

# Evaluating Where Overlap Occurs in a Landline and Cell Phone Dual Frame Survey

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## Abstract

There are two common approaches to a landline/cell phone dual frame RDD sample: the screened approach where landline users from the cell phone sample are screened out; and the overlap approach where everyone is interviewed in the landline and cell phone samples. The Behavioral Risk Factor Surveillance System (BRFSS) began using the screened approach in 2008. In 2012 the design was modified to include dual-users who receive at least 90 percent of all calls on their cell phone. In 2011 we conducted an experiment wherein all cell-users (those with and without a landline) in 4 states were eligible to complete the BRFSS survey. We grouped respondents on a continuum according to the percentage of calls received on their cell phone: 100% landline, 90% landline/10% cell up to 10% cell/90% landline and 100% cell. Theoretically, respondents in the same usership category should be similar regardless of the sample from which they came. We will evaluate this by demographically comparing respondents reached by landline to those reached by cell for each category on the continuum. We will also evaluate the continuum distribution for the landline sample compared to the cell phone sample.

## 1. Introduction

As the industry learns more about telecommunication behaviors and response propensities, dual-frame designs are evolving to include combinations of screening and overlap. As telecommunication behaviors evolve, who we are actually reaching on landline and cell phone samples is also evolving. In theory, respondents who are dual users that fall into the same usership category should be similar in characteristics regardless of the sample from which they are selected.

In 2012 the BRFSS design was modified to include dual users who self-report receiving 90% or more of calls on their cell phone. Respondents to both the landline and cell surveys are asked "Thinking about all the phone calls that you receive on your landline and cell phone, what percent, between 0 and 100, are received on your cell phone?"

The change from cell-only to the dual-user mode on the BRFSS survey with the criteria of 90% or more cell phone user ship led us to question what type of respondents we would interview – and what type of respondents would still be missing – by screening for the 90% and above users in the cell interview.

The objective of this study was to determine whether dual users that fall into the same usership category have similar characteristics, and to determine who we are reaching when sampling dual users.

We examined demographic characteristics of BRFSS landline and cell phone survey respondents to determine whether they are similar at different points along the usage continuum. If they are similar, respondents who fall into the same user ship category should be similar regardless of the sample from which they were selected.

We also wanted to see if the user ship categories are adequately represented if we select only one of the frames. If we are screening for 90% or more usage on cell phones, how many <90% users do we get from the landline survey and is that enough to adequately represent the population?

## 2. Methods

The population from which the Behavioral Risk Factor Surveillance Survey cell phone sample was drawn prior to 2012 was the total non-institutionalized adult population residing in dwelling units (DUs), that have a cell phone, and that do not also have a land line telephone. This population excludes: (1) adults in penal, mental, or other institutions; (2) adults living in other group quarters such as dormitories, barracks, convents, or boarding houses (with ten or more unrelated residents); (3) adults contacted at their second DU during a stay of less than 30 days; and (4) adults living in a DU with a landline telephone.

During November and December of 2011 we expanded the cell phone sample frame so that all cell-users (those who also have a landline and those who do not) contacted in Arizona, Connecticut, New Hampshire and Vermont were eligible to complete the BRFSS cell survey.

## 3. Results

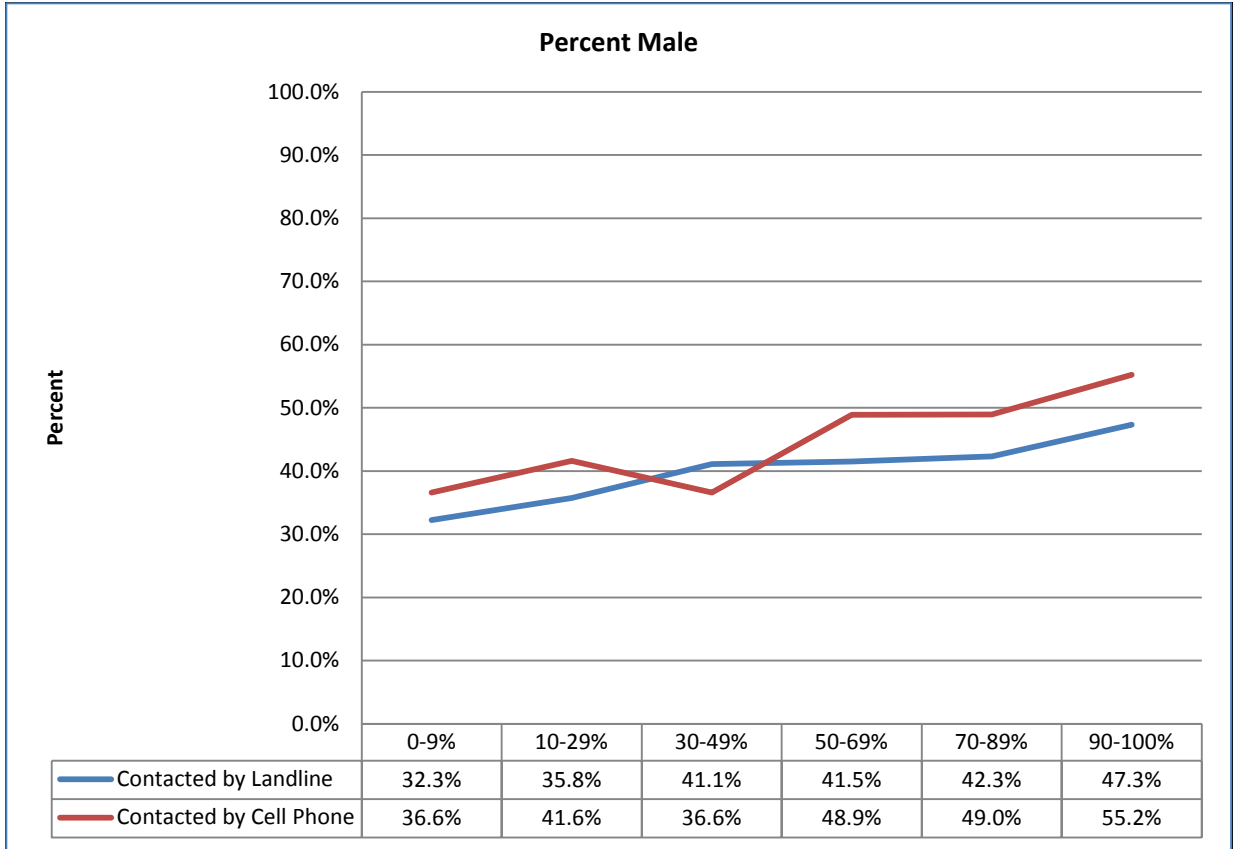
### 3.1 Characteristics of Dual-Users.

