

# **Adoption of the Dual Frame Telephone Survey with Cell Phones as Well as Landline Phones**

**From the Survey on “Attitudes and Values on Society and Life”<sup>1</sup>**

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<sup>1</sup> This is the English translation of the author’s article “Denwa yoron chosa, kotei denwa ni kuwae keitai denwa mo taisho ni: ‘Shakai to seikatsu ni kansuru ishiki/kachikan’ chosa no kekka kara” [Introduction of the Dual Frame Telephone Survey with Cell Phones as well as Landline Phones: Based on Findings from the Survey on “Attitudes and Values on Society and Life”], originally published in the May 2017 issue of *Hoso kenkyu to chosa*, NHK’s monthly report on broadcasting research. The full text in Japanese is available at: [http://www.nhk.or.jp/bunken/research/yoron/pdf/20170501\\_9.pdf](http://www.nhk.or.jp/bunken/research/yoron/pdf/20170501_9.pdf)

## Abstract

For its December 2016 survey on “Attitudes and Values on Society and Life,” NHK adopted a dual frame telephone survey targeting not only landline telephone but also cell phone users. Based mainly on findings from the survey, this article reports on the validity of the new survey method verified in the process of its adoption. The following are some major findings from the verification study: (1) Careful consideration of the circumstances of cell phone users (they might be driving, be outside the home, etc.) enabled the survey to be conducted without major problems; (2) adoption of the dual frame approach surveying both cell users and landline users enabled us to obtain responses not available in conventional landline telephone surveys; (3) the increase of young people responding via the cell survey brought the sample composition by gender and age group closer to the national census composition of the population; (4) there was little difference in response tendencies between the landline survey and the cell survey, indicating that both rendered appropriate results.

For the time being, the dual frame surveys are designed with sample allocations of almost the same number of responses for the landline and cell surveys, and, as a rule, we did not assign weight to either, instead simply adding up the responses.

Besides endeavoring to gain better response rates and analyze response tendencies, we explore the optimum sample allocation and optimum method of tallying survey results according to the changes in landline and/or cell phone ownership as well as the social circumstances surrounding telephone use.

There has recently been a steady decline in the number of landline telephone users, and today quite a few people are accessible only by cell phone. Given this situation, it has been questioned whether conventional public opinion surveys that target landline telephone users really reflect popular tendencies. With this in mind, NHK began in 2014 to conduct a series of test surveys focusing on cell phones and studied the practical application of a survey method done by asking both landline telephone and cell phone users. The result was the adoption of the dual frame telephone sampling approach for the December 2016 NHK survey on “Attitudes and Values on Society and Life.”

Based mainly on the results of the survey, this article reports on the content of the study that led to the introduction of the dual frame approach and compares the results of the December 2016 survey with those of conventional surveys that targeted landline phones. It also discusses response calculation methods and the problems involved. (Hereafter, surveys of landline telephone users are referred to as “landline surveys” and surveys of cell phone users are called “cell surveys.”)

## I. The Necessity of Cell Surveys

In conventional telephone surveys covering users of landline telephones, people who have only cell phone access are not selected for the sample. If cell-only users—those accessible only by cell phone—should display a significant proportion of characteristic response tendencies, then there is a possibility that the results of surveys of landline users already conducted have been affected. To verify that possibility, when NHK conducted a survey on Japanese eating habits (self-completion with interviewer involvement) in 2016,<sup>2</sup> we added a set of new questions to learn about landline and/or cell phone use. Using the responses to those questions, we compared the overall response results and those of respondents who were not cell-only users. Some 50 questions were asked, and of a total of more than 490 answer options 9 options—only about 2 percent of the total—showed significant difference between the two sets of results. Similar findings were observed for an NHK public opinion survey on political attitudes and behavior (self-completion with interviewer involvement) conducted soon after the House of Councilors election took place in July 2016.<sup>3</sup> These test cases indicate that, in the case of surveys using the self-completion interviewer-involvement method, responses from cell-only users have little effect on the overall results. We can assume therefore that at this point of time telephone public opinion surveys targeting only landline telephone users would be subject to little influence even if cell-only users are not covered.

The proportion of cell-only users, however, is expected to continue to rise. The conventional method of surveying only landline phone users will most likely prove to be limiting in the near future.

In the above-mentioned post-House of Councilors election survey of 2016, cell-only users made up 14 percent of all respondents. A look at the cell-only users by age group shows that 30 percent were age 18 to 29 and 34 percent were their 30s, indicating that most cell-only users are young people aged up to 39 years (Figure 1). As will be discussed later, today there are more cell-only users than landline-only users. In landline surveys, furthermore, since people who are away from home cannot be surveyed it is difficult to obtain responses from younger people, who often are not at home or return home late at night.

In landline surveys so far the number of responses from young people in their 20s and 30s is relatively small, and the sample composition skews toward people in higher age groups. If the situation in which the survey sample does not reflect the actual composition of the national population becomes serious, public opinion surveys conducted by telephone will lose their credibility.

In the United States, where dual frame telephone surveys using a landline and cell phone sampling frame are already the mainstream mode in telephone surveys, public opinion polling companies began conducting cell as well as landline surveys around 2007. According to a U.S. National Center for Health Statistics survey,<sup>4</sup> as of 2007 the number of people living in cell-only households constituted more than 10 percent of all respondents, a situation similar to that of Japan today. The proportion of cell-only users in the United States continued to increase in the following decade and in the first half of 2016 stood at 49.0 percent for people aged 18 or

