

Residential Mobility and the Cell-Only Population

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Abstract

The cell phone only (CPO) population has grown rapidly over the past several years, causing concern for researchers who rely mostly on random digit dialing (RDD) of landlines to conduct their research. While early research on CPOs has focused largely on age differences, CPOs may differ from those with landlines in many other ways even after controlling for age. In this paper, we use the Cooperative Congressional Election Study—an internet survey based on matched random sampling—and the American National Election Study—an in-person survey based on stratified residential sampling—to examine the potential effects of the cell-only population for survey research. These surveys are ideal for studying the causes and consequences of cell-only lifestyles for survey research because they reach cell-only and landline respondents through a single sampling frame. We reach two main conclusions: (1) CPO households are not simply a function of age, but of other factors as well, especially residential mobility and (2) there are notable differentials in vote preferences between CPOs and others even after controlling for standard demographics, though these effects are somewhat mitigated by the fact that CPOs are less likely to vote than landline respondents. We conclude by noting that re-weighting RDD phone surveys with traditional demographic data will not be sufficient to adjust the sample frame to the population.

Introduction

Innovations in communications technology present new opportunities and new challenges for survey research. As people adopt new technologies, new ways to contact people and elicit their opinions emerge. Cheap printing costs facilitated the rise of mail surveys; the spread of telephones and the use of computerized dialing precipitated the emergence of random digit dialing phone surveys and computer assisted telephone interviews; the development of the Internet led naturally to web-based surveys. New technologies also cause problems for survey methods as they alter the nature of sampling frames and may create systematic skews in the samples drawn using established procedures. That problem is of particular interest today, as a growing number of people have abandoned landlines and rely exclusively on their cell phones, making it difficult to reach these people through random digit dialing (Lavrakas et al. 2007). In short, technological innovations are creating greater heterogeneity in the modes of communications that people rely on and making it difficult to sample from the population using a single approach.

Changes in communications technology will matter in the short-run for survey research if they create systematic biases in questions of interest to researchers. One of the most notable factors that has been linked to cell-only lifestyles is age (e.g. Keeter et al. 2007; Keeter 2006; Blumberg 2009). Younger adults are substantially more likely to be without a landline compared to their older counterparts; age is also correlated with political measures of interest to pollsters such as party identification, ideology, and vote choice. Thus, the fact that younger Americans are harder to reach through landline surveys creates the potential for significant bias in such studies. But is age the sole substantial difference between the landline majority and the rapidly increasing set of cell-onlys or are there other factors associated with cell-only lifestyles that also have political consequences?

In this paper, we draw from three surveys using two different sampling frames to gain a

better understanding of the cell phone only (CPO) population to gauge the potential effects of this class of people on traditional phone polls. We reach two main conclusions. First, CPO households are not simply a function of age, but of other factors, particularly residential mobility. Because CPOs are significantly different on these other factors, re-weighting RDD phone surveys with traditional demographic measures will not be sufficient to calibrate the sample frame to the population. Second, there are notable differentials in vote preferences between CPOs and others, though these differences may be mitigated somewhat by the fact that CPOs are less likely to vote than landline respondents. The following section describes the data we use to analyze the cell-only population. We then turn first to our analysis of the factors that influence one's phone status and then to our examination of political differences between CPOs and landline respondents. We conclude by discussing the implications of our findings for the conduct of future survey research.

Data and Methods

This paper examines differences between cell-only adults and others using the 2006 and 2008 Cooperative Congressional Election Study (CCES) and the 2008 American National Election Study (ANES). The CCES surveys each contain large samples (36,500 in 2006 and 32,800 in 2008), which facilitate the examination of a relatively small segment of the population, namely those with cell-phones only (CPOs). These surveys were conducted through the Internet, making it possible to reach those who lack landline phone service through the same sampling frame as others in the sample (those with only a landline and those with both cell phone and landline service).

Both CCES surveys were conducted by YouGov/Polimetrix, of Palo Alto, California, and consist of matched random sample surveys. The sampling proceeded along two tracks. First, a very large number of people were recruited to participate in online surveys. Second, a

random sample was drawn from the consumer files available to YouGov/Polimetrix, and the characteristics of these people were recorded. A subset of respondents to the online surveys was then selected by matching them on a set of demographic characteristics to the randomly selected set of individuals from the population (i.e., the consumer files) using indicators of age, race, gender, income, education, and media usage. Propensity score weights for the samples were developed so as to ensure that the sample represents the demographic characteristics of the adult population as reflected in the 2004 and 2008 Current Population Survey. Additional information about the sampling methodology and the total survey error for vote and other objective indicators is presented in the guides to each of the surveys, posted at <http://web.mit.edu/polisci/portl/cces/index.html>. The 2006 and 2008 CCES each asked respondents what phone service they had - landline only, cell phone only, both, or no phone service. In 2006, this question was only asked of half of the sample (16,171 cases); in 2008, it was asked of all 32,700 respondents.

To allay concerns that our analyses of the CPO population may be influenced by CCES's survey methodology we conduct parallel analyses using the 2008 ANES. The ANES conducts a stratified national random sample of households in the United States and performs in-person interviews. Thus, like the CCES, the ANES is able to reach both landline and CPO respondents through a single sampling frame.¹ Additional information about the sampling methodology is presented in the user's guide to the 2008 ANES, posted at <http://electionstudies.org/studypages/2008prepost/2008prepost.htm> (Lupia et al. 2009).

On the one hand, the residential sampling and interview strategy utilized by the ANES has the advantage of reaching even those respondents who may not have computer access or who would be unwilling to participate in online surveys. On the other hand, this costly

¹It is important to note that the ANES measures phone status through a different battery of questions than the CCES. Respondents are first asked "How many telephone numbers are there in this household, including regular phone numbers, fax numbers, and cell phone numbers that are answered by anyone who lives here?" Follow up questions then determine how many of these phone lines were cell phones. When the number of cell lines was equal to the total number of phone lines, we coded that respondent as cell-only.

