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Ways of Coping with a Growing Population Segment
THE IMPACT OF "CELL-ONLYS" ON PUBLIC OPINION POLLING

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THE IMPACT OF "CELL-ONLYS" ON PUBLIC OPINION POLLING

The proportion of Americans who rely solely on a cell phone for their telephone service continues to grow, as does the share who still have a landline phone but do most of their calling on their cell phone. With these changes, there is an increased concern that polls conducted only on landline telephones may not accurately measure public opinion. A new Pew Research Center study finds that, while different demographically, Americans who mostly or exclusively rely on cell phones are not substantially different from the landline population in their basic political attitudes and preferences.

On key political measures such as presidential approval, Iraq policy, presidential primary voter preference, and party affiliation, respondents reached on cell phones hold attitudes that are very similar to those reached on landline telephones. Analysis of two separate nationwide studies shows that including interviews conducted by cell phone does not substantially change any key survey findings.

These findings are based on two surveys of adults, conducted Oct. 17-23 and Dec. 19-30, 2007 by the Pew Research Center for the People & the Press. The surveys included interviews with a total of 2,596 adults reached in a conventional landline sample, as well as 841 adults interviewed on their cell phones, using a sample drawn from a nationally representative cell telephone number database. Of those reached on a cell phone, 312 people (or 37%) reported that their cell phone is their *only* phone.

Including Cell Phones Makes Little Difference in Polling Results

	Standard landline sample	Combined landline/cell sample
State of nation	%	%
Satisfied	27	28
Dissatisfied	66	66
DK/Ref	7	6
	100	100
Presidential approval		
Approve	30	30
Disapprove	62	62
DK/Ref	8	8
	100	100
Thought about campaign		
A lot/Some	68	67
Not much/None at all	30	31
DK/Ref	2	2
	100	100
Party affiliation		
Republican/Lean Rep	37	36
Democrat/Lean Dem	52	52
No leaning/Don't know	11	12
	100	100
Ideology		
Conservative	35	35
Moderate	40	39
Liberal	20	21
DK/Ref	5	5
	100	100
Registered to vote		
Yes, certain	76	74
No/don't know	24	26
	100	100
Sample size	(2596)	(3437)

Figures based on weighted data from surveys conducted in October and December 2007.

When data from both samples are combined and weighted to match the U.S. population on key demographic measures, the results are virtually identical to those from the landline survey

alone. Across more than 100 political and attitudinal questions on the surveys, including cell phone interviews does not change the results by more than two points in the vast majority of comparisons, and in only one comparison is the difference as large as 4 points.

In particular, there is no evidence that the polling in the Democratic and Republican nomination contests is biased by the fact that most polls rely only on landline interviews. In the December national poll, support for no candidate in the landline sample changed by more than two points when the preferences of cell phone respondents were blended in. The same was true in the October national poll.

There is no doubt that Americans who rely solely on cell phones differ from the rest of the public in some key respects. However, in most cases these differences are the result of their demographic characteristics, particularly the fact they tend to be very young. Since adjustments for age are made in standard landline surveys, adding the cell-only component to the survey substantially increases the raw number of younger people surveyed, but does not alter the overall weight of younger respondents in the final estimates.

In most respects, the political attitudes and behaviors of younger people who are cell-only do not differ substantially from younger people surveys do reach on landlines, meaning that the overall results are virtually identical to those from the landline survey alone.

The Primary Races
(December 2007)

*Democratic Primary**	Standard landline sample %	Combined landline/cell sample %
Clinton	44	46
Obama	27	26
Edwards	14	14
Kucinich	3	3
Richardson	4	3
Biden	2	2
Dodd	*	*
Other (Vol.)	*	*
None (Vol.)	2	2
DK/Ref	4	4
	100	100
Sample size	(456)	(556)
*Republican Primary***		
McCain	21	22
Giuliani	19	20
Huckabee	18	17
Romney	11	12
Thompson	8	9
Paul	4	4
Hunter	1	1
Other (Vol.)	1	1
None (Vol.)	3	2
DK/Ref	14	12
	100	100
Sample size	(370)	(471)

Figures based on weighted data.
* Based on Democratic & Dem-leaning RVs.
** Based on Republican & Rep-leaning RVs.

However, on some non-political topics, and in surveys of certain groups in addition to young people, studies have shown that the inclusion of cell phones in the sample design makes a difference in the combined results. An earlier study by the Pew Research Center for the People & the Press[1] found that blending landline and cell phone samples resulted in higher estimates of young people ages 18 to 25 using new technologies. In addition, small but significant differences were found for lifestyle measures such as attending church and alcohol consumption. In another

[1] Scott Keeter, Courtney Kennedy, April Clark, Trevor Tompson, and Mike Mokrzycki. 2007. "What's Missing from National Landline RDD Surveys? The Impact of the Growing Cell-Only Population." *Public Opinion Quarterly* 71(5): 772-792.

study from the National Health Interview Survey, Blumberg and Luke (2007)[2] found that for surveys of low-income adults and young adults, the estimates for health risk behaviors, HIV testing, exercise and obesity were all changed when cell phones were included in the sample.

