

Methodology Report

Phase 3

Mountain State Assessment of Trends in Community Health^a

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^a Between August 2021 and February 2022, the Mountain State Assessment of Trends in Community Health (MATCH) survey was administered by West Virginia University Health Affairs Institute and funded by the West Virginia Department of Human Services,* with input from the West Virginia Department of Health,* to 88,004 adults across all West Virginia counties, and 20% (16,185) responded. The results have been weighted and are representative of all West Virginia adults. For more information, visit WVMATCHSurvey.org.

*Formerly part of the West Virginia Department of Health and Human Resources.

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Document Acronyms

The following acronyms are used throughout this document:

Acronym	Definition
AA	Black or African American
AAPOR	American Association for Public Opinion Research
ABS	Address-Based Sample
ACS	American Community Survey
API	Application Programming Interface
CAWI	Computer-Assisted Web Interview
CATI	Computer-Assisted Telephone Interview
CBG	Census Block Group
Census	United States Census Bureau
COVID-19	Coronavirus Disease 2019
DAGJK	Delete-a-Group Jackknife
FPL	Federal Poverty Level
GC	Geographic Characteristic
Health Affairs	West Virginia University Health Affairs Institute
ICR	Intelligent Character Recognition
IRB	Institutional Review Board
MATCH	Mountain State Assessment of Trends in Community Health
NHSR	Not Human Subjects Research
OMR	Optical Mark Recognition
OWGM	Only Way to Get Mail
PAPI	Paper-and-Pencil Interviewing
P.O. Box	Post Office Box
PUMS	Public Use Microdata Sample
RTI	Research Triangle Institute
RUF	Restricted-Use File
SES	Socioeconomic Status

Acronym	Definition
SOC	Standard Occupational Categories
TSL	Taylor Series Linearization
USPS	United States Postal Service
UWE	Unequal Weighting Effect
WSHD	Weighted Sequential Hot-Deck
WV	West Virginia
WV DHHR	West Virginia Department of Health and Human Resources
WVU	West Virginia University

1 Introduction

1.1 Project Overview

The West Virginia University Health Affairs Institute (Health Affairs), along with the West Virginia Department of Health and Human Resources (WV DHHR), partnered with Research Triangle Institute International (RTI) to conduct the 2021 fielding of the Mountain State Assessment of Trends in Community Health (MATCH) survey. MATCH is a new public health surveillance system designed to provide state and sub-state level estimates on various health indicators (e.g., health status, health behavior, social determinants, and coronavirus disease 2019 [COVID-19]) in West Virginia (WV). The data obtained from the MATCH survey can be used by WV DHHR staff, researchers, academicians, legislators, policymakers, healthcare providers, insurance providers, and the general public to better understand the health of West Virginians and match community health needs with resources specifically designed to meet those needs. Additionally, the survey sets a baseline for future survey iterations that can be used to monitor health trends and potentially measure the impact of health programs and initiatives across the state.

MATCH was fielded between August 31, 2021 and February 28, 2022. The survey utilized a dual-frame design consisting of (1) an address-based sampling (ABS) frame to sample the general WV population, and (2) a Medicaid Administrative frame to target Medicaid recipients. Randomly selected respondents were invited to participate in the survey in one of two main ways: through a computer-assisted web interviewing (CAWI) module, where respondents could complete the survey on a computer, tablet, or smartphone, or a paper-and-pencil interviewing (PAPI) survey, where respondents could complete the paper survey and then mail it back in a self-addressed, postage-paid envelope. In addition, respondents who did not wish to complete the survey by web or by paper could call RTI directly to complete the survey by phone. If a respondent wished to complete the survey but was physically or mentally unable to, a proxy respondent could complete the survey on the individual's behalf. Respondents who preferred to complete the survey in Spanish could complete both the web survey and phone survey in that language.

The survey implementation protocol used a sequential “push-to-web” design that utilized up to four mailings sent to sample members. Sample members were first invited to complete the survey by web with the initial invitation letter; this letter contained an explanation of the project, a hyperlink to a landing page, and a unique Survey Access Code. The second invitation, a postcard, also invited sample members to complete the survey by web. Sample members who did not respond to the first two invitations were then sent a paper survey packet in the third mailing. Finally, the fourth mailing was a second paper survey packet. Whereas mailing materials for sample members in the Medicaid sample were selected and addressed by name, the names of individuals in the households of the ABS sample were unknown. Therefore, mailing materials sent to households in the ABS sample asked that the adult in the household, age 18 years or over, with the most recent birthday, be the one to complete the survey.

The survey was administered in two phases, with 44,002 sample members in each phase. The purpose of the design was to allow for findings from the first phase to inform the second, if design changes to the project were necessary. During Phase 1, an incentive experiment was administered which divided the

sample members into three incentive groups. The first group received a \$2 prepaid incentive with the initial invitation letter. The second group received a \$10 post-incentive upon completing the survey. The third group received both the \$2 prepaid incentive and the \$10 post-incentive. Upon examining the response rates of the three groups in Phase 1, only the third incentive group (\$2 pre- and \$10 post-incentive) was utilized for Phase 2 (see Section 2.7).

Throughout the process, Health Affairs and RTI collaborated closely, and Health Affairs coordinated with WV DHHR and other stakeholders. In addition, Health Affairs conducted extensive partner outreach to promote the survey during the fielding timeline. This report describes the procedures utilized to design and implement the MATCH survey, and to meet the objectives defined by Health Affairs and WV DHHR.

