Exploring the Potential Redesign of a Traditionally In-Person Federal Survey after Pandemic-related Mode Changes and Evolving Priorities

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MCBS
Medicare Current Beneficiary Survey

CMS
CENTERS FOR MEDICARE & MEDICAID SERVICES
OFFICE OF ENTERPRISE DATA & ANALYTICS

MCBS Introduction

- The Medicare Current Beneficiary Survey (MCBS):
  - A nationally representative survey of the Medicare population conducted by the Centers for Medicare & Medicaid Services (CMS) through a contract with NORC at the University of Chicago (NORC)
  - Surveys beneficiaries longitudinally, at three points per year for four consecutive years
  - In addition to traditional survey question items, collects healthcare utilization and cost data to obtain a complete picture of beneficiaries' usage of services and all sources of payment, including out of pocket
  - Since inception, has used a three-stage geographically clustered sampling design developed for in-person interviewing
    - includes oversample of Hispanic beneficiaries
  - Since pandemic, has completed a majority of interviews by telephone and is currently multi-mode

Purpose

- Explore alternative sampling frames and sample designs for the MCBS
  - Acknowledge recent shifts in response rates and interview modalities
  - Assess the need for a geographically clustered design and the viability of non-clustered designs
  - React to emerging analytic priorities and anticipated challenges
  - Inform future decision-making; current research is exploratory

Motivation and Goals

Motivation

- Increasing interest in oversampling subpopulations
- Ongoing efforts to reduce the cost of conducting large surveys

A redesigned MCBS sample should…

- Reduce the limitations of MCBS geography to allow more oversampling
- Save money by reducing interview cost per complete
- Increase or maintain precision levels, possibly allowing for more granular estimation (e.g., state/region-level estimates, robust subpopulation estimates)

Research Phases

Phase 1

- National telephone frame design
  - Response rates
  - Stratification and representation options
  - Variance estimation

Phase 2

- Oversampling designs
  - Direct oversampling
  - Geography-based oversampling
  - Frame limitations

Phase 3

- Dual-frame and multimode designs
  - Combining telephone and in-person interviews
  - Data quality

Phase 1 Research Areas

- Review existing national telephone surveys
- National- and state-level yield rates
- Precision requirements for outcomes and domains of interest
- Stratification options and impacts on precision
- Suitability of current sampling frame (a 5% extract of Medicare enrollment database)
- Implications for national- and state-level estimation
- Variance estimation

Estimating National and State-Level Yield Rates (Phase 1)

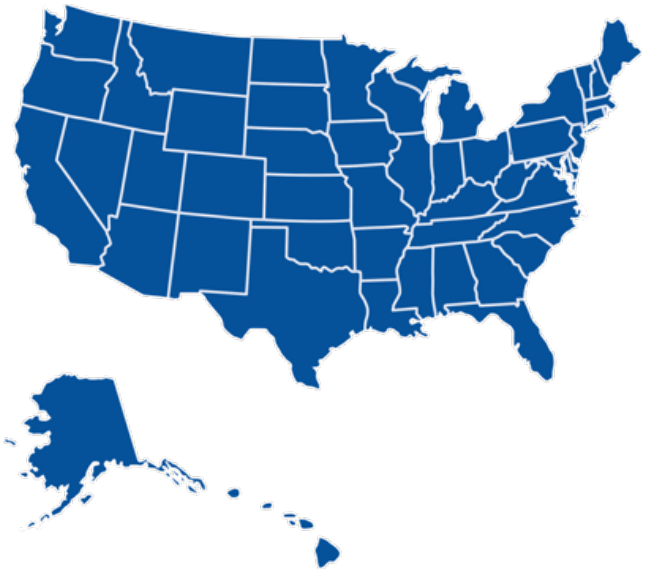
- Inputs
  - 2020-2021 MCBS national- and state-level response rates (not representative of every state)
  - 2020-2021 MCBS telephone matching and contact success rates
  - National Immunization Survey Adult COVID interview relative performance by state (to fill in gaps)
- Output
  - Estimated state-level response rates for first interview under a national telephone design
  - Not adjusted for potential efficiency gains from having dedicated telephone interviewers

Domains and Precision (Phase 1)

- Domains of interest: age group, sex, race/ethnicity, education, region, metro/non-metro, income, disability status, plan type (FFS, Medicare Advantage), dually eligible status
- Defining precision:
  - Assess sample designs based on ability to achieve a target coefficient of variation (CV) for a 50% estimate: CV = 5%, CV = 6%, and CV = 7%
    - *CV = (standard error of estimate) / (mean of estimate)*
  - For example, to achieve a CV of 5% on a 50% mean estimate, the standard error must be ≤ 2.5%
- Precision goals:
  - For all designs, meet the criterion in all domains of interest nationally
  - For state-level designs, meet the criterion for the state overall (not within subpopulations)

Stratification and Substratification Options (Phase 1)

- National-level with existing stratification: 7 age groups (*Age7*) by Hispanicity (*Hisp*), for 14 strata
- State-level stratification with varying substratification options:
  - 7-level age (*Age7*; <45, 45-64, 65-69, 70-74, 75-79, 80-84, 85+)
  - 5-level age (*Age5*; <45, 45-64, 65-74, 75-84, 85+)
  - 3-level age (*Age3*; <65, 65-84, 85+)
  - 2-level age (*Age2*; <65, 65+)
  - Hispanicity (*Hisp*)
  - 2-level age x Hispanicity (*Age2*x*Hisp*)
  - None (state-level only)



