12
	A US study comparing palliative care with usual care among patients with advanced cancer, indicated that, of the $1,539 overall cost-savings per hospitalisation, 63% ($968) is attributable to reduced LOS and 37% ($571) is due to reduced intensity of service (less use of laboratory tests, pharmacy, radiology/imaging, etc.).	19
Hospice care	A literature review of Palliative care services (not differentiating between hospice, hospital and home-based services) found that some studies showed a statistically significant reduction in the use of hospital services for palliative care patients compared to controls, whilst others did not show a significant difference.	28
	Hospice care is associated with lower health care costs at the end of life for patients with myeloma. The authors speculate that this is driven by lower use of costly end-stage treatment regimens (e.g., chemotherapy, radiation, etc.) and supportive care interventions (e.g.; dialysis, blood transfusions, etc.).	7
	Patients with primary liver cancer using a hospice had fewer total hospitalisations than patients not doing so, although the initial hospitalisations were the same there were fewer re-hospitalisations (2 vs 3).	8
	Patients who had integrated hospice/outpatient palliative care had fewer ICU visits than comparators. The two groups did not differ in hospital days ED visits and hospitalisations.	6
	The study by Henson LA, et al. 2014 (above) is also appropriate for hospices.	13
	The study by Taylor P, et al. 2022 (above) is also appropriate for hospices.	34
	In a Canadian study of hospital use before and after the establishment of a paediatric hospice, found that: The mean monthly inpatient days reduced by 2.9; the mean monthly outpatient days reduced by 0.5. The total monthly inpatient days of the hospital and hospice combined increased significantly, however, there was a mean decrease in total costs of $4,252, due to the fact that the hospice has a significantly lower cost for care.	23
	An inpatient palliative care unit (PCU) could generate a saving of $452 per 'patient encounter' per day (each distinct stay of a patient in the unit – so if a patient was in the unit twice, there were two separate PEs), compared to inpatient hospital care. Care received at the PCU was not inpatient hospice care, but active management (e.g., transfusions, epidural pain therapy, radiation therapy, physical therapy).	14
	A study in the South East US found that 167 transfers of critically ill terminal patients, from ICUs to a dedicated hospice inpatient unit, saved 585 ICU bed days.	1
	A systematic review of palliative care interventions providing social support to people with life-limiting illness indicated that these interventions may improve psychological well-being (indicated by improved mood and reduced depression or fewer maladaptive cognition) and quality of life. Evidence of impact on resource use was not clear.	2
Information and Support services	The literature review did not find any evidence specifically relating to the provision of information and support services in palliative care.	
Mental health benefits for closest individuals	Canaway et al. advised that economic evaluations should include three 'closest individuals' when capturing 'spill-over' effects in end of life care. The analysis, therefore, makes a conservative assumption of two family members.	3
	65% of palliative care patients' family members reporting that their emotional or spiritual needs were met, as compared to 35% of usual care patients' family members (P=0.004). Sixty-seven percent of palliative care patients' family members reported confidence	10

Service	Evidence of benefits	Ref.
	in one or more self-efficacy domains, as compared to 44% of usual care patients' family members (P=0.03). Our study shows that palliative care consultation is associated with improved satisfaction, with attention to family and enhanced self-efficacy. Palliative care offers a unique approach by integrating the needs of the family into the care of the patient.	
Volunteer services	In a systematic review, quality of care, or satisfaction with care, was rated as higher by subjects who had received more volunteer support. One study included in the review reported that patients receiving volunteer services lived an average of 80 days longer than comparators.	4
	Patients and families receive many benefits from using the services of hospice palliative care volunteers, including: Emotional support; companionship; practical assistance (e.g., respite or breaks from caregiving). There are also benefits for the volunteers, including: Being able to make a difference in the lives of others; personal growth; greater appreciation of what is really important in life.	5
	A small, qualitative study found that a volunteer befriending service had an impact on a range of outcomes including: Emotional and psychological wellbeing; reduced social isolation; practical support; family carer support.	9

Appendix B: Assumptions of Benefits used in the Analysis

Table B1 Literature based assumptions of benefits resulting from use of Marie Curie services

This table presents the source of evidence used for the assumptions made about the impact of palliative care on the use of other services. It is important to note that the sources cited relate to different models of service provision, different patient populations and different health and social care environments, with results reported for different years. The quality of evidence also varies somewhat, although poor quality sources were excluded from the literature review. All assumptions are intentionally conservative, tending towards lower rather than higher levels of benefit.

