Use of a Reimbursement to Increase the Proportion of Prepaid Cellphone Respondents

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Abstract
Prepaid, or pay-as-you-go, cellphone plans are a popular option for many cellphone users. In 2012 an estimated 30% of the cellphone users are using month-to-month type plans that cap the number of airtime minutes allowed or charge for each minute used (Lifsher, 2013). Because these alternative plans cost a person plan minutes for both incoming and outgoing calls, persons on these plans may be less likely to participate in a survey for fear of running out of allocated minutes and being forced to pay additional costs. Excluding persons on these alternative plan types may introduce bias in survey estimates intended to be representative of the entire population or some low socioeconomic subpopulation. This concern over potential bias by under covering alternative phone plan persons is especially true for the 2015 Ohio Medicaid Assessment Survey (OMAS) which is designed to identify low income and Medicaid eligible people in the state of Ohio. While OMAS has not traditionally provided an incentive or reimbursement for their survey, the 2015 pilot study, which included a sample of 18,500 cellphone numbers and resulted in 1,076 cellphone respondents, experimented with a $10 reimbursement. This paper presents the results of a split-sample experiment which tested if such a reimbursement increased participation overall or increased the proportion of respondents that are on alternative cellphone plans. Alternative plan respondents were identified through survey questions as well as identification flags provided by the sample vender. Our experiment found that the use of a $10 experiment (1) significantly increases the participation rate, and (2) significantly decreased the number average number of call attempts need to obtain a completed interviews. These data collection efficiencies offset the cost of the incentive by about 25%. Additional findings include that (3) the incentive increases the proportion of respondents in key demographics, (4) the flag for cellphone numbers on a prepaid plan is not accurate in Ohio, and (5) prepaid respondents do not report an increase in their bill due to taking the survey.

Key Words: Cellphone, prepaid, pay-as-you-go, experimental design, incentive, dual-frame survey, coverage bias, Ohio Medicaid Assessment Survey (OMAS)

1. Introduction

1.1 Introduction

Nationally, in 2014, 44.1% of adults and 54.1% of children live in a wireless only household (Blumberg & Luke, 2015). While there is variation at the state level the same general finding occurs. For example, in 2012, the state of Ohio had 52.9% of adults and 62.8% of children live in cellphone only or cellphone mostly households (Blumberg, et. al., 2013). These percentages in Ohio increase to 72.9% of adults and 85.6% of children when dual-user households are included. In California, in 2012, 54.1% of adults and 60.1% of children live in cellphone only or cellphone mostly households (Blumberg, et. al. 2013).

State surveys such as the Ohio Medicaid Assessment Survey (OMAS) and California Health Interview Survey (CHIS) had previously used a dual-frame telephone design, but with disproportionately small percentage of respondents coming from the cellphone frame. Specifically, the 2012 OMAS obtained 25% of respondents from the cellphone frame and the 2011-12 CHIS obtained 20% of respondents from the cellphone frame (Ohio Medicaid Assessment Survey, 2012; California Health Interview Survey, 2014). However, due to the shift towards cellphone only and cellphone mostly, both of these surveys are moving to a larger proportion of respondents from the cellphone frame. For instance, OMAS targeted 55% - 60% of its respondents in the 2015 iteration to come from the cellphone frame (OMAS, 2015).

This shift in the allocation provides two key benefits to the survey design. First, minorities; households with children; and lower income persons are more likely to be found on the cellphone frame (Lu, et. al., 2014). Second, with the population shift towards greater usage of cellphones sample dual-frame designs can be better optimized to reduce design effects thereby improving precision (Peytchev & Neely, 2013; Levine & Harter, 2014).

Additionally, with the greater use of cellphone usage by lower income respondents, the use of *prepaid* or *pay-as-you-go* plans (herby referred to only as prepaid for the rest of the paper) have greatly increased. In 2012, 1 in 3 U.S. residents – over 100 million users – used a prepaid plan to pay for the cellphone an increase of 12% over 2011 (Lifsher, 2013). Because prepaid cellphone users have a pre-set number of minutes each month, there is reason for concern that they are less likely to participate in surveys such as OMAS which have traditionally not provided incentives to respondents (OMAS, 2012).

With the simultaneous need to increase the proportion of cellphone respondents with the increased use of prepaid plans by cellphone users, survey methodologists need to be concerned with the potential for coverage bias due to under covering prepaid users due to their potential reluctance to use their monthly minute allotment on a 20 – 30 minute survey[1]. This potential bias is of great importance to studies such as OMAS which is interested in access to health care including Medicaid eligibility – which is directly tied to a household's income. It should be noted that some research has suggested that prepaid cellphone respondents will report that their monthly bill is not impacted (Guterbock, 2012). But, this study was among college students rather than a general population which includes lower income respondents.