1.2 Design Overview

The MATCH survey covered numerous topics pertaining to health and health coverage of WV residents. Topics included the following:

- Your Health (General Health)
- Healthcare Access
- Mental Health
- Lifestyle
- About You (Demographics)
- Coronavirus Disease 2019 (COVID-19)
- Substance Use
- Other Topics (e.g., physical activity and satisfaction with life)

The sample design for MATCH utilized two sampling frames. The first frame, an ABS frame, consisted of randomly selected addresses throughout WV. The ABS frame was constructed using the United States Postal Service's (USPS) computerized delivery sequence addresses. The frame excluded Post Office Boxes (P.O. Box) and ineligible housing units such as group housing (e.g., retirement homes, dormitories). Mailing materials contained instructions that asked for the member of the household who was age 18 years or older with the most recent birthday to complete the survey because the sample was at the household level. The second frame, the Medicaid Administrative frame, consisted of individuals currently receiving WV Medicaid services. The Medicaid Administrative frame was an individual-level sample and mailing materials were addressed directly to the intended respondent at the address WV DHHR had on file as of July 2021.

1.3 Institutional Review Board Determination

The West Virginia University (WVU) Office of Research Integrity and Compliance reviewed the MATCH survey instrument and a plan for data sharing with respect to human subjects' protection and determined that the proposed project was considered public health surveillance that informs public health programs in the state. The MATCH project did not meet the criteria for original research involving human subjects as defined by the WVU Office of Research Integrity and Compliance (see below), and it was classified as constituting Not Human Subjects Research (NHSR). This designation allows certain research projects to be excluded from Institutional Review Board (IRB) review and approval.

As per the WVU Office of Research Integrity and Compliance, “Public Health Surveillance constitutes data and information to assess and characterize the burden and distribution of adverse health events, prioritize public health actions, monitor the impact of control measures, and identify emerging health conditions that may have a significant impact upon population health.”

Subsequently, RTI’s IRB also reviewed the project and accepted WVU’s IRB determination.

1.4 Pretesting

As part of the development phase for the MATCH survey, Health Affairs conducted a Cognitive-Usability Test and a Pilot Test. The results of these two pretests are covered in this section.

Cognitive-Usability Test

The Cognitive-Usability Test was conducted in the spring of 2021. The major goal of this pretest was to evaluate respondent burden related to the length, content, question wording, visual design, and ability to follow the navigational path of the survey instrument. Prior to the cognitive interview, the paper survey was mailed to the interview participant who was asked not to open the contents until the interview. At the time of the interview, the participant was asked to open the paper survey and complete it while on the phone call reading questions and answering them out loud. The cognitive interviewer recorded the respondent’s answers, monitored for signs that a respondent struggled with a question, asked probing questions where applicable, and then asked several summary questions at the end of the survey. In total, 12 interviews were completed.

The primary findings indicated that the length of the survey needed to be reduced and that the skip complexity of the survey would benefit from being simplified. In response to the findings, Health Affairs modified the survey instrument to reduce the length, improve individual question wording, and simplify the skip pattern. More details on the Cognitive-Usability Test can be found in Section 3.2.

Pilot Test

After updating the survey instrument based on the results of the Cognitive-Usability Test, the Pilot Test was conducted. In addition to testing the survey instrument, the Pilot Test examined the protocols and operations that would be used for the main project, including components from mailing and data processing. Whereas the Cognitive-Usability Test only sent participants a paper survey instrument, Pilot Test recipients were concurrently offered both the web and paper survey instruments, as well as the option of completing the survey by phone.

The Pilot Test was fielded from July 12, 2021, through July 26, 2021, and yielded 216 completed surveys out of the 1,500 in the initial sample (14.4% response). Of the 216 responses, 74.1% were by paper and 25.9% by web. The findings culminated in a variety of recommendations for changes to both the survey instrument and survey fielding protocol. After the Pilot Test was completed, Health Affairs updated the wording of the invitation letter, removed numerous questions deemed not necessary to the core analyses, updated question wording, and restructured several sections of the survey. More details on the Pilot Test can be found in Section 3.3.

2 Sampling

2.1 Overall Description of the Sample Design

MATCH employed a stratified random sample of persons residing in WV using two sampling frames to select the survey participants:

1. A stratified sample of addresses from an ABS frame, oversampling counties with lower populations, select geographical areas with a higher density of low socioeconomic status (SES) households and/or Black or African American residents, and
2. A stratified random sample of Medicaid enrollees from the Medicaid Administrative database, oversampling within select counties, those who are non-White, including those who are Hispanic, and those enrolled in Medicaid.

All strata were either county or subcounty level for oversampling a select group.

The target population for MATCH was the total noninstitutionalized adult (aged 18 years or older) population residing in residential households in WV. Excluded from this population were adults who met at least one of the following criteria:

- Resided in penal, mental, or other institutions
- Resided on military bases covered by dedicated central office codes
- Resided in other group quarters such as dormitories, barracks, convents, or boarding houses (with 10 or more unrelated residents)
- Did not speak or read English or Spanish well enough to be interviewed^b
- Had physical or mental impairments or a language barrier that prevented them from completing an interview (as defined by the interviewer or by another member of the household) if a knowledgeable proxy was not available

2.2 Objectives of the Sample Design

Estimation Domains of Interest

The MATCH sampling plan was a probability-based design with known probabilities of selection at each stage of selection. The general sample design was a stratified simple random sample of persons residing in WV. The MATCH sample design needed to support estimation at the following geographic levels:

- State
- Regional Classification 1, Medical Services – 4 regions
- Regional Classification 2, Behavioral Health – 6 regions
- Regional Classification 3, Ryan Brown Fund – 7 regions
- County

^b According to the 2020 American Community Survey 5-Year Estimates for West Virginia, only 1.1% of adults speak a language other than English or Spanish at home. Of those respondents, 23.7% (~ 2,750 adults) indicated that they speak English “less than very well.”