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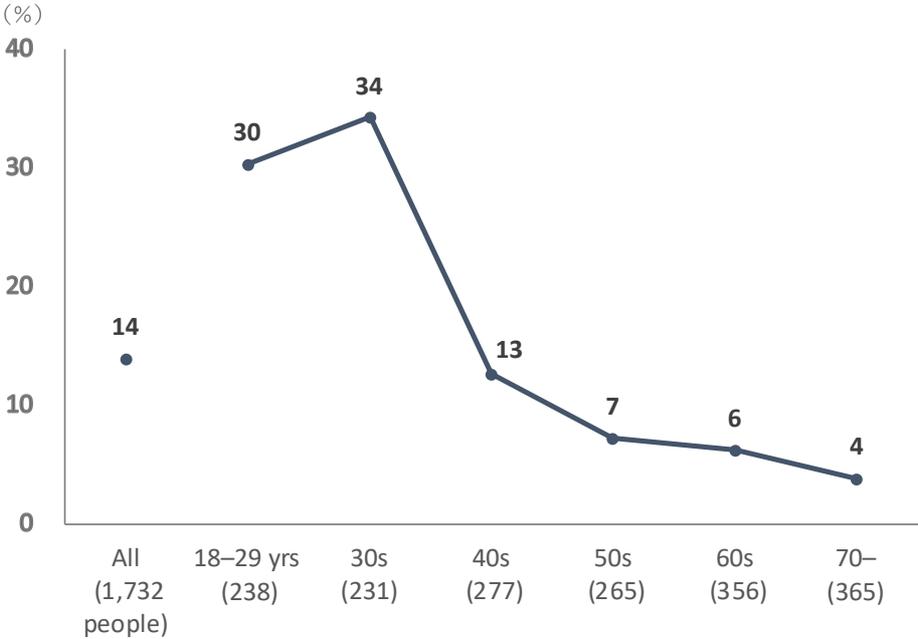
<sup>2</sup> “Shokuseikatsu ni kansuru yoron chosa” [Public Opinion Survey on Eating Habits], conducted by the NHK Broadcasting Culture Research Institute in February-March 2016.

<sup>3</sup> “San’in-sen go no seiji ishiki 2016” [Political Attitudes and Behaviors after the House of Councilors Election, 2016], survey conducted by the NHK Broadcasting Culture Research Institute, September 2016.

<sup>4</sup> National Health Interview Survey 2016, by the U.S. National Center for Health Statistics. <https://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201612.pdf>

older and as high as 59.4 percent for young people under 18 years of age. We cannot tell how fast the proportion of cell-only users will increase in Japan from now on, but it will certainly be necessary to adopt cell phone-based surveys to secure the credibility of telephone public opinion surveys.

**Figure 1. Cell-only Users (all respondents, by age group)**



From the 2016 NHK survey “Political Attitudes and Behaviors after the House of Councilors Election.”

## II. Special Issues in Experimental Cell Surveys

Not only NHK but other Japanese media organizations have been well aware of the necessity of cell surveys. In 2014, the Japan Association for Public Opinion Research and six of its members, Asahi Shimbun, Kyodo News, Nikkei Research, Mainichi Shimbun, Yomiuri Shimbun, and NHK jointly conducted a test survey focusing on cell phones.<sup>5</sup> The sampling method used was random digit dialing (RDD) of computer-generated numbers, the same method as used in conventional landline surveys. The possibility feared most at that time was that a telephone call might be received by a person driving a car, possibly resulting in serious trouble.

An analysis of the test results suggested that the trouble would be avoided if preventive procedures were adopted. For example, the call would begin by asking if the person who receives the call is driving, and if he/she is driving, terminating the call immediately after saying that another call would be placed later. It was also found that more responses were obtained from young people compared with landline surveys and that cell survey responses to questions

<sup>5</sup> Six media organizations and the Japan Association for Public Opinion Research, “Keitai denwa RDD jikken chosa kekka no matome” [A Summary of Cell Phone RDD Test Survey Results], 2015. [http://www.japor.or.jp/pdf/RDD\\_Report.pdf](http://www.japor.or.jp/pdf/RDD_Report.pdf)

concerning political attitudes had a similar tendency to the responses received in the landline surveys.

Some other issues were also identified. First, the number of female responses was smaller than that of male responses. In terms of sample composition, less than 40 percent of the responses are from women and 60–70 percent from men. The reasons for such findings will be discussed in detail later, but one most likely reason is that many women do not answer a cell phone call from an unknown number. Another issue concerns sample allocation and response calculation method. When a cell survey is adopted, the results and those of a landline survey are generally combined as a single survey. In that case, how should the sample size be allocated between the two? What weights be assigned to individual responses? These issues require further study and exploration.

### **III. Design of a Dual Frame Survey**

In January 2016, to seek advice and information about sample allocation and response calculation in dual frame telephone survey, NHK interviewed several public opinion polling organizations in the United States where dual frame surveys are widely used. It was found that there was no consensus among the polling organizations regarding dual frame survey designs. Each organization repeatedly reviewed survey designs and response calculation methods on their own and revised their methods successively to increase their precision.

Regarding sample allocation between landline and cell surveys, all the organizations we interviewed determined the ratios of the two survey samples according to the status of landline and/or cell telephone ownership. In the United States, the National Center for Health Statistics conducts a relevant large-scale survey through face-to-face interviews every year, making it possible to compute very precise ratios for each of the three categories of cell-only users, landline-only users, and users of both cell and landline telephones. Utilizing the statistical data, the polling organizations have been increasing the allocation ratio of the cell phone sample each year in accordance with the annual rise of cell-only users.

In Japan, on the other hand, no official statistical data about the status of landline and/or cell phone ownership is available. For that reason, once every year at the time of its public opinion survey (self-completion with interviewer involvement) NHK includes an additional question inquiring about the respondent's telephone ownership.

The results of the additional question provided at the post-election survey in September 2016 show 77 percent, or about eight out of every ten Japanese, have both landline phones and cell phones (Figure 2). Landline-only users make up 9 percent and cell-only users 14 percent, meaning there are more cell-only than landline-only users. Since both groups occupy a non-negligible proportion, conducting dual frame surveys is more appropriate than conducting surveys in only one of the two.

