FOR RELEASE AUGUST 1, 2016

Moving Without Changing Your Cellphone Number: A Predicament for Pollsters

10% of U.S. adults have a cellphone number from another state

BY *Meredith Dost and Kyley McGeeney*

FOR MEDIA OR OTHER INQUIRIES:

Kyley McGeeney, Research Methodologist
Rachel Weisel, Communications Associate

202.419.4372

www.pewresearch.org

RECOMMENDED CITATION: Pew Research Center, August, 2016, "Moving Without Changing Your Cellphone Number: A Predicament for Pollsters"

About Pew Research Center

Pew Research Center is a nonpartisan fact tank that informs the public about the issues, attitudes and trends shaping America and the world. It does not take policy positions. The Center conducts public opinion polling, demographic research, content analysis and other data-driven social science research. It studies U.S. politics and policy; journalism and media; internet, science and technology; religion and public life; Hispanic trends; global attitudes and trends; and U.S. social and demographic trends. All of the Center's reports are available at www.pewresearch.org. Pew Research Center is a subsidiary of The Pew Charitable Trusts, its primary funder.

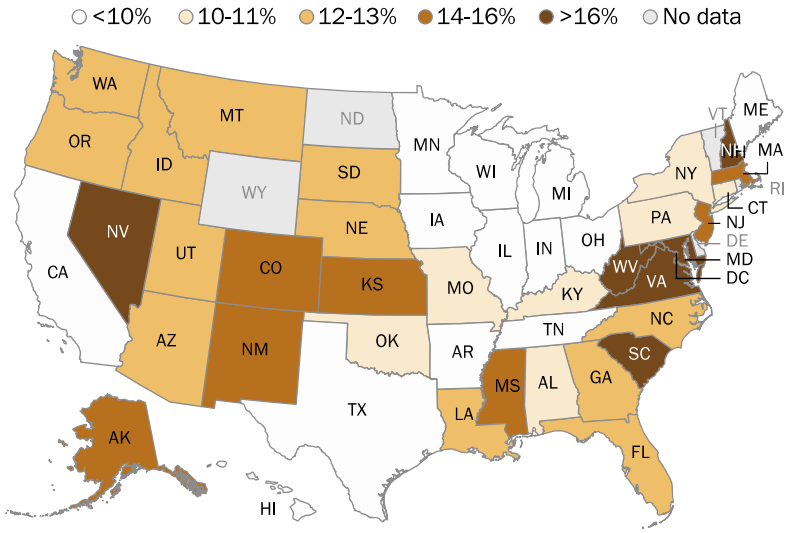
Moving Without Changing Your Cellphone Number: A Predicament for Pollsters

10% of U.S. adults have a cellphone number from another state

Each year about 36 million Americans move residences, according to the Census Bureau. And they quite often take their cellphone numbers with them. Others have not moved but bought their cellphone in a different state. The net result, according to new Pew Research Center estimates, is that 10% of U.S. adults have a cellphone number that doesn't match the state where they actually live. For example, a potential survey respondent may live in Maryland but have a cellphone with a New York area code. For urban dwellers, four-in-ten have a number that doesn't match the *city* where they live.

Washington, D.C., region has highest proportion of residents with cellphone numbers from other states

Proportion living in state with cellphone number from another state



Note: Based on unweighted data from cellphone respondents who provided a valid ZIP code. DE, ND, RI, VT and WY not shown due to insufficient sample size.
Source: Surveys conducted January 2013-December 2015.
"Moving Without Changing your Cellphone Number: A Predicament for Pollsters"

PEW RESEARCH CENTER

This trend has become a headache for researchers doing state- and local-level telephone polling. While some technical solutions are in the works, there is presently no surefire way to capture people with out-of-state or out-of-area numbers in sub-national polls. At the state level, the trend is most pronounced in Washington, D.C., where 55% of residents with a cellphone have a number from outside the District. In some parts of the country, by contrast, this is almost a nonissue. In Michigan, for example, just 5% of adults with cellphones have an out-of-state number.

