

Recruiting Probability-Based Web Panel Members Using an Address-Based Sample Frame: Results from a Pilot Study Conducted by Knowledge Networks

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Abstract

Address-based sample (ABS) frames have emerged as a solution to shrinking RDD frame coverage due to cell-phone-only households. The Knowledge Networks (KN) probability-based online KnowledgePanel[®] has used RDD frames for telephone recruiting since 1999. In 2008, KN conducted a pilot study (n= 10,000) to recruit panelists via mail using an ABS frame. KN developed and tested recruitment materials (advance postcard, initial mailer, non-respondent mailer), and tested a protocol for a mailing strategy with telephone follow-up. Half the sample was mailed the advance postcard, half received no advance postcard. Randomized portions of each half received a \$5 cash incentive, \$1, or \$0. Non-respondents with a landline match received a recruitment telephone call; the rest were mailed a final reminder letter. Response was allowed via mail, online, or toll-free telephone number. Results are presented showing demographic response, mode response, nested incentive conditions and advance postcard effects.

Key Words: Address-based sample; KnowledgePanel; mixed-mode response.

1. Introduction

Knowledge Networks (KN) began recruiting panel members using a landline RDD frame since its beginning in 1999 (Krotki, 2000). At that time, the potential coverage error due to households without a landline phone was of about 3.8% (Blumberg, Luke, Cynamon, & Frankel, 2008). With the increasing number of households either cutting the cord or just not having a landline phone and relying only on cell phones, the percentage of households that could be reached via landline RDD was 77.9% at the end of 2008 (Blumberg & Luke, 2009). In order to find a comparable number in the past, we have to go back to 1958 (Kalsbeek & Agans, 2008). In Figure 1 we show the percent of households that cannot be reached via traditional landline RDD telephone from 1999 to 2008 using data from the National Health Interview Survey (Blumberg & Luke, 2007, 2009; Blumberg, et al., 2008).

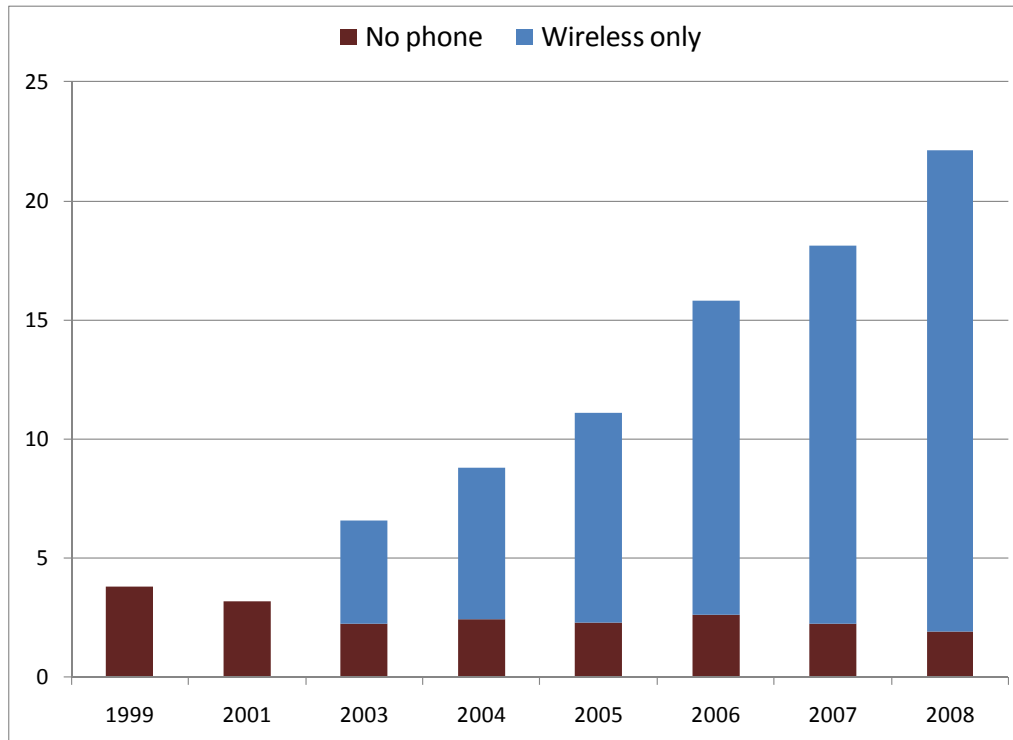


Figure 1. Percent of U.S. households that cannot be reached via landline RDD telephone – 1999-2008

