

**Economic and Social Council**Distr.: General  
27 July 2015

English only

**Economic Commission for Europe**

## Conference of European Statisticians

## Group of Experts on Population and Housing Censuses

## Seventeenth Meeting

Geneva, 30 September to 2 October 2015

Item 3a of the provisional agenda

**Innovations planned for the 2020 census round, and results of tests****Changing Times, Changing Methods, Changing Technologies: Innovation and Testing for the U. S. 2020 Population and Housing Census<sup>1</sup>****Note by the United States Census Bureau<sup>2</sup>***Summary*

Following the United States (U. S.) paper under the first topic<sup>3</sup> for this meeting, this paper will focus on our changing methods, using new technologies, and testing for the U. S. 2020 Census, helping inform our design decision. The Census Bureau is researching and developing innovative and efficient methods to increase response rates, decrease the number of door-to-door interviews, raise workforce productivity, and streamline operations without sacrificing the accuracy of the census. The attention is on our major census design innovations oriented around major cost drivers of the 2010 Census. Our four innovation areas are reengineering address canvassing, optimizing self-response, utilizing administrative data, and reengineering field operations. Test results will be discussed from our 2014 and 2015 tests on two of our innovative areas – optimizing self-response and reengineering field operations. The paper will also outline our plans for upcoming testing in 2016 through 2018.

<sup>1</sup>Disclaimer: This report is to inform interested parties of research and to encourage discussion. Any views expressed are those of the author and not necessarily those of the U.S. Census Bureau.

<sup>2</sup> Prepared by Arona L. Pistiner, Senior Advisor for International Collaboration and Policy, Decennial Communication and Budget Office.

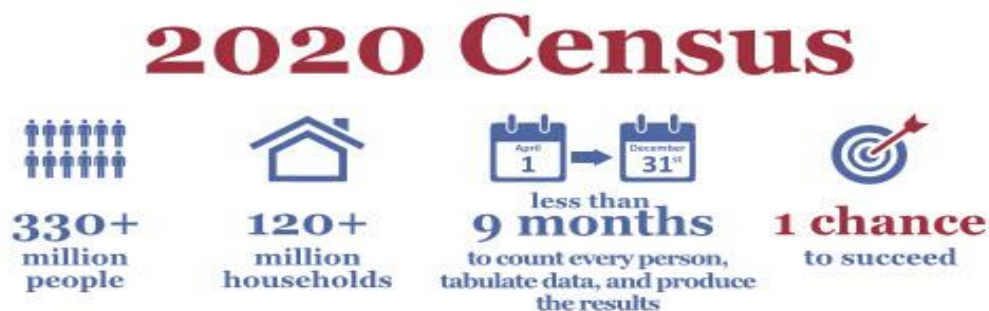
<sup>3</sup> See: Shirin Ahmed, “Reducing the Cost for the 2020 Decennial Census of the United States.”

## I. Background and Introduction

1. The U.S. Constitution, Article I, Section 2, requires that every ten years, we conduct a census to apportion the number of seats in the U.S. House of Representatives among the states. We also use the data to distribute federal funds to local communities.

2. The 2020 U. S. Census will be like no other U. S. Census. We are reengineering key components of it, to ensure that we take a quality census at a reduced cost, all while bringing it into the 21st century through the use of modern technology, innovative techniques, and new data sources. In the next census, we will be trying to reach an increasingly diverse and growing population of around 330 million people in more than 120 million housing units. We have nine months to count everyone (Census Day is April 1, 2020), tabulate the data and produce the results. Federal law requires us to provide the President with state population counts, for apportionment, by 31 December of Census year.

Figure 1  
2020 Census



3. This is the point in the decade where we must make the choices that set the major operations in motion. The program has spent the past few years doing extensive research, testing, and design. We have spent the better part of this past year narrowing our efforts to lead us to the major design decisions.