Additionally, the design needed to maximize the precision among key subpopulation groups. The design needed to maximize the number of respondents in the following subpopulations:

- Black or African American persons
- Low-SES persons
- Medicaid enrollees

Sample Target Goals

To support estimation at each of these geographic levels and subpopulations, MATCH had two sample target goals:

- Statewide survey goal: 22,000 interviews minimum
- County survey goal: 250 interviews minimum per county

2.3 Sampling Plan

Sampling Population

To make inference to the target population, MATCH utilized two sampling frames:

1. **ABS frame.** The ABS frame consists of residential households covering the full residential population of WV.
2. **Medicaid Administrative frame.** The Medicaid Administrative frame consists of all West Virginians enrolled in Medicaid. The Medicaid Administrative frame was used to target low-SES persons in WV.

Sampling Unit

Due to differences between the two frames used to select the sample, the initial sampling unit and basic sampling plan varied for samples selected from the two frames.

1. **ABS frame.** Records on this frame represent housing units. The MATCH sample from this frame was selected using a two-phase, probability-based sample design. The initial sampling unit (also referred to as the primary sampling unit) was the household. Households were randomly selected within strata in the first phase of the sample selection process. Then within each household, a randomly selected adult was chosen in the second phase of the design. As noted earlier, this random selection in the second phase was accomplished by asking the individual who opened the survey solicitation materials to give the materials to the adult in the household with the most recent birthday.
2. **Medicaid Administrative frame.** Records on this frame represent people with Medicaid. The MATCH sample from this frame was selected using a single phase, probability-based sample design. The initial sampling unit was the individual to whom the survey solicitation materials were mailed directly.

Design Considerations

The MATCH sampling plan considered several design considerations. Each of these design considerations were intended to help achieve one of the design objectives.

Selection of sampling frames. The ABS and Medicaid Administrative frames were selected for MATCH for four main reasons:

- Geographic areas (e.g., counties) in the state could be targeted as both the ABS and Medicaid Administrative frames include address-level information.
- The data collection protocols used across all frames needed to be as similar as possible. Because address information is available on both frames, the use of a mail invitation and self-administered mode options of CAWI or PAPI could be used for most respondents.
- Alternative frame options with similar cost structures, such as a random digit dialing frame, would have limited the ability to use self-administered response modes and hampered the ability to accurately target substate geographic areas.
- The Medicaid Administrative frame was the most direct way to access persons enrolled in Medicaid and ensure Medicaid enrollees were represented in the sample.

Minimum sample target in each county. Health Affairs set the minimum completed survey target to 250 in each county. The purpose of this target was to ensure that the key outcomes of interest could be analyzed at the county level via direct survey estimation.

Oversample of low-income geographic areas. Persons with a low SES status were of particular interest to MATCH because they are known to have poorer health outcomes and greater health disparities. As such, select geographical areas with a higher density of low socioeconomic status were oversampled on the ABS frame. As Medicaid enrollment status was used as a proxy for low SES, the entire Medicaid sample represents a secondary oversampling of low SES.

Oversample of Black or African American residents. According to the 2019 American Community Survey (ACS) totals from the United States Census Bureau (Census), the WV population is 93.1% White. Black or African American persons make up the second largest racial group at 3.7% of the population. If the design did not do anything to increase the number of Black or African American respondents, then the expected 814 Black or African American respondents would be insufficient for subdomain-level analyses (e.g., breakdown of Black or African Americans by age category or gender) for most outcomes. The absence of oversampling would limit the utility of understanding differences in healthcare access and health outcomes among the Black or African American residents in WV. Therefore, the design incorporated an oversampling of Census Block Group (CBG) with higher density of Black or African American residents in select counties on the ABS frame and an oversampling of residents who are non-White, including Hispanic in select counties on the Medicaid Administrative frame.

Multiphase design. The MATCH design assumed an average response rate of 25% across all sampling frames. However, because this assumption was based on similar surveys in other states—and not WV specifically—there was uncertainty about the overall response rate and how the response rate would disaggregate at the county level. Because of this uncertainty, a multiphase design was implemented to allow for shifting of the sample across the counties to optimize survey response and achieve the sample target goals. Given the data collection field period, two phases were built into the sample design. By design, the second phase would use empirical information from the first phase to adjust the sample release in the second phase, if needed.

Incentive experiment. Since it was the first iteration of the MATCH survey, there was uncertainty about what the optimal incentive level would be in WV that would help the project obtain the desired minimum response rate of 25%. To determine the optimal incentive structure, a three-arm experiment with incentive options of (1) \$2 cash pre-incentive only, (2) \$10 post-incentive only, and (3) \$2 pre-incentive and \$10 post-incentive was implemented in the first phase. Pre-incentives were provided to all sample members with the initial invitation letter, regardless of response. Post-incentives were provided only to persons who completed the survey and provided details for reimbursement. The incentive experiment was designed to be implemented during the first phase with the option to either (1) continue the experiment during the second phase if no conclusive decision about an optimal incentive could be made, or (2) end the experiment after the first phase and proceed during the second phase with the incentive option determined to be optimal (Section 2.7).

Sample Allocation Across Sampling Frames

The MATCH survey design allocated 80% of the target sample (17,600 targeted completed surveys) to the ABS frame and 20% of the target sample (4,400 targeted completed surveys) to the Medicaid Administrative frame.

Table 2-1 summarizes the baseline samples selected from the ABS frame and Medicaid Administrative frame based on target sample.

Table 2-1: Proposed Sample Sizes by Type of Sample

Sample frame	Sample	
	Target	Selected
ABS	17,600	70,400
Medicaid Administrative database sample	4,400	17,604
Total	22,000	88,004

Abbreviation: ABS, Address Based Sample

2.4 Address-Based Sampling Design

MATCH utilized an ABS frame to sample WV residential addresses to achieve 80% of the overall sample goal.