In order to compensate for this rapid loss of households that can be reached via landline RDD, there are two kinds of solutions available: augment the landline RDD with a cell phone sample frame, or switch the frame and mode of data collection. The first solution presents some challenges: one is cost. The cost for a completed interview on a cell phone is *at best* two times higher than on a landline phone (Keeter, Dimock, Kennedy, Best, & Horrigan, 2008). Three main reasons are responsible: the mandatory rule to manually dial cell phones imposed by the Telephone Consumer Protection Act (American Association for Public Opinion Research, 2008b), the higher number of minors and language barriers encountered when dialing cell phones, and the cost of incentives that is generally offered to compensate respondents for their airtime. Response rates were also found to be lower in a cell phone sample than with a landline sample, although very recently comparable response rates have been obtained using both these modes (Keeter, et al., 2008).

The second solution is to use a sample frame that is less prone to coverage error. This would be either an area-based frame with face-to-face interviewers, or an address-based sample (ABS) frame. The first solution (in-person interviews) has definite major cost implications and is limited to a few research companies/organizations that have a nationwide interviewing staff. The second solution has been explored and implemented by many research organizations (Barron, 2009; Cohen, 2009; M. Link, et al., 2009; Michael W. Link, Battaglia, Frankel, Osborn, & Mokdad, 2007; McMichael, Ridenhour, Shook-Sa, & Iannacchione, 2009) due to new developments in the availability of a national frame of mailing addresses.

2. Coverage and Quality of the ABS Frame

The ABS frame that is currently available for sampling comes originally from the United States Postal Office (USPS) which maintains a list of residential addresses that is constantly updated. This list is called the Delivery Sequence File (United States Postal Office, 2009) or “DSF” and it is sold to certified vendors and licensees. This list contains virtually all residential mail delivery points in the U.S. estimated to be 135 million addresses (Fahimi, Kulp, & Malarek, 2009). There are two types of addresses in the list: city-style addresses (containing a street name and number), and rural-style or simplified addresses. The latter contains only the city, state and zip code. In the DSF, P.O. boxes and multidrop addresses (i.e. an address associated with more than one name) are included as well.

From a sampling point of view, simplified and multidrop addresses pose problems. In the first case, rural or simplified addresses cannot be used to mail something to potential survey respondents. From a coverage point of view, simplified addresses are associated with rural areas and vary by state, with West Virginia and Arkansas as extremes (about 8% of all addresses). The amount of simplified addresses has been rapidly decreasing over the years from about 10 millions in 2004 to 1.5 million in 2009. One of the main reasons for the conversion from simplified addresses to city-style is the Enhanced 9-1-1 initiative. One goal of this initiative is to provide a locatable city-style address associated with the landline telephone number to give rescue personnel a physical location to find in the event of an emergency. Simplified addresses can be further decreased if they are processed, matched and augmented with information from other databases.

Mostly since 2003, studies have been examining the completeness and coverage rate of the DSF ABS sample frame. For example, O’Muircheartaigh, Eckman and Weiss (2003) compared a nationwide sample of addresses from 18 zip codes with data coming from trained listers (on site enumeration) who checked each address in person. They found a 97% match rate. In a study of a metropolitan area, 1.9% “missed addresses” were found in the field when attempting to confirm a list provided by the USPS (Iannacchione, Staab, & Redden, 2003). Dohrmann, Han and Mohadjer (2007) computed a matching rate between a list of addresses from different vendors and field enumerators for a highly urban area, an urban/suburban area, and a rural area. They found matching rates (with group quarters) of 94.8%, 79.1% and 76.8%, respectively. This study (including group quarters) can be seen as the worst case scenario. In fact, when group quarters were excluded, the matching rate went up to 97.2% and 99.1% for the highly urban and urban/suburban areas (no group quarters were in the rural area surveyed). In a subsequent study with a similar methodology, the same authors reviewed the coverage of six U.S. counties of varying size and urban population levels (Dohrmann, Han, & Mohadjer, 2008). All urban areas had high matching rates exceeding 97%, but rural areas still had rates around 75%. In an evaluation of 50 segments assembled from Census Blocks in North Carolina, Iannacchione and colleagues (2008) found a matching rate of 95.7% between field enumeration and active mailing addresses for occupied housing. The rate was much lower when focusing on all housing units.

