

Mobile Phone Usage Survey

1. Introduction

Mobile phone data generated through mobile phone usage is of key interest to statistical organisations because it has potential to inform various important aspects of population behaviour. In particular, ONS interest is focused around:

- Population densities – at specific times of the day and/or small geographies
- Population flows – for example the number of people who travel from A to B
- Tourism statistics – a Eurostat funded feasibility study on the use of mobile phone positioning data for tourism statistics has generated research within a number of NSIs, most notably Statistics Estonia, Statistics, Finland and CSO Ireland.

Analysis using location data (as within commuting estimates using mobile phone data) relies on a good longitudinal trace of location/timestamps. The detail of information provided opens new potentials of analysis of both temporal and spatial aspects of human behaviour.

However, one of the main issues associated with mobile phone data is its unknown representativeness of the population. The problem is intensified by the fact specific subset of users may prefer a particular Mobile Network Operator¹(MNO) among all.

Since it is more likely for ONS to have access to data from a single MNO, is fundamental to understand the characteristics of their users.

These properties can have an impact on the movement behaviour of the mobile phone users, which may therefore differ from the movement behaviour of general people.

In analysing a dataset where the set of movers is not representative of the whole population of interest, it is important to avoid over-generalisation in interpreting discovered patterns.

When the set of movers in a dataset is judged as representative of the population of interest but not covering the whole population, it is important to know what proportion of the population is covered.

This information would allow ONS to know which subset of the population might be subject to more unreliable representation in any modelled products.

As a result, ONS commissioned questions in the Opinions survey to study these issues.

This report highlights the results from the survey and, whenever available, compares those with the summary data from Ofcom² authority.

¹ A [Mobile Network Operator](#) (MNO) is a telecommunication service provider organisation that provides wireless voice and data communication for its subscribed mobile users.

² [Ofcom](#) is the communications regulator. Ofcom regulates the TV, radio and video on demand sectors, fixed line telecoms, mobiles, postal services, plus the airwaves over which wireless devices operate.

2. Survey Data

The Mobile Phone and survey is available for the months of August, October and November 2015.

Each month 67 postal sectors are selected within England, Scotland and Wales, with probability proportionate to size. Within each sector, 30 addresses are chosen randomly giving an initial sample of 2,010 addresses each month. One person per household is randomly selected as the respondent. The interviewer determines the household composition and the respondent is selected from amongst all the over-16s. The data are subsequently weighted to correct for unequal probability of selection.

The small users' Postcode Address File includes some addresses at which no private households are living, for example business and empty properties. The expected proportion of such addresses, which are classified as ineligible, is 11%. These are excluded from the sample before response rates are calculated.

The final response rate is the number of achieved interviews as a percentage of the eligible sample.

Weighting factors are applied to Opinions and Lifestyle data to correct for unequal probability of selection caused by interviewing only one adult per household, or restricting the eligibility of the module to certain types of respondent.

The weighting system also adjusts for some non-response bias by calibrating the Opinions and Lifestyle sample to ONS population totals. In order to compensate for possible non-response bias, the Opinion and Lifestyle sample is divided into weighting classes of age-group by sex and Government Office Region.

This method of sampling and the consequent weighting affect the standard errors of the survey estimates. On average the Effective Sample Size of the Opinions and Lifestyle Survey is 84% to 86% of the actual sample of individuals.

Table 1 reports the aggregated response rates for August, October and November samples.

Table 1: Response rate summary for August, October, November 2015.

Survey Total			
	Number	Initial Sample (%)	Response rate (%)
Set Sample of Addresses	6030	100	
Ineligible Addresses	532	9	
Eligible Addresses	5498	91	
Eligible Households	5479		100
No Interview - refusal	1901		35

Comment [w1]: I would expect the introduction to include:

1. ONS is interested in mobile phone data as it has many potential applications for official statistics ..
2. One main issue is that it is unknown how representative of the population, the customer base is for each Mobile Network Operator.
3. Analysis using location data (as within commuting estimates using mobile phone data) relies on a good longitudinal trace of location/timestamps. We want to know what demographics tend to switch their phones off and might therefore be subject to more unreliable representation in any modelled products.
4. ONS commissioned questions in the Opinions survey to study these two issues. Data was collected during August, October and Nov 2015.
5. Then put the detail on the Opinion Survey and its response rates in an appendix

Comment [w2]:

Comment [w3]: Across mainland UK, England??

Unknown Eligibility	161		3
No Interview - non-contact	464		8
Interviews	2944		54

Detailed information of the individual month response rate data can be found in the Appendix.

