Cassiopeia consultancy

Impact assessment: telephony equivalency for d/Deaf people for UKCoD and Deaf Access to Communication group

Need, demand and cost of relay services for d/Deaf people in the UK

Final Report

November 2013

Executive summary

Background

In July 2013, Cassiopeia Consultancy Limited was commissioned by the United Kingdom Council on Deafness (UKCoD) to estimate the need, demand and cost of relay services for d/Deaf people[1]. Relay services are forms of electronic communication that enable d/Deaf people and hearing people to communicate, using a third party (relay assistant) who acts as a 'translator' to ensure that both the d/Deaf and hearing party understands and can be understood.

There are three broad types of relay service, which may be delivered either via internet-based or telephone-based service and may (or may not) use specialist phone equipment such as a textphone or a videophone. The three broad relay types are text relay services, video relay services and captioned telephony services. Text relay services currently exist on a funded[2] basis in the UK. The current service was introduced in the 1980s and is due to be replaced by Next Generation Text Relay in 2014. In some limited circumstances, video relay services are available on a funded basis. Captioned telephony services are not currently available in the UK.

Under the European Union's Universal Service Directive, member states ensure that access to, and affordability of, voice telephony for end-users with disabilities is 'equivalent' to the level enjoyed by the majority of end-users. The UK is to meet this requirement through the introduction, in April 2014, of Next Generation Text Relay

[1] The term d/Deaf is used in this report to cover anyone with some form of deafness, whatever the form of that deafness, the age of onset of deafness, the context or condition of deafness. Using the term d/Deaf therefore covers people who are deafened, heard of hearing, Deaf, Deafblind, orally deaf and anyone experiencing some form of deafness.

[2] That is, where the cost incurred by service users is lower than the cost of supplying the service. Such services might be free at point of demand (such as most public services), charged at a flat rate (such as prescription charges) or charged at subsidised or below-market rates (such as public housing).

(NGTR). However, UKCoD believes that d/Deaf people want choice in their telephony that goes beyond NGTR.

Method

To enable such choice, UKCoD is working with key stakeholders on four strands of work, of which this project is one. This project was completed over the period June to November 2013. It involved stakeholders from the d/Deaf communities, communication providers (including relay service providers), government departments and others at each of four key stages: identifying the existing evidence that might allow us to estimate need, demand and cost for relay services in the UK; evaluating that evidence through the use of an iterative survey method known as Delphi; developing a model of need, demand and cost over the ten year period to 2024; and, validating the outputs of this model through a validation workshop.

Modelling approach

The diagram below illustrates the approach taken to developing the estimates of need, demand and cost of relay services. The model seeks to estimate the likely need, demand and cost of relay services that are not currently available in the UK. Although a standard modelling approach has been used and extensive work has been undertaken to identify the evidence and data needed to populate the model, like any attempt to forecast future demand, this project has a number of limitations and caveats. These must be taken into account when considering the outputs from this work.

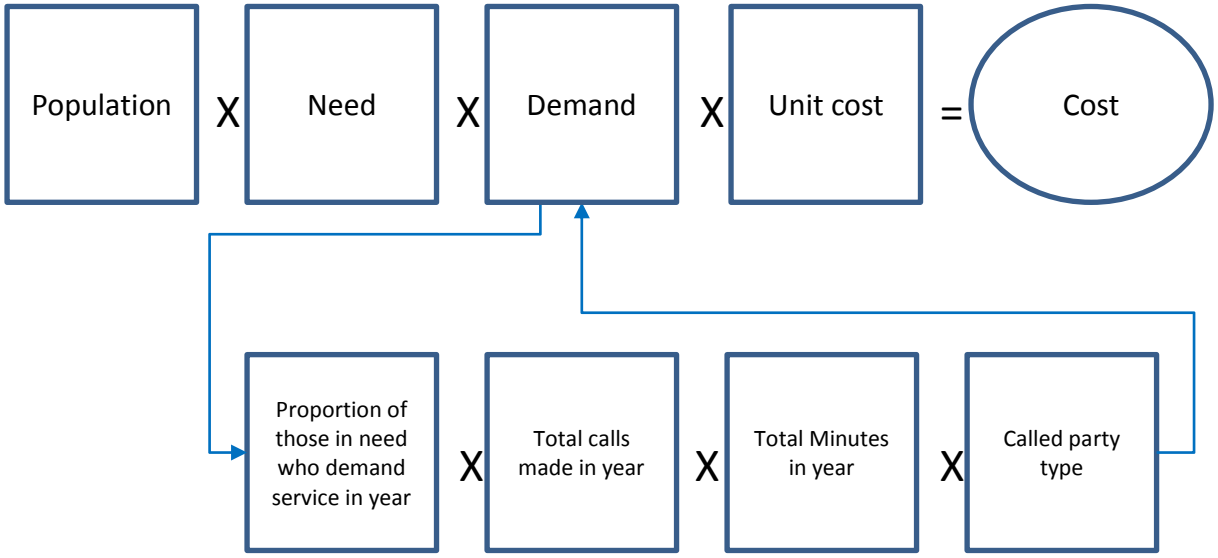

Figure 1: Modelling approach

Need, demand and cost of funded video relay services

We estimate that by 2024, the gross total annual cost of a funded video relay service will be just over £55m (at April 2013 prices). Of this, we estimate that some £22m would relate to calls made to public services[3]. The diagram below illustrates to estimate costs of video relay services over the next ten years.

[3] This £22m includes calls that are or could be funded publicly, such as via the government's Access to Work programme. It also includes calls to public services, some of which are or could be already provided on a funded basis, such as calls made to NHS Scotland.

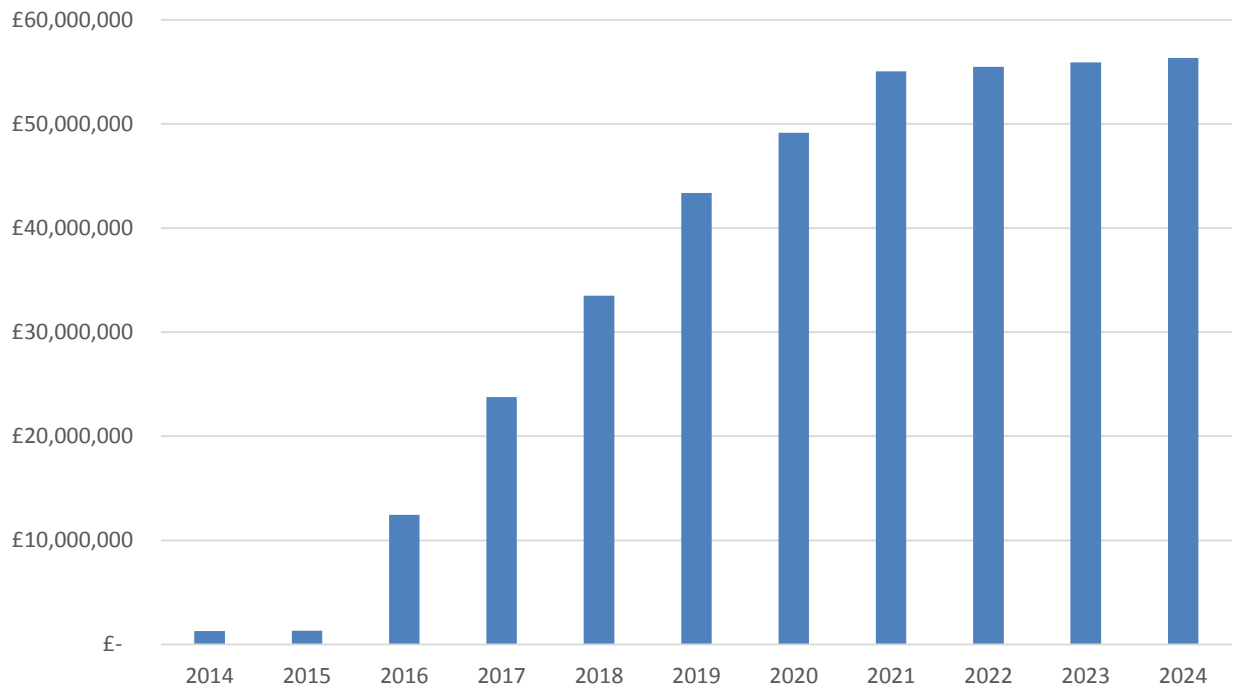

Figure 2: Estimated cost per annum of funded video relay service (April 2013 prices)

Need, demand and cost of funded captioned telephony

Compared to video relay services, there is a dearth of evidence around likely demand for and cost of captioned telephony. Internationally, few countries provide funded captioned telephony services and a non-funded service in the UK ceased to operate over five years ago. There is also a lack of clarity around whether and to what extent Next Generation Text Relay will provide functionality that is similar to captioned telephony. As such, the estimates provided here are less well developed than those provided for video relay services, and further research is needed before any such service could be implemented in the UK.

This research estimates that by 2024, the annual gross cost of a funded captioned telephony services could be £32m (at April 2013 prices). The diagram below illustrates the estimated gross cost over the next ten years.

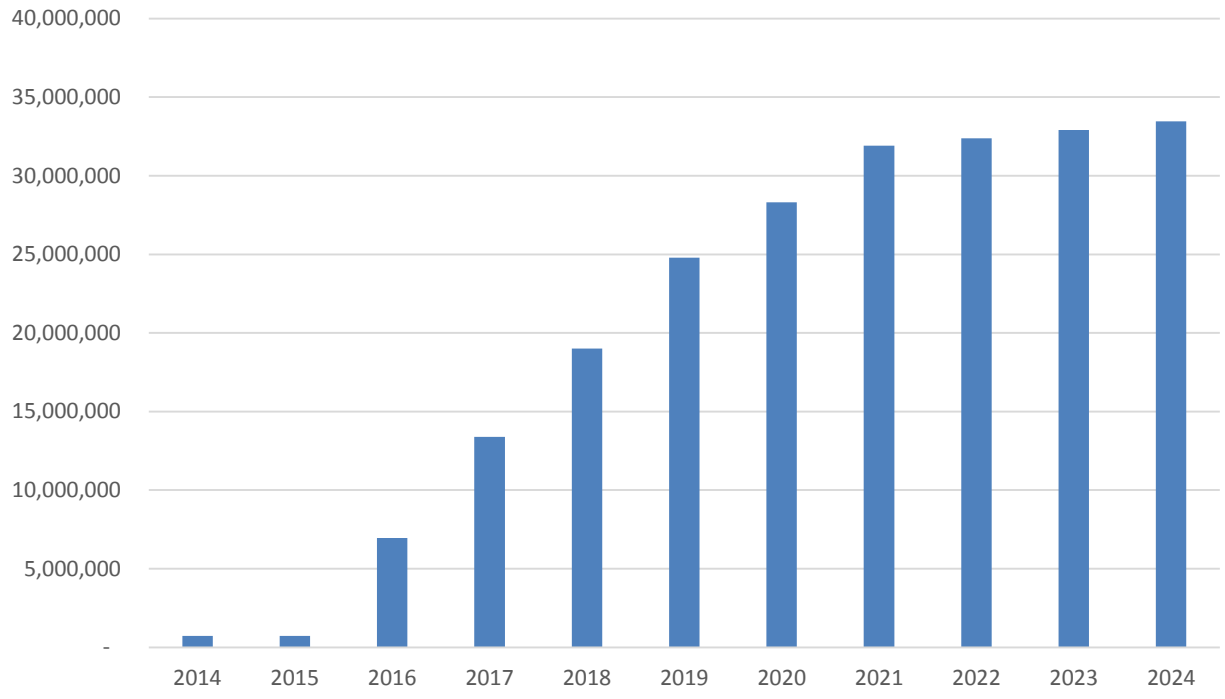

Figure 3: Estimated annual cost of funded captioned telephony (April 2013 prices)

Delivering relay services: the options

Estimating the need, demand and cost of relay services is only part of the picture. What is needed is a decision on how these services might be funded so that d/Deaf people can access them at an equivalent cost to that experienced by hearing people when they access telephony services. The various streams of work currently being undertaken by UKCoD/DAC (of which this research is one) are intended to enable stakeholders to come to such a decision at a Strategy Agreement workshop on 6th November. There are

five potential options for such a funding decision. There is, of course, the **'do nothing'** option or, more strictly speaking, the status quo. The 'do nothing' option has the advantage that it does not require stakeholders to agree on a funding model, but the disadvantage that it has yet to deliver real access to low cost video relay services for most Deaf people.