The biggest study done on a national scale was conducted by the National Opinion Research Center (NORC) and the Institute of Survey Research (ISR). The authors focused on 549 national segments identified in 2004 for an area-based sample produced by the ISR. These segments were listed by professional enumerators and called *traditional listing*. In the first study conducted in 2005 (O’Muircheartaigh, Eckman, English,

Lepkowski, & Heeringa, 2005), the authors compared these traditional listings with addresses provided by USPS and reported “disappointing matching rates.” In a second study, 100 segments were identified and field listers were provided with a record of addresses coming from the combined USPS and traditional listings. Findings showed that the USPS list worked better than the traditional listing in most situations. Rural areas were better covered by traditional listing than the USPS DSF (O’Muircheartaigh, English, & Eckman, 2008; O’Muircheartaigh, et al., 2006). The authors conclude that the ABS frame is a high quality, cost effective solution compared to in-field enumeration, even with the limitations of lower matching rates in rural areas. When surveys require the highest precision (e.g. Census) the ABS frame is a great starting point that can provide a list of addresses to be verified and improved by trained in-field listers.

In summary, the overall coverage of an ABS frame is quite excellent, with acknowledged issues of slightly less good coverage affecting mostly rural areas. The rapid and steadily decreasing number of simplified addresses (due to the Enhanced 9-1-1 Initiative) is very reassuring for the research community. For example, Marketing Systems Group (MSG), a DSF sample vendor, estimates that 99% of the DSF addresses can be processed as city-style after some augmentation via different databases (Fahimi, et al., 2009). This is definitely better coverage than any RDD telephone frame, even when including cell phones in the sample design.

3. Data Collection Design

3.1 Development of the Recruitment Material

3.1.1 Research on mail handling habits

Because we were concerned that our recruitment package might be perceived by potential respondents as an advertisement piece of mail, we felt it useful to gather some information on how people handle the commercial and unsolicited mail they receive. This knowledge was used to guide the design of our panel recruitment materials. This also guided research questions that can be qualitatively explored in focus groups. To the best of our knowledge, the only publicly available data on how people handle mail is provided by the USPS. Since 1987, the USPS has fielded the Household Diary Study, a survey with nationally representative sample of U.S. households. The most recent report refers to the time frame between October 2007 and September 2008 (Mazzone & Pickett, 2009). To our interest, on average, a U.S. household receives 16.4 pieces of advertisement mail per week, 16.5% of them first class and the rest standard mail. Advertisement mail represents 63% of all mail received by households in 2008. The trend in the past three years is negative, with households receiving less advertisement mail (it was an average of 17.7 pieces in 2006, table 5.3).

Income and education are factors regarding advertisement mailings, with higher income and higher education households receiving more pieces of advertisement mail per week. For example, households with less than \$35,000 income receive less than half as much advertisement mail as households with \$100,000 income or more (table 5.4). Households with Internet access receive more advertisement mail than households with no Internet access (18.4 pieces per weeks-broadband access vs. 15.8 pieces-dialup vs. 11.1 pieces for no access).

Forty-nine percent of households report that they read their advertisement mail, 30% scan it only, and 21% do not usually read it. This last percent is constantly going up from an

initial 9% in 1987, it was 17% in 2006 and 19% in 2007. Interestingly, the reports showed no relationship between advertisement reading behavior and how many pieces are received per week.

The above information was used in guiding the design strategies for the recruitment materials and the qualitative focus group research in the development of these materials.

3.1.2 Recruitment material development

This pilot required all recruitment materials to be developed since KN had only recruited by RDD telephone interviews prior to this time. Drawing on 10 years of experience through telephone recruitment, refusal conversions and panel member communications, messages and descriptions were generated for print materials. These described what a panel is about, obligations, rewards, and the business of survey research. Several variations evolved and all would be the basis for further qualitative research. It was also assumed that name recognition with the general public might be a problem so it was felt that an advance postcard strategy might help mitigate this. Since KN enables households without Internet access by providing a laptop computer and free monthly dial-up service, a description of this benefit/assistance had to be carefully crafted so as not to mislead households who already had Internet access and would not get this benefit and, more importantly, make it clear that there was no hidden “catch” that would result in costs to the panel member. All materials would be developed in English and Spanish.