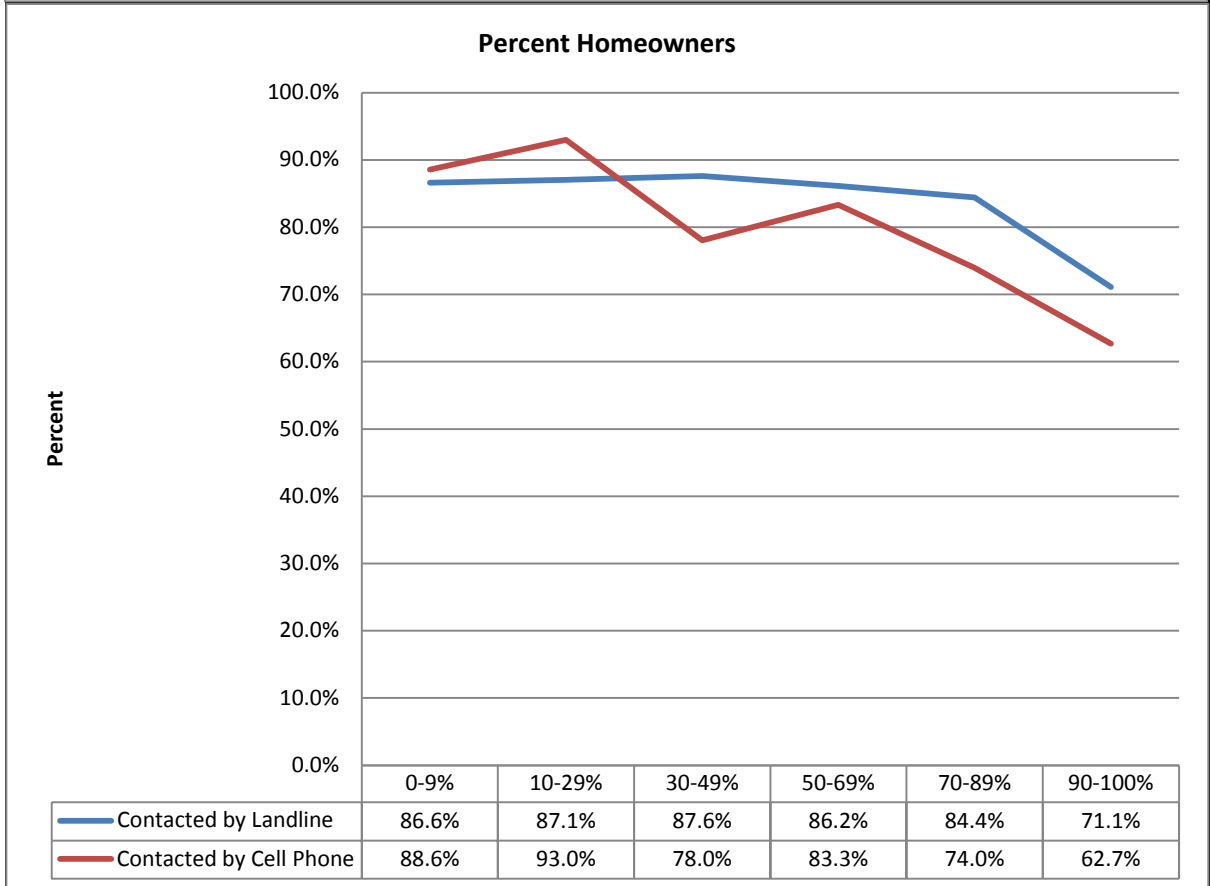
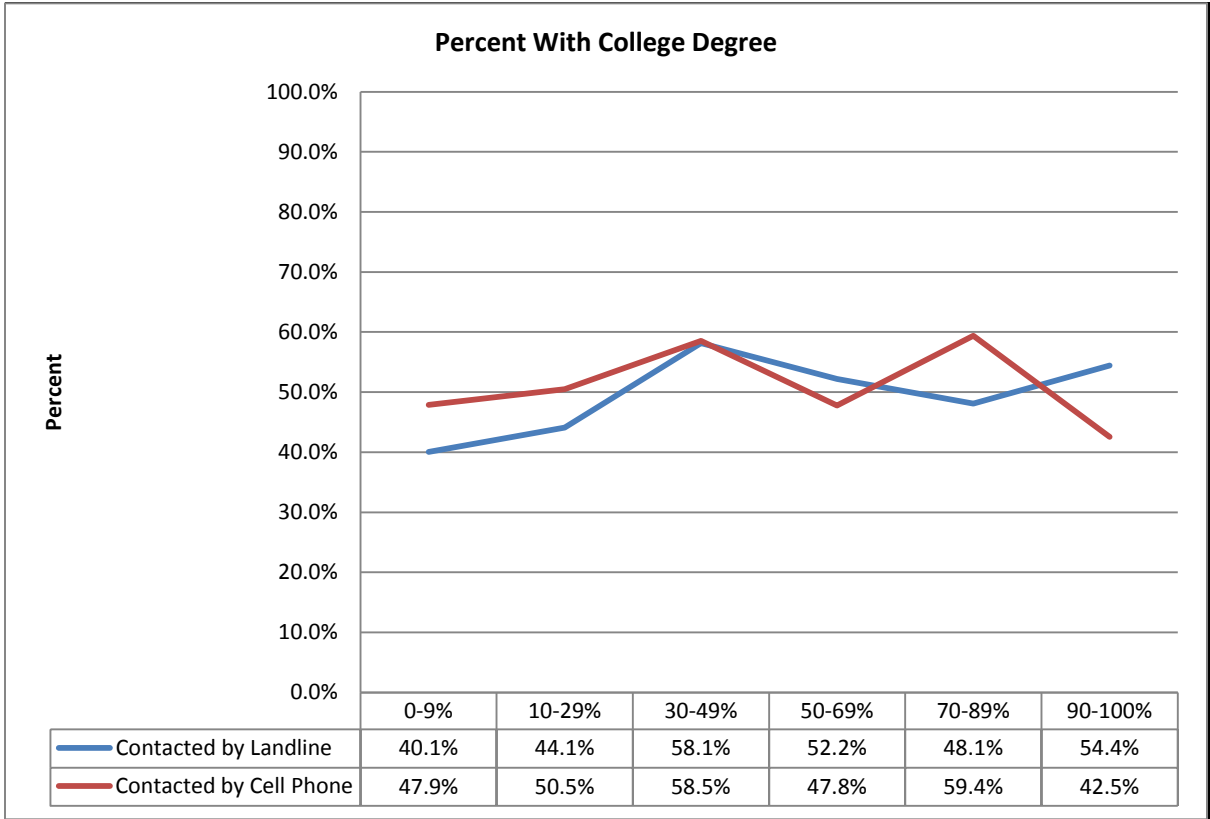
The demographic characteristics and health indicators we compared include gender, age, race, college degree, employment status, home ownership, health insurance status, marital status, children, general health status, diabetes, binge drinking, and smoking status. First we looked at these characteristics of dual land and cell users, across all user categories combined. When viewed as a whole, the dual users reached by landline differ from dual users reached by cell phone on a number of characteristics, which is expected based on prior research of cell respondents. For example:

