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Wireless Substitution in the U.S. and Canada: Prevalence and Impact on Random-Digit-Dialed Health Surveys

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Abstract

Most major survey research organizations in the United States and Canada do not include wireless telephone numbers when conducting random-digit-dialed (RDD) household telephone surveys. In this paper, we offer the most up-to-date estimates available from the U.S. National Center for Health Statistics and Statistics Canada concerning the prevalence and demographic characteristics of the wireless-only population. We then present data from the U.S. National Health Interview Survey on the health and health care access of wireless-only adults, and we examine the potential for coverage bias when health research is conducted using RDD surveys that exclude wireless telephone numbers.

KEY WORDS: Wireless-only households; Mobile phones; Coverage bias.

1. Prevalence of Wireless-Only Households

1.1 Statement of Problem

The widespread availability of wireless telephone service and the relatively low cost of such service means that some people are now indifferent as to whether they make a call on a landline or wireless telephone. In fact, many wireless telephone users have substituted one or more wireless telephones (also called cellular telephones or mobile telephones) for their traditional household telephones (also called residential landline telephones). These wireless-only households pose a problem for most major survey research organizations in the United States and Canada because wireless telephone numbers are not typically included when conducting random-digit-dial telephone surveys.

The inability to reach wireless-only households has potential implications for coverage bias in random-digit-dialed telephone surveys. Coverage bias may exist if wireless-only households are not included in survey sampling frames and if persons living in wireless-only households differ on the survey variables of interest from persons living in households with landline telephones. To understand the nature of this potential coverage bias, the size and characteristics of the wireless-only population must be monitored using a personal visit survey. Both the U.S. National Center for Health Statistics and Statistics Canada have personal visit surveys that, to some extent, achieve this goal.

1.2 Estimates from the United States

In the United States, the National Health Interview Survey (NHIS) regularly provides the most up-to-date estimates available from the U.S. federal government concerning the size and characteristics of the wireless-only population. In-person interviews are conducted throughout the year with approximately 40,000 households annually, and the survey achieves generally high annual household response rates (86%-92%). This cross-sectional survey looks at the health status, health-related behaviors, and health care utilization of the U.S. civilian noninstitutionalized

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population. Since 2003, the survey has also included information about household telephones and whether anyone in the household has a working wireless telephone.

The percentage of U.S. households without landline telephones steadily declined from 1963 (19.7%), dropping below 10% in 1975, and reaching 3.2% in 2001 (Blumberg et al., in press). However, by the last six months of 2005, the percentage of households without landline telephones had increased to 10.4%. The cause of this increase is the growing prevalence of wireless-only households. In late 2005, 8.4% of households were wireless-only. The percent of households without any telephone service (landline or wireless) has remained low, averaging 2.0% from 2003 through 2005. Trends in the percent of adults and of children living in wireless-only households and households without any telephone service are shown in Figure 1.

Table 1 presents the percent of wireless-only adults (i.e., adults living in wireless-only households) by demographic characteristics. The single most important predictor of whether an adult is wireless-only is whether the home is rented or owned. Renters are more likely to be wireless-only than owners.

Adults living with roommates are more likely to be wireless-only than adults living alone or with family. Young adults are more likely to be wireless-only than older adults. Men are more likely than women to be wireless-only. Hispanic adults are more likely than non-Hispanic black adults or non-Hispanic white adults to be wireless-only. Adults living in poverty are more likely to be wireless-only than adults with higher incomes. Adults living in urban areas (i.e., metropolitan statistical areas, or MSAs) are more likely to be wireless-only than adults living in rural areas (non-MSAs). Adults living in the South, Midwest, or West are more likely to be wireless-only than adults living in the Northeast.