3.1.3 Focus group research

A series of focus groups were planned to be conducted in two phases. The first set of focus groups explored concept development, descriptions, image preferences, and how people judge and handle their mail. The second phase used at least two variations of complete sets of mock materials to get reactions, preferences and suggestions for change. Most importantly, both phases addressed the issue of what people would open, what they would read, and what incentives would motivate them. Some key topics addressed in the research were:

- the concept of a “panel”
- messaging who KN is, what our panel members do
- offers of both cash and non-cash incentives
- graphics for design purposes (appeal, best communicates)
- which panel member testimonials most motivate
- standing apart from junk mail, “what would you open?”
- acceptance forms to fill out including privacy issues
- postcard and envelope designs, brochure design
- the content of the cover letter and the reminder letter for non-responders.

Based on KN’s telephone recruitment experience, historical panel attrition considerations, and the general difficulty in obtaining successful participation in survey research across all modes of data collection (not just Web surveys), focus group participants were strategically segmented. These segments were all no higher than High School educated, mostly males, mostly young adults (18-29), families with young children, minority population groups (specifically African American and Hispanic), and Spanish-speaking/reading Latinos. Among all of these segments were cell-phone only households and also households with no Internet access and no computer.

3.2 Development of the Sample Frame

For purposes of the pilot, the sample frame used was the most recently updated DSF. A simple random sample of city-style residential addresses was purchased from MSG. This would measure the maximum yield from opening, reading, and responding from the most likely occupied residential addresses. The size of the sample mailing was 10,000 addresses. Attached to these addresses in the sample file were additional household level and head of household level demographic information obtained from multiple data sources and provided by MSG. These addresses were also further processed to obtain the most current landline telephone number match. It was possible to match a landline phone number to 68% of the sample. For each address, latitude and longitude coordinates were developed for geo-coding the sample and respondents. Although names were available and provided for most of these addresses, they were not used. All mailings were addressed bilingually to “Current Resident/Residente Actual.”

3.3 Nested Experiments

Two experiments were nested in this pilot study: the testing of an advance postcard and the testing of different incentive amounts. The advance postcard was designed to introduce KN and KnowledgePanel and alert the household to look for our invitation in the mail. The incentive levels were design to measure impact on yield. Of the 10,000 addresses in the sample, half (5,000) were mailed the advance postcard and half were not mailed the postcard. Each half was further divided into three equal parts (approx. 1,667) with each part receiving no cash incentive (\$0), one crisp one dollar bill (\$1), and one crisp five dollar bill (\$5), respectively. No mention of the cash incentive was made in the cover letter. The bills were attached to the left margin of the cover letter with glue dots. Figure 2 shows the design of these nested experiments. When the incentive groups are combined, the sample size of each group is doubled to about 3,333 for greater statistical precision controlling for any advance postcard effect.

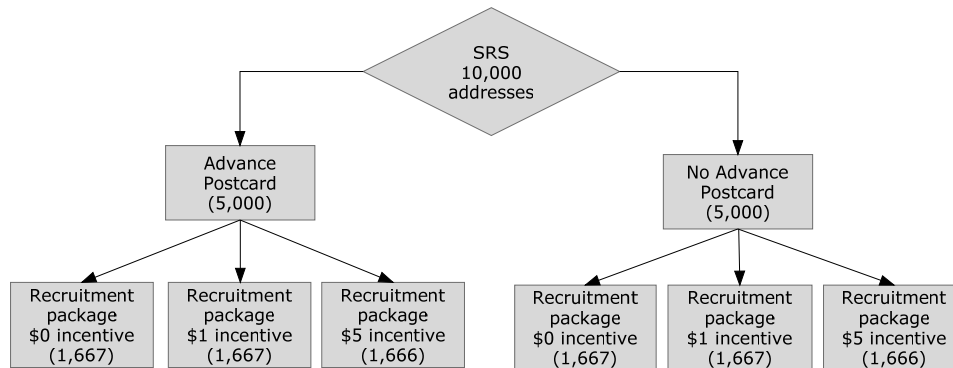


Figure 2. Mail plan experimental design

3.4 Mailing Strategy and Timeline

The strategy for this mail recruitment pilot involved an advance postcard (no advance postcard to half the sample) followed by the initial mailing packet sent one week after the advance postcard was mailed. This initial packet included the cash incentive for those addresses receiving an incentive. Three weeks after the initial packet a second full packet is mailed to all non-responders. No further incentives were included. Two weeks after the second packet was mailed, outbound recruitment calls began to non-responding house-

holds where a landline telephone match existed. Non-responding households that did not have a telephone match were mailed a one-page letter.