Service	Assumptions	Sources
Nursing Service: ▪ Multi Visit (MVS) ▪ Planned Variable (PVS) ▪ Rapid Response (RRS)	▪ 20% of PVS patient cases will have an elective hospital admission prevented ▪ 10% of PVS patient cases will have an emergency hospital admission prevented ▪ 5% of PVS patient cases will have an ICU admission prevented ▪ 10% of PVS patient cases will have an ED visit prevented ▪ 84% of patients having an ED visit will be conveyed by ambulance ▪ MVS patient cases will accrue 75% of the benefits described for PVS above. ▪ RRS patient cases will accrue 50% of the benefits described for PVS above. ▪ In the absence of the Marie Curie services, an equivalent number of bed nights in local authority respite care or hospital would be used. Changed to be 100% minus hospital admissions ▪ The 'spill-over' effects of palliative care will affect three 'closest individuals'. For patients receiving care from PVS, it is assumed that 20% of these will benefit from reduced health care use and improved QOL. ▪ 50% of patients will experience improved QOL ▪ 50% of inpatients experience prolonged life (approximately 2 months), of reduced quality	Evidence from published literature indicates that end of life or palliative nursing care may reduce hospital admissions by 0% [17], 8.1% [28], 23.3% [22], 34% [31] or 36.1% [18]. The period over which these changes occur ranges from the last 2 weeks of life [28] to the last 2 years of life [18]. End of life or palliative nursing care may reduce visits to EDs by 0% [17], 5.6% [28], 12.9% [18], 20.8% [22], 50% [13,32], or there may be a 2.02 reduction in the rate of high-acuity visits and a 0.45 reduction in the rate of low-acuity visits per 100 person days [33]. 84.4% of palliative care patients who visit an ED are conveyed by ambulance [34]. Palliative nursing care may reduce ICU admissions by 22.1%[18]. End of life or palliative nursing care may reduce costs of hospital use by £1,140 [21] or €1617 per person [18]; by $733 in the last 30 days of life [27]; by 27% in the last year of life [30]; by $1,539 per hospitalisation [20]. Lower benefits were shown by MVS and RRS compared to PVS in terms of avoided service use. The extent of this different varied across the type of service use avoided [22]. Palliative care patients can have a 0.16 point improvement in QOL (measured by European Organization for Research and Treatment of Cancer QLQ-C30 scale) [9]. Close-person networks at the end of life contained eight individuals on average, of which three were rated as being 'closest' [3].
Hospice Inpatient Unit (IPU): ▪ Planned admissions ▪ Unplanned admissions	▪ It is assumed that 50% of IPU admissions are planned and 50% are unplanned or 'urgent same day admissions' requiring a bed that day or in the next 24 to 48 hours ▪ 10% of the unplanned admissions will have an elective hospital admission prevented	Hospice care may ICU bed days by 3.5 per person [1] or ICU costs by $452 per day [15]. Palliative care consultations may reduce the number of ICU days by 7.59 per person [6] Hospice care may reduce length of stay in hospital by 2.9 days per month, outpatient days by 0.5 per month and hospital costs by Can$4,252 per person [24]. It may reduce episodes of re-

