2020 Census Experiment

Extending the Census Environment to the Mailing Materials Study Plan

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I. Introduction

The decennial census of housing and population occurs in a unique survey environment. Everyone living in the United States is included in the survey universe, and all levels of government have a tangible interest in ensuring that the people living within their boundaries respond at the highest levels. We propose tapping into the unique environment surrounding the decennial census through the materials we use to contact households and request self-enumeration. Specifically, we want to test the effect of a wearable nonmonetary insert that promotes the 2020 Census on self-response rates, mailing materials that incorporate messaging developed by the 2020 Census communications campaign, and the addition of an every door direct mailer (EDDM) sent on Census Day. The communication campaign and heightened public awareness are unique to the 2020 Census and would be difficult to replicate in a census test. The three treatments proposed all rely on these two elements that are unique to the census environment. Convincing a respondent to wear a promotional item would be challenging for a census test, and the communication campaign and emphasis on Census Day are not as salient in a test. For these reasons, we believe this experiment needs to be conducted during the 2020 Census. All interventions are hypothesized to increase self-response rates by different mechanisms, and all rely on the heightened public awareness that exists only during a decennial census in order to effectively test their influence with responders.

Though incentives have generally been found to increase response rates for mail surveys (Singer and Kulka, 2001), and promotional inserts have also seen some increases in response rates, research on the effect of inserts on self-response rates in a census are limited. Inserts that promote the 2020 Census brand and connect to the once-a-decade nature of this national undertaking may emphasize the importance of responding. Even less understood are the gains that may be seen from a wearable promotional insert. A wearable item such as a sticker may not only encourage the recipient to respond but, if worn, may capitalize on pro-social factors to remind and encourage encountered community members to respond.

Also of interest is measuring the effect on response rates of sending households mailing materials that are integrated with the overall 2020 Census communications campaign. We hypothesize that such redesigned letters, postcards, and envelopes may be more easily recognizable to respondents as being connected to the 2020 Census and thus may lead to a higher response rate, compared with materials designed iteratively throughout the decade.

This experiment is not intended to evaluate the effectiveness of specific messages developed for the 2020 Census communications campaign. This research will not recommend the use of any particular messages in the 2030 Census. Rather, this experiment aims to measure changes in response rates when mailing materials could be viewed as an extension of, rather than distinct from, the larger communications campaign. The messages included in the 2020 Census campaign may not be the same as the messages included in the 2030 Census campaign.

II. Background

This experiment's proposal to test a wearable item promoting the 2020 Census was inspired by the "I Voted" stickers worn by voters during elections. Such stickers have been distributed by local entities since at least the 1980s as a get-out-the-vote effort (Waxman, 2016). Though often seen as a potent motivator for Election Day voting behaviors, research on the direct effect of the ubiquitous "I Voted" sticker on voting turnout is difficult to find. Instead, the sticker's effect is often equated with other measured effects, such as a trigger for habitual behavior (Aldrich et al, 2010) or a way to publicize taking part in a socially valued behavior (Bolsen et al, 2010). Other research about the effect of social pressure on voting supports theories about the sticker's effect. People who know they will be asked about their voting behavior (DellaVinga et al, 2016) or who know their voting behavior will be reported to neighbors (Gerber et al, 2008) are more likely to vote.

The Census Bureau has limited experience in sending incentives of any kind to sampled households, especially in a decennial census. During the 2000 Census, an experiment was conducted that included an incentive. In this experiment, 6,130 nonrespondents were invited to respond to the census in a mode other than the standard mail questionnaire. Half of the housing units in the sample received a calling card worth 30 minutes of long distance service, activated after the response was obtained through the experimental mode. Results showed that while response rates were higher in the experimental mode for housing units that received the incentive, they were not higher overall (Guarino, 2001).

The 2014 Survey of Income and Program Participation (SIPP) incorporated the use of incentives and found that a higher incentive value saves more money on average than a lower incentive value. The SIPP is conducted across multiple years, and within each year, there are waves that represent one round of interviewing over a four-month interval. In Wave 1 of the 2014 SIPP, they offered $20 and $40 conditional upon completion of the survey, and on average, the cost per interview went down by $6.50 and $8.53, respectively (Westra, Sundukchi, and Mattingly, 2015).