4. Our goals include:

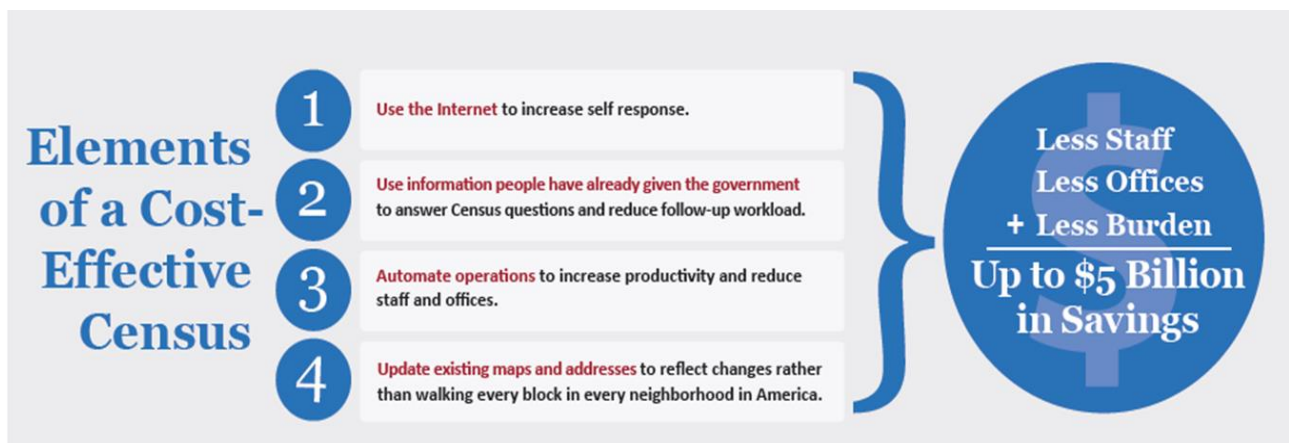
- Designing and conducting a census that costs less per housing unit than the 2010 Census while maintaining high quality,
- Identifying cost drivers and implementing innovative enumeration methods aimed at reducing these costs, and
- Focusing research and the testing program on major innovations to the census design oriented around major cost drivers.

5. We have already identified cost drivers for the census and are conducting research to implement innovative enumeration methods aimed at reducing these costs. The key cost drivers are:

- Increased diversity of the population;
- Demand for the Census Bureau to strive for improved accuracy over previous censuses;
- Lack of full public participation in the self-response phase of the census, requiring the hiring of a large field staff for non-response follow-up;

- Challenges managing major acquisitions, schedule, and budget; and
  - Substantial investments in major, national updating of the address list prior to enumeration.
6. We have focused our research and testing efforts on four major innovation areas that may lead up to US\$5 billion in cost savings for our 2020 Census:
- (a) **Optimizing Self-Response** – Make responding to the Census more convenient by offering secure online, phone, and mail options. (US\$548 Million in savings)
  - (b) **Utilizing Administrative Data** – Use existing government and commercial data to reduce respondent burden and adaptive design techniques to reduce the non-response follow-up workload and improve the efficiency of operations. (US\$1.2 Billion in savings)
  - (c) **Reengineering Field Operations** – Use technology to better manage and track field cases. Use GPS-enabled technology to efficiently route and manage field staff. Use smart phones and tablets for fieldwork rather than pen and paper. (US\$2.3 Billion in savings)
  - (d) **Reengineering Address Canvassing** – Validate the master address list using U. S. Postal Service information, aerial imagery, and other sources, instead of walking every street in the nation. (US\$1 Billion in savings)