Table 1: Comparing Telephone Status of Adults in Three Surveys

Survey	Landline Only	Cell Only	Both
2008 NHIS	17.4% (16.2%, 18.6%)	20.2% (18.8%, 21.7%)	59.6% (58.0%, 61.2%)
2008 CCES	9.4% (9.0%, 9.9%)	19.7% (19.1%, 20.3%)	70.0% (69.3%, 70.7%)
2008 ANES	13.7% (12.2%, 15.4%)	22.3% (20.3%, 24.5%)	63.2% (60.7%, 65.5%)

Note: All estimates produced with sampling weights applied. 95% confidence intervals in parentheses. Table excludes a small proportion of respondents who report having no phone service.

approach to conducting the ANES means that far fewer respondents were interviewed compared to the CCES. Thus, we utilize both surveys to maximize the statistical power with which we can examine CPOs while also testing the validity of the findings produced through either approach.

As an initial check of these data, Table 1 compares the percentage of the population that each survey estimates is cell-only compared to the the National Health Interview Survey (NHIS). The NHIS uses a similar sampling and interview approach as the ANES but also reaches a much larger number of respondents. The NHIS has also served as a benchmark for estimating the size of the cell-only population over the the past several years (Blumberg and Luke 2009). More information on the NHIS is posted at <http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless200905.htm>.² The table includes each survey’s estimate of the size of the CPO population along with 95% confidence intervals surrounding that estimate. Importantly, none of these surveys used phone service in its sampling frame.

During the second half of 2008, the NHIS found that 20.2% of American adults lived in a household that only had cell phone access (Blumberg and Luke 2009). The 2008 CCES and

²While the NHIS provides an effective sampling approach for estimating the size of the cell-only population, it includes few questions that are useful for analyzing the political significance of this group. Therefore, after comparing estimates of the size of the CPO population, we do not analyze the NHIS data further in this paper.

ANES produced estimates on either side of that figure. The CCES estimates that 19.7% of the population was cell-only in 2008 while the ANES pegged the figure at 22.3%. Importantly, the confidence intervals for each of these estimates overlap. It is also important to note that while the CCES estimate of the CPO population is statistically indistinguishable from that produced by the NHIS or ANES, there are larger differences in the CCES's estimates of the percentage of American adults who have both a landline and a cell and those who have only a landline. The CCES over-estimates the share of the public falling in the former category and under-estimates the size of the latter.

While not included in the table, the rate at which the CPO population has increased in recent years is also notable. The 2006 CCES estimated that one in eight respondents was cell-only, a figure that increased to one in five just two years later. The NHIS data indicate a similar increase over the past two years. During the second half of 2006, that survey indicated that 12.6% of American adults lived in cell-only households. A year later that figure had increased to 15.8% and by 2008 the NHIS estimated that one in five Americans were without a landline. Thus, CPOs not only constitute a significant share of the population, but their numbers have been increasing rapidly in recent years. This group is significant because it represents respondents difficult (and more costly) to reach through traditional random digit dialing methodologies (Keeter et al. 2008). In the following section, we examine which factors are most strongly associated with CPO status.

Who Is “Cell Phone Only”?

The size of the CPO population raises a challenge for survey researchers. A substantial portion of the population is now outside the frame commonly used for Random Digit Dialing surveys. This may create problems using traditional phone methods to the extent that those who rely exclusively on cell phones differ from those who have landlines as part of their

phone service. If this is a problem, many solutions are possible, including using mixed mode samples or adjusting for the bias in the sampling frame analytically. Such corrections require that we know much more about the segment of the population that is CPO.

Appendix 1 presents some of the basic demographic features of the segment of the population that has decided to rely exclusively on cell phones. The table presents patterns from the 2008 CCES and ANES (the patterns from the 2006 CCES are very similar so we focus on the 2008 studies here). On the whole the cell phone only population is younger, single, more mobile, and more likely to rent than those who have landlines. Age has the most dramatic effect. Over forty percent of those under 30 report being CPO, compared with just 4-5 percent of those over 65. Over one-third of renters report having only a cell phone compared with just 11-12 percent of home owners. Over half of those who moved in the past six months rely solely on cell phones, compared with less than 10 percent of those who have lived in their homes at least 5 years. Finally, over one-third of single people are cell only, compared with less than 16 percent of those who are married. Overall these characteristics suggest that the cell phone only users are, on the whole, the less rooted and more mobile segment of the population.

Many of these variables are correlated with each other. To tease out their independent effects on CPO households we estimate a logit model in which we predict an indicator of CPO adults using a host of demographic variables, namely: region, age, race, gender, income, education, marital status, children, residency, and home ownership. The results are presented in Table 2 for the 2006 and 2008 CCES and the 2008 ANES. The variables for gender (female), married, single, kids under 18, own home, rent home, Northeast, Midwest, South, white, black, and hispanic are 1-0 indicators. Residency is measured with 5 indicator variables corresponding to the categories in Appendix 1; the omitted category is for those who have lived in the same residence for 5 or more years. Age is a continuous measure with a mean between 45 and 48 in each of the three studies. Income takes 14 categories, with

Table 2: Logit Models Predicting Cell-Only Status

Independent Variables	2006 CCES		2008 CCES		2008 ANES	
	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
Age (in years)	-.039	.003	-.045	.002	-.047	.007
In residence < 1 month	1.693	.221	1.496	.158	2.033	.412
In residence 1-6 months	1.462	.125	1.209	.073	1.551	.258
In residence 7-11 months	1.145	.160	.948	.090	1.363	.373
In residence 1-2 years	.877	.090	.749	.064	1.029	.209
In residence 3-4 years	.398	.110	.514	.065	.669	.233
Own Home	-.218	.166	.080	.092	.341	.622
Rent Home	.575	.160	.611	.087	.908	.611
Married	-.708	.099	-.461	.060	.002	.196
Single	-.033	.105	-.279	.073	-.185	.220
Kids Under 18	-.424	.093	-.405	.053	-.604	.174
Income	-.028	.011	-.031	.007	-.071	.026
Education	.059	.027	.080	.017	.057	.058
Female	-.305	.071	-.228	.045	-.109	.150
Black	-.570	.215	-.170	.115	.288	.401
Hispanic	-.082	.193	.226	.111	.715	.407
White	-.065	.160	.218	.094	.372	.380
Northeast	-.054	.112	-.415	.073	-1.035	.299
Midwest	.185	.100	-.004	.066	.162	.222
South	.153	.090	.044	.059	.073	.187
Intercept	-.257	.291	.163	.170	-.116	.856
Observations	13,319		30,309		2,138	
Log Likelihood	-3,460.418		-11,090.077		-944.807	
Pseudo R ²	.226		.175		.205	

median category of 8 (\$50,000-59,999) in the 2008 CCES. Finally, education is an ordinal variable, which takes a value of 1 if the respondent did not complete high school up to 6 for someone who has done post-graduate work. The average value is around 3 in each of the surveys, which corresponds to someone who has taken some college but not completed a college degree.