In May 2018, the American Community Survey (ACS) tested sending a modified version of their popular data wheel in the first or fourth mailing. This new data slide includes a set of metrics derived from ACS data at the national and state levels. The ACS experiment is based on research that suggests that building trust is the most important aspect of survey messaging (Dillman, Smyth, and Christian, 2014), and the hypothesis for this experiment is that a data slide will communicate the legitimacy of the ACS and thus increase response rates (Barth and Heimel, 2018).

There are numerous factors when setting up an experiment that can determine the effectiveness of an incentive on response rates. Providing an incentive unconditionally at the beginning of a survey performed better than promising a conditional incentive after the completion of a survey (Church, 1993; Mercer et al, 2015). Non monetary incentives could have other advantages that have yet to be thoroughly tested. Dillman, Smyth, and Christian (2014) suggest that the irregular shape of a package containing an incentive could possibly lead to less mailings being unopened or discarded, which in turn could lead to higher response rates. Gendall and Healey (2008) as

well as Nederhof (1983) found that nonmonetary incentives may increase initial self-response rates thereby decreasing the total survey cost since reminders do not need to be mailed. Nonmonetary incentives that are tailored to particular groups of the sample may be effective (Gendall and Healey, 2008).

This proposal primarily supports the 2020 Census innovation area *Optimizing Self-Response*. Specifically, this proposal motivates people to respond by sending new notices that encourage self-response. Redesigned letters that include elements from advertising can help motivate respondents. In addition, a wearable insert could transform reliable respondents into temporary outreach partners at a micro level for the duration that the insert is displayed, urging others to respond at any location and at any time.

III. Assumptions

1. The project team will obtain adequate funding to implement the experiment as it is designed in this study plan.

2. The Census Data Lake will contain 2020 Census response and operational data required for analysis.

3. The Census Bureau will be able to obtain the services of a contractor to create the nonmonetary promotional inserts that will be tested in this experiment.

4. The 2020 Census communications campaign will be adequately developed in time to inform the treatments of this test.

5. The printing, assembly, addressing, and mailing of mailing materials that are different from production materials can be supported by the National Processing Center (NPC) or a print vendor to implement the experiment as it is designed in this study plan.

IV. Research Questions

1. Does the inclusion of a promotional insert featuring 2020 Census branding in the initial mailing package increase self-response rates?

2. Does the inclusion of a promotional insert in the initial mailing package lead to earlier responses?

3. Does the cost of producing and sending promotional inserts outweigh any observed savings gained from increased or earlier self-response compared to a control group?

4. Do mailing materials designed to complement the 2020 Census communications campaign increase the self-response rate?

5. Does sending an EDDM on Census Day lead to an increase in response rates?

V. Methodology

A. Experimental Design

This experiment will test the effect on the response rate of including a wearable insert in the invitation to respond. It will also test the effect on response rates of redesigned mailing materials that reflect the 2020 Census communications campaign and of the addition of an EDDM that arrives on or near Census Day. Panels will be assigned randomly to housing units selected from across the nation and from sampled geographic clusters.

1. Control and treatment panels

We propose treatments for two aspects of the mail packages: the experimental inclusion of a nonmonetary promotional insert and the redesign of the envelopes, letters, and postcards to mirror major elements developed by the communications campaign.

Table 1 describes the treatments for the nonmonetary promotional inserts. The first will contain no insert, which is the current design for the 2020 Census. The treatment is the inclusion of multiple copies of a wearable insert in the first mailing. This insert would be small, such as a sticker, and will feature the 2020 Census logo or a phrase encouraging response, such as "I count." The design may also feature other languages, such as a multilingual word cloud for "I count."

Table 1: Promotional Insert Treatments

Nonmonetary Promotional Insert Treatments	Description
P0: No insert	Households will not receive a nonmonetary promotional insert, which matches the current production design.
P1: Wearable insert	Households will receive multiple copies of a wearable insert promoting the 2020 Census, such as a sticker that says, "I count."

