

Evaluation of the Impacts of Neustar Caller Name Optimization and Branded Caller ID on the National Immunization Survey-Child

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Abstract

The National Immunization Surveys (NIS) are random-digit-dial (RDD) telephone surveys used to assess vaccination coverage among children age 19-35 months (NIS-Child), adolescents age 13-17 years (NIS-Teen), and influenza vaccination coverage for children age 6 months-17 years (NIS-Flu) in the United States. In 2018, the NIS transitioned from a dual-frame landline and cell phone sample to a single-frame cell phone sample design.

Declining response rates for cell phone samples motivated the exploration of new ways to encourage cell phone users to answer when the NIS interviewer calls and to participate in the NIS interview if they have age-eligible children. NORC has explored two potential ways to encourage contact and participation through Neustar's Caller Name Optimization and Branded Caller ID Display products. Neustar's Caller Name Optimization makes legitimate calls less likely to be flagged as spam on cell users' phones. Branded Caller ID displays the CDC name and official logo on enabled smart phones when an incoming call is received. In Quarters 3 and 4 of 2019, NORC assigned a portion of the NIS sample to be dialed from an outgoing number flagged for Caller Name Optimization (Treatment 1), a portion to be dialed from an outgoing number flagged for Branded Caller ID Display and Caller Name Optimization (Treatment 2), and a control group to be dialed from an "untreated" outgoing number. In this paper, the results of the evaluation will be described, showing differences between the two treatment groups and the size of the impact.

Key Words: Cell phone sample, Neustar, response rates

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

1. Background

Surveys with cell phone samples have faced declining response rates over the years, in part due to the number of telemarketing and spam calls respondents receive and because legitimate survey calls are sometimes flagged as spam by cell phone carriers or devices (Kennedy & Hartig, 2019). The National Immunization Surveys (NIS) have also contended with this issue. The NIS are random-digit-dial (RDD) cell-phone surveys used to assess vaccination coverage among children age 19-35 months (NIS-Child) and adolescents age 13-17 years (NIS-Teen), and influenza vaccination coverage for children age 6 months-17

years (NIS-Flu) in the United States (National Immunization Surveys, 2018). The NIS is reviewed by the NORC Institutional Review Board before fielding.

In recent years, the Federal Communications Commission (FCC) has issued several rulings to protect consumers from “unwanted calls” (Federal Communications Commission, 2019, p.1). During the time of this evaluation on the NIS, there were two FCC rulings in place that may have affected how NIS calls were handled by cell phone carriers. In November 2017, the FCC ruled to “[allow] phone companies to proactively block calls that are likely to be fraudulent” (Federal Communications Commission, 2017, p. 1). In June 2019, FCC ruled that “voice service providers may, as the default, block unwanted calls based on reasonable call analytics” (Federal Communications Commission, 2019, p. 1). This effort poses a challenge for legitimate telephone surveys as their calls may be blocked or marked as spam by cell phone carriers, reducing the likelihood that respondents will answer the phone (Dutwin et al., 2018).

As part of an effort to improve declining response rates, the NIS explored two potential ways to encourage contact and participation using communication services from Neustar. NORC worked closely with Neustar to test the impact of two services on the NIS—Caller Name Optimization and Branded Caller ID Display. The Caller Name Optimization (CNO) is a reputation management service, where Neustar works with the cell phone carriers to keep calls from being flagged as spam. CNO is not able to prevent spam flagging by all carriers and devices, but Neustar estimates that it covers over 95% of devices. The Branded Caller ID Display (BCD) is a pilot service that allows certain smartphones and carriers to display a color logo in addition to the other elements of caller ID. The BCD service has to be used in combination with the CNO service—it cannot be used alone. At the time of this evaluation, Neustar had one carrier participating in BCD and they expect that more carriers will participate in the future. In addition, at the time of this evaluation, only newer Android phones for that carrier had the ability to display the BCD logo. Neustar expects phone capability to increase in the future as well.

For both services, it is important to note that many respondents will not see a caller ID name. Generally, only those respondents that have subscribed to a service with their carrier see the caller ID name. Most respondents instead see only the calling telephone number, city, and state. NORC conducted two studies to test the effect of these services on key outcomes in the NIS.