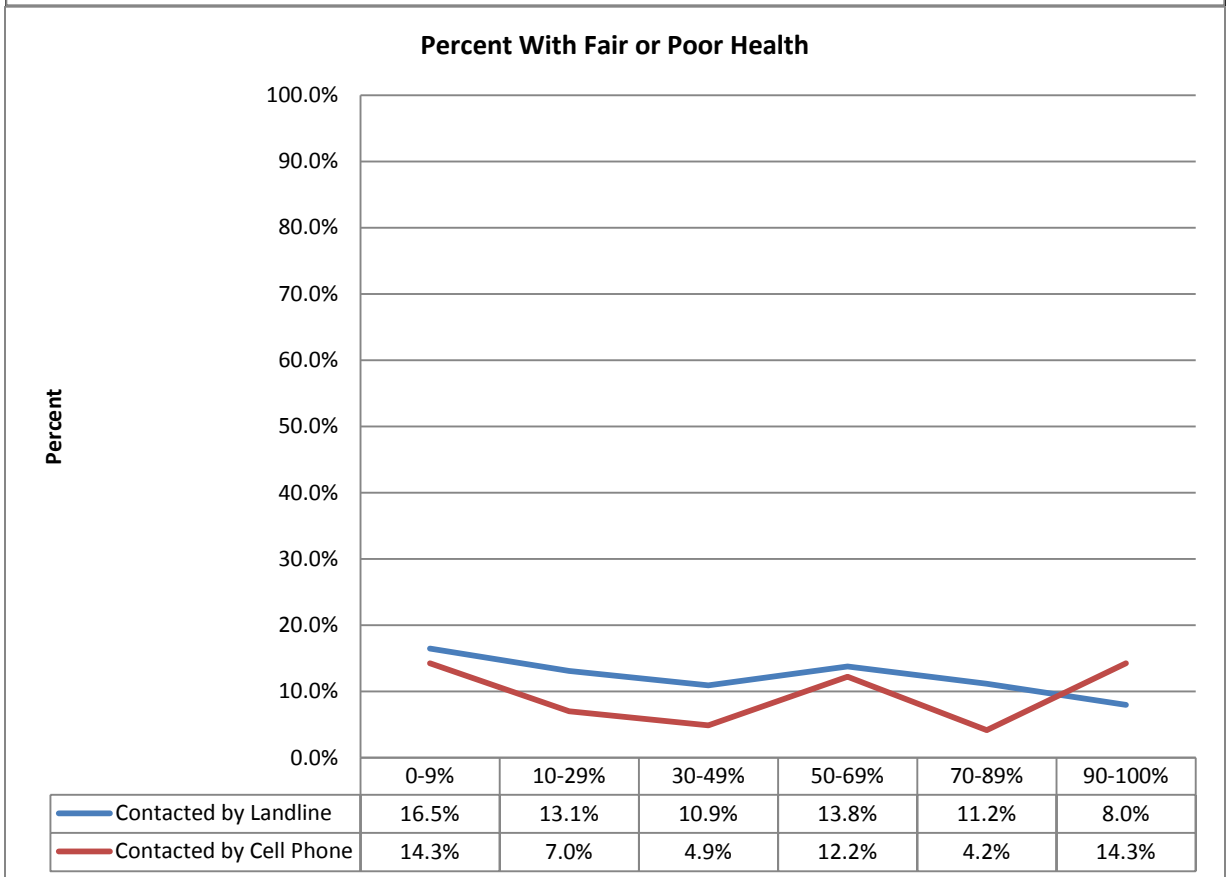
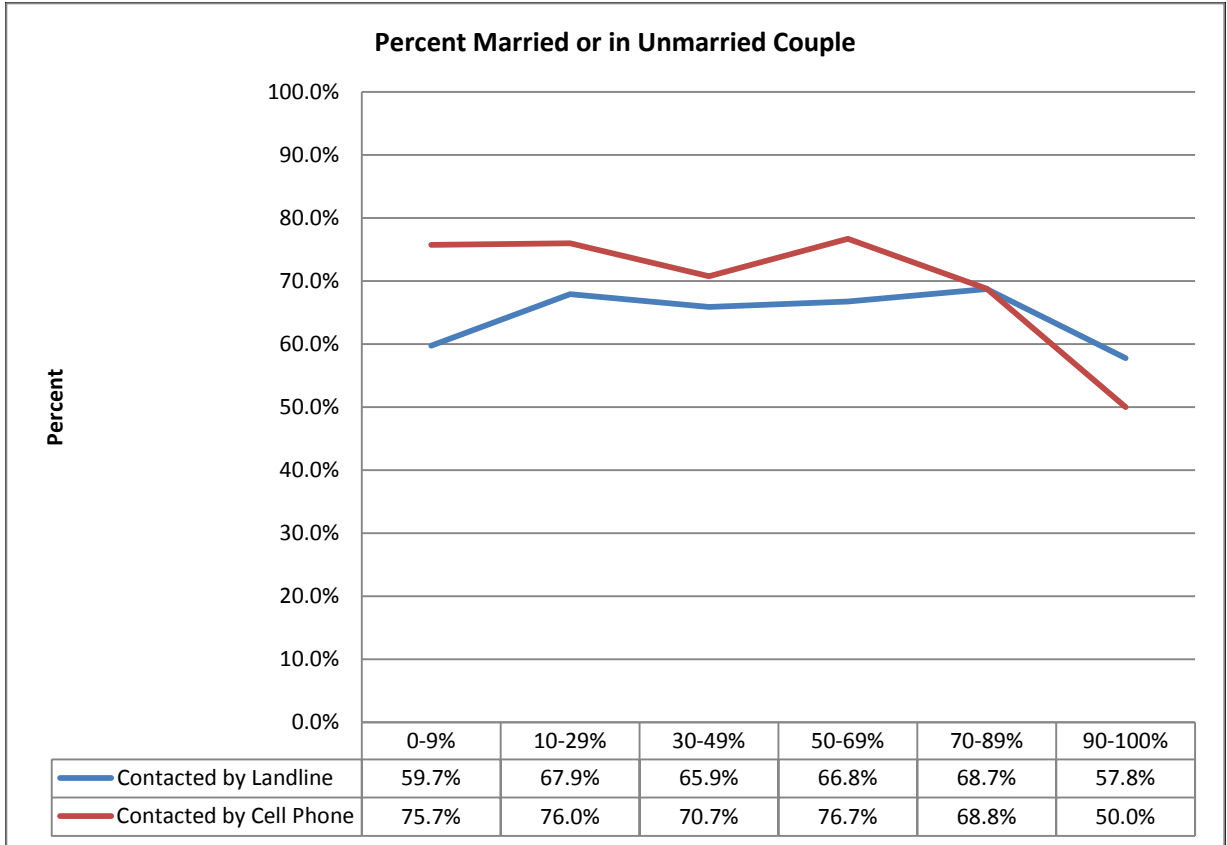
- Adults 18-24 years old are reached 3.3% more often on cell phones than landlines.
- Adults 65 and older are reached 16.9% more often on landlines than cell phones.
- Females are reached 9.1% more often on landlines than cell phones
- Males are reached 9.1% more often on cell phones than landlines.
- Minority respondents are 1.5% more likely to be interviewed on cell phones than white non-Hispanic persons.
- Cell respondents are 6.8% more likely to have children in their household.
- Landline respondents are 5.7% more likely to own their home.
- Cell respondents were 2.9% more likely to have a college degree.