1.2 Research Goals

Given the concern over coverage bias, the 2015 OMAS integrated an experiment into the initial set of cellphone replicates released in order to assess the primary research goal of

[1] The adult portion of the survey averaged around 20 minutes. When a child was present in the household the combined adult and child interview averaged around 30 minutes.

whether a $10 incentive provided to cellphone respondents that complete the survey (1) improved data collection efficiency and (2) increased the demographic distribution of respondents to include more persons in key groups of interest such as low income (including Medicaid eligible persons), minority, rural, and households with children.

Secondarily, we wanted to determine if prepaid phone users are a good proxy for some of the populations of interest – rural, low income, households with children. Therefore, it was of interest to determine the best way to classify cellphone respondents as on a prepaid plan. In order to make this determination, two options were available (1) insert a question asking about a cellphone respondents prepaid status directly into the instrument, or (2) append the activity flag provided by Marketing Systems Group (MSG) which identifies cellphone numbers associated with a prepaid plan to the sampled set of cellphone numbers. The first option has the advantage of having a known means for measurement. However, if the question wording is unclear, measurement error may make the prepaid assignment misleading. Furthermore, for surveys wanting to limit the survey length, adding an additional item may not be desirable. The second option has the advantage of not adding burden to the survey. However, no detail on how the flag is defined or the proportion of the frame that is covered were provided[2]. If the MSG flag proved to be reliable and the correlation between prepaid users and the populations of interest were true then the MSG flag could be used to oversample prepaid phone users to increase respondents in key domains[3].

Additionally, a sub-goal of interest is whether prepaid respondents indicated that their cellphone bill would be impacted by participating in the survey. We were interested in determining if the Guterbock (2012) finding can be extended to a general population.

2. Methods

2.1 Experimental Design

In order to assess whether the $10 incentive improved data collection efficiency and improved the respondent demographic distributions an experiment was incorporated into the 2015 OMAS. OMAS is a periodic survey of residents in the state of Ohio measuring the rate of health insurance coverage among adults and children and access that each have to medical services. Because these outcomes of interest vary across the state and by respondent characteristics (Lu, et. al., 2014), it is important to ensure that the increase in the cellphone allocation to 55% - 60% of total completes is not disproportionate by *county type* (metro, suburban, rural Appalachian, rural non-Appalachian) in the state or type of respondent characteristics (e.g., minority status, poverty status).

Under the experiment, a random sample of 372 cellphone main sample replicates (approximately 18,500 phone numbers) were selected. This sample size was based on a power analysis desiring a detectable difference in the participation rate between the two groups of 1.4%. The main sample for OMAS was stratified by rate center county to approximate a county-level stratification (Berzofsky, et. al., in press-a). The selection of

[2] The only information provided about the coverage of the frame that the activity flag has was that some cellphone carriers provide information while others may not. No information as to which carriers provided information was given and the participating carriers may change by geographic area.

[3] The MSG flag is appended to a sample after it is initially selected. Therefore, to utilize this flag in sampling, a two-stage design is required.

replicates was conducted using a stratified random sample. County type was used to stratify the experiment sample. A balanced allocation across the four strata was used – i.e., 93 replicates were allocated to each county type – in order to ensure that the experiment replicates were not skewed toward the metro counties where a large portion of the main sample resided. ***Figure 1*** presents the distribution of the replicates across the 88 rate center counties in Ohio, corresponding to the 88 actual counties, and the replicate opacity across counties. In all 75 of the 88 counties had at least one replicate (approximately 50 cellphone numbers) in the experiment.

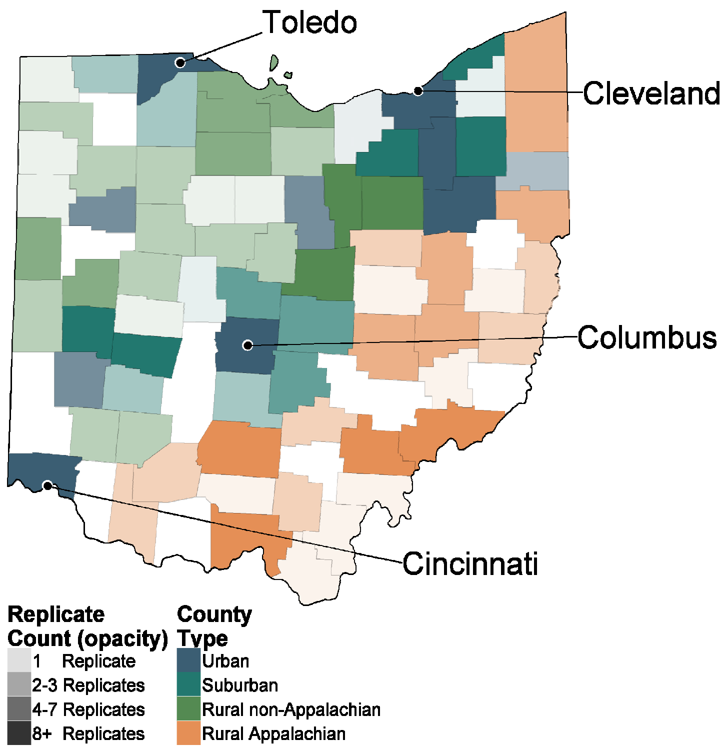

Figure 1: Distribution of incentive experiment replicates by rate center county, county type and sample opacity in the 2015 Ohio Medicaid Assessment Survey