2. Description of Study Design and Methods

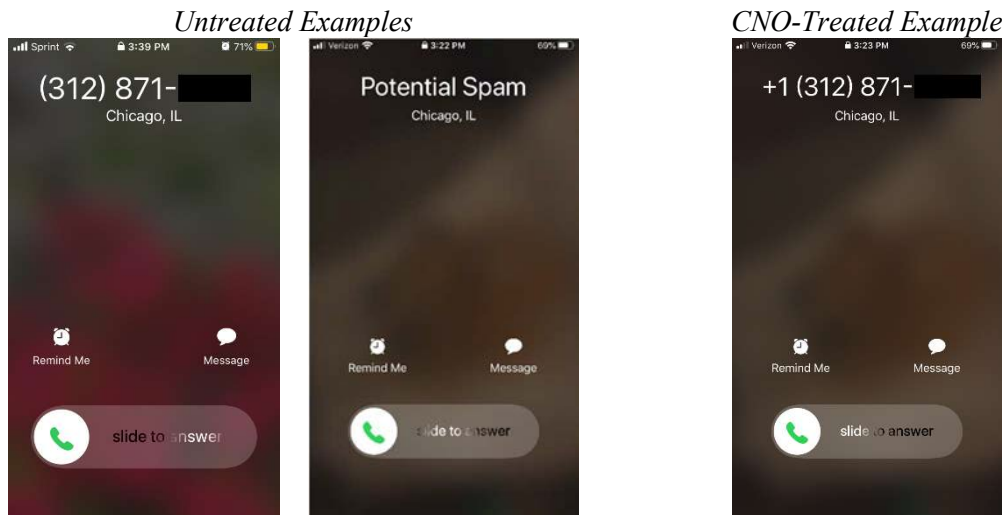
In Quarters 3 and 4 of 2019, the NIS utilized both the CNO and BCD services. Sample was randomly assigned to be dialed on one of three outbound telephone numbers: 5% of sample was dialed using an untreated outbound number, 47.5% of sample was dialed using a CNO-treated number, and 47.5% of sample was dialed using a BCD + CNO-treated number. The BCD + CNO treatment will be referred to as BCD-treatment since both services are included when Branded Caller ID Display is used.

2.1 Description of Caller Name Optimization (CNO)

As can be seen in Example 1, the two cell phone screens on the left are possible caller ID displays for the untreated number for a recipient with no caller ID service. The respondent may see only the NIS phone number or see a description identifying the number as spam. Some cell phone carriers identify the NIS number as spam and some do not. In addition, some devices have the capability to display “Potential Spam” and some do not.

For the CNO-treated number on the right in Example 1, there will be no “Potential Spam” identification attached to the number for the carriers where Neustar has managed the reputation of the number to keep it off of spam lists. Caller ID would display the number, city and state.

Example 1: Caller ID examples for the untreated telephone number and the CNO-treated telephone number

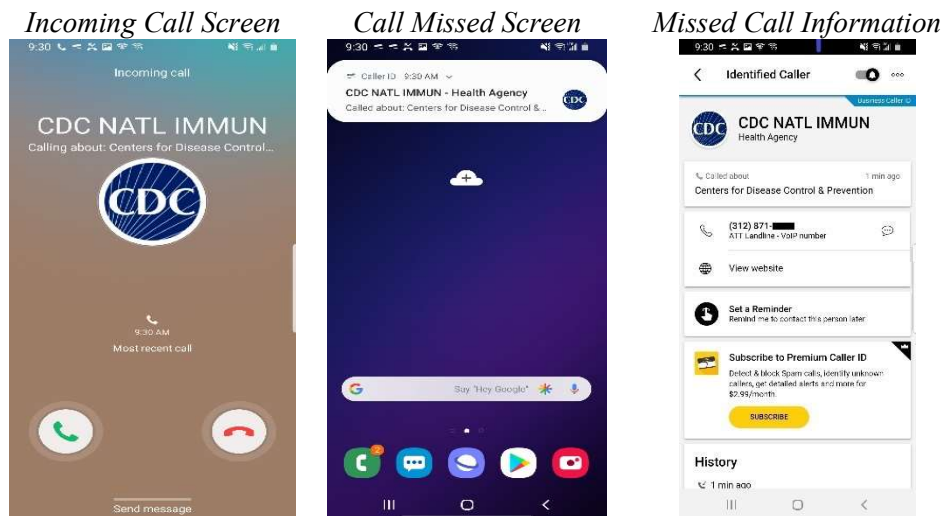


2.2 Description of Branded Caller ID Display (BCD)

Example 2 shows how the BCD-treatment functions for the NIS when supported by the recipient’s carrier and phone. All three of the cell phone screens in Example 2 are displays of what may be seen by the respondent: (1) the incoming call screen, (2) the missed call screen, and (3) the detail provided when a respondent clicks on missed call information.

The three screens all include the CDC logo, the Caller ID name (“CDC NATL IMMUN”), and a “calling about” description. The BCD-treated outbound telephone number also has the CNO-treatment applied, so receiving phones not supporting BCD would get the standard caller ID displaying the phone number, city, and state.

Example 2: Branded Caller ID Display examples for BCD capable phone



2.3 Methods

In this evaluation, the impact of Neustar applying the Caller Name Optimization (CNO) treatment and Neustar applying the Branded Caller ID Display (BCD) treatment was estimated. The impact of what is displayed on respondents’ phones could not be estimated, because device level information was unknown.

First, the CNO-treated sample was compared to the untreated sample to evaluate whether the CNO-treatment is beneficial to the NIS. Second, the BCD-treated sample—which included CNO-treatment—was compared to the CNO-treated sample to examine whether the BCD-treatment is adding benefit beyond the CNO-treatment.

The following key outcomes were compared for the treatment groups: working number rate among dialed cases, contact rate among working numbers, age-screener completion rate among contacts, age-eligibility rate among age-screener completes, interview completion rate among age-eligibles, and interview yield rate among dialed cases. Results focus on the NIS-Child, because all sample is first screened for the NIS-Child.