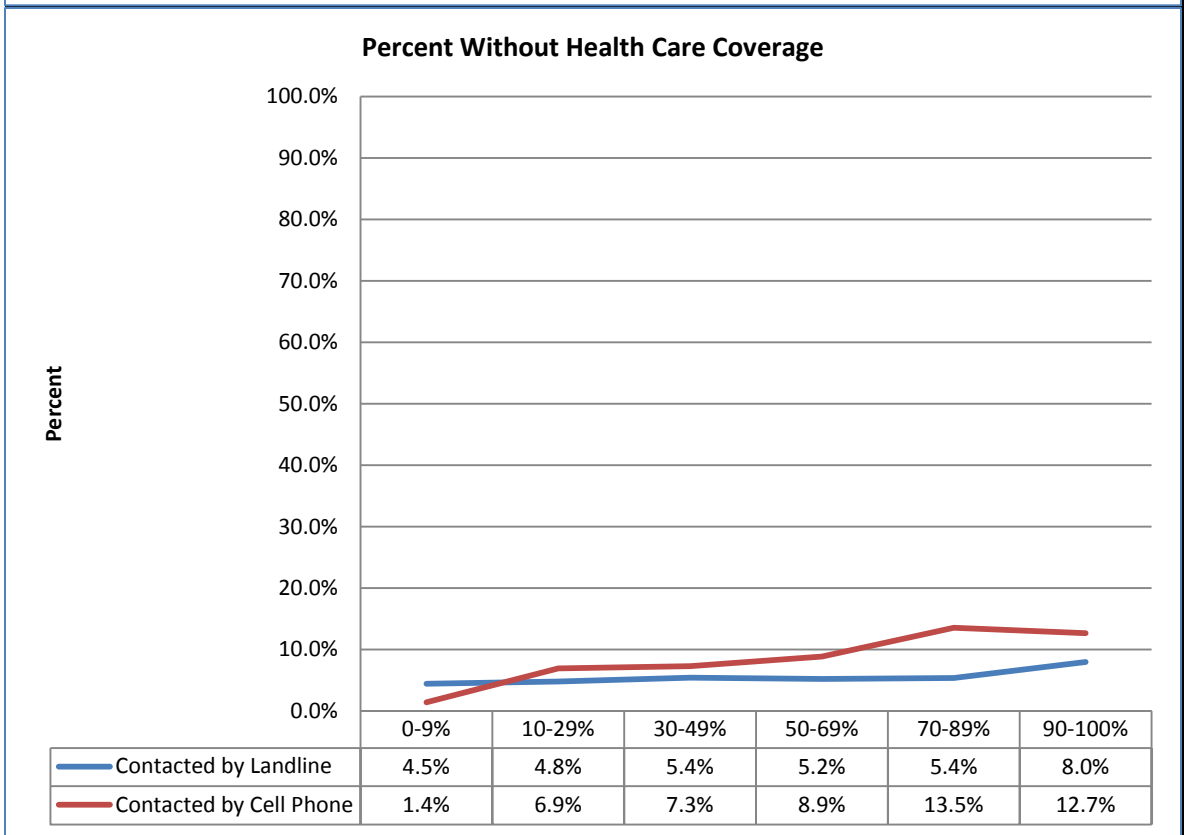
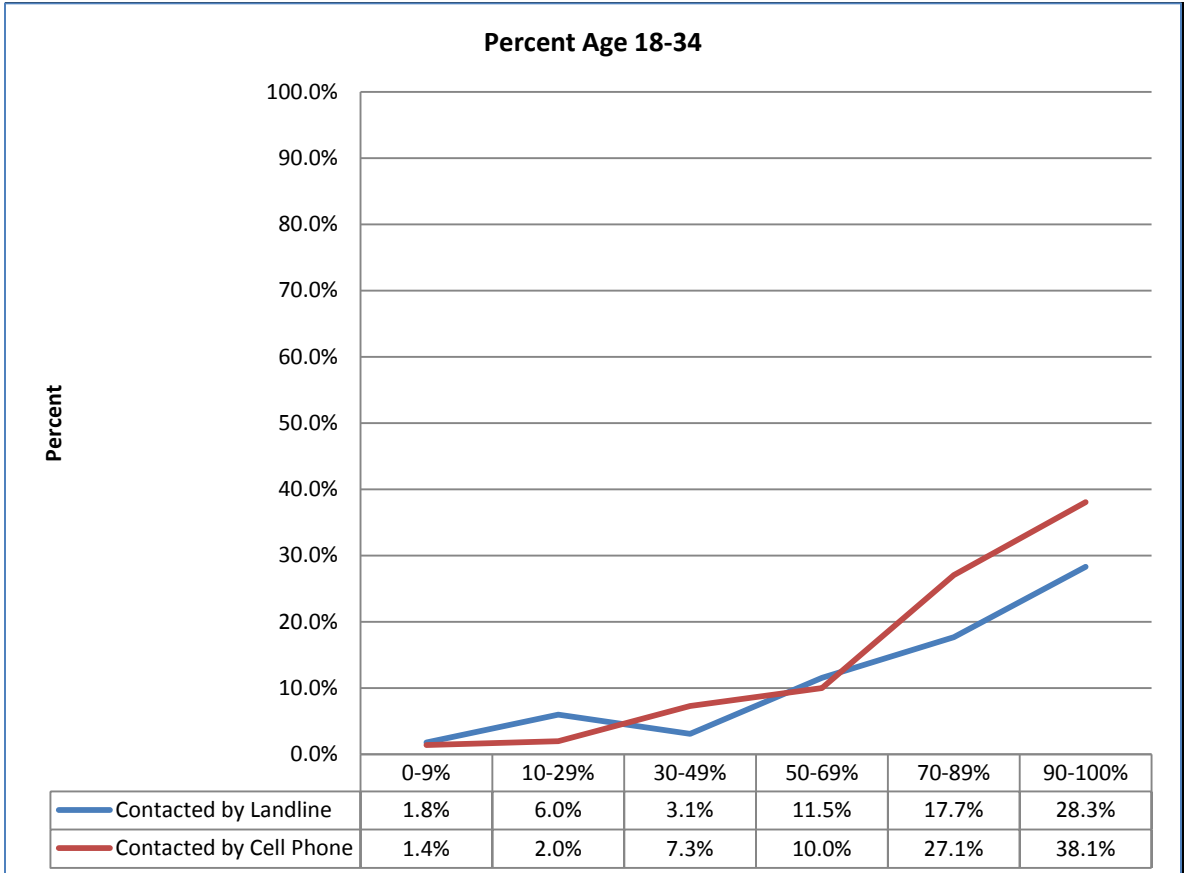
### 3.2 Charting Dual User Characteristics by Percent Cell Usage.