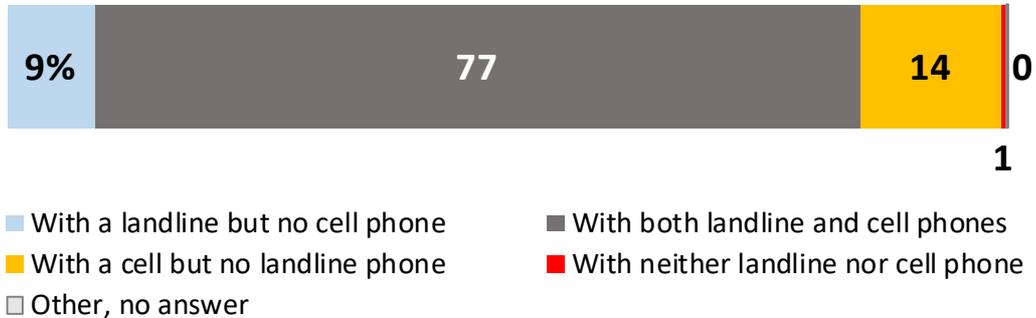
The survey also reveals that 85 percent have a landline telephone and 91 percent a cell phone,<sup>6</sup> their ratios being almost equal, at 49:51. So, it was decided that for the time being dual frame surveys will be designed in such a way that the number of responses from a landline survey and those from a cell survey will be almost the same. From now on, the ratios of the two

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<sup>6</sup> In computing response results, percentages are computed after real numbers are added together, and so they may not be identical to the figures obtained by simply adding the percentages.

will be reviewed on the basis of the results of a public opinion survey that is conducted once a year using the self-completion interviewer-involvement method.

**Figure 2. Ownership of Landline and/or Cell Phones (n = 1,732)**



From the 2016 NHK survey “Political Attitudes and Behaviors after the House of Councilors Election.”

The next problem is how to calculate the weights for the landline and cell surveys. In this regard, the U.S. polling organizations, although their methods vary slightly, use the base weight method, which adjusts the probabilities of selection, and then adjusts variables—such as gender, age, education, race/ethnicity and region—to the population. Considering their methods, NHK tried several weight calculations, the results of which will be discussed later.

## IV. Results of the Dual Frame Survey

### 1. Survey Outline

In this section let us look at the “Attitudes and Values on Society and Life” survey (dual frame survey) we conducted in December 2016. An outline of the survey is provided in Figure 3. The “dual frame sample” in the table indicates the figures obtained by simply adding up the numbers of responses of the landline and cell surveys.

The landline and cell survey sample allocation was so designed that the number of responses from the landline survey and that from the cell survey are almost the same, as mentioned earlier. NHK calculates the cell survey response rate by dividing the number of responses by the number of contacts, that is, the number of those who answered the call (omitting non-eligible responses). The response rate this time is 48.9 percent. The response rates of previous test cell surveys were also around 50 percent. We cannot make a simple comparison because the operation of the cell and landline surveys slightly differ, but there is not much difference between the two in terms of the ratio of number of responses against number of telephone numbers chosen for each of the two samples.

**Figure 3. Survey Outline**

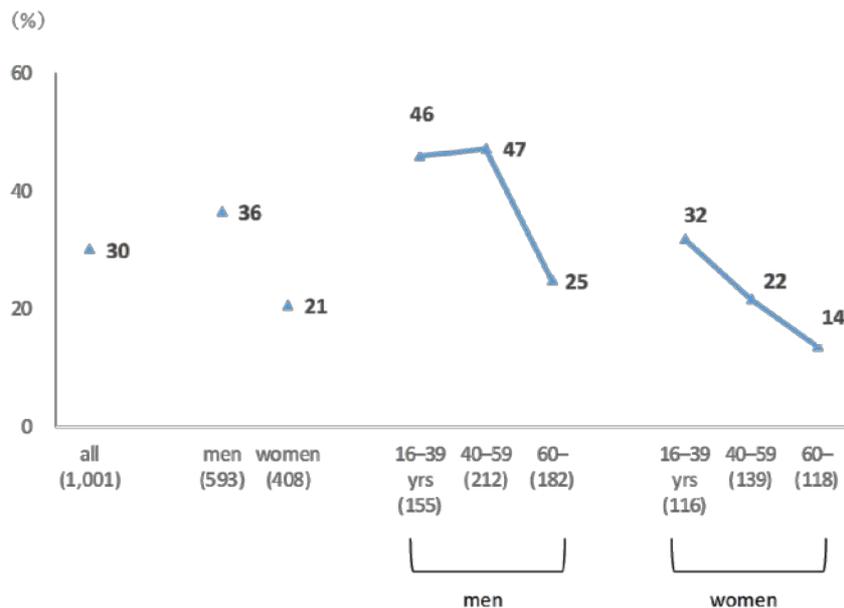
	Landline	Cell	Dual frame
Name	“Attitudes and Values on Society and Life”		
Period	December 16 (Fri.)–18 (Sun.), 2016		
Items	View of society, attitudes toward life, trust in media, etc.		
Method	Telephone survey (landline and cell RDD)		
Sample	Japanese aged 16 or older		
	1,528	2,047	3,575
Valid response (rate)	932 (61.0%)	1,001 (48.9%)	1,933 (54.1%)

**2. Operation Features**

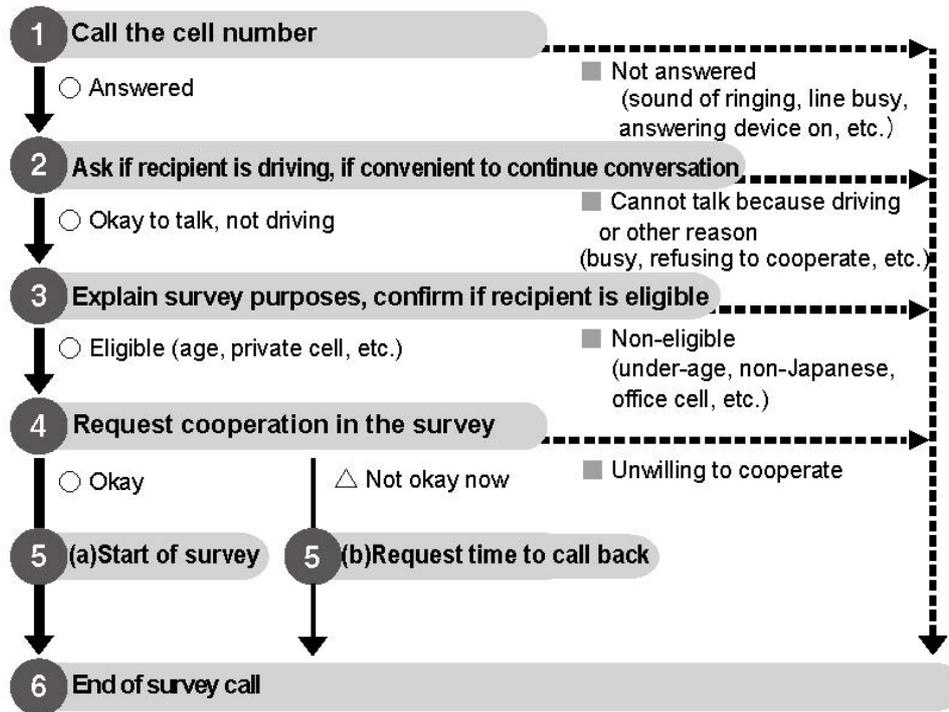
Both landline and cell phone surveys involve calling computer-generated random numbers. Landline telephones are owned by households and cell phones by individuals, and therefore, in the case of landline surveys, we first ask whoever answers the phone the number of the members of the household and then choose one of them at random. In the cell survey, since the person who answers the phone is directly part of the survey sample we can immediately ask him or her for cooperation in the survey. This is an advantage of cell surveys, but there is a great difference among respondents regarding where or under what conditions they receive the phone call.