Table 1. Key Outcome Definitions

<i>Rate</i>	<i>Definition</i>
Working Number Rate among Dialed Cases	Working Numbers / Dialed Cases
Contact Rate among Working Numbers	Contacts / Working Numbers
Age-Screener Completion Rate among Contacts	Age-Screener Completes / Contacts
Age-Eligibility Rate among Age-Screener Completes	Age-Eligible Cases / Age-Screener Completes
Interview Completion Rate among Age-Eligibles	Interview Completes / Age-Eligible Cases
Interview Yield Rate among Dialed Cases	Interview Completes / Dialed Cases

These key outcomes were compared overall and by carrier. To be able to make comparisons within carriers, carrier information was appended to the sampled phone numbers by the NIS sample provider. Carriers are identified only as Carrier A, Carrier B, Carrier C, Carrier D, and Carrier E.

Carrier B was the only participating carrier in BCD at the time of this evaluation. All carriers were still evaluated for the effect of the BCD-treatment. Carrier assignment is based on phone number. If a respondent has ported his or her phone number to another carrier, the carrier information used in this analysis will not be correct. Therefore, it is possible to have some respondent phone numbers receiving BCD-treatment in other carriers in the analysis. In addition, by looking at individual carriers, it can be confirmed whether carriers are behaving as expected with regards to the BCD-treatment.

3. Results

3.1 Neustar Caller Name Optimization

CNO-treatment sample was compared to the untreated sample.

3.1.1 Working number rate among dialed cases for CNO-treated compared to untreated

As shown in Figure 1, we observed a significantly higher working number rate for CNO-treated sample compared to untreated sample overall (56.1% vs. 54.9%, $p < 0.001$) and for all of the carriers, except Carrier D. Carrier E had the largest improvement with CNO-treatment (64.6% vs. 59.9%, $p < 0.001$).

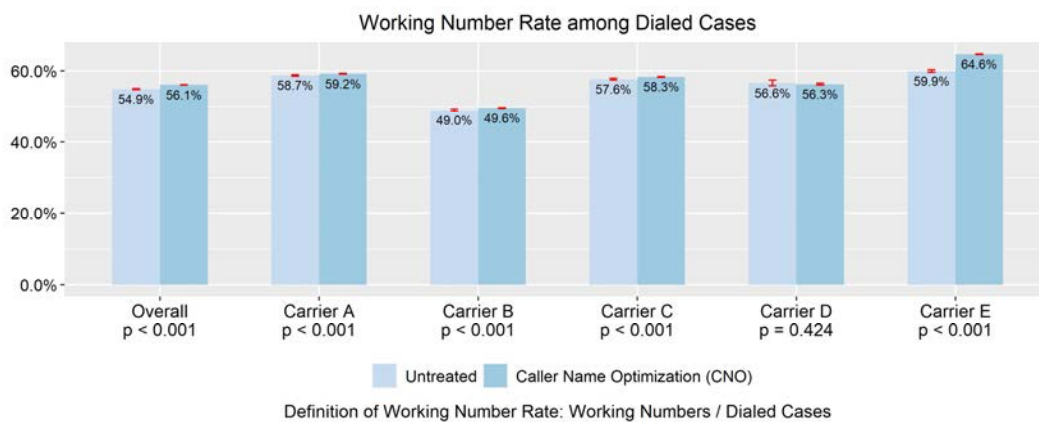


Figure 1: Working number rate among dialed cases for CNO-treated sample compared to untreated sample. Overall sample p-value for test of no difference, $p < 0.001$

3.1.2 Contact rate among working numbers for CNO-treated compared to untreated

Among working numbers, the differences in the contact rate were assessed (Figure 2). Overall, the contact rate among working numbers was higher for the CNO-treatment compared to untreated (40.4% vs. 37.1%, $p < 0.001$). All of the carriers showed significant differences except for Carrier D. Carrier E again had the largest difference (45.1% vs. 34.5%, $p < 0.001$).

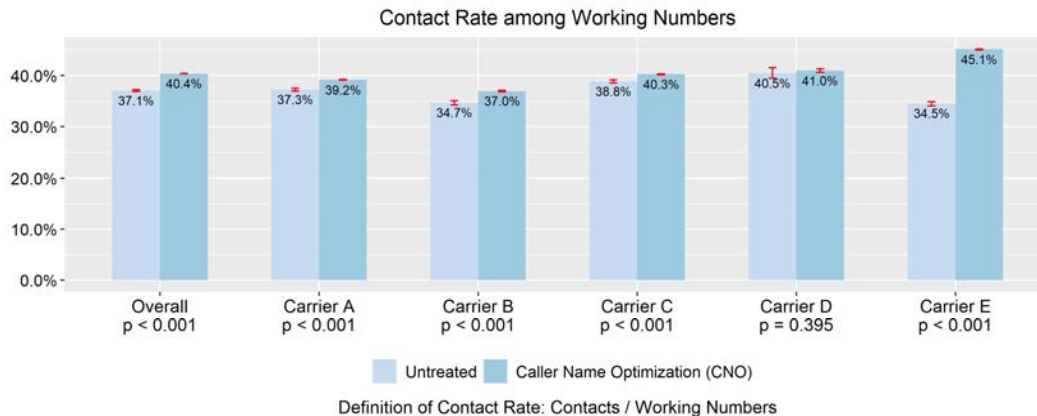


Figure 2: Contact rate among working numbers for CNO-treated sample compared to untreated sample. Overall sample, p-value for test of no difference, $p < 0.001$

3.1.3 Age-screener completion rate among contacts for CNO-treated compared to untreated

The age-screener completion rate among contacts was also improved in the CNO-treated sample compared to the untreated sample overall (21.6% vs. 20.7%, $p < 0.001$) and for most carriers (Figure 3). Two carriers' differences in age-screener completion rate were significant at the 0.001 level (Carriers A and E), a third carrier at the 0.01 level (Carrier B), and a fourth at the 0.05 level (Carrier C). The largest impact was seen in Carrier E (19.2% vs. 16.2%, $p < 0.001$).