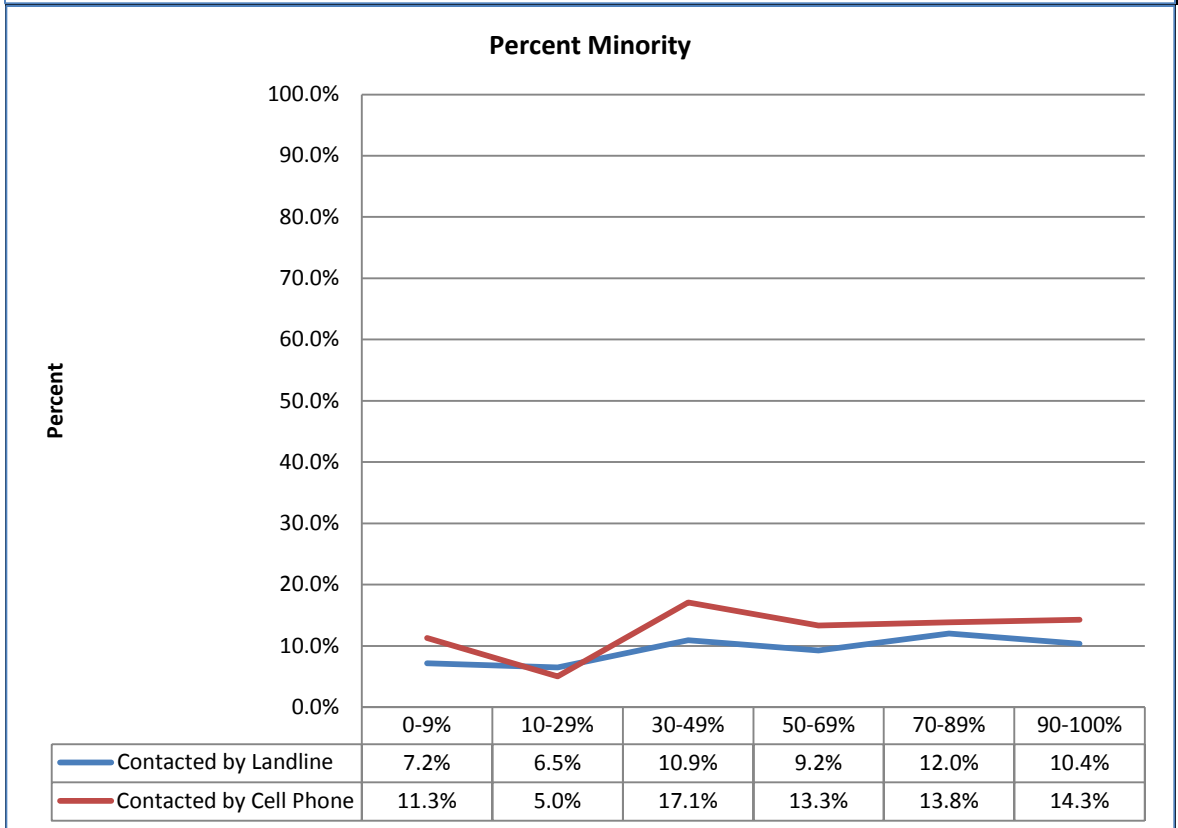
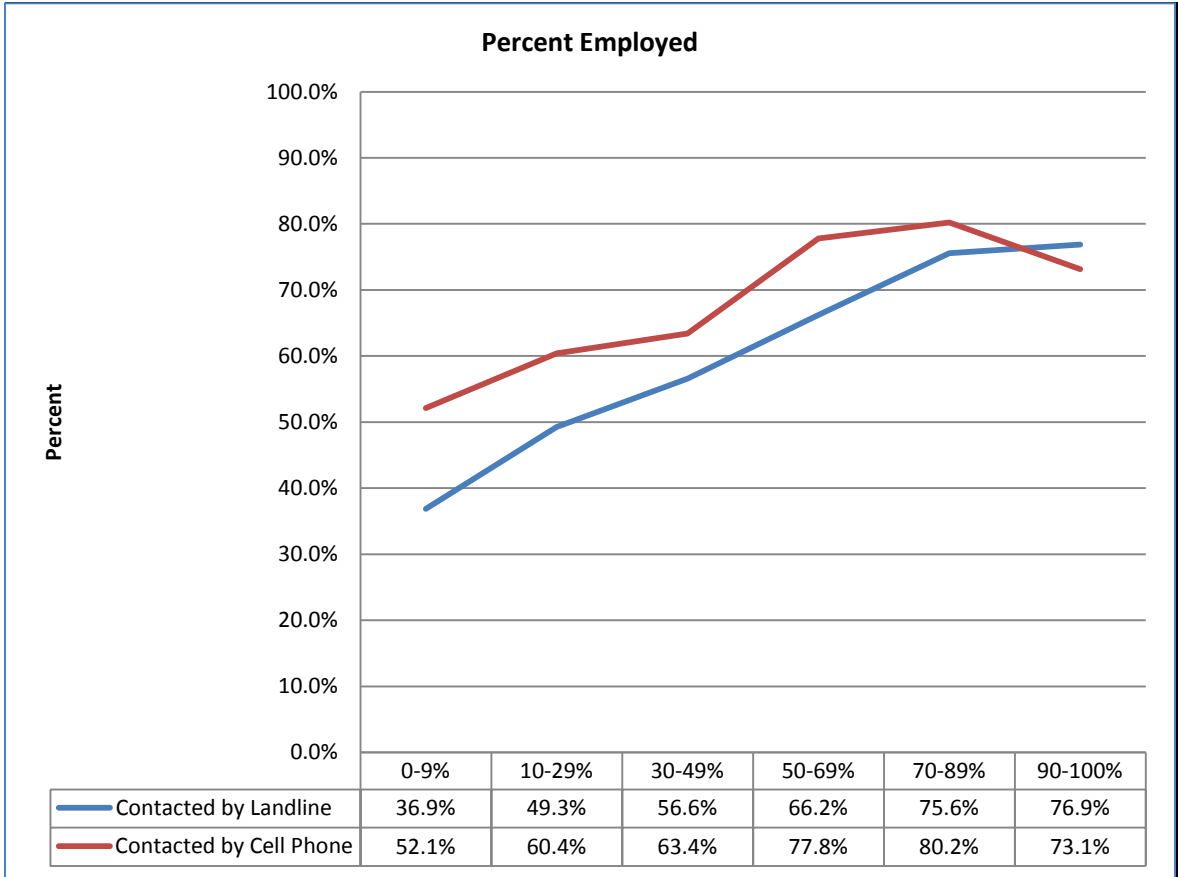
Next we looked at these demographic and health indicators of respondents, and compared them at each user ship category between land and cell samples. We found that some characteristics were more similar across usage groups than others. Degree status, home ownership, marital status, and poor health status had the greatest differences between usage groups.