These results are based on an analysis of 30 national political surveys conducted by Pew Research Center from 2013 to 2015. The pooled data consist of more than 32,000 cellphone respondents[1],

[1] This analysis is based on cellphone respondents who reported their ZIP code. Some 4% of the respondents (n=1,374) didn't know their zip code, provided an invalid one or declined to provide it and were, thus, excluded from analysis.

including nearly 18,000 respondents who do not have a landline in their home. To determine the share of geographic mismatch, researchers compared respondents' self-reported ZIP code with the location associated with their cellphone number. A cellphone's location is based on its area code, exchange and thousand-block, e.g. 917-593-2xxx, which are assigned according to the location where the phone was purchased. It was necessary to go back to 2013 to amass enough data to report results at the state level. This may be an underestimation of this phenomenon, especially as more people acquire cellphones and as it becomes the norm to keep them for a longer period of time and retain the same number when moving.

Determining how big of a problem out-of-area cellphone numbers are for pollsters entirely depends on the geographic population pollsters are trying to target. For national polls, including nearly all those conducted by Pew Research Center, it is not a problem. By dialing nationwide, researchers reach the target population of U.S. adults regardless of any internal mismatch across cities and states. If the goal is then to report survey findings by geography, researchers use respondents' self-reported locations based on ZIP code. But for pollsters conducting surveys at the state or local level, especially in areas where the mismatch rate is high, out-of-area cellphone numbers are a serious concern because self-reported location is typically not available when selecting the sample of numbers to call.

In state-level polling, researchers typically draw a sample of phone numbers from a state in order to survey its residents. If people living there have a cellphone number from a different state, they won't be included in that sample. This phenomenon is known as under-coverage. Excluding a group of people, especially one that's shown to be demographically distinct, has the potential to bias survey estimates. It's therefore important to understand just how large the under-coverage rate is, as well as the characteristics of who is excluded, in order to assess its potential effect on the final data.

Nearly half of adults living in urban areas have a cellphone number from elsewhere

Trying to infer where someone lives based on their cellphone number is clearly subject to error, and this error increases as the geographic unit of analysis gets smaller. For regional analysis (e.g., Northeast, South, Midwest, West), this is a minor concern; the new analysis finds that the cellphone number's region and self-reported region match for 95% of adults, similar to findings in a 2009 Pew Research Center analysis.

At the state level, the geographic accuracy rate tends to be lower. Overall, about 10% of adults who live in a particular state have a cellphone number associated with a different state. Even more striking is the fact that, at the metropolitan level, four-in-ten adults have a number from outside the metropolitan area in which they live.

Match rate is lower for smaller geographic areas

% whose self-reported geography matches geography based on cellphone phone number

	Region	State	MSA	n
	%	%	%	
All adults	95	90	60	32,247
Cellphone users				
No landline	**93**	**86**	**55**	17,800
Have landline	96	91	57	14,447
Total	94	89	56	32,247

Note: Cellphone user data based on unweighted data from respondents who provided a valid ZIP code. All adults data based on cellphone users re-based to all adult using NHIS data. Significant differences between cellphone respondents with versus without a landline in **bold.**
Source: Surveys conducted January 2013-December 2015. Percent of all adults that have a cellphone from July-December 2015 NHIS. "Moving Without Changing Your Cellphone Number: A Predicament for Pollsters"

PEW RESEARCH CENTER

Unfortunately for pollsters, the mismatch rates are somewhat higher for respondents who are cellphone-only – those without a landline telephone in their home – than for cellphone respondents who have a landline. This is a problem because cellphone-only individuals can only be reached via their cellphone, whereas people who also have a landline can be reached on their landline even if their cellphone is excluded from the sample due to a geographic mismatch. At the regional level, 93% of cellphone-only respondents report living in the region that matches their sample information, compared with 96% of respondents who also have a landline. A similar pattern exists for state and metropolitan-level geographic data. The remainder of this analysis focuses on all cellphone respondents regardless of landline telephone ownership.

Share of adults with out-of-area cellphone numbers varies widely by state

The mismatch between where people live and their cellphone number location has the potential to be an issue in state polls, and the risk to pollsters is greater in some states than in others. In states such as Michigan, Ohio, Iowa and California the mismatch rate is 5% to 7%. By contrast, Washington,

Substantial variation across states in the share of adults with nonlocal numbers

Under-coverage (% of state's cellphone-using residents who have cellphone number from other state) and over-coverage (% of cellphone users with cellphone number from this state but who don't live there). For example, 55% of cellphone users living in Washington, D.C., have a cellphone number from another state, while 61% of cellphone users with a D.C. cellphone number don't actually live in D.C.