In this cell survey, when asked where they received the call, 30 percent of the respondents say “Outside the home” (Figure 4). By gender and age group, about half of the men aged up to 59 received the call outside the home, a proportion by far higher than for the men aged 60 and older and for women of all age groups. Being able to obtain responses even from people who are “outside the home”—which is impossible with landline surveys—is a major merit of cell surveys.

**Figure 4. Cell Survey: Call Received “Outside the Home”  
(all; by gender and age group)**



**Figure 5. Cell Survey Procedure**



Since it is possible that the call may be received by a person who is driving or in the midst of work-related or other outside activity, high priority must be accorded to the safety of the respondent and consideration for the interruption caused by the call. In implementing the present survey NHK asked, at the beginning, whether the recipient of the call was driving or if it was convenient to continue the call (Figure 5).

The reasons cited for failing to obtain a response to the survey thus include a rather high proportion (14 percent) for “driving” (Figure 6), as is also the case with several other similar surveys in which 10–20 percent of those contacted were “driving.” Apparently this approach on initial contact is effective since there has never been a case in cell surveys conducted so far in which talking with a respondent has led to a major issue or difficulty.

**Figure 6. Cell Survey: Reasons for Failing to Obtain a Response**

<b>In transit (driving)</b>	<b>14.0%</b>
In transit (train, bus, car, etc.)	1.2
Working	11.5
At home but cannot talk	5.4
Outside the home but cannot talk	4.2
Busy (details unknown)	18.3
Other/reasons unknown, etc.	45.4

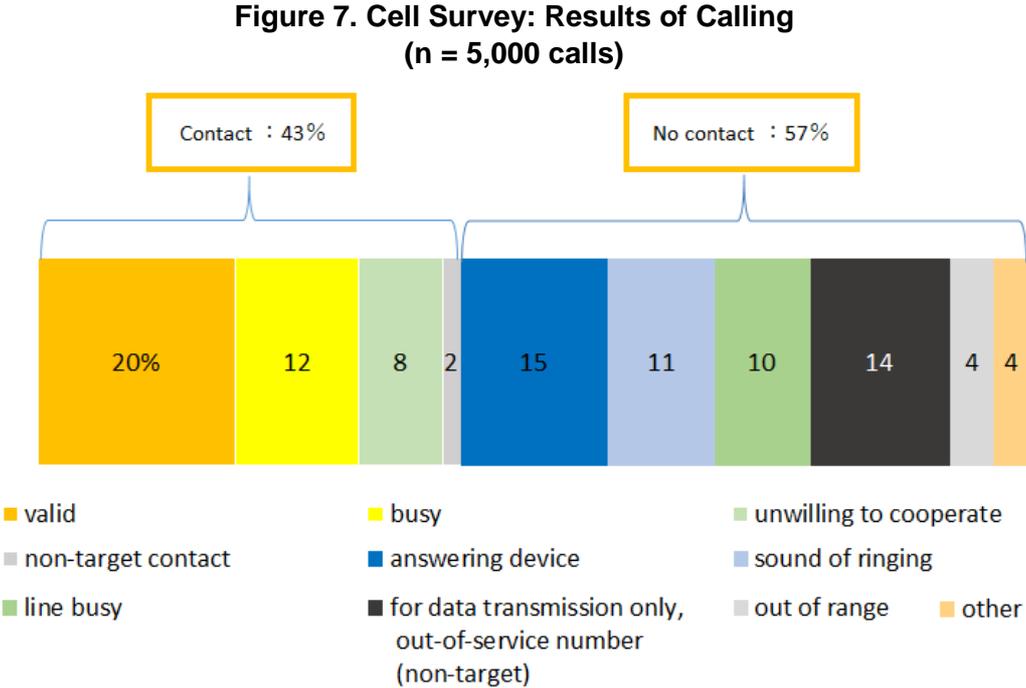
N = 1,554 (total cases for which responses not obtained)

Another feature of cell surveys is that since cell phones have no area code you cannot select or exclude a specific region. In the April 2016 landline survey NHK conducted immediately after the Kumamoto Earthquake,<sup>7</sup> we excluded from the survey sample the phone numbers that had the area code of the earthquake-affected region. Such a procedure cannot be adopted in the case of a cell survey. In cell surveys, there is always a possibility, even if small, that a survey phone call might reach a disaster-affected person who, for example, is living in an evacuation shelter. Assuming that a cell survey might be made soon after a major disaster such as an earthquake or heavy rain, we prepared what the caller would say on initial contact if the respondent happens to be a disaster victim, giving consideration to the feelings of the recipient.

In case of a warning of an earthquake or other disaster issued during the period of a telephone survey, either cell or landline, the manual on emergencies has been compiled stipulating the prompt suspension of the survey and judgment as to whether the survey should be resumed.

### 3. The Results of Calling

Next, let us look at the results of calling for the cell survey. Figure 7 shows the breakdown of the results of calling the telephone numbers (totaling 5,000) prepared for the cell survey.