The second option would be a **voluntary arrangement**. This might be delivered through a voluntary arrangement established by communication providers, or through a 'called party pays' model or a combination of the two. The advantage of this option is that it is probably the most realistic of the options presented here. However, it would require a complex series of agreements to be in place and some means of delivery.

A third option is for UKCoD (or some other group or individual) **taking legal action** to force the provision of funded video relay services. A separate stream of work to this project, being undertaken by UKCoD, is exploring whether and how such legal action might be taken, and also the potential costs of such action. Such an option would have the advantage of being able to deliver without the need for all stakeholders to agree and commit to a funding model. However, legal action is a costly and timely business, which is a major disadvantage of this option.

The fourth option is to lobby for **government funding** of all video relay services. This funding approach is used in a number of other European countries. The key advantage is that it avoids voluntary and private sector organisations for committing themselves to funding video relay services. The disadvantage is that, in the current climate, it is highly improbable that government will agree to fund such a service.

The final option is to lobby for **government action to require** services to be provided. This might involve lobbying Ofcom to review whether, and what, regulatory avenues are appropriate in relation to requiring communication providers to provide access to video relay services. The advantage of this option is that it passes responsibility for the key decision from all stakeholders to Ofcom as the regulator. Alternatively, it might involve lobbying Government to pass legislation to require the provision of such services.

Table of Contents

1: Introduction

In July 2013, Cassiopeia Consultancy Limited was commissioned by the United Kingdom Council on Deafness (UKCoD) to estimate the need, demand and cost of relay services for d/Deaf people[4]. Relay services are forms of electronic communication that enable d/Deaf people and hearing people to communicate, using a third party (relay assistant) who acts as a 'translator' to ensure that both the d/Deaf and hearing party understands and can be understood. There are three broad types of relay service, which may be delivered either via internet-based or telephone-based service and may (or may not) use specialist phone equipment such as a textphone or a videophone. The three broad relay types are:

- **text relay** services involve a relay assistant who translates to text the spoken word of a hearing person and translates to spoken word the text of a d/Deaf person. Text relay services are available in a number of countries and were first developed in the UK in the early 1980s. Under the European Union's Universal Service Directive, member states ensure that access to, and affordability of, voice telephony for end-users with disabilities is 'equivalent' to the level enjoyed by the majority of end-users. The UK is to meet this requirement through the introduction, in April 2014, of Next Generation Text Relay (NGTR)[5]. As this new service will shortly become available on a free at point of demand basis, the modelling of demand and cost for NGTR is excluded from this project;

[4] The term d/Deaf is used in this report to cover anyone with some form of deafness, whatever the form of that deafness, the age of onset of deafness, the context or condition of deafness. Using the term d/Deaf therefore covers people who are deafened, heard of hearing, Deaf, Deafblind, orally deaf and anyone experiencing some form of deafness.

[5] The terms Next Generation Text Relay (NGTR) and Next Generation Text Relay Services (NGTS) are often used, sometimes interchangeably. NGTR is here understood to be the minimum requirements established by Ofcom to enable the UK to meet its obligations under the Universal Services Directive in terms of equivalent access. NGTS is here understood to be the service being developed by BT that meets Ofcom's requirements and may also provide other functionality.

- **video relay** services involve a relay assistant (in this case, a sign language interpreter) who interprets the sign language communication of a Deaf person to spoken English for the hearing party and who interprets the spoken English of a hearing person to sign language for the Deaf person. Some video relay services are currently available in the UK but only in limited circumstances. For instance, some video relay services are available on a funded basis such as via the government's Access to Work programme or through services that are specific to a given organisation (such as NHS Scotland); and
- **captioned telephony** services are similar to text relay, except that only the d/Deaf party receives a text translation of the spoken words of the hearing person (that is, the d/Deaf person speaks to the hearing person as in non-relay telephony call; when the hearing person speaks, their words are translated into text for the d/Deaf person). Captioned telephony services are increasingly delivered via the relay assistant 're-speaking' for speech recognition software the words of the hearing party.

2: Method

This project is an attempt to quantify, for future years, the likely need for, demand of and cost of services which do not currently exist in the UK[6]. There are established methods for undertaking such work, drawing on published or primary data sources to measure key components known to be important to assess whether, when and to what extent services might be used. However, the estimation of demand for, and likely costs of, new service configurations is far from an exact science (O'Leary et al, 2007). Any such approach will almost always involve the use of data originally intended for quite different purposes and of assumptions on the likely target population over time, the level of expected demand, the impact that service provision will have on future demand profiles and the likely costs of service delivery.

In relation to relay services for Deaf people, several pieces of research on likely demand and cost have been published over the last ten years. Pilling (2006), Plum (2009) and Opinion Leaders (2011) have all sought to understand likely demand for video relay services, both on a funded and non-funded basis. This project has drawn on these three pieces of research.

However, the conclusions drawn from these three previous pieces of research were not generally accepted by some of the stakeholders involved in policy decisions around funded relay services. This lack of buy-in may, in part, explain why the UK is behind many other western countries in implementing funded video relay services. UKCoD recognised this as a potential barrier to implementing funded relay services and in November 2012 began a programme of strategic engagement with key stakeholders

[6] The two key relay services that are modelled here are video relay and captioned telephony. Video relay services exist in the UK. For some calls, such services are free at point of demand (for example, calls made to NHS services in Scotland) and some calls are funded via the government's Access to Work scheme. However, these are specific services for limited use, and a comprehensive, funded service is not currently available. UK-based captioned telephony services have not been available since 2009; and have never been available on a funded basis.

and four workstreams designed to ensure that agreement could be reached. This project is one of the four workstreams.

In designing this project, the previous lack of engagement and buy-in has been recognised and specific steps taken to ensure all stakeholders had the opportunity to know, understand and input into the development of the need, demand and cost model.

The diagram below illustrates the method used to deliver this project.

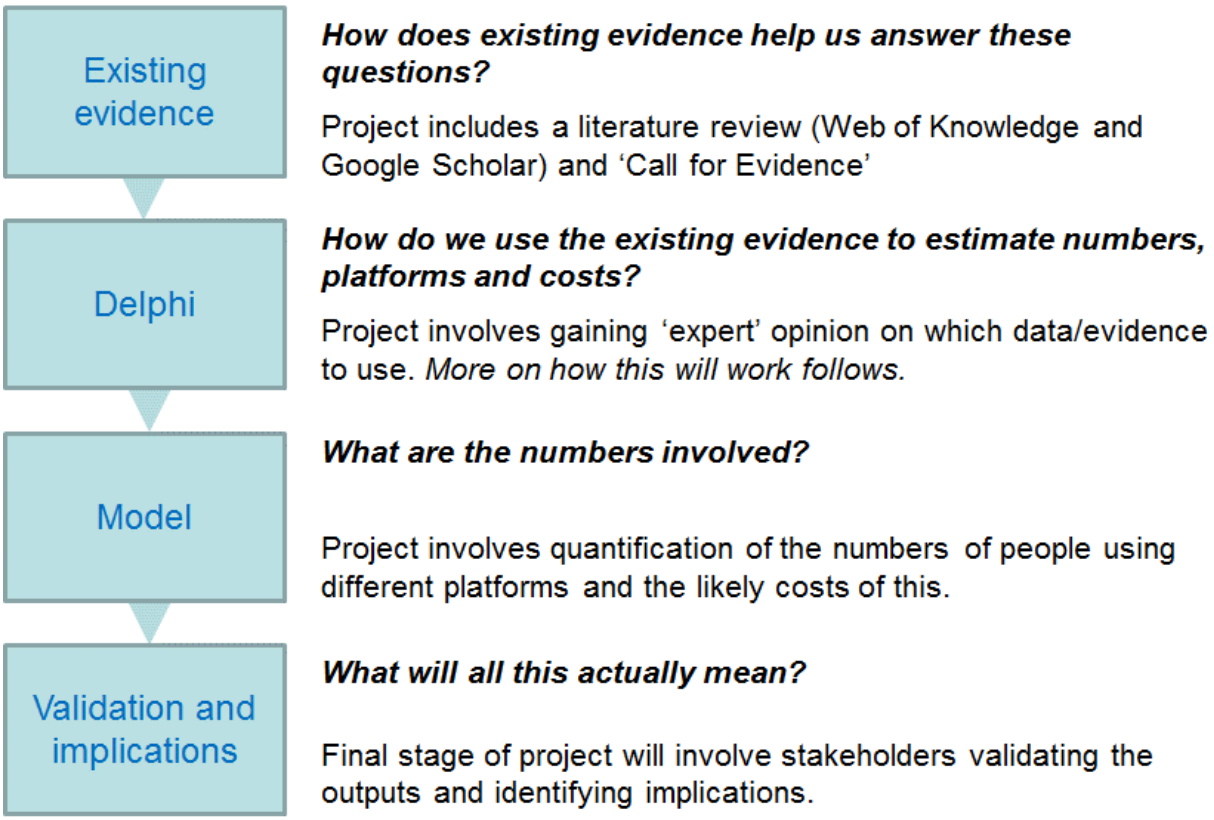

Figure 4: Project method

Existing evidence

Relevant documents were identified from three sources; the Web of Knowledge database, the internet and a call for evidence undertaken by UKCoD.

The most substantive piece of this work involved the Web of Knowledge search, which focused on peer reviewed articles (which are therefore likely to be more robust in evidential terms). Searches involved themes of ‘deaf’, ‘Deaf’, ‘deafness’, deafblind’, ‘hard of hearing’, ‘acquired hearing loss’, ‘relay services’, ‘text relay’, ‘TTY‘, captioning’ and ‘video relay’, combined with words and phrases such as ‘need’, ‘communication needs’, ‘communication’, ‘electronic communication’, ‘demand’, ‘cost’, ‘numbers’, ‘services’, ‘British Sign Language’, ‘BSL’, ‘sign languages’, ‘assistive technology’. Articles titles were used in the first stage to exclude non-relevant articles during the initial search. Following this initial assessment, articles were identified for further assessment, which was completed by reviewing each article abstract.

A number of non-peer reviewed documents were also reviewed for this report. These include policy statements made by relevant government departments[7] and Ofcom, policy positions by charities and other groups advocating for deaf people and wider stakeholders. Other documents reviewed are listed in the bibliography to this report.

A Call for Evidence was undertaken during June 2013. A list of key stakeholders was developed by UKCoD and the call was emailed to stakeholders, with an invitation to re-send the email to other relevant individuals and organisations. A total of fourteen responses were received from the Call for Evidence.

This work was not conducted as a systematic review. It is recognised that the existing literature has gaps, utilises various research methods (at various levels of quality) and

[7] Department of Culture, Media and Sport, Department for Work and Pensions, Department of Health, Scottish Government, National Assembly for Wales and the Northern Ireland Executive.

can be contradictory in its findings. In undertaking this review, evidence identified has therefore been subjected to a three part test; to assess the relevance of any literature (is it in the UK or a country with a similar uses of electronic communication? Is it the right population? Is it the right type of service?), the robustness of the method used (using the Maryland scale of evaluation effectiveness, and focusing on research which utilises experimental or quasi-experimental research design)(Sherman, 1998) and the usefulness (does it allow us to identify and quantify need, demand and cost of relay services?). The output of this phase of the project has been published as a literature review, and is available from the UKCoD website.

Delphi

The Delphi method is a structured communication technique that is often used as a systematic, interactive forecasting method. Using a series of iterative questionnaires, the purpose of the Delphi method is to draw on the views and expertise of stakeholders in a structured way with the aim of achieving consensus on the likely impact of changes over time in populations, demands and costs of particular policy interventions, technologies or service configurations. It is commonly assumed that the method makes better use of group interaction (Häder/Häder 1995) whereby the questionnaire is the medium of interaction (Martino 1983). The Delphi method is based on structural surveys and makes use of the intuitive available information of the participants, who are mainly experts. Therefore, it delivers qualitative as well as quantitative results and has beneath it explorative, predictive even normative elements. The method is a 'relatively strongly structured group communication process, in which matters, on which naturally unsure and incomplete knowledge is available, are judged upon by experts', (Häder and Häder, 1995).