In addition to testing the impact of cell phone sampling, the October and December Pew studies demonstrate the feasibility of including cell phones in telephone surveys. The response rates for the cell and landline samples were virtually identical in both studies, and there is no evidence that the quality of data gathered from cell phone surveys is lower than in landline surveys. Including cell phones, however, is very costly. On average, a cell phone interview costs approximately three times as much as a comparable landline interview.

Although the inclusion of cell phone samples is very costly, and may make little difference in the substantive conclusions one would draw from political surveys, other aspects of the dual frame design provide particular benefits that may argue for the adoption of this type of sampling frame design. Chief among these benefits is the improved demographic representation for certain groups and the attendant increase in the sizes of the samples of these groups for further analysis. This is because it is easier to reach by cell phone than by landline certain groups of respondents who have both types of service.

The inclusion of a cell phone sample may be essential in surveys of population groups that have high rates of cell-only households. More generally, with an estimated 14% of Americans relying solely on cell phones, their exclusion from opinion surveys may call into question the credibility of polls in the mind of the public.

[2] Stephen J. Blumberg and JulianV. Luke. 2007. "Coverage Bias in Traditional Telephone Surveys of Low-Income and Young Adults." *Public Opinion Quarterly* 71(5): 734-749.

Overview of Differences

Results from both the December and October polls show that the cell-only respondents have somewhat different attitudes and behaviors from those reached on landline telephones. In the December survey, which focused on the public's campaign news sources, cell-only respondents were significantly less likely to say they have watched a presidential debate on television, but more likely to have seen debate video online. This reflects a more general pattern: cell-only Americans are somewhat less likely to rely on newspapers and network evening news for campaign information, but more apt to get campaign news from the internet, late night comedy shows, and to use social networking sites. Not surprisingly, these behaviors are characteristic of younger respondents in general – whether cell-only or not – and the blended results for none of these measures change by no more than two percentage points.

The October survey included questions that asked registered voters about the importance of 16 issues to their vote. There were a few significant differences between the landline respondents and those who were cell-only: the latter group was 14 points less likely to say Social Security would be important to their vote, and somewhat more likely to say immigration would be important. Again, these differences are understandable, given the fact that cell-only respondents are younger (and thus less concerned about Social Security) and more likely to be Hispanic (who are more concerned about immigration). When the cell-only respondents were combined with the

Little Difference between Landline and Blended Samples

	Landline sample	Cell only	Total sample
December 2007	%	%	%
Enjoy following political news	66	61	65
Watched…			
Presidential debate	45	30	43
Presidential debate video online	11	19	12
Campaign commercials online	13	14	12
Get most campaign news…			
From internet	26	49	26
From newspaper	32	25	33
Regularly get campaign information from…			
Internet	24	35	24
Local TV news	41	34	40
Network news	32	28	32
Cable news	37	40	38
Daily newspaper	30	25	31
Leno/Letterman	8	9	9
SNL/Daily Show	7	12	8
Go online	71	77	70
Send/receive email	67	68	66
Send campaign emails w/friends	17	12	16
Get campaign news from…			
Google	5	6	5
Candidate sites	9	6	8
News satire sites	6	12	8
Social networking sites	7	12	7
Use social networking sites	21	38	22
'Friend' of candidate online	2	6	3
Sample size	(1089)	(113)	(1430)
October 2007*			
Issues very important to vote…			
Economy	80	78	79
Health care	75	79	76
Iraq	76	76	76
Education	76	81	75
Jobs	71	79	71
Terrorism	69	67	69
Social Security	69	55	68
Energy	66	58	65
Taxes	62	68	63
Moral values	61	65	61
Federal budget deficit	61	62	61
Environment	57	59	58
Immigration	57	65	56
Abortion	39	38	39
Stem cell research	36	37	35
Gay marriage	22	20	22
Sample size	(1249)	(120)	(1607)

The landline and combined samples are weighted. The cell-only column is unweighted.
*Based on registered voters.

landline respondents, none of the overall survey estimates changed by more than one percentage point.

While including interviews conducted by cell phone in a national sample does not substantially affect survey findings, it does improve the overall representativeness of the sample by reaching more respondents in otherwise hard to reach subpopulations. This reduces sampling error for these groups, and may also mean that the survey requires less statistical adjustment to match the demographic profile of the population. Less clear is whether adding cell phone interviews is the most efficient use of resources. Cell phone interviews cost approximately three times as much as landline interviews, and the sample sizes of underrepresented groups can be boosted more cheaply by simply expanding the overall sample size of the landline survey.