Table 2 describes the treatments for the new mail designs. The first treatment consists of sending standard 2020 Census mailing materials. These materials were designed iteratively throughout the decade and describe why and how to respond to the 2020 Census. They will not, however, feature anything that respondents may encounter in television, print, radio, or digital medias around Census Day, including slogans, images, colors, or points of emphasis other than the census's general benefit to communities. One treatment will therefore send envelopes, letters, and postcards that have been redesigned to blend with the 2020 Census communications campaign. Changes to content will be limited to what is needed to add these new elements. Respondents who are exposed to 2020 Census advertising may more easily recognize and connect with mailing materials that have been designed similarly.

Table 2: Description of Mail Design Treatments

Mail Design Treatments	Description
L0: Production design	Production mailing materials, which were designed iteratively through the mid decade tests.
L1: Communications campaign design	Mailing materials that reflect elements of the communications campaign, such as slogans, logos, or other messaging features.

Table 3 describes the treatments for other aspects of the mailing strategy. The first treatment consists of sending standard 2020 Census mailing materials following the production strategy. Households in the second treatment will receive an EDDM on Census Day reminding them to respond in the language that they would receive or an EDDM promoting the ease of responding online to the Census. An EDDM is a mailer that is unaddressed and delivered to every housing unit on a letter carrier's route. Because of the nature of this treatment, it will not be included in the national sample.

Table 3: Description of EDDM treatment

Other Strategy Treatments	Description
S0: Production design	Production strategy, which was designed iteratively through the mid decade tests.
S1: Census Day EDDM	An EDDM promoting the 2020 Census will arrive on Census Day.

Table 4 describes the five panels included in this proposed experiment created by the two control groups, and the three treatments.

Table 4: Description of Panels

Panel	Treatment	Language of Materials	National Sample Size	Geographic Sample Size
1: P0, L0, S0 (Control #1)	No treatment	Production	24,956	10,760
2: P0, L1, S0	Communications campaign	Bilingual	24,956	0
3: P1, L0, S0	Wearable Insert	Bilingual	24,956	25,824
4: P0, L0, S1	EDDM delivered on Census Day	Production	0	21,520
5: P0, L0, S2 (Control #2)	No Treatment	Bilingual	24,956	25,824
Total			99,824	83,928

Even though the sample will include housing units identified as eligible for either English-only or English/Spanish bilingual mailing materials in the 2020 Census, all mailing materials, e except those for the panel receiving the EDDM, will be bilingual (English and Spanish) to reduce

operational complexity. Also, mailing materials will be developed for both production contact strategies for the 2020 Census, Internet First, and Internet Choice.

2. Sample Design

The Master Address File (MAF) extract will be divided into seven sub frames. Each sub frame will be used to select the sample for different components of the 2020 Census experiments. Control groups for other 2020 Census experiments will be sampled from the sub frames used in the sampling procedure. See the study plan for Optimized Self-Response for more details. The sample will consist of 99,824 housing units selected for a national sample and 83,928 housing units, approximately 28 tracts and 54 United States Postal Service (USPS) routes, selected in geographic clusters. This results in a total sample size of 183,752 housing units. Sampling for this experiment will be coordinated with other sampling activities to ensure that housing units are not sampled for more than one experiment or evaluation.

Other direct mailers outside of the five production mailings are in the process of being developed. These mailers will be sent before or during self-response in order to promote response in subpopulations of interest. Though the addresses identified to receive these additional mailers will not be known until after sampling for this experiment is underway, it is possible that the sample selected in this experiment may overlap with the additional mailers being proposed. One of the proposed mailers may target up to 20 percent of all mailable addresses. To account for this possible overlap in samples, all of the panels except the EDDM panels will be sampled at 120 percent of the minimum sample size calculated in the appendix.

Geographic clusters

To measure any social norming behaviors that would result from a wearable promotional insert, part of the sample for this experiment will be clustered geographically. This ensures that households in a given region will have a chance to see and react to inserts worn at work, school, or other public places. Specifically, about 44,800 housing units within about 32 tracts that pass to-be-determined thresholds for size and population density will be eligible to receive one of the three panels. These tracts will be randomly selected as described below.