Phone numbers within each replicate were randomized to either being offered the incentive or not being offered any incentive. Replicates were randomized such that half of phone numbers in each replicate were assigned to the incentive group[4]. In all, 9,006 cellphone numbers were assigned to the treatment (incentive) group and 9,505 cellphone numbers were assigned to the control (non-incentive) group.

2.2 Methods for Assessing Data Collection Efficiency

Data collection efficiency was measured through two metrics in the experiment: (1) participation rates, and (2) required number of call attempts. For the assessment of data collection efficiency unweighted statistics and statistical tests were conducted because the

[4] Assuming the participation rate is higher among incentive group numbers, ten replicates (2 or 3 in each county type) were randomly selected to only be assigned to the non-incentive group better ensure an equal number of respondents across the two groups.

population of interest was the set of respondents or sample rather than the entire population of Ohio.

2.2.1 Participation Rates

Participation rates – the percentage of respondents out of all valid (i.e., working and eligible) numbers – were used to assess if the offering of the incentive at the beginning of the survey (the incentive was only given to those that completed the survey) increased the number of persons that agreed to complete the survey. Participation rates were calculated for overall persons by treatment group as well as by county type and Medicaid region (seven geographic regions consisting of adjacent counties) by treatment group.

2.2.2. Call Attempts

The number of call attempts to obtain a completed interview were used as a second metric of data collection efficiency. The average number of call attempts to obtain a completed interview were calculated two ways: (1) number of call attempts among completed interviews divided by number completed interviews, and (2) number of call attempts among completed interviews divided by completed interviews and known nonrespondents (i.e., refusals). A test of differences (pooled variance t-test) was conducted between the two treatment groups was conducted to determine statistical significance.

2.3 Methods for Assessing Characteristics of Respondents

Assessing whether the incentive altered the population characteristics of respondents three metrics were used: (1) comparison of respondents identified as prepaid by treatment group, (2) comparison of proportion of respondents in key demographic groups, and (3) distribution of prepaid and non-prepaid respondents by county type[5]. Because the population of interest was the respondent, unweighted analyses were conducted for all three metrics.

For the comparison of key demographic groups, the respondents in each group were dichotomized into the following categories:

- Adult under 30 years old
- Child in household
- Child uninsured
- Child on Medicaid
- Reside in rural county
- Minority
- Adult uninsured
- Adult on Medicaid
- Below poverty line

2.4 Methods for Assessing Accuracy of Identifying Prepaid Cellphone Users

As noted, there are two potential methods for determining if a cellphone user is on a prepaid plan or not: (1) through a direct question in the instrument, or (2) through the activity flag provided by MSG. In order to assess the two methods both identifiers were obtained for replicates in the experiment.

For the first method, the following yes/no response question was asked of all respondents: “Did we reach you on a cell phone that is prepaid or pay as you go?” While this question is believed to be clear, there was not time to cognitively test the item to verity its clarity. For the second method, the MSG activity flag identifying prepaid phone numbers was

[5] Because it does not depend on the treatment group, the distribution of prepaid and non-prepaid respondents by county type is based on the full cellphone respondent sample.

appended to the 18,500 phone numbers in the experiment. The activity flag append cost $0.07 per record.

Because the direct approach is only obtained among respondents the comparison was restricted to respondents only. The two methods were compared using a chi-square test of association based on the contingency table containing the agreement classifications between the two measures.

2.5 Methods for Determining if Survey Impacts Phone Bill

In order to assess if taking the survey impacts the phone bill of prepaid respondents, a second question was added to the survey instrument. To best compare our results to those of Guterbock (2012), the same question wording and responses used in their survey were used in ours. Namely, the following question was inserted: “Do you expect to pay a higher bill this month as a result of doing this survey?” There were five response options: (1) Definitely will, (2) Probably will, (3) Probably not, (4) Definitely not, and (5) Depends.

One limitation about this analysis (and the Guterbock analysis) is that since this information was obtained through the survey, it was only ascertained among respondents. The impact of this limitation is that those that did not respond to the survey because taking it would impact their wallet/pocketbook are not captured. Therefore, our analysis is restricted to respondents. We compared the percentage of respondents that indicated their phone bill would “definitely” or “probably” be higher by treatment group among all respondents and just those that self-identified (i.e., through the direct question) as a prepaid phone user.