Profile of Cell-Only Respondents

One of the most striking differences between cell-only respondents and people reached on a landline telephone is their age. Nearly half of the cell-only respondents (46%) are under age 30 compared to only 12% in the landline sample. Related to their younger age, only 26% of cell-only respondents are married, compared with 57% percent of those in the landline sample. Similarly, about half of cell-only respondents have never been married (51%), compared with only 16% in the landline sample.

In addition, the landline sample includes a higher proportion of college graduates than the cell-only group (38% vs. 26%), which may also reflect the greater use of cell phones among young people who are still in college. The income distribution also is quite different for the landline and cell-only groups; 29% of people in the landline sample have household incomes of at least $75,000 annually, compared with just 16% in the cell-only group. Similarly, nearly twice as many cell-only than landline respondents earn less than $30,000 a year (41% vs. 21%).

Overall, the landline sample includes more whites (82% vs. 68%) than the cell-only group while the cell-only group includes a greater proportion of minorities. In the cell-only group, there are more African-Americans (19% vs.

Demographic Composition of the Landline and Cell-Only Samples

	Landline sample %	Cell only %
18-29	12	46
30-49	30	34
50-64	31	15
65+	25	4
Male	48	61
Female	52	39
College grad	38	26
Some college	24	28
H.S. grad	31	35
Less than H.S.	7	11
$75K or more	29	16
$50-74,999	15	11
$30-49,999	20	24
Less than $30K	21	41
White	82	68
Black	11	19
Asian	1	5
Other/Mixed	4	6
Hispanic	6	13
Married	57	26
Never married	16	51
Parent of minor	28	26
Protestant	56	49
Catholic	21	17
Other	7	6
Unaffiliated	14	27
Sample size	(2596)	(312)

Figures based on unweighted data.

11%), Hispanics (13% vs. 6%), and Asians (5% vs. 1%) compared with the landline sample. The cell-only group also includes a larger percentage of males than the landline group (61% vs. 48%). Finally, more cell-only respondents than landline respondents are religiously unaffiliated (27% vs. 14%).

The "Dual" Households

In this study, cell phone interviews were conducted with cell-only individuals (those who have no landline phone), as well as with those who were reached by cell phone but also have a landline telephone. Since these so-called dual-phone respondents could, in fact, be contacted on a landline telephone, some prior studies did not interview them, focusing only on those reachable only on a cell phone.

However, the current study includes dual-phone respondents regardless of whether they were reached on their landline or cell phones. This choice reflects the fact that about half (47%) of the dual-phone respondents who were reached on their cell phone say that they receive more of their calls on their cell phone, in most cases a lot more. While it may be possible to reach these respondents on their landline telephone, it may be more difficult to do so.

The crux of the issue is whether the dual users reached by cell phone are different from those reached by landline. For the most part, the answer is no. Among the dual users, more males than females were reached by cell phone (56% male, compared with 48% male among dual users reached by landline). And more than twice as many Hispanics were reached by cell phone (11% vs. 5%). Those reached by cell phone were somewhat

Demographic Composition of the Landline and Cell Phone Publics
(October and December 2007 combined)

Proportion of U.S. adults[1]	**26%**	**60%**		**14%**
	Landline only	*Landline & cell interviewed on…* Landline	Cell	Cell only
	%	%	%	%
18-29	11	13	17	46
30-49	19	34	40	34
50-64	27	33	29	15
65+	41	20	14	4
Male	49	48	56	61
Female	51	52	44	39
College grad	21	44	40	26
Some college	22	25	25	28
H.S. grad	41	27	29	35
Less than H.S.	15	4	6	11
$75K or more	11	36	35	16
$50-74,999	7	18	16	11
$30-49,999	20	19	22	24
Less than $30K	42	14	16	41
White	76	84	79	68
Black	14	9	13	19
Asian	1	1	3	5
Other/Mixed	5	4	4	6
Hispanic	6	5	11	13
Protestant	58	54	52	49
Catholic	20	22	22	17
Other	5	7	9	6
Unaffiliated	14	15	15	27
Married	40	63	60	26
Never married	21	15	23	51
Parent of minor	16	32	35	26
Union Household	12	14	14	9
Sample size	(673)	(1923)	(529)	(312)

Figures based on unweighted data.
[1]Source: Extrapolated from 2007 National Health Interview Survey conducted by the National Center for Health Statistics through in-person interviewing.

younger (57% under age 50, compared with 47% among those reached by landline). Across a broad range of attitudinal questions in the two surveys, there was very little difference between the dual users reached by cell phone and those reached by landline.