Service	Assumptions	Sources
	▪ 30% of the planned admissions will have an elective hospital admission prevented ▪ 10% of the unplanned admissions will have an ICU admission prevented ▪ 0% of the planned admissions will have an ICU admission prevented ▪ 50% of the unplanned admissions will have an ED visit prevented ▪ 10% of the planned admissions will have an ED visit prevented ▪ 84% of all patients having an ED visit will be conveyed by ambulance ▪ 30% of hospice patients are admitted from inpatient wards, with an average reduction in hospital length of stay of 10 days ▪ For patients who did not have a hospital admission avoided, there is a health and social care package prevented, consisting of the same length of care in a local authority respite care facility, for both planned and unplanned care. ▪ The 'spill-over' effects of palliative care will affect three 'closest individuals'. For patients receiving care from PVS, it is assumed that 20% of these will benefit from reduced health care use and improved QOL ▪ 50% of patients will experience improved QOL ▪ 50% of inpatients experience prolonged life (approximately 2 months), of reduced quality	hospitalisation from 2 to 3 per person with an average saving of $9,291 per person [8], or it may have no impact [6]. Hospice care may reduce ED visits by 50% [13] or have no impact [6]. 84.4% of palliative care patients who visit an ED are conveyed by ambulance [34]. Hospice care may reduce costs of care at the end of life by $7,051 per person [7]. A review reported a range of results from hospice care and 'hospital-based palliative care' on total care costs, in the range of a 13%-20% reduction in the last year of life; a $1,479, $1,696, $2.309, $6,766 or $44,155 reduction per person; or no significant difference, plus other benefits such as lower hospital admissions and primary care visits [29]. Increases in costs and service use associated with palliative care were also reported. Palliative care patients can have a 0.16 point improvement in QOL (measured by European Organization for Research and Treatment of Cancer QLQ-C30 scale) [9]. Close-person networks at the end of life contained eight individuals on average, of which three were rated as being 'closest' [3].
Hospice Day Care	▪ 5% of cases will have an elective hospital admission prevented ▪ 20% of cases will have a hospital outpatient appointment prevented. ▪ The 'spill-over' effects of palliative care will affect three 'closest individuals'. For patients receiving care from PVS, it is assumed that 20% of these will benefit from reduced health care use and improved QOL. ▪ 50% of patients will experience improved QOL ▪ 50% of inpatients experience prolonged life (approximately 2 months), of reduced quality	A review reported a statistically significant effect of palliative day care on patients' symptoms and feelings of hope, but robust evidence of economic impacts was not found [2]. The evidence on IPU services has been used here with more conservative assumptions across the board. Palliative care patients can have a 0.16 point improvement in QOL (measured by European Organization for Research and Treatment of Cancer QLQ-C30 scale) [9]. Close-person networks at the end of life contained eight individuals on average, of which three were rated as being 'closest' [3].
Volunteer Services	▪ The 9,373 volunteers gave an average of 50 hours of their time in the year.	

Table B2 Other Assumptions

This table lists assumptions that were made for the analysis that do not have a direct impact on the values of benefits used in the analysis. In general, these assumptions are made for pragmatic purposes, in lieu of evidence.

Service	Assumptions

Nursing Service:
▪ Multi Visit (MVS)
▪ Planned Variable (PVS)
▪ Rapid Response (RRS)
	▪ The benefits are applied equally to all the patient cases that receive a service in the year, not taking account of the 'quantity' of service received.
	▪ Evidence indicates that the benefits are attributable to the service model. So, for example, if a patient has PVS nursing and RRS, they will accrue the benefits attributed to PVS and also those attributed to RRS. We assume this to be the case in this analysis.
	▪ The smaller nursing service models are incorporated into the larger service models as follows:
	  ▪ 190 Planned Guaranteed cases are included with PVS
	  ▪ 405 Reactive cases are included with RRS
	  ▪ There were no recorded Discharge Liaison cases in 2019/20
	▪ Patients who have received hospice services as well as nursing services will have all the benefits of avoided health and social care use of the nursing and hospice services, but their family members will not receive the relevant benefits from the nursing service to avoid double-counting these benefits

Hospice Inpatient Unit (IPU0029: ▪ Planned admissions ▪ Unplanned admissions	▪ Activity data are for referrals. We are advised that this is equivalent to the number of admissions to the hospices.
Hospice Day Care	▪ 'Day care' is used to include single-professional appointments (may be called 'outpatient' cases) and longer patient visits, seeing more than one professional (but not staying overnight) ▪ The benefits of bereavement services will be applied to the number of referrals for 'Bereavement support', as shown in the Marie Curie service data.
Volunteer Services	▪ As we cannot assume that the volunteer hours provided would have been replaced by another service, we apply a 'value' of volunteer time to the hours of work provided in the year. ▪ Mental health benefits to families/carers are not included separately as there is a risk that these will double count those mental health benefits already included in the analysis of Marie Curie Nursing services.