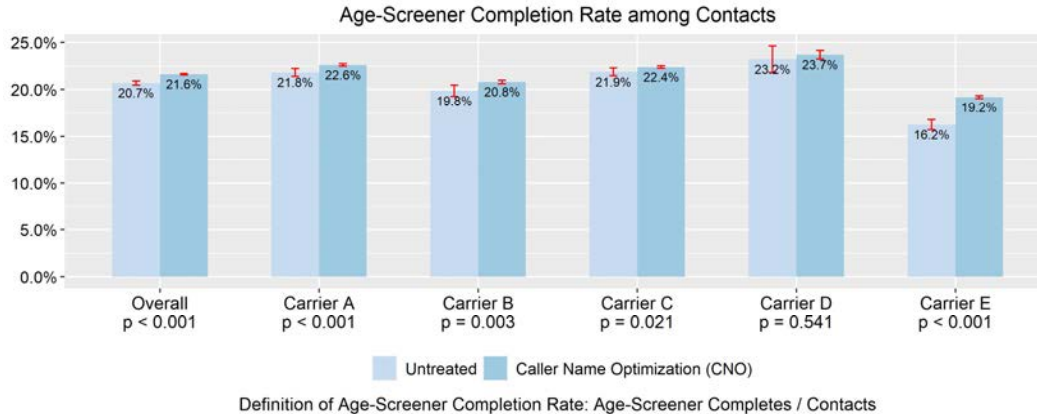


Figure 3: Age-screener completion rate among contacts for CNO-treated sample compared to untreated sample. Overall sample, p-value for test of no difference, $p < 0.001$

3.1.4 Age-eligibility rate among age-screener completes for CNO-treated compared to untreated

No significant differences were found for the age-eligibility rate overall or for individual carriers at the 0.001 significance level (Figure 4). For Carrier D, the age-eligibility rate was higher for the CNO-treatment than for untreated (2.57% vs. 1.62%, $p = 0.047$).

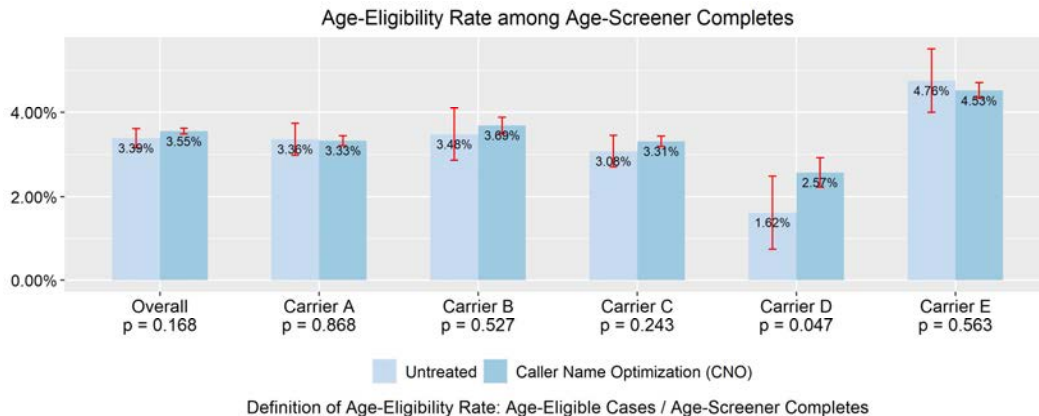


Figure 4: Age-eligibility rate among age-screener completes for CNO-treated sample compared to untreated sample. Overall sample, p-value for test of no difference, $p = 0.168$

3.1.5 Interview completion rate among age-eligibles for CNO-treated compared to untreated

No significant differences were found for the interview completion rate among age-eligible households overall or for individual carriers (Figure 5).

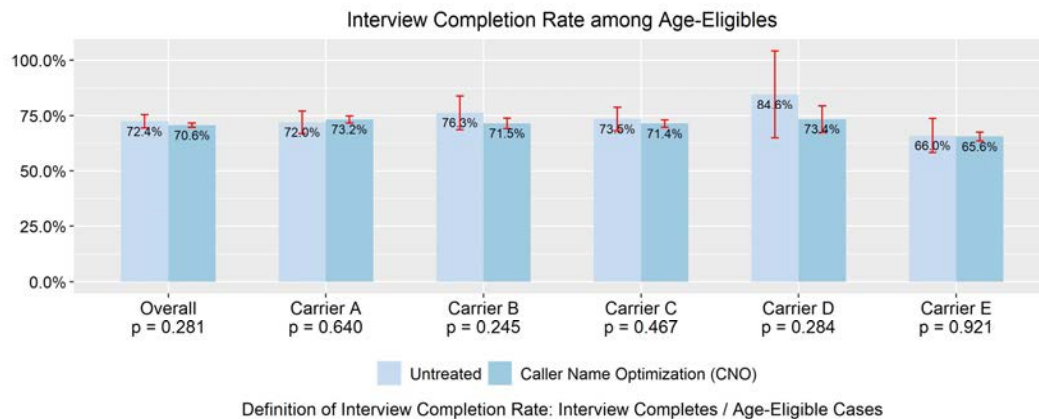


Figure 5: Interview completion rate among age-eligibles for CNO-treated sample compared to untreated sample. Overall sample, p-value for test of no difference, $p = 0.281$