Young Landline vs. Cell Users

In some respects, young people who rely solely on cell phones are quite different demographically from young people who have landline telephones. Much of the difference is driven by the fact that, even within the 18-29 year-old age group, the average age of cell-only respondents is much younger than of landline respondents. Among respondents under age 30, a greater proportion of cell-only respondents than landline respondents are under age 25 (70% vs. 55%). In part because of their younger age, fewer young cell-only people are married (15% vs. 32%) and fewer have children (19% vs. 31%). Nearly half of young people under the age of 30 who rely exclusively on their cell phones (48%) have household incomes of less than $30,000 a year, compared with about a third (32%) of those in the same age category with landline telephones. There also is a substantial gender difference, with men outnumbering women in the cell-only sample (62% vs. 38%), compared with a more even balance in the landline sample (48% male, 52% female).

However, there are no significant differences in education between young people with landlines and those that are cell-only. While both groups have comparable numbers of whites and African Americans, a greater proportion of cell-only people are Asian (8% vs. 2% of the landline sample) Finally, fewer cell-only young people than those with landlines attend religious services once a week (24% vs. 36%) probably because more are religiously unaffiliated (36% vs. 26%).

Under Age 30 Demographics: Landline Sample vs. Cell Only

	-Ages 18-29-	
	Landline sample	Cell only
	%	%
Ages 18-24	55	70
Ages 25-29	45	30
Male	48	62
Female	52	38
Married	32	15
Never married	64	82
Parent of minor	31	19
$75K or more*	21	15
$50-74,999*	15	11
$30-49,999*	20	20
Less than $30K	32	48
College grad*	25	24
Some college*	31	34
H.S. grad*	33	34
Less than H.S.*	11	8
White*	72	68
Black*	16	15
Asian	2	8
Other/Mixed*	7	6
Hispanic*	12	15
Protestant*	49	41
Catholic*	18	16
Other*	5	6
Unaffiliated*	26	36
Attend Religious Services Weekly	36	24
Sample size	(314)	(143)

Combined Oct. and Dec. 2007 data
Figures based on unweighted data.
*Differences not statistically significant (p>.05)

Although cell-only and landline users under the age of 30 differ demographically, there are very few differences in their political attitudes, ideology, and partisan affiliation. Comparable majorities of young people in the landline and cell-only samples express dissatisfaction with the way things are going in the country, and about the same proportions in both groups disapprove of President Bush's job performance. Slightly more cell-only than landline people affiliate with the Democratic Party; however, ideologically, more cell-only people report they are conservative than their landline counterparts and neither of these differences are significant.

When it comes to the campaign, young people who are cell-only report that they regularly learn about the campaign from a larger number of news sources (an average of 1.98 "regular" sources per person) than do those with landline telephones (an average of 1.66). In contrast, slightly fewer cell-only young people say they have given a lot or some thought to the 2008 presidential campaign and slightly fewer are registered voters than are those with landlines. Among those registered to vote, there are no differences in whether young people are likely to vote in the presidential primary.

Young people have similar views on the situation in Iraq regardless of whether they rely exclusively on their cell phones or have landline telephones. Identical percentages of cell-only and landline young people (55% each) say that the United States made the wrong decision in using military force against Iraq and that the U.S. military effort there is not going well (53%). Compared with those who have landlines, a slightly larger number of cell-only young people think that the U.S. should keep military troops in Iraq until the situation is stabilized (43% vs. 35%).

Under Age 30: Politics in Landline Sample vs. Cell-Only

	-Ages 18-29-	
	Landline sample	Cell only
State of the nation	%	%
Satisfied	37	41
Dissatisfied	52	55
DK/Ref	11	4
	100	100
Presidential approval		
Approve	27	30
Disapprove	65	64
DK/Ref	8	6
	100	100
Party affiliation		
Republican/Lean Rep	35	32
Democrat/Lean Dem	52	59
No leaning/Don't know	13	9
	100	100
Ideology		
Conservative	24	32
Moderate	43	36
Liberal	26	29
DK/Ref	7	3
	100	100
Thought about campaign		
A lot/Some	65	61
Not much/None at all	33	38
DK/Ref	2	1
	100	100
Registered to vote		
Yes, certain	52	49
No/don't know	48	51
	100	100
Right Decision	38	39
Wrong Decision	55	55
DK/Ref	7	6
	100	100
Military effort in Iraq		
Very/Fairly well	43	42
Not too/Not at all well	53	53
DK/Ref	4	5
	100	100
Policy in Iraq		
Keep troops in	35	43
Bring troops home	60	53
DK/Ref	5	4
	100	100
Sample size	(314)	(143)

Combined Oct. and Dec. 2007 data
Landline sample figures based on weighted data.
Cell only figures based on unweighted data.

Overall, these results suggest that the political attitudes of young people do not vary much by telephone status. As a result, while their inclusion in the study substantially increases the number of younger people interviewed, it does not substantially change overall survey estimates.