Appendix C: Outcome Proxy Values

Table C1 The values and sources used for benefits

Item	Source of proxy value, including assumptions	Unit value of outcome (2020)
Unplanned admission to hospital (England/Wales)	PSSRU 2020. Non-elective inpatient stays (long stays). National average for England	£3,366
Unplanned admission to hospital (Scotland)	ISD Scotland, NHS Highland Board hospital running costs D025_2019, 'inpatient' cost per inpatient week £4,714. Average length of stay for an emergency admission in 2018/19 was 6.6 days	£3,766
Unplanned admission to hospital (Northern Ireland)	https://www.health-ni.gov.uk/publications/hrg-unit-costs-by-provider	£3,470
Elective admission to hospital (England/Wales)	PSSRU 2020 Elective in patient stay	£4,186
Elective admission to hospital (Scotland)	https://beta.isdscotland.org/topics/finance/file-listings-fy-2019-to-2020/	£3,503
Elective admission to hospital (Northern Ireland)	https://www.health-ni.gov.uk/publications/hrg-unit-costs-by-provider	£4,671
Inpatient cost per bed day (England/Wales)	PSSRU 2020. Inpatient, specialist palliative care (adults only), average cost per bed day	£447
Inpatient cost per bed day (Scotland)	Using England cost	£447
Inpatient cost per bed day (Northern Ireland)	Using England cost	£447
ICU admission (England/Wales)	National Cost Collection 2019/20 average of Critical Care data. £1620 per day multiplied by average LoS of 5.186 from https://digital.nhs.uk/data-and-information/publications/statistical/hospital-admitted-patient-care-activity/2020-21/summary-reports---acc---days	£8,403
ICU admission (Scotland)	https://beta.isdscotland.org/topics/finance/file-listings-fy-2019-to-2020/	£9,660
ICU admission (Northern Ireland)	https://www.health-ni.gov.uk/publications/specialist-services	£3,127
Attendance at emergency department - average (England/Wales)	National Cost Collection 2019/20	£182
Attendance at emergency department - average (Scotland)	https://beta.isdscotland.org/topics/finance/file-listings-fy-2019-to-2020/	£110

Item	Source of proxy value, including assumptions	Unit value of outcome (2020)
Attendance at emergency department - average (Northern Ireland)	Using England cost	£182
Hospital outpatient appointment - average (England/Wales)	PSSRU 2019: Outpatient, medical specialist palliative care attendance (adults and children)	£189
Hospital outpatient appointment - average (Scotland)	https://beta.isdscotland.org/topics/finance/file-listings-fy-2019-to-2020/	£179
Hospital outpatient appointment - average (Northern Ireland)	https://www.health-ni.gov.uk/publications/outpatient-first-and-follow-appointments	£273
Ambulance see and treat and convey (England/Wales)	PSSRU 2019: NHS reference costs for hospital services - Ambulance Services - See and treat and convey	£263
Ambulance see and treat and convey (Scotland)	Using England/Wales Costs	£263
Ambulance see and treat and convey (Northern Ireland)	Using England/Wales Costs	£263
Health & social care package at home (England/Wales)	Healthcare: £1,164 based on PSSRU 2019 example Hospice Rapid Response Service '...providing care for relatively short periods when crises arise, and work alongside regular domiciliary services that offer longer-term support, to help avoid admission to hospice or hospital'.	£1,189.72
	Social care: TOTAL £1,120. Derived as follows: £160 per day, (assuming 2 home carers providing hour long care four times per day, at the SDS rate of £20 per hour, SDS: Self Directed Support - NHS Highland). Assumes care is needed for 1 week - i.e. equivalent to the length of the hospital admission alternative costed above.	£1,189.72
Health & social care package at home (Scotland)	Healthcare: £1,164 based on PSSRU 2019 example Hospice Rapid Response Service '...providing care for relatively short periods when crises arise, and work alongside regular domiciliary services that offer longer-term support, to help avoid admission to hospice or hospital'.	£1,189.72
	Social care: TOTAL £1,120. Derived as follows: £160 per day, (assuming 2 home carers providing hour long care four times per day, at the SDS rate of £20 per hour, SDS: Self Directed Support - NHS Highland). Assumes care is needed for 1 week - i.e. equivalent to the length of the hospital admission alternative costed above.	£1,144.75
Health & social care package at home (Northern Ireland)	Healthcare: £1,164 based on PSSRU 2019 example Hospice Rapid Response Service '...providing care for relatively short periods when crises arise, and work alongside regular domiciliary services that offer longer-term support, to help avoid admission to hospice or hospital'.	£1,189.72
	Social care: TOTAL £1,120. Derived as follows: £160 per day, (assuming 2 home carers providing hour long care four times per day, at the SDS rate of £20 per hour, SDS: Self Directed Support - NHS Highland). Assumes care is needed for 1 week - i.e., equivalent to the length of the hospital admission alternative costed above.	£1,189.72
GP appointment (England/Wales)	PSSRU 2020: GP visit: £39 each	£39
GP appointment (Scotland)	PSSRU 2020: GP visit: £39 each	£39
GP appointment (Northern Ireland)	See note	£39
Local Authority respite care (England/Wales)	Nuffield Trust 2012: Understanding patterns of health and social care at the end of life. Cost for 1 week of respite care, assumed to be the same as the cost of 1 week of residential care. Adjusted for inflation.	£594.93