ABS Frame Construction

The sampling frame consisted of addresses from the USPS computerized delivery sequence program, including city-style, Rural Route Boxes, Highway Contract Boxes, and Only Way to Get Mail (OWGM) PO Boxes (both vendor and RTI identified). The frame excluded the following unit types: drop points with more than four units; non-OWGM PO Boxes; and addresses flagged as business only, seasonal, or educational. Drop points with more than four units were excluded because the responding unit cannot be clearly identified in the sample. Non-OWGM PO Boxes were excluded because no street address was identified. Addresses flagged as business only, seasonal, or educational were excluded because they were ineligible.

On the ABS frame, Census population information at the CBG level was appended to identify areas with high concentrations of key subpopulations. Specifically, geographical areas with high concentrations of Black or African American residents and areas with high concentrations of low SES households were identified.

ABS Sample Selection Methods

The ABS design consisted of four components: (1) stratification, (2) allocation, (3) household selection and release, and (4) within-household selection.

Stratification

The ABS sample utilized a stratified design to help achieve the goals of improving the precision of county and other sub-state level estimates and increasing the number of Black or African American and low-SES respondents. The state was initially stratified by county. Within each county, if the population met specified criteria, the county was further stratified by areas with a high concentration of Black or African American residents or low SES households. In total, 102 strata were formed.

Defining areas with a high concentration of Black or African American residents. The oversample for residents who are Black or African American, as directed by Health Affairs, was conducted in seven counties. Two approaches to identifying the seven counties were considered. (1) The percentage of persons who are non-White in the county, and (2) The percentage of Black or African Americans. Although there is a correlation between the non-White percentage and Black or African American, the two rankings are not exact. **Table 2-2** presents the 10 counties with the largest non-White population (as a percentage of total population).

Table 2-2: Percentage of Non-White^a and Black or African American Persons by County

County	Population	Non-White ^b (%)	Black or African American (%)
Gilmer	8,205	19.01	11.0
Jefferson	56,179	16.52	6.3
Berkeley	113,495	15.77	7.2
Raleigh	76,232	12.89	7.6
Kanawha	185,710	12.23	7.2
Monongalia	105,252	12.04	3.6
McDowell	19,217	11.35	8.4
Cabell	95,318	10.11	5.0
Hardy	13,842	9.85	5.5
Mercer	60,486	9.66	6.1

^aPercentages came from 2018 ACS totals.

^bNon-White persons includes Hispanics and persons of any non-White race.

The percentage of persons who are non-White was used to identify the seven counties for two reasons. First, using the non-White percentage will increase the percentage of Black or African American and other non-White races and Hispanics. Second, from a practical perspective, only one county would have

been different—Monongalia County would have been replaced by Mercer County. Therefore, from a substantive perspective, using the non-White percentage would have minimal impact on which counties were identified. Additionally, because of its small population, Gilmer County was ruled out as one of the seven counties. The seven counties oversampled for Black or African American residents were:

- Berkeley County
- Cabell County
- Jefferson County
- Kanawha County
- McDowell County
- Monongalia County
- Raleigh County

Within each identified county, CBGs with the highest concentration of Black or African American residents were identified. **Table 2-3** presents the number and percentage of CBGs based on the percentage of Black or African Americans residing in the CBG. The rule used for identifying the CBGs to be used in this oversample was twofold: (1) there needed to be at least five CBGs, and (2) the number of CBGs needed to account for at least 10% of the county’s total CBGs (and, by proxy, population).^c These rules were used to balance the desire to make the oversample as efficient as possible in terms of the number of households with Black or African American residents selected and, at the same time, minimize the impact the oversample has on the design effect.

Table 2-3: Number and Percentage^a of Census Block Groups by Percentage of Residents who are Black or African American

County	Total CBG	10+ % AA		20+ % AA		30+ % AA	
		#	%	#	%	#	%
Berkeley	65	20	31	4	6	2	3
Cabell	82	14	17	5	6	2	2
Jefferson	32	5	16	2	6	0	0
Kanawha	171	47	27	26	15	10	6
McDowell	27	7	26	6	22	3	11
Monongalia ^b	100	7	7	1	1	1	1
Raleigh	57	16	28	6	11	5	9

Note: The highlighted cells identify the CBGs selected in each of seven counties by the predefined counties.

^aCounts and percentages come from 2019 ACS totals.

^bThe exception to the rule is Monongalia, where 7 CBGs were identified that accounted for roughly 7% of the population (less than 10%).

Abbreviations: CBG, Census Block Group; AA, Black or African American

^c The exception to the rule is Monongalia, where 7 BGs were identified that accounted for roughly 7% of the population (less than 10%).

Defining high-concentration, low-SES households. Although low SES is a construct based on several factors, the ABS frame only has the ability to append income level. Therefore, areas with low-income populations were used as a proxy for low SES in the ABS sample. For the purposes of sampling, low income was defined as an annual household income of \$20,000 or less. The income value was chosen because the 2021 federal poverty level (FPL) for a single-person household is \$12,880 and increases by \$4,540 for each additional household member. According to the data from the Census, in 2021 the average number of persons per household in WV was 2.47. Using the formula above, the FPL for the average 2.47-person^d household in WV was \$19,554 in 2021.

Using the definition of “low-income,” high-concentration low-income CBGs were constructed based on two criteria: (1) the efficiency of the oversample (i.e., the probability of sampling a low-income household from an area where a higher probability indicates a more efficient oversample) and (2) the impact of the oversample on variance, if a very small proportion of the county is eligible for the oversample. In balancing these two criteria, a threshold was set at having: (1) at least two CBGs with at least 30% of the CBG meeting the low-income definition, and (2) those CBGs constituting at least 15% of all CBGs in the county. If a county met the threshold with at least 30% of the CBG meeting the low-income definition, then the density was increased to at least 40% to see if the efficiency could be increased without a likely decrease in the precision. This process was repeated for 50% and 60%. **Table 2-4** identifies the 40 counties or subcounties (in the case of high/low Black or African American areas) in 36 distinct counties that meet the criteria for a high-concentration low-income stratum.