Practical Considerations in Conducting Interviews on Cell Phones

This study and several others conducted by the Pew Research Center, as well as those by other survey organizations, demonstrate that it is feasible to conduct random sample surveys by cell phone. But the process is costly, requiring significant additional effort by the survey field house and some additional work in data processing and weighting. Exclusive of the fixed study costs such as CATI programming, pre-testing surveys, creating demographic banners, the marginal cost of a cell phone interview in these two studies was approximately *three times larger* than the marginal cost of a landline interview. And in terms of reaching the most critical "cell-only" respondents, previous studies suggest that such interviews cost four to five times more than comparable landline interviews, largely because of the additional screening necessary to locate cell-only respondents.

Interview Features

	Landline sample	Cell sample
Dialing	auto	manual
Voice mail message	Yes	Yes
Approx. cost factor	1.0	3.0
Reimbursement		
October	none	$10 or $20
December	none	$10
Mean number of calls for completions		
October	4.0	4.0
December	3.4	4.3
Underage cases*		
October	0.0% (0/1991)	41.7% (513/1231)
December	0.0% (0/1483)	42.0% (419/997)
Median length		
December	20.0	21.0

*Those under age 18 as a percentage of cooperating numbers.

The cost differential for calling cell phones is a result of several operational differences between calling in the landline and cell sample frames. One of the largest differences results from the fact that, due to federal regulations, telephone numbers in the cell frame must be manually dialed by the interviewer. For landline numbers, an "auto-dialer" is used to take a number from the sample and actually dial it before transferring the call to the interviewer.

Another difference is that a significant number of people reached in the cell frame turned out to be under the age of 18 and thus ineligible for the survey. In fact, more than four-in-ten (42%) of the cell phone respondents who were willing to cooperate with the survey could not be interviewed because the phone belonged to an underage person. None of the cooperating

households in the landline frame was excluded because they contained no adults.[3] This aspect of the cell sample, along with the fact that the cell phone frame reaches a higher percentage of individuals who do not speak English, meant that the percentage of contacted individuals eligible for the survey was far lower in the cell frame – just 45% and 40% in October and December, respectively, compared with 86% and 85% in the landline frame.

Similar Cooperation and Response Rates

	Landline sample %	Cell sample %
Response rate		
October	23	23
December	18	22
Cooperation rate		
October	27	28
December	23	26
Contact rate		
October	84	83
December	82	84
Breakoff rate		
October	12	10
December	13	15
Eligibility rate		
October	86	45
December	85	40
No. of completes		
October	(1507)	(500)
December	(1089)	(341)

Figures computed according to American Association for Public Opinion Research (AAPOR) standard definitions of Response Rate (3), Cooperation Rate (3), Refusal Rate (2), and Contact Rate (2).

A third difference is that respondents in the cell frame were offered a modest cash reimbursement to offset the cost of airtime they might incur while taking the survey. Beyond the expenses incurred, the collection of contact information in order to reimburse respondents, and the attendant administrative and processing costs, adds to the overall cost of interviewing in the cell frame. The vast majority of respondents (85% in October and 80% in December) who agreed to participate in the interview provided the necessary name and mailing address to receive the reimbursement.

To test the potential impact of different amounts of reimbursement, cell phone respondents in October were randomly assigned to be offered either $10 or $20. Somewhat surprisingly, there was virtually no difference in the response rate between those offered $10 and those offered $20. (There also was no difference in the percentage of cooperating respondents who provided a name and address for reimbursement at the end of the interview.)

Apart from the eligibility rates and the cost differential, however, there were remarkable similarities between the cell and landline samples in several aspects of the fieldwork. The contact and cooperation rates between the cell and landline samples were nearly identical. Similarly, the breakoff rate – the percentage of people who begin the interview but do not complete it – was the same in each sample. As a result, overall response rates were very similar in the cell and landline samples – 23% in each sample in October, and 18% in the landline sample in December – compared with 22% in the cell sample.

[3] This difference reflects the fact that the basic unit in the landline frame is typically the household, from which an eligible respondent is selected for interviewing, while cell phones are usually considered to be personal devices linked to a specific individual.

Quality of Responses: Landline vs. Cell Phone Interviews

Differences in the ways that people use landline telephones and cell phones could potentially affect the quality of data collected in surveys sampling both kinds of phone numbers. For example, if people are more distracted or more accustomed to short conversations on a cell phone compared to when they use a landline, then they may not respond as carefully when interviewed on a cell phone. However, studies on this topic[4] have found no substantive differences between the quality of answers recorded in landline interviews and those recorded in cell phone interviews. Results from recent Pew surveys are generally consistent with this finding.

People interviewed in cell samples were less likely to refuse to answer or say "don't know" on at least one question than those interviewed in the landline sample. This result, however, simply reflects the different characteristics of people reachable by landline versus those reachable on a cell phone. For example, adults ages 60 and older are more likely than younger people to decline to answer questions; they also are much more likely to be interviewed in the landline sample. After accounting for such demographic differences, there is no perceptible difference in the rates of Refused/Don't know responses between cell phone and landline samples.