Evidence and data identified through the literature review were presented to a group of ‘experts’ through a survey conducted in two rounds. A series of questions were posed around how the evidence and data might be used to estimate need, demand and cost of

relay services. Participants in the second round were presented with the results of the first, given an opportunity to reflect on theirs and others views and asked further questions about the modelling approach. Responses to both survey rounds, and the implications and recommendations for the modelling work arising from the Delphi survey, are published on the UKCoD website.

Model

The diagram below illustrates the approach to modelling used in this project:

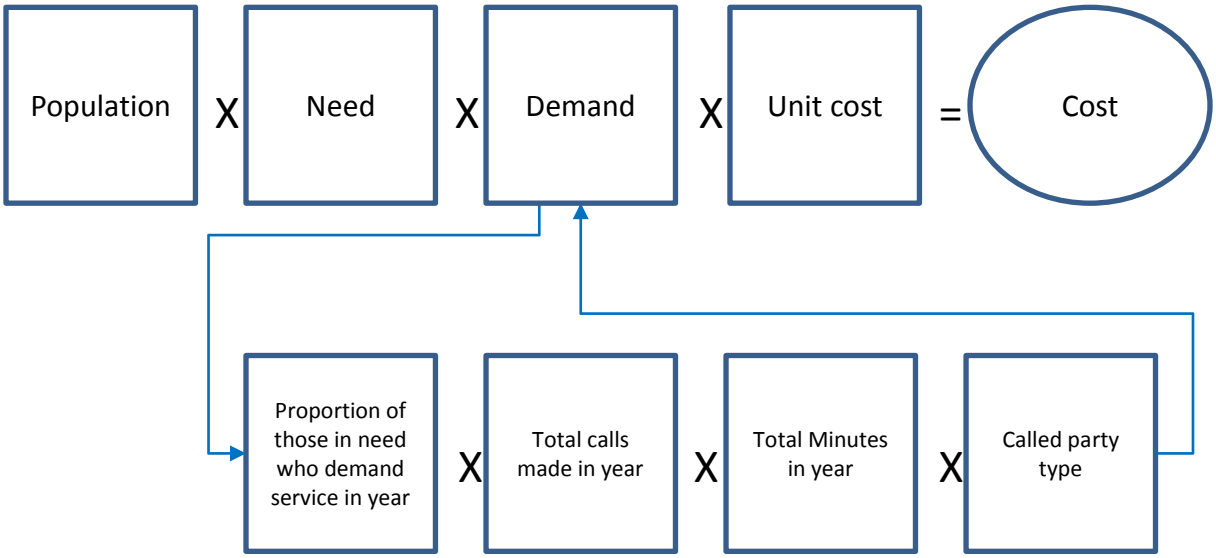

Figure 5: Modelling approach

<u>Where:</u>

Population is an estimate of the number of d/Deaf people in the UK in 2014 and each year through to 2024. Such estimation is far from an easy task, as there are both definitional and data issues. There are many ways to experience, understand, define

and measure deaf communities (Young and Hunt, 2011) and many ways to 'be deaf' (Taylor and Darby, 2003). There are many different terms used in the literature, in part reflecting different contexts, conditions and understandings (Shields, 2006). There are medical, cultural and social models of deafness (Corker, 1998 as quoted in Young and Hunt, 2011)(Power, 2005). For the purposes of this project, and drawing on distinctions made in the academic literature, three d/Deaf populations have been identified:

- Deafblind. There is no generally accepted definition of deafblind (DH, 2009), which here is used here for people with some degree of combined hearing and visual impairment (Hersh, 2013), where this combination causes communication difficulties[8]. This definition includes people born or experienced early onset of hearing and vision impairment and people whose onset happened later in life. It includes those who are blind from birth or early childhood and subsequently acquire a significant hearing loss and those who are deaf from birth or early childhood and subsequently acquire a significant vision loss;

- Deaf is defined as those who use British Sign Language and are members of the Deaf community (Young and Hunt, 2011). It follows the World Federation of the Deaf norm of capitalisation of the word "deaf" when referring to those with any degree of hearing loss who use fluent sign language, identify with the Deaf community and share common cultural beliefs values and life experiences (Power, 1996 as quoted in Deaf Australia Online II, 2001); and

- Hard of Hearing/Deafened is defined as all people who have a hearing loss and whose usual means of communication is by speech (Power, 1996 as quoted in Deaf Australia Online II, 2001). It includes those who have become totally deaf

[8] Although Hersh does not make this distinction, it is one that is found in US federal definitions of deafblind (Individuals with Disabilities Education Act 2004) and in government policies documents in the UK (DH, 1995).

after acquisition of speech (Mitchell and Karchmer, 2004) or who are deafened. For this group, their cultural identify is distinct from Deaf people, as are their communication needs (Valentine and Skelton, 2009).

It is recognised that many d/Deaf people will self-identify outside these three groups. It is not possible in this research to capture all of the different ways in which individuals might self-identify in terms of their deafness, or cover groups where there is a limited extant literature or limited ability to measure population size. For example, there are no data that would allow us to estimate the size of the Oral Deaf community. However, we believe that the Oral Deaf community would be included within the data used to measure the above populations, even if they are not measured as a specific population.

Need to an estimate of the proportion of the above three populations who need communication support when using telephony.

Demand is an estimate of how many of those who need communication support go on to use funded relay services; how adoption of new funded services might change over a ten year period, how many calls they would make in any given year, the average length of calls and the types of calls (by organisation type) that would be made.

Cost is the estimated cost per minute of a relay call at April 2013 prices.

The data used in each of the above components of the model are set out in **Appendix A** to this report.

Model limitations and caveats

The model seeks to estimate the likely need, demand and cost of relay services that are not currently available in the UK. Although a standard modelling approach has been used and extensive work has been undertaken to identify the evidence and data needed to populate the model, like any attempt to forecast future demand, this project has a number of limitations and caveats.

The first of these is the lack of a single, comprehensive dataset that measures the number of d/Deaf people in the UK. The lack of such population measures is not uncommon in such modelling projects, but here is combined with disagreement over the population definitions, available data and how these might be used in practical terms. We have attempted to mitigate this limitation by being clear about how we define the d/Deaf populations and through gaining the views of key stakeholder 'experts' through the Delphi survey as to which data should be used.

Secondly, while there are a number of data and research that might be used to estimate need, demand and cost of relay services, there are nevertheless areas where no evidence exists. We have therefore used a number of working assumptions in the model, which are clearly identified in the technical specification outlined in appendix A to this report. These may be areas where future research or evaluation work (of funded relay services in the UK) might be focused.

Thirdly, much of the evidence used in the demand component of the model draws on research commissioned for Ofcom. Some of this research (Pilling, 2006) is eight years old; a considerable length of time in terms of communication technologies. Each of the three relevant pieces of research (Pilling, 2006; Plum, 2009; Opinion Leaders, 2011) draw on the views of respondents who have generally not used either video relay or

captioned telephony services. To mitigate this, where possible international comparisons have been made, drawing on data from pilots or existing services elsewhere. Again, these might be areas where future research or evaluation work (of funded relay services in the UK) might be focused.

Fourthly, although we know that the use of electronic communication generally is rising, we do not yet know the full capabilities of, and likely impact on, other forms of electronic communication through the use of, Next Generation Text Relay. We also do not know how communication technologies might develop in future years and how such developments might impact on demand for existing technologies.

Fifthly, the estimates of demand assume services are provided to service users at a below market rate (that is, they attract some form of price subsidy, whether or not from public funds). The Opinion Leaders (2011) research would suggest that demand for relay services is likely to be price-sensitive. As such, should relay services be free at point of demand, it is likely that costs would be higher than identified in this model and should relay services be provided on a non-funded basis, it is likely that costs would be lower than identified in this model.

Finally, the model estimates need, demand and cost over the ten year period to 2024. The ten year period has been used as recommended by HM Treasury in undertaking such work (HMT, 2003), but it should be recognised that the pace of technological change is likely to be such that the outputs from the earlier years in the model are likely to be more robust than those after 2020.

Validation and implications

Once the modelling work was complete, key elements of the model in terms of how data were used, working assumptions and the outputs from the model were presented to a stakeholder validation workshop for challenge and discussion. A briefing note on changes to the model arising from this workshop has been published on the UKCoD website. Through discussions with the UKCoD committee overseeing this work, potential options for implementing a funding service have been identified and are set out in chapter 4 of this report. These options will be discussed by stakeholders at a Strategy Agreement workshop, scheduled for 6th November 2013. Key barriers to implementation have also been identified, which are also set out in chapter 4 of this report. In the following chapter, findings from the modelling work are presented.

3: Findings

Size of the d/Deaf communities in the UK

Deafblind population

This research estimates that by 2024, there will be some 371,000 people with co-occurring hearing and vision loss in the UK, of whom over 330,000 will be aged 70 and over. The chart below illustrates the changes to the Deafblind population over the next ten years by home country of the UK. It is followed by estimates, at the UK level, of these populations aged under 70 and 70 and over through to 2024.