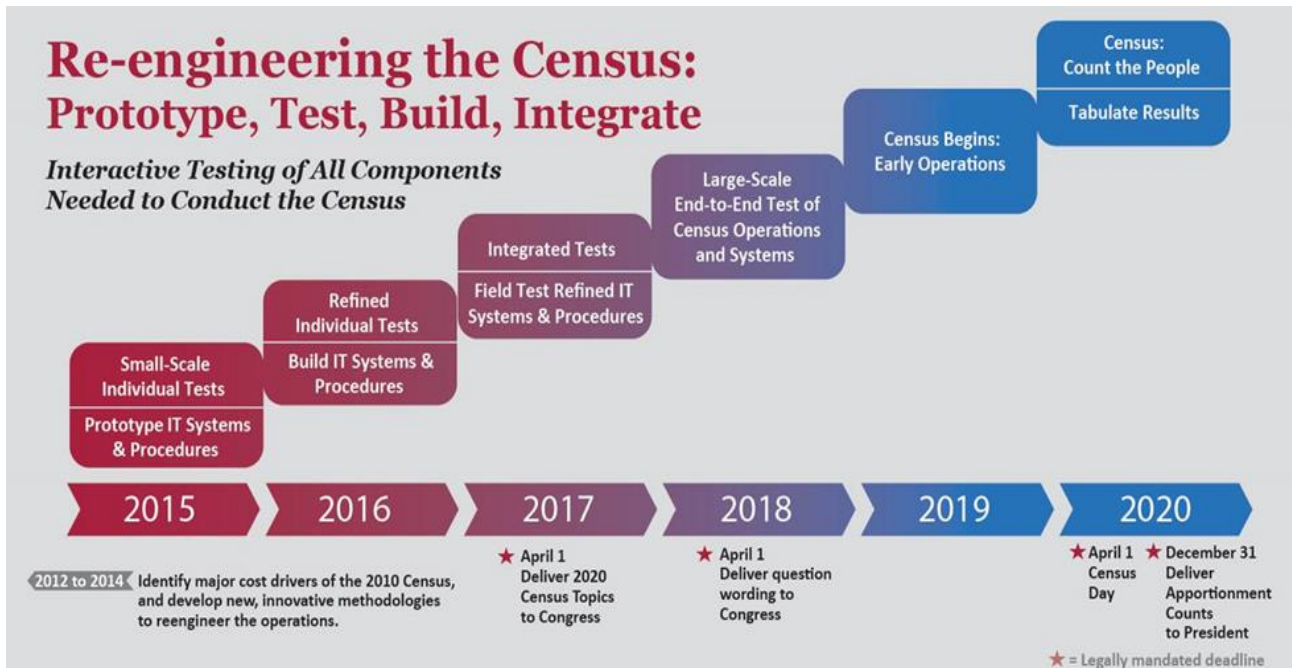
Figure 2

**Elements of cost-effective census****II. Overview of 2020 Census Testing Plans**

7. From 2012 to 2014, we focused on identifying the cost drivers of the 2010 Census, and research on reengineering our census. Small scale testing will occur in 2014-2016, with integrated testing in 2017 and an end-to-end test in 2018. These tests are described in more detail below. In 2019, we will begin implementation of early 2020 Census operations. Census Day is 1 April 2020.

8. From now until the end of the decade, the high-level plan for 2020 Census testing and implementation, looks like in figure 3.

Figure 3  
 Path for prototyping, testing, building and integrating components



9. Provided below is an outline of the main census tests from 2013 until 2018. The next section of this paper will look at key tests for two of the research areas: Optimizing Self-Response and Reengineering Field Operations.

10. For the 2013 test, the testing examined the operational feasibility of using administrative data and adaptive contact strategy tailored to each household to reduce the non-response follow-up (NRFU) workload and increase productivity.

11. In 2014, we conducted the 2014 Census Test to look at contact alternatives for self-response enumeration and the use of administrative data to reduce the NRFU workload.

12. In 2015, we have five tests that will be discussed in detail in Section F of this paper.

13. The 2016 Census Test will focus on strategies for self-response and nonresponse follow-up. In the autumn of 2016, testing will focus on the reengineered address canvassing operation.

14. For the 2017 Census Tests, the emphasis is integration of operations with enterprise information technology (IT) solutions. In 2018, we will conduct an operational readiness test.