Allocation

The target sample of 17,600 was allocated across the 102 strata using the following algorithm:

- *Sample was allocated to each county.* The target sample of 17,600 was initially proportionally allocated to each county based on its population. The target floor of 250 was applied.^e Across the 55 counties in WV, 41 had an initial allocation below 250. The target was raised to 250 in these counties. In the remaining 14 counties, the target sample was reduced proportionally to maintain the overall target sample size.
- *Sample was allocated within county to the high-concentration Black or African American strata.* An oversampling factor of 2.0 was used for the high-concentration Black or African American strata. This oversampling factor was determined to best balance the design to increase the respondent sample size in these two subpopulations while maintaining an acceptable design effect due to unequal probability sampling. During this step, any high-concentration low-income strata were ignored for purposes of allocation. For example, in Berkeley County 31.8% of the population is in the high-concentration Black or African American strata. Therefore, of the 737 interviews allocated to Berkeley County, 469 (63.6%) were allocated to the high Black or African American strata and 268 (36.4%) to the low-concentration Black or African American strata.

^d A 2.47-person household is purely hypothetical.

^e Even though the Medicaid Administrative frame sample would obtain sample in each county, the design minimum target of 250 was applied fully to the ABS frame for two reasons: (1) because the ABS frame fully represents the population rather than only a subset, and (2) some counties have a nominal number of Medicaid enrollees.

- *Sample was allocated to the high-concentration low-income strata.* An oversampling factor of 2.5 was used for the high-concentration low-income strata. This oversampling factor was determined to best balance the design to increase the respondent sample size in these two subpopulations while maintaining an acceptable design effect due to unequal probability sampling. Because a high- and low-concentration Black or African American stratum can have a low-income stratum, the low-income oversampling factor was applied after the allocation to the high and low Black or African American strata. For example, in Berkeley County, the high-concentration Black or African American strata had a high-concentration low-income stratum with 22.6% of the high Black or African American population being in the low-income stratum. Applying the oversampling factor, the 469 high Black or African American stratum sample was allocated 266 (56.7%) to the low-income stratum and 203 (43.3%) to the non-low-income stratum.

Household Selection and Release

There was no estimate of the response rate because this was the first iteration of MATCH. Based on studies with similar topic areas and designs, a response rate of 25% was assumed.^f Under this response rate assumption, a starting sample size of 70,400 households was produced. Furthermore, because no county-specific information was available about differential response rates, the 25% response rate assumption was applied equally to each county and strata. The target and starting sample sizes for each stratum are detailed in **Table 2-5**.

^f While external sources for response rate exist, such as the Community Planning and Development county and sub-state level response rate score or the Census response rate data, these sources may not be comparable if the project design (e.g., survey length, mode, incentive offered) or topic area is different from those external studies. Therefore, studies with similar designs and topic areas were identified and used to develop a starting response rate. A fixed response rate was assumed with the ability to adjust the allocation based on empirical evidence in the second fielding phase.

Table 2-4: Density of Low-Income Households in Census Block Groups by County^{a,b}

County Name	Total Number of CBG	30+ % Low Income		40+ % Low Income		50+ % Low Income		60+ % Low Income	
		#	%	#	%	#	%	#	%
Barbour	16	5	31	2	13		0		0
Berkeley_HighAA	20	6	30	1	5	1	5		0
Berkeley_LowAA	45	3	7	2	4		0		0
Boone	17	6	35		0		0		0
Braxton	13	2	15	1	8		0		0
Brooke	22	2	9		0		0		0
Cabell_HighAA	14	13	93	8	57	5	36	4	29
Cabell_LowAA	68	20	29	9	13	4	6	2	3
Calhoun	6	2	33	1	17		0		0
Clay	8	4	50	2	25	1	13		0
Doddridge	8		0		0		0		0
Fayette	39	8	21	4	10	1	3		0
Gilmer	9	3	33	1	11		0		0
Grant	10	2	20		0		0		0
Greenbrier	31	7	23	3	10		0		0
Hampshire	16	1	6		0		0		0
Hancock	31	5	16	3	10		0		0
Hardy	12		0		0		0		0
Harrison	56	7	13	4	7		0		0
Jackson	23	7	30	3	13	2	9	1	4
Jefferson_LowAA	27		0		0		0		0
Jefferson_HighAA	5		0		0		0		0

County Name	Total Number of CBG	30+ % Low Income		40+ % Low Income		50+ % Low Income		60+ % Low Income	
		#	%	#	%	#	%	#	%
Kanawha_HighAA	26	11	42	8	31	8	31	3	12
Kanawha_LowAA	145	31	21	11	8	2	1	1	1
Lewis	15	3	20	1	7		0		0
Lincoln	21	5	24	2	10		0		0
Logan	31	17	55	6	19		0		0
McDowell_LowAA	21	15	71	8	38	3	14	1	5
McDowell_HighAA	6	4	67	1	17		0		0
Marion	59	9	15	6	10	3	5		0
Marshall	33	6	18	4	12	1	3		0
Mason	22	4	18	1	5	1	5	1	5
Mercer	49	19	39	5	10	3	6	1	2
Mineral	20	2	10	1	5		0		0
Mingo	25	14	56	8	32	3	12	1	4
Monongalia_HighAA	7	3	43	2	29	1	14		0
Monongalia_LowAA	93	21	23	12	13	7	8	4	4
Monroe	12	1	8	1	8		0		0
Morgan	13		0		0		0		0
Nicholas	21	3	14		0		0		0
Ohio	48	7	15	6	13	3	6	1	2
Pendleton	8		0		0		0		0
Pleasants	7	1	14		0		0		0
Pocahontas	9	1	11		0		0		0
Preston	33	4	12	1	3		0		0