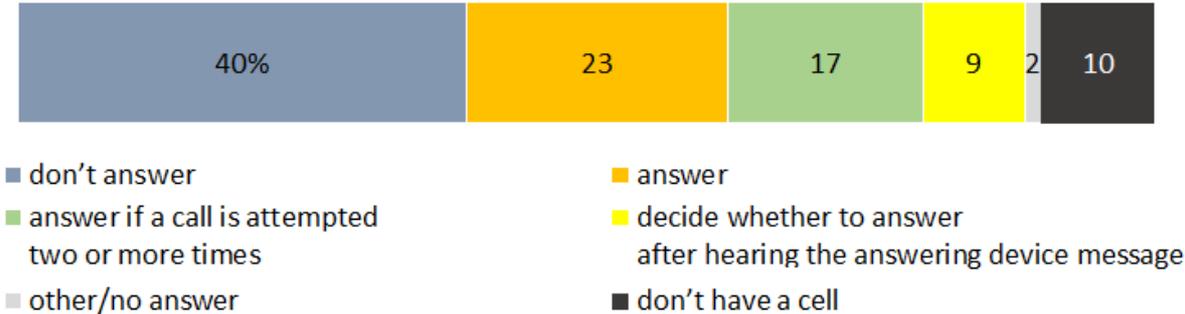


First of all, the rate of contact, that is, the rate of success in speaking to the person who answered the call (“valid,” “busy,” “refused to cooperate,” etc.) is 43 percent. In preceding test surveys, too, the rate of contact was less than 50 percent. This indicates that, for more than half of the phone numbers called, contact cannot be established. The reasons for this, besides such non-targeted numbers as “for data transmission only,” include “answering device,” which is the biggest reason (15 percent), followed by “ringing (no answer)” (11 percent) and “line busy”

<sup>7</sup> “Kenpo ni kansuru ishiki chosa” [A Survey on Attitudes toward the Constitution], by the NHK Broadcasting Culture Research Institute, April 2016. [http://www.nhk.or.jp/bunken/research/yoron/pdf/20160506\\_1.pdf](http://www.nhk.or.jp/bunken/research/yoron/pdf/20160506_1.pdf)

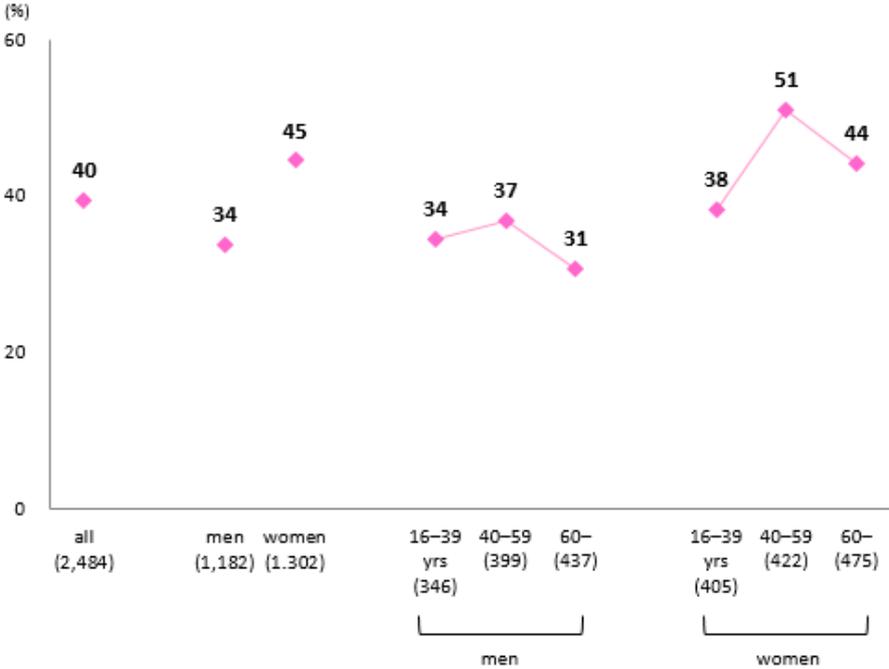
(10 percent). These results may suggest that a non-negligible number of people do not answer a call from an unknown phone number. In the aforementioned NHK survey on Japanese eating habits (February-March 2016), when asked whether or not you answer if you get a call from an unknown number on your cell phone, the highest proportion (40 percent) said they “don’t answer” (Figure 8). On the other hand, 23 percent say they “answer” and 17 percent “answer if a call is attempted two or more times,” for a total of 40 percent. In other words, the proportion of “don’t answer” and “answer” both stand at about half and half.

**Figure 8. Cell Phones: Handling of Call from Unknown Number (n = 2,484)**



From “NHK Public Opinion Survey on Eating Habits” (2016)

**Figure 9. Cell Phone: “Don’t Answer” a Call from an Unknown Number (all, by gender and age group)**



From “NHK Public Opinion Survey on Eating Habits” (2016)

By gender, 45 percent among women “don’t answer,” compared with 34 percent among men (Figure 9). By gender and age group, 51 percent of those women who “don’t answer” are aged between 40 and 59 and 44 percent aged 60 and older, both being higher compared with other age groups. These findings show women have a stronger resistance to an unknown telephone number than men and that the resistance is especially strong among middle-aged and older women.

How to make contact with those who do not answer an unknown caller is a key to increasing the number of responses in cell surveys. Since about 9 percent—one out of every 10 cell phone users—“decide whether to answer after hearing the answering device message,” it is important to leave an effective message on the answering device. The message should state clearly that the caller represents an NHK public opinion survey and concisely explain the purpose of the survey. Even such a message may not be received. Further study is needed as to how to explain the purposes of the survey and ask for cooperation when there is no answer or the line is busy.

**4. Comparison of Sample Compositions**

Comparisons in terms of composition ratios were made among the landline, cell phone, and dual frame samples. A look at the status of landline and/or cell phone ownership indicates that 26 percent own only a cell phone in the cell phone sample and 14 percent in the dual frame sample (Figure 10). The latter proportion is the same (14 percent) as found in the earlier-mentioned 2016 post-House of Councilors election survey. There is also no significant difference in the distribution of ownership between “owning of landline phone only” and “owning of both landline and cell phones” compared with the post-House of Councilors election survey.