Evaluations of Respondent Behavior

Respondent's cooperation	Landline sample %	Cell sample %
Very good	78	81
Good	15	13
Fair	6	5
Poor	1	1
Very poor	*	*
	100	100
Respondent distracted?		
Very	1	2
Somewhat	11	11
Not too	18	14
Not at all	70	74
	100	100

Based on interviewer rating recorded immediately after the interview. Figures based on unweighted data.

Another way to gain insight into how carefully people respond is through interviewer evaluations. Immediately after completing each interview, interviewers recorded their impressions of the respondent's level of cooperation and level of distraction (each on a four-point scale).

There is a slight suggestion that the cell sample respondents were more cooperative and less distracted than those reached on landlines, but again the difference may be attributable to factors other than the type of phone used by the respondent. The difference in the age distributions of the two samples is one factor. The monetary reimbursement, which was offered only to persons in the cell sample, also may have an effect. Presumably, cell sample respondents' knowledge that they would be remunerated had a positive effect on their attitude during the

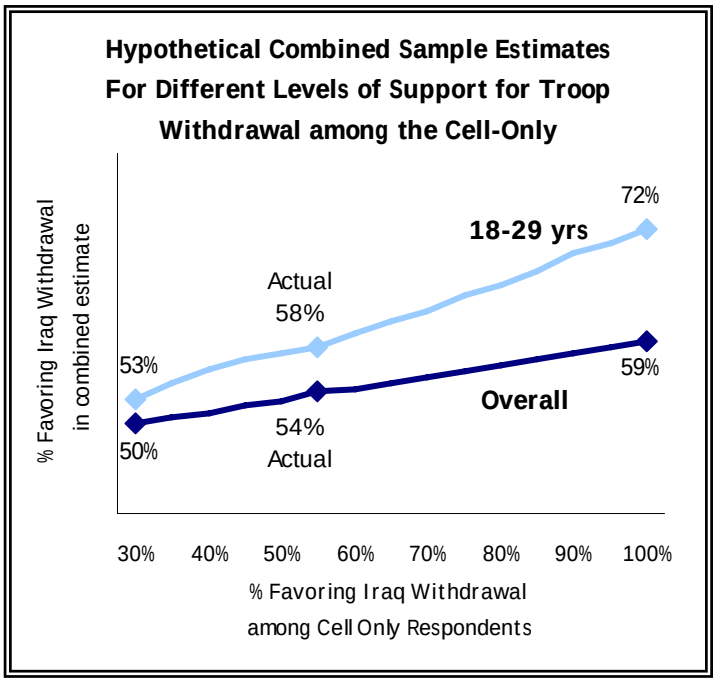
[4] See J. Michael Brick, Pat D. Brick, Sarah Dipko, Stanley Presser, Clyde Tucker, and Yangyang Yuan (2007) "Cell Phone Survey Feasibility in The U.S.: Sampling and Calling Cell Numbers Versus Landline Numbers" *Public Opinion Quarterly*, 71(1): 23-39 and Charlotte Steeh (2004) "A New Era for Telephone Surveys" paper presented at the Annual Conference of the American Association for Public Opinion Research.

interview. By this logic, if an incentive had been offered to the landline sample as well, the rates of cooperation would be even more similar.

Benefits of Conducting Cell Phone Samples

Surveys that rely only on landline interviews are more likely to produce biased estimates if the segment of the public unreachable on a landline differs substantially from the landline public. If the cell-only respondents are not very different from the landline respondents, the survey estimates will not be biased by the absence of the cell-only group. For example, the landline survey finds that 54% of Americans favor bringing troops home from Iraq; among the cell-only respondents, 55% favor a U.S. troop withdrawal. Thus the overall survey estimate is unaffected when the cell-only respondents are blended in. One way to consider the impact of adding cell-only interviews to a survey is to ask the question: How different would the cell-only have to be for the total survey estimates to be affected by their inclusion?

For example, in the unlikely instance that 100% of the cell-only adults favored a troop withdrawal from Iraq, and landline respondents remained divided (with 54% favoring withdrawal), then the combined survey estimate would shift to 59% – a five-point increase. The standard survey alone would underestimate national support for withdrawal. Alternatively, if just 30% of the cell-only respondents favored withdrawal, the combined estimate would be 50%, four points below the current estimate from the landline survey.



These effects are potentially greater when analyzing subgroups in the population, such as young people, who are less likely to be reached on a landline. For example, if 100% of cell-only young people (ages 18-29) favored a troop withdrawal, the combined sample estimate for this age group would be 72% in favor of withdrawal, rather than the 60% that the landline sample of young people produces.

Guarding Against Bias

Findings reported here and in other studies[5] demonstrate that standard landline samples still perform well relative to more expensive designs that combine landline and cell phone samples. Currently, this holds true for most *overall* population estimates. The potential for bias, however, is greater for estimates for subgroups that tend to rely more on cell phones, such as young adults, blacks, Hispanics.