3. Number of phones owned

Question: *How many mobile phones do you use? Please include both personal and business mobiles.*

Respondents were asked how many mobile phones do they use, including both personal and business mobiles.

Responses ranged from 0 to at most 5 phones owned.

In this section responses of 3, 4, 5 phones owned are grouped together under the category "More than 2".

Comment [w4]: Might be useful to include the exact question

Table 2: Number of phones owned by the respondents

Number of phones	Totals	Percentage
0	2583697	5%
1	41614933	82%
2	5991779	12%
More than 2	329879	1%
Refuse to say or unrecorded	94284	0%
Total	50614572	100%

Comment [w5]: That's about correct re Ofcom estimates of the % UK adults with no mobile

Comment [AS6]: Yes see later section

From Table 2 we can see that approximately 95% of Great Britain's adult population uses at least one phone, with the majority using just one phone. On the other side, about 5% doesn't own a mobile phone at all.

The following figures examines how responses "0", "1", "2" and "More than 2" vary by age-group, gender and Government Office Region.

Figure 1: Number of phones owned by age-group

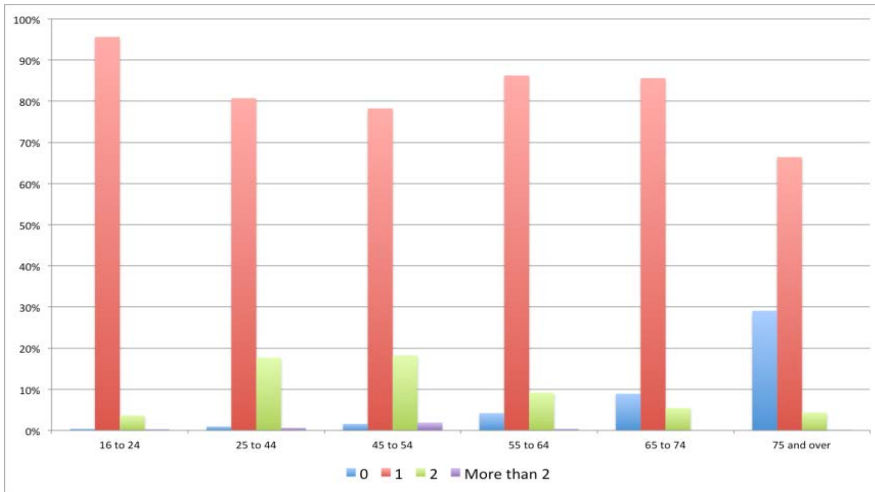


Figure 1 shows the percentage of respondents with no mobile increases with age. The age-group "16 to 24" is the one that is most likely to have only one phone. The age-groups '25 to 44' and '45 to 54' are more likely to have 2 or more mobiles than other age groups.

Ofcom estimates for end 2013 are that 31% of people aged 75+, 10% of people aged 65 to 74 and 3% of people age 55 to 64 do not have a mobile. Ofcom estimates are therefore inline with those from the Opinion Survey reported in Figure 1.

Figure 2: Number of phones owned by gender

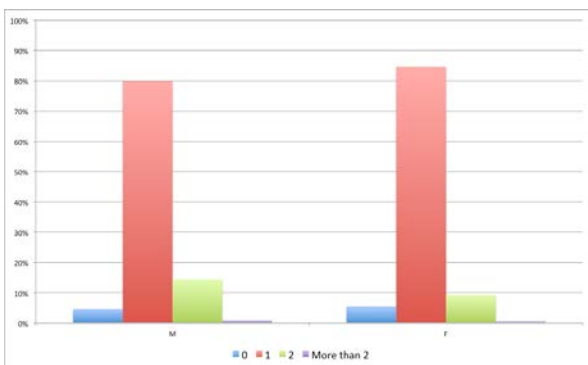
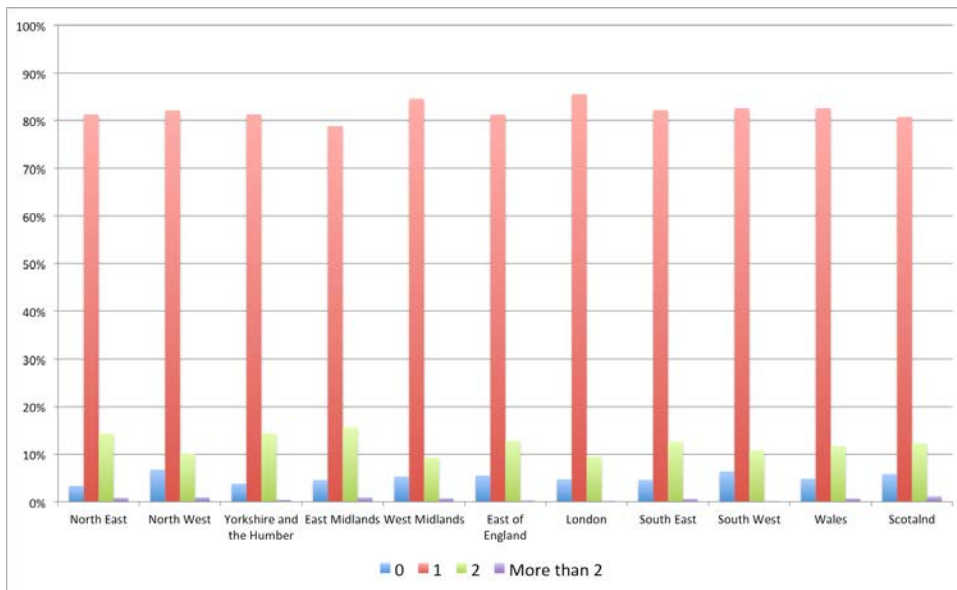