15. The table 1 below combines the four innovation areas with the testing programs to provide a high-level view of the innovation areas and their associated tests.

Table 1  
2020 Census Innovation Areas and Testing

	Reengineering Address Canvassing	Optimizing Self-Response	Utilizing Administrative Records	Reengineering Field Operations
2012 National Census Test		X		
2013 Census Test			X	
2014 Census Test		X	X	
2015 Address Validation Test	X			
2015 Optimizing Self Response Test		X		
2015 Census Test			X	X
2015 National Content and Self Response Test		X		
Geographic Support System Initiative	X			
Decennial Modeling and Analysis	X		X	
ROCKIT Simulations				X
2012 Gallup Poll			X	
American Community Survey	X	X	X	X

### III. 2020 Census Testing and Results<sup>4</sup> – Optimizing Self-Response

16. Now we will concentrate on just two of the innovation areas and their associated tests and results - Optimizing Self-Response and Reengineering Field Operations. Let us look first at Optimizing Self-Response.

17. In the table 2 below, highlighted are the tests for Optimizing Self- Response.

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<sup>4</sup>At the deadline for this paper, our 2014 and 2015 test results were still being evaluated and are not yet public. The results should be released in time for the meeting and will be included in the presentation.

Table 2  
**United States 2020 Census Innovation Areas and Testing Optimizing Self-Response**

	Reengineering Address Canvassing	Optimizing Self-Response	Utilizing Administrative Records	Reengineering Field Operations
2012 National Census Test		X		
2013 Census Test			X	
2014 Census Test		X	X	
2015 Address Validation Test	X			
2015 Optimizing Self Response Test		X		
2015 Census Test			X	X
2015 National Content and Self Response Test		X		
Geographic Support System Initiative	X			
Decennial Modeling and Analysis	X		X	
ROckIT Simulations				X
2012 Gallup Poll			X	
American Community Survey	X	X	X	X

**A. Assumptions for Optimizing Self-Response**

18. The Census Bureau has made a number of assumptions for each of the innovation areas and their possible implementation in the 2020 Census. For Optimizing Self-Response, our assumptions are:

- The response rate for the Internet instrument will be 55 percent.
- The Census Bureau’s strategy will include paper questionnaires using a mail-out/mail-back approach.
- Paper questionnaires will be mailed to 20 percent of specific non-respondents based on data analysis.
- This approach will result in a reduction in paper data capture operations workload and field infrastructure as compared to the 2010 Census.
- This approach has the potential savings of US\$548 Million.

**B. Key Research Questions**

19. For Optimizing Self-Response, the key research questions are:

- What are the best methods for communicating the importance of responding to the 2020 Census as measured by public response?
- What is the estimated self-response rate? What are the response rates for different modes?

- What infrastructure is necessary to support the Internet as the primary mechanism for self-response?
- Is there value in asking households to pre-register for the census?
- Is it necessary to provide households with an identification code to respond via the Internet?

### C. Key Design Components

20. There are two key components to the research and testing for Optimizing Self-Response:

- 1) Employ the use of a pre-registration phase (with a tool called “Notify Me”).
- 2) Allow Respondents to answer the 2020 Census Questionnaire without an identification code (“Non-ID” processing)
  - a. Option 1 is to provide on-line tools that allow real-time matching and geocoding at the time of questionnaire completion.
  - b. Option 2 is to conduct batch processing of matching and geocoding at specific periods during the day.