County Name	Total Number of CBG	30+ % Low Income		40+ % Low Income		50+ % Low Income		60+ % Low Income	
		#	%	#	%	#	%	#	%
Putnam	39	3	8	1	3		0		0
Raleigh_LowAA	51	17	33	4	8	2	4		0
Raleigh_HighAA	6	1	17	1	17	1	17		0
Randolph	27	6	22	2	7		0		0
Ritchie	10		0		0		0		0
Roane	16	5	31		0		0		0
Summers	12	5	42	1	8		0		0
Taylor	21	3	14	1	5	1	5		0
Tucker	8		0		0		0		0
Tyler	10	3	30	1	10		0		0
Upshur	19	6	32	1	5	1	5	1	5
Wayne	36	17	47	11	31	3	8	1	3
Webster	7	3	43	2	29		0		0
Wetzel	18	3	17		0		0		0
Wirt	4		0		0		0		0
Wood	69	13	19	6	9	1	1	1	1
Wyoming	19	5	26	1	5		0		0

Note: The highlighted cells represent the cut-point for low-income Census Block Groups.

^aLow income was defined as household income in past 12 months less than \$20,000.

^bBlank cells mean a count of 0.

Abbreviations: CBG, Census Block Group; HighAA, High population of Black or African American adults; LowAA, Low population of Black or African American adults

Table 2-5: Target and Starting Sample, Address Based Sample Frame

Stratum Number	Stratum Name	Strata Address Units	Sample	
			Target Strata Size	Selected
1	Barbour	4,745	68	272
2	Barbour_LowInc	1,955	182	728
3	Berkeley_LowAA	34,258	268	1,072
4	Berkeley_HighAA	12,362	203	812
5	Berkeley_HighAA_LowInc	3,623	266	1,064
6	Boone	4,024	28	112
7	Boone_LowInc	2,526	222	888
8	Braxton	4,553	156	624
9	Braxton_LowInc	802	94	376
10	Brooke	11,192	250	1,000
11	Cabell_LowAA	27,910	127	508
12	Cabell_LowAA_LowInc	11,472	342	1,368
13	Cabell_HighAA	5,007	41	164
14	Cabell_HighAA_LowInc	2,405	177	708
15	Calhoun	1,658	83	397
16	Calhoun_LowInc	603	167	603 ^a
17	Clay	3,319	180	720
18	Clay_LowInc	417	70	280
19	Doddridge	3,236	250	1,000
20	Fayette	13,479	104	416
21	Fayette_LowInc	4,288	157	628
22	Gilmer	1,632	28	112
23	Gilmer_LowInc	1,067	222	888
24	Grant	5,167	173	692
25	Grant_LowInc	726	77	308
26	Greenbrier	12,296	127	508
27	Greenbrier_LowInc	3,019	123	492
28	Hampshire	9,148	250	1,000
29	Hancock	11,828	155	620
30	Hancock_LowInc	2,117	95	380
31	Hardy	6,019	250	1,000
32	Harrison	31,422	461	1,844
33	Jackson	6,851	54	216
34	Jackson_LowInc	3,125	196	784
35	Jefferson_LowAA	20,633	278	1,112

Stratum Number	Stratum Name	Strata Address Units	Sample	
			Target Strata Size	Selected
36	Jefferson_HighAA	1,675	49	196
37	Kanawha_LowAA	61,781	441	1,764
38	Kanawha_LowAA_LowInc	16,784	506	2,024
39	Kanawha_HighAA	10,045	122	488
40	Kanawha_HighAA_LowInc	3,918	288	1,152
41	Lewis	6,358	125	500
42	Lewis_LowInc	1,587	125	500
43	Lincoln	5,984	104	416
44	Lincoln_LowInc	1,822	146	584
45	Logan	12,435	171	684
46	Logan_LowInc	1,792	79	316
47	McDowell_LowAA	5,900	52	208
48	McDowell_LowAA_LowInc	1,835	76	304
49	McDowell_HighAA	1,304	14	56
50	McDowell_HighAA_LowInc	1,194	108	432
51	Marion	22,694	254	1,016
52	Marion_LowInc	3,608	132	528
53	Marshall	12,304	150	600
54	Marshall_LowInc	2,335	100	400
55	Mason	9,070	134	536
56	Mason_LowInc	2,077	116	464
57	Mercer	18,209	46	184
58	Mercer_LowInc	10,044	368	1,472
59	Mineral	11,276	250	1,000
60	Mingo	7,057	71	284
61	Mingo_LowInc	2,829	179	716
62	Monongalia_LowAA	35,041	238	952
63	Monongalia_LowAA_LowInc	11,719	399	1,596
64	Monongalia_HighAA	2,497	34	136
65	Monongalia_HighAA_LowInc	882	65	260
66	Monroe	5,017	250	1,000
67	Morgan	7,603	250	1,000
68	Nicholas	9,809	250	1,000
69	Ohio	16,927	172	688
70	Ohio_LowInc	3,454	127	508
71	Pendleton	2,406	250	1,000
72	Pleasants	2,951	250	1,000

Stratum Number	Stratum Name	Strata Address Units	Sample	
			Target Strata Size	Selected
73	Pocahontas	3,841	250	1,000
74	Preston	12,891	250	1,000
75	Putnam	24,881	365	1,460
76	Raleigh_LowAA	18,982	67	268
77	Raleigh_LowAA_LowInc	9,184	295	1,180
78	Raleigh_HighAA	3,480	102	408
79	Randolph	7,869	97	388
80	Randolph_LowInc	2,555	153	612
81	Ritchie	4,375	250	1,000
82	Roane	4,623	64	256
83	Roane_LowInc	1,965	186	744
84	Summers	3,036	28	112
85	Summers_LowInc	2,640	222	888
86	Taylor	7,231	250	1,000
87	Tucker	2,600	250	1,000
88	Tyler	2,704	65	260
89	Tyler_LowInc	1,140	185	740
90	Upshur	7,192	56	224
91	Upshur_LowInc	3,242	194	776
92	Wayne	12,922	82	328
93	Wayne_LowInc	4,909	180	720
94	Webster	2,676	117	468
95	Webster_LowInc	726	133	532
96	Wetzel	6,352	164	656
97	Wetzel_LowInc	1,010	86	344
98	Wirt	1,971	250	1,000
99	Wood	32,288	293	1,172
100	Wood_LowInc	8,205	301	1,204
101	Wyoming	3,675	28	112
102	Wyoming_LowInc	2,256	222	888

^aPer raw computations, the allocation was 668 addresses. Therefore all 603 addresses were used, and the target represents more than a 25% response rate.