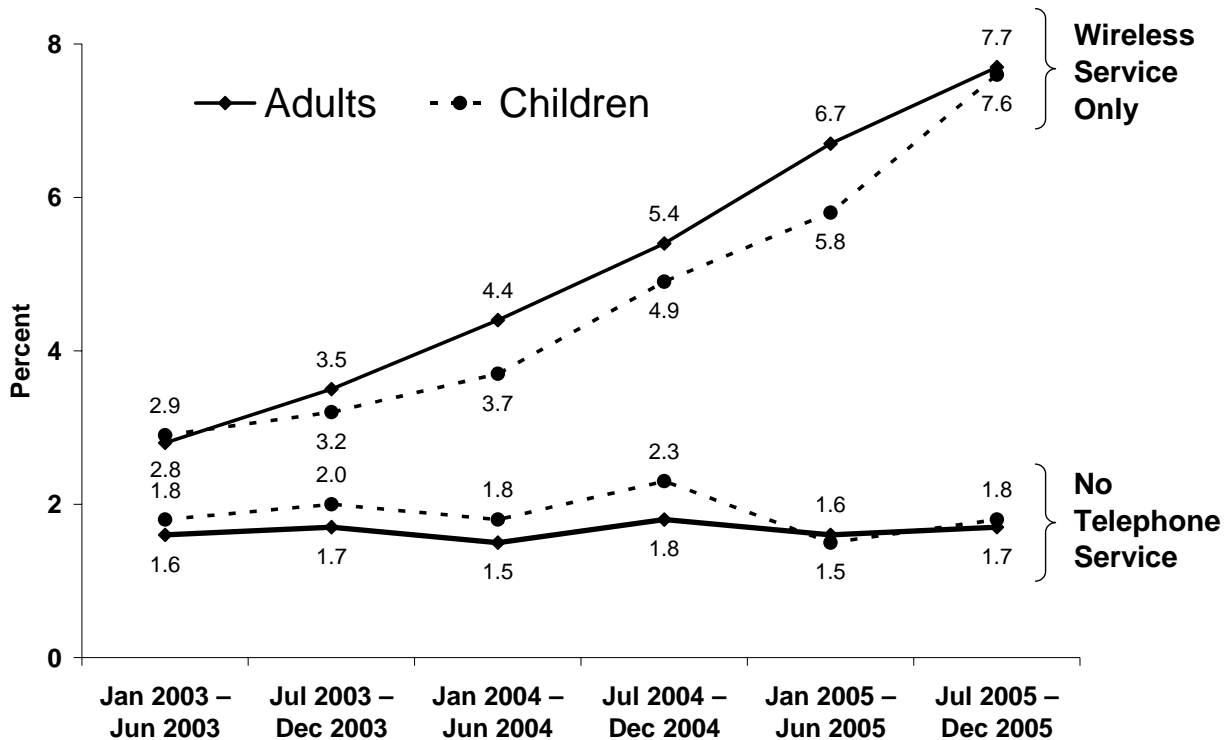


Figure 1. Percent of adults and of children living in households with only wireless telephones and households with no telephone service: United States, 2003 – 2005

Table 1. Percent of adults living in households with only wireless telephones, by selected demographic characteristics and by calendar half-years: United States, 2003 – 2005

