

## Telephone Survey Response: Effects of Cell Phones in Landline Households

Dennis Lambries\*<sup>1</sup>, Michael Link<sup>2</sup>, Robert Oldendick<sup>1</sup>

<sup>1</sup>University of South Carolina, <sup>2</sup>Centers for Disease Control and Prevention

\*[dennis-lambries@sc.edu](mailto:dennis-lambries@sc.edu), Institute for Public Service and Policy Research, University of South Carolina, Columbia, SC 29208

### Abstract

Understanding the evolving role of cell phones in how people communicate every day is one of the fundamental challenges facing survey researchers as the popularity of cell phones in the United States continues to grow. While the increase in cell-phone-only households (which doubled from 2.8% in 2003 to 5.5% in 2004, according to a recent Centers for Disease Control and Prevention study) is a major concern, a host of questions remains about how the use of cell phones even in households with landlines can affect telephone surveys. Using data from the South Carolina State Survey, this research (1) examines the level of effort required to reach landline-only households versus those with both a landline and a cell phone, (2) compares the demographic profiles of households with and without cell phones, and (3) assesses the likelihood that respondents will give up their landline phone for exclusive cell phone use. The findings further our understanding of how cell phone technology, even in households with landlines, is affecting survey research efforts.

**Keywords:** cell phones; response rates

### 1. Background

Understanding the evolving role of cell phones in people's everyday communications is one of the fundamental challenges facing survey researchers as the use of cell phones in the United States becomes more common. The proportion of cell phone-only households doubled from 2.8% in 2003 to 5.5% in 2004, according to a recent study by the Centers for Disease Control and Prevention. This increase was greatest among adults aged 18-24, those with a college degree, those living with unrelated roommates, and those whose household income was greater than 200% of the federal poverty threshold (Blumberg, Luke, and Cynamon 2006). Other research has suggested that while the number of cell-phone-only households has increased, it is still not large enough to significantly impact the results of research based on landline telephone surveys. In fact, proper weighting can be used to reduce the impact of

any nonresponse bias resulting from inability to contact those within the demographic profile of the cell-phone-only user (Keeter 2006). Other recent studies have produced similar results in both the changing pattern of cell phone use and the demographic characteristics of cell phone users (Link and Town 2005; Tuckel and O'Neill 2005; Tucker, et al. 2004).

Although studies such as these seem to suggest that the growth in the number of cell-phone-only users is not yet a major problem, there is still reason for concern about the impact of continued increased preference over time for exclusive cell phone use. Additionally, a host of questions remains about how the use of cell phones even in households with landlines can affect telephone surveys. Using data from the South Carolina State Survey (SCSS), this research (1) examines the level of effort required to reach landline-only households versus those with both a landline and a cell phone, (2) compares the demographic profiles of households with and without cell phones, and (3) assesses the likelihood that respondents will drop their landline phone and use only a cell phone. The findings further our understanding of how cell phone technology, even in households with landlines, is affecting survey research efforts.

### 2. Methods

The SCSS is a semi-annual telephone survey of South Carolina residents aged 18 or older. Households are sampled using random-digit-dialed (RDD) surveys, with one member of the household selected for interviewing using the "next-birthday" respondent selection technique. Data from three surveys conducted during 2005 were combined in the analysis presented here: two parallel surveys conducted in the spring and one survey conducted in the fall. The first spring survey was conducted between April 26 and June 4, the second between May 10 and July 2, and the fall survey between November 10 and December 21. All three surveys contained a module of questions on telephone access within the household, focusing primarily on the use of cell phones. These questions included:

"Not counting business lines, cell phones, extension phones, faxes, or modems -- on how many different landline telephone numbers can your household be reached?"

"Do you or anyone else living in your household have a working cellular telephone?"

"On how many different cell phone numbers can you or members of your household be reached?"

"Thinking about ALL the telephone calls that you and other members of your household make and receive ... would you say that almost all of these calls are on a landline phone, that most of them are on a landline phone, that the amount of calls on a landline and cell phone are about equal, that most of the calls are on a cell phone, or that almost all of them are on a cell phone?"

"Some households are dropping their landline service and using cellular phones only for all of their telephone calls. In the next 12 months, how likely is it that your household will drop its landline telephone service and use only cell phones ... very likely, somewhat likely, not too likely, or not at all likely?"

*(For non-cell-phone households only.)* "In the next 12 months, how likely is it that you or someone in your household will get a cellular telephone ... very likely, somewhat likely, not too likely, or not at all likely?"

