

Estimating the value of mobile telephony in mobile network not-spots

Summary

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Summary

Second-generation mobile coverage in the UK is high. Figures from the Ofcom 2013 *Infrastructure Report*¹ show that 99.6 per cent of UK premises and 87 per cent of the UK land mass have 2G coverage for one or more operator. Despite this apparently high level of coverage, areas without signal, referred to as 'not-spots', remain. Moreover, despite substantial efforts by the government and regulators to enhance mobile coverage it is likely that not-spots will continue to persist, in particular in rural areas, to some degree. This research was commissioned to increase understanding of the range of costs and benefits to different population segments, arising from provision of mobile coverage in complete not-spot areas in rural locations within England.

A research approach was designed using a mix of qualitative and quantitative methods to provide an understanding and estimates of the **value** of providing mobile services in not-spots to residents and businesses located in these areas, and also local visitors and tourists to these areas. At the core of the project was a survey, containing a stated preference discrete choice experiment in which respondents were presented with a series of scenarios with two hypothetical mobile phone service options, described by three service characteristics:

- Access to mobile phone services, described by the distance (travel time) that the respondent would have to travel to get a signal²
- Strength of signal, described qualitatively as weak or strong
- Type of service: voice and basic data only (2G), voice and Internet data (3G) and voice and high-speed Internet data (4G).

Each service option also included a price associated with provision of the services. For residents, businesses and local visitors the price reflected the monthly cost that would have to be paid in addition to existing subscription fees to be able to receive mobile phone services. For visiting tourists, the prices were presented as the additional price per day that would have to be paid to obtain mobile phone services (similar to the idea of paying roaming charges for a short period, something that people are perhaps familiar with when travelling abroad). It is emphasised that the inclusion of price in the experiments was to gain an understanding of the value placed on coverage, and not to suggest that consumers are charged more, which would in any case be impractical.

From the data collected from the choice experiments, discrete choice models were developed to quantify the importance of the service characteristics and price in respondents' choices, thus providing estimates of respondents' **willingness to pay** (WTP) for provision of mobile phone services.

1 Ofcom (2013b).

2 On the basis that the value of having a signal within the home or business may depend on the ease of getting the current service.

Qualitative research, through in-depth interviews, was also conducted with residents in not-spot areas and local visitors to these areas to provide more detailed information on people's mobile phone needs in not-spot areas.

Below we discuss key aspects of the methodology followed by discussion of the key findings from the study.

The quality of the quantitative survey results is believed to be high

We believe the quality of the results to be high, because of the robustness of the survey sample and level of engagement of respondents in the stated preference discrete choice experiments.

A robust sampling method was employed, providing a description of those living in not-spot areas

The sampling method employed provided an accurate picture of residents and businesses in not-spot areas, and local visitors and tourists to these areas. In total over 700 interviews were collected.

Residents and local visitors were sampled from a database of not-spot areas provided by the Department for Culture, Media & Sport (DCMS). The resulting survey responses were geographically diverse, reflecting a wide range of not-spot areas as well as rurality types, closely matching the distribution in the DCMS database.

However, we found that the sample of residents contained a much higher proportion of 60–74 year olds than is observed in the 2011 Census for England for rural hamlets or sparse settings (and a lower number of young people under 25 years of age). Both the resident and local visitor samples also contained higher proportions of retired people, although the proportion of employed people among local visitors was very close to the 2011 Census data for rural hamlet or sparse settings. In addition, the proportions of self-employed residents and local visitors (20 per cent) were close to that expected for remote areas.

We see two possible explanations for the higher proportion of older and retired people in the resident sample: either older people were more likely to participate in the survey and therefore were over-represented or else more elderly people live in the particular not-spot locations that were sampled for the survey than in rural locations in general. With regard to the first possibility, substantial effort was made to reduce potential sampling bias caused by the telephone interviewing method (by calling during evenings and weekends as well as during the day, and undertaking multiple call-backs to try to maximise response from households where no answer was received at first contact). Moreover, the fact that both the resident and local visitor samples were obtained in the same way and that this characteristic is not present in the local visitors' sample suggests that older or retired people may well be more likely to live in not-spot areas. This hypothesis is evidenced to some degree by the qualitative work where we found indications that young people were reluctant to live in not-spot areas and tended to move away, although it is emphasised that the sample sizes from the qualitative research are very small. However, if the sample *is* biased towards older people then the resulting valuations will be underestimated (because we find that older people provide lower valuations for some aspects of mobile phone services), but this impact will not be large.