Summary Figures (Phase 1)

Primary Stratification	Sub-stratification	Precision Criteria (CV on a 50% Est.)	State-Level Annual Completes	Total Annual Completes	State-Level Est. Design Effect	National Est. Design Effect	Meet CV in All Domains of Interest?
National	*Age7 x Hisp*	5	n/a	14,200	n/a	1.52	Yes
State	*Age7*	7	306	15,599	1.50	3.07	Yes
State	*Age5*	7	302	15,381	1.48	3.97	No
State	*Age2 x Hisp*	7	278	14,168	1.36	5.63	No
State	*Age3*	7	300	14,142	1.36	4.29	No
State	*Age2*	7	275	14,020	1.36	3.69	No
State	*Hisp*	7	274	13,974	1.35	3.64	No
State	none	7	271	13,842	1.33	2.43	Yes

Phase 2 Research Areas

- Direct oversampling for distinct race and ethnicity subpopulations
- Geographical stratification for joint oversampling of minority populations
- Extension to smaller geographically-concentrated populations (e.g., Cuban-American beneficiaries)
- Impacts on precision
- Assessment of sample availability

Direct Oversampling (Phase 2)

- Medicare Enrollment Database contains indicators of race and ethnicity, which can be used to set up sampling strata
- Currently used to oversample Hispanic beneficiaries
- Simultaneous direct oversampling of Hispanic, Black, and Asian beneficiaries is possible from the perspective of sample availability
- Disadvantages:
  - Too many sampling strata
  - Less precise estimates when combining subpopulations
  - Difficult for sample release and monitoring
  - More difficult to implement along with state-level stratification

Geographical Oversampling

- Divide nation into two strata geographically – those with a relatively large number of Hispanic, Black, and/or Asian beneficiaries, and those without
- Oversample in the set of geographies with more non-white representation
- Advantages:
  - May achieve similar results as direct oversampling with only two strata
  - Less reduction in precision of estimates
  - Easier to implement and monitor

Geographical Oversampling Example

- Tested Census tract-based creation of two national sampling strata based on representation of Hispanic, Black, and Asian beneficiaries relative to nation as a whole
  - Oversample tracts includes those with:
    - Any 1 subpopulation with overrepresentation ≥ x;
    - Any 2 subpopulations with overrepresentation ≥ y; or
    - All 3 subpopulations with overrepresentation ≥ z
  - Non-oversample tracts: all others
  - Example:

Oversample?	Non-Hispanic White	Hispanic	Non-Hispanic Black	Non-Hispanic Asian	Non-Hispanic Other	Total
No	90.5%	3.2%	4.0%	1.3%	1.0%	2,346,478
Yes	42.6%	20.6%	26.0%	9.1%	1.6%	1,025,432
					% in oversample:	*30.4%*

Geographical Oversampling Example

- Tested a variety of relative sampling fractions in the oversample stratum compared to non-oversampling stratum
- Simulated estimated design effects for each combination of stratification and oversampling ratio
- Calculated estimate percentage of annual completes from each subpopulation
- Example:

Oversample?	Non-Hispanic White	Hispanic	Non-Hispanic Black	Non-Hispanic Asian	Non-Hispanic Other
No	75.9%	8.5%	10.7%	3.7%	1.2%
Yes	58.6%	14.8%	18.7%	6.5%	1.4%

Key Findings – Phase 2

- Direct oversampling is feasible but has disadvantages
- Geographical oversampling is likely a better approach and performed well in test scenarios
- Possible to overlay additional oversampling for smaller geographically-clustered subpopulations, though it is not easy to sufficiently oversample very small groups
- Trade-off between oversampling for race and ethnicity and state-level estimation:
  - State-stratified designs do not allow for sufficient oversampling
  - Geographical oversampling cannot be replicated in many states

Phase 3 Research

- Some in-person interviewing would likely remain to address considerations around data quality, response rates, questionnaire sections that are necessary or easier to collect in-person, and speech, hearing, or language difficulties over the telephone
- Dual-frame design
  - A national telephone frame plus an in-person frame using the current MCBS geographies
  - In-person frame would provide a data quality subsample for assessment and validation
  - In-person completes could be priority donors for imputation
- National single-frame design with in-person support
  - Strategically place interviewers who can travel to assist in gaining cooperation and/or completing interviews as needed
  - Requires optimization of interviewer dispersal compared to sample cases

Less Disruptive Options

- Not a total redesign, but could address sample exhaustion and certainty selections by modifying MCBS secondary sampling units (SSUs)
- Determined that doubling the annual sampling extract from 5% to 10% would be most effective and least disruptive method to expand sample availability
  - Solved problem of exhausted sample, reduced certainty selections, and improved precision slightly
  - Would not be enough to allow significant new oversampling, but could modestly increase capacity

Redraw larger SSUs	**Expand Existing SSUs**
Release Buffer SSUs	**Double 5% Enrollment Extract**

Discussion

- A national telephone survey with status quo stratification (Age7 x Hisp) is feasible and would likely:
  - Achieve similar or better precision vs. current design;
  - Allow for significantly more oversampling; and
  - Potentially bring cost savings
- Achieving good precision for almost all domains of interest appears possible
- A number of state-level substratification options are feasible, but having too many strata poses challenges to sample monitoring and variance estimation
- Trade-off between state-level representation and national-level precision
- Trade-off between state-level stratification and oversampling for race and ethnicity (Small Area Estimation for states may help)

Thank you!

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NORC at the University of Chicago