The results are mostly consistent across the three surveys. As a rule of thumb, the marginal effect of a unit change in a variable in a logit equals the coefficient divided by 4.

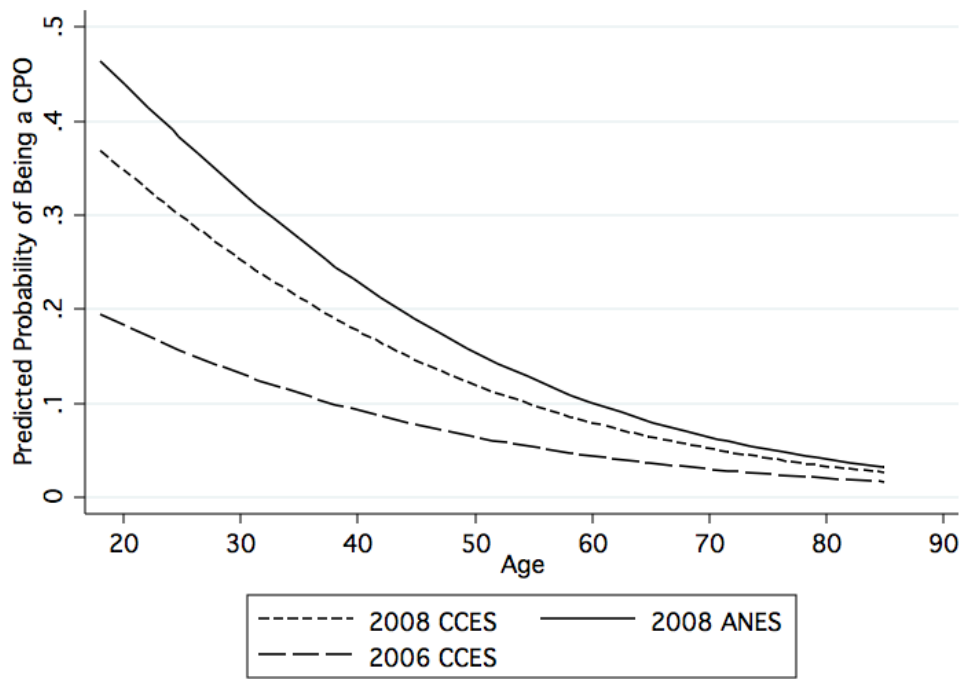
Using this rule of thumb many of the coefficients, although statistically significant in the CCES models, translate into trivially small effects. These same coefficients tend to fail to attain statistical significance in the ANES model given its much smaller sample size.

Ultimately, age, residency, renting, and children under 18 are among the strongest determinants of whether one is CPO. Figure 1 compares the effect of age on the predicted probability of being cell-only (while holding the other variables at their means) from each of the three surveys. While the ANES estimates higher probabilities than the CCES, the patterns are very similar. Americans in their 20s and 30s are much more likely than those over 50 to be cell-only, even after holding constant the other variables in our model such as income, education, mobility, race, region, and gender. Respondents were less likely to have chosen cell-only lifestyles in 2006, but the effect of age was strong in that year as well. Thus, even as the cell-only population has grown, the age divide in CPO status remains substantial.

While age clearly exerts a strong effect on one's likelihood of being cell-only, the results from the models estimated in Table 2 indicate that it is not the only significant factor influencing phone status. As noted above, renting, children under 18, and length of residency all play an important role in predicting whether one is cell-only. Based on the 2008 CCES data, CPO households are more common among renters than others by 15 percentage points. Those with kids under 18 are less likely to be cell-only by 10 percentage points. In addition, the 2008 CCES model indicates that those living in the Northeast U.S. are about 10 percent less likely to be CPO (this effect was even larger in the ANES model). Northeasterners move less than citizens in any other part of the country (U.S. Census Bureau 2009), though this effect is persistent even after controlling for mobility.

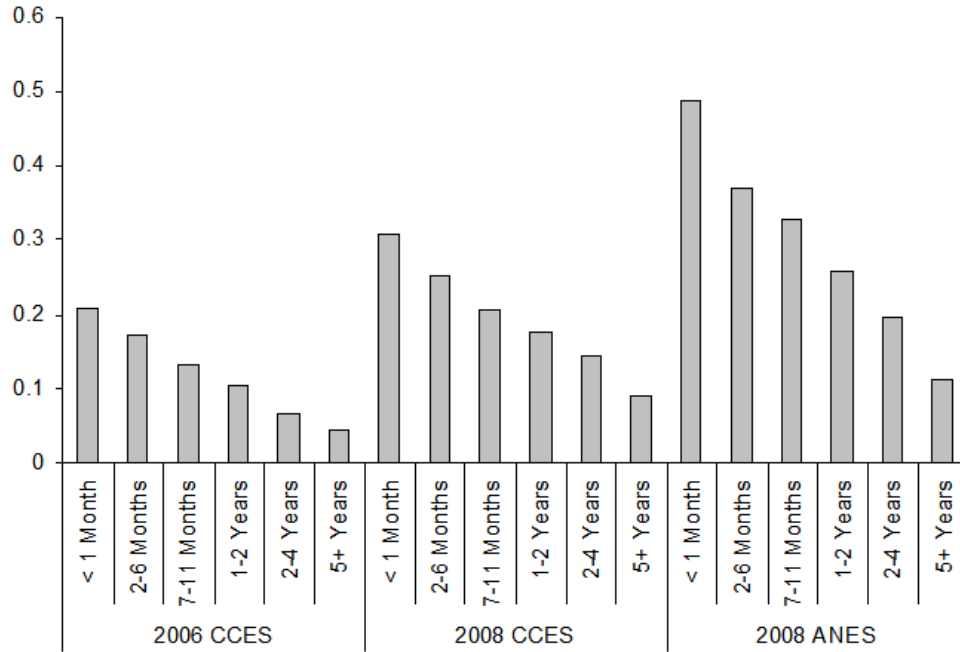
The effect of residential mobility is particularly notable. Figure 2 presents the influence of the length of time a respondent had been living in their current residence on their probability of being cell-only, holding all other variables in the model at their means. The table reveals

Figure 1: Effect of Age on Predicted Probability of Being Cell-Only



Note: Predictions generated from models presented in Table 2 holding all other variables at their means.