Figure 2 reveals that there are no major differences on the number of phones owned by gender.

There is a slight tendency for males to be more likely than females to have two mobiles.

Figure 3: Number of phones owned by Government Office Region



Across GORs the profile of the number of mobiles owned by the adult population is roughly the same. London region has the biggest proportion of respondents having only 1 phone.

4. Mobile phone Switch On/Off

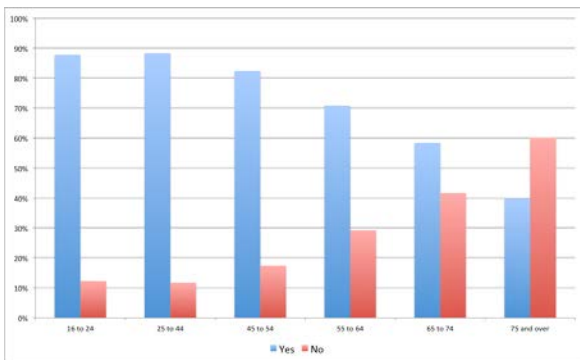
Question: *Do you keep your [main] mobile switched on at all times?*

Respondents were asked whether they keep their [main] mobile phone switched on at all times. The next table shows the overall situation, followed by an analysis of responses by age-group, gender and Government Office Region.

Table 3: Estimates for “Switch On/Off” question

Switch On always	Totals	Percentage
Yes	37230046	78%
No	10696831	22%
Refuse to say	9713	0%
Total	47936591	100%

Figure 4: Responses to “Switch On/Off” question by age-group



A higher proportion of people switch off their phones as age increases.

In the age group 16 to 44, just over 10% of people regularly switch their phones off.

Older age groups have a higher tendency to switch their phones off, rising to 40% of people aged 75 or over. This indicates estimates for these groups may be more unreliable or that that total population estimates may have a bias towards behaviours of younger people.

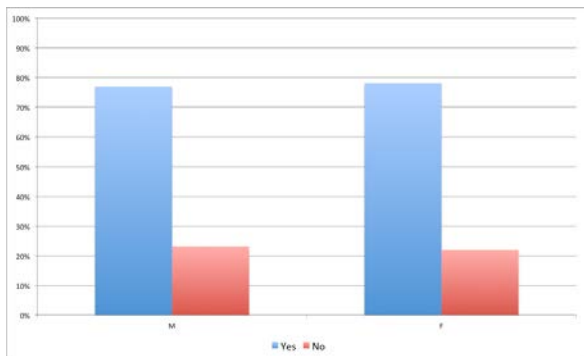
Comment [w7]: Is this the number who have at least one mobile? Or are you missing the mobil phone owners who didn't reply to this question?

I was expecting this total to be 47,936,591 based on the numbers in Table 4

Comment [AS8]: Yes, there are some people who refuse to respond to this question..not many, probably just one or two. I didn't include them before because so then I could calculate the percentage as the fraction among those who actually responded to the question, ie %people who said yes + %people who said no = 100%. Here I propose the complete table and the percentages are: %people who say yes + %people who say no + %people didn't answer = 100%