**Figure 10. Status of Landline and/or Cell Phone Ownership**

(%)	Landline survey (n = 867)	Cell survey (n = 916)	dual frame survey (n = 1,783)	Public opinion survey (n = 1,718)
Own landline only	14.4	-	7.0	8.7
Own both landline and cell	85.6	73.6	79.4	77.2
Own cell only	-	26.4	13.6	14.0

Notes: “No answer” is excluded from figures for “landline survey,” “cell survey,” and “dual frame survey.” “No answer” is excluded from figures for the “public opinion survey” (self-completion with interviewer involvement), based on data from the 2016 NHK survey “Political Attitudes and Behaviors after the House of Councilors Election.”

A look at the sample composition of respondents by gender shows that the ratio of women is higher than that of men in the landline sample while the reverse is the case for the cell phone sample (Figure 11). As for the dual frame sample, the ratio of women is somewhat lower, approaching the ratio of the national census.

By age group, more responses were obtained from young people in their 20s and 30s in the cell survey than in the landline survey, their responses having not been easy to obtain in conventional surveys. When it comes to the dual frame sample, the overall composition ratio is

closer to the ratio of the national census although the ratio of young people in their 20s and 30s is slightly lower and that of people in their 60s slightly higher compared with the national census. A similar tendency was also found in test surveys. Obtaining more responses from young people means that finer analysis of young Japanese can be made by telephone public opinion surveys.

Observed by region, the composition ratios for the landline, cell phone, and dual frame samples are fairly close to the ratios of the national census (Figure 12 ).

**Figure 11. Sample Composition Ratio  
(by gender and age group)**

by gender	by age group																	
	men	women	men								women							
			16-19 yrs	20s	30s	40s	50s	60s	70-	no answer	16-19 yrs	20s	30s	40s	50s	60s	70-	no answer
landline survey (n = 932)	39.5	60.5	1.2	1.6	1.5	6.2	5.9	9.1	11.5	2.5	0.6	1.3	2.8	6.1	7.5	13.5	24.1	4.5
cell survey (n = 1,001)	59.2	40.8	2.2	6.4	6.9	12.0	9.2	9.9	8.3	4.4	0.8	5.0	5.8	7.4	6.5	6.5	5.3	3.5
dual frame survey (n = 1,933)	49.7	50.3	1.7	4.1	4.3	9.2	7.6	9.5	9.8	3.5	0.7	3.2	4.3	6.8	7.0	9.9	14.4	4.0
national census	48.2	51.8	2.2	5.8	7.1	8.7	7.1	8.2	9.2	-	2.1	5.5	6.8	8.4	7.1	8.7	13.1	-

Note: “National census” is the estimated population as of June 1, 2016 based on the advance report on population estimates from the 2015 national census.

**Figure 12. Sample Composition Ratio  
(by region)**

By region	By region									
	Hokkaido	Tohoku	Kanto	Koshin'etsu	Tokai/Hokuriku	Kinki	Chugoku	Shikoku	Kyushu/Okinawa	No answer
landline survey (n = 932)	4.7	5.9	30.3	3.8	15.0	19.2	6.0	3.9	11.3	-
cell survey (n = 1,001)	3.4	7.3	28.4	3.9	13.0	16.2	6.1	2.8	9.1	9.9
dual frame survey (n = 1,933)	4.0	6.6	29.3	3.8	14.0	17.6	6.1	3.3	10.1	5.1
national census	4.3	7.1	34.0	4.1	14.1	16.3	5.8	3.0	11.2	-

Note: “National census” is population estimates as of October 1, 2015.

## 5. Comparison of Response Results

Next we will see if there are differences in the content of responses to questions between the landline and cell surveys. The present surveys ask a total of 10 questions concerning a wide range of value orientation such as levels of satisfaction with life, friendships, and views of marriage. Except for Question 8, little difference in responses is seen between the landline and cell surveys. Responses differed between the two surveys for Question 8, which provided two options—“a free competitive society” and “a society aimed to eliminate disparities”—concerning “preferred social environment”(Figure 13).

This difference can be assumed to be largely due to a substantial difference among age groups. The proportion choosing “a free competitive society” tends to be high among young people and low among people of higher age brackets in both the landline and cell surveys. In the cell survey, since the number of responses from young people is larger than that in landline surveys, their tendencies are more strongly reflected in the overall results. In the test surveys too, those questions that made a difference in results between landline and cell samples were those that produced a notable difference between age groups.

Meanwhile, even in the same age group there may be a difference in responses between the landline and cell surveys. In response to Question 8 above, only men in their 60s show a difference in response between the two surveys (Figure14),<sup>8</sup> with “a free competitive society” chosen by 27 percent of them in the landline survey and 56 percent in the cell survey. To find out what caused the difference, we looked at demographic characteristics such as employment or unemployment, but could not find a variable that might be responsible for the difference. The response results of this and other such questions need to be analyzed with care to get a better understanding of their tendencies.

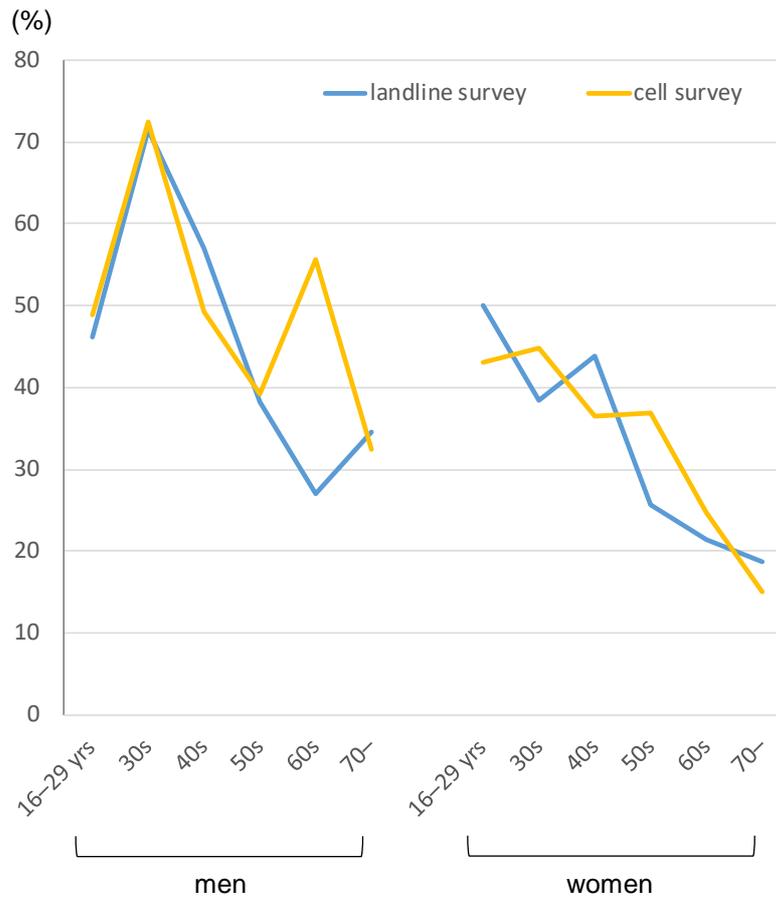
**Figure 13. Question 8: “Preferred Social Environment”**

