

# Does Continuing Data Collection Beyond One Month Improve the Completion and Response Rates in Behavioral Risk Factor Surveillance System Survey?

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## Survey Practice

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The behavioral risk factor surveillance system (BRFSS) is an ongoing state-based random-digit-dialing (RDD) landline telephone survey. The data is used for monitoring national, state and local health objectives, and developing local health programs. States are required to call all monthly sampled telephone numbers within a month from their release to survey implementers. When samples are not completed within that month, states strive to complete them shortly thereafter. Despite this endeavor, BRFSS survey response and completion rates have been declining since 2002 (Centers for Disease Control and Prevention n.d.). Other telephone surveys observed similar trends in response rates (Battaliglia et al. 2007; Groves et al. 2002). Recently, states expressed interest in exploring the effect of continuing the data collection longer than a month on the percentage of completed interviews and response rates.

Included among the factors contributing to this declining trend in the response rates cited by many studies are high refusal rates, increased telemarketing, use of new technologies, increase in single-person households, difficulty in contacting eligible respondents, decline in civic participation, lack of adequate leisure time, increased concern about privacy and confidentiality, demographic shifts in the U.S. population causing high language barriers, and physical and mental disabilities to complete the survey (Groves, Singer, and Corning 2000; Tourangeau 2004). These factors are often grouped into either refusal to cooperate, non-contacts or inability to participate (Groves and Couper 1998).

In 2007, the percentage of completed interviews of the total sample in the BRFSS survey was approximately 10%. Few states maintained or increased

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their 2006 completion rates (Centers for Disease Control and Prevention n.d.). States and survey organizations are searching for ways to improve response rates. The impact of various methods on the response rates were examined (Kropf and Blair 2005). In BRFSS, the average number of calls per completed interview has increased recently in many states, indicating enhanced efforts to contact selected households. This, however, did not improve the completion or response rates (Centers for Disease Control and Prevention n.d.). Additionally, retraining interviewers, hiring experienced interviewers and increasing hourly wages become routine practices for survey organizations and states as a potential means to improve response rates. Prolonging the length of time allotted for data collection also resulted in an increase in the response rate (Keeter et al. 2000).

In this paper, we examine whether continuing the data collection beyond one month improves the completion and response rates in BRFSS. If significant gains are observed, loosening the current BRFSS guidelines might become necessary.

## METHODS

We used the 2007 BRFSS data, a cross-sectional survey conducted in 50 states, Washington DC, and U.S. territories in collaboration with the Centers for Disease Control and Prevention (CDC). A representative sample of household landline telephone numbers is selected using a modified RDD method (Centers for Disease Control and Prevention 2006). Within the selected household an adult is selected randomly to be interviewed within 31 days, which is the current practice for data collection. We excluded Michigan and Louisiana from the analysis because of quarterly (3 months) data collection length for Michigan and data collection issues for Louisiana.

