CELLULAR TELEPHONE USE AMONG HOUSEHOLDS WITH ABSENT OR INTERMITTENT LAND-LINE SERVICE

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1. Introduction

In addition to ongoing concerns about RDD sampling frames, the increasing use of wireless or cellular telephone (cell phones) raises new questions about the coverage of those frames. One can conceive of both land-line and cellular service as being continuous, intermittent or absent. See Figure 1. RDD samples provide inadequate coverage where land-line service is intermittent or absent (cells 4-9 in Figure 1). This paper is concerned with cells 4, 5, 7, and 8 on Figure 1. These are households where land-line service is less than continuous, but cellular service is present; in these instances, and being able to sample cellular telephones might fill the coverage gap. The ongoing coverage issues from RDD samples include:

- RDD samples omit people in households with no land-line service (3-5%; Tucker et al, 2004)
- RDD samples underrepresent those with intermittent land-line service
- Omitted and underrepresented persons and households differ from fully covered households. They are:
  - Lower income
  - More likely African American or Hispanic
  - Younger
  - Less likely to be employed

FIGURE 1

HOUSEHOLD TELEPHONE SERVICE

Service Type	Cellular		
Landline	Contin-uous	Intermit-tent	Absent
Continuous	1	2	3
Intermittent	4	5	6
Absent	7	8	9

A new set of issues have arisen with the spread of cell phones, for two reasons: first, some households who would ordinarily have continuous landline service may be substituting cellular for landline service, increasing the proportion of the population inadequately covered by RDD frames; second, including cell phone numbers in RDD frames could increase coverage. Coverage could be increased if either the substitution phenomenon occurs, or if those who previously had less than continuous landline service have obtained cell phones.

RDD samples omit most of those with only cellular service.[1] This group includes 3-6% of US households according to analysis of the NHIS and the CPS (Luke et al, 2004; Tucker et al, 2004). Further, prevalence of cell phone services is still growing.

This paper uses data from the Round 4 household survey of the Community Tracking Study (CTS) a large survey conducted in 60 sites in 2002-2003. We explore whether including numbers for cellular telephones would increase frame coverage for RDD surveys; the prevalence of cell phone ownership and use among households with absent or with intermittent land-line service; and, among limited land-line service households, how those with cell phones differ from those without.

The CTS focuses on issues of health insurance coverage and utilization of health care services, both of which are correlated with race and income, which in turn are correlated with level of land-line service. Other studies of the CTS have found differences between those sampled by RDD and those interviewed in-person whose land-line service was absent or intermittent (Touzani and Hall, 2004; Hall, et al, 2000). Thus, this paper focuses on a group that has cellular services and might serve to increase coverage of subgroups of interest to CTS and similar studies. As mentioned above, the groups of interest to CTS, but underrepresented by RDD frames have lower income, more likely to be African American or Hispanic, and have lower education levels. While there is another potential subset of cell-only users,

[1] A small number of cellular numbers inadvertently are included in RDD frames. However, commercial list-assisted RDD frames intentionally exclude exchanges reserved for cell phones.

who are hypothesized to be younger, with incomes closer to that of the general population, they are not the focus of this paper.

2. Description of Data Source

The data for this paper are drawn from the Community Tracking Study (CTS) Round 4 Household Survey. The CTS used a multi-stage design to provide national and some site-specific estimates. There were 60 sites, with RDD samples in all, in-person in 12 only. The design of the CTS Household Survey including the field (in-person) component has been documented in JSM Proceedings and elsewhere. See Hall and Carlson, 2002, Carlson, Strouse, and Hall (2002), Strouse, Carlson, and Hall (2001), Hall, et al, (2000) Strouse, et al (1998), Metcalf et al, (1996).

The CTS field sample provided in-person contacts with households. The purpose of the field sample was to increase coverage of households with no or intermittent phone coverage. (Households with continuous land-line service were excluded from the field sample.) It included 73 interviewing areas (IAs) in 12 sites, all of which were MSAs with 1992 population $\geq$250,000. Areas were omitted if 1990 estimates of non-phone was $\leq$3% of total (on average).

The data sources included both the screening survey for the field component (3,577 completed screeners), and the field samples main interview (595 households, 806 families, 1,241 persons). The screener included these questions on the number of working cell phones in household; whether calls are received on cell phones; whether the household has (current) land-line service and whether they have had any land-line service interruptions of 2 weeks or more in last 12 months.

Main interview topics included questions on economic status, health status and utilization of care, insurance, and demographic items

3. Analysis

As part of the field sample 5,129 were addresses contacted, and 3,577 households screened, with a response rate (CASRO method) of 86% (unweighted). 595 households completed main interview with a weighted response rate of 77%.