			Landline survey (n = 932)		Cell survey (n = 1,001)
			(%)		
Q8 “Preferred Social Environment”	1	A free competitive society	28.6	<	39.7
	2	A society that aims to eliminate disparities	60.1	>	51.8
	3	Don’t know/No answer	11.3		8.5

Note: The signs < and > indicate statistically significant differences compared with the landline survey (confidence level 95%).

<sup>8</sup> The following is the number of respondents in each age group. **Landline survey:** 26 respondents for men aged 16–29; 14 for men in their 30s; 58 for men in their 40s; 55 for men in their 50s; 85 for men in their 60s; 107 for men aged 70 and older; 18 respondents for women aged 16–29; 26 for women in their 30s; 57 for women in their 40s; 70 for women in their 50s; 126 for women in their 60s; 225 for women aged 70 and older. **Cell Survey:** 86 respondents for men aged 16–29; 69 for men in their 30s; 120 for men in their 40s; 92 for men in their 50s; 99 for men in their 60s; 83 for men aged 70 and older; 58 respondents for women aged 16–29; 58 for women in their 30s; 74 for women in their 40s; 65 for women in their 50s; 65 for women in their 60s; 53 for women aged 70 and older. Numbers less than 100 are given as reference.

**Figure 14. “A Free Competitive Society”  
(by gender and age group)**



Note: For the number of respondents in each age group, see footnote 8.

## 6. Weighting Procedures

To determine whether to weight the sample results of landline and cell surveys, we tried the following three types of weighting, drawing on the methods used by major opinion poll companies in the United States, where dual frame surveys are common and various weighting methods are employed.

### (1) Adjusting the probabilities of selection

Adjustments are required to make the probability of being selected to participate in the survey sample equal for all people. In the landline survey, the more members you have in your household the lower the probability of your being selected. The probability of people living in two-member households being selected, for example, is half that of people in single-member households; for the sake of equality the weight of two-member-household people’s responses is made double that of single-household respondents. In the cell survey, meanwhile, the more cell phones you have the higher the selection probability. The selection probability for people with two cell phones is twice higher than that for people with one. In this case, the weight of the response of people with two cell phones is made half the weight of one-cell users’ response. Also, people with both landline and cell phones have a higher selection probability than people with only one of the two, and therefore the weight of the former’s response is reduced by that

much. In addition, since the total number of landline phone subscribers is different from that of cell phone subscribers in Japan, if the number of responses from landline users is the same as that from cell users the selection probability will differ between the two types of phone users. This too should be adjusted. In this way, an adjustment weight is assigned to each survey respondent with respect to variables such as number of members of a household, owing or not owning of a landline phone, number of cell phones owned, and total number of cell/landline phones.

(2) Adjusting the composition ratio by gender and age group

The sample composition ratio by gender and age group is adjusted to the population composition of the national census. For example, if the ratio of young men in the whole sample is small its weight is raised to match the ratio in the national census.

(3) Both (1) and (2) adjustments made

Both probability and composition ratio are adjusted.

Here let us compare the dual frame sample (the simply tallying of landline and cell survey responses) with the results of each of the above three types of weighting.

Looking at the ownership of cell and/or landline phones we see that the dual frame sample alone shows little difference compared to another NHK public opinion survey (Figure 15). In other words, if the ownership distribution of this public opinion survey represents a miniature of the Japanese people as a whole, it can be said that the dual frame sample is the closest—at this point of time—to that distribution.

**Figure 15. Comparison of Ownership of Landline and/or Cell Phone (all)**

(%)	Public opinion survey	Dual frame sample	(1) Selection probability adjusted	(2) Gender/age group adjusted	(3) Adjustment (2) followed by adjustment (1)			
1 Own landline only	8.7	7.0	10.6	>	6.1	>	9.5	
2 Own both landline and cell	77.2	79.4	>	67.6	>	76.8	>	66.1
3 Own cell only	14.0	13.6	<	21.8	<	17.1	<	24.5

Notes: The “public opinion survey” (self-completion with interviewer involvement) here is calculated based on the 2016 NHK survey “Political Attitudes and Behaviors after the House of Councilors Election,” excluding the “no answer” and other such responses. The signs < and > indicate statistically significant differences compared with the “public opinion survey” (confidence level 95%).

Next, let us look at the response results to each of the ten questions asked. Excluding some “no answer” cases, few answer options of the questions show a significant difference between the dual frame sample and each of the three types of weighting (Figure 16). The preceding test surveys produced similar results. This means that the weighting of each type had little effect on response results.