Abbreviations: LowInc, Low income; LowAA, Low Black or African American population; High AA, High Black or African American population; HighAALowInc, High Black or African American population and low income; LowAALowInc, Low Black or African American population and low income

MATCH utilized a two-phase design. Each phase consisted of half the starting sample (i.e., 35,200 households with each phase from the ABS frame). The allocation across strata was the same across both

phases. The allocation was maintained to optimize the number of interviews while ensuring some additional respondents in all counties.

Within-Household Selection

Each selected household was mailed an invitation to participate in the survey. The invitation instructed each household to identify the household member who had the most recent birthday and was aged 18 years or older. The person who met these criteria was asked to take the survey, and the survey instrument also reminded respondents of this selection criteria.

2.5 Medicaid Administrative Design

MATCH utilized the WV Medicaid Administrative database to sample WV Medicaid enrollees to achieve 20% of the overall sample goal.

Medicaid Administrative Frame Construction

The sampling frame consisted of all persons enrolled in Medicaid as of July 2021. The frame contained 373,766 persons.

Medicaid Sample Selection Methods

The Medicaid design consisted of four components: (1) stratification, (2) allocation, (3) sample selection and release, and (4) person selection.

Stratification

The Medicaid sample design utilized a stratified design to help achieve the goals of improving county and other sub-state level estimate precision and increasing the number of Non-White, including Hispanic, persons.^{g,h} The state was initially stratified by county. Within each county, if the population met specified criteria, the county was further stratified by whether the enrollee was identified as a person who was Non-White or not on the Medicaid Administrative frame. In total, 62 strata were formed.

The counties with high concentrations of persons who are non-White were selected to be consistent with the ABS sample. As such, Cabell, Jefferson, Berkeley, Raleigh, Kanawha, Monongalia, and McDowell Counties were split into two strata each: (1) White Medicaid enrollees and (2) non-White Medicaid enrollees. **Table 2-6** presents the Medicaid population in the seven counties by White and non-White persons.

^g All enrolled persons are assumed to be low SES because the Medicaid population by definition is at or near FPL. Therefore, no additional stratification was needed for low-SES persons.

^h Unlike the ABS frame, all non-White persons were oversampled. This oversampling was done because the number of non-White Medicaid enrollees was so small that oversampling all of them did not impact the allocation appreciably.

Table 2-6: Medicaid Population by White and Non-White by High Concentration Non-White County

County	Population		Percentage Non-White
	White	Non-White	
Berkeley	17,124	1,776	9.4
Cabell	20,504	1,352	6.2
Jefferson	6,582	624	8.7
Kanawha	37,317	4,193	10.1
Monongalia	11,227	637	5.4
McDowell	6,663	500	7.0
Raleigh	16,960	1,472	8.0

Allocation

The target sample of 4,400 was allocated across the 62 strata using the following algorithm:

- *Sample was allocated to each county.* The target sample of 4,400 was initially proportionally allocated to each county based on its population. To ensure a minimum number of respondents in each county, a sample target floor of 10 was used. Only one county (Brooke) had an initial allocation of less than 10. The sample for this county was raised to 10 and the sample targets in the other 61 strata were slightly decreased to maintain the overall sample target.
- *Sample was allocated within county to persons who are non-white.* Within the seven counties selected to oversample persons who are non-White, an oversampling factor of seven was used. Although this is a relatively high oversampling factor, because the proportion of persons who are non-White is so small, the impact on the design effect was negligible with the statewide design effect of 1.39 and the county-specific design effects all below 2.0 except in two counties.

Sample Selection and Release

1. Since it was the first iteration of MATCH, there was no experience of the likely response rate. While external sources for response rate exist, such as the Community Planning and Development county and sub-state level response rate score or the Census response rate data, these sources may not be comparable if the project design (e.g., survey length, mode, incentive offered) or topic area is different from those external studies. Therefore, studies with similar designs and topic areas were identified and used to develop a starting response rate. Based on studies with similar topic areas and designs (e.g., Ohio Medicaid Assessment Survey), a response rate of 25% was assumed. Under this response rate assumption, a starting sample size of 17,604 respondents was produced. Furthermore, because no county-specific information was available about differential response rates, the 25% response rate assumption was applied equally to each county. The target and starting sample sizes for each stratum are detailed in **Table 2-7**.

Table 2-7: Target and Selected Sample, Medicaid Administrative Frame

Stratum Number	Stratum Name	Stratum Size	Sample Size	
			Target	Selected
1	Barbour	3,765	43	172
2	Berkeley_White	17,124	74	296
3	Berkeley_NonWhite	1,776	142	568
4	Boone	6,413	73	292
5	Braxton	3,452	39	156
6	Brooke	152	10	40
7	Cabell_White	20,504	142	568
8	Cabell_NonWhite	1,352	108	432
9	Calhoun	2,042	23	92
10	Clay	2,926	33	132
11	Doddridge	1,397	16	64
12	Fayette	10,759	123	492
13	Gilmer	1,456	17	68
14	Grant	2,361	27	108
15	Greenbrier	7,666	88	352
16	Hampshire	4,568	52	208
17	Hancock	8,295	95	380
18	Hardy	2,679	31	124
19	Harrison	13,040	149	596
20	Jackson	5,876	67	268
21	Jefferson_White	6,582	32	128
22	Jefferson_NonWhite	624	50	200
23	Kanawha_White	37,317	139	556
24	Kanawha_NonWhite	4,193	336	1344
25	Lewis	4,222	48	192
26	Lincoln	6,421	73	292
27	Logan	10,622	122	488
28	Marion	11,094	127	508
29	Marshall	5,228	60	240
30	Mason	5,698	65	260
31	Mercer	16,962	194	776
32	Mineral	4,356	50	200
33	Mingo	8,939	102	408
34	Monongalia_White	11,227	85	340
35	Monongalia_NonWhite	637	51	204
36	Monroe	2,345	27	108