3. Results

3.1 Data Collection Efficiency

3.1.1 Participation Rates

The experiment resulted in 1,075 completed interviews – 577 interviews among those assigned to the incentive group and 498 among those assigned to the no incentive group. Moreover, the number of working, eligible numbers was 3,708 for the incentive group and 3,698 for the no incentive group – approximately 40% of phone numbers assigned to each group.

Figure 2 presents the overall comparison of participation rates by treatment group. The participation rate was 15.6% among those that received the incentive and 13.5% among those that did not. This difference was found to be a significant increase in the participation rate (p-value: 0.0105).

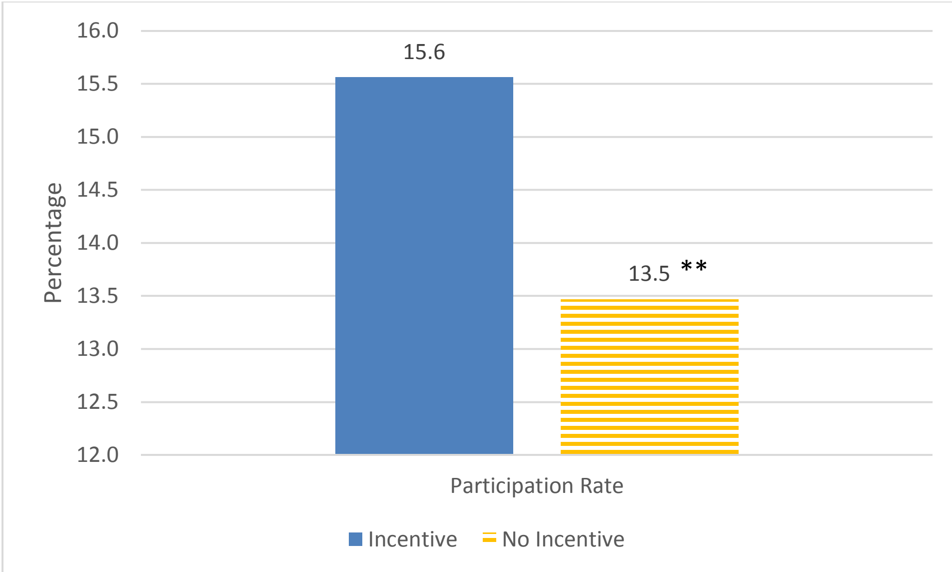

Figure 2: Participation rates among those assigned to receive an incentive and those assigned to not receive an incentive

Figure 3 and ***Figure 4*** present the participation rates by county type and Medicaid region, respectively. Among county types, rural Appalachian respondents particpated significantly more when offered the incentive (15.5% vs. 12.0%; p-value: 0.0305. Rural non-Appalachian respondents who received the incentive did participate in larger numbers (16.4% vs. 13.9%). However, because of lack of power, this difference was not found to be significantly different (p-value: 0.1329). Among Medicaid regions, the incentive significantly increased participation in the Southeast region (19.4% vs. 13.7%; p-value: 0.0104). Two other regions – the North Centeral and Northwest – had large differences, but were not significantly different due to lack of power.

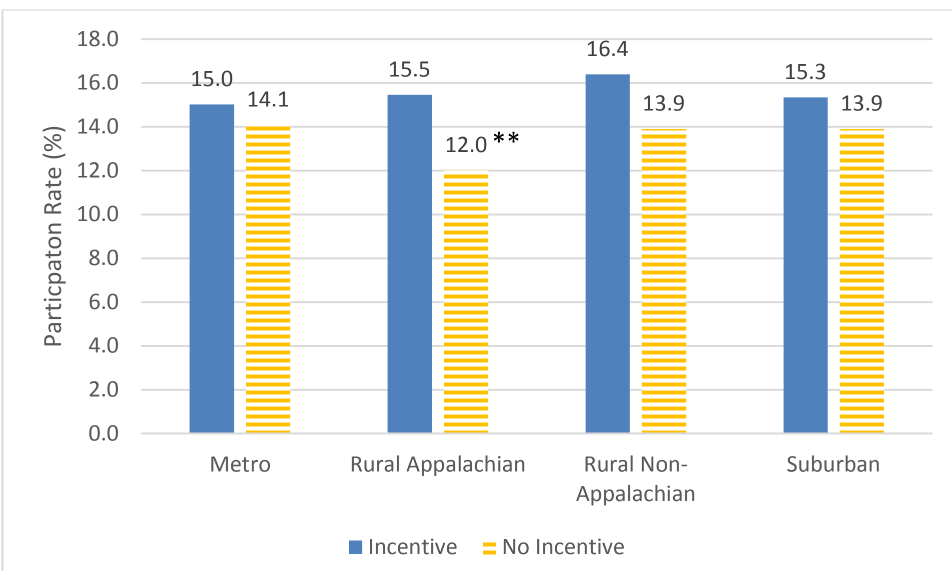

Figure 3: Participation rates by county type among those assigned to receive an incentive and those assigned to not receive an incentive