## IV. 2020 Census Testing and Results – Reengineering Field Operations

21. In this table, highlighted in the far right column are the tests for Reengineering Field Operations.

Table 3

**United States 2020 Census Innovation Areas and Testing Reengineering Field Operations**

	Reengineering Address Canvassing	Optimizing Self-Response	Utilizing Administrative Records	Reengineering Field Operations
2012 National Census Test		X		
2013 Census Test			X	
2014 Census Test		X	X	
2015 Address Validation Test	X			
2015 Optimizing Self Response Test		X		
2015 Census Test			X	X
2015 National Content and Self Response Test		X		
Geographic Support System Initiative	X			
Decennial Modeling and Analysis	X		X	
ROCKIT Simulations				X
2012 Gallup Poll			X	
American Community Survey	X	X	X	X

## **A. Assumptions for Reengineering Field Operations**

22. For the Reengineering Field Operations, our assumptions are to:
- Increase Non-response Follow-up (NRFU) productivity by 20 percent with the use of automation.
  - Remove late responses from the NRFU workload.
  - Reduce the total number of local census offices (LCOs) by 5 percent.
  - Reduce the total square footage of LCOs by 70 percent.
  - Eliminate crew leader assistants.
  - Reduce the number of clerical staff by 20 percent.
  - Redesign the training strategy to reduce enumerator-training hours by 35 percent.
  - Establish a lower training pay rate than the production pay rate.
  - About 75 percent of enumerators will use bring their own device (“Bring Your Own Devise”).
  - Reduce the phone/personal visit contact cycle relative to the 2010 Census from a maximum of six contacts to a maximum of three contacts.
  - Use adaptive design (routing and dynamic case management) to allocate resources efficiently.
  - Preliminary lifecycle cost estimates show this approach has the potential savings of US\$2.3 Billion.

## **B. Key Research Questions**

23. For the Reengineering Field Operations, the key research questions are:
- How can the Census Bureau reduce the cost of field operations with automation?
  - What does the model for reengineered field operations entail?
  - How will the field staff structure change?
  - How will we manage interaction with employees?
  - What is the optimal workload assignment for field staff?
  - Where will workload management occur?
  - What type of systems and devices will be used to support:
    - Case assignment (OCS)
    - Routing and navigation (GIS)
    - Data collection
    - Administrative activities
  - Will the Census Bureau build or buy these systems?
  - How will the employees obtain the handheld devices for enumeration?



## C. Key Design Components

24. There are two key components to the research and testing for Reengineering Field Operations:
  - 1) Reengineer the field work:
    - a. Provide enumerators with daily, optimal, and sequence contact attempt assignments.
    - b. Provide supervisors with electronic access to enumerator workload and status information.
    - c. Automate training.
  - 2) Reengineer the field staff structure:
    - a. Redefine field staff roles.
    - b. Change how we think about work schedules.
    - c. Change staffing ratios.

## V. 2014 Census Test

25. The 2014 Census Test took place from June to September 2014, in portions of Washington, D.C. and Montgomery County, Maryland; the test area included approximately 200,000 housing units. Census Day was on 1 July 2014. For this test, we looked at self-response and nonresponse follow-up field components to obtain results needed to answer research questions and inform the preliminary design decisions for the 2020 Census. The scope of the test included:
26. Comparing response rates, cost, and data quality across strategies aimed at reducing costs by utilizing:
  - The testing of self-response modes and contact strategies for our pre-registration tool, “Notify Me”;
  - Utilization of email and automated voice invitations;
  - Testing of the mobile devices that are used for nonresponse follow-up enumeration in the field;
  - Testing of alternative contact strategies (telephone or personal visit) for non-responders;
  - Using administrative data to remove cases from the nonresponse follow-up workload; and applying adaptive design methodologies in managing the way field enumerators are assigned their work; and
  - We also conducted focus groups in the geographic area of the 2014 Census Test to examine reactions to the alternate contacts, response options, administrative data use, and privacy or confidentiality concerns (including how the Census Bureau might address these concerns through our communication plan).

## VI. 2015 Census Tests:

27. In 2015, we will conduct five tests in preparation for the 2020 Census:
- **Human in the Loop Simulation (SIMEX)** – Nationwide simulation to test the new field management structure and operational control system.
  - **Address Validation Test** – to test methods to develop the master address list, use of aerial imagery, and the delineation of address canvassing workloads.
  - **2015 Optimizing Self-Response Test** – to test pre-registration (“Notify Me”) and a non-ID response option.
  - **2015 Census Test** – will test Bring Your Own Device (BYOD), the use of administrative data to reduce the nonresponse follow-up workload, and the use of automated routing and navigation for enumerator assignments.
  - **2015 National Content Test** – will test question changes to race and Hispanic origin, relationship, and within-household coverage.
28. This paper will not discuss the Address Validation Test or the 2015 Content Test, as these tests do not concentrate on either optimizing self-response or reengineering field operations.