Figure 2: Effect of Residential Mobility on Predicted Probability of Being Cell-Only



Note: Predictions generated from models presented in Table 2 holding all other variables at their means.

strong and consistent effects for the residency variable across each of the three surveys. Controlling for other variables (including age), an individual who reported moving during the previous month was more than three-times as likely to be without a landline as one who had been living at the same residence for over five years.

Among the remaining variables in the model, the results from the 2008 CCES indicate that married people are less likely than singles to be cell-only by 6 points and less likely than divorced, separated, and those in domestic partnerships by 13 points. However, the coefficients for these variables were not statistically significant in the ANES model. Other variables that failed to attain statistical significance in the ANES model had only limited effects in the CCES model. For example, the CCES results indicated that the CPO gap between men and women is approximately 7 points but this variable's coefficient was not

statistically significant in the ANES model.

Nevertheless, we wish to stress that many of these are substantively large effects. Age is the most substantial predictor of CPO households, but so too are renting, length of residency, and having children, and these factors dwarf differences in CPO status across levels of education and income. Overall, these parameters reflect the general pattern that the more rootless in American society are more likely to be CPOs. There are several reasons that highly mobile Americans may be more likely to go without landlines. First, whenever someone moves from one residence to another, they have an opportunity to reassess their phone needs. Thus, the act of moving provides an opportunity for individuals to shed their landlines. Second, mobile Americans may choose a CPO lifestyle because cell phone numbers tend to be more portable than landlines. When moving from one metropolitan area to another, individuals must change their landline phone number, but do not need to change their cell number. This may provide an incentive for choosing not to maintain a landline in a new residence. Third, those with fewer family and community ties may feel less of a need to have multiple phone lines on which they can be reached by members of their social networks.

In sum, the findings from this section suggest that traditional phone surveys will face substantial difficulties reaching younger segments of the population and those who have recently moved or rent. In the following section, we examine the amount of bias introduced by excluding CPOs from political surveys. We then examine some potential political consequences of the high rates of mobility among the CPO public.

Examining the Cell-only Bias in Political Preferences

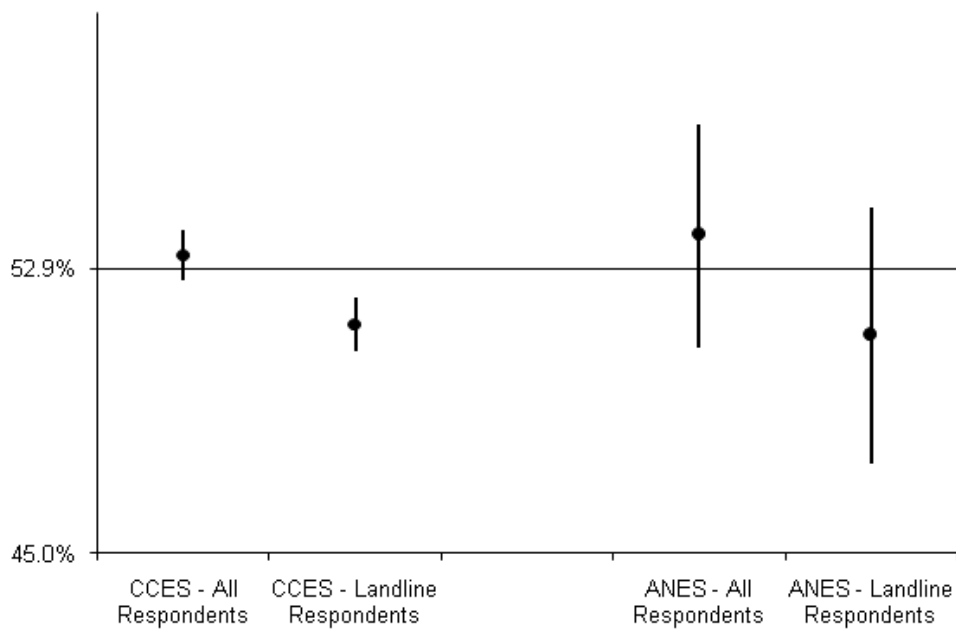
Survey organizations tend to weight their data according to several of the factors that we showed above to have a significant influence on the likelihood of owning a cell phone, in-

cluding age, race, ethnicity, gender, education, and region (e.g., ABC News, CBS News/New York Times, Pew). During the 2004 presidential campaign, it appeared that such weighting successfully removed any bias that might have arisen from the exclusion of CPOs (Keeter 2006). However, in 2008, the Pew Center for the People & the Press reported that even after weighting, their landline samples consistently showed less support for Obama than their samples that included CPOs (Keeter, Dimock, and Christian 2008). Thus, it now appears to be an open question whether weighted landline surveys produce substantively equivalent results compared to polls that contact CPOs.

While analysis conducted by Keeter and his colleagues at Pew demonstrates that including CPOs in the sampling frame produced consistently higher support for Obama in their pre-election polling, this does not necessarily constitute evidence of bias. In fact, it is possible that the landline sample produced results that were consistently closer to the population parameter of actual Obama support. To determine whether the exclusion of CPOs caused bias in these estimates, it is necessary to know what the actual support for Obama was. Fortunately, election outcomes provide a useful census of candidate support against which we can judge survey estimates. Figure 3 presents the percentage of respondents to the post-election wave of the CCES and ANES who indicated that they voted for Obama in the presidential contest. For each survey, the marker on the left indicates the estimate of the Obama support based on the post-election survey question asking respondents who they voted for, while the marker on the right indicates the estimate once CPOs are excluded from the sample. The vertical lines represent 95% confidence intervals surrounding the estimates. The horizontal line is the actual percentage of the vote captured by Obama. Each estimate is produced using survey weights.