Item	Source of proxy value, including assumptions	Unit value of outcome (2020)
Local Authority respite care (Scotland)	Using England/Wales Costs	£594.93
Local Authority respite care (Northern Ireland)	Using England/Wales Costs	£594.93
GP attendances for depression/mental health problems (England/Wales)	PSSRU 2020: GP visit: 2.6 visits at £39 each. Number of GP consultations based on this reference: Scottish primary care consultations for depression https://www.isdscotland.org/Health-Topics/General-Practice/GP-Consultations/Health-Conditions/Depression/. 2012/13 No. consultations 420,060, no. patients consulting for depression 160,490 = 2.6 consultations per patient in 2012/13	£101
GP attendances for depression/mental health problems (Scotland)	PSSRU 2020: GP visit: 2.6 visits at £39 each GP uses England costs.	£101
GP attendances for depression/mental health problems (Northern Ireland)	Uses England costs	£101
Community & mental health teams for depression/MH problem (England/Wales)	PSSRU 2019: IAPT, adult and elderly per care contact. Average number of sessions = 10 (based on information on NHS.uk website, https://www.nhs.uk/mental-health/talking-therapies-medicine-treatments/talking-therapies-and-counselling/cognitive-behavioural-therapy-cbt/overview/) 10 x 96 = £960	£981.22
Community & mental health teams for depression/MH problem (Scotland)	PSSRU 2019: IAPT, adult and elderly per care contact	£981.22
Community & mental health teams for depression/MH problem (Northern Ireland)	PSSRU 2019: IAPT, adult and elderly per care contact	£981.22
Improved mental health status (same for all countries)	Based on EQ-5D scores for depression severity categories: From Jia & Lubetkin 2017. EQ-5D non/minimal 0.875, EQ-5D mild depression 0.680, Therefore, HR QoL is 0.195. Assume over one year. At Green Book societal value of QALY of £60,000 per QALY: 0.195 x £60,000 = £11,700.	£11,700
QOL gains for patient (same for all countries)	Temel et al, 2010: Early integration of palliative care with standard oncologic care in patients with metastatic non–small-cell lung cancer resulted in survival that was prolonged by approximately 2 months and clinically meaningful improvements in quality of life and mood. Early introduction of palliative care also led to less aggressive end-of-life care, including reduced chemotherapy and longer hospice care. We have conservatively assumed that any additional life gained would not have the same utility value as the 'full health' state (i.e. QoL = 1). We have assumed a utility value of 0.5 for the additional life gained. Therefore, if one QALY is worth £60,000, 2 months of additional life at end of life is worth £60,000/6 x 0.5) = £5,000. Source: The Green Book, Central Government Guidance on Appraisal and Evaluation, 2018 available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf.	£5,000
Sick days (England/Wales)	£569 December 2020 x 2	£1,138

Item	Source of proxy value, including assumptions	Unit value of outcome (2020)
Sick days (Scotland)	Improved productivity from 10 prevented sick days for mild depression. Scottish Government Annual Survey of Hours and Earning (AHSE), ONS = £592.70 x 2 = £1,185.40 https://www2.gov.scot/Topics/Statistics/Browse/Labour-Market/Earnings	£1,185
Sick days (Northern Ireland)	£529 in 2020 x 2 £1,058	£1,058
Good death in preferred place	Cost of an unplanned hospital admission - using values above	NA
Value of volunteering (same for all countries)	ONS. Changes in the value and division of unpaid volunteering in the UK: 2000 to 2015 (available at: https://www.ons.gov.uk/economy/nationalaccounts/satelliteaccounts/articles/changesinthevalueanddivisionofunpaidcareworkintheuk/2015#valuation-of-unpaid-formal-volunteering). Average value per hour based on total value (£22.62bn) and number of hours (1.93bn) in 2015 = £11.72. Updated to 2019/20 using NHS Cost Inflation Index (£12.43).	£12.70

Table C2 Full list of values of assumptions used in the base case analysis

Service	Variable	Value (base case)
Nursing all	Uplift for Support Services/Corporate Overheads	18.5%
Nursing MVS	Elective hospital admissions prevented	15%
Nursing MVS	Emergency hospital admissions prevented	8%
Nursing MVS	ICU admissions prevented	4%
Nursing MVS	ED visit prevented	8%
Nursing MVS	ED visits that would have been conveyed by ambulance	84%
Nursing MVS	Bed nights in local authority respite care or hospital prevented	49%
Nursing MVS	'Closest individuals' who experience improved mental health quality of life for each patient	2.25
Nursing MVS	Percentage of 'closest individuals' experiencing mental health benefits for family members/carers (see below)	15%
Nursing MVS	Patients who experience improved quality of life	38%
Nursing MVS	Patients who experience prolonged life (approximately 2 months), of reduced quality	38%
Nursing PVS	Elective hospital admissions prevented	20%
Nursing PVS	Emergency hospital admissions prevented	10%
Nursing PVS	ICU admissions prevented	5%
Nursing PVS	ED visit prevented	10%
Nursing PVS	ED visits that would have been conveyed by ambulance	84%
Nursing PVS	Bed nights in local authority respite care or hospital prevented	65%