	January – June 2003	July – December 2003	January – June 2004	July – December 2004	January – June 2005	July – December 2005
	Percent					
Race/ethnicity						
Hispanic	3.3	4.3	6.0	6.8	8.5	11.2
White, non-Hispanic	2.6	3.2	4.2	5.1	6.5	6.9
Black, non-Hispanic	2.9	4.0	4.1	5.8	6.6	8.5
Other single race, non-Hispanic	2.7	5.1	4.0	5.4	6.0	6.9
Multiple race, non-Hispanic	*5.5	7.2	8.9	11.2	8.1	11.5
Age						
18-24 years	6.0	8.1	10.3	14.2	16.6	17.5
25-44 years	3.7	4.8	5.7	6.8	8.9	10.6
45-64 years	1.4	1.7	2.3	2.7	3.2	3.7
65 years or more	0.5	0.5	0.9	0.8	0.9	1.2
Sex						
Male	3.2	3.9	5.2	6.5	7.5	8.6
Female	2.4	3.1	3.7	4.5	6.0	6.9
Education						
Some high school or less	2.9	3.4	4.9	5.5	6.7	8.0
High school graduate or GED	2.9	4.2	4.2	5.1	6.9	7.6
Some post-high school, but no degree	3.5	3.9	5.6	7.2	8.2	9.4
4-year college degree or higher	1.9	2.7	3.2	4.3	5.5	6.3
Employment status last week						
Working at a job or business	3.2	4.2	5.1	6.4	8.0	9.2
Keeping house	2.4	2.5	3.6	4.0	5.1	6.1
Going to school	4.2	7.3	7.1	12.2	10.8	15.5
Something else (including unemployed)	1.8	2.0	2.6	2.8	3.6	3.7
Household structure						
Living alone	5.3	7.1	8.3	9.7	11.2	12.3
Living with roommate(s)	10.8	*6.6	19.7	33.1	36.0	33.6
Living with spouse and/or related adults	2.0	2.7	3.2	3.6	5.3	5.9
Adult with children households	2.4	2.9	3.6	4.7	5.4	7.0
Household poverty status ^a						
Poor	5.9	6.3	8.0	10.1	11.8	14.2
Near poor	4.8	6.2	6.7	7.6	10.8	12.7
Not poor	2.5	3.2	3.7	5.1	6.2	7.0
Geographic region						
Northeast	1.3	2.1	2.3	2.9	4.1	4.7
Midwest	3.2	4.1	5.1	6.4	7.2	8.8
South	3.2	3.8	5.3	6.3	7.6	9.6
West	2.9	3.7	4.2	5.4	7.0	6.2
Metropolitan statistical area status						
Metropolitan	3.1	3.8	5.0	6.3	7.7	8.7
Not metropolitan	1.8	2.8	2.9	3.4	4.1	5.1
Home ownership status						
Owned or being bought	1.4	1.8	2.1	2.6	3.1	3.8
Renting	6.7	8.5	10.9	13.9	16.7	19.3
Other arrangement	4.0	5.9	6.3	10.1	10.7	8.4

*Estimate has a relative standard error greater than 30% and does not meet NCHS standards for reliability.

^aPoverty status is based on household income and household size using the U.S. Census Bureau's poverty thresholds. "Poor" persons are defined as those below the poverty threshold. "Near poor" persons have incomes of 100% to less than 200% of the poverty threshold. "Not poor" persons have incomes of 200% of the poverty threshold or greater.

1.2 Estimates from Canada

In Canada, the prevalence and characteristics of wireless-only households are tracked using the Residential Telephone Service Survey (RTSS), a personal visit survey conducted by Statistics Canada for the telecommunications companies and for the Canadian Radio-Television and Telecommunications Commission. The RTSS is fielded annually as a supplement to the monthly Labour Force Survey to monitor telephone penetration rates across Canada and to identify reasons why some households do not have telephones.

Based on results published in *The Daily* on April 5, 2006, 4.8% of Canadian households were wireless-only in December 2005 (Statistics Canada, 2006). As in the United States, the prevalence of wireless-only households in Canada has increased steadily since May 2003, when 1.9% of households were wireless-only. The percent of households without any telephone service (landline or wireless) has remained as stable over time in Canada as in the U.S., averaging only 1.3% of households since 2003.

In December 2005, British Columbia (7.1%) and Alberta (5.8%) had the highest prevalence of wireless-only households among the Canadian provinces. Newfoundland and Labrador (2.3%), New Brunswick (2.4%), Saskatchewan (2.5%), and Prince Edward Island (3.8%) had the lowest prevalence rates, whereas the remainder of the provinces had prevalence rates between 4 and 5%. As in the United States, households in urban areas with populations greater than 500,000 persons (6.1%) were more likely to be wireless-only than households in rural areas (1.8%). And households with incomes below Statistics Canada's Low Income Cutoff (7.7%) were more likely to be wireless-only than households with incomes above the Low Income Cutoff (4.1%).