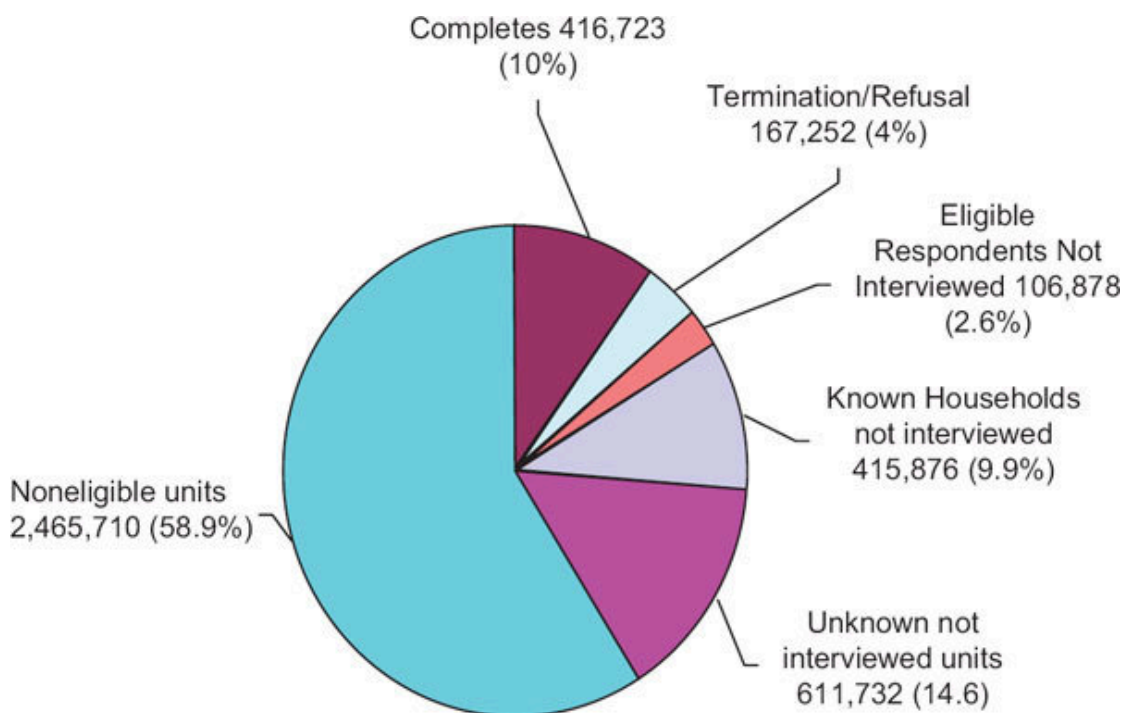
For each state, we estimated the percentage of the sample that was called and given a final disposition code (American Association of Public Opinion Research 2008), percentage of completed interviews and response rates in 31 days, 32 days–41 days and >41 days.

The numerator for the percentage of completed interviews was the completed and partially completed interviews (American Association of Public Opinion Research 2008). For the response rate numerator, we used the completed and partially completed interviews, and records indicating termination of interview in which at least 50% of the core questions prior to demographics section were answered. Because some states did not call all telephone numbers in the sample and could not have interview dates, we used a single denominator, as defined by American Association of Public Opinion Research (AAPOR) (American Association of Public Opinion Research 2008), to calculate response rates for 31 days, 41 days, and >41 days. We chose the single denominator because we were interested in the increase in the response rates as a result of the prolongation of the length of the data collection. We used SAS (*SAS 9.1* 1999)

to calculate our estimates.

## RESULTS

In 2007, excluding Michigan and Louisiana, a total of 4,184,515 telephone numbers were selected from the U.S. landline telephones for the BRFSS survey. We excluded 344 records with missing disposition codes and analyzed 4,184,171. Of these, 416,723 (10%) interviews were completed; 167,252 (4%) terminated or refused; 106,878 (2.6%) were eligible respondents not interviewed; 415,876 (9.9%) were households where the presence of eligible respondents could not be determined; 611,732 (14.6%) were numbers that could not be determined whether they belong to households or not; and 2,465,710 (58.9%) were ineligible numbers (Figure 1).



**Figure 1** Distribution of BRFSS Sample. Michigan and Louisiana Excluded, 2007.

Of the total telephone numbers analyzed, 4,173,620 (99.7%) received a final disposition code in 2007. Of these, 3,184,631 (76%) were called and had valid information on the interview date and 988,989 (24%) were not called. Of the numbers called, 2,828,171 (89%) received final disposition code within 31 days, 258,041 (8%) between 32 days to 41 days, and 98,419 (3%) more than 41 days. The percentage of telephone numbers receiving final disposition varied by state (Table 1).

**Table 1** Number and Percent of BRFSS sample called and given final disposition by interview duration by State, BRFSS 2007.