**Figure 16. Comparison of Response Results (all)**

		(%)	Dual frame sample	(1) Selection probability adjusted	(2) Gender/age group adjusted	(3) Adjustment (2) followed by adjustment (1)
Question 1 Level of satisfaction with life	1	Satisfied	32.8	32.1	32.9	32.3
	2	Somewhat satisfied	44.9	45.8	45.6	46.1
	3	Somewhat dissatisfied	14.3	14.4	14.1	14.2
	4	Dissatisfied	5.8	5.8	5.5	5.6
	5	Don't know/No answer	2.2	1.9	2.0	1.8
Question 2 Friendships	1	Rarely meet but somehow know how he/she's getting along	15.8	15.8	15.4	15.4
	2	Sometimes meet and spend time together	47.4	47.8	47.8	48.2
	3	We consult about everything and help each other	26.5	26.3	27.3	26.8
	4	Have no one I call a friend	5.6	5.8	5.2	5.5
	5	Other	0.2	0.1	0.1	0.1
	6	Don't know/No answer	4.5	4.2	4.1	3.9
Question 3 View of work	1	Give priority to own free time over work	40.7	41.3	41.5	41.7
	2	Give priority to work over own free time	51.9	52.0	51.5	52.0
	3	Don't know/No answer	7.4	6.7	7.0	6.3
Question 4 View of marriage	1	Think it's better to be married	57.3	57.1	55.9	56.0
	2	Don't need to marry but should have steady girl/boy friend	30.0	30.8	31.1	31.8
	3	Need neither to marry nor have steady girl/boy friend	7.6	7.7	8.3	8.1
	4	Don't know/No answer	5.1	4.4	4.8	4.1
Question 5 A View of falling in love (meaning of love)	1	Understand the feeling	59.3	59.2	58.8	58.9
	2	Somewhat understand the feeling	29.4	29.6	30.6	30.6
	3	Don't understand the feeling well	4.2	4.6	4.1	4.4
	4	Don't understand the feeling at all	1.4	1.5	1.5	1.5
	5	Don't know/No answer	5.6	5.2	5.1	4.7
Question 5 B View of falling in love (love and own time)	1	Understand the feeling	17.6	17.7	18.0	17.8
	2	Somewhat understand the feeling	48.6	49.3	49.5	50.0
	3	Don't understand the feeling well	20.7	20.7	20.4	20.6
	4	Don't understand the feeling at all	5.0	5.0	4.7	4.8
	5	Don't know/No answer	8.0	7.3	7.4	6.8
Question 6 View of life	1	Work hard to get ahead in life	38.4	38.4	39.4	39.2
	2	Lead a carefree life not worrying about getting ahead	50.4	51.7	50.2	51.5
	3	Don't know/No answer	11.2	9.9	10.4	9.3
Question 7 A Level of trust in the media (TV broadcasters)	1	Trust	8.0	8.7	7.5	8.2
	2	Somewhat trust	57.0	57.1	56.9	57.2
	3	Somewhat distrust	22.4	22.8	23.1	23.3
	4	Distrust	5.5	5.3	5.9	5.6
	5	Don't know/No answer	7.2	6.1	6.6	> 5.6
Question 7 B Level of trust in the media (newspaper companies)	1	Trust	13.6	14.0	13.2	13.6
	2	Somewhat trust	57.8	58.3	57.8	58.5
	3	Somewhat distrust	15.5	15.9	16.3	16.4
	4	Distrust	4.7	4.3	4.7	4.4
	5	Don't know/No answer	8.5	7.5	8.0	7.1

Question 7 C Level of trust in the media (weekly and magazine publishers)	1	Trust	1.5		1.9		1.5		1.9
	2	Somewhat trust	16.7		17.3		16.8		17.3
	3	Somewhat distrust	52.5		52.7		52.5		52.9
	4	Distrust	18.9		18.6		19.8		19.2
	5	Don't know/No answer	10.3		9.5		9.4		8.8
Question 7 D Level of trust in the media (Internet news media)	1	Trust	2.7		2.9		2.6		2.7
	2	Somewhat trust	28.6		29.0		28.7		29.3
	3	Somewhat distrust	40.6		40.8		42.2		42.0
	4	Distrust	10.9		11.1		11.3		11.4
	5	Don't know/No answer	17.2		16.2		15.1	>	14.5
Question 8 Preferred social environment	1	A free competitive society	34.4		35.2		36.4		36.8
	2	A society that aims to eliminate disparities	55.8		55.9		54.5		54.9
	3	Don't know/No answer	9.8		8.9		9.1		8.3
Question 9 Future of the public pension plan	1	Taxes and other burdens should be increased to maintain the pension system	39.5		39.3		39.3		39.3
	2	Taxes and other burdens should be maintained as they are even if public pensions are eventually decreased	35.0		35.9		35.5		36.2
	3	Taxes and other burdens should be lowered if it means there will eventually be a large decrease in pensions	10.0		10.4		10.6		10.8
	4	Don't know/No answer	15.5		14.3		14.6		13.6
Question 10 Your Nationalist sentiment	1	Strong	15.0		14.9		14.0		14.1
	2	Somewhat strong	50.2		51.2		50.8		51.9
	3	Somewhat weak	20.7		21.0		21.6		21.6
	4	Weak	4.2		4.3		4.4		4.4
	5	Don't know/No answer	9.9		8.5		9.2	>	8.0

Note: The sign > indicates statistically significant differences compared with the dual frame sample (confidence level 95%).

Weighting does not necessarily yield accurate data. In public opinion surveys there are always a non-negligible number of people who refuse to cooperate or who cannot participate due to absence from home and other reasons, and their percentages differ by gender and age group. For that reason, assigning weights to the responses of only those who cooperate with the survey and increasing or decreasing the weight of their responses may raise the possibility of distorting the results. If the weight of the responses of young people in their 20s alone is increased just because the number of their responses is small, this may only make their tendencies appear lopsided. Furthermore, in calculating and analyzing the data as well as in terms of understandability, applying weights would make the handling of data very complicated.

For these reasons, NHK as a rule does not assign weights to landline and cell survey responses and simply adds up the responses of both surveys. We will, however, continue to study in search of the optimal method for data calculation in accordance with landline and/or cell phone ownership status and changes in social conditions.

## Conclusion

We have identified the following major findings from the dual frame telephone survey:

- When designing the procedures of the survey for cell phone users, we took into careful consideration the conditions of respondents (they might be driving or away from home, etc.), which enabled us to conduct the survey without problems.
- The dual frame allows us to receive responses from cell-only users and people who happen to be outside the home. Such responses were not available in conventional landline telephone surveys.
- With more young people responding, the sample composition ratio by gender and age group comes closer to that of the national census.
- The response tendencies in the landline survey and the cell survey were not very different, indicating that we can obtain appropriate results from each of the two surveys.

From these findings, NHK has adopted the dual frame survey. We will continue seeking to improve the precision of the surveys by raising the response rate, analyzing the response tendencies of landline and cell surveys, and further studying sample allocations and weighting calculations as well as drawing on the expertise and knowhow of polling organizations in and outside Japan.