1. Tracts that do not pass to-be-determined thresholds for size and population density will be removed from the designated sampling sub frame.
2. Tracts will be sorted by 2020 Census contact strategy, language of materials, the number of housing units eligible to receive mailout in the 2020 Census, and any demographic measures of interest.
3. A sample of 32 tracts will then be systematically selected using an appropriate sampling fraction.
4. Tracts will be assigned one of the two panels sequentially.

A sample of 32 tracts, which amounts to around 44,800 housing units, will allow us to detect a difference of 3 percentage points in response rates, with α=0.1, β=0.2, and a design effect of 4.0.

The EDDM experiment will be sampled at the USPS carrier route level. Entire carrier routes of a to-be-determined housing unit size will be selected, and all housing units in the carrier route will receive the EDDM.

1. Mail routes will be sorted by zip code and route identifier within their state..

2. A sample of 54 carrier routes will then be systematically selected using an appropriate sampling fraction.
3. The carrier routes that do not have a minimum of 200 housing units' will not receive the EDDM. (USPS does not allow EDDM deliveries on routes with less than 200 housing units.)
4. Carrier routes will be assigned one of the two panels sequentially.

National sample

A national sample of 99,824 households will be selected to receive one of the three panels. The national sample will allow us to understand the overall effect of receiving a promotional insert or redesigned materials.

1. Housing units in the designated sub frame will be stratified by 2020 Census contact strategy to form two strata: Internet First and Internet Choice.
2. Housing units within each stratum will be sorted by language, geographic identifiers, and MAF identifier.
3. A sample of 99,824 housing units will be systematically selected from each of the two strata using an appropriate sampling fraction.
4. Housing units will be assigned to one of the three panels sequentially.

A national sample of 99,824 housing units allows us to detect a difference of 3 percentage points in response rates, with α=0.1, β=0.2, and a design effect of 1.0.

B. Answering the Research Questions

The primary measure of interest for this study is the self-response rate, which this study plan will simply call the response rate. The response rate is a measure of respondent cooperation and reflects the sampling housing units that respond to the census by one of the three self-response modes: responding online to the internet instrument, providing information to a phone interviewer, or completing and returning the mail questionnaire. In general, the response rate will be calculated using the following formula:

$$Response\ rate = \frac{Unduplicated^{1}\ sufficient\ responses}{Total\ sample\ size} * 100$$

Response rates will be calculated for specific panels or other subsets of cases using the same formula, but in each case, the denominator will be restricted to the appropriate set of eligible cases. The total response rate of each treatment group will be compared to that of the control group using t-tests, and distributions will be compared using chi-squared tests.

For appropriate estimation, the mailing materials response data will be weighted to reflect the complex sample designs and adjusted to reduce nonresponse bias. Replicate weights will be created, and we will use a stratified jackknife replication estimation method. In this method, housing units are sorted in the order they were selected and reassigned to a replicate group. To

[1] Households providing more than one self-response are counted in the response rate calculation only once.

help ensure the validity of statistical inference when making multiple statistical comparisons, when applicable, multiple comparison corrections will be used to maintain the family-wise error rate at $\alpha = 0.1$. The Holm-Bonferroni procedure will be performed to adjust for the increased possibility of erroneous conclusions when making multiple comparisons. Multiple comparison corrections reduce the possibility of identifying false-positive differences and ensure that we do not cloud our ability to form inferential conclusions. For this report, each table is considered a family of comparisons.

1. Does the inclusion of a nonmonetary promotional insert featuring 2020 Census branding in the initial mailing package increase self-response rates?

To answer this question, response rates will be calculated by treatment for the national sample and the geographic cluster sample separately. Responses rates for panels receiving an insert will be compared to the control panel.