3.1.6 Interview yield rate among dialed cases for CNO-treated compared to untreated

The interview yield rate among dialed cases (Figure 6) was higher for the CNO-treated sample compared to the untreated sample overall (0.123% vs. 0.103%, $p < 0.001$). This difference in the overall yield rate was a result of the improvements for CNO-treated sample in the working number rate, contact rate, and age-screener completion rate. The only individual carrier where there was a significant difference is Carrier E (0.166% vs. 0.105%, $p < 0.001$).

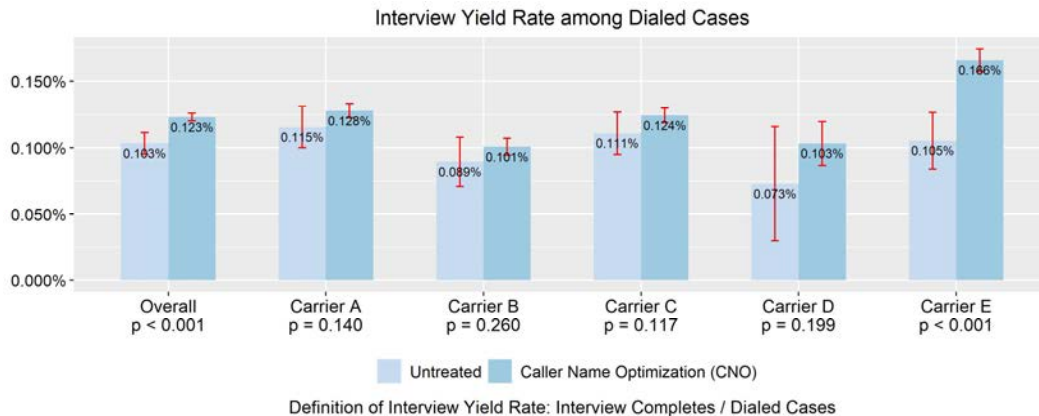


Figure 6: Interview yield rate among dialed cases for CNO-treated sample compared to untreated sample. Overall sample, p-value for test of no difference, $p < 0.001$

3.2 Neustar Branded Caller ID Display

The BCD-treatment was compared to the CNO-treatment for the same six key outcomes.

3.2.1 Working number rate among dialed cases for BCD-treated compared to CNO-treated

No differences were seen in the working number rate among dialed cases for BCD-treated sample compared to CNO-treated sample (Figure 7).

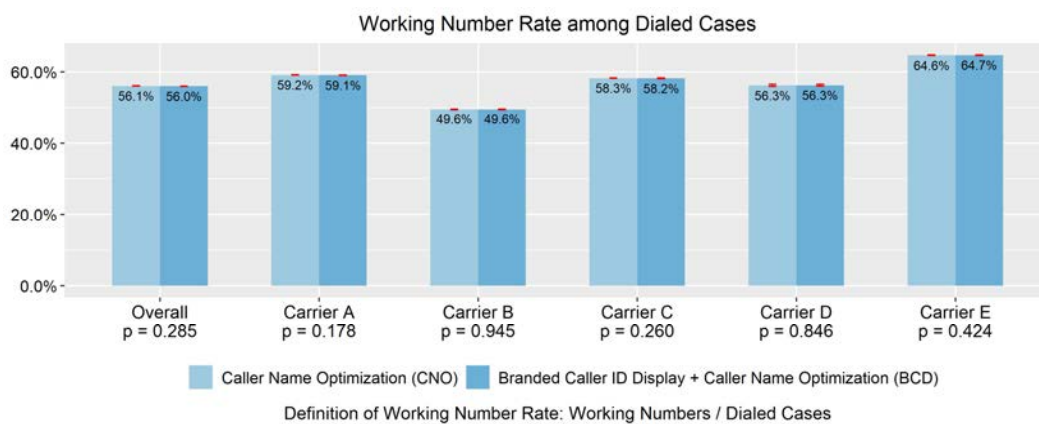


Figure 7: Working number rate among dialed cases for BCD-treated sample compared to CNO-treated sample. Overall sample, p-value for test of no difference, $p = 0.285$

3.2.2 Contact rate among working numbers for BCD-treated compared to CNO-treated

No significant differences were seen for the contact rate overall (Figure 8). For participating Carrier B, the contact rate was higher for the BCD-treatment compared to the CNO-treatment (37.3% vs. 37.0%, $p=0.002$). For Carrier C, BCD-treatment did not perform as well as CNO-treatment (39.9% vs. 40.3%, $p<0.001$).