We found that businesses located in not-spot regions were relatively small in scale and mostly in the agriculture and accommodation industries.

Caveats

We emphasise a couple of caveats to the study findings. First, even with careful design stated preference experiments may over-estimate willingness-to-pay valuations, and this should be considered when quantifying the benefits of proposed schemes. Second, the qualitative research is based on a small sample of in-depth interviews, and as a result the findings from this component of the study should be treated with some caution. Finally, the valuations are relevant for those who live, work and travel to not-spot areas and cannot be used to calculate the value to society as whole for the elimination of all not-spot areas.

Key findings

Below we summarise the key findings from the study, starting with general observations and culminating in presentation of the willingness-to-pay valuations for provision of mobile services in not-spot areas.

Most people living in not-spot areas own mobile phones

Despite living in rural areas without mobile phone reception, the majority of respondents in the survey owned a mobile telephone (over 97 per cent of residents and local visitors to not-spot areas owned a mobile phone for personal use). A slightly lower percentage of those who ran businesses from home owned mobile phones, but the figures were still high, with ownership levels over 85 per cent.

The main reason for owning a personal mobile telephone appears to be for peace of mind, to offer the possibility of communicating with others should the need arise, which is most relevant when plans change or problems occur. Respondents in the qualitative research said that even though they were not always able to use their mobile phones (because of a lack of signal), they felt it was worth owning one to at least have the possibility of doing so, on the occasions when they were able to obtain a signal.

Somewhat surprisingly, mobile phone ownership was much lower for respondents from the business sample: about half indicated that they had a mobile phone for personal use, and between 35 and 40 per cent had a mobile phone for business purposes. We found no significant relationship between mobile phone ownership and usage and the scale of business or type of industry. However, we did observe that the businesses in the survey tended to be located in more remote areas compared to residents and local visitors, as measured by the average distance to the next house, which may have an impact on mobile phone ownership.

More than two-thirds of residents of local visitors and 80 per cent of businesses felt that it was important to be able to make and receive mobile phone calls. About a third of residents and local visitors thought it was important to be able to get Internet services on their phone; far more business respondents (48 per cent) and tourists (42 per cent) thought that this was important.

Among both residents and businesses, a key reason for having a mobile phone is to deal with emergencies

The most important reason cited by resident and local visitor survey participants for owning a mobile phone was for dealing with potential emergencies – with almost 80 per cent of residents stating this to be the case, alongside over 60 per cent of local visitors. This was also one of the most important reasons cited by businesses, with over 60 per cent of large businesses and 50 per cent of small businesses reporting that ownership of mobile phones was important to manage the safety of staff.

Improved mobile phone services would benefit local businesses

Despite the lower proportion of mobile phone ownership in our business sample, a substantial proportion of business respondents saw being located in a not-spot area as a drawback. For large businesses this arose from the inability to communicate effectively with colleagues or suppliers/business partners and the lack of flexibility in decisionmaking. For smaller businesses, key issues were hindrances in building contacts, contacting suppliers/business partners, and loss of profit.

About half of the respondents from both large and small businesses indicated that being located in a not-spot area had a negative impact on their profit, turnover and productivity. However, respondents found it difficult to estimate the size of this impact. Of those who were able to make an estimate (47 per cent of businesses and 41 per cent of home-run businesses), almost 65 per cent reported losses between £100/month and £250/month. The remaining 35 per cent reported monthly losses in excess of this value, with 1 per cent (large businesses) indicating monthly losses greater than £50,000/month. It is observed that there seems to be a relationship between the size of the impact and the size of the businesses, with larger impacts being reported by larger businesses.