Table 5: Response Rate by Promotional Insert Treatment, National Sample

Promotional Insert Treatment	Internet Response Rate	CQA Response Rate	Mail Response Rate	Total Response Rate
No insert (Panel 1)				
Wearable Insert (Panel 3)				

Source: U.S. Census Bureau, 2020 Census Decennial Response File

Table 6: Response Rate by Promotional Insert Treatment, Geographic Cluster Sample

Promotional Insert Treatment	Internet Response Rate	CQA Response Rate	Mail Response Rate	Total Response Rate
No insert (Panel 1)				
Wearable Insert (Panel 3)				

Source: U.S. Census Bureau, 2020 Census Decennial Response File

Response rates will also be calculated by contact strategy and treatment. We will compare response rates of the treatment compared to neighboring tracts. We also calculate non-ID responses for Internet Self-Response.

2. Does the inclusion of a nonmonetary promotional insert in the initial mailing package lead to earlier responses?

To answer this question, response rates will be calculated after each contact and before the Nonresponse Followup (NRFU) operation begins by treatment for the national sample and the geographic cluster sample separately. Responses rates for panels receiving an insert will be compared to the control panel.

Table 7: Response Rate by Promotional Insert Treatment after Each Mailing, National Sample

Promotional Insert Treatment	Response Rate after First Mailing	Response Rate after Second Mailing	Response Rate after Third Mailing	Response Rate after Fourth Mailing	Response Rate before NRFU	Final Response Rate
No insert (Panel 1)						
Wearable Insert (Panel 3)						

Source: U.S. Census Bureau, 2020 Census Decennial Response File

Table 8: Response Rate by Promotional Insert Treatment after Each Mailing, Geographic Cluster Sample

Promotional Insert Treatment	Response Rate after First Mailing	Response Rate after Second Mailing	Response Rate after Third Mailing	Response Rate after Fourth Mailing	Response Rate before NRFU	Final Response Rate
No insert (Panel 1)						
Wearable Insert (Panel 3)						

Source: U.S. Census Bureau, 2020 Census Decennial Response File

Response rates will also be calculated by contact strategy and treatment. We also calculate non-ID responses for Internet Self-Response.

3. Does the cost of producing and sending promotional inserts outweigh any observed savings gained from increased or earlier self-response compared to a control group?

To answer this question, the cost of a control case will be compared to the cost of a treatment case. The cost of a control case will be calculated by dividing the product of the overall NRFU cost per case and the number of nonresponders in the control panel by the total number of control cases. The cost of a treatment case will be calculated similarly, but the cost of the insert will be included in the numerator. These calculated costs ignore the cost of developing the data collection instruments, sending the other self-response materials, and other common costs that would be the same for control and treatment cases.

$$Cost\ per\ control\ case = \frac{(NRFU\ cost\ per\ case)(Number\ of\ control\ nonresponders)}{Number\ of\ control\ cases}$$

$$Cost\ per\ treatment\ case = \frac{(NRFU\ cost\ per\ case)(Number\ of\ treatment\ nonresponders) + (Insert\ cost)}{Number\ of\ treatment\ cases}$$

The cost of the insert will be calculated by summing the total costs unique to the insert.

$$Insert\ cost = Total\ insert\ production\ cost + Unique\ postal\ cost$$

4. Do mailing materials designed to complement the 2020 Census communications campaign increase self-response rate?

To answer this question, response rates will be calculated by treatment for the national sample and the geographic cluster sample separately. Responses rates for panels receiving the communications campaign materials will be compared to those receiving production materials.

Table 9: Response Rate by Mail Design Treatment, National Sample

Mail Design Treatment	Internet Response Rate	CQA Response Rate	Mail Response Rate	Total Response Rate
Production (Panel 1)				
Communications campaign (Panel 2)				

Source: U.S. Census Bureau, 2020 Census Decennial Response File

Table 10: Response Rate by Mail Design Treatment, Geographic Cluster Sample

Mail Design Treatment	Internet Response Rate	CQA Response Rate	Mail Response Rate	Total Response Rate
Production (Panel 1)				
Communications campaign (Panel 2)				

Source: U.S. Census Bureau, 2020 Census Decennial Response File

Response rates will also be calculated by language of materials and treatment as well as by contact strategy and treatment. The response rates for geographic treatment panels will also be compared to the results of the 2020 Census.