1.3 Estimates from the European Union

The prevalence of wireless-only households in European Union countries is shown in Figure 2 (IPSOS-INRA, 2004). In general, every country in Europe had higher prevalence rates than the United States or Canada in 2003 and 2004. Moreover, it is worth noting that the prevalence of wireless-only households increased in every country from 2003 to 2004. This suggests that the rapid increase in the prevalence of wireless-only households in the United States and Canada is unlikely to end in the near future, and the prevalence of wireless-only households in the U.S. could reach 25% or greater within the next 3-5 years.

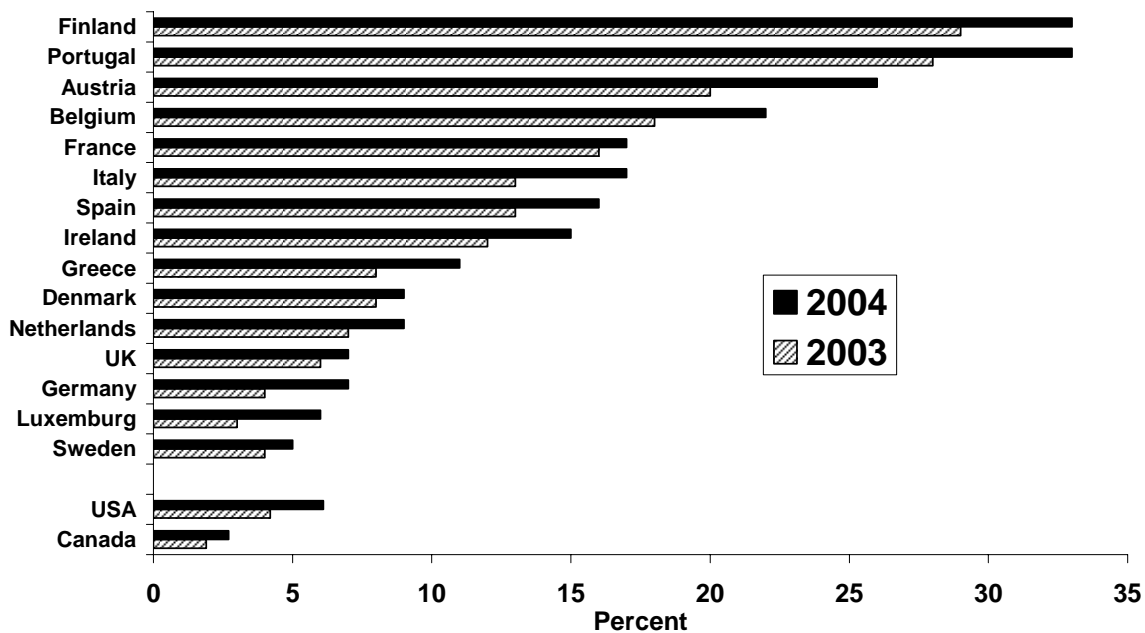


Figure 2. Percent of households with only wireless telephones: United States, Canada, and Countries of the European Union, 2003 and 2004

2. Potential Impact on Random-Digit-Dialed Health Surveys

2.1 Health and Health Care Service Use for Adults Without Landline Telephones

Two factors determine the degree of coverage bias due to telephone ownership in a telephone survey: 1) the percentage of persons without landline telephones in the population of interest; and 2) the magnitude of the difference between persons with and without landline telephones on the variable of interest. The earlier portion of this paper has focused on the first factor. We turn now to the second factor, using data from the 2005 NHIS.