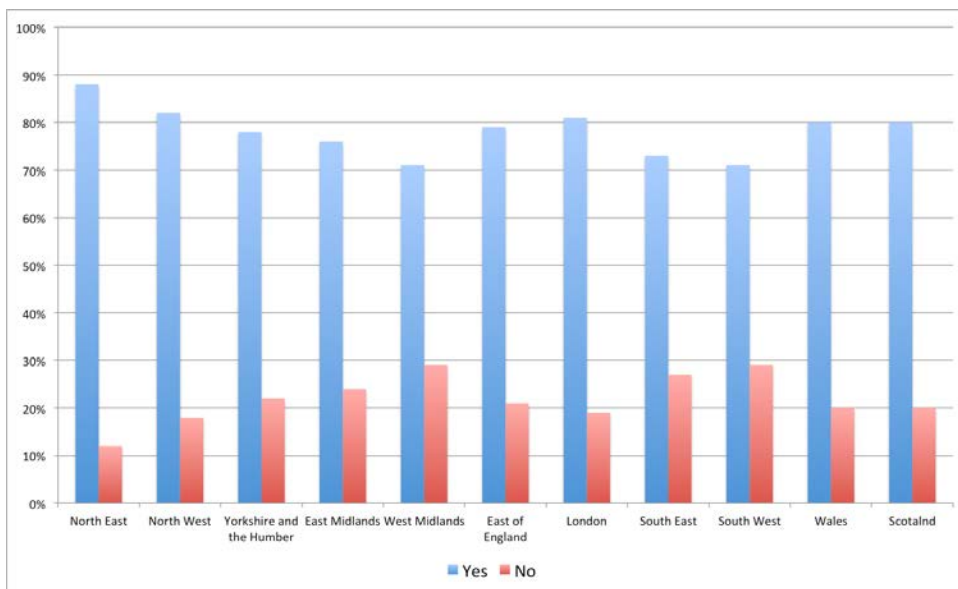
The monthly report from Opinion Survey use the previous approach, ie does not consider people who didn't replay

Figure 5: Responses to “Switch On/Off” question by gender



No differences appear between male and females respondents.

Figure 6: Responses to “Switch On/Off” question by Government Office Region



Distribution within regions varies with the West Midlands and South West having the highest proportion of people switching off their mobiles (just under 30% of people). The North East has the lowest proportion of people switching off with around 12%.

Question: *For which of the following activities would you usually have your mobile phone switched off?*

Respondents who switch off their phone were asked an additional question to indicate the reasons for doing so.

Table 4 highlights the reasons why respondents choose to regularly switch off their phone. Respondents were allowed to select more than one answer from the list of options available. Therefore percentages are calculated considering each answer individually and calculating the overall percentage among the 10,696,831 respondents who said no at previous question (22% of whole population).

Table 4: Reason for switching off

Reason for switching off	Totals	Percentage
Whilst sleeping	8321429	78%
Whilst driving a private vehicle such as a car or van	3012385	28%
As a passenger in a private vehicle such as a car or van	2279778	21%
As a passenger in a taxi or on public transport such as a bus or train	2021655	19%
When at work	3077916	29%
Whilst socialising	3278364	31%
None of the above	959446	9%
Totals	10696831	100%

Reason for switching off	Totals	Percentage	Percentage all Population
Whilst sleeping	8321429	78%	17%
Whilst driving a private vehicle such as a car or van	3012385	28%	6%
As a passenger in a private vehicle such as a car or van	2279778	21%	5%
As a passenger in a taxi or on public transport such as a bus or train	2021655	19%	4%
When at work	3077916	29%	6%
Whilst socialising	3278364	31%	7%
None of the above	959446	9%	2%
Totals	10696831	100%	

Comment [w9]: You should explain that multiple answers are allowed here and that only the 22% of respondents who regularly switched off are included (the 10,696,831 people)

..the totals do not sum to the numbers in the columns.

Is there a better way of displaying this?

Comment [AS10]: Percentage among all population?
I can remove the 100% if it is confusing

Table 4 shows that the main reason is for sleeping. Around 17% of mobile phone users do this (i.e. 78% of the 22% who switch off regularly). It is known that one method to derive estimates of resident population relies on identifying the usual location of the mobile phone

at night-time. Research in Japan, by [NTDocomo](#) has indicated that people switching off their phones can affect the reliability of such estimates.

Comment [w11]: Input ref

Around 6 to 7% of mobile phone users switch their phone off at work (i.e. 29% of the 22% who regularly switch off). Although workplace is similarly modelled as the usual location of the mobile during standard work hours, there is greater uncertainty that a regularly visited location is a workplace at all (rather than an area visited for some other purpose such as shopping or visiting relatives etc.)

Reliable transport estimates such as densities by vehicle mode, route and speed, require that phones are switched on whilst travelling. The Opinion Survey shows that around 5% of mobile phone owners switch their phones off (i.e. 20 to 30% of the 22% who switch off regularly).

5. Network provider

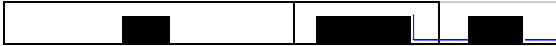
Question: *Mobile phone networks used*

Respondents were asked to provide information about the network provider of each phone they own, ranked from the most to the least important.