Table 11: Response Rate by EDDM, Geographic Cluster Sample

EDDM Treatment	Internet Response Rate	CQA Response Rate	Mail Response Rate	Total Response Rate
Control (Panel 5)				
EDDM Treatment 1				
EDDM Treatment 2				

Source: U.S. Census Bureau, 2020 Census Decennial Response File

C. Interventions with the 2020 Census

Name of solution/system/process: Content and Forms Design IPT

Explicit intervention requested
- Develop experimental mailing materials and questionnaires.
- Assign form types to the newly developed materials.

Estimated impact: Minimal impact on the 2020 Census.

Name of solution/system/process: NPC
Explicit intervention requested
- Printing of mailing materials.
- Assembling mail packages.
- Addressing materials.
- Mailing packages to respondents.
- Receiving and storing materials provided by other print vendors.

Estimated impact: Minimal impact on the 2020 Census.

Name of solution/system/process: Forms Printing and Distribution, print vendor RR Donnelly, any other to-be-determined print vendor
Explicit intervention requested
- Printing of production mailing materials.
- Bulk printing of alternative mailing materials that do not contain variable data.
- Assembling mail packages.
- Addressing mail packages that do not differ from production.
- Mailing packages that do not differ from production to respondents.
- Shipping bulk printed materials or assembled packages to NPC.

Estimated impact: Minimal impact on the 2020 Census.

Name of solution/system/process: CaRDS
Explicit intervention requested:
- Sample cases for this experiment as specified.
- Add necessary experiment variables to the sample delivery file.

Estimated impact: Moderate impact on the 2020 Census. The sampling specifications are complicated, especially considering that the frame comes in three stages and by state. Errors in sampling could affect other systems.

Name of solution/system/process: ECaSE-OCS
Explicit intervention requested
- Ingest the sample delivery file with experiment variables.
- Create workloads for each contact.
- Send created workloads to NPC.

Estimated impact: Minimal impact on the 2020 Census.

Name of solution/system/process: Paper Data Capture
Explicit intervention requested: Receive and process experimental questionnaires.
Estimated impact: Minimal impact on 2020 Census.

Name of solution/system/process: iCADE

Explicit intervention requested: Data capture of experimental questionnaires.
Estimated impact: Minimal impact on 2020 Census.

Name of solution/system/process: Response Processing Operation
Explicit intervention requested: Process responses from experimental questionnaires.
Estimated impact: Minimal impact on 2020 Census.

D. Implications for 2030 Census Design Decisions and Future Research and Testing

This experiment tests different mailing material treatments in the 2020 Census. Results from this experiment can potentially be used to improve or enhance the strategies for encouraging and motivating self-responses during the research and testing phase of the 2030 Census program and in the 2030 Census. If one of the mailing treatments does increase the self-response rate at no or low additional cost, the Census Bureau should focus the mid decade tests on refining the mailing materials in this experiment.

VI. Data Requirements

Data File/Report	Source	Purpose	Expected Delivery Date
Decennial Response File	Census Data Lake, Response Processing Operation	This is the main file for analysis. It contains census responses and includes mode and time of response.	Fall 2020
CQA call records	Census Data Lake	This file will contain records from CQA to analyze any addiotional burden due to EDDM.	Fall 2020

VII. Risks

1. The messaging developed for the 2020 Census communications campaign may not resonate with respondents. If the 2020 Census campaign is ineffective, the experiment may not find an effect on the response rates. Such a finding would imply that mailing materials that reflect the communications campign are not effective.
2. This experiment relies on having elements of the 2020 Census communications campaign developed in time for the design and printing of mailing materials. If the communications campaign is developed too late, this experiment cannot test materials that incorporate elements from the campaign.
3. The wearable incentive must be compatible with NPC equipment for inserting into mail packages. If a compatabile wearable incentive cannot be developed, then this panel may need to be removed.