ST	0–31 days		32–41 days		42+ days		Total
	No.	%	No.	%	No.	%	
AK	8,996	90.8	832	8.4	76	0.8	9,904
AL	29,541	87.3	4,060	12.0	245	0.7	33,846
AR	26,008	99.4	168	0.6	0	0.0	26,176
AZ	47,301	92.0	2,853	5.6	1,236	2.4	51,390
CA	63,963	80.5	8,497	10.7	7,000	8.8	79,460
CO	26,389	59.3	7,309	16.4	10,769	24.2	44,467
CT	86,286	80.0	18,931	17.6	2,603	2.4	107,820
DC	70,543	84.8	11,596	13.9	1,021	1.2	83,160
DE	28,710	100.0	0	0.0	0	0.0	28,710
FL	204,039	93.7	13,712	6.3	0	0.0	217,751
GA	118,779	83.2	19,865	13.9	4,036	2.8	142,680
GU	8,965	99.9	1	0.0	4	0.0	8,970
HI	30,130	98.4	494	1.6	0	0.0	30,624
IA	15,402	91.3	1,375	8.2	91	0.5	16,868
ID	23,277	100.0	0	0.0	0	0.0	23,277
IL	49,253	84.4	2,455	4.2	6,658	11.4	58,366
IN	29,490	97.3	810	2.7	0	0.0	30,300
KS	26,420	98.7	343	1.3	0	0.0	26,763
KY	22,337	69.5	7,049	21.9	2,765	8.6	32,151
MA	225,430	86.8	22,484	8.7	11,826	4.6	259,740
MD	97,270	81.8	18,279	15.4	3,431	2.9	118,980
ME	33,032	97.3	913	2.7	0	0.0	33,945
MN	32,408	86.6	2,762	7.4	2,270	6.1	37,440
MO	17,940	100.0	0	0.0	0	0.0	17,940
MS	49,587	99.2	403	0.8	13	0.0	50,003
MT	52,454	88.4	5,705	9.6	1,210	2.0	59,369
NC	34,841	66.8	8,229	15.8	9,100	17.4	52,170
ND	16,339	100.0	0	0.0	0	0.0	16,339
NE	29,184	100.0	0	0.0	0	0.0	29,184
NH	52,575	87.5	5,885	9.8	1,660	2.8	60,120
NJ	123,394	84.1	18,752	12.8	4,583	3.1	146,729
NM	15,612	73.9	4,874	23.1	639	3.0	21,125
NV	22,059	70.6	2,250	7.2	6,953	22.2	31,262
NY	54,379	98.6	777	1.4	0	0.0	55,156
OH	72,635	77.0	12,437	13.2	9,294	9.8	94,366
OK	22,913	94.4	1,363	5.6	0	0.0	24,276
OR	52,909	96.1	2,126	3.9	45	0.1	55,080
PA	83,785	99.0	871	1.0	0	0.0	84,656
PR	27,630	100.0	0	0.0	0	0.0	27,630
RI	36,237	86.2	5,120	12.2	668	1.6	42,025
SC	34,971	100.0	0	0.0	0	0.0	34,971
SD	23,603	98.1	453	1.9	0	0.0	24,056
TN	26,352	100.0	0	0.0	1	0.0	26,353
TX	211,150	92.1	11,899	5.2	6,181	2.7	229,230
UT	8,966	68.3	2,786	21.2	1,367	10.4	13,119
VA	55,873	82.9	9,459	14.0	2,078	3.1	67,410

ST	0–31 days		32–41 days		42+ days		Total
	No.	%	No.	%	No.	%	
VI	13,837	98.0	287	2.0	0	0.0	14,124
VT	24,935	98.4	397	1.6	0	0.0	25,332
WA	276,463	94.0	17,140	5.8	587	0.2	294,190
WI	44,620	95.7	2,006	4.3	8	0.0	46,634
WV	11,919	100.0	0	0.0	1	0.0	11,920
WY	27,040	99.9	34	0.1	0	0.0	27,074
Total	2,828,171	88.8	258,041	8.1	98,419	3.1	3,184,631

Of the 3,184,631 numbers called in 2007, 415,371 (13%) completed the interviews, of which 94.6% were completed within 31 days, 3.7% were completed between 32 days to 41 days and 1.7% completed after 41 days. The percentage of interviews completed in these three time intervals varied between states (Table 2). The median increase in the percentage of completed interviews was 3.4%.