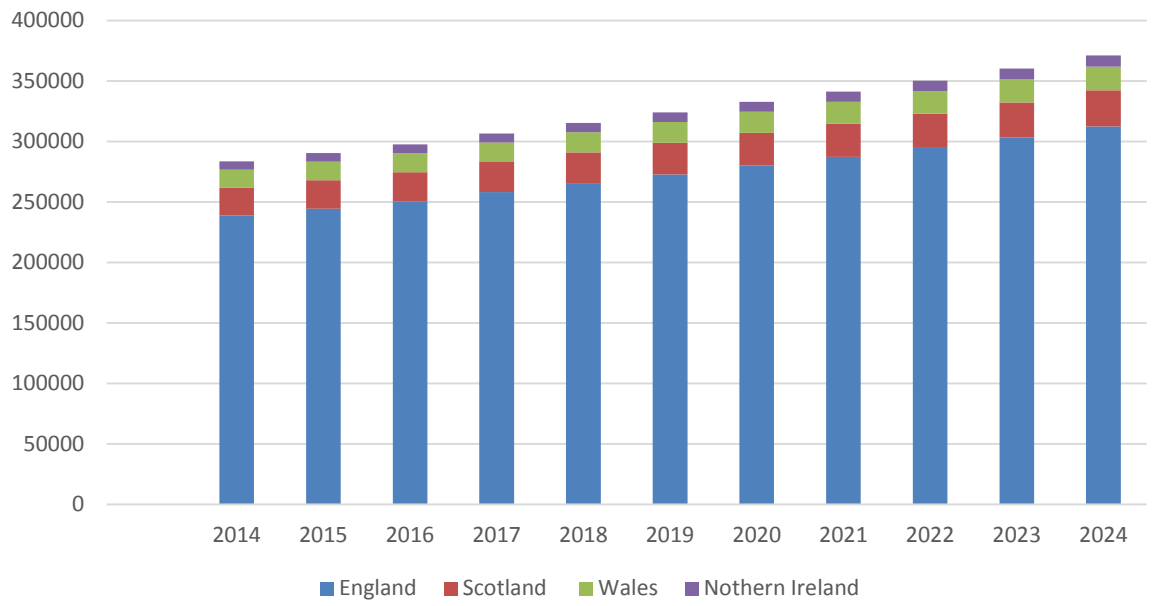

Figure 6: Estimated size of Deafblind population

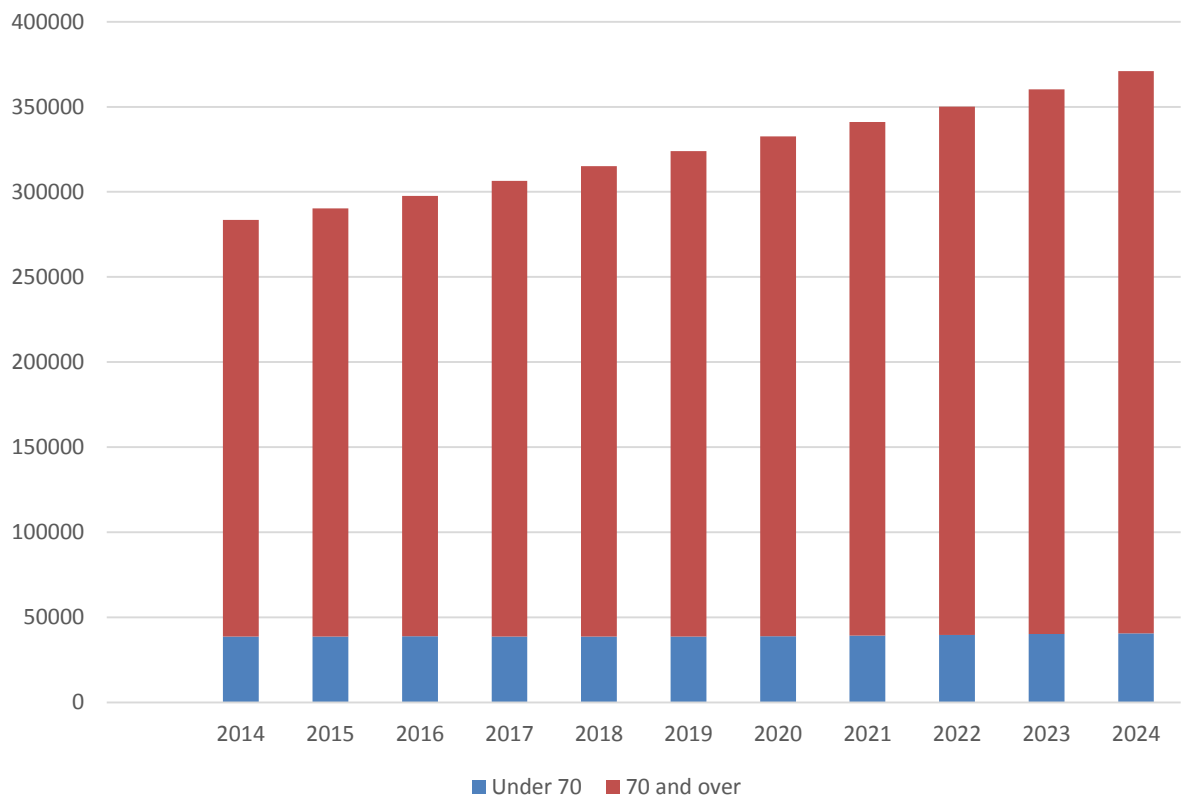

Figure 7: Estimate of size of Deafblind population by age

Prevalence rates estimated by Robertson and Emerson (2010) have been combined with the ONS Mid-2010 population projections to estimate this population. Robertson and Emerson give upper and lower estimated prevalence rates, by ten year age bands, for men and women. An average of the male and female prevalence rate by age band has been applied using the lower estimate range for population aged under 70 and the upper estimate range for the population aged 70 and over[9].

[9] The Robertson and Emerson prevalence rates and how they have been applied in the model are set out in the technical appendix.

Deaf population

This research estimates that by 2024, there will be 28,200 people in the UK who are Deaf and whose preferred language is a sign language. The chart below sets out the changes in the size of this population over the next ten years in each home country of the UK.

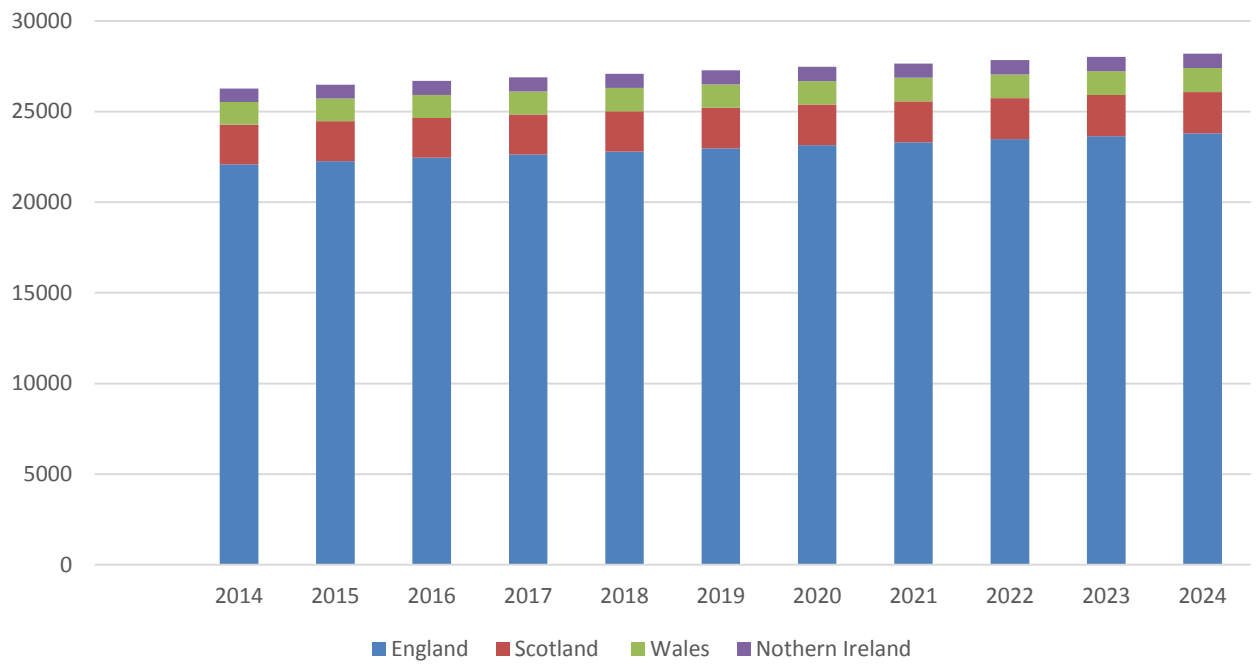

Figure 8: Estimated size of Deaf whose preferred language is a sign language population

Data from the 2011 census in England, combined with the mid-2010 population estimates (both published by the Office of National Statistics) have been used to calculate the size of this population. During this project, data on sign language users were also published from the 2011 census in Scotland, which gave a very different (and much higher) prevalence rate than is presented by the England data. However, differences in the question posed in the census between the two countries are such that

the England census rate is considered the most appropriate for the purposes of estimate need, demand and cost of relay services. A briefing note on this issue has been published on the UKCoD website.

Hard of Hearing/Deafened population

This research estimates that by 2014, some 10.4 million people will have a hearing loss in the UK at Better Ear Hearing Loss (BEHL) of ≥ 25db, rising to 11.2m by 2024. The chart below illustrates the changes over the ten years to 2024, by home country of the UK, in the estimated size of this population.

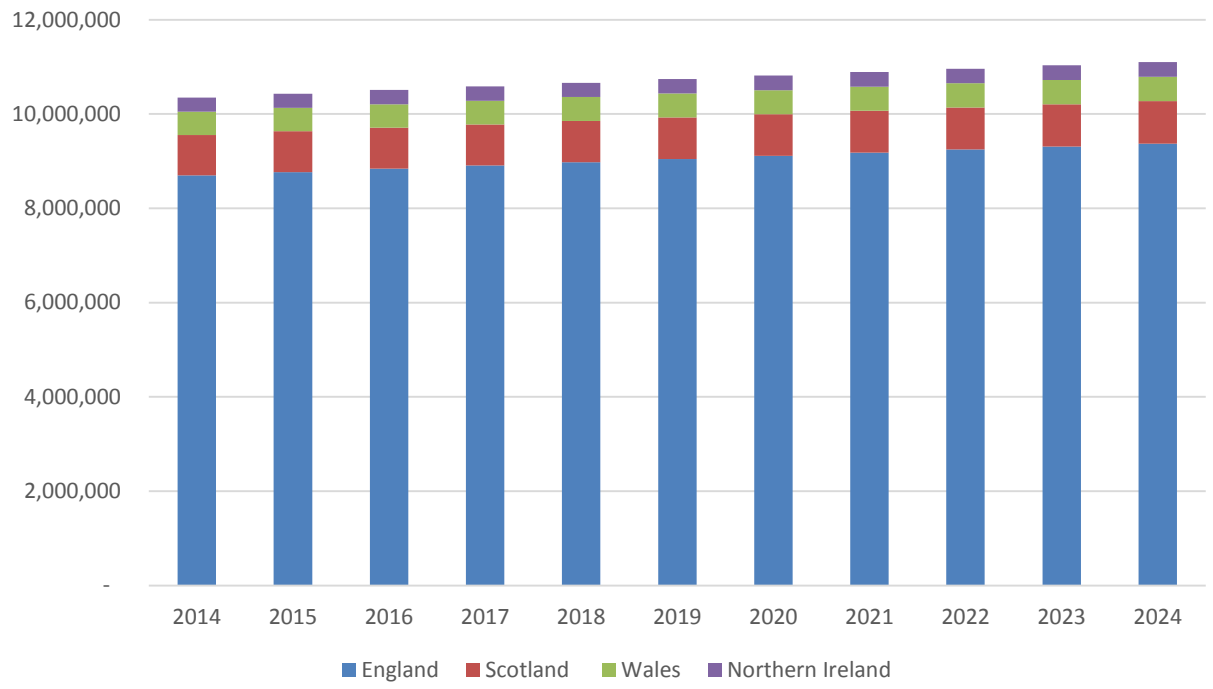

Figure 9: Estimated size of hard of hearing/deafened population

Need, demand and cost of funded video relay services

We estimate that by 2024, the gross total annual cost of a funded video relay service will be just over £55m (at April 2013 prices). Of this, we estimate that some £22m would relate to calls made to public services[10]. The diagram below illustrates to estimate costs of video relay services over the next ten years.

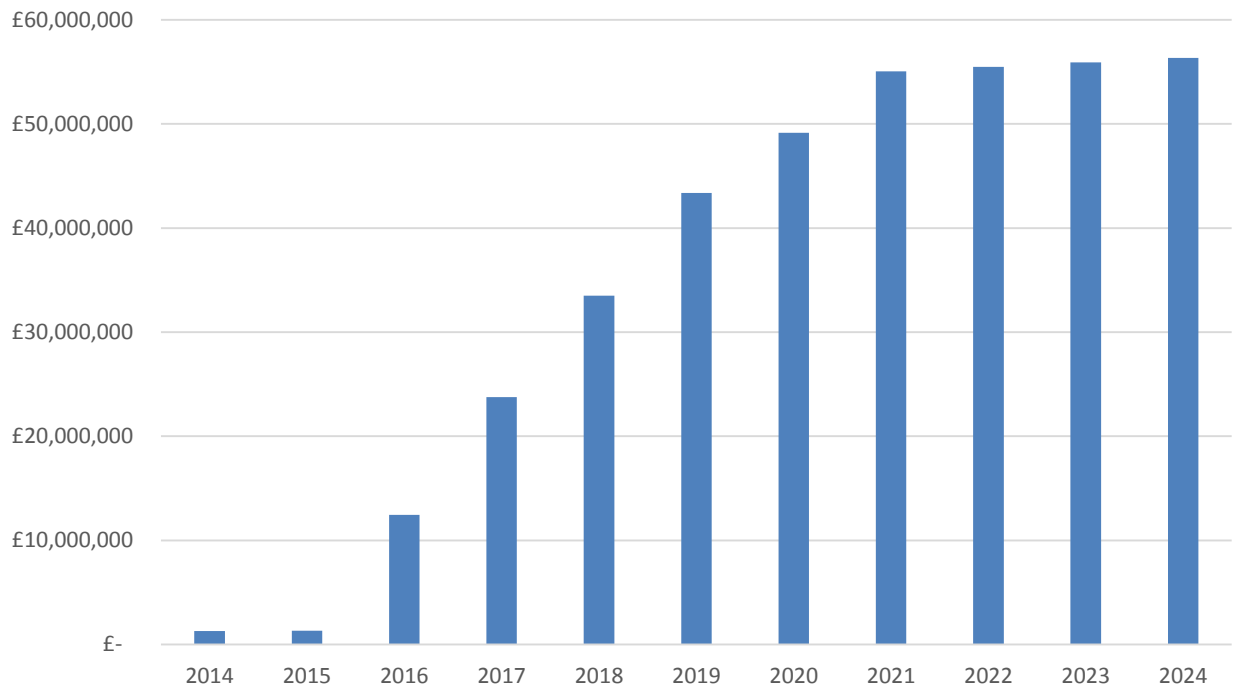

Figure 10: Estimated cost per annum of funded video relay service (April 2013 prices)

Calculating this estimated cost requires several steps. We need to know the likely number of users; how many Deaf people will use video relay services? How many hearing people? We need to know how many calls they are likely to make, and the

[10] This £22m includes calls that are or could be funded publicly, such as via the government's Access to Work programme. It also includes calls to public services, some of which are or could be already provided on a funded basis, such as calls made to NHS Scotland.

average length of those calls. To develop a fair and equitable funding model, we might also need to understand what kind of calls will be made and to whom (called party), and whether any of these calls are covered by existing public funding programmes.