Several patterns from this figure deserve attention. First, note that the confidence intervals are much larger for the ANES due to its much smaller sample size. As a result of these larger confidence intervals, we cannot be confident that removing CPOs from the

Figure 3: Reported Vote Choice among CCES and ANES Respondents Including and Excluding CPOs



Note: Estimates are produced using sampling weights. Bars represent 95% confidence intervals and horizontal line represents actual national vote for Obama.

sample produces an estimate of Obama support that is statistically different from the estimate generated from the full ANES sample. In addition, the confidence intervals for both ANES estimates overlap with the actual Obama vote, indicating that removing the cell-only respondents did not generate a biased measure of support for Obama. Nevertheless, aside from the larger confidence intervals, the patterns with the ANES data are quite similar to those produced from the CCES. When CPOs are removed from the sample, the estimated support for Obama declines.

Second, the confidence intervals for the two CCES estimates do not overlap. This indicates that removing CPOs from the CCES sample produces an estimate that is statistically different from the estimate produced by the full sample. In fact, just as Pew found during the pre-election period, removing CPOs from the sample produces estimates that are a few percentage points less favorable for Obama. Third, and more importantly, the sample that includes CPOs produces a more accurate estimate of the population parameter (Obama's actual vote share). Obama's actual percentage of the vote (52.9%) falls within the 95% confidence interval surrounding the full sample estimate from the CCES, but it falls outside of the 95% confidence interval for the estimate produced without CPOs included. Thus, comparing the CCES survey estimates to the actual vote provides support for the claim that excluding CPOs biased horse race estimates.

While Figure 3 provides evidence of bias in the aggregate, we examine individual-level vote preferences to gain a better understanding of the nature and extent of this bias. In noting that pre-election landline polls fared reasonably well in 2004 Keeter explained that "they were aided by the fact that CPOs were a relatively small segment of the electorate and that CPO voters were similar politically to others in their age groups" (Keeter 2006). Thus, the crucial question is whether CPOs have vote preferences that are distinct from landline respondents even after controlling for the regiment of demographic factors (such as age) that pollsters might weight for.

To determine whether cell-only respondents are politically distinct even after controlling for these factors we estimate three logit models using the 2008 CCES and ANES data. In the first model, the dependent variable equals 1 if the respondent voted for the Democratic House candidate and 0 if he/she reported voting for the Republican (respondents voting for other candidates are excluded). The second and third models use the two-party presidential vote as the dependent variable; this variable equals 1 if the respondent reported voting for Obama and 0 if he/she cast a vote for McCain. Both models include controls for age, gender, race, ethnicity, education, income, and region. To conduct a particularly stringent test, we also control for party identification since some survey organizations weight by party, especially during the latter stages of presidential campaigns (e.g. Rasmussen). The first model also includes dummy variables controlling for whether there was a Democratic or Republican incumbent running in the respondent's House election in order to control for incumbency advantage.

Finally, each model includes a dummy variable indicating whether the respondent was cell-only or if he/she also (or only) had a landline. If the coefficient for this variable is small and lacks statistical significance in both models, then that would indicate that accounting for other factors can largely eliminate any bias that may result from excluding CPOs. However, if the variable has a significant effect on vote choice even after controlling for the other variables in the model, then that would provide evidence that the bias cannot be fully accounted for with standard demographic (or even partisan) variables.

The results from these models are presented in Table 3. Most of the control variables in the models have coefficients that are statistically significant and in the expected direction. Not surprisingly, partisanship had a strong effect on the vote, as did the presence of a Democratic or Republican incumbent in the House race in which respondents voted. Respondents who were older and had higher incomes were less likely to vote Democratic, while those who were African American or had more formal education were more likely to do so. Females

Table 3: Logit Models Predicting Vote for President and House (2008)

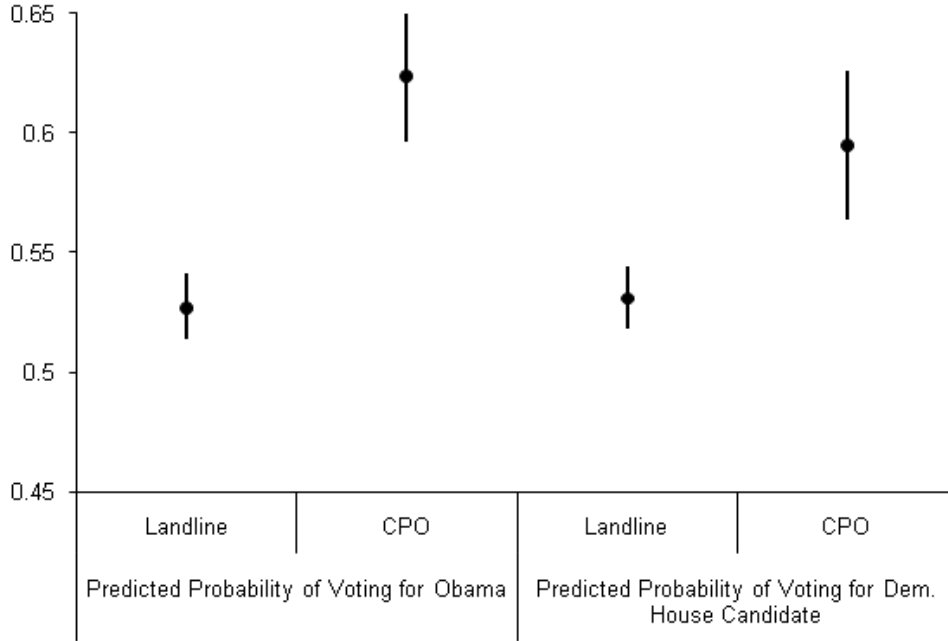
Independent Variables	CCES House Vote		CCES Pres. Vote		ANES Pres. Vote	
	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
Cell-Only	.278	.071	.418	.068	.188	.269
Age (in years)	-.007	.002	-.017	.002	-.018	.006
Income	-.038	.008	-.031	.007	-.049	.032
Education	.145	.017	.188	.016	.013	.076
Female	.078	.046	.108	.044	.193	.206
Black	1.203	.147	2.594	.156	3.165	.802
Hispanic	.096	.130	.226	.111	-.362	.531
White	.048	.097	.186	.090	-1.130	.491
Northeast	.011	.073	-.039	.069	-.117	.352
Midwest	-.188	.065	-.105	.065	-.303	.282
South	-.272	.063	-.521	.060	-.976	.251
Democratic Incumbent	.585	.079				
Republican Incumbent	-.465	.079				
Intercept	.157	.174	.409	.155	2.742	.699
Observations	18,154		21,284		1,439	
Log Likelihood	-7,273.297		-7,929.818		-514.464	
Pseudo R ²	.421		.462		.481	

voted more Democratic in the election for president, but the coefficient for gender was not statistically significant in the House vote model (or in the ANES presidential model).