**Table 2** The number and percent of completed interviews by interview length for each State, BRFSS, 2007.

State	0–31 days		32–41 days		42+days		Total
	No.	%	No.	%	No.	%	
AK	2,382	95.5	103	4.1	8	0.3	2,493
AL	7,052	97.3	186	2.6	12	0.2	7,250
AR	5,733	100	0	0	0	0	5,733
AZ	4,552	96.2	119	2.5	62	1.3	4,733
CA	4,395	77.2	686	12.1	610	10.7	5,691
CO	9,393	80.5	1,306	11.2	967	8.3	11,666
CT	7,129	94.8	359	4.8	35	0.5	7,523
DC	3,757	94.9	177	4.5	23	0.6	3,957
DE	3,991	100	0	0	0	0	3,991
FL	39,037	98.7	510	1.3	0	0	39,547
GA	7,226	93.8	413	5.4	64	0.8	7,703
GU	657	100	0	0	0	0	657
HI	6,566	99.4	37	0.6	0	0	6,603
IA	5,182	95.5	239	4.4	7	0.1	5,428
ID	5,315	100	0	0	0	0	5,315
IL	4,595	87.8	248	4.7	393	7.5	5,236
IN	5,978	99.8	13	0.2	0	0	5,991
KS	8,466	99.7	22	0.3	0	0	8,488
KY	5,576	85.7	780	12	149	2.3	6,505
MA	20,154	93.7	1,053	4.9	300	1.4	21,507
MD	8,397	95.1	343	3.9	89	1	8,829
ME	6,816	99.8	14	0.2	0	0	6,830
MN	3,890	81.5	546	11.4	338	7.1	4,774
MO	5,236	100	0	0	0	0	5,236
MS	7,774	99.5	34	0.4	3	0	7,811
MT	5,764	96.1	204	3.4	27	0.5	5,995
NC	11,446	77.6	2,072	14	1,233	8.4	14,751
ND	4,751	100	0	0	0	0	4,751
NE	10,944	100	0	0	0	0	10,944
NH	5,784	96.6	154	2.6	52	0.9	5,990
NJ	6,868	94.9	308	4.3	60	0.8	7,236
NM	5,776	89.9	588	9.2	60	0.9	6,424
NV	2,973	74.8	440	11.1	563	14.2	3,976
NY	6,518	99.9	7	0.1	0	0	6,525
OH	9,293	82.8	923	8.2	1,013	9	11,229
OK	7,218	98.6	102	1.4	0	0	7,320
OR	4,788	96.7	135	2.7	28	0.6	4,951
PA	13,223	99.9	8	0.1	0	0	13,231
PR	3,934	100	0	0	0	0	3,934
RI	4,334	96.3	141	3.1	24	0.5	4,499
SC	10,395	100	0	0	0	0	10,395
SD	6,811	99.1	60	0.9	0	0	6,871
TN	5,032	100	0	0	0	0	5,032
TX	16,333	94.7	533	3.1	382	2.2	17,248
UT	4,420	88	469	9.3	131	2.6	5,020
VA	5,865	94.6	276	4.4	62	1	6,203

State	0–31 days		32–41 days		42+days		Total
	No.	%	No.	%	No.	%	
VI	2,537	100	1	0	0	0	2,538
VT	6,934	100	2	0	0	0	6,936
WA	24,631	95.2	1,085	4.2	165	0.6	25,881
WI	6,699	90.7	689	9.3	1	0	7,389
WV	4,444	100	0	0	1	0	4,445
WY	6,160	100	0	0	0	0	6,160
Total	393,124	94.6	15,385	3.7	6,862	1.7	415,371

The CSARO response rates by state and length of data collection are shown in Table 3. The median CASRO response rate in 2007 for the US was 51%. It increased 1.4% after continuing data collection longer than 31 days.