Lack of mobile services may affect the long-term sustainability of rural communities

Although respondents felt that the benefits of rural life outweigh the disadvantages, including lack of mobile services, some felt it was unfair that their areas were being left behind as telecommunications technology advances. There was some evidence from the qualitative research that, for some younger people, rural areas without a mobile signal are less desirable to live in. Those who said they had less need for mobile phone reception were most likely to be middle aged and older respondents who had grown up without relying on a mobile telephone and felt content to live without a reliable signal.

Almost all respondents who participated in the qualitative research felt that having improved mobile telephone reception in their area would be positive for the whole community. For some there was a perception that those who would benefit most were businesses and younger people. For others having a reliable mobile telephone signal would mean less wasted time, reduced anxiety about being out of contact when needed, and enhanced flexibility in how they spend their day. The provision of a mobile phone signal also would have additional benefits for those seeking employment, in terms of enhanced communication, as well as reduced costs for those who did not wish to finance both a landline and a mobile phone. Though a few respondents could see positive aspects to a lack of mobile signal, to do with privacy

and control over contactability, the overall advantages of improved connectivity were felt to outweigh any disadvantage.

The potential visual impact of additional mobile phone masts was not a major concern

The reaction to the potential arrival of telephone masts in the local area was fairly muted. While some regard telephone masts as an eyesore it was more typically believed that masts would be constructed and placed in the community in a sympathetic manner in keeping with the local area and to blend in rather than stand out. Should this happen then respondents would be more likely to accept it. Consultation with local residents about the physical location of telephone masts would also be important.

People who live and work in, and travel to, not-spot areas are willing to pay for provision of mobile services

Our study found that respondents in all segments were willing to pay for local mobile phone services. Residents and businesses in not-spot areas were willing to pay the highest amounts for having a signal at their house or business premises; local visitors and tourists were willing to pay less for services in the not-spot areas they travelled to. Perhaps this is not surprising, since people living or working on a daily basis within not-spots may be most affected by not having mobile phone coverage.

In general, our research shows that willingness to pay for services is influenced by a number of factors that will vary between different not-spot areas, and should be taken into account in quantifying the benefits of local services.

One key factor influencing WTP is proximity of access to a mobile signal.

Specifically, we found that the further that people had to travel to get a signal, the greater their willingness to pay for local services. This suggests that people in more remote or cut-off areas are therefore likely to be willing to pay more for the provision of mobile services.

The WTP valuations also depend on the quality of the signal. It is suggested that higher value can be placed on providing connectivity with high signal quality compared to low signal quality.

We find WTP valuations to be influenced by the type of service available, with some respondents willing to pay more for 3G and 4G services. Somewhat unexpectedly, we did not find 4G services to be valued more highly than 3G services, except for tourists aged less than 45 years. This may be because most people have not yet experienced 4G services and have yet to see the value of such services. Thus we would expect these valuations to change if people start to experience the benefits of 4G, and perhaps 3G services, and would recommend that WTP valuations be revisited periodically.

We find that the average willingness to pay for residents in not-spot areas for local 2G services of the same quality of those available nearby is £12/month (+/- £4.10³). It

is emphasised that this is in addition to the amount that they would pay for a service contract. If the quality of signal is improved, relative to a weak signal nearby, residents would be willing to pay £23.40/month (+/- £5.10). The value of mobile phone services for local visitors to not-spot areas is £6.30/month (+/- £3.80), for the same quality of service, and £15.10/month (+/- £4.10), for improved services. The values for businesses are £20.90/phone/month (+/- £11.50) and £24.50/phone/month (+/- £14.00), for the same or improved services, respectively. We found that the values for tourists over 65 years old are higher than for those under 65, with tourists over 65 being willing to pay 40 pence per day (+/- £0.35) and those under 65 being willing to pay 20 pence per day (+/- £0.10) for mobile services of the same quality at their tourist destination, and £3.00/day (+/- £0.80) and £2.70 per day (+/- £0.70) for improved services, by age category respectively.