Number of users

Drawing on the research commissioned by Ofcom (Opinion Leaders, 2011), we estimate that, at full adoption, some 76 per cent of Deaf people will use a funded video relay service. All things being equal, it will take some time for Deaf people and other users to learn about and begin to use a funded service. Based on stakeholder views expressed at the validation workshop, we have made a working assumption that it will take some seven years for the service to be fully adopted, and have drawn on research undertaken in 2008 by Saladin and Hemsmann around adoption of assistive technology at a Deaf school in Austin, Texas to estimate how adoption will change over that seven year period[11]. This research draws on the much used categorisation of people in terms of their technology adoption as innovators, early adopters, early and late majority and laggards developed by Rogers (2003) but suggests that Deaf people are more likely to be early adopters compared to the general population. By utilising these two pieces of research, the chart below illustrates the estimate number of Deaf users of video relay services in each year through to 2024.

[11] Much research on the adoption of new technologies does not provide the time period over which it takes full adoption to occur. The seven year period to full adoption used in the model is a working assumption, derived from stakeholders at the validation workshop held on 10th October 2013.

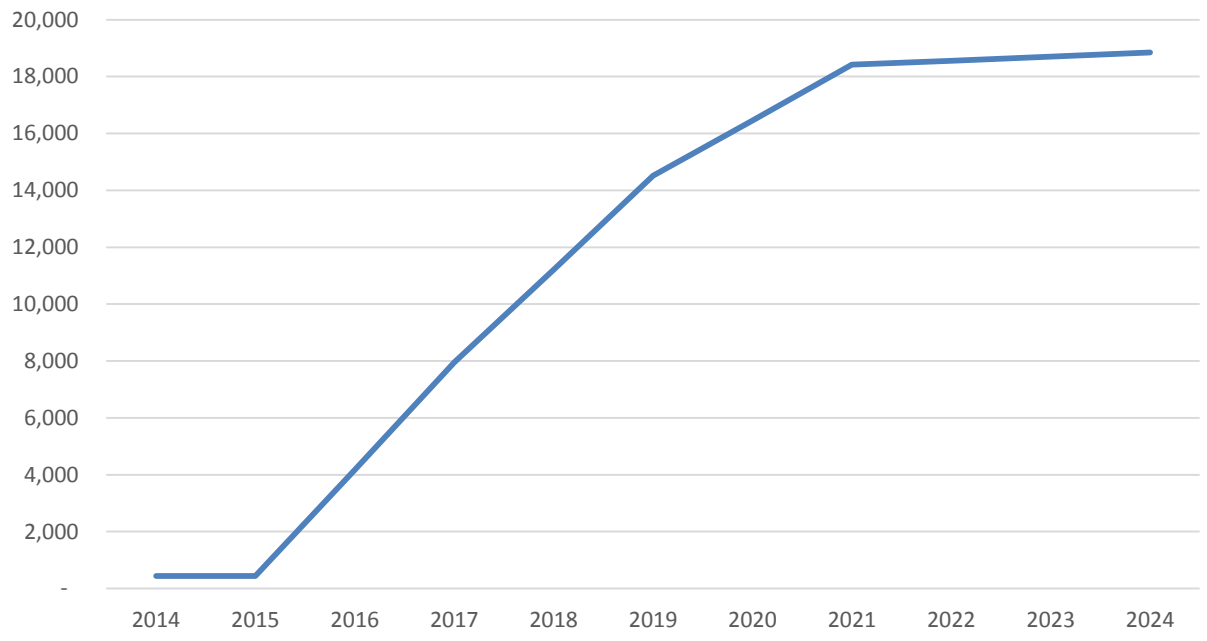

Figure 11: Estimated adoption and number of users of funded video relay services

Of course, Deaf people will not be the only ones using a funded video relay service. But both data from existing services (including the recent trial in Canada) and from academic research suggests that the vast majority of calls will be initiated by Deaf users.

Number and duration of calls

The Opinion Leaders research, commissioned by Ofcom in 2011, provides useful insight into the potential number of calls that an average funded video relay service user might make in any year. This research covers all types of calls, whether personal or business related. Drawing on this research, and assuming an average call length of five minutes, we estimate that the average user will make 190 relayed calls per year and around 79 minutes of relayed calls per month.

The research mentioned above (Warnicke and Plejert, 2012) suggests that 90 per cent of video relay calls will be initiated by a Deaf person. Taking this together, we estimate

that by full adoption (2021), some 18,000 Deaf people will make over 3.2m calls and a further 300,000 calls will be made by hearing people.

Called party

Very little of the extant research or data from existing services or pilots allows us to estimate the volume and cost of video relay calls by called party (that is, by the type of organisation receiving the call or by the purpose of the call). One of the few pieces of research to do is was commissioned by Ofcom and published in 2006. It was completed by Doria Pilling at City University. It includes data from interviews and a survey with Deaf people who have used video relay services at the time of the research and a survey of Deaf people who had not used video relay services. Using data from Pilling to identify how likely it was that respondents would use a video relay service to call various called party categories, we have estimated the total volume of calls by called party. The piechart below illustrates the proportion of calls by called party at full adoption (2021).

Figure 12: Breakdown of total calls by called party

It must be stressed that this part of the analysis must be viewed with some caution. In relation to communication technologies, the research is now quite old (the research was conducted in 2005 and published in 2006). The research does not provide a proportion of total calls by called party but rather the likelihood that users would use video relay services to call different types of party/organisation. As such, the underlying research does not account for differences in number of calls each year to different called parties (that is, it allows us to identify that more people would use video relay to contact hearing friends and relatives than work colleagues; but we do not know how many calls each would make to these respective parties).

Cost

In figure 7 above, we outlined the estimated total cost per annum of a funded video relay service over the next ten years. This uses the data created through the model on total minutes, mulitpled by a cost per minute of £3.15 at April 2013 prices (Ofcom, 2011). This was the highest of three costs identified from the extant literature, and its use was agreed upon by Delphi participants.

In considering the different options for implementing a funded video relay service, UKCoD has identified the 'called party pays' model as one potential option[12]. Such a model would involve a voluntary agreement between all stakeholders, so that (for example) public sector and large private and voluntary sector organisations would commission video relay services for their customers/service users and other funding might be available for calls not covered by this arrangement. One of the key issues is therefore to understand how the volume of calls breaks down by called party, and also to understand what proportion of this cost is currently (or would in future) be picked up by public sector organisations and other organisations. It should be noted that the costs outlined in this report do not account for the costs of managing a funded video relay service (costs incurred by businesses or the public sector when contracting a video relay service provider or of billing arrangements, for example) via such a 'called party pays' arrangement.

Drawing on the Pilling research outlined above, we have estimated the cost per year to 2024 by called party as follows:

[12] It should be noted that the costs outlined in this report do not account for the costs of managing a funded video relay service (such as the costs incurred by businesses or the public sector when contracting a video relay service provider or of billing arrangements, for example) via such a 'called party pays' arrangement.

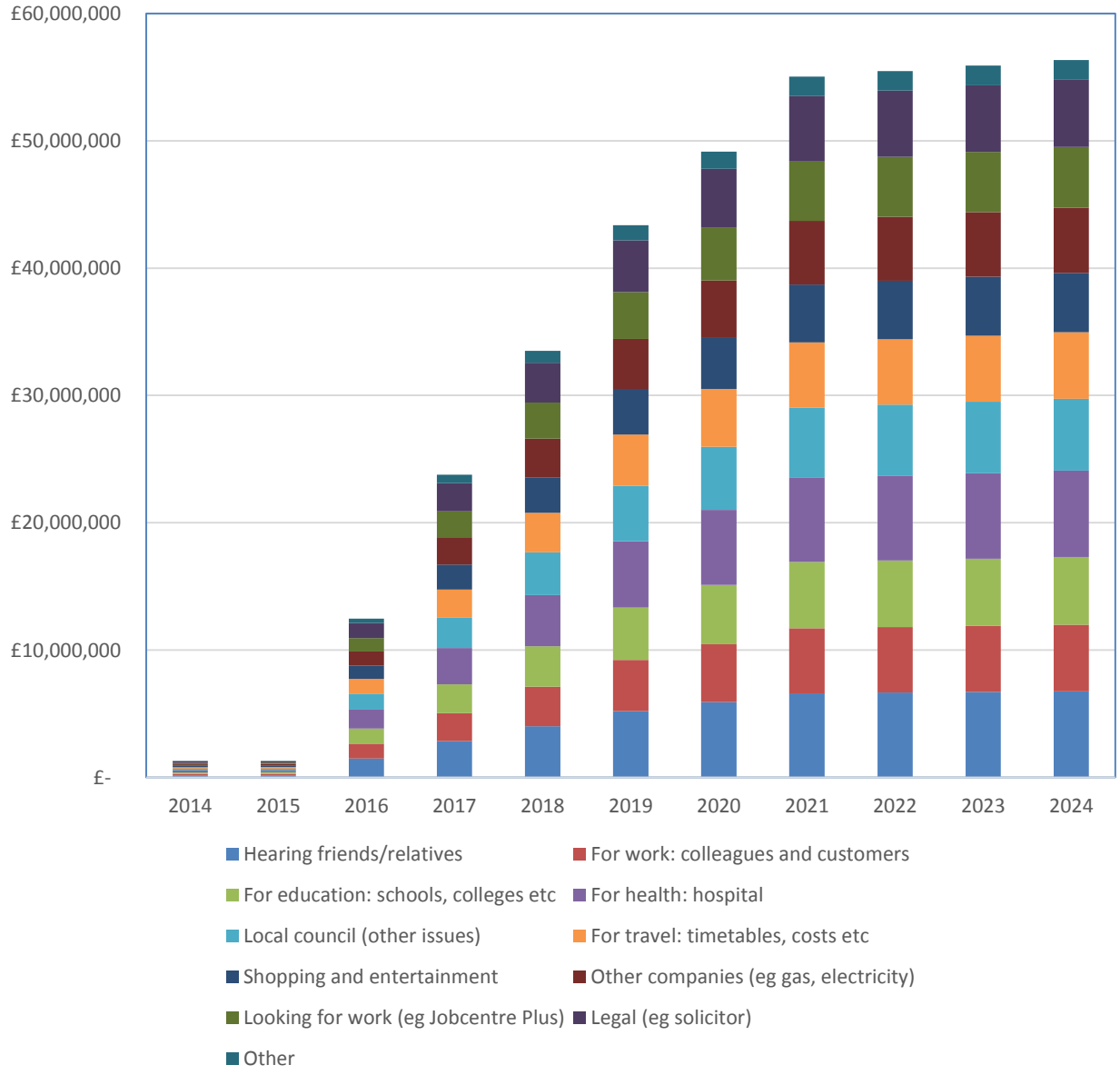

Figure 13: Indicative cost per annum of video relay services by called party

The table overleaf gives the cost by called party at full adoption in 2021, at April 2013 prices.