For 14 key measures of health and health care service use, we compared estimates for adults with landline telephones to estimates for wireless-only adults and to estimates for adults living in households without any telephone service (i.e., phoneless adults). Operational definitions for these 14 measures have been presented elsewhere (Schiller, Martinez, & Barnes, 2006). The results of this analysis are presented in Table 2 (cf. Blumberg, Luke, & Cynamon, 2006).

Relative to adults living in households with landline telephones, adults living in wireless-only households were more likely to have engaged in binge drinking, more likely to smoke, and more likely to have experienced serious psychological distress in the past 30 days. They also were more likely to be in excellent or very good health. They were less likely to have been diagnosed with diabetes and more likely to engage in regular leisure-time physical activity.

Table 2. Prevalence rates of selected measures of health status, conditions, behaviors, health care access, and health care use, by household telephone status: United States, 2005

	In landline households ^a	In wireless-only households	In phoneless households	In all households with known telephone status
	Percent			
Health-related behaviors				
Five or more alcoholic drinks in 1 day at least once in past year	17.9	38.2	19.2	19.6
Current smoker	19.4	33.3	36.8	20.9
Engaged in regular leisure-time physical activity	29.9	36.4	21.0	30.2
Health status				
Excellent or very good health status	61.2	68.0	47.4	61.5
Experienced serious psychological distress in past 30 days	2.8	3.5	7.8	3.0
Obese (adults 20 years of age or older)	25.5	23.8	25.8	25.4
Asthma episode in the past 12 months	3.8	4.3	4.6	3.9
Ever diagnosed with diabetes	7.8	3.4	7.3	7.5
Health care service use				
Received influenza vaccine during past 12 months	22.4	9.5	16.5	21.2
Ever received a pneumococcal vaccination	17.5	7.6	9.2	16.5
Ever been tested for HIV	34.2	46.2	40.0	35.3
Health care access				
Has a usual place to go for medical care	86.4	66.9	67.4	84.5
Failed to obtain needed medical care in past 12 months due to financial barriers	6.4	12.9	14.6	7.0
Currently uninsured	14.3	31.5	40.4	16.2

^aIncludes households that also have wireless telephone service.

Adults living in wireless-only households were more than twice as likely to be uninsured for health care as adults living in households with landline telephones. Perhaps as a result, adults living in wireless-only households were also twice as likely to have experienced financial barriers to care, less likely to have a usual place for health care, and less likely to have received influenza or pneumococcal vaccinations. However, adults living in wireless-only households were more likely to have ever been tested for HIV.

2.2 Potential for Coverage Bias

To examine the potential coverage bias due to the exclusion of wireless-only households and phoneless households from RDD sampling frames, we compared the percent of adults with selected health-related characteristics from the full 2005 NHIS (which is considered to be a standard for population-based estimates) with estimates from the NHIS as if it were restricted only to those persons living in landline households. The potential bias is quite small; see the first and last columns in Table 2. For adults, potential bias of greater than one percentage point was observed for estimates of binge drinking, smoking, having a usual place to go for medical care, receiving influenza vaccine, having had an HIV test, and being uninsured. None of the measures revealed potential bias greater than two percentage points.

It is worth noting that the bias revealed by Table 2 is only the “potential” bias. The sampling weights that were applied to the NHIS data for adults in landline households were the same weights generated for estimates of the full U.S. civilian noninstitutionalized population. In contrast, many RDD telephone survey researchers would adjust the sampling weights for landline households so that estimates of key demographic characteristics match population control totals obtained from an independent source. If the differences on these health measures between persons with landline telephones and persons without landline telephones are related to demographic characteristics that can be controlled in this manner, then the actual coverage bias would be reduced by this weighting adjustment.

2.3 Summary

In summary, the noncoverage of wireless-only households in random-digit-dial health surveys can lead to bias, but—at the present time—the magnitude of that bias is small. Nevertheless, as the size of the wireless-only population grows in today’s rapidly changing technological environment, the potential for coverage bias may also increase.

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