Policy implications

The willingness-to-pay valuations obtained from this study help us to understand the value that residents and businesses located in not-spot areas, and local visitors and tourists to these areas place on being able to access a mobile service locally. They can be used to help quantify the social benefits of programmes aimed at providing or improving signal strength (quality) in not-spot areas. These benefits can then be compared to the costs of these investments to provide an assessment of the overall value of these investments. Environmental costs, including the visual impact of masts, should also be taken into account, although these were not quantified in our research. However, evidence from the small in-depth samples of this study suggest that the visual impact of phone masts was not a major concern to local residents in not-spot areas and local visitors, this is an area where further research is required.

We present 90% confidence intervals for the estimates, and we recommend that sensitivity tests are undertaken when comparing the WTP benefits with costs, using the lower-bound values.

Finally, we also found some evidence, from the qualitative research, that young people find rural areas without a mobile phone signal less desirable to live in. This might suggest that the provision of mobile phone coverage may influence the future structure and sustainability of communities affected by not-spots. The impact of availability of mobile services on the structure of the economy may also be an important factor. This study found that even though local businesses had lower mobile phone ownership than not-spot residents, they too were willing to pay for local mobile phone services (£20.90/phone/month for 2G services of the same quality as current services and £24.50/phone/month for 2G services with improved signal quality). The study has not directly examined the extent to which availability of mobile services might affect both business performance and the types of businesses which can operate in remote and rural areas. However, this is potentially significant, and it is proposed that the availability of mobile services could be an important factor in the diversity of rural economies, and long-term sustainability of rural communities. This is an area that could both be further investigated in future research, and be monitored as a possible impact of new and improved mobile infrastructure services (such as 4G deployment, or resulting from the Government's £150million investment in the Mobile Infrastructure Project).

THE OBJECTIVES OF THIS STUDY

The objective of the mobile phone not-spots study is to estimate the social and economic impacts associated with eliminating mobile not-spot areas.

OUR STUDY

Our study aims to provide an estimate of the value of mobile telephony in mobile network not-spots.

OUR RESEARCH METHODOLOGY

Quantitative survey: with a discrete choice experiment embedded in the survey, to quantify the value of eliminating not-spots to key population segments.

Qualitative research: to gain insights into some of the not-spot-related issues and to understand the social and community benefits that may arise as a result of improved mobile connectivity.

OUR EVIDENCE *(See main text for details)*

The majority of people living in not-spot areas own mobile phones:

- Over 97% of residents, local visitors and tourists have mobile phones.
- Businesses in the sample are less likely to have a mobile phone than other groups sampled.

People who live and work in not-spot areas are willing to pay for local mobile services:

- The further they have to travel to get a signal, the more they are willing to pay.
- They are willing to pay for a strong signal, therefore giving a good service.

A key reason for having a mobile phone for both residents and businesses is to deal with emergencies:

- 80% of residents & local visitors state this to be the case.
- As well as over half of businesses, whose concern was health and safety of staff.

Improved mobile phone services would benefit local businesses:

- Most businesses said being located in a not-spot had a negative impact on profit & productivity.
- Although they found this hard to quantify in the survey.

The lack of a mobile phone signal may affect the long-term sustainability of rural communities:

- Impacting the profitability and diversity of local businesses and rural economies.
- Potentially impacting the make-up of these areas, as young people may choose not to live in not-spots.

CONCLUSIONS

In this study the social and economic impacts associated with eliminating mobile not-spot areas are examined using a mix of qualitative and quantitative methods, including a survey incorporating a stated preference discrete choice experiment. A high-quality representative sample of responses is collected, which forms the basis for the choice modelling analysis. The resulting models quantify the value that residents and businesses in not-spot areas and local visitors and tourists to not-spot areas are willing to pay for mobile phone coverage. We find that individuals are willing to pay to reduce the distances that they have to travel to obtain mobile phone coverage, and that they are willing to pay for a high-quality and reliable signal. These benefits can then be compared to the costs of providing these services to provide an assessment of the social benefit of these investments. We did not find substantial evidence for willingness to pay for better services (3G/4G), although this may emerge as these services become more mainstream. Moreover, not-spots were found to have a negative impact on local businesses located in these areas and may impact the long-term sustainability of rural communities.