The coefficient for the variable indicating whether a respondent was CPO or not is statistically significant and positive in both CCES models, indicating that even after controlling for the other variables in the model, CPOs were more likely to vote Democratic than those with landlines. In the ANES model, the cell-only coefficient is in the expected direction, but it is not statistically significant. The size of the coefficient in the ANES model suggests that 4-5% difference in the Obama vote between landline and CPO respondents. However, since the coefficient is not statistically significant, we cannot be confident that this difference would exist in the population of voters.

We can, however, be quite confident in the differences uncovered in the CCES models.

Figure 4: Predicted Probability of Voting Democratic Based on CPO Status



Note: Predictions generated from first two models presented in Table 4, holding all other variables at their means. Bars represent 95% confidence intervals.

Figure 4 demonstrates the strength of the CPO effect in the CCES models by plotting the predicted probability of voting for Obama and the House Democratic candidate depending on whether one was a CPO or not (with all other variables in the model held at their means). The figure indicates that the difference between landline users and CPOs was substantial. CPOs had a predicted probability of voting for Obama that was .10 higher than those with landlines. The effect was somewhat smaller, but still significant and notable in the House election model. The predicted probability of voting for the Democratic House candidates was .07 higher for CPOs.

Overall, the analyses presented in this section indicate that CPO respondents were more likely to report voting for Obama in both surveys, even after controlling for other factors. While this difference was only statistically significant in the CCES models, the results do suggest that excluding CPOs from surveys during the 2008 campaign could have systematically

depressed reported support for Obama, even after weighting. Yet, comparisons conducted in the wake of the 2008 campaign suggested that vote estimates produced by pollsters that called cell phones were not more accurate on average than those produced by organizations that only called landlines (Schaffner 2008). In the following section we examine one possible reason for this finding—while CPOs were more supportive of Democrats in the 2008 election, they also tend to be less likely to participate in elections.

Political Participation and Phone Status

The results from our vote choice models indicate that CPOs were more likely to have reported voting for Obama than those with landlines. However, the amount of bias this pattern would create in the aggregate depends at least partly on the extent to which CPOs actually turn out to vote. The research on CPOs has generally focused on the large age differences between those who do and do not have landlines in their homes (Keeter et al. 2007). The fact that CPOs tend to be younger means that they may also be less likely to vote, since age is positively associated with political participation (Wolfinger and Rosenstone 1980). However, as we demonstrated above, residential mobility is also a significant factor influencing whether an individual adopts a cell-only lifestyle. Citizens who have moved more recently are much more likely to be without a landline than those who have lived in the same place for a longer period of time. Previous work has demonstrated that recent movers are also significantly less likely to vote, even when controlling for other characteristics like age (Squire, Wolfinger, and Glass 1987; Highton 2000). The most important reason for this depressed turnout is due to registration requirements in the U.S. When an individual moves to a new location, he or she must register to vote in that new area and many fail to do so before the next election. Thus, higher levels of residential mobility may result in lower rates of turnout among CPOs.

In the 2008 CCES post-election study, 72.7% of landline respondents said that they

had voted in the election while just 62.8% of CPOs reported voting (the difference was significant at $p < .01$). A similar pattern was evident in the ANES data; 80.1% of landline respondents reported voting while just 67.4% of CPOs reported doing so ($p < .01$). Of course, reported turnout rates tend to be susceptible to social desirability bias, with many respondents claiming to have voted when they actually did not do so (Neuman 1986; Silver et al. 1986; Ansolabehere and Hersh 2008). Thus, for a more reliable measure of turnout, we turn to the 2006 CCES, which included vote validation data for respondents in 26 states and the District of Columbia (see Ansolabehere and Hersh 2008 for more information on the validation study).³

Table 4 compares the reported and actual registration and turnout rates for landline and CPO respondents. The difference in the percentage of landline and CPO respondents who reported being registered was fairly small—over 95% in both groups. However, there was a much larger gap in actual registration rates (66.8% versus 53.9%). Despite the fact that over 95% of CPO respondents reported being registered, the voter files indicated that little over one-half actually were. A similar pattern is evident for turnout. As with 2008, CPOs were about 10% less likely to report that they voted as those with landlines. But the validation data indicate that the actual turnout gap between those with landlines and CPOs was 16%.

Thus, the validation data not only confirm that CPOs were less likely to vote than citizens with landlines, but they also indicate that CPOs were more likely to over-report their registration and turnout status. But why would CPOs be more likely to misreport their registration and turnout compared to those with landlines? Given that over 50% of CPOs reported having lived in their current residence for 2 years or less, it would not be surprising to find that a non-trivial portion of CPOs may have thought that they had properly changed their registration when they had not actually done so. Furthermore, even if CPOs had properly registered in their new homes, mistakes by local election officials in processing

³Validation data were not available for the 2008 CCES or the ANES.

Table 4: Validated Registration and Vote Among CPOs and Landline Respondents, 2006