4. This experiment relies on NPC to assemble and mail packages. If NPC has commitments to other surveys during this experiment's mailout time, then the mail packages may not be sent at the same time as the production 2020 Census materials.
5. A mitigation for the previous risk is that the print vendor could mail packages that do not differ from the production packages, which would mainly be the control cases. If the print vendor mails the control packages, then any differences in actual mailout procedures or timing may lead to observed differences between control and treatment panels that may not be distinguishable from differences because of the experimental mainipulation of interest.
6. Sample sizes were calculated considering the number of housing units needed to detect a meaningful difference. Some housing units are being selected by tracts or by carrier route level; these geographic units vary in size. If the variance in the number of housing units per tract or carrier route is not properly accounted for, the actual number of housing units sampled may not be large enough to support the comparisons of interest.
7. The sampling frame will be available in three extracts, and sampling must occur from each extract without knowing what will come in the next extract and without the ability to sample more housing units from the previous extract. Sampling must therefore properly account for the contents of all extracts so that enough housing units are sampled and that all housing units have a chance to be sampled. If sampling ratios are improperly estimated, then the actual number of housing units sampled may not be sufficient to support the comparisons of interest or some housing units may not have a chance to be sampled.
8. The EDDM is designed to arrive on Census Day. EDDMs are delivered to each door by the mail carrier within a couple of days after the materials are given to the local post office, so the timing of delivery depends on when the post office receives the materials from the Census Bureau. If the EDDM is not delivered on Census Day, then it may appear to be less effective than it is.
9. If the data are not available in the Census Data Lake, then the analysis cannot be performed.
10. If sufficient funds are not granted for this experiment, than the scope of the experiment may be reduced.
11. Other Census Bureau groups will be sending additional mailers. It is possible that these mailings will overlap with the mailings in this experiment. The minimum sample size is being increased by twenty percent to account for possible overlap. If the overlap is not random and significant, then the ability to make adequate conclusions about the effect of the planned treatments may be negatively affected.

VIII. Limitations

1. The 2020 Census communiations campaign will include some local advertisements. Elements unique to local advertising will not be included in the tested mailing materials; the materials will be designed to reflect the national campaign.

IX. Issues that Need to be Resolved

1. The printing solution needs to be identified.
2. The nonmontary promotional inserts need to be designed.
3. The number copies of the wearable insert must be decided.
4. A contract needs to be established for the nonmonetary promotional inserts.
5. The 2020 Census communications campaign needs to be developed.
6. Appropriate sampling ratios need to be calculated.

X. Division Responsibilities

Division or Office	Responsibilities
Decennial Statistical Studies Division	• Plan and manage the experiment • Design the panels • Select the sample • Monitor the results • Analyze the data • Write and release the report
Center for Behavioral Science Methods	• Qualitatively test developed materials
DCMD	• Develop alternative materials • Project management support
NPC	• Receive workloads • Print, assemble, address, and mail packages according to the workloads

XI. Milestone Schedule

Extending the Census Environment to the Mailing Materials Study Plan Milestones	Date
Design Mailing Materials	January 1, 2019 – November 30, 2019
Select Sample	June 28, 2019 – February 12, 2020
2020 Census Self-Response	March 12 – August 31, 2020
Receive, Verify, and Validate Data For Extending the Census Environment to the Mailing Materials	December 31, 2020
Distribute Initial Draft of the Extending the Census Environment to the Mailing Materials Report to the Decennial Research Objectives and Methods Working Group for Pre-Briefing Review	March 31, 2021
Decennial Census Communications Office Staff Formally Release the FINAL Extending the Census Environment to the Mailing Materials Report in the 2020 Memorandum Series	June 30, 2021

XII. Review/Approval Table

Role	Approval Date
Primary Author's Division Chief (or designee)	March 20, 2019
Decennial Census Management Division Asisstant Division Chief for Nonresponse, Evaluations, and Experiments	March 20, 2019
Decennial Research Objectives and Methods Working Group	March 20, 2019
Decennial Census Communications Office	June 12, 2019

XIII. Document Revision and Version Control History

Version/Editor	Date	Revision Description
Version 0.1	8/15/18	Initial draft for peer review
Version 0.2	9/20/18	Draft for division chief review
Version 0.3	3/08/19	Draft for DROM review
Version 0.4	3/25/19	Revised from DROM and Quality Process Review
Version 0.5	6/12/19	Revised from Decennial Census Communications Office review
Version 0.6	8/07/19	Updated sample sizes and corresponding text, in addition to minor editorial and formatting changes
Version 0.7	1/31/20	Made relevant changes to describe the two EDDM designs