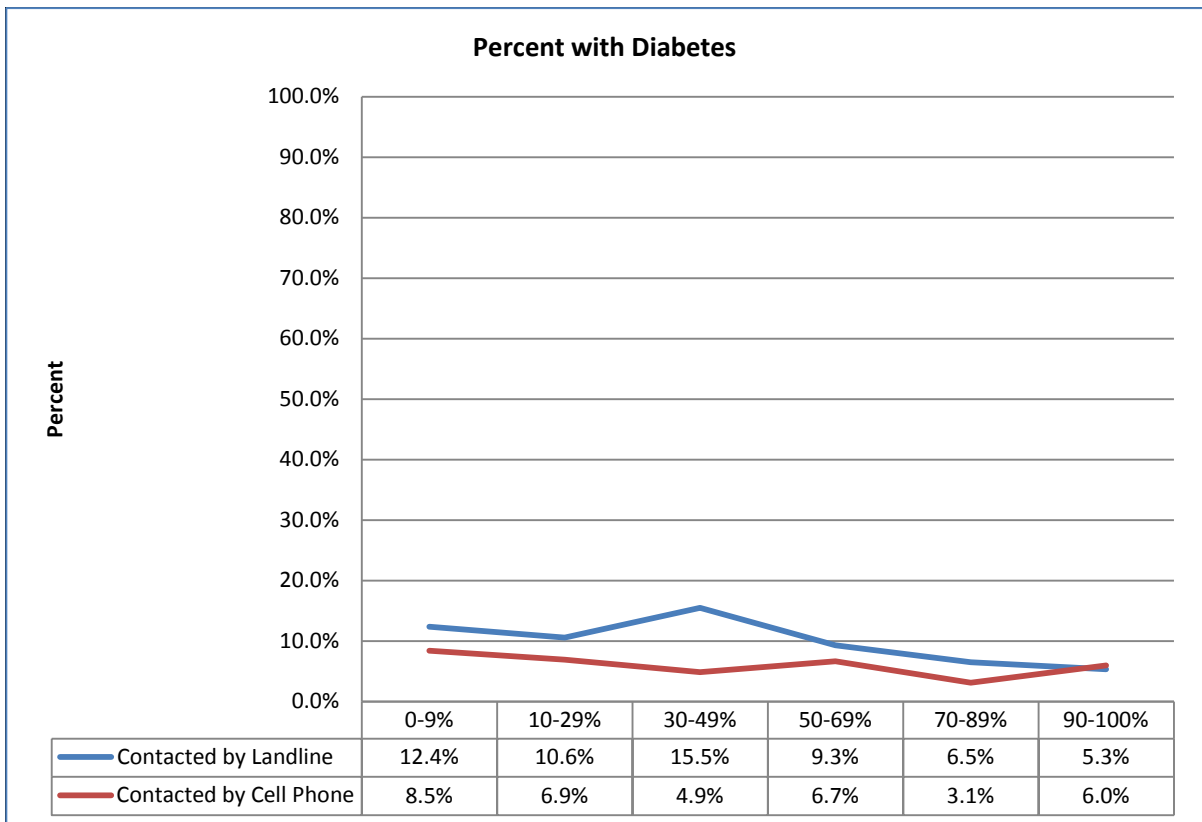
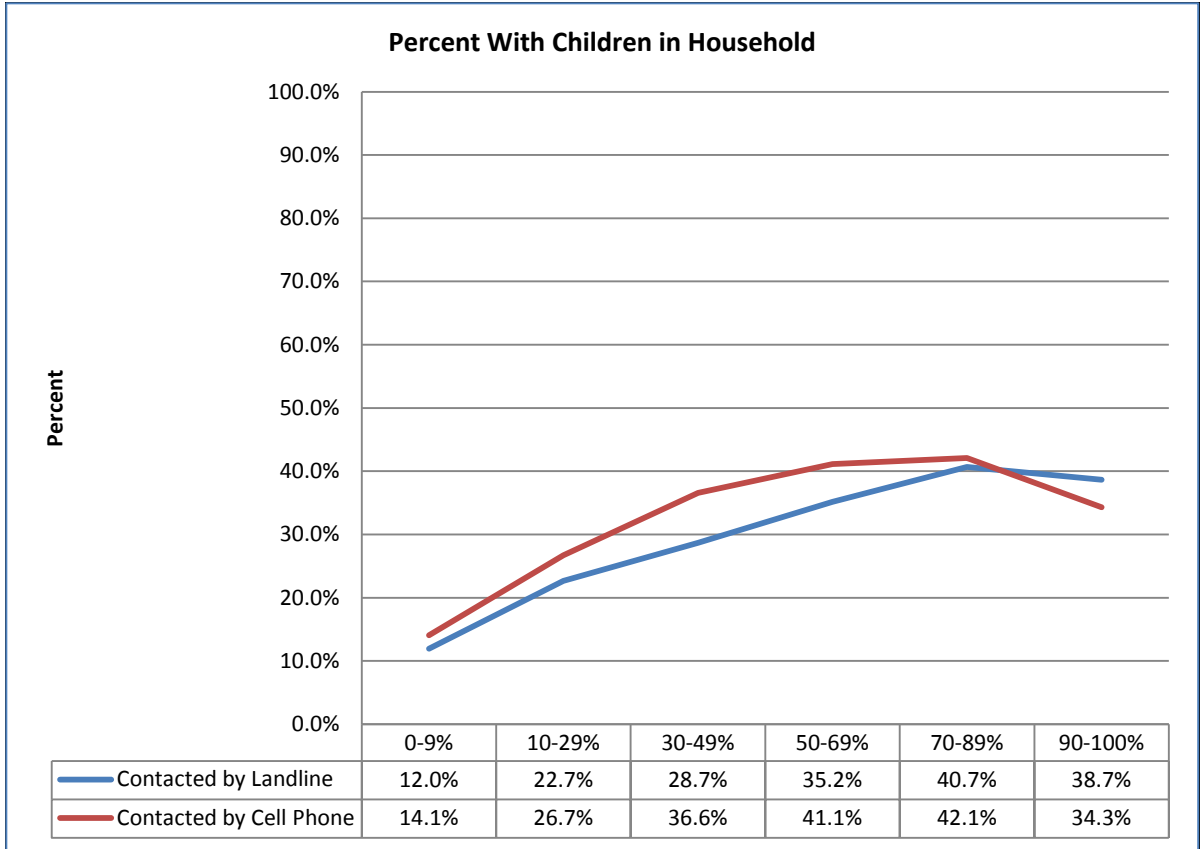