	Under-coverage	Over-coverage		Under-coverage	Over-coverage
	%	%		%	%
D.C.	55	61	Louisiana	12	12
Maryland	21	18	Oregon	12	12
New Hampshire	21	25	Utah	12	10
Nevada	19	18	Alabama	11	8
Virginia	18	15	Connecticut	11	19
West Virginia	18	12	Kentucky	11	10
South Carolina	17	8	New York	11	15
Colorado	16	13	Pennsylvania	11	11
Massachusetts	16	15	Missouri	10	13
New Mexico	16	9	Oklahoma	10	9
Kansas	15	9	Illinois	9	13
New Jersey	15	18	Indiana	9	9
Alaska	14	13	Maine	9	15
Mississippi	14	10	Tennessee	9	14
Arizona	13	10	Texas	9	8
Florida	13	10	Wisconsin	9	10
Montana	13	8	Arkansas	8	8
Nebraska	13	12	Hawaii	8	21
North Carolina	13	11	Minnesota	8	12
South Dakota	13	10	California	7	8
Washington	13	10	Iowa	7	8
Georgia	12	12	Ohio	7	10
Idaho	12	10	Michigan	5	9

Note: Based on unweighted data from cellphone respondents who provided a valid ZIP code. DE, ND, RI, VT and WY not shown due to insufficient sample size. Full table with N sizes available in appendix.
Source: Surveys conducted January 2013-December 2015.
"Moving Without Changing Your Cellphone Number: A Predicament for Pollsters"

PEW RESEARCH CENTER

D.C. (55%), Maryland and New Hampshire (21% each) all have relatively high shares of cellphone users with out-of-state numbers.

The flip side of this mismatching is also problematic for pollsters. If a pollster attempts to conduct a cellphone random-digit-dial (RDD) survey in Maryland, for example, about one-in-five respondents (18%) will report living elsewhere. Such interviews are typically treated as ineligible for the survey, wasting interviewer time and increasing the survey cost. This phenomenon,

sometimes called over-coverage, can be measured as the proportion of adults with a cellphone number associated with a given state but who live elsewhere. Washington, D.C. (61%), New Hampshire (25%) and Hawaii (21%) all have relatively high rates of over-coverage. In other words, approximately six-in-ten cellphone respondents with D.C. cellphone numbers actually live in a different state.

Geographically mismatched respondents younger, more highly educated

Cellphone respondents whose cellphone number does not match the state where they live (i.e., mismatched) are demographically distinct from cellphone respondents whose phone number and state of residence match. Mismatched respondents are younger, more highly educated and have higher incomes than matched respondents. A majority (55%) of those with mismatched geography are college graduates, compared with 38% of respondents who currently live in the state associated with their cellphone number.

The mismatched respondents are also more likely to be non-Hispanic whites and religiously unaffiliated and are less likely to be married and to be parents of children under age 18. Just 20% of those with mismatched states are parents of under-18 children, while about three-in-ten adults (31%) whose sample and self-reported states match report being parents. These findings are generally consistent with research by other research teams studying the

Mismatched younger, more educated

% of adult cellphone users whose self-reported state and state where their cellphone number is from are …

	Matched	Mismatched
	%	%
Men	57	59
Women	43	41
18-29	**22**	33
30-49	**32**	35
50-64	**29**	19
65+	**16**	12
White, non-Hispanic	**66**	69
Black, non-Hispanic	**12**	10
Hispanic	**14**	9
Other, non-Hispanic	**7**	10
College grad+	**38**	55
Some college	**29**	24
HS graduate or less	**32**	21
$75,000 or more	**31**	37
$30,000-$74,999	32	33
Less than $30,000	**30**	24
Republican/Lean Rep	**41**	39
Democrat/Lean Dem	**48**	51
Protestant	**48**	41
Catholic	**20**	16
Other	**10**	13
Unaffiliated	**23**	30
Married	**47**	41
Parent of child <18	**31**	20

Note: Based on unweighted data from cellphone respondents who provided a valid ZIP code. Significant differences between matched and mismatched in **bold.**
Source: Surveys conducted January 2013-December 2015. "Moving Without Changing Your Cellphone Number: A Predicament for Pollsters"