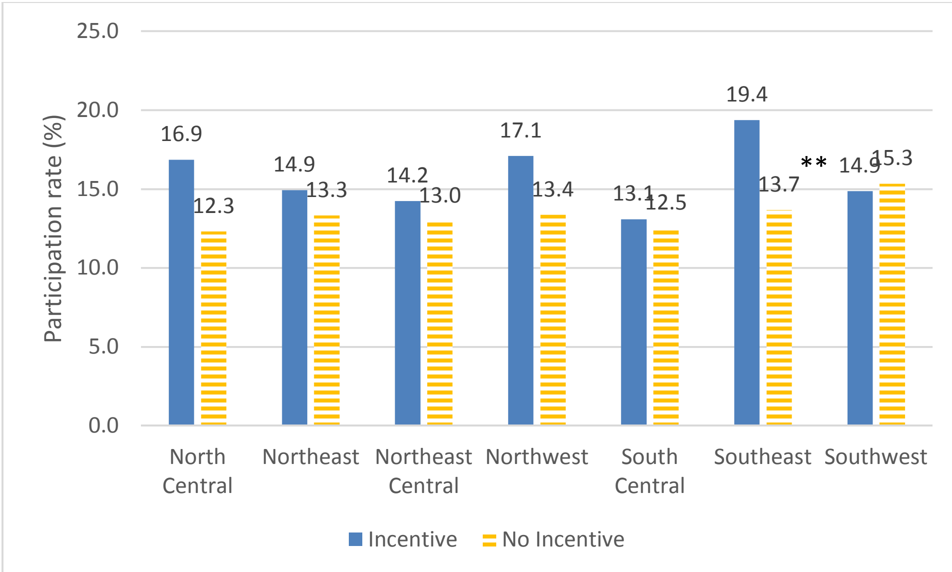

Figure 4: Participation rates by Medicaid Region among those assigned to receive an incentive and those assigned to not receive an incentive

3.1.2 Number of Call Attempts

Figure 5 presents the comparison of the average number of call attempts to obtain a completed interview. Among those numbers for which contact with an person was made, the incetive reduced the number of call attempts an average of 0.21 calls (5.3 vs. 5.5 calls). This difference was significantly different (p-value: 0.0388). Among completed interviews, while the incentive reduced the average number of call attempts, the difference was not significant.

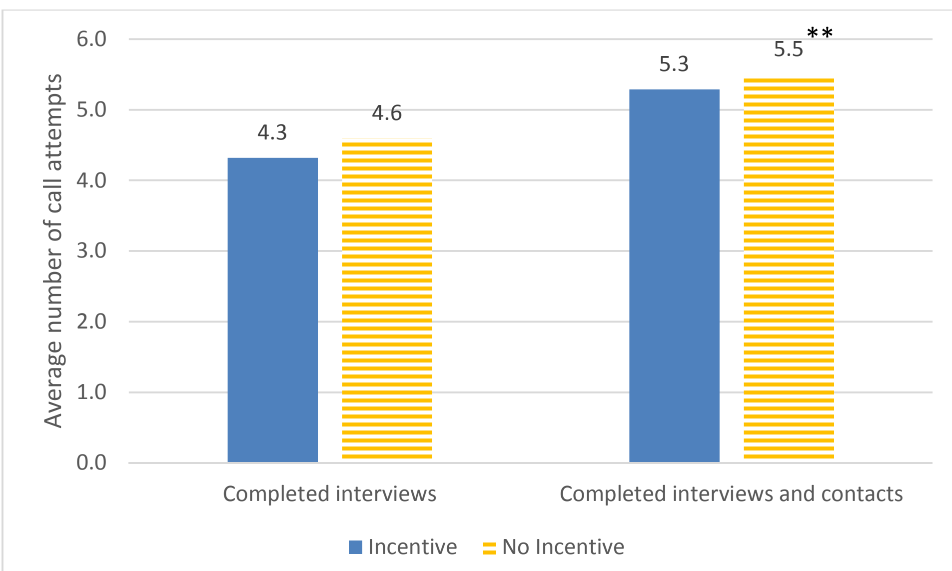

Figure 5: Average number call attempts by treatment group among completed interviews and any number where contact was made

3.2 Characteristics of Respondents

Across all respondents 42.5% self-reported being on a prepaid plan. ***Figure 6*** presents the percentage of respondents that indicated being on a prepaid plan by treatment group. Among those that received the incentive, 43.3% (250 respondents) self-identified as being on a prepaid plan. Among those that did not receive the incentive, 41.8% (208 respondents) of respondents indicated being on a prepaid plan. The difference in these rates is not significantly different at the 95% confidence level.