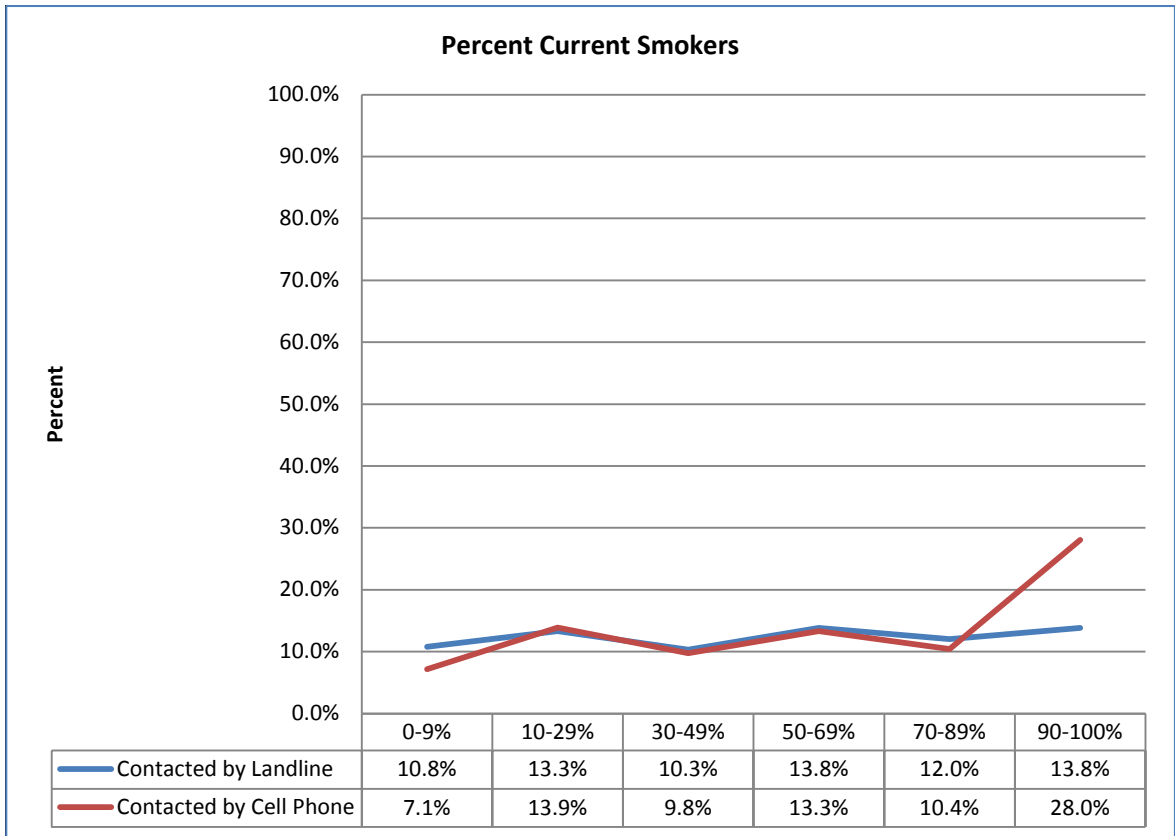
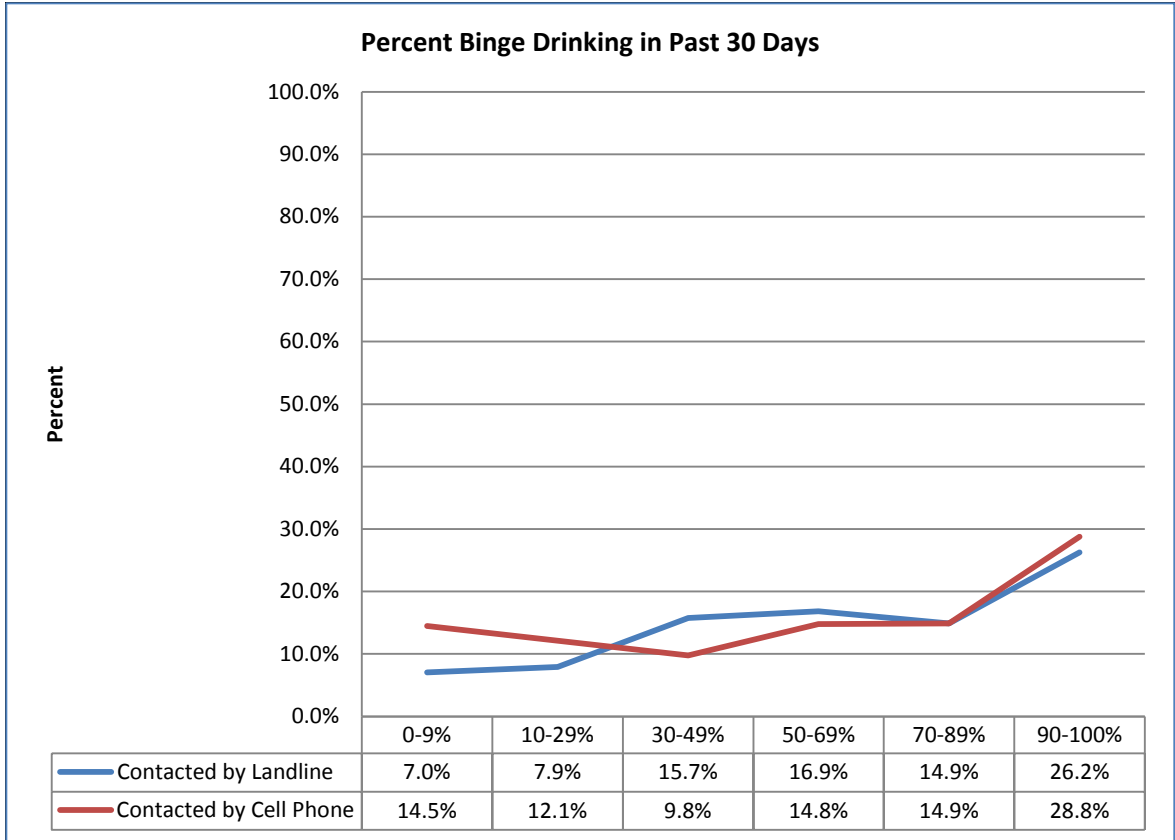