**Table 3** CASRO Response rates by length of data collection by State, BRFSS 2007.

State	Numerator			Denominator	CASRO Response Rate			Response rate gain after 31days
	31 days	41 days	42+ days		31 days	41 days	42+ days	
AK	2,438	2,541	2,549	3,895	62.6	65.2	65.4	2.8
AL	7,315	7,501	7,513	14,001	52.2	53.6	53.7	1.5
AR	5,898	5,898	5,898	11,900	49.6	49.6	49.6	0.0
AZ	4,664	4,783	4,845	11,990	38.9	39.9	40.4	1.5
CA	4,610	5,296	5,906	16,670	27.7	31.8	35.4	7.7
CO	9,599	10,905	11,872	19,242	49.9	56.7	61.7	11.8
CT	7,277	7,636	7,671	21,625	33.6	35.3	35.5	1.9
DC	3,895	4,072	4,095	10,574	36.8	38.5	38.7	1.9
DE	4,011	4,011	4,011	9,281	43.2	43.2	43.2	0.0
FL	39,940	40,450	40,450	79,569	50.2	50.8	50.8	0.6
GA	7,487	7,900	7,964	23,434	31.9	33.7	34	2.1
GU	661	661	661	827	79.9	79.9	79.9	0.0
HI	6,711	6,748	6,748	13,536	49.6	49.9	49.9	0.3
IA	5,278	5,517	5,524	8,980	58.8	61.4	61.5	2.7
ID	5,480	5,480	5,480	10,684	51.3	51.3	51.3	0.0
IL	4,706	4,954	5,347	12,935	36.4	38.3	41.3	4.9
IN	6,189	6,202	6,202	13,127	47.1	47.2	47.2	0.1
KS	8,546	8,568	8,568	13,717	62.3	62.5	62.5	0.2
KY	5,614	6,394	6,543	10,878	51.6	58.8	60.2	8.6
MA	20,699	21,752	22,052	63,768	32.5	34.1	34.6	2.1
MD	8,619	8,962	9,051	28,858	29.9	31.1	31.4	1.5
ME	6,979	6,993	6,993	14,623	47.7	47.8	47.8	0.1
MN	3,897	4,443	4,781	7,795	50	57	61.3	11.3
MO	5,434	5,434	5,434	9,127	59.5	59.5	59.5	0.0
MS	7,926	7,960	7,963	15,163	52.3	52.5	52.5	0.2
MT	5,861	6,065	6,092	13,510	43.4	44.9	45.1	1.7
NC	11,710	13,782	15,015	27,026	43.3	51	55.6	12.3
ND	4,886	4,886	4,886	8,582	56.9	56.9	56.9	0.0
NE	11,149	11,149	11,149	17,059	65.4	65.4	65.4	0.0
NH	5,868	6,022	6,074	16,120	36.4	37.4	37.7	1.3
NJ	7,124	7,432	7,492	27,847	25.6	26.7	26.9	1.3
NM	6,014	6,602	6,662	11,758	51.1	56.2	56.7	5.6
NV	2,973	3,413	3,977	7,765	38.3	44	51.2	12.9
NY	6,831	6,838	6,838	17,510	39	39.1	39.1	0.1
OH	9,427	10,350	11,363	27,118	34.8	38.2	41.9	7.1
OK	7,417	7,519	7,519	13,285	55.8	56.6	56.6	0.8
OR	4,789	4,924	4,952	10,642	45	46.3	46.5	1.5
PA	13,643	13,651	13,651	30,602	44.6	44.6	44.6	0.0
PR	3,974	3,974	3,974	5,643	70.4	70.4	70.4	0.0
RI	4,440	4,581	4,605	11,266	39.4	40.7	40.9	1.5
SC	10,636	10,636	10,636	18,097	58.8	58.8	58.8	0.0
SD	6,986	7,046	7,046	11,380	61.4	61.9	61.9	0.5
TN	5,074	5,074	5,074	9,470	53.6	53.6	53.6	0.0
TX	16,875	17,408	17,790	45,655	37	38.1	39	2.0
UT	4,489	4,958	5,089	7,770	57.8	63.8	65.5	7.7