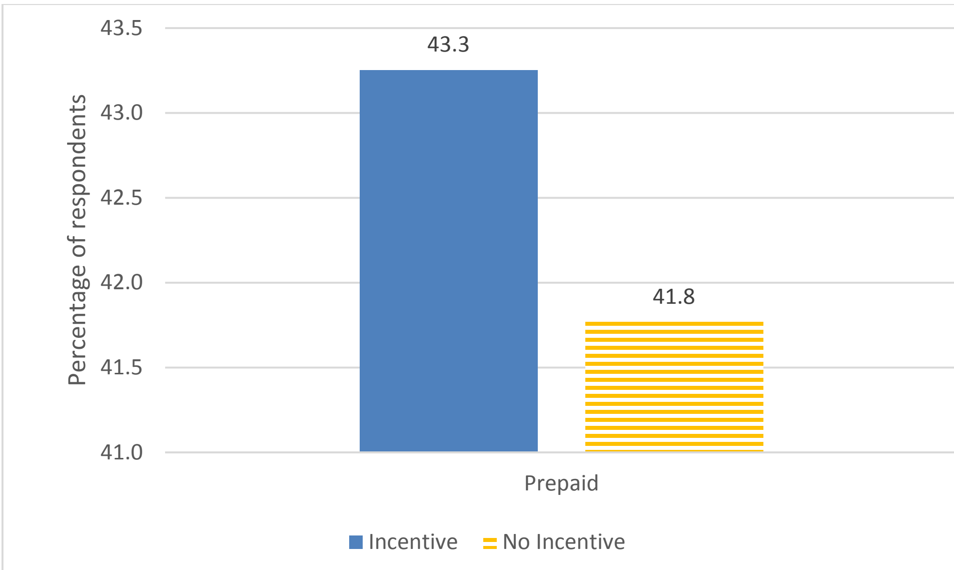

Figure 6: Percentage of respondents that self-reported as prepaid by treatment group

Figure 7 presents the percentage of respondents in each of the key demographic groups by treatment group. While none of the differences are statistically significant at the 95% confidence level, in all cases, except adult uninsured, the incentive group brings more of the desired group of interest into the respondent sample. For example, among those that received the incentive 45.9% of children indicated being on Medicaid while 40.4% of child respondents that did not receive an incentive reported being on Medicaid. Moreover, some of the differences are relatively much larger. For instance, the proportion of respondents for child uninsured are approximately 30% larger among those that received the incentive. Moreover, while not statistically different, applied to the main sample of data collection which consists of 20,000 cellphone interviews, these differences can lead to large and meaningful increases in the number of respondents in key domains. For example, the inclusion of the incentive would increase the number of adult respondents under 30 by 383; the number of children with Medicaid would increase by 1,100; and the number of respondents in households below the poverty line would increase by 418.

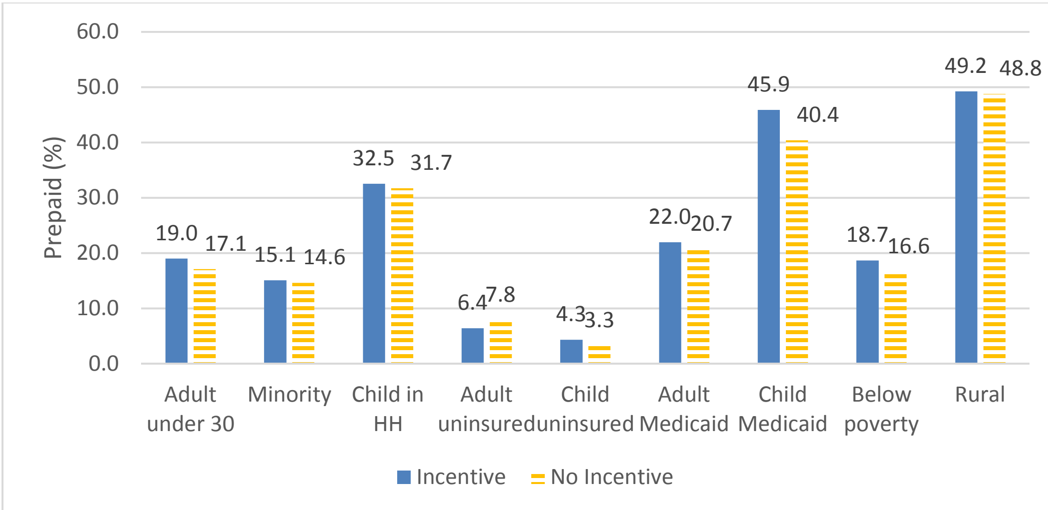

Figure 7: Percentage of respondents that self-reported as prepaid by treatment group

Figure 8 presents the distribution of respondents by county type and prepaid status. As the figure shows, a larger portion of rural Appalachian respondents reported using a prepaid phone (19.2% vs. 15.8%; p-value: <0.0001). In metro and suburban areas more respondents indicated being not prepaid users (47.8% vs. 49.1%; p-value: 0.0414 in metro counties and 15.4% vs. 17.9%; p-value: <0.0001 in suburban counties). In rural non-Appalachian, the two rates were about the same (17.6% vs. 17.2%). These significant differences indicate that the differences in prepaid use by county type is real rather than simply due to sampling variation.