### A. Human in the Loop Simulation (SIMEX)

29. Human in the Loop Simulation or SIMEX was a nationwide simulation conducted in November of 2014, at the Census Bureau’s Center for Adaptive Technology (CAT) Lab and at a contractor’s lab. The SIMEX involved 100 participants from Census Bureau headquarters and our six Regional Offices.
30. The SIMEX tested the proposed devices, systems, and field staff structure and management processes. It was an opportunity for us to test – without going into the field and incurring the full expense of a field test – our proposed management structure and the prototype operational control system.
31. We learned a number of things from this simulation:
- Streamlining the field management structure is doable.
  - Messaging and alerts within the operational control system provide real-time and consistent communication.
  - The enhanced operational control system is intuitive – users were able to use the system with just a small amount of training.
  - Smart devices were usable by all people – even those with little technology experience were able to adjust/adapt and ultimately embraced the use of smart devices.
  - Technology will allow us to streamline the field staffing structures and increase the staff to supervisor ratios.
  - The SIMEX results advised us on the approaches we will utilize and evaluate in the 2015 Census Test.

## B. 2015 Optimizing Self Response Test

32. We will test self-response to obtain results needed to answer research questions and inform preliminary design decisions for the 2020 Census. The scope of the test includes:

- Conducting early research on the use of advertising and outreach to engage and motivate respondents;
- Promoting the “Notify Me” and Non-ID response options, and encouraging participation in the test;
- Testing the operational feasibility of real-time processing of Non-ID cases;
- Determining the extent to which we will use pre-registration and our tool, “Notify Me,” in the 2020 Census;
- Determining the extent to which allowing Non-ID responses will contribute to the national self and Internet responses rates; and
- Optimizing the Internet data collection application for mobile devices.

33. This is the first time we will use real-time Non-ID processing to make the census mobile – allowing people the opportunity to respond anytime, anywhere. While Non ID processing is not new, the real-time processing aspect is new. For the first time, we will be comparing respondent-provided addresses to our frame during the interview for geocoding.

34. The test is located in Savannah Georgia and neighboring counties in Georgia and South Carolina, with approximately 400,000 households. We selected this test site based on several criteria:

- It is a medium size media market;
- It’s population is racially and ethnically diverse;
- It includes households with a variety of levels of Internet access and use; and
- It offers a mixture of address types from city-style addresses to rural route designations.
- This kind of test area can help the Census Bureau test new forms of digital advertising and targeted promotion for increasing response, particularly via the Internet.

35. Data collection for this test occurred from February to May 2015. Census Day was 1 April 2015. The test will not include nonresponse follow-up operations.

36. The three panels include 90,000 sampled housing units who will be contacted using our Internet Push Strategy consisting of an invitation letter, followed by two post cards, and lastly a paper questionnaire.

37. One of these mail panels tested the early announcement offer. The Census Bureau mailed a post card to approximately 30,000 housing units. These housing units – as well as others not sampled – may have been exposed to the media outreach related to the “Notify Me” campaign. The postcard mailing precedes the invitation letter that is part of the Internet Push Strategy.

38. If a housing unit chose to be notified and provided an email address or mobile phone number, they did not receive a letter of invitation or any reminder postcards. Instead, those messages were sent using the stated preferred method – either email or text message.

39. Housing units that did not respond to the “Notify Me” offer were contacted using the standard Internet Push method. Preliminary results show – similar to the 2014 Census Test,

this was not a highly used option. The use of advertising and promotion during the pre-registration period does appear to have increased the participation in this test compared to the 2014 Census Test, which was extremely low.