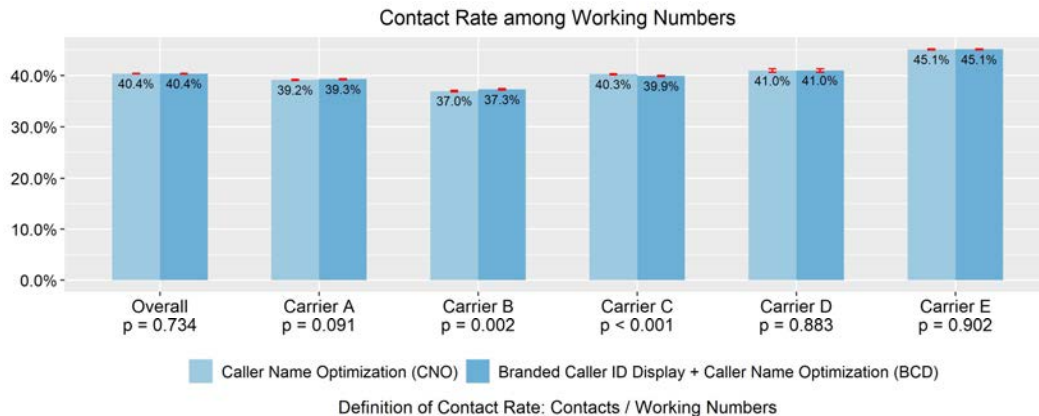


Figure 8: Contact rate among working numbers for BCD-treated sample compared to CNO-treated sample. Overall sample, p-value for test of no difference, $p = 0.734$

3.2.3 Age-screener completion rate among contacts for BCD-treated compared to CNO-treated

In participating Carrier B, the age-screener completion rate (Figure 9) was higher for BCD-treated sample compared to CNO-treated sample (22.5% vs. 20.8%, $p < 0.001$). The effect was large enough to drive the overall age-screener completion rate difference to be significant as well (21.9% vs. 21.6%, $p < 0.001$).

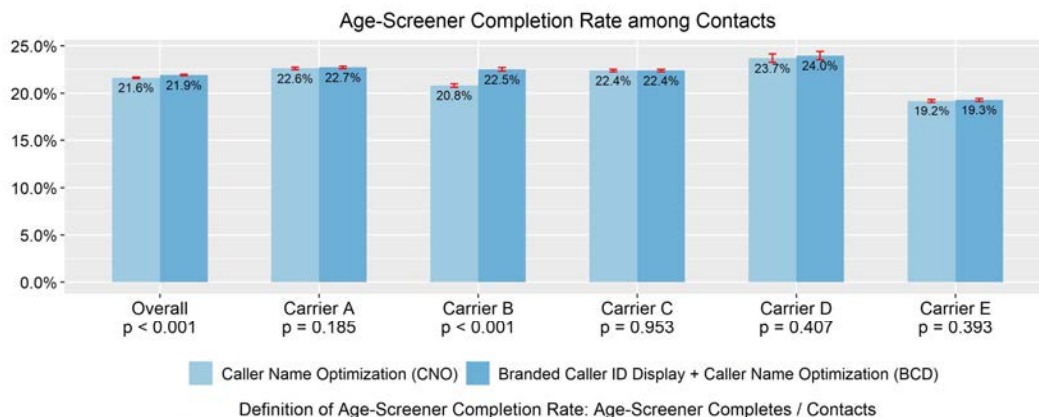


Figure 9: Age-screener completion rate among contacts for BCD-treated sample compared to CNO-treated sample. Overall sample, p-value for test of no difference, $p < 0.001$

3.2.4 Age-eligibility rate among age-screener completes for BCD-treated compared to CNO-treated

Similar to the analysis of CNO-treated versus untreated, no significant differences were seen for the overall age-eligibility rate and most carriers (Figure 10). For Carrier C, the age-eligibility rate was higher for BCD compared to CNO-treatment (3.53% vs. 3.31%, $p = 0.015$).

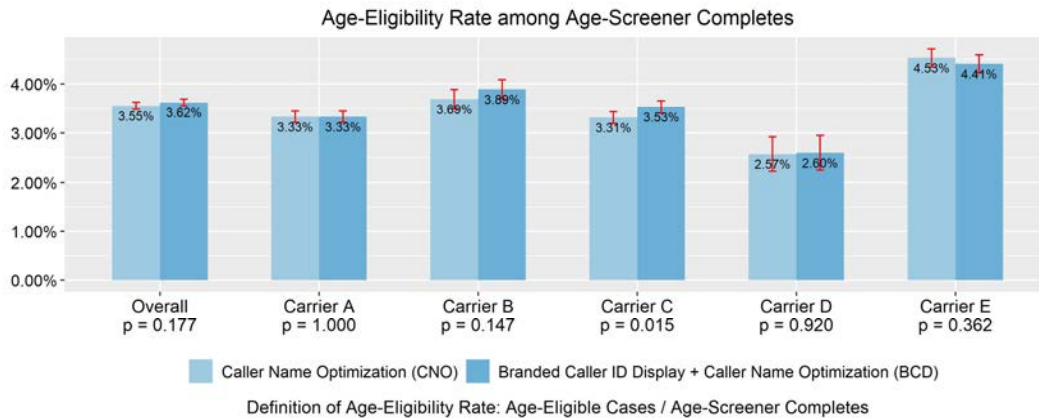


Figure 10: Age-eligibility rate among age-screener completes for BCD-treated sample compared to CNO-treated sample. Overall sample, p-value for test of no difference, p = 0.177

3.2.5 Interview completion rate among age-eligibles for BCD-treated compared to CNO-treated

No significant differences were found for the interview completion rate (Figure 11).