Since respondents may use more than one mobile phone, this percentages of market share are computed by % of mobile phones, multiplying the weights of the survey times the number of phones using each specific network provider.

Table 5: Network Provider Shares

Network Provider	Share (%)	Weighted Share (%)
NTT Docomo	45	15.75
KDDI	35	12.25
Softbank	15	5.25
Other	5	1.75

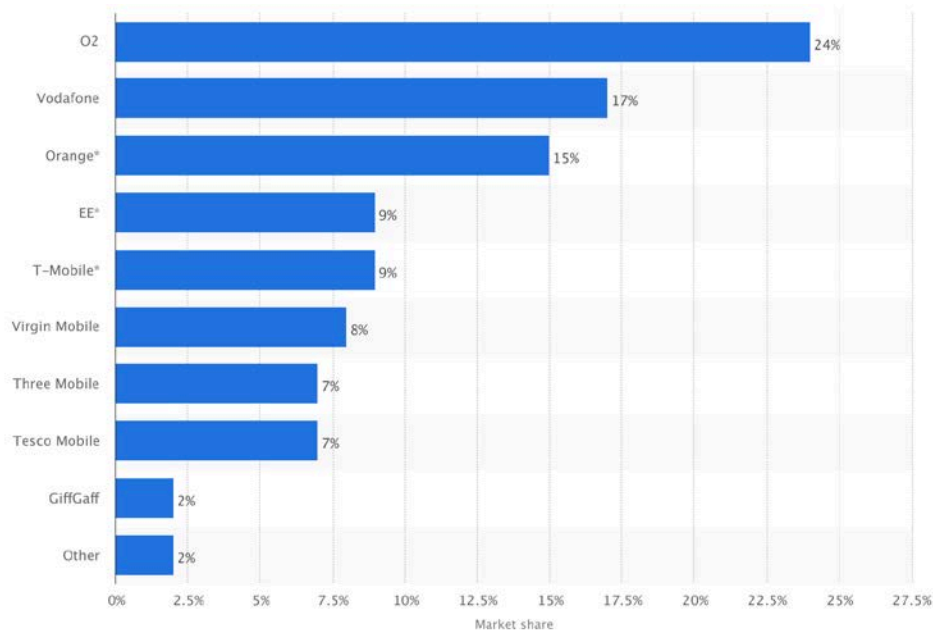


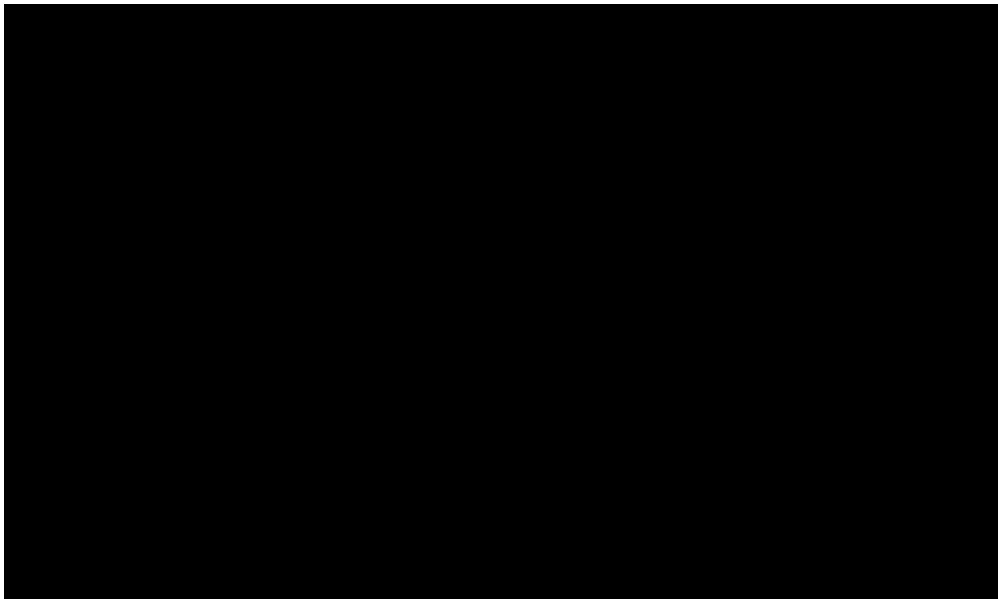
The total number of phones from the previous table is 53,993,466. This number doesn't include respondents that didn't know (or didn't want to disclose) the network operator of their mobile phone.

If we include the non-respondents we get a total number of mobile phones of 54,715,537.