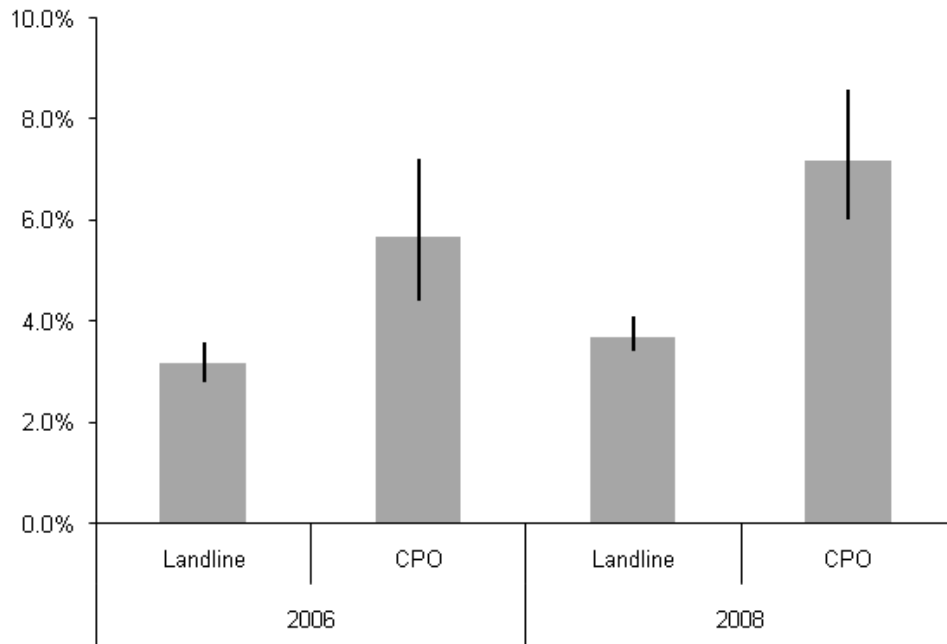
	Landline Respondents	CPO Respondents
Reported Being Registered	97.8% (97.3%, 98.1%)	95.8% (93.9%, 97.1%)
Registration Validated	66.8% (65.6%, 67.8%)	53.9% (50.5%, 57.1%)
Number of Respondents	9,410	1,014
Reported Having Voted	94.2% (93.5%, 94.8%)	84.2% (81.2%, 86.7%)
Vote Validated	61.9% (60.6%, 63.1%)	45.9% (42.3%, 49.6%)
Number of Respondents	8,043	841

Note: Analysis limited to 26 states (and the District of Columbia) where complete 2006 vote records were available. 95% confidence intervals in parentheses.

those registrations would likely only become known to CPOs when they first attempted to cast a ballot.

Individuals who believe they are registered when they are not will face issues when they attempt to cast a ballot at their polling place. Because they are highly mobile, we expect that CPOs will be more likely to encounter such problems. Both the 2006 and 2008 CCES asked respondents whether they encountered any problems with their registration status when they attempted to vote. Figure 5 shows the percentage of CPO and landline respondents who reported such problems. In both years, CPOs were significantly more likely to have problems with their registration when attempting to vote. In 2008, over 7% of CPO respondents indicated that there was a problem with their registration when they attempted to vote, compared to fewer than 4% of respondents with landlines. These differences remain statistically significant even when we control for the other demographic factors. While, overall, the share of CPOs encountering registration problems is relatively small, the pattern

Figure 5: Percentage Reporting Problems with their Registration at the Polls, 2006 and 2008
CCES



Note: Based on weighted CCES data. Bars represent 95% confidence intervals.

is suggestive of the role that residential mobility plays in leading CPOs to be registered (and ultimately vote) at lower rates than those with landlines.

CPOs and Campaign Mobilization

The evidence presented thus far suggests that part of the reason that CPOs are less likely to vote may be because they are less likely to be registered at their current address. However, the fact that CPOs are highly mobile may have other consequences related to turnout. For example, citizens who move around more frequently and do not have landlines may be more challenging targets for campaign mobilization efforts. Citizens are more likely to participate politically when they are asked to do so (Verba, Schlozman, and Brady 1995). Parties and campaign organizations spend significant resources on mobilizing voters and such contact can have a positive (though limited) influence on the likelihood that an individual turns

Table 5: Reported Contact from Campaigns, 2008

Contacted by	CCES		ANES	
	Landline	Cell-only	Landline	Cell-only
No Contact	29.5% (25.2%, 34.3%)	64.9% (54.3%, 74.2%)	51.9% (48.8%, 54.9%)	78.4% (73.4%, 82.6%)
Democrats	21.6% (17.8%, 26.0%)	19.5% (12.3%, 29.4%)	17.9% (15.7%, 20.3%)	15.2% (11.6%, 19.7%)
Republicans	13.0% (10.6%, 15.9%)	8.1% (4.7%, 13.6%)	11.2% (9.3%, 13.3%)	2.4% (1.2%, 4.8%)
Both Parties	35.9% (31.5%, 40.4%)	7.6% (4.6%, 12.3%)	18.6% (16.3%, 21.1%)	3.7% (2.1%, 6.3%)
Respondents	654	139	1,586	475

Note: 95% confidence intervals in parentheses. Figures calculated using sampling weights.

out to vote (Green and Gerber 2004). In fact, some research has even indicated that text messages can be used to mobilize voters with cell phones (Dale and Strauss 2007). Yet, if parties and campaigns find it as costly and difficult to reach CPOs as pollsters do, then CPOs may be less likely to receive these solicitations.

Table 5 presents the extent to which landline and CPO respondents to the CCES and ANES reported being contacted by the campaigns in 2008.⁴ Note that CCES respondents were more likely to report being contacted by the campaigns than those interviewed by the ANES. Nevertheless, the patterns revealed by comparing landline and CPOs are similar across surveys. The first row shows the most significant difference between these groups—CPO respondents were much more likely than those with landlines to report that neither campaign contacted them. Nearly two-thirds of CPOs in the CCES went unreached by either of the campaign organizations and the figure was three-fourths for the ANES. These differences held up even when controlling for demographics (including age).

Among CPOs who were contacted by one of the campaigns, most were reached only by the Democratic Party, with the remainder split roughly evenly between being contacted by

⁴The CCES analysis is based on interviews with a randomly selected subset of the full sample.

both parties or just the Republican Party. Furthermore, the CCES also asked respondents how they were contacted by the campaigns (whether in person, by phone, by postal mail, by email, or by text message). Even among those who were contacted by the campaigns, CPOs were much less likely to be contacted by phone than landline respondents. When CPOs were contacted by the campaigns, it was mostly by e-mail or postal mail whereas the most frequent mode of contact reported for landline respondents was over the phone.

Thus, the reduced levels of contact from campaigns and increased chances of registration problems meant that CPOs comprised a smaller share of the electorate than their percentage of the adult population. In the 26 states for which we have validation data for the 2006 election, CPOs accounted for 11.4% of adult respondents but just 8.8% of validated voters. While the inclusion of CPOs provides for a better representation of the adult population as well as the electorate, it appears to be slightly more crucial for the former.