Deaf person to:	**2021**
Hearing friends/relatives	£ 6,614,853
For work: colleagues and customers	£ 5,096,690
For education: schools, colleges etc	£ 5,205,130
For health: hospital	£ 6,614,853
Local council (other issues)	£ 5,530,451
For travel: timetables, costs etc	£ 5,096,690
Shopping and entertainment	£ 4,554,489
Other companies (eg gas, electricity)	£ 4,988,250
Looking for work (eg Jobcentre Plus)	£ 4,662,929
Legal (eg solicitor)	£ 5,150,910
Other	£ 1,518,163

Total	**£ 55,033,408**

Table 1: Indicative costs at full adoption (2021) per called party (April 2013 prices)

By recoding the Pilling called party categories by whether or not they are likely to be public sector organisations, it is possible to give an indicative picture of the likely split between the public purse and other funding of a voluntary funding model for video relay services. The chart below gives an idea of this indicative picture.

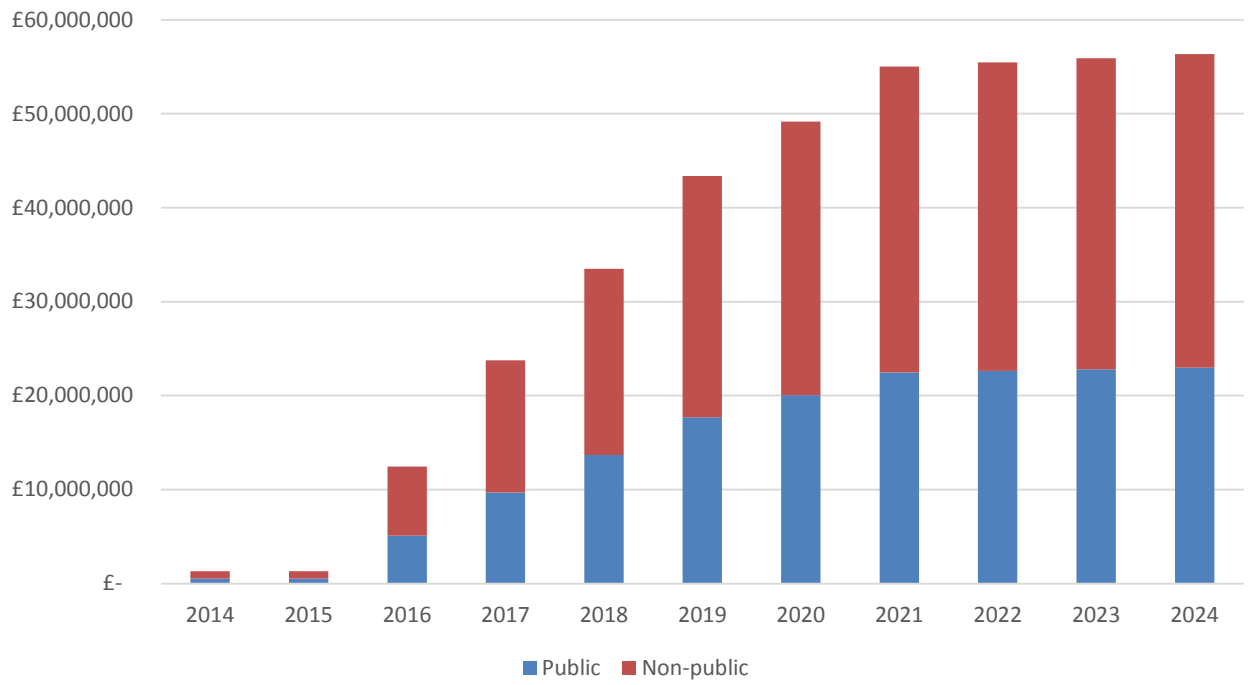

Figure 14: Indicative cost per annum of demand for video relay services, public sector and non-public sector

It must be stressed that this analysis is, at best, indicative. It has required some recoding of the Pilling data using working assumptions, over and above which it is subject to the same limitations as set out previously. It is not possible to estimate, from published data, what proportion of these costs to the public sector are already covered by existing funding streams (such as Access to Work), and more detailed, further research would be needed before such analysis could be used for business planning purposes.

Need, demand and cost of funded captioned telephony

Compared to video relay services, there is a dearth of evidence around likely demand for and cost of captioned telephony. Internationally, few countries provide funded

captioned telephony services and a non-funded service in the UK ceased to operate over five years ago. There is also a lack of clarity around whether and to what extent Next Generation Text Relay will provide functionality that is similar to captioned telephony. As such, the estimates provided here are less well developed than those provided for video relay services, and further research is needed before any such service could be implemented in the UK.

This research estimates that by 2024, the annual gross cost of a funded captioned telephony services could be £32m (at April 2013 prices). The diagram below illustrates the estimated gross cost over the next ten years.

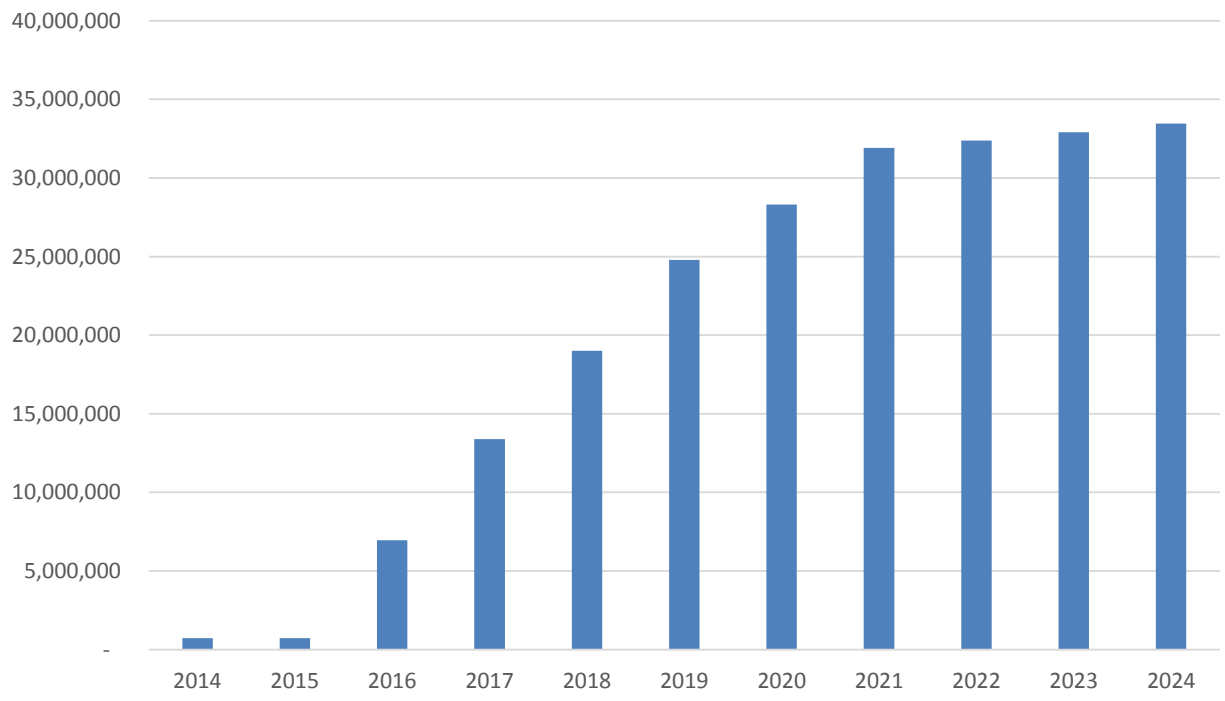

Figure 15: Estimated annual cost of funded captioned telephony (April 2013 prices)

Calculating this estimated cost requires several steps. We need to know the likely number of users; how many d/Deaf people will use captioned telephony? How many hearing people? We need to know how many calls they are likely to make, and the average length of those calls. Ideally, we would want to understand what kind of calls will be made and to whom (called party), and whether any of these calls are covered by existing public funding programmes.

Number of users

A key initial question in relation to the potential number of users of a captioned telephony service is which of our three d/Deaf communities are likely to be users. We have assumed that the Hard of Hearing/Deafened population are most likely to be users of this services, and those Deafblind individuals whose need for communication support is spoken English.

The Hard of Hearing/Deafened population is potential huge, as illustrated in the section at the start of this chapter. There is no research that enables us to estimate the proportion of this population who would need communication support such as captioned telephony, and participants in the Delphi study conducted as part of this research were unable to suggest what proportion might be used in this modelling work. At this stage, working assumptions have been used as to the proportion of the relevant population at each level of hearing loss might need communication support. The diagram overleaf illustrates the working assumptions used around levels of communication support need at each of the levels of BEHL loss (as used by Davis, 1995).

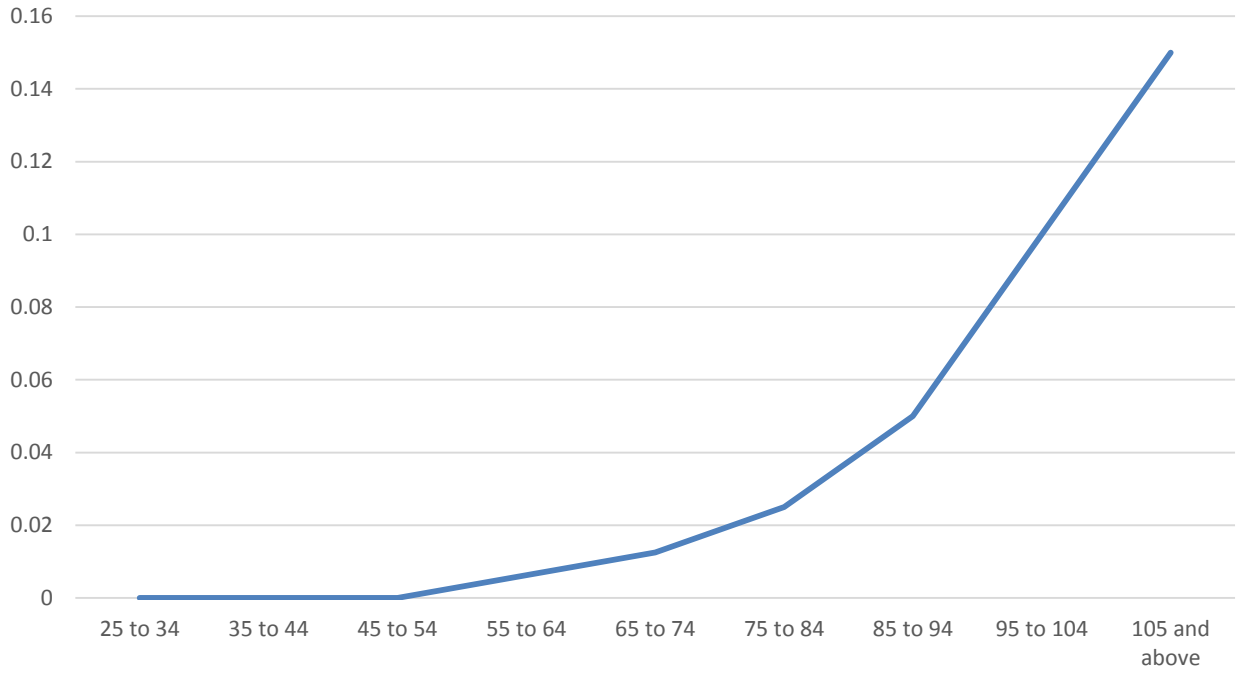

Figure 16: Assumed proportion of Hard of Hearing/Deafened population with communication support needs, by level of BEHL dB (BEHL on horizontal axis)

As for video relay services, the Opinion Leader research commissioned by Ofcom in 2011 includes data on the whether, and how often, d/Deaf people might use captioned telephony. Drawing of this research, we have assumed that at full adoption, 50 per cent of the relevant populations will demand captioned telephony services. As with video relay services, we have used the Saladin and Hemsman research (2008) to estimate the rate of adoption over a seven year period. Taken together, the diagram below illustrate our estimates of the likely number of users of a funded captioned telephony service over the next ten years.