In terms of response, there are three modes available: mail, online and telephone. The recruitment packets included a mail response form than can be filled out and returned in a provided postage-paid business reply envelope. An online mode was also made available. Respondents could log on to a dedicated recruitment Web site using a unique code printed in the recruitment materials. These unique codes allowed tracking of individual households and prevented duplicate responses in the event a household responds through more than one mode. Finally a toll-free telephone number was provided for those who wanted to call and speak with a recruitment representative. All of these modes had an identical paper form, Web site and live recruiter in Spanish language.

In line with our usual offer made in KN's RDD telephone recruitment, all ABS pilot recruits were offered \$10 to complete their profile survey. This information was included in the printed materials, on the online recruitment site and was told to non-responders contacted for a telephone follow-up call.

4. Recruitment Results

4.1 Computation of Response Rates

4.1.1 Mail recruitment rates

In computing a response rate, in our case *recruitment rate* (Callegaro & DiSogra, 2008; DiSogra & Callegaro, 2009), we had to use a modified approach applying the American Association for Public Opinion Research (AAPOR) disposition codes (American Association for Public Opinion Research, 2008a). The AAPOR standards for computing mail survey rates are written for "mail surveys of specifically named persons." Because we mailed our pilot recruitment packages to "current resident" we had to make some modifications to the standards in order to compute the recruitment rate. In fact AAPOR "assumes that only the named person is the appropriate respondent and that some confirmation is needed that the named respondent is at the target address or otherwise still eligible for inclusion (p. 23)." By having address as the driver of eligibility and being the appropriate unit of analysis, the main modification applied was to treat as not eligible¹ cases in which the envelope was sent back to KN by the USPS (due to reasons such as un deliverable, vacant or no such address). In the original AAPOR definition, these cases should be treated as unknown eligibility. A similar approach was taken by Link and colleagues (2008).

Our second eligibility rule was that at least one person in the household had to be 18 years old or older in order to submit the acceptance form. Although any member of the household 13 years and older can join the panel, only an adult can sign up a minor.

The envelopes were addressed to "current resident" to prevent the recruitment packets being forwarded to another address and thus becoming ineligible for our purposes. As a means to catch any change of address, we asked all respondents (on paper, on line or through the live recruiter) to confirm their current address or indicate a change of address. Respondents who indicated an address change were classified as ineligible. Returned envelopes were logged into the system with the USPS code reporting the reason for

¹ These cases are numbered as 3.20, 3.30, 3.40 and 3.90 by the AAPOR standards, p. 47.

return. Some returns came back late in the field period, some showed up a few months after active recruitment efforts ended. Because of these issues, with mail surveys (unlike telephone) it is impossible to produce a response rate as soon as the field is closed. Clearly, some period of time needs to be allocated in order to wait until all undeliverables come back and until the late responders reply. For this reason, a preliminary response rate can be calculated early pending a final rate at a later point in time.

4.1.2 Non-response telephone follow-up of matched addresses: combining telephone disposition codes with mail disposition codes

As described in section 3, when the sample was constructed, telephone matching was made. The match rate for these city-style addresses was 68%. An outbound recruitment call was made to non-responding households with a telephone match. In order to assign a final disposition code to each address with a telephone match, we had to decide on some rules on how to combine mail and telephone disposition codes. The starting point was to treat the addresses from which we didn't get anything back as 3.19 in the AAPOR notation: "nothing ever returned" or as unknown eligibility-household, UH. In our case, nothing ever returned encompasses all modes: mail, online, or toll-free phone. We then followed a series of priority rules developed in order to use the best and more recent information about each address to assign a final disposition code. Table 1 describes the rule followed.

Table 1. Priority Rules to Assign a Final Disposition Code for the Non-Response Telephone Follow-up of Matched Addresses

Starting point ►	Reached someone on the phone ►	Address verification attempt ►	Final disposition code
Mail UH	No, using telephone disposition 3.10 to 3.161 and 4.20 to 4.70	Not possible	UH
Mail UH	Yes	No, address could not be verified	UH
Mail UH	Yes	Yes, wrong address	UH
Mail UH	Yes	Yes, right address	Final disposition given by phone disposition codes

4.1.3 Computing an estimate of the eligibility rate (e)

Eligibility rate was computed using the proportional allocation method based on the best information that was given by the rules followed in Table 1. There is some debate about using proportional allocation to estimate e for mail surveys because of the likelihood to underestimate household occupancy rates. We are working on alternative methods to be evaluated in future ABS recruitments for our panel.