Conclusion

In this paper, we have provided a detailed examination of which individuals are more likely to be cell-only and how CPOs differ from landline respondents with regard to their political preferences and their participation in politics. Consistent with previous research, our profile of CPOs underscores the central role of age—younger Americans are far more likely to be cell-only. However, this is only part of the story. Even after accounting for age, residential mobility has a strong effect on whether an individual has adopted a cell-only lifestyle. The rootless population is more likely to have shed its landlines compared to those who are less mobile. One important consequence of this finding is that it helps us to consider how (and whether) the CPO population may increase over the next several years. Indeed, it appears that when an individual moves, he/she takes the opportunity to re-evaluate phone service needs and many who make this re-evaluation choose to go without a landline at their new

residence. Thus, we should expect cell-only rates to increase not only among younger adults in the U.S., but also among groups and in areas where residential mobility is higher.

Our findings have immediate value for those conducting random digit dialing surveys. The analyses in Table 2 reveal the demographic groups more likely to be missed in RDD surveys of the general population and the likely extent of selection biases. Specifically, we have shown which factors are of most importance in explaining who is cell-phone only: age, marital status, residency, and renting. Some of these factors may be adjusted for with conventional weights, especially age. However, most surveys do not adjust for residential mobility or other related factors. These variables continue to factor into the cell-phone only population, even after controlling for age, gender, race, education, income, and region. The results in Table 2 indicate that these variables ought to be incorporated into any effort to correct for potential biases in general population phone surveys that cannot reach cell phone only households.

In addition, the higher mobility rates of CPOs have important political consequences. CPOs are more likely to encounter problems with their registration when they attempt to vote, likely due to the fact that they are more likely to have moved to a new area recently. CPOs are less likely to be contacted by the campaigns, a factor that could also serve to depress their propensity to turn out. Indeed, CPOs appear to vote at much lower rates than their landline counterparts. Perhaps of more concern to pollsters is that they also tend to misreport their turnout at higher rates, a fact that could complicate horse race polling. One of the most challenging issues for pollsters is distinguishing “likely voters” from those who are not likely to vote. A significant share of CPOs may appear to be likely voters in a pre-election survey; yet, many of these individuals may ultimately fail to cast ballots due to factors that have little to do with their intent to vote or their political engagement.

Finally, our analysis confirms that CPOs had distinct candidate preferences in 2008 and that these differences persisted even after controlling for demographic factors. This em-

phasizes the importance of continuing to survey this segment of the population. After all, without CPOs, the CCES's vote estimate for Obama was biased and as the size of the CPO population continues to increase, such bias may only grow larger in future elections. Furthermore, our analysis indicates that landline-only surveys would produce biased measures of other political measures such as campaign contact and vote intentions. Thus, in this rapidly evolving communications environment, pollsters will need to continue to re-assess their approaches to capturing public opinion.

Appendix 1: Differences Between CPOs and Landline Respondents (CCES and ANES)

	2008 CCES			2008 ANES		
	Only Landline	CPO	Both	Only Landline	CPO	Both
All Respondents	9.4%	19.7%	70.0%	13.7%	22.3%	63.2%
Age						
Under 30	6.4%	40.3%	51.9%	4.0%	49.2%	46.4%
30 to 50	8.4%	21.1%	69.5%	9.4%	21.3%	68.0%
50 to 65	11.3%	10.3%	77.9%	13.9%	13.9%	71.1%
Over 65	12.6%	5.1%	81.8%	34.7%	4.1%	60.9%
Race						
White	10.0%	18.6%	70.8%	12.4%	20.9%	66.2%
Black	9.6%	18.9%	70.2%	19.6%	25.1%	53.7%
Hispanic	6.8%	26.5%	65.1%	16.0%	30.6%	51.4%
Other	6.7%	23.6%	68.4%	13.8%	23.6%	60.4%
Gender						
Male	9.2%	21.5%	68.3%	13.1%	23.4%	62.4%
Female	9.6%	18.1%	71.6%	14.2%	21.4%	63.8%
Education						
No HS	17.4%	20.8%	59.0%	28.3%	18.8%	50.0%
HS Grad	12.8%	16.8%	69.3%	16.4%	23.5%	59.2%
Some Coll.	7.4%	25.1%	66.7%	10.3%	27.3%	61.7%
2-Yr Coll.	6.9%	17.9%	74.6%	6.9%	23.4%	69.3%
4-Yr Coll.	4.8%	21.8%	73.2%	8.3%	21.3%	70.3%
Post-Grad	5.3%	13.9%	80.7%	11.3%	13.5%	75.2%
Home Ownership						
Own	8.0%	11.1%	80.5%	13.1%	12.5%	74.0%
Rent	12.8%	34.0%	51.7%	14.5%	42.3%	41.4%
Other	8.0%	28.1%	62.5%	21.8%	15.5%	62.7%
Length of Residence						
< 1 Month	8.1%	50.8%	38.4%	2.8%	61.1%	32.9%
1-6 Months	6.4%	48.4%	44.2%	8.8%	56.0%	34.0%
7-11 Months	8.0%	36.5%	53.2%	8.4%	46.0%	44.6%
1-2 Years	8.9%	29.1%	60.8%	8.5%	36.0%	53.6%
3-4 Years	9.9%	20.4%	69.2%	15.3%	22.7%	61.3%
5+ Years	10.2%	9.5%	79.7%	16.5%	9.2%	73.9%
Marital Status						
Married	7.4%	13.3%	78.7%	10.5%	15.7%	73.5%
Single	9.9%	34.2%	54.6%	9.8%	39.3%	49.5%
Other	14.3%	20.7%	64.0%	23.6%	18.6%	56.3%
Children Under 18						
Yes	7.5%	18.9%	72.9%	7.7%	21.3%	70.1%
No	10.3%	20.1%	68.7%	17.1%	22.9%	70.1%
Income						
<\$25,000	20.9%	27.2%	49.8%	19.1%	23.6%	55.9%
\$25,000 - \$50,000	11.1%	21.2%	66.9%	9.6%	25.7%	64.3%
\$50,000 - \$100,000	4.8%	18.0%	77.0%	7.2%	15.8%	77.0%
\$100,000>	1.6%	12.5%	85.7%	3.1%	13.1%	83.5%
Region						
Northeast	10.8%	14.3%	73.9%	17.1%	10.2%	72.2%
Midwest	10.8%	20.1%	68.6%	15.5%	22.2%	61.9%
South	8.3%	20.9%	69.7%	12.8%	23.1%	62.9%
West	8.6%	22.2%	68.6%	11.6%	29.0%	58.8%

Note: All figures calculated using sampling weights. Table excludes a small proportion of respondents who report having no phone service.

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