Service	Variable	Value (base case)
Nursing PVS	'Closest individuals' who experience improved mental health quality of life for each patient	3
Nursing PVS	Percentage of 'closest individuals' experiencing mental health benefits for family members/carers (see below)	20%
Nursing PVS	Patients who experience improved quality of life	50%
Nursing PVS	Patients who experience prolonged life (approximately 2 months), of reduced quality	50%
Nursing RRS	Elective hospital admissions prevented	10%
Nursing RRS	Emergency hospital admissions prevented	5%
Nursing RRS	ICU admissions prevented	2.5%
Nursing RRS	ED visit prevented	5%
Nursing RRS	ED visits that would have been conveyed by ambulance	84%
Nursing RRS	Bed nights in local authority respite care or hospital prevented	33%
Nursing RRS	'Closest individuals' who experience improved mental health quality of life for each patient	1.5
Nursing RRS	Percentage of 'closest individuals' experiencing mental health benefits for family members/carers (see below)	10%
Nursing RRS	Patients who experience improved quality of life	25%
Nursing RRS	Patients who experience prolonged life (approximately 2 months), of reduced quality	25%
Hospice all	Uplift for Support Services/Corporate Overheads	30%
Hospice IPU all	Proportion of patients who are planned	50%
Hospice IPU all	Proportion of patients who are unplanned	50%
Hospice IPU planned	Elective hospital admissions prevented	30%
Hospice IPU planned	Admissions who have an inpatient length of stay reduced	30%
Hospice IPU planned	Length of hospital inpatient stay reduced by hospice admission (days)	10
Hospice IPU planned	ICU admissions prevented	0%
Hospice IPU planned	ED visit prevented	10%
Hospice IPU planned	ED visits that would have been conveyed by ambulance	84%
Hospice IPU planned	Health and social care package in respite care avoided	70%
Hospice IPU planned	Patients who experience improved quality of life	50%
Hospice IPU planned	Patients who experience prolonged life (approximately 2 months), of reduced quality	50%
Hospice IPU planned	'Closest individuals' who experience improved mental health quality of life for each patient	3
Hospice IPU planned	Percentage of 'closest individuals' experiencing mental health benefits for family members/carers (see below)	25%
Hospice IPU unplanned	Elective hospital admissions prevented	10%

Service	Variable	Value (base case)
Hospice IPU unplanned	Emergency hospital admissions prevented	10%
Hospice IPU unplanned	Admissions who have an inpatient length of stay reduced	30%
Hospice IPU unplanned	Length of hospital inpatient stay reduced by hospice admission (days)	10
Hospice IPU unplanned	ICU admissions prevented	10%
Hospice IPU unplanned	ED visit prevented	50%
Hospice IPU unplanned	ED visits that would have been conveyed by ambulance	84%
Hospice IPU unplanned	Health and social care package in respite care avoided	80%
Hospice IPU unplanned	Patients who experience improved quality of life	50%
Hospice IPU unplanned	Patients who experience prolonged life (approximately 2 months), of reduced quality	50%
Hospice IPU unplanned	'Closest individuals' who experience improved mental health quality of life for each patient	3
Hospice IPU unplanned	Percentage of 'closest individuals' experiencing mental health benefits for family members/carers (see below)	25%
Hospice Day Care	Elective hospital admissions prevented	5%
Hospice Day Care	Hospital outpatient appointment prevented	20%
Hospice Day Care	Percentage of 'closest individuals' experiencing mental health benefits for family members/carers (see below)	25%
Hospice Bereavement support	'Closest individuals' who experience improved mental health quality of life for each patient	3
Hospice Bereavement support	Cases for which two family members would have suffered from a mental health issue/depression	25%
Volunteer services	Time given by each volunteer in the year (hours)	52
Ambulance conveyances	Proportion of ED visits where patient is conveyed by ambulance	84.4%
Mental health benefits for family members/carers	'Closest individuals' who experience improved mental health quality of life for each patient. For which:	3
Mental health benefits for family members/carers	Number of GP appointments for a mental health problem avoided (all cases)	2.6
Mental health benefits for family members/carers	Percentage of cases of mild depression who require further treatment from community mental health teams/IAPT	50%
Mental health benefits for family members/carers	Percentage of people taking 2 weeks' sick leave	25%
Mental health benefits for family members/carers	Percentage of people experiencing improved mental health status (QOL)	50%