Indeed, for such groups, several standard sample estimates differ from the corresponding combined sample estimates. For example, 46% of Hispanics align with the Democratic Party, based on the standard landline sample. Based on the combined sample, however, 43% of Hispanics consider themselves Democrats. On other items, the standard and combined samples yield similar results, even on estimates for young adults.

When there is a difference between the standard and combined estimates, the natural question is which figure is more accurate. Benchmark data from the American Community Survey (a large multi-mode survey conducted by the Census Bureau) shows that the answer varies.

The combined survey sample yields more accurate estimates for Hispanics on two of the characteristics evaluated here. With regard to African Americans, the combined sample estimate of the proportion of the black population who are parents of children under age 18 is more accurate than the corresponding landline sample estimate. However, the combined sample estimate for the marriage rate among

Subgroup Estimates under Different Sample Designs

	Landline sample	Combined total	*diff*	ACS*
Estimates for Hispanics^				
% Vote for Obama**	12%	15%	*+3*	--
% Democrat	46%	43%	*-3*	--
% Parent of minor	50%	46%	*-4*	47%
% Married	55%	48%	-7	51%
Sample size	(142)	(239)		
Estimate for ages 18-29				
% Vote for Obama**	33%	32%	*-1*	--
% Democrat	33%	35%	*+2*	--
% Parent of minor	32%	29%	*-3*	20%
% Married	30%	25%	*-5*	23%
% Own home***	44%	43%	*-1*	52%
Sample size	(314)	(545)		
Estimate for blacks				
% Vote for Obama**	41%	42%	*+1*	--
% Democrat	60%	58%	-2	--
% Parent of minor	32%	35%	*+3*	37%
% Married	30%	27%	*-3*	33%
% Own home***	44%	46%	+2	53%
Sample size	(274)	(400)		

* Benchmark from the 2006 American Community Survey conducted by the U.S. Census Bureau
^Hispanics in Pew surveys interviewed in English only
** Based on Democratic & Dem-leaning RVs.
Pew figures are weighted based on combined Oct. and Dec. surveys.
*** Asked in December only. Sample size for 18-29: landline (128); combined total (225). Sample size for blacks: landline (106); combined total (154).

[5] See Keeter et al. (2007). Michael W. Link, Michael P. Battaglia, Martin R. Frankel, Larry Osborn, and Ali H. Mokdad. (2007). "Reaching the U.S. Cell Phone Generation: Comparison of Cell Phone Survey Results with an Oungoing Landline Telephone Survey." *Public Opinion Quarterly* 71(5): 814-839. J Michael Brick, Sarah Dipko, Stanley Presser, Clyde Tucker, and Yangyang Yuan. (2006). "Nonresponse Bias in a Dual Frame Sample of Cell and Landline Numbers." *Public Opinion Quarterly* 70(5): 780-793.

blacks is less accurate. For all 18-29 year olds, the combined sample appears to be slightly less biased in estimating the marriage rate and the proportion who are parents of children under 18.

These results demonstrate that a combined sample is not always superior to a standard sample (and vice versa). This may seem counterintuitive given that the combined sample, by definition, does a better job covering the population (both landline and cell phone users). The primary explanation for the shortcomings of both the standard and combined designs appears to be non-response: Everyone with a telephone has a chance of being interviewed in the combined design, but most either do not answer the call or decline to be interviewed. Those who do respond in landline or cell samples sometimes differ systematically on items in the survey from those who do not participate.

Sample Sizes of Groups Relying Mostly on Cell Phones

One potential advantage of a dual-frame survey is that it may be possible to complete more interviews with groups who rely more on cell phones. For example, 28% of cell phone respondents are under age 30. This is more than double the rate of young adults in landline samples (12%). Thus, a sample of 1,000 cell interviews would yield roughly 280 adults age 18 to 30, while an equally-sized sample of landline numbers would yield roughly 120 adults in this age group.

Having a larger sample size is important because it means more precise estimates. Roughly speaking, the margin of error on an estimate for young adults is 6% with a sample size of 280. With the smaller sample size of 120, the estimate is less reliable and the margin of error is about 9%.