4.2 Effect of the Advance Postcard

The advance postcard was intended to introduce KN and KnowledgePanel to the household and ask them to look for our invitation to join coming in the mail. There was no statistical difference in yield between households who did or did not get the advance postcard. This was also true among the different incentive level groups.

4.3 Overall Yield by Response Mode

When the mail efforts plus all telephone follow-up of non-responders was completed, 40% of the households joining KnowledgePanel were recruited via the telephone follow-up. The balance of 60% came mostly through the online mode, 29%, followed closely by

the return mail mode, 26%. Only 5% of households chose to use the toll-free telephone number to join.

4.4 Effect on Yield and Response Rate by Incentive Level

The pilot’s overall yield was 9.6%. Incentive had a significant effect on yield. Where the \$0 (no incentive) had a 7.3% yield, \$1 had a 9.1% yield ($p<.01$). Compared to no incentive, the highest yield came from the \$5 incentive at 12.3% ($p<.001$). The pilot’s overall calculated response rate was 11.2% (AAPOR RR3, see section 4.1 above). The response rates were also progressively higher as the amount of the incentive increased from 8.8% (\$0) to 10.5% and 14.2%, respectively. These results are shown in Table 2.

Table 2. Yield and Response Rates by Incentive Level and Overall

	Incentive level			Overall
	\$0	\$1	\$5	
Yield	7.3	9.1	12.3	9.6
RR3	8.8	10.5	14.2	11.2

4.5 Effect on Profile Rates by Incentive Level

Being recruited is only the first step in becoming a panel member. Only after completing a follow-up online profile survey can the individual receive client surveys. The overall completion rate of this profile survey (profile rate) for this pilot was 67%. No significant difference was found when testing across all three incentive levels ($p=.11$). However, the highest incentive level (\$5) had an observed higher profile rate than the \$1 group (71.5% vs. 64.5%, $p=.04$ uncorrected for multiple comparisons).

5. Profiled Demographic Comparisons by Incentive Level

In this last section we explore the question of possible sample bias due to the incentive provided. Specifically, is a different amount of provided incentive biasing the sample of profiled members in terms of their demographic characteristics? To answer this question, an analysis of incentive level by key demographic variables is performed. To test an association between incentive level and the variable of interest we use Cramer’s V for nominal variables and Gamma (γ) for ordinal variables.

5.1 Incentive by Household Level Variables

Two household level variables, income and Census region were examined. Neither showed any association with incentive level. Figure 3 shows how well income levels correspond with the expected Census distribution of income groups.