Appendix D: Calculations of Values of Benefits for the Base Case

Table D1: Service benefits value calculations: Nursing service MVS

Outcome description	Number	Unit value of outcome	Value of outcomes				
			Healthcare	Social care	QALY	Productivity	TOTAL
Elective hospital admissions prevented	1,304	£4,186	£5,457,522				**£5,457,522**
Emergency hospital admissions prevented	652	£3,366	£2,194,221				**£2,194,221**
ICU admissions prevented	326	£8,403	£2,738,784				**£2,738,784**
ED visit prevented	652	£182	£118,642				**£118,642**
ED visits with conveyance by ambulance prevented	550	£263	£144,699				**£144,699**
Bed nights in local authority respite care or hospital prevented	4,237	£595		£2,520,850			**£2,520,850**
Family members/carers avoiding 2.6 GP visits	2,508	£101	£254,340				**£254,340**
Family members with mild depression who require further treatment from CMHT	1,254	£981	£1,230,585				**£1,230,585**
Family members/carers avoiding two weeks' sick leave due to mild depression	627	£1,138				£713,607	**£713,607**
Family members/carers with mild depression experiencing improved mental health QOL	1,254	£11,700			£14,673,475		**£14,673,475**
Patients who experience an improvement in quality of life	3,259	£9,600			£31,290,139		
Patients who experience prolonged life (approximately 2 months), of reduced quality	3,259	£5,000			£16,296,947		**£16,296,947**
Totals			*£12,138,792*	*£2,520,850*	*£62,260,562*	*£713,607*	*£77,633,812*

Table D2: Service benefits value calculations: Nursing service PVS

Outcome description	Number	Unit value of outcome	Value of outcomes				
			Healthcare	**Social care**	**QALY**	**Productivity**	**TOTAL**
Elective hospital admissions prevented	3,541	£4,186	£14,823,073				**£14,823,073**
Emergency hospital admissions prevented	1,771	£3,366	£5,959,683				**£5,959,683**
ICU admissions prevented	885	£8,403	£7,438,759				**£7,438,759**
ED visit prevented	1,771	£182	£322,241				**£322,241**
ED visits with conveyance by ambulance prevented	1,494	£263	£393,013				**£393,013**
Bed nights in local authority respite care or hospital prevented	11,509	£595		£6,846,834			**£6,846,834**
Family members/carers avoiding 2.6 GP visits	9,084	£101	£921,078				**£921,078**
Family members with mild depression who require further treatment from CMHT	4,542	£981	£4,456,493				**£4,456,493**
Family members/carers avoiding two weeks' sick leave due to mild depression	2,271	£1,138				£2,584,288	**£2,584,288**
Family members/carers with mild depression experiencing improved mental health QOL	4,542	£11,700			£53,139,134		**£53,139,134**
Patients who experience an improvement in quality of life	8,853	£9,600			£84,986,561		
Patients who experience prolonged life (approximately 2 months), of reduced quality	8,853	£5,000			£44,263,834		**£44,263,834**
Totals			*£34,314,339*	*£6,846,834*	*£182,389,529*	*£2,584,288*	*£226,134,990*

Table D3: Service benefits value calculations: Nursing service RRS

Outcome description	Number	Unit value of outcome	Value of outcomes				
			Healthcare	Social care	QALY	Productivity	TOTAL
Elective hospital admissions prevented	1,798	£4,186	£7,527,584				**£7,527,584**
Emergency hospital admissions prevented	899	£3,366	£3,026,499				**£3,026,499**
ICU admissions prevented	450	£8,403	£3,777,616				**£3,777,616**
ED visit prevented	899	£182	£163,643				**£163,643**
ED visits with conveyance by ambulance prevented	759	£263	£199,583				**£199,583**
Bed nights in local authority respite care or hospital prevented	5,844	£595		£3,477,020			**£3,477,020**
Family members/carers avoiding 2.6 GP visits	2,306	£101	£233,875				**£233,875**
Family members with mild depression who require further treatment from CMHT	1,153	£981	£1,131,568				**£1,131,568**
Family members/carers avoiding two weeks' sick leave due to mild depression	577	£1,138				£656,188	**£656,188**
Family members/carers with mild depression experiencing improved mental health QOL	1,153	£11,700			£13,492,793		**£13,492,793**
Patients who experience an improvement in quality of life	4,496	£9,600			£43,158,627		
Patients who experience prolonged life (approximately 2 months), of reduced quality	4,496	£5,000			£22,478,451		**£22,478,451**
Totals			*£16,060,368*	*£3,477,020*	*£79,129,871*	*£656,188*	*£99,323,447*