Currently, these advantages are not being realized, largely because of the cost. Cell phone interviews are approximately three times more expensive than landline interviews. Young adults, however, are *not* three times more likely to be reached in the cell sample (only about twice as likely). When the survey budget is held fixed, the most effective way to maximize the number of interviews – even for groups like 18-29 year olds who rely more heavily on cell phones – is to allocate the entire budget to increasing the overall number of landline interviews. This is because

An Illustration: Subgroup Sample Sizes under Landline vs. Combined Designs (budget held fixed)

------- *Landline Sample Only Design* -------
(Budget = $100,000, Total *N* = 2,000)

	Expected *n* landline sample		Expected *n* cell sample		Expected *n* total sample
Total	2,000	+	0	=	**2,000**
Blacks	212	+	0	=	**212**
Hispanics	110	+	0	=	**110**
18-29 yr olds	246	+	0	=	**246**

------*Combined (Dual Frame) Design* ------
(Budget = $100,000, Total *N* = 1,400)

	Expected *n* landline sample		Expected *n* cell sample		Expected *n* total sample
Total	1,100	+	300	=	**1,400**
Blacks	117	+	45	=	**162**
Hispanics	61	+	35	=	**95**
18-29 yr olds	135	+	83	=	**218**

Figures are hypothetical and assume a cost ratio of 3-to-1 for the cost of a cell interview versus a landline interview. The incidence rates of each group in landline and cell samples are based on the October and December surveys.

roughly three landline interviews can be completed for the same cost as every one cell phone interview.

Over time the cost differential between landline and cell interviews may narrow. It also is possible that the prevalence of various subgroups may become lower in landline samples and higher in cell samples. Such developments would imply greater sample sizes under a dual frame design (for fixed cost) relative to sample sizes expected under current conditions.

ABOUT THESE SURVEYS

The findings in this report are based on two telephone surveys conducted under the direction of Princeton Survey Research Associates International (PSRAI). The first was among a nationwide sample of 2,007 adults, 18 years of age or older, from October 17-23, 2007 (1,507 respondents were interviewed on a landline telephone, and 500 were interviewed on a cell phone, including 199 who had no landline telephone). The second survey was conducted among a nationwide sample of 1,430 adults, 18 years of age or older, from December 19-30, 2007 (1,089 respondents were interviewed on a landline telephone, and 341 were interviewed on a cell phone, including 113 who had no landline telephone).

A combination of landline and cellular random digit dial (RDD) samples was used to represent all adults in the continental United States who have access to either a landline or cellular telephone. Both samples were provided by Survey Sampling International, LLC (SSI) according to PSRAI specifications.

Numbers for the landline sample were drawn with equal probabilities from active blocks (area code + exchange + two-digit block number) that contained three or more residential directory listings. The cellular sample was not list-assisted, but was drawn through a systematic sampling from 1000-blocks dedicated to cellular service according to the Telcordia database.

For the landline sample, interviewers asked to speak with the youngest adult male currently at home. If no male was available, interviewers asked to speak with the youngest female at home. This systematic respondent selection technique has been shown to produce samples that closely mirror the population in terms of age and gender. For the cellular sample, interviews were conducted with the person who answered the phone. Interviewers verified that the person was an adult and in a safe place before administering the survey. Cellular sample respondents were offered a post-paid cash reimbursement for their participation.

Weighting is generally used in survey analysis to compensate for sample designs and patterns of non-response that might bias results. A two-stage weighting procedure was used to weight these dual-frame samples. A first-stage weight of 0.5 was applied to all dual-users to account for the fact that they were included in both sample frames. All other cases were given a first-stage weight of 1. The second stage of weighting balanced sample demographics to population parameters. The sample was balanced - by form - to match national population parameters for sex, age, education, race, Hispanic origin, region (U.S. Census definitions), population density, and telephone usage. The White, non-Hispanic subgroup was also balanced on age, education and region. The basic weighting parameters came from a special analysis of the Census Bureau's 2006 Annual Social and Economic Supplement (ASEC) that included all households in the continental United States that had a telephone. Based on an extrapolation from the National Health Interview Survey, the cell phone usage parameters were: cell-only = 14%, cell + landline = 60%, landline only = 26%.

The following table shows the error attributable to sampling that would be expected at the 95% level of confidence for different groups in the surveys:

Group	Sample Size	Plus or minus…
October survey (total)	2,007	2.5 percentage points
Landline respondents	1,507	3.0 percentage points
Cell phone respondents	500	5.0 percentage points
Cell-only respondents	199	8.0 percentage points
December survey (total)	1,430	3.0 percentage points
Landline respondents	1,089	3.5 percentage points
Cell phone respondents	341	6.0 percentage points
Cell-only respondents	113	10.5 percentage points

In addition to sampling error, one should bear in mind that question wording and practical difficulties in conducting surveys can introduce error or bias into the findings of opinion polls.

ABOUT THE CENTER

The Pew Research Center for the People & the Press is an independent opinion research group that studies attitudes toward the press, politics and public policy issues. We are sponsored by The Pew Charitable Trusts and are one of eight projects that make up the Pew Research Center, a nonpartisan "fact tank" that provides information on the issues, attitudes and trends shaping America and the world.

The Center's purpose is to serve as a forum for ideas on the media and public policy through public opinion research. In this role it serves as an important information resource for political leaders, journalists, scholars, and public interest organizations. All of our current survey results are made available free of charge.

All of the Center’s research and reports are collaborative products based on the input and analysis of the entire Center staff consisting of:

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