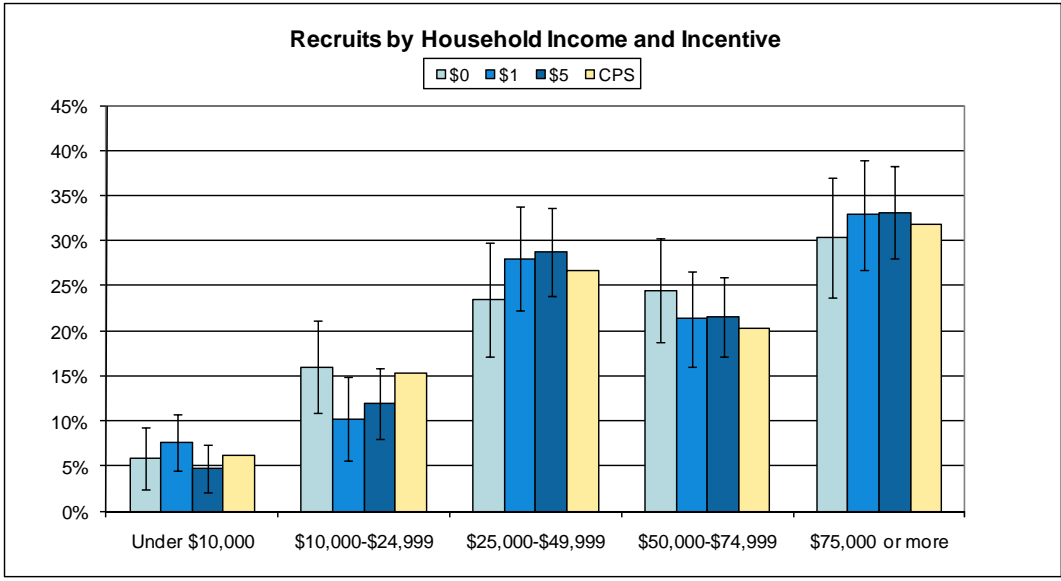


Figure 3. Income distribution of profiled recruits by incentive level as compared to the U.S. Census distribution (CPS 11/08)

5.2 Incentive by Person Level Variables

Four person level variables, gender, race (white, non-Hispanic vs. else, non-Hispanic), age, and education were examined. None showed any association with incentive level, although an association approached significance for age group ($\gamma = -0.059$ $p = 0.053$). Figure 4 shows how well income levels correspond with the expected Census distribution for age groupings.

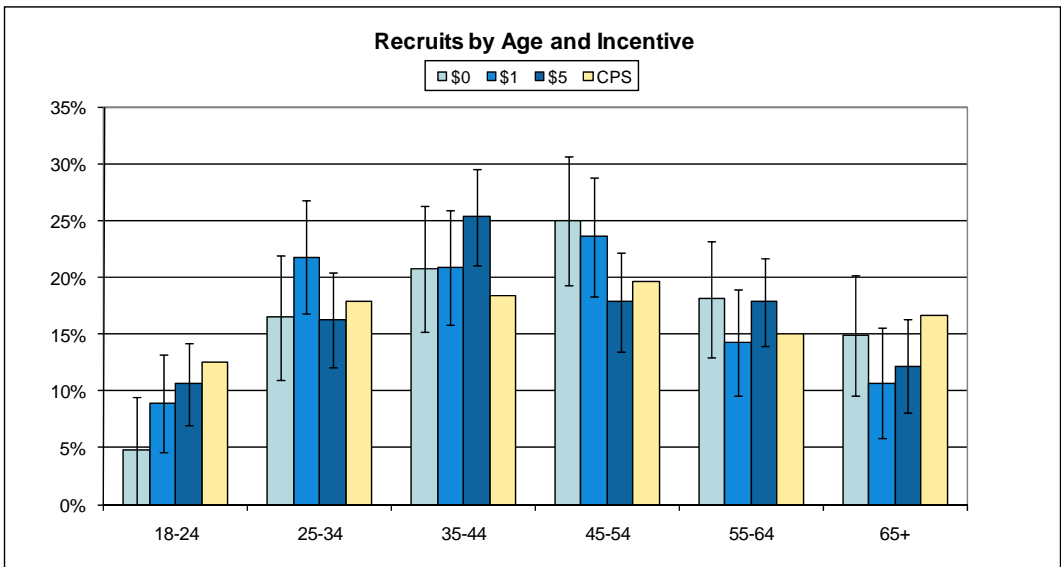


Figure 4. Age group distribution of profiled recruits by incentive level as compared to the U.S. Census distribution (CPS 11/08)

Figure 5 shows the resulting underrepresentation of High School and Less than High School groups as compared to the expected Census distribution with differences due to the provided incentive level.