Figure 10 and Figure 11 report some sources about network share estimation found online.

Figure 7: Network providers market share. Source: [Statista.com](https://www.statista.com)
Market share held by mobile phone operators in the United Kingdom (UK) as of February 2013.





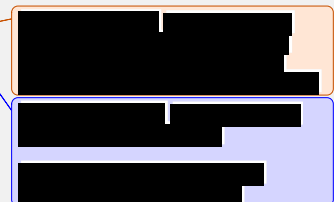
Do users with two phones have the same network provider?

The following table report estimates for owners of two phones (which constitute a 12% of the population) to see whether they tend to have the same network provider or prefer to have different network providers for the two phones.

Table 6: Do respondents have the same network provider for different phones?

NP First and Second Phone	Totals	Percentage
Same Provider	2106319	36%
Different Provider	3754279	64%
Total	5860598	100%

Some of the respondents don't know the network provider of the second phone. Thus estimates only consider responses for which the network provider is specified. From Table 8 we can see that the majority of respondents tend to use a different provider for the second phone.



[Redacted text]

[Redacted text]

[Redacted text]

Comment [w17]: [Redacted]

[Redacted]	[Redacted]
[Redacted]	[Redacted]
[Redacted]	[Redacted]
[Redacted]	[Redacted]

[Redacted text]

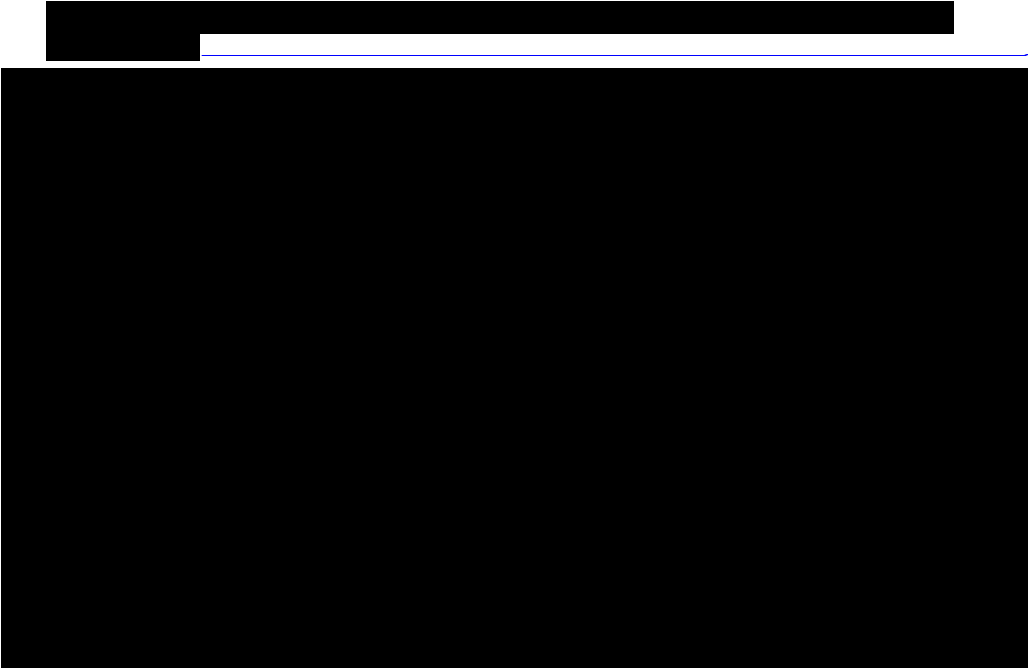
[Redacted text]

[Large redacted block]

[Redacted text]

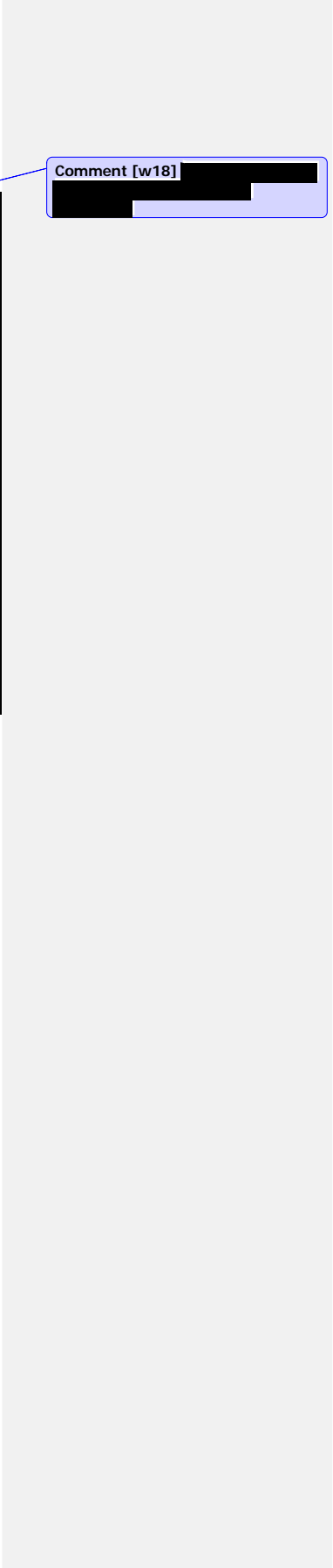
[Redacted text]