PEW RESEARCH CENTER

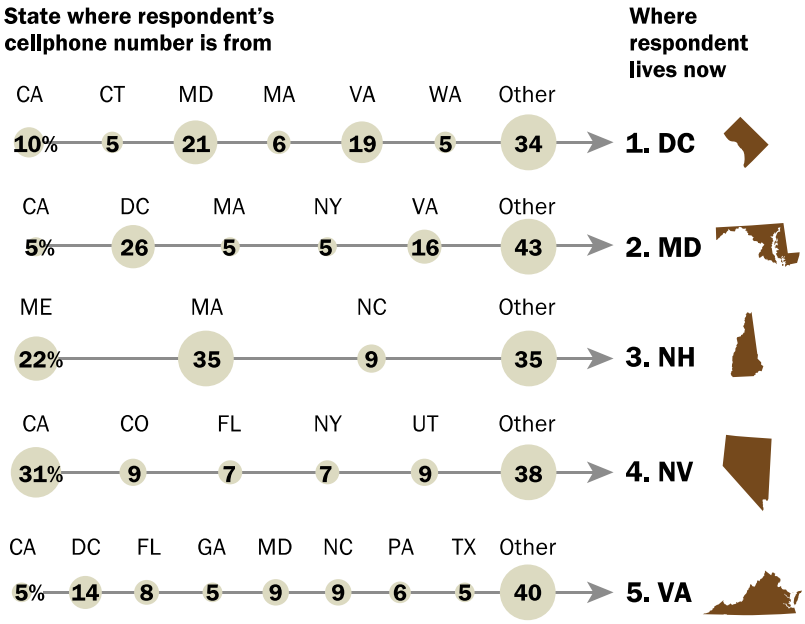
characteristics of adults with out-of-area cellphone numbers.[2]

Strategies to include people with out-of-area numbers in telephone polls

Several strategies are available for including people with out-of-area numbers in telephone polls, but all of them have limitations. The most straightforward approach is to sample cellphone numbers from surrounding geographies when conducting a poll of a small area, such as a city or even a state. For instance, a telephone survey of District of Columbia residents would likely need to sample Maryland and Virginia telephone numbers; however, people living in the District with cellphone numbers from California would still not be captured in the cellphone sample, and D.C. phone numbers belonging to individuals now living in California would need to be screened out.

Out-of-state cellphone numbers not always from nearby states

Below are the five states with the highest share of cellphone users who have an out-of-state number. The chart shows the state of origin of these out-of-state numbers. For example, 10% of adult cellphone users with an out-of-state number in Washington, D.C., have a California cellphone number.



Note: Based on unweighted data from cellphone respondents who provided a valid ZIP code. May not add to 100% due to rounding. States making up at least 5% of out-of-state cellphone numbers in a given state are shown.
Source: Surveys conducted January 2013-December 2015.
"Moving Without Changing your Cellphone Number: A Predicament for Pollsters"

PEW RESEARCH CENTER

In a previous report, Pew Research Center discussed alternative strategies that employ products telephone sample vendors offer to address this issue. For example, it is now possible to design a telephone sample using the billing address associated with a cellphone number. That helps to improve accuracy in many cases, but it is not a perfect solution. Billing address information is still not new

[2] Benjamin Skalland and Meena Khare. 2013. "Geographic Inaccuracy of Cell Phone Samples and the Effect on Telephone Survey Bias, Variance, and Cost." Journal of Survey Statistics and Methodology, 1(1), 45-65; and Stephanie Marken, Manas Chattopadhyay, and Anna Chan. 2016. "Covering Our Most Mobile Users: Identifying Which States are Most Susceptible to Coverage Error." Presented at the Annual Conference of the American Association for Public Opinion Research.

available for a large fraction of cellphone numbers, and even when it is available, it is sometimes not indicative of where the user actually lives. For example, the billing address for a college student included on a family plan would reflect a parent's location, not the student's.

Notably, pollsters who draw their samples from voter files rather than RDD frames do not have this problem. Polls built off voter files are based on the residential address on file for each person. Telephone numbers, including those of cellphones, are included in those files, but the sampling is based on the residential address reported by the adult when they registered to vote. While voter file samples are good option for pollsters looking to survey voters, it is not clear that they are a good option for organizations like Pew Research Center that study the attitudes and experiences of all U.S. adults, regardless of registration status.

Appendix: Full under-coverage and over-coverage table

Substantial variation across states in the share of adults with nonlocal numbers

Under-coverage (% of state's cellphone-using residents who have cellphone number from other state) and over-coverage (% of cellphone users with cellphone number from this state but who don't live there). For example, 55% of cellphone users living in Washington, D.C., have a cellphone number from another state, while 61% of cellphone users with a D.C. cellphone number don't actually live in D.C.