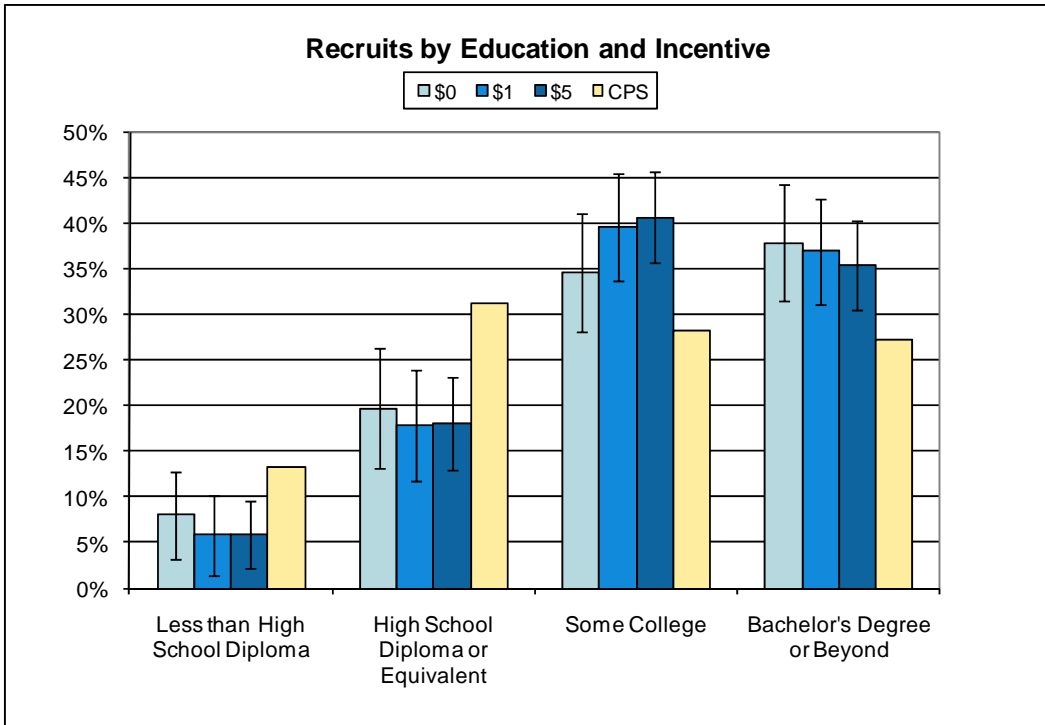


Figure 5. Education level distribution of profiled recruits by incentive level as compared to the U.S. Census distribution (CPS 11/08)

6. Results for Household Members, Non-Internet, and Cell-phone Only Recruitment

6.1 Recruits per Household

The mail recruitment is designed to recruit all household members, ages 13 and older. This mail pilot successfully recruited 2.3 persons per household (median and mode = 2.0) with 1.9 persons per household completed the follow-up online profile survey.

6.2 Non-Internet Households Recruited

Households without Internet access from home also tend to be lower income, lower education and more likely Hispanic. It is estimated that about 38% of households in the U.S. are such households as of October 2007 (U.S. Census Bureau, 2009). In this pilot, 11.7% of all recruits had no Internet access from home.

6.2 Cell-phone Only Households Recruited

It is estimated that at the time of the pilot, 18.4% of households were cell-phone only (Blumberg & Luke, 2009). We had 14.5% of all responding households as cell-phone only (no difference in this proportion was found by incentive level).

7. Conclusions

As a result of this pilot, several conclusions and recommendations were made. The advance postcard clearly had no impact on yield. Even if it worked to give advance notice, it is recommended that resources be better used to mail a 1-week reminder postcard to compress the response time to the initial recruitment packet.

The more costly mailing of a second full recruitment packet might be replaced with a reminder business letter sent sooner, highlighting the online and phone response options. Again, to compress the response time. Analyses need to be conducted on the impact of not mentioning the return mail option in this letter.

Cash incentives had a clear impact on yield and response rate over no incentive. Incentive levels showed no demographic or geographic differences whether \$0, \$1, or \$5. Incentive levels also showed no profile rate differences.

For cost purposes we would move forward with a \$1 incentive but because of the very positive impact on yield and the relatively good profile rate, we would want to test a \$2 incentive in the next effort.

The 67% pilot profile rate is 14 percentage points higher than experienced through traditional RDD recruitment methods at KN. This is possibly because mail eliminates live telephone recruiter "satisficing." It may be no coincidence that households recruited from the non-responder telephone campaign had the same lower profile rate (55%) as RDD telephone recruited households. We also believe that when a household has well designed and comprehensive printed materials in front of them to read at their convenience and at their own pace, a more considered response is made about joining. Thus, these responders are more likely to complete their profile survey.

The online response was proportionally larger than was expected compared to return mail replies. With more respondents going to the recruitment Web site, we recommend expanding the online information and enhance the ease of finding answers in order to accommodate a larger online audience.

Finally, for scaling up from a pilot to full production, we recommend optical scanning technology be used for mail reply forms. We will also be expanding the response form to allow for recruitment of multiple household members via return mail.

We believe this ABS pilot not only demonstrates the feasibility of a mail recruitment operation, but because of the success in recruiting cell-phone only households as well as young adults, we believe it has been shown to be a viable solution to the problem of RDD's shrinking coverage of U.S. households.

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