[Redacted text]



[Redacted text]

Comment [w18] [Redacted text]



7. [REDACTED]

[REDACTED]

[REDACTED]

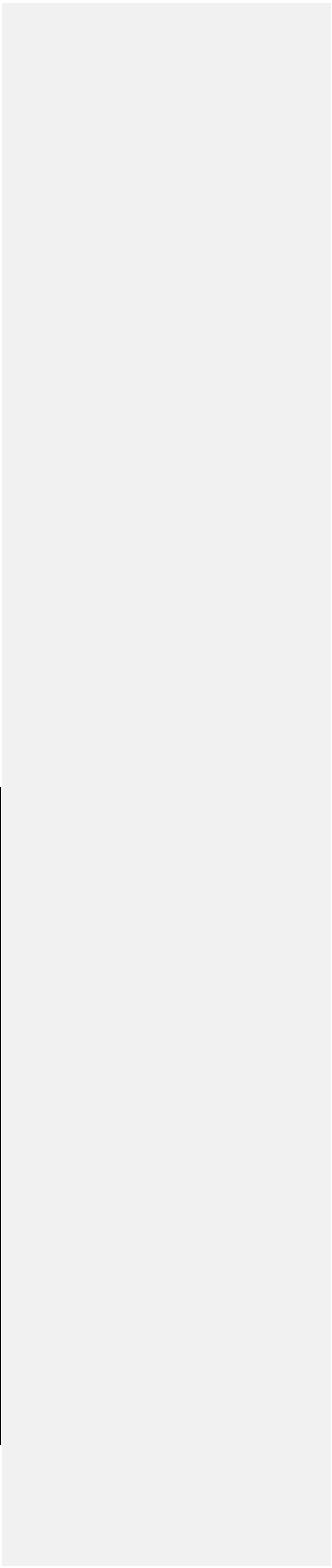
[REDACTED]

[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]

[REDACTED]

[REDACTED]

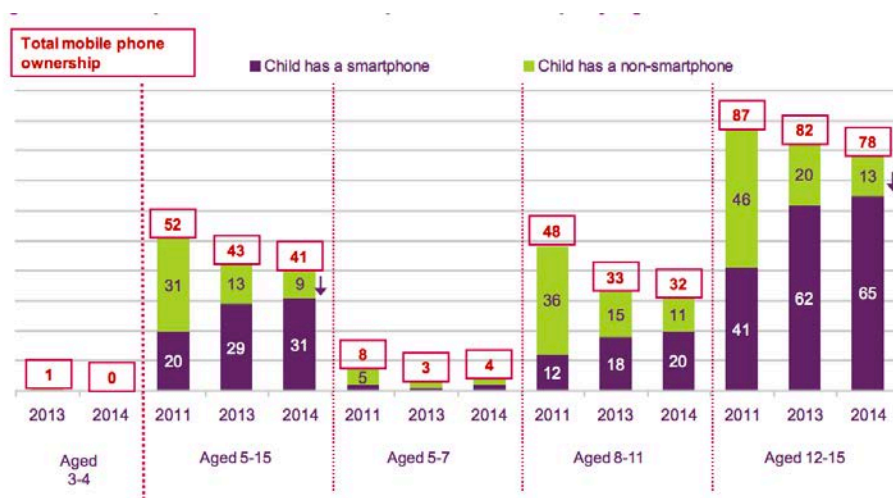
[REDACTED]



8. Children aged 5-15

The 2014 [“Children and Parents: Media Use and Attitudes Report”](#) by Ofcom reports estimates for children (5-15 years old) on the usage and ownerships of mobile phones. In this report Ofcom states that within children aged 5-15, in 2014 the 41% have a mobile phone of some kind (31% Smartphone vs. 9% non-Smartphone).

Figure 13: Smartphone and non-Smartphone ownership, by age: 2011, 2013 and 2014



9. Numbers

In Section 3 *Number of phones owned*, we have seen that see that approximately 95% of Great Britain's adult population uses at least one phone, with the majority using just one phone. On the other side, about 5% doesn't own a mobile phone at all.