### 3.3 Logistic Regression Model.

After reviewing the charted characteristics by user ship mode, to further evaluate the data we used a logistic regression model to determine whether a respondent came from landline or cell phone sample. To determine whether predicting the sample source is possible, we developed a logistic regression model, where 1 means the record is from the landline sample and 0 means it is from the cell phone sample. We used the model to identify distinguishing characteristics between landline and cell dual-users, and to evaluate how distinguishing characteristics vary by user ship category.

When we view them as a whole, the dual users from land and cell have a number of predictors:

- Males are less likely to come from landline sample.
- 18-34 year olds are less likely to come from landline.
- Uninsured respondents are less likely to come from landline.
- Employed respondents are less likely to come from the landline sample.
- Those who are 55 years old or older are more likely to come from landline.

When we match people by the cell usage categories, we uncover some new differences that are masked when the groups are viewed as a whole. This chart shows whether a respondent is more (designated by a + sign) or less (designated by a – sign) likely to come from the landline sample based on the characteristics on the left, by each cell user ship category.

	All Dual Users	0-9%	10-29%	30-49%	50-69%	70-89%	90-100%
Gender - Male	-						-
Age 18-34	-					-	-
Age 55+	+	+		+			
Uninsured	-					-	
Employed	-		-		-		
College Degree		-				-	-
Children in HH		+					
Married		-					
Never Married			+				
Widowed				+			
Poor Health Status							+
Current Smoker							-

College degree, having children, marital status, health status, and smoking status are all predictors among different user ship categories, but are unseen in the combined category.

- Having a College degree is significant in three categories—in the lowest cell usage category, 0-9%, and the two highest 70-89%, and 90-100%, but is not significant overall. By combining with the middle groups, we are losing this level of differentiation.
- Age is a predictor in the lower categories and higher categories.
- Employment status also shows up in two middle categories.

The high and low user ship categories had the most noticeable differences.

- For the 0-9% user category, respondents who are 55 or older, and those who have children in the HH are more likely to be from land sample; respondents with a college degree and those who are married are less likely to be from the land sample.
- For the 90-100% user category, males, 18-34 year olds, those with a degree, and current smokers are less likely to come from land; those with poor health status are more likely to come from the land sample.

As we get closer to the middle, the number of significant differences declines. As shown in the below table the cell and landline respondents meet in the mid-range usage categories.

- 45% of all dual users from the landline sample fall between 10-69% cell usage
- 44% of dual users from the cell sample fall between 10-69% cell usage.

Cell Usage %	Land - freq	Cell - freq
0-9%	33%	13%
10-29%	22%	19%
30-49%	6%	8%
50-69%	17%	17%
70-89%	12%	18%
90-100%	10%	25%
<b>Total</b>	<b>100%</b>	<b>100%</b>

Not only are the mid-values equally representing the cell and landline users, the mid-range users also had fewer predictors than the high and low users - we are reaching the same people in these middle usage categories regardless of sample source. For the outliers, the low cell phone users are being reached on the landline sample, but the 33% that we are reaching in the landline sample are different in characteristics than the 13% we would reach in the cell sample. Likewise, the higher cell users, 70-100% usage, are reached more frequently on cell phones, but the 22% in the land sample are different than the 43% contacted on their cell phones. This suggests that there are people we are missing if we exclude one mode of sample in these outlying user ship category groups.

#### 4. Limitations

One of the biggest limitations to this experiment was the limited sample size, particularly in the cell phone sample. Because the duration of the experiment was for 2 months, and monthly samples are rather small for the BRFSS survey, there were only 533 completed cell interviews to work with. This caused some of the percentage groups to be rather small for cell phone sample, particularly in the 30-49% range. Ideally we would compare characteristics for usage groups on a 10% scale, however, due to the small sample size some groups had to be combined. Table 1 shows the sample size by user ship category.

Table 1.

cell usage %	Land - freq	Cell - freq
0-9%	719	71
10-29%	481	101
30-49%	129	41
50-69%	364	90
70-89%	260	96
90-100%	226	134
<b>Total</b>	<b>2179</b>	<b>533</b>

Another limitation to consider is that the usage percentage is of self-reported data, which may not be accurately representing the percent of landline and cell phone usage. Responses tend to be clustered, and not evenly distributed, since respondents tend to answer in whole numbers such as 50%, or 75%.

## 5. Conclusion

As expected, there are differences between landline and cell phone dual users. Analyzing these differences based on cell phone usage category identifies where these differences are occurring. In some cases, differences between respondents in the two sample sources emerged that weren't evident when the sample is analyzed as a whole.

There are still other factors to be considered, for example, in the 50% group, those who are employed are more likely to come from cell phone; one hypothesis is that respondents who are employed are more available when reached via cell phone.

We found more differences at the extreme usage categories, while respondents are most alike within the 10-69% usage groups. Both landline and cell phone samples seem to represent this group; the percentage of respondents in this sample is equal between the 2 groups.

We saw that the mid-values are being represented in both frames. Between 10-69%, the dual-user percentage is the same. This seems to be the group that are responding equally as often on landlines and on cell phones, and the respondents are closer in characteristics than the groups at the upper and lower extremes.

The low user ship categories are more prevalent in the land sample, and the high user ship categories are more prevalent in the cell sample, however these respondents differ in characteristics between each sample type.

- In the 70-89% cell user ship category, 48.1% of landline respondents reported having a college degree, compared to 59.4% of cell phone respondents.
- In the 0-9% cell user ship category, 59.7% of landline respondents reported being married or in an unmarried couple, compared to 75.7% of cell respondents.
- In the 90-100% user ship category, 13.8% of landline respondents reported being current smokers, compared to 28% of cell phone respondents.

The implications of this experiment indicate that increasing the usage range for the cell interview to 70% or above would provide a better representation of the population when using a dual screening and overlap approach.