*(For non-cell-phone households only.)* "If your household did get a cellular telephone, how likely is it that you would drop your landline and use the cellular telephone for all of your telephone calls ... very likely, somewhat likely, not too likely, or not at all likely?"

Based upon responses to these questions, we developed two primary analysis variables. The first categorized respondents by the type of phone used primarily for household calls: (1) landline only, (2) mix of landline and cell phone, or (3) primarily cell phone. Households with no access to a cell phone were categorized as "landline only," while those whose respondents indicated that they receive almost all of their calls on a cell phone were categorized as "primarily cell phone" households. All other households were categorized as a "mix of landline and cell phone." The second variable identified respondents who indicated they were "very likely" to drop their landline telephone in favor of a cell phone over the next 12 months.

The analysis proceeded in three parts. First, we examined the difficulty in reaching households with different types of phone use and completing an interview. We hypothesized that because the SCSS is a survey conducted with a sample of landline telephone numbers that people who primarily use a cell phone would be more difficult to reach. This was assessed by calculating the mean number of call attempts required to obtain a completed interview. Second, we examined the demographic characteristics of respondents with different types of telephone access. This was assessed using cross-tabulation tables and logistic regression modeling. Third, we looked at the demographic correlates of those who indicated they were very likely to stop using their landline and just use a cell phone within the next 12 months, again using cross-tabulation tables and logistic regression modeling. Confidence intervals (CI) of 95% were used to determine whether differences were statistically significant.

### 3. Findings

A total of 2,498 completed interviews were obtained across the three surveys (Spring-1 = 846; Spring-2 = 826; Fall = 826). The response rates for each were calculated using the American Association for Public Opinion Research (AAPOR) response rate formula #4: Spring-1 = 48.1%, Spring-2 = 46.3%, and Fall = 47.3% (AAPOR 2004).

Among those completing the interview, 73.5% indicated that they have at least one working cell phone in the household. For those with a working cell phone, the average number per household was 2.0 cell phones, with 32.6% reporting one working cell phone in the household, 41.9% having two cell phones, and 25.5% having three or more. One in five (21.9%) of those who do not currently have a cell phone in the household said they were very likely to obtain a cell phone in the next 12 months. In classifying respondents in terms of the type of household telephone on which they can be reached most readily, 5.2% were primarily cell phone, 29.0% were landline only, and 65.8% used a mix of landline and cell phone.

#### 3.1 Difficulty contacting households by primary type of telephone used

As would be expected, significantly more call attempts were required to obtain a completed interview from respondents who said they receive almost all of their calls on a cell phone than were required for the other two groups. Those using

primarily cell phones required an average of 5.8 attempts, those using both landline and cell phone required an average of 5.0 attempts, and who use landline only required an average of 4.7 ( $p < .001$ ). While it is possible to reach respondents in households that primarily use cell phone, doing so requires more interviewer resources.

### 3.2 Characteristics of primarily cell phone users

Respondents with different types of telephone preferences differed significantly across a number of demographic characteristics (Table 1).

Those who said they use a cell phone for almost all of their calls were significantly more likely to be younger adults, to have at least some college education, to live in larger households (those with three or more adults or those with children), to be white, and to be male. From a political perspective, those who were not registered to vote were more likely to be landline-only users (37.6%) than registered voters (23.5%), while registered voters were more likely (56.5%) than nonvoters (37.8%) to use both landline and cell phones. In terms of political party, those who said they were Republicans (25.9%) were more likely to say they used a cell phone for almost all their calls than were those who indicated they were politically independent (16.4%) or Democrats (15.9%).

Using logistic regression to examine the joint effects of the demographic characteristics (excluding the voter registration and political party variables), we found that having at least some college education, living in households with three or more adults, being white, and being aged 44 or younger significantly increased the odds of a person indicating that they primarily use a cell phone for their calls (Table 2).

### 3.3 Likelihood of household becoming cell-phone-only

When asked about the likelihood that their household would stop using a landline altogether and use only a cell phone for household calls, 6.9% said very likely, 9.4% somewhat likely, 22.2% not too likely, and 61.5% not at all likely (Table 3).