XIV. Glossary of Acronyms

Acronym	Definition
ACS	American Community Survey
CQA	Census Questionnaire Assistance
EDDM	Every Door Direct Mailer
MAF	Master Address File
NPC	National Processing Center
NRFU	Nonresponse Followup
SIPP	Survey of Income Program Participation

XV. References

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XVI. Appendix A

The formula used to calculate the minimum sample size necessary for the desired comparisons is

$$n \geq \frac{\left(\left(Z_{\alpha^*/2} + Z_{\beta}\right)^2 \left(p_1(1-p_1) + p_2(1-p_2)\right) \times deff\right)}{\delta^2}$$

where

n	=	minimum sample size
δ	=	minimum detectible difference
α^*	=	alpha level adjusted for multiple comparisons (Bonferroni)
$Z_{\alpha^*/2}$	=	critical value for set alpha level assuming a two-sided test
Z_{β}	=	critical value for set beta level
p_1	=	proportion for group 1
p_2	=	proportion for group 2
deff	=	design effect due to unequal weighting

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National sample size

δ	=	0.03		
α^*	=	0.05		
$Z_{\alpha^*/2}$	=	1.959964		
Z_{β}	=	0.841621	***n with deff =***	**10,396.8503**
p_1	=	0.57	***n without deff =***	**5,941.0573**
p_2	=	0.54		
deff	=	1.75		

Cluster sample size

δ	=	0.03		
α^*	=	0.053		
$Z_{\alpha^*/2}$	=			
Z_{β}	=	0.841621	***n with deff =***	**10760**
p_1	=	0.57	***n without deff =***	**4304**
p_2	=	0.54		
deff	=	2.50		

- The sample sizes for the national sample of the Extending the Census Environment to the Mailing Materials Experiment and the Optimization of Self-Response Experiment were calculated simultaneously. The samples share two national controls (one for production language materials and one for bilingual only mailing materials) and will be selected simultaneously.

- The value of p_1 is the expected 2020 Census response rate after six weeks, which is between the minimum and average expected 2020 Census response rate.
- The estimated design effect is 1.75 for the national sample. This is based off of 2015 National Content Test (NCT) data evaluation of the variable *analysis_response*. The Optimizing Self-Response sample for 2015 NCT is the most complex this experiment would be which has a deff = 1.2351. The design effect of the entire 2015 NCT is 1.9513.
- The estimated design effect is 2.50 for the cluster sample. This is based off of 2015 NCT data evaluation of the variable *analysis_response* increased to take into consideration the clustering nature of the sample.

The values of *n* found here are the sample size needed in both group 1 and group 2 to detect a 3 percentage point difference. Note that most of the panels in this experiment have a national and geographic sampling component to them. Therefore, if only two groups were being compared using the national sample, we would need 20,796 housing units with the given parameters. If comparing two groups using the geographic sample, we would need 21,520 housing units

The sample for the Extending the Census Environment to the Mailing Materials Experiment includes four groups, three of which will be compared. Panels 1 and 3 are sampled at both the national and geographic level Panel 2 only has a national sample. Panel 4 is sampled at the carrier route level. For the four groups, the total mailing sample size is 116,912. Note that the selection of the national control portion of Panels 1 and 5 was outlined in the Optimization of Self-Response Experiment Study Plan where each panel has a sample size of 20,796 housing units. Therefore, the grand total mailing sample size needed for this experiment is 158,564 housing units.

Minimum Sample Size	Number of Tracts for Minimum Sample Size[1]	Number of HUs Receiving Mail Materials[1]
43,040	32	44,800

[1]Calculated assuming 1,400 HUs/tract

Minimum Sample Size	Number of Carrier Routes for Minimum Sample Size[1]	Number of HUs Receiving Mail Materials[1]
32,280	54	21,600

[1]Calculated assuming 600 HUs/carrier route