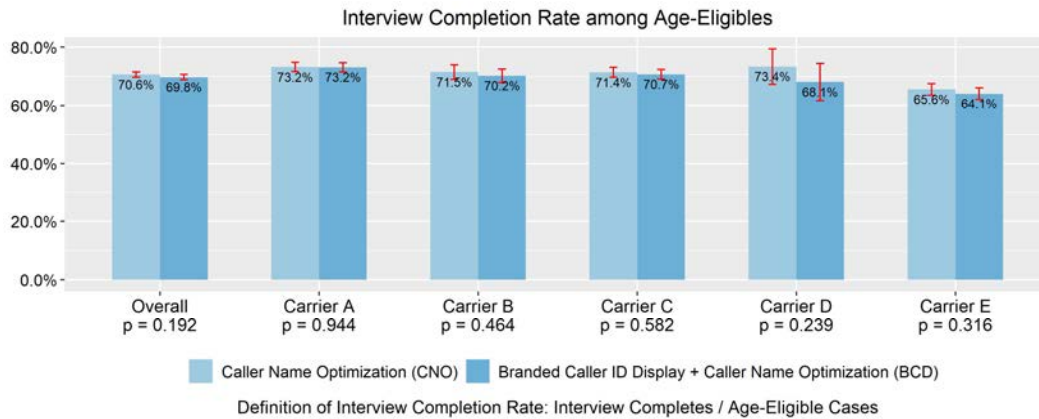


Figure 11: Interview completion rate among age-eligibles for BCD-treated sample compared to CNO-treated sample. Overall sample, p-value for test of no difference, p = 0.192

3.2.6 Interview yield rate among dialed cases for BCD-treated compared to CNO-treated
While there was no difference in overall interview yield rate (Figure 12), the BCD-treated sample interview yield rate was higher than CNO-treated sample for participating Carrier B (0.114% vs. 0.101%, $p=0.006$).

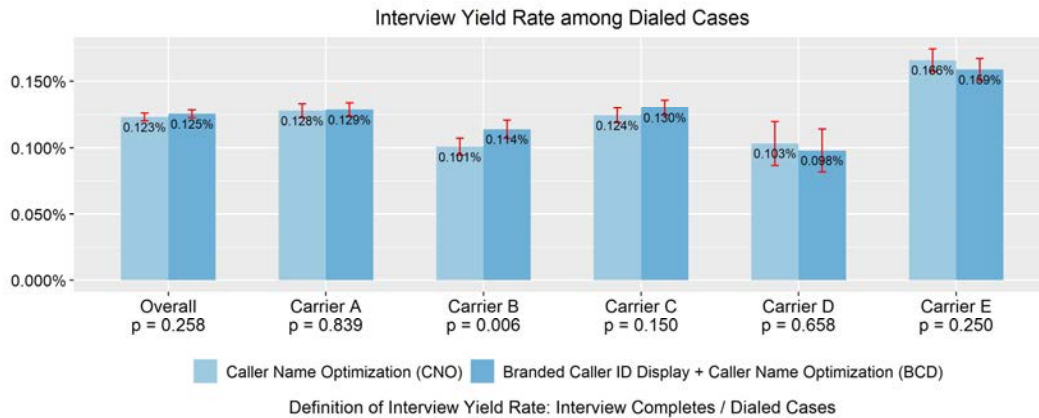


Figure 12: Interview yield rate among dialed cases for BCD-treated sample compared to CNO-treated sample. Overall sample, p-value for test of no difference, $p = 0.258$

4. Discussion

4.1 Neustar Caller Name Optimization

Overall, the working number rate, the contact rate, the age-screener completion rate, and interview yield rate were all significantly higher for the CNO-treated sample compared to untreated.

Initially, it was not expected that there would be differences in the working number rate among dialed cases for CNO-treated compared to the untreated. That is, it was assumed that a cell phone number is either working or not working at the time of dial, and that working number status could not be impacted by the CNO-treatment. Instead, it appears that the untreated outbound number was flagged as spam and blocked to a greater extent compared to the CNO-treated number, especially by Carrier E. For some carrier-device combinations, the act of blocking a call may return a non-working number indicator even if the number is in service.

Based on the increases seen in the contact rate and age-screener completion rate for CNO-treated sample, it appears that respondents are more likely to answer the NIS call and stay on the phone to complete the age screener if the Caller ID displays the phone number instead of a spam indication.

Few differences were seen in the age-eligibility rate and no differences in interview completion rate. Sample sizes of age-eligible households are small, as the age-eligibility range for the NIS-Child requires the household to have a child between 19 and 35 months of age. In addition, completing the interview is likely far enough removed from the initial caller ID screen that the caller ID would have less impact at this point in the interview.

The higher working number rate, contact rate and age-screener completion rate for CNO-treatment contributed to an overall higher interview yield rate. As the NIS dials millions of numbers every year, even small differences in rates can have a meaningful impact.