The likelihood of switching from a landline to exclusive cell phone use was highest among those who currently use a cell phone for almost all of their calls; however, this percentage was quite modest, with only 10.7% indicating they had a high likelihood of switching. Nearly 85% of this group said they

were not too likely or not at all likely to switch. The odds of primarily cell users indicating that they were very likely to drop their landline in the next 12 months remained significant even after adjusting a logistic regression model using the other variables. No demographic characteristic was significantly related to the likelihood of dropping a landline. While the number of cell-phone-only households is likely to continue growing, it is more likely to be across demographic variables rather than within specific demographic groups.

## 4. Discussion

The growth in the percentage of cell-phone-only households in the United States is an increasing concern for researchers using traditional RDD telephone surveys for general population surveys. Cell-phone-only households should not, however, be the sole focus of such concern. Households that have both a landline and one or more cell phones are also a potential problem if such households are harder to reach and differ significantly from households that are easier to contact. Based on the data presented here, we found this to be the case. Households with landlines where respondents indicated that they use a cell phone for almost all of their calls required significantly more call attempts to complete the interview than did households without cell phones or where cell phones were used less extensively for calls. Quick-turnaround surveys or surveys with shorter fielding periods where fewer call attempts are made may be less likely to obtain interviews from such households.

This can be problematic in that we found the characteristics of primarily cell households to be significantly different from other types of households on a number of demographic characteristics. In particular, respondents who use a cell phone for nearly all of their calls are significantly more likely to be college educated, live in larger households (those with three or more adults), be younger than 45, and be white. The fact that primarily cell users differ significantly from other types of landline households indicates an increased risk of nonresponse bias to the degree that such respondents are missed in short-turnaround surveys and differ from respondents on issues of concern to researchers. This may be particularly problematic in overnight political polls, given that primarily cell users are more likely to be Republican.

## 5. Conclusion

The potential good news from these data is that there does not appear to be a large group of individuals who indicate that they plan to drop their landlines in favor of cell phones in the near future. Just under 7% said they were very likely to drop their landline in the next 12 months. Even among those who self-identified as primarily cell users, just 1 in 10 indicated that they were very likely to switch. Moreover, with the exception of primarily cell users, no statistically significant, identifiable characteristics were associated with those who indicated they were very likely to switch. This may indicate that for the foreseeable future the impact of cell phones will be minimal and can be reduced through sample design and weighting.

The results presented here need to be viewed within the following limitations. The South Carolina State Survey uses a RDD sample that by definition attempts to contact and interview households that have landline telephone service. Cell-phone-only households are excluded from this sample. Because the data on telephone use required interviewing respondents, it is not possible from these data to determine the percentage of nonrespondents who may be primarily cell phone users, nor the degree to which those nonrespondents may differ significantly in their attitudes and behaviors from the respondents. Next, the responses about telephone use behavior and desire to potentially switch from a landline to exclusive cell phone use may have differed if a different member of the household had been interviewed. Finally, the results are from one state

that may not be representative of the United States as a whole or other subpopulations.

## References

American Association for Public Opinion Research. Standard definitions: Final dispositions of case codes and outcome rates for surveys (3rd edition). Ann Arbor, MI: AAPOR, 2004.

Blumberg, Stephen J., Julian V. Luke, and Marcie L. Cynamon. 2006. "Telephone Coverage and Health Survey Estimates: Evaluating the Need for Concern About Wireless Substitution." *Am J Public Health* 96 (5): 926-931.

Keeter, Scott. 2006. "The Impact of Cell Phone Noncoverage Bias on Polling in the 2004 Presidential Election." *Public Opin Q* 70 (1): 88-98.

Link, Michael W., and Machell Town. 2005. "RDD Sampling Frames and Cell Phones: The BRFSS Experience." Paper presented at Cell Phone Summit - II, at New York, NY.

Tuckel, Peter, and Harry O'Neill. 2005. "Ownership and Usage Patterns of Cell Phones: 2000-2005." Paper presented at AAPOR Annual Meeting, at Miami, FL.

Tucker, Clyde, Michael J. Brick, Brian Meekins, and David Morganstein. 2004. "Household Telephone Service and Usage Patterns in the U.S. in 2004." Paper presented at AAPOR Annual Conference, at Phoenix, AZ.