State	Numerator			Denominator	CASRO Response Rate			Response rate gain after 31days
	31 days	41 days	42+ days		31 days	41 days	42+ days	
VA	6,023	6,299	6,361	16,535	36.4	38.1	38.5	2.1
VI	2,674	2,675	2,675	5,021	53.3	53.3	53.3	0.0
VT	7,045	7,047	7,047	12,359	57	57	57	0.0
WA	24,637	25,722	25,887	58,765	41.9	43.8	44.1	2.2
WI	6,863	7,552	7,553	12,913	53.1	58.5	58.5	5.4
WV	4,490	4,490	4,491	7,606	59	59	59	0.0
WY	6,285	6,285	6,285	11,740	53.5	53.5	53.5	0.0
Total	402,054	417,439	424,302	909,243	44.2	45.9	46.7	2.5
Median					49.75	50.9	51.25	1.4

## DISCUSSION

Continuing the data collection beyond 1 month shows a minimal contribution to the percentage of completed interviews and CASRO response rates, but the contribution is slightly higher on the percentage of the sampled telephone numbers that were given final dispositions than both of the former estimates. The median increase in the percent of completed interviews and the percentage of the sample that was given final disposition codes are 3.4% and 6%, respectively. Similarly, the median increase in the response rate is 1.4%. As the response rate and percent of completed interviews indicate, two essential measures of survey success, these gains could not warrant a change in the current guidelines, which is to complete the samples within a month. Improving the efficiency of the survey operation could result in similar gains within the limits of 1 month duration of data collection. Some states completed their samples within a month, and those adopted 3 months (quarterly) data collection length were not different than those following the current 1 month practice in the percent of completed interviews. Also, states that gave final disposition to their samples within a month include those that used large and small samples in their BRFSS survey, and did not confine themselves to call telephone numbers prescreened as working numbers and are likely households.

Furthermore, changing the current guidelines might compromise standardized practices, a major strength for the BRFSS data collection, which allowed survey analysts to compare parameters across states and territories. It could also bring unnecessary disruptions and confusion in survey operations and efficiency in the course of its implementation and introduce additional variation to estimates.

Although the majority of states continue to collect data after 31 days, the remaining numbers in their samples are completed shortly after 31 days, thus preserving comparability of information by time reasonably across states and counties. Seventy three percent of the sample called after 31 days received final

disposition within 10 days from the 31 days. Similarly, 80% of the interviews completed after 31 days were completed within 10 days from the 31 days. Studies that examined the effects of the extended length of data collection on response rates showed varied effects (Groves, Lyberg, et al. 1988) and (Collins et al. 1988), which is consistent closely with our findings across states.

The observed minimal increase in the percent of completed interviews and CASRO response rate from the extended field period might not bias U.S. estimates in diseases, risk factors and disease-risk associations because the majority of completed interviews (95%) were captured within 31 days. Few states could experience biases in state and local estimates because of the wide variations in the proportion of completed interviews captured after 31 days. However, further studies are needed to verify the existence and determine the extent of such bias. Likewise, further studies are needed to examine the differences between the information captured before and after 31 days of data collection.

Our study has limitations. The analysis excluded two states and telephone numbers that were not called. We did not group the states by the organization or agency that collects the data, which could vary in their survey operation strategies. Therefore, generalization of the findings should consider these limitations. In addition, the BRFSS survey uses RDD landlines, and findings might not be applicable to surveys using other modes of data collection.

After 31 days of calling, telephone numbers that were hard to reach are the ones to be called further and are less likely to end up in completed interviews as the results show. Thus, continuing the data collection longer than 31 days is inefficient for landline telephone surveys. BRFSS survey shares similar problems with other landline surveys. Incorporating other modes of data collection, such as cell-phone and mail modes, to RDD landline could bring some solution to the declining response rate problem.

**CDC disclaimer:** The findings and conclusions in this report are those of the authors and do not necessarily reflect the official position of the Centers for Disease Control and Prevention.

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