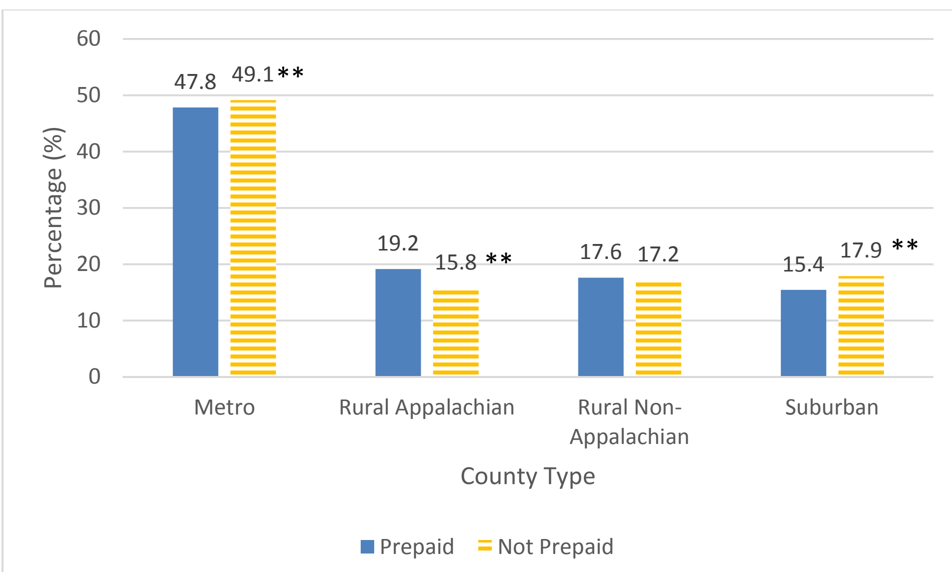

Figure 8: Percentage of respondents[6] by county type and prepaid status

[6] Based on the final respondent sample size of cellphone respondents – 26,423 respondents.

3.3 Accuracy of Prepaid Status Methods

Table 1 presents the contingency table comparing the two methods for identifying a person's prepaid status. Overall, the self-identification method that inserted a survey item in the instrument was endorsed by 42.7% of respondents; whereas, the MSG activity flag identified 12.5% of respondents as prepaid. These rates led to a disagreement rate of 35.0% (=32.5% + 2.5%). The largest source of error was from respondents who self-identified as prepaid, but the MSG flag indicated they were not (93% of self-identified prepaid cellphone users were not identified by the MSG flag as a prepaid user. This disagreement rate was significantly different from zero (p-value < 0.0001).

Table 1: Comparison of Assignment of Prepaid Status by Survey Question Method and MSG Prepaid Activity Flag Method

		MSG Prepaid Activity Flag	
		Prepaid Plan (%)	Not Prepaid Plan (%)
Survey Question	Prepaid Plan (%)	10.0	32.5
	Not Prepaid Plan (%)	2.5	54.9

3.4 Impact on Monthly Phone Bill

Figure 9 presents the results on whether taking the survey will impact the respondent's monthly phone bill. For both all respondents and self-identified prepaid respondents the percentage of respondents indicating their monthly bill would be affected is small (less than 10%). Among prepaid respondents, more respondents that did not receive the incentive indicated their monthly bill would be affected (9.6% vs. 9.2%). However, this difference is not significantly different at the 95% confidence level due to the small number of prepaid respondents (455 respondents).

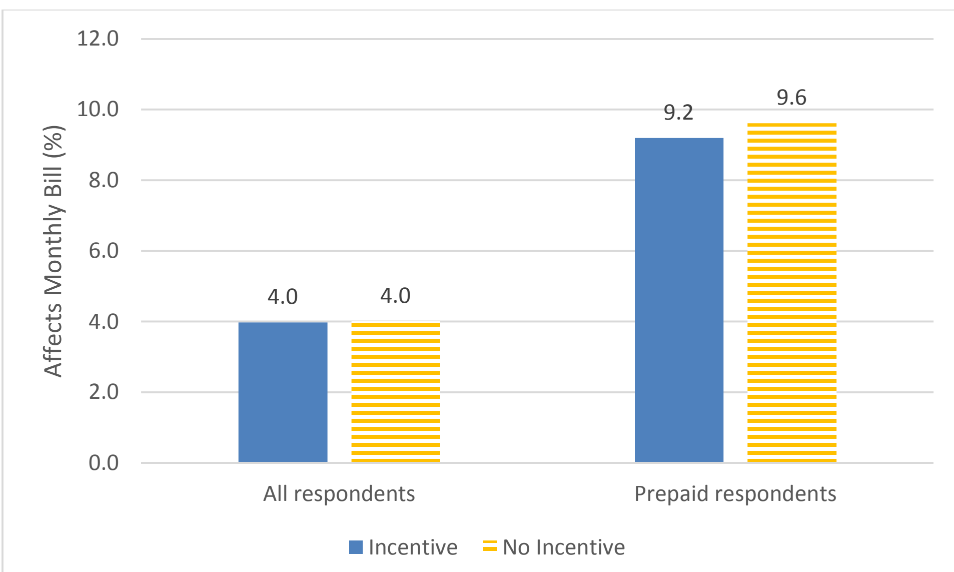

Figure 9: Percentage of respondents indicating their monthly bill will be affected by taking survey by treatment group and respondent type (all and prepaid only)