Table 1. Type of telephone access in the household, by respondent demographic characteristics

Characteristic	(n)	Type of telephone access in household			Sig. <sup>1</sup>
		Landline only	Both landline and cell phone	Primarily cell phone	
Sex					.025
Male	(1,080)	23.9	52.7	23.4	
Female	(1,214)	28.4	53.0	18.6	
Race					.001
Black	(626)	37.7	47.6	14.7	
White	(1,625)	21.8	55.1	23.1	
Age					.001
18-29	(522)	24.1	46.0	29.9	
30-44	(696)	19.0	56.3	24.7	
45-64	(706)	24.1	57.6	18.3	
65 or older	(349)	48.1	47.0	4.9	
Education					.001
Less than high school	(262)	59.5	34.4	6.1	
High school/GED	(682)	33.6	49.7	16.7	
Some college	(672)	19.0	53.6	27.4	
College degree	(672)	12.9	62.8	24.3	
Children in household					.001
None	(1,265)	31.7	49.9	18.4	
One or more	(1,027)	19.7	56.4	24.0	
Adults in household					.001
One	(405)	43.7	43.7	12.6	
Two	(1,304)	23.2	57.2	19.6	
Three	(580)	21.0	49.1	29.8	
Registered to vote					.001
Yes	(1,836)	23.5	56.6	19.9	
No	(455)	37.6	37.8	24.6	
Party identification					.001
Republican	(1,079)	18.9	55.1	25.9	
Independent	(286)	33.2	50.3	16.4	
Democrat	(776)	32.9	51.3	15.9	

<sup>1</sup>Significance based on chi-square test of significance

Table 2. Logistic regression adjusted odds ratios for primarily cell phone users, by respondent demographic characteristics

Characteristics	Cell phone is primary telephone mode of access to household	
	AOR	95% CI
Sex		
Female	1.00	
Male	1.29	0.99, 1.70
Race		
Black	1.00	
White	1.80***	1.26, 2.57
Age		
18-29	1.00	
30-44	0.75	0.51, 1.12
45-64	0.48***	0.33, 0.70
65 or older	0.13***	0.07, 0.24
Education		
High school or less	1.00	
Some college or more	2.11***	1.55, 2.88
Children in household		
None	1.00	
One or more	0.92	0.66, 1.26
Adults in household		
One	1.00	
Two	1.25	0.91, 1.70
Three or more	2.09***	1.39, 3.13
(n)	(2,240)	

AOR = adjusted odds ratios

Significance: \* =  $p < .05$ , \*\* =  $p < .01$ , \*\*\* =  $p < .001$

Table 3. Likelihood of dropping landline in favor of cell phone only over the next 12 months, by respondent demographic characteristics

Characteristic	(n)	Likelihood of dropping landline in the next 12 months				Sig. <sup>1</sup>
		Very likely	Somewhat likely	Not too likely	Not at all likely	
Total	(1,876)	6.9	9.4	22.2	61.5	
Primary type of telephone in household						.001
Landline only	(220)	5.9	16.6	23.2	54.3	
Both landline and cell	(1,234)	5.0	6.4	21.4	67.3	
Primarily cell phone	(396)	10.7	15.0	26.0	48.3	
Sex						.223
Male	(689)	6.9	11.3	23.9	58.0	
Female	(1,187)	6.3	9.1	21.1	63.5	
Race						.145
Black	(447)	8.5	11.9	19.2	60.4	
White	(1,383)	5.9	9.4	23.6	61.0	
Age						.896
18-29	(274)	6.0	11.8	22.0	60.2	
30-44	(526)	7.2	10.1	21.2	61.5	
45-64	(783)	6.9	9.9	23.8	59.4	
65 or older	(270)	5.8	7.5	21.4	65.4	
Education						.062
Less than high school	(144)	7.7	14.7	21.8	55.8	
High school/GED	(503)	7.2	10.0	16.8	66.0	
Some college	(589)	7.6	9.2	23.2	60.0	
College degree	(635)	4.8	9.9	26.9	58.3	
Children in household						.337
None	(1,112)	6.9	8.5	22.6	61.9	
One or more	(761)	6.3	11.5	22.3	59.9	
Adults in household						.786
One	(530)	8.4	9.3	23.3	59.0	
Two	(1,045)	6.8	9.9	21.8	61.5	
Three	(295)	5.3	10.9	23.2	60.6	
Registered to vote						.467
Yes	(1,598)	6.4	9.7	21.9	62.0	
No	(275)	7.4	11.9	24.9	55.8	
Party identification						.142
Republican	(901)	6.3	10.0	24.6	59.2	
Independent	(232)	9.8	7.1	23.9	59.2	
Democrat	(626)	5.1	11.8	20.4	62.7	

<sup>1</sup> Significance based on chi-square test of significance.