Table D4: Service benefits value calculations: Hospice IPU planned admissions

Outcome description	Number	Unit value of outcome	Value of outcomes				
			Healthcare	Social care	QALY	Productivity	TOTAL
Elective hospital admission prevented	457	£4,186	£1,913,211				**£1,913,211**
Inpatient length of stay reduced	457	£4,470	£2,043,014				**£2,043,014**
ED visits prevented	152	£182	£27,728				**£27,728**
ED visits with conveyance by ambulance prevented	129	£263	£33,817				**£33,817**
Patients with no hospital admission avoided, having health and social care package in a LA respite care facility - Health component	1,066	£1,190	£1,268,782				**£1,268,782**
Patients with no hospital admission avoided, having health and social care package in a LA respite care facility - Social care component	1,066	£1,190		£1,268,782			**£1,268,782**
Patients who experience an improvement in quality of life	762	£9,600			£7,312,800		**£7,312,800**
Patients who experience prolonged life (approximately 2 months), of reduced quality	762	£5,000			£3,808,750		**£3,808,750**
Family members/carers avoiding 2.6 GP visits	1,143	£101	£115,862.18				**£115,862**
Family members with mild depression who require further treatment from CMHT	571	£981	£560,581				**£560,581**
Family members/carers avoiding two weeks' sick leave due to mild depression	286	£1,138				£325,077	**£325,077**
Family members/carers with mild depression experiencing improved mental health QOL	571	£11,700			£6,684,356		**£6,684,356**
Totals			*£5,962,995*	*£1,268,782*	*£17,805,906*	*£325,077*	*£25,362,759*

Table D5: Service benefits value calculations: Hospice IPU unplanned admissions

Outcome description	Number	Unit value of outcome	Value of outcomes				
			Healthcare	Social care	QALY	Productivity	TOTAL
Elective hospital admissions prevented	152	£4,186	£637,737				**£637,737**
Emergency hospital admissions prevented	152	£3,366	£512,810				**£512,810**
Inpatient length of stay reduced	457	£4,470	£2,043,014				**£2,043,014**
ICU admissions prevented	152	£8,403	£1,280,159				**£1,280,159**
ED visits prevented	762	£182	£138,639				**£138,639**
ED visits with conveyance by ambulance prevented	643	£263	£169,087				**£169,087**
Patients with no hospital admission avoided, having health and social care package in a LA respite care facility - Health component	1,219	£1,190	£1,450,036				**£1,450,036**
Patients with no hospital admission avoided, having health and social care package in a LA respite care facility - Social care component	1,219	£1,190		£1,450,036			**£1,450,036**
Patients who experience an improvement in quality of life	762	£9,600			£7,312,800		**£7,312,800**
Patients who experience prolonged life (approximately 2 months), of reduced quality	762	£5,000			£3,808,750		**£3,808,750**
Family members/carers avoiding 2.6 GP visits	1,143	£101	£115,862.18				**£115,862**
Family members with mild depression who require further treatment from CMHT	571	£981	£560,581				**£560,581**
Family members/carers avoiding two weeks' sick leave due to mild depression	286	£1,138				£325,077	**£325,077**
Family members/carers with mild depression experiencing improved mental health QOL	571	£11,700			£6,684,356		**£6,684,356**
Totals			*£6,907,925*	*£1,450,036*	*£17,805,906*	*£325,077*	*£26,488,944*

Table D6: Service benefits value calculations: Hospice day cases

Outcome description	Number	Unit value of outcome	Value of outcomes				
			Healthcare	Social care	QALY	Productivity	TOTAL
Elective hospital admissions prevented	393	£4,186	£1,646,145				**£1,646,145**
Outpatient appointment prevented	1,573	£189	£297,297				**£297,297**
Family members/carers avoiding 2.6 GP visits	601	£101	£60,916				**£60,916**
Family members with mild depression who require further treatment from CMHT	300	£981	£294,733				**£294,733**
Family members/carers avoiding two weeks' sick leave due to mild depression	150	£1,138				£170,913	**£170,913**
Family members/carers with mild depression experiencing improved mental health QOL	300	£11,700			£3,514,388		**£3,514,388**
Totals			*£2,299,090*	*£0*	*£3,514,388*	*£170,913*	*£5,984,391*