4. Discussion

4.1 Data Collection Efficiency

The experiment results found that for both efficiency measures – participation rates and average number of call attempts – the $10 incentive[7] significantly increased data collection efficiency. Based on these results, the cost of the incentive was offset by 25.2%. In other words, for every $11.25 incentive, the increase in the participation rate by 2.1% and the reduction in the number of call attempts by 0.21, $2.83 would be saved compared to when no incentive is offered. Across 24,000 cellphone interviews, the cost of the incentive is reduced by $67,920.

4.2 Characteristics of Respondents

Our experiment did not find that the incentive brought in more respondents on a prepaid plan. However, we did find that for most key demographic groups – including age, insurance status, poverty status, minority status, rural resident, and households with children – the incentive brought in more respondents. Unfortunately, the necessary sample size to determine significance at the subdomain level could not be afforded for the pilot study, but, our results indicate that the incentive did do a better job at increasing the respondents in key demographics. In fact, as indicated, the incentive is projected to increase the number of respondents in key demographics (e.g., adults under 30, children with Medicaid, persons in households below the poverty line) by several hundred cases. This is helpful for key subdomain analyses that the data users want to conduct.

We did find that prepaid users are more likely to be in rural Appalachia. This is an important finding for the goal of the 2015 OMAS to produce county level estimates. As described in Berzofsky, et al. (in press-b), the 2015 sample design targeted at least 45 cellphone interviews in all counties. In the rural counties, where it is most difficult to obtain completed interviews, the slight increase due to the incentive and slight up-tick in prepaid users helped us achieve our county level cellphone targets in the rural counties.

4.3 Accuracy of Prepaid Identifiers

Our results showed that the two methods for identifying prepaid users produced wildly different results. After reviewing the two in more detail, decided the self-identifying approach was most likely more accurate. This conclusion was made for two reasons: (1) compared to the national estimate of prepaid users of 33% (Lifsher, 2013) the direct approach through a question in the instrument seemed to produce closer estimates; and (2) the lack of information about the coverage of the MSG activity flag and the fact that the number of prepaid respondents identified by the flag are substantially less than expected gave us pause. In addition, the cost of $0.07 per record seemed excessive given the questionable quality.

4.4 Impact on Monthly Phone Bill

One of the main reasons to be concerned about prepaid respondents given the increased allocation to the cellphone frame is that prepaid users would not want to participate in the survey because of the impact on their phone bill. A previous study on college students found that this was not the case (Guterbock, 2012), but the impact on a general population was not known. Using the identical question as Guterbock (2012), we found the same

[7] The incentive cost $11.25 per respondent because an additional $1.25 processing fee was added by the vender (Prince, et. al., 2015)

result. A limitation to this finding is that it is based only on respondents. In other words, since we used the self-identified prepaid method, we can only conduct the test among respondents preventing us from knowing how many nonrespondents refused because they were prepaid users.

5. Conclusions and Recommendations

The simultaneous increase in cellphone only or cellphone mostly users and prepaid phone users creates an interesting dilemma for survey methodologists because of the need to increase the proportion of the interviews that come from the cellphone frame in order to (1) reduce design effects and increase precision, and (2) increase the number of interviews among key demographic groups like low socioeconomic stats, rural, young adults, minorities, and households with children conflicts with the possibility that prepaid phone users are less likely to participate due to their limited number of minutes each month. In order to assess this dilemma, we embedded a split sample experiment in the 2012 OMAS pilot to determine if a $10 incentive given to respondents improved data collection efficiency and obtained a greater proportion of interviews from key demographic groups.

Based on our experiment results, we made the following conclusions and recommendations:

- The incentive significantly increased participation rates and reduced the average number of call attempts needed to obtain a completed interview. These efficiencies offset the cost of the incentive by 25.2%.
- While the incentive did not bring in a significantly larger number of prepaid users, the incentive did increase the proportion of respondents in all key demographic groups.
- The self-identifying approach to classifying a respondent as a prepaid users appears to be more accurate than the MSG activity flag
- Based on responses less than 10% of survey respondents who self-identify as prepaid users, taking the OMAS survey – 20 to 30 minutes in length – report that the time allocated to the survey had no impact on their cellphone bill.

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