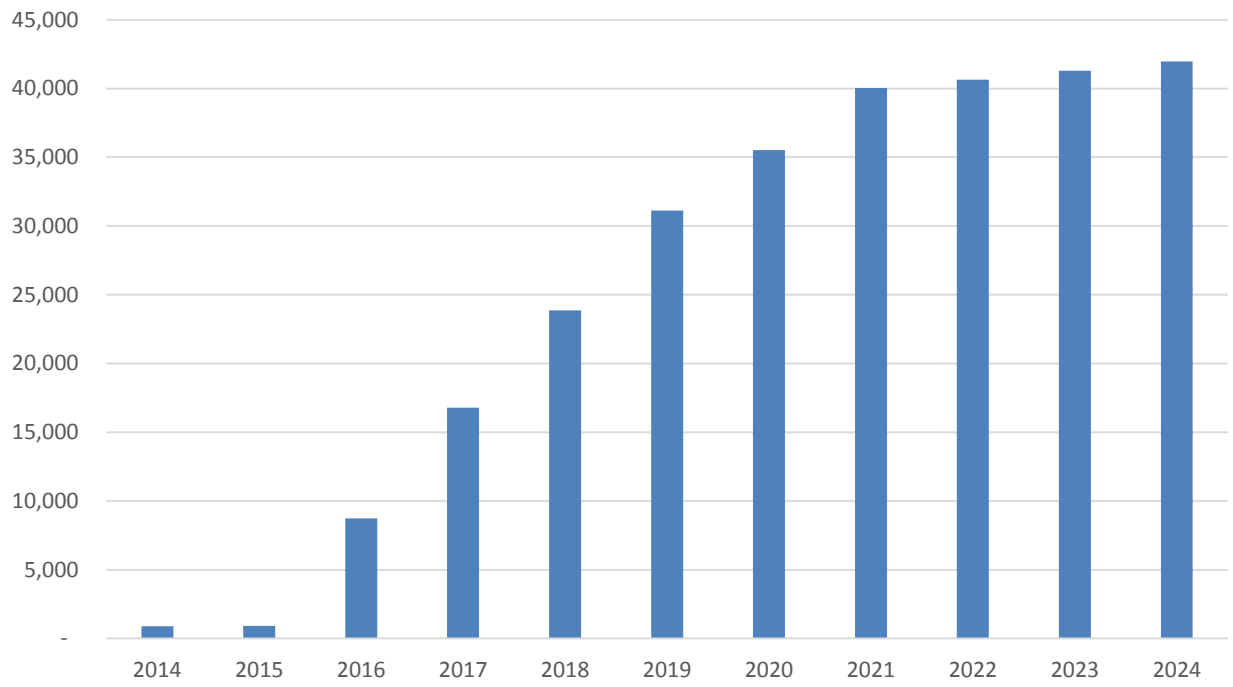

Figure 17: Estimated number of likely users of funded captioned telephony service

Number and duration of calls

The Opinion Leaders research, commissioned by Ofcom in 2011, provides useful insight into the potential number of calls that an average funded captioned telephony service user might make in any year. Drawing on this research, and assuming an average call length of five minutes[13], we estimate that the average user will make 87 calls per year and around 36 minutes of calls per month.

The research mentioned above (Warnicke and Plejert, 2012) suggests that 90 per cent of video relay calls will be initiated by a Deaf person. We have not been able to find similar research in relation to captioned telephony, but assume that most captioned telephony calls will be initiated by a d/Deaf person. Taking this together, we estimate

[13] This is a working assumption, in line with that made in relation to video relay services.

that by full adoption (2021), some 40,000 d/Deaf people will make over 3.2m calls and a further 300,000 calls will be made by hearing people.

Called party

We have not found any research or data that would allow us to estimate the volume of calls by different organisations/parties or by type of use (business, personal etc). Although the Pilling research does provide some evidence (with limitations) in relation to video relay services, it provides no evidence in relation to captioned telephony, and we consider the two services to be quite different in terms of who might use them. At this stage, therefore, we have not estimated the likely volume of calls or gross cost of calls by called party.

4: Delivering funded relay services: options and barriers

The first half of this report has set out the estimated need, demand and cost of funded relay services for d/Deaf people in the UK. It sets out the indicative cost, by called party, of such funded services, assuming that some or all of these costs are **not** met by Deaf people themselves, but through some funding model which enables Deaf people to use relay services in a similar way that hearing people might use telephony services.

Estimating the need, demand and cost of relay services is therefore only part of the picture. What is needed is a decision on how these services might be funded so that Deaf people can access them at an equivalent cost to that experienced by hearing people when they access telephony services. The various streams of work currently being undertaken by UKCoD/DAC (of which this research is one) are intended to enable stakeholders to come to such a decision at a Strategy Agreement workshop on 6th November.

Of course, one issue to be considered is whether to focus on one type of relay service at this stage, or try to achieve agreement on a funding model for both video relay and captioned telephony services. At this stage, the options outlined here assume a focus on video relay services. This is partly because there are no current captioned telephony services in the UK (and the options outlined assume some existing capacity) and also because it is currently unclear as to whether Next generation Text Relay will provide similar capabilities to captioned telephony.

Options for delivering funded relay services

There are five potential options for such a funding decision. There is, of course, the **'do nothing'** option or, more strictly speaking, the status quo. There is already limited access to video relay services through some limited exchequer funding streams. As already highlighted, some costs of access to video relay services may be met through the government's Access to Work scheme, and some public sector organisations provide video relay services access service users as part of their call centre arrangements. Some charities provide access to video relay services, albeit it at a subsidised price. Some companies also provide video relay call centre access for their customers (BT, for example) and others are likely to do so in the future. Captioned telephony services are not currently available in the UK, although it is unlikely that such services would be excluded from Access to Work funding. This option would involve such video relay developing on an ad hoc basis, much as they have done so over the past few years. The 'do nothing' option has the advantage that it does not require stakeholders to agree on a funding model, but the disadvantage that it has yet to deliver real access to low cost video relay services for most Deaf people.

The second option would be a **voluntary arrangement**. This might be delivered through a voluntary arrangement established by communication providers, or through a 'called party pays' model or a combination of the two. The advantage of this option is that it is probably the most realistic of the options presented here. However, it would require a complex series of agreements to be in place and some means of delivery.

A third option is for UKCoD (or some other group or individual) **taking legal action** to force the provision of funded video relay services. A separate stream of work to this project, being undertaken by UKCoD, is exploring whether and how such legal action might be taken, and also the potential costs of such action. Such an option would have the advantage of being able to deliver without the need for all stakeholders to agree and

commit to a funding model. However, legal action is a costly and timely business, which is a major disadvantage of this option.

The fourth option is to lobby for **government funding** of all video relay services. This funding approach is used in a number of other European countries. The key advantage is that it avoids voluntary and private sector organisations for committing themselves to funding video relay services. The disadvantage is that, in the current climate, it is highly improbable that government will agree to fund such a service.

The final option is to lobby for **government action to require** services to be provided. This might involve lobbying Ofcom to review whether, and what, regulatory avenues are appropriate in relation to requiring communication providers to provide access to video relay services. The advantage of this option is that it passes responsibility for the key decision from all stakeholders to Ofcom as the regulator. Alternatively, it might involve lobbying Government to pass legislation to require the provision of such services.

These options will be presented to stakeholders at a Strategy Agreement Workshop on 6th November. Choosing between them will be a complex and challenging task. Doing so might require the use of objective assessment criteria to differentiate between the options. These might include:

- enables equivalency of access and choice to Deaf people in their use of telephony communication;
- is achievable within a reasonable timeframe;
- is equitable to all parties; and
- can be implemented given current capacities in the market.

Barriers to delivery

Over and above the lack of agreement between stakeholders to date, there are several potential barriers that might be considered important at the Strategy Agreement workshop on 6th November.

The first of these potential barriers is **service provider capacity**. Most video relay service providers are small organisations that would not be able to cope with the increase in income anticipated in the need, demand and cost model. There are also huge 'back office' implications arising from some of the options outlined above, particularly in terms of managing the payment arrangements in a voluntary funded model. UKCoD and its partners will want to ensure that the delivery of a funded video relay service is managed so as to promote competition while avoiding undue strain on existing providers.

The second potential barrier, and one identified in a number of video relay service trials in other countries, is **sign language interpreter availability**. There are around 900 sign language interpreters registered with the National Registers of Communication Professionals who work with Deaf and Deafblind people. It takes around five years to train and most of those currently practising do not have experience of interpreting for video relay calls. At full adoption in 2021, around 1000 sign language interpreters would be needed to manage anticipated demand for the service[14]. Given that interpreter costs are recognised as the most significant part of the overall cost of video relay services, such a gap in numbers needed and numbers available could have significant implications on both access and cost of services.

[14] Assuming a full time interpreter has 1500 hours of interpreter time available a year, and that one minute of interpreting in a video relay call requires a further four minutes of preparation and downtime.

A third potential barrier is the need to gain the **agreement of the various public sector organisations involved**. Deaf people, just as hearing people, want to access local council services, make appointments with their GP, access benefits when they are out of work or retire and, in general, contact a wide variety of public services. This research suggests an indicative cost to the public purse of over £20m at full adoption in 2013. While this is small compared to other government programmes (and a fraction of that spent on language interpreters), it is nevertheless a significant sum in the current circumstances. There may also be issues around ensuring private sector organisations agree to provide and implement video relay services.

Appendices

Appendix A: Technical specification

The diagram below illustrates the model design:

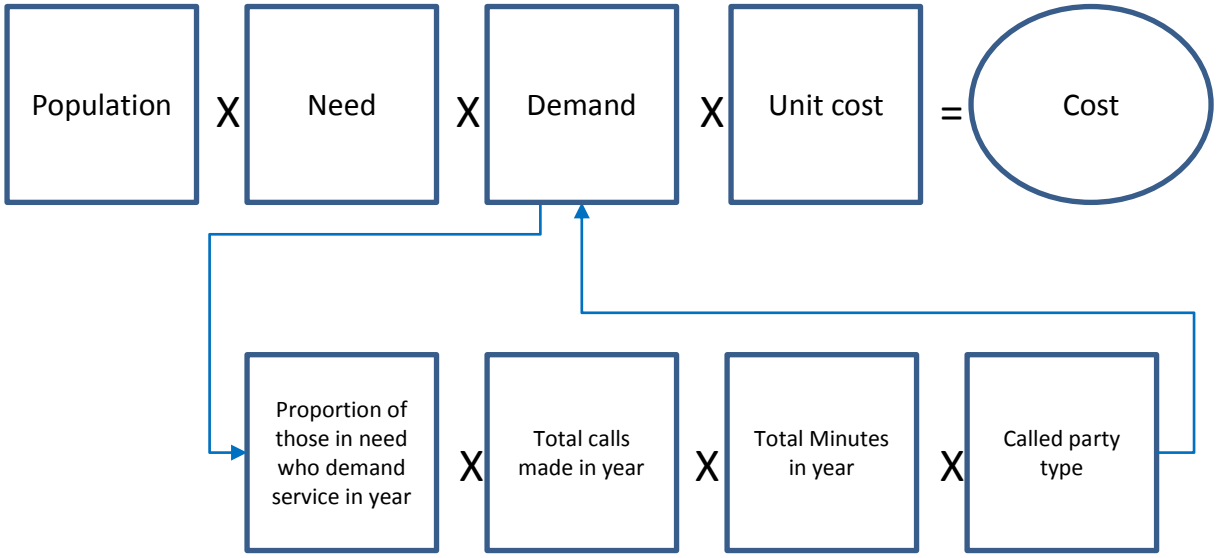

Table 2: Model outline

Each part of the model is described below, setting out the core data and working assumptions used.

Population

Population is an estimate of the size of each of the three d/Deaf populations in each year between 2014 and 2024, regardless of whether that population needs or demands relay services. The model uses evidence of the prevalence rates for each of the three populations, applied to the Mid-2010 population projections produced by the Office of National Statistics. Prevalence rates are calculated in five year age bands and for each of the home countries of the UK. The table below gives these population projection data for the whole of the UK.