	Under-coverage %	n	Over-coverage %	n		Under-coverage %	n	Over-coverage %	n
D.C.	55	113	61	132	Louisiana	12	497	12	495
Maryland	21	618	18	597	Oregon	12	515	12	516
New Hampshire	21	112	25	119	Utah	12	403	10	394
Nevada	19	243	18	241	Alabama	11	505	8	487
Virginia	18	1,020	15	984	Connecticut	11	305	19	332
West Virginia	18	187	12	175	Kentucky	11	465	10	460
South Carolina	17	489	8	442	New York	11	1,724	15	1,813
Colorado	16	657	13	636	Pennsylvania	11	1,220	11	1,228
Massachusetts	16	633	15	629	Missouri	10	636	13	659
New Mexico	16	289	9	267	Oklahoma	10	486	9	479
Kansas	15	331	9	308	Illinois	9	1,128	13	1,181
New Jersey	15	748	18	773	Indiana	9	790	9	784
Alaska	14	137	13	136	Maine	9	149	15	158
Mississippi	14	300	10	288	Tennessee	9	674	14	712
Arizona	13	735	10	714	Texas	9	2,581	8	2,558
Florida	13	1,914	10	1,853	Wisconsin	9	604	10	609
Montana	13	163	8	154	Arkansas	8	336	8	337
Nebraska	13	185	12	183	Hawaii	8	116	21	136
North Carolina	13	1,099	11	1,071	Minnesota	8	598	12	620
South Dakota	13	109	10	106	California	7	3,267	8	3,297
Washington	13	788	10	759	Iowa	7	367	8	369
Georgia	12	1,072	12	1,064	Ohio	7	1,212	10	1,255
Idaho	12	275	10	267	Michigan	5	1,038	9	1,080

Note: Based on unweighted data from cellphone respondents who provided a valid ZIP code. DE, ND, RI, VT and WY not shown due to insufficient sample size.
Source: Surveys conducted January 2013-December 2015.
"Moving Without Changing Your Cellphone Number: A Predicament for Pollsters""

PEW RESEARCH CENTER

Acknowledgements

This report is a collaborative effort based on the input and analysis of the following individuals:

Primary Researchers
Meredith Dost, *Research Assistant*
Kyley McGeeney, *Senior Research Methodologist*
Courtney Kennedy, *Director, Survey Research*

Collaborating Researchers
Scott Keeter, *Senior Survey Advisor*
Anna Brown, *Research Analyst*
Nick Hatley, *Research Assistant*

Editorial and Graphic Design
Bill Webster, *Information Graphics Designer*
David Kent, *Copy Editor*

Communications and Web Publishing
Rachel Weisel, *Communications Manager*
Travis Mitchell, *Digital Producer*

Methodology

The analysis in this report is based on a compilation of 30 general population political surveys conducted by the Pew Research Center from January 2013 to December 2015. These interviews were conducted among adults 18 years of age or older, living in all 50 U.S. states and the District of Columbia. The analysis is based on the 32,247 cellphone respondents who provided valid ZIP codes, including 17,800 respondents who do not have a landline in their home.

The majority of these surveys were conducted by Princeton Survey Research Associates International; the March 2013, October 2013, 2014 Political Polarization and Typology and August 2014 surveys, as well as the 2015 Survey on Government, were conducted by Abt SRBI. A combination of landline and cellphone random-digit-dial samples were used; both samples were provided by Survey Sampling International. Interviews were conducted in English and Spanish. Respondents in the landline sample were selected by randomly asking for the youngest adult male or female who is now at home. Interviews in the cell sample were conducted with the person who answered the phone, if that person was an adult 18 years of age or older. For detailed information about our survey methodology, see http://www.pewresearch.org/methodology/u-s-survey-research/. Pew Research Center undertakes all polling activity, including calls to mobile telephone numbers, in compliance with the Telephone Consumer Protection Act and other applicable laws.

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

Group	Unweighted sample size	Margin of error Plus or minus …
All cellphone respondents	32,247	0.5 percentage points
Matched sample and self-reported state	28,546	0.6 percentage points
Mismatched sample and self-reported state	3,701	1.6 percentage points

Sample sizes and sampling errors for other subgroups are available upon request.

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.

Pew Research Center is a nonprofit, tax-exempt 501(c)(3) organization and a subsidiary of The Pew Charitable Trusts, its primary funder.