At the carrier level, the size of the effect varied for CNO-treatment. This may be because some carriers do not flag the NIS number as spam even without treatment, so the untreated and CNO-treated calls would appear the same to a respondent. It is likely that Carrier D did not flag the NIS untreated number as spam or block it, given that we see no differences in working number rate, contact rate or age-screener completion rate for this carrier. On the other hand, it is likely that Carrier E identified the untreated outbound NIS number as spam, resulting in the CNO-treatment being so effective. Although CNO-treatment benefits differed by carrier, overall, it is beneficial to use the CNO-treatment for the NIS.

4.2 Neustar Branded Caller ID Display

Neustar noted that Carrier B was the only participating carrier in BCD at the time of this evaluation. As expected, this is likely why positive effects were seen for BCD-treatment for Carrier B, but not for other carriers. If other carriers in the analysis have any telephone numbers that were BCD capable—for example, due to number porting—they do not appear to impact rates for those carriers. For Carrier B, there were improvements in the contact rate among working numbers, the age-screener completion rate among contacts, and the interview yield rate.

As expected, there were no differences in the working number rate for BCD and CNO-treatments. BCD-treatment includes the CNO-treatment, so actions to prevent the NIS outbound number from being flagged as spam or blocked were the same.

The BCD logo was displayed for only a subset of devices for one carrier which did not have an overall effect on the contact rate. However, the BCD impact for carrier B on the age-screener completion rate was large enough to affect the overall age-screener completion rate. Once respondents were on the phone, it appeared the logo may have added legitimacy to the call and increased the likelihood that respondents would stay on the phone to complete the age screener.

Both overall and for Carrier B, there are no differences in the age-eligibility rate or interview completion rate for BCD-treatment compared to CNO-treatment. Again, this is likely due to small sample sizes and interview completion being far removed from the initial caller ID display.

Some unexpected differences were found for Carrier C contact rate and eligibility rate in the comparison of BCD and CNO-treatments. Carrier C was not a participating BCD carrier, so these treatments should be the same.

For Carrier B, the improvements in contact rate and age-screener completion rate resulted in a higher interview yield rate for BCD-treatment compared to CNO. This demonstrates that BCD-treatment is helpful beyond CNO-treatment alone. With only one participating carrier and only certain phones currently BCD-capable, the effects seen are a minimum of the potential. If and when the BCD-treatment is expanded to other carriers, it is likely to be increasingly helpful.

4.3 Summary of Findings

These services are beneficial to the NIS. As expected, it appears that the services have the most impact early in the survey. First, they increase the likelihood that the NIS calls will ring on respondents' phones. Second, the improved caller ID information increases the likelihood that respondents will answer the NIS call and stay on the phone to complete the age-screener. The improvements are large enough to impact interview yield rates.

The NIS will continue to field both the CNO-treatment and the BCD-treatment, plus a small amount of untreated sample, to monitor the impact of these services.

5. Limitations and Future Research

It is important to acknowledge some limitations of the research. Even though sample was assigned to untreated, CNO-treated and BCD-treated outgoing numbers, it is unknown how the caller ID actually appeared on respondents' phones without device-level information. Based on individual carrier results, it appears that spam flagging and caller ID display vary by carrier. In addition, carrier assignment in this evaluation is based on the sampled phone number itself. If a respondent has ported his or her phone number to another carrier, our carrier assignment will not be correct. It is also a limitation that BCD was only available with one carrier and certain newer phones. The number of respondents seeing the Branded Caller ID Display is small. Future research is needed as BCD is expanded. Lastly, these results are specific to a CDC-sponsored, cell-phone RDD survey, targeting a population of households with young children. These results may not be generalizable to other surveys.

Phone technology is rapidly changing. The plan is to continue exploring new services and assess the impact on the NIS.

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References

Dutwin, D., Blum, M., Copeland, K., Fienberg, H., Jackson, C., Jodts, E., Koly, O., Malarek, D., Holzbaaur, G., Marken, S., Matuzak, J., Pierannunzi, C., Ridenhour, J., Sheppard, D., Ernst Staehli, M., Stalone, L., Thompson, J., & Vrudhula, S. (2018, February 12). *Spam Flagging and Call Blocking and Its Impact on Survey Research*. American Association for Public Opinion Research. Retrieved July 24, 2020, from <https://www.aapor.org/Education-Resources/Reports/Spam-Flagging-and-Call-Blocking-and-Its-Impact-on.aspx>

Federal Communications Commission. (2017, November 16). *FCC Adopts Rules to Allow Phone Companies to Proactively Block Illegal Robocalls* [News Release]. Retrieved July 22, 2020, from <https://www.fcc.gov/document/fcc-adopts-rules-help-block-illegal-robocalls>

Federal Communications Commission. (2019, June 6). *FCC Affirms Robocall Blocking By Default to Protect Consumers* [News Release]. Retrieved July 22, 2020, from <https://www.fcc.gov/document/fcc-affirms-robocall-blocking-default-protect-consumers-0>

Kennedy, C., & Hartig, H. (2019, February 27). *Response rates in telephone surveys have resumed their decline*. Fact Tank News in the Numbers, Pew Research Center. Retrieved July 24, 2020, from <https://www.pewresearch.org/fact-tank/2019/02/27/response-rates-in-telephone-surveys-have-resumed-their-decline/>

National Immunization Surveys. (2018, January 23). Centers for Disease Control and Prevention. Retrieved July 22, 2020, from <https://www.cdc.gov/vaccines/imz-managers/nis/index.html>