Results from the field screener data indicate (See Table 1, data are weighted to reflect differences in probabilities of selection and propensity to respond):

- 45% had cell phones, and 95% of households with cell phones received calls on them
- 10% of screened households had no working land-line phone at time of screener
- 91% of those without working land-line service had been without service for at least 2 weeks

We also find that an additional 6% had land-line service interrupted 2 or more weeks in last 12 months. Of the 15% that had current or past interruption:

- 43% have cell phone service vs. 46% of those without interruption
- 40% receive cell phone calls more than once of twice a month

We found large differences among sites in both the prevalence of cell phone service and land-line interruption. As seen in Table 2, the site-level prevalence of cell phone service ranges from 8% to 67% (median 40%) and the site -level prevalence of households with interruptions in land-line service ranges from 2% to 65% (median 15%).

The above results indicate that cell phone use is prevalent among households with no or intermittent land-line service.

We also compared families and persons based on whether household had a cell phone. As seen in Table 3, we found differences on:

- Income and work status
- Health service utilization
- Health insurance
- Interruption in land-line service

Compared to those living in households without cellular service, families with cellular service reported higher income (median family income was 50 percent higher) and adults were more likely to be working for pay (61 percent versus 42 percent). Those with cellular service were also less likely to be covered by Medicare or be without health insurance, and were more likely to have visited a physician in the last 12 months. Finally, those with cell phone service had longer interruptions of land-line service (7 months on average compared to 4 months) but less likely to report that the interruption was due to cost.

4. Conclusions

The households in the field sample have incomes substantially below the national average. This is expected because intermittent or absent land-line service is associated with lower incomes. Among the field sample those with no cellular service had lower incomes then those with cellular service. Their lower incomes are consistent with the lower level of health insurance coverage, less frequent doctor visits, and reporting that land-line service interruptions were due to cost. The finding that the non-cell group reported lower duration of interruptions in land-line service suggests that those with cell phones rely on them as a substitute for land-line service.

Our findings indicate that including cell phone numbers in the RDD sample would increase coverage of groups considered important to key estimates made by CTS. However, the differences between those with and without cell phones suggest that the coverage gap would not be filled completely. Any potential bias due to frame undercoverage would be decreased but not eliminated.

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TABLE 1

CTS SCREENER SURVEY RESULTS

	Total
No Land Line Service At Time Of Interview	9.87%
Service Interrupted 2 Weeks Or More (No Phone At Interview)	8.98%
Service Interrupted 2 Weeks Or More (Other)	5.95%
Service Interrupted 2 Weeks Or More (Total)	14.93%
Reported Having Cell Phone	45.20%
Received Calls On Cell Phone	42.94%

*Results are weighted for national estimates.

TABLE 2

PREVALENCE OF INTERRUPTION IN LAND-LINE SERVICE AND USE OF CELL PHONES BY SITE

Site	Interrupt	Cell Phone
Boston	6.11%	41.81%
Cleveland	25.41%	28.73%
Greenville, SC	18.64%	47.38%
Indianapolis	31.37%	36.07%
Lansing, MI	11.48%	35.79%
Little Rock	24.46%	55.42%
Miami	4.85%	48.16%
Newark, NJ	71.57%	9.80%
Orange County, CA	1.63%	65.63%
Phoenix	33.67%	44.95%
Seattle	11.46%	43.75%
Syracuse, NY	10.50%	27.00%
Total (Weighted for National Estimates)	**14.93%**	**45.20%**

TABLE 3

DIFFERENCES BETWEEN THOSE WITH AND WITHOUT CELL PHONES

	Cell	No Cell		Cell	No Cell
Household Composition[a]			Health		
Size	3.43	3.21	Asthma (current)	8.90%	12.27%
Number of children	0.655	0.485	Dr. visit (last 12 mo.)***	70.36%	56.46%
One person household	11.71%	11.30%			
Demographics			Insurance		
Median age	25.0	30.0	Medicaid	32.60%	36.39%
Female	51.09%	49.74%	Medicare***	3.04%	7.14%
Black[a]	29.60%	43.08%	Uninsured***	30.61%	41.32%
Hispanic[d]	21.90%	13.84%			
Economic			Land-line Phone		
Median income[b]***	24,000	16,000	Months interruption[b]**	7.0	4.0
Work for pay [c]***	61.20%	41.84%	Interruption due to cost[b]***	61.17%	77.49%

Sample Sizes	Cell	No Cell
Families	291	515
All Persons	481	760
Adults	376	620

Results are for all persons, except where noted.

[a]Households
[b]Family level
[c]Adults (18+)
[d]Significance not tested because CTS has large DEFFs on race/ethnicity

*Difference statistically significant; $p \leq 0.10$
**Difference statistically significant; $p \leq 0.05$
***Difference statistically significant; $p \leq 0.01$