Ages	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
0- 4	4,118	4,164	4,196	4,206	4,201	4,187	4,172	4,156	4,140	4,124	4,106
5- 9	4,118	3,872	3,949	4,021	4,071	4,129	4,175	4,206	4,216	4,211	4,198
10-14	4,118	3,461	3,529	3,620	3,726	3,804	3,884	3,961	4,033	4,083	4,141
15-19	4,118	3,644	3,583	3,516	3,488	3,496	3,534	3,601	3,693	3,799	3,877
20-24	4,118	4,289	4,213	4,155	4,104	4,052	4,001	3,940	3,873	3,845	3,853
25-29	4,118	4,686	4,731	4,751	4,724	4,695	4,634	4,556	4,498	4,447	4,396
30-34	4,118	4,404	4,495	4,605	4,713	4,778	4,818	4,861	4,880	4,854	4,825
35-39	4,118	3,938	4,033	4,132	4,240	4,340	4,435	4,525	4,634	4,742	4,807
40-44	4,118	4,203	4,067	3,938	3,865	3,871	3,932	4,026	4,125	4,232	4,331
45-49	4,118	4,599	4,557	4,488	4,399	4,278	4,170	4,036	3,908	3,836	3,842
50-54	4,118	4,523	4,588	4,634	4,636	4,615	4,558	4,516	4,449	4,362	4,244
55-59	4,118	3,895	4,007	4,115	4,219	4,328	4,433	4,498	4,545	4,548	4,529
60-64	4,118	3,446	3,465	3,517	3,592	3,667	3,761	3,872	3,979	4,082	4,191
65-69	4,118	3,557	3,561	3,418	3,318	3,282	3,265	3,286	3,337	3,412	3,487
70-74	4,118	2,706	2,827	3,058	3,201	3,271	3,309	3,314	3,184	3,095	3,064
75-79	4,118	2,166	2,166	2,186	2,248	2,325	2,411	2,523	2,738	2,871	2,938
80-84	4,118	1,602	1,629	1,665	1,708	1,753	1,785	1,791	1,815	1,874	1,946
85-89	4,118	1,004	1,034	1,062	1,090	1,113	1,142	1,173	1,210	1,252	1,293
90-94	4,118	476	484	496	510	529	554	581	607	633	656
95-99	4,118	122	139	151	160	168	174	181	190	199	212
100+	4,118	18	19	20	21	23	28	32	36	38	41
All ages	64,271	64,776	65,271	65,755	66,232	66,705	67,173	67,636	68,092	68,539	68,976

Table 3: Projected UK population in 000s, 2014 to 2024. Source: ONS Mid-2010 population projections

Deafblind population

Robertson and Emerson (2010) provide and upper and lower estimate prevalence rate for men and women by ten year age bands. For those aged 69 and under, an average of the lower estimate rate for men and women has been applied in age bands and for those aged 70 and above, the upper estimate rate has been applied. The table below sets out the prevalence rates applied in the model.

	Robertson & Emerson		Lower or upper	Rate applied in model (average)
Age band	**Men**	**Women**		
0 to 9	0.052	0.02	Lower	0.036
10 to 19	0.016	0.029	Lower	0.0225
20 to 29	0.036	0.124	Lower	0.08
30 to 39	0.009	0.013	Lower	0.011
40 to 49	0.02	0.29	Lower	0.155
50 to 59	0.053	0.043	Lower	0.048
60 to 69	0.499	0.73	Lower	0.6145
70 to 79	1.064	1.445	Upper	1.2545
80 to 89	4.029	4.419	Upper	4.224
90 +	12.623	13.405	Upper	13.014

Table 4: Deafblind prevalence rates in model

Deaf population

The prevalence rate of 41 per 100,000 is used (0.000409 in the model). This is calculated as the number of people aged three and over who use sign language in England identified in the 2011 census (20,853) as a proportion of the total resident population aged three and over in England (51,005,610). This prevalence rate is applied to all age bands in each year from 2014 to 2024.

Hard of Hearing/Deafened population

Prevalence rates from Davis (1995) provide the proportion of the population expected to experience hearing loss at various levels. These suggest that 16.1 per cent of the population have a loss of 25 dB or greater. The rates set out by Davis are given in table 4 below. This is followed by a table setting out how these have been used to calculate the proportion of the population experiencing hearing loss are applied to each age band in each year between 2014 and 2024.

BEHL	≥ 25	≥ 35	≥ 45	≥ 55	≥ 65	≥ 75	≥ 85	≥ 95	≥ 105
Estimated prevalence	16.1	8.2	3.9	2.1	1.1	0.7	0.4	0.2	0.1

Table 5: Davis (1995) prevalence rates of hearing loss

BEHL	25 and over	25 to 34	35 to 44	45 to 54	55 to 64	65 to 74	75 to 84	85 to 94	95 to 104	105 and over
Estimated prevalence	16.1	7.9	4.3	1.8	1	0.4	0.3	0.2	0.1	0.1

Table 6: Davis (1995) rates as applied in model

Need

Need is an estimate of the level and type of communication support needed for each of the three d/Deaf populations.

Deafblind

Based on research by Sense (2005), the following categories and proportions have been used to calculate need for this population. Drawing on the view of participants in the Delphi study, it is recognised that the sample used in the Sense research may result in some over-estimation of the level of communication support need. A downlift has therefore been applied. There is no research evidence that allows us to estimate this downlift and Delphi participants were not able to agree on the level of downlift that should be applied. A working assumption that 75 per cent of the Deafblind population will not have communication support needs has therefore been used. The table overleaf

sets out the proportion of the Deafblind population with each form of communication support need and how these have been applied in the model[15].

	Raw	In model
	Downlift applied	0.25
Spoken English	116 (36%)	0.09
BSL	34 (10%)	0.025
Deafblind manual	29 (9%)	0.0225
Hands on BSL	26 (8%)	0.02
Tadoma	1 (0.3%)	0.0075
Symbols	1 (0.3%)	0.0075
Other	40 (12%)	0.03
Not stated	79 (24%)	0.06

Figure 18: Communication support need for Deafblind population (Sense, 2005)

Deaf

It has been assumed that 100 per cent of the Deaf population need sign language communication support. This is a working assumption that was supported by the Delphi survey participants.

Hard of Hearing/Deafened

There is not extant research will allows us to estimate the proportion of this population that might need communication support, and Delphi participants were unable to agree on any working assumption that might be used. The model therefore uses working assumptions about the proportions of this population (by level of hearing loss identified by Davis 1995) that might need support. The table below sets out the assumptions used.

[15] The proportion in communication need in the Sense (2005) report has been divided by 0.25; that is, 25 per cent of the Deafblind population would have communication support needs at this level and 75 per cent would have no communication support need).

BEHL	25 to 34	35 to 44	45 to 54	55 to 64	65 to 74	75 to 84	85 to 94	95 to 104	105 and above
Estimated prevalence	0	0	0	0.00625	0.0125	0.025	0.05	0.1	0.15

Figure 19: Assumed proportion of Hard of Hearing/Deafened population with communication support needs (1 = 100%)

Demand

The model estimates demand for video relay services and captioned telephony services.

Video relay services

Proportion of those in need who demand a service during the year

It is assumed that demand for video relay services will come predominately from the Deaf community. The Telus report on the Canadian VRS trial states that a majority were initiated by the d/Deaf user, although does not quantify this. Warnicke and Plejert put this figure at 90 per cent in relation to Sweden (Warnicke and Plejert, 2012).

The proportion of the Deaf population aged 10 and over who will demand video relay services is estimated at 76 per cent. This figure is drawn from the Opinion Leaders (2011) research conducted for Ofcom, figure 7.1 on page 80. Drawing on the video relay (BSL users) line, those who answered ‘don’t know’ or ‘never’ to the question ‘how often would you use a low cost video relay service’ total 24 per cent of the total.

All things being equal, it is assumed that it will take time for Deaf people to adopt this new service. The model therefore assumes an adoption period of seven years, drawing on feedback from the validation workshop and drawing on the research of Saladin and

Hensmann (2008). The model therefore calculates the total number of users in each year as Deaf population aged 10 and over x 76 per cent x proportion adoption for the year. The table below sets out the calculations in each year:

Year	User calculation
2014	Deaf x 76% x 2.5%
2015	Deaf x 76% x 2.5%
2016	Deaf x 76% x 23.5%
2017	Deaf x 76% x 44.5%
2018	Deaf x 76% x 62.25%
2019	Deaf x 76% x 80%
2020	Deaf x 76% x 90%
2021	Deaf x 76% x 100%
2022	Deaf x 76% x 100%
2023	Deaf x 76% x 100%
2024	Deaf x 76% x 100%

Table 7: Cell calculations for number of users of video relay services, using survey data from Opinion Leaders (2011, figure 7.1, page 80)

Total number of calls made

Figure 7.1 in the Opinion Leaders research also provides data from which the number of calls is calculated. The research states that 38% of participants would use a low cost video service at least once a day, 25 per cent at least once a week, 9 per cent at least once a month, 9 per cent less often and 24 per cent never or 'don't know'. To calculate the total number of calls, these percentages have been adjusted to exclude the 'never' and 'don't know's and the following calculations have been used:

Total calls = (users x 47% x 365) + (users x 31% x 52) + (users x 11% x 12) + (users x 11% x 6[16]) / 90 x 100

The final part of the above calculation takes account of the estimated ten per cent of calls that are initiated by hearing people (Warnicke and Plejert, 2012).

Total minutes

The model assumes an average of 5 minutes per call. The model calculates the total minutes using the calculation:

Total minutes = total calls x 5 minutes

Total minutes by called party

The Pilling (2006) research provides survey data on the likelihood that video relay services will be used to contact a variety of called parties. These have been weighted to

[16] 6 here is a working assumption for the number of calls where the response was 'less than once a month'.

100 to provide proportion of calls made to each called party. The table below illustrates how these calculations are made and used in the model.

Purpose of VRS use		%	Weighted
Hearing friends/relatives		61	12.02
For work: colleagues and customers		47	9.26
For education: schools, colleges etc		48	9.46
For health: hospital		61	12.02
Local council (other issues)		51	10.05
For travel: timetables, costs etc		47	9.26
Shopping and entertainment		42	8.28
Other companies (eg gas, electricity)		46	9.06
Looking for work (eg Jobcentre Plus)		43	8.47
Legal (eg solicitor)		47.5	9.36
Other		14	2.76
		507.5	100

Table 8: Use of Pilling (2006) survey data on called party in model

The total minutes calculation is then divided by the weighted percentage set out in the table above to give the total minutes per called party.

Captioned telephony

Proportion of those in need who demand a service during the year

The model assumes that captioned telephony will be used by Hard of Hearing/Deafened people with communication support needs and by Deafblind people whose communication support need is spoken English, aged 10 and above. The Opinion Leaders research (2011, figure 7.1, page 80) provides survey data on likely use of

captioned telephony, and suggests that 50 per cent of people would never use the service or answered 'don't know'. The model therefore assumes a full adoption rate of 50 per cent.

As with video relay services, it is assumed that it will take some seven years for full adoption to be achieved. The adoption rates set out in table 5 above are used. The cell calculation is therefore:

Total users in year = users (Hard of Hearing/Deafened with communication need + Deafblind with spoken English communication need aged 10 and above) x 50 per cent x annual adoption rate

Total number of calls made

Figure 7.1 in the Opinion Leaders research also provides data from which the number of calls is calculated. The research states that 17 per cent of participants would use a low cost service at least once a day, 11 per cent at least once a week, 11 per cent at least once a month, 11 per cent less often and 50 per cent never or 'don't know'. To calculate the total number of calls, these percentages have been adjusted to exclude the 'never' and 'don't know's and the following calculations have been used:

Total calls = (users x 17% x 365) + (users x 11% x 52) + (users x 11% x 12) + (users x 11% x 6[17]) / 90 x 100

[17] 6 here is a working assumption for the number of calls where the response was 'less than once a month'.

The final part of the above calculation aims to take account of calls initiated by a hearing person. A working assumption that ten per cent of calls will be initiated by a hearing person is used in the model.

Total number of minutes

A working assumption is used in the model that the average captioned telephony call will last five minutes. The total minutes is therefore calculated as:

Total minutes = Total calls x 5 minutes

Cost of video relay services

A unit cost of £3.15 per minute at April 2013 prices is used. This was the highest of three estimates in the extant research and its used was agreed upon through the Delphi surveys. The total cost for each year is therefore calculated as:

Total cost = Total number of minutes by called party x unit cost

Cost of captioned telephony calls

A unit cost of £1 per minute at April 2013 prices is used. This is a working assumption. The total cost for each year is therefore calculated as:

Total cost = Total number of minutes x unit cost

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