40. The remaining two mail panels differ only by whether their initial letters include a Census ID or not. Both received the standard Internet Push approach. We added one supplemental postcard, which was mailed to 30,000 additional housing units in order to help determine the effect of exposure to advertising/partnership from direct mail contact strategies.

### **C. 2015 Census Test**

41. In the 2015 Census Test, we are testing the reengineering of the field roles, responsibilities, and infrastructure for conducting field data collection.

42. This includes:

- Testing the feasibility of fully utilizing planned automation and available real-time data to transform our data collection operations;
- Exploring the use of data that households have already provided to the government and third party data to reduce the nonresponse follow-up workload;
- Increasing the overall nonresponse follow-up productivity through the use of administrative records, field reengineering, and adaptive design;
- Testing the operational implementation of a BYOD option for enumerators; and
- Using focus groups to explore reactions to the contact methods, use of administrative data, privacy and confidentiality concerns, and how the Census Bureau might address those concerns.

43. Maricopa County, Arizona is the test site for the 2015 Census Test, with approximately 165,000 addresses. Approximately 161,000 addresses are in the initial self-response universe and another approximately 4500 addresses for the BYOD testing. The BYOD addresses were not included in the self-response universe. Maricopa County was selected for three primary reasons:

- Diversity of the population – including a high Hispanic population.
- Mobility – a relatively transient population and potentially high vacancy rates.
- Close proximity of urban and suburban areas.

44. Having these characteristics in the test site will better allow us to understand the impact of our new methods to assign and manage staff, as well as allowing us to test the quality of administrative data with a diverse population.

45. The data collection for this test will take place from March to August 2015.

46. The focus of this test is on Nonresponse Follow-up and the methods and technologies to reduce the workload and increase the efficiency and effectiveness of conducting Nonresponse Follow-up. To that end, the initial universe and the opportunity to self-respond – using the Internet Push Strategy - enable us to get to the nonresponding universe.

47. There are three panels for this test: a control panel and two experimental panels, consisting of a Full Removal Panel and the Hybrid Removal Panel.

48. The control panel will employ similar nonresponse follow-up procedures to those used in the 2010 Census. Work will be managed out of the LCO using a system and approach, again, similar to that used in the 2010 Census.

49. The Full Removal Panel implements an adaptive design contact strategy and will reduce the initial nonresponse follow-up workload to exclude any addresses identified as vacant or occupied based on administrative data prior to any contact attempts being made. We will visit remaining nonresponse cases at least once.

50. In the Hybrid Removal Panel, the initial nonresponse follow-up workload will be reduced to exclude any addresses identified as vacant using administrative data – prior to any contact attempts being made. For all remaining addresses, enumerators will make one personal visit. After that initial attempt, we will further reduce the nonresponse follow-up workload to remove any addresses that could be enumerated using administrative data. The cases that remain will have at least one additional contact attempt made.

51. The work of the experimental panels will be controlled and managed out of the Area Operations Support Center, in the Denver Regional Office, using the Enhanced Operational Control System. All data collection will be automated – using the COMPASS application<sup>5</sup> – on a handheld device.

## VII. Summary

52. This is the point in the decade where we must make the choices that set the major operations in motion. The program has spent the past few years doing extensive research, testing, and design. The better part of this past year, we have spent narrowing our efforts to lead us to our design decisions. The 2020 U. S. Census will be fundamentally different from prior censuses to meet our goals and the changing needs of the American public.

53. We plan to discuss the results of the 2014 and preliminary results from the 2015 tests at the meeting. The Census Bureau will make design decisions for the 2020 Census by September/October 2015.

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<sup>5</sup> Compass is a mobile application, framework, and platform for supporting on-device applications, server components and interfaces for mobile data collection. It includes seamless integration of all on device functionality required by enumerators: manage, schedule, locate and navigate to and between cases, and computer-assisted personal interviewing (CAPI).