In term of mobile phones figures we have seen in Section 6 *Network provider* that the total number of phones estimated for the adult population of Great Britain is 54,715,537.

From the population official statistics we know in Great Britain there are 7,868,817 children aged 5 to 15 ([mid-2014 estimation](#)).

Considering that 41% of children aged 5 to 15 have a phone of any kind and assuming that everyone has just one phone, we can estimate additional 3,226,215 mobile phones.

Overall, estimations reach roughly 58 million mobile phone subscriptions.

As comparator data the communications regulator, Ofcom, produces estimates of mobile phone penetration every year. The 2015 edition of [The Communication Market Report](#) by Ofcom reports figures on the telecommunication market only for those aged 16+.

Ofcom estimated that 3% of the UK³ adult population did not own a mobile phone.

In particular in UK a total of 78.5 million mobile phone subscriptions have been registered at end 2014.

From this figure we subtract a roughly 3% of Northern Ireland's adult population, which lead to 76.1 million.

The source of the Ofcom data is quarterly returns from mobile network operators and virtual mobile network operators (operators that pay to use one of the four main providers networks).

"Active subscribers" are defined as "those with any registered activity within the last 90 days". Ofcom also collect numbers of subscribers ported to other networks over the period, to avoid double counting.

Subscribers are measured by SIM, and so a dual SIM phone would count as two subscribers.

However also SIM-only packages are counted in this data, and may include some number of tablets or e-book readers, with the ability to insert purchased SIM cards for example.

By SIM-only is meant the packages that do not come with a mobile handset. The SIMs are still able to be used in phones to make voice calls and send messages, as well as for data.

The difference in figures is likely due to the different methodologies and definitions used.

Comment [s19]: Different persons have different weights so by calculating the exact number of phones times the weight the result is 55m

³ Ofcom estimates include Northern Ireland. However, Northern Ireland's adult population represents approximately 2.8% of the overall UK's adult population. We don't expect this to have a sensible impact in the difference between the percentages.

Thoughts

So Ofcom says there are 78.5 million mobile phone subscriptions at end 2014.

Our Opinion survey estimates around 60 million

Why?

..is there are difference between mobile phones and mobile phone subscriptions? E.g. do people have multiple sim cards – but only one mobile handset?

Comment [s20]: I contacted the person of the Opinion Survey and he said they also did a survey with focus on smartphones. He said that number are pretty similar to Ofcom figures I think a multiple sim cards are possible in smartphones. Im not sure in non-smartphones

As you know, some users can use more than one mobile phone and as we have seen are more likely to have different operators.

Each observation in the sample is associated with an individual weight, to correct for unequal probability of selection.

Comment [w21]:
[Redacted]

Comment [w22]: What table – where does 13 million come from?

I believe the reason beyond this is because we estimate the network share in terms of customers rather than in terms of phones. So if someone has two mobile phones with the same operator than is counted only once.

Comment [w23]: All is not lost here!

Ofcom say there are 83million mobile phone subscriptions.

Also that 95 (or so)% of adults have a mobile.

Opinion survey says we have 25% of respondents with O2 as main phone.

Appendix

In this section the detailed response rates for each month are shown.

Table 9: Response rate for August 2015

	Number	Initial sample (%)	Response rate (%)
Set Sample of Addresses	2010	100	
^{††} Ineligible Addresses	214	11	
Eligible Addresses	1796	89	
Eligible Households	1790		100
No interview – refusal	609		34
[†] Unknown Eligibility	58		3
No interview – non-contact	158		9
Interviews	965		54

Table 10: Response rate for October 2015

	Number	Initial sample (%)	Response rate (%)
Set Sample of Addresses	2010	100	
^{††} Ineligible Addresses	184	9	
Eligible Addresses	1826	91	
Eligible Households	1822		100
No interview – refusal	648		36
[†] Unknown Eligibility	9		0
No interview – non-contact	170		9
Interviews	995		55

Table 11: Response rate for November 2015

	Number	Initial sample (%)	Response rate (%)
Set Sample of Addresses	2010	100	
^{††} Ineligible Addresses	134	7	
Eligible Addresses	1876	93	
Eligible Households	1867		100
No interview – refusal	644		34
[†] Unknown Eligibility	94		5
No interview – non-contact	136		7
Interviews	993		53

[†] Unknown eligibility may include a proportion of unallocated cases.

^{††} Ineligible addresses may include a proportion of unallocated cases.

Comment [w24]: I think it best to remove this – too much detail. Just leave the aggregated table below – and put it in an appendix as suggested above