Stratum Number	Stratum Name	Stratum Size	Sample Size	
			Target	Selected
37	Morgan	2,928	33	132
38	McDowell_White	6,663	42	168
39	McDowell_NonWhite	500	40	160
40	Nicholas	6,338	73	292
41	Ohio	7,785	89	356
42	Pendleton	1,350	15	60
43	Pleasants	1,398	16	64
44	Pocahontas	1,888	22	88
45	Preston	6,060	69	276
46	Putnam	7,675	88	352
47	Raleigh_White	16,960	93	372
48	Raleigh_NonWhite	1,472	118	472
49	Randolph	6,020	69	276
50	Ritchie	2,178	25	100
51	Roane	3,759	43	172
52	Summers	3,392	39	156
53	Taylor	3,257	37	148
54	Tucker	1,257	14	56
55	Tyler	1,673	19	76
56	Upshur	5,614	64	256
57	Wayne	9,729	111	444
58	Webster	3,155	36	144
59	Wetzel	3,630	42	168
60	Wirt	1,514	17	68
61	Wood	17,912	205	820
62	Wyoming	6,002	69	276

MATCH utilized a two-phase design. Each phase consisted of half the starting sample (i.e., 8,802 persons with each phase from the Medicaid Administrative frame). The allocation across strata was the same across both phases. Even though the Phase 1 strata response rates were not equal, the allocation was not changed for Phase 2 because a higher priority was given to making sure better performing counties achieved their 250-sample target rather than maximizing the response in the poor-performing counties.

Person Selection

The Medicaid Administrative frame is a list frame. As such, the sampling unit is a person. Therefore, there was no within-household selection and the person selected was the intended respondent.

2.6 Survey Respondents

Statewide Respondents

MATCH obtained 16,185 survey responses. This included 16,081 fully completed surveys and 104 partially completed surveys that were considered acceptable to include in the analytic dataset. A partially completed survey was deemed acceptable if the respondent completed through Section 5 of the survey instrument.ⁱ **Table 2-8** details the overall breakdown of the survey respondents by frame type.

Table 2-8: Number of Fully and Partially Completed Surveys^a by Frame and Mode

Frame	Complete			
	Web ^b		Paper	
	Fully	Partial	Fully	Partial
ABS	6,970	78	5,613	0
Medicaid Administrative	2,261	26	1,237	0
Total	9,231	104	6,850	0

^aSurveys are considered partially completed if the respondent completed the survey through Section 5.

^bInterviewers recorded responses in the Computer-Assisted Web Interview Survey (CAWI) Instrument from the MATCH sample members who called in for a telephone interview.

Abbreviation: ABS, Address Based Sample

The total number of completed surveys was 73.6% of the target 22,000 surveys. This included 12,661 ABS respondents (72% of target) and 3,524 Medicaid Administrative database respondents (80% of target).

County-Level Respondents

Table 2-9 lists the county-level respondents by frame and mode. Of the 55 WV counties, 24 exceeded the 250-survey target. An additional 23 counties obtained between 200 and 249 completed surveys. Only eight counties achieved fewer than 200 surveys: Boone (172), Clay (185), Logan (189), McDowell (142), Mingo (155), Tyler (196), Wirt (195), and Wyoming (193). These are the final county totals and they may differ slightly from the initial county totals prior to the second geocoding.

Table 2-9: Number of Completed Surveys by Frame and Mode and County

County	Respondents								
	ABS			Medicaid Administrative			All		
	Web	Paper	Total	Web	Paper	Total	Web	Paper	Total
Barbour	117	81	198	18	13	31	135	94	229
Berkeley	314	181	495	96	36	132	410	217	627
Boone	60	65	125	27	20	47	87	85	172

ⁱ An additional 346 persons began the MATCH survey but stopped taking the survey prior to completing Section 5.

County	Respondents								
	ABS			Medicaid Administrative			All		
	Web	Paper	Total	Web	Paper	Total	Web	Paper	Total
Braxton	97	111	208	19	13	32	116	124	240
Brooke	90	99	189	23	14	37	113	113	226
Cabell	230	118	348	122	54	176	352	172	524
Calhoun	86	105	191	5	11	16	91	116	207
Clay	80	86	166	8	11	19	88	97	185
Doddridge	113	88	201	3	7	10	116	95	211
Fayette	95	76	171	86	33	119	181	109	290
Gilmer	114	86	200	10	12	22	124	98	222
Grant	93	100	193	17	13	30	110	113	223
Greenbrier	102	81	183	44	21	65	146	102	248
Hampshire	98	86	184	30	26	56	128	112	240
Hancock	87	73	160	36	15	51	123	88	211
Hardy	96	113	209	15	7	22	111	120	231
Harrison	214	156	370	91	42	133	305	198	503
Jackson	109	85	194	36	20	56	145	105	250
Jefferson	167	87	254	32	23	55	199	110	309
Kanawha	485	351	836	222	86	308	707	437	1144
Lewis	94	118	212	26	22	48	120	140	260
Lincoln	98	78	176	35	27	62	133	105	238
Logan	59	49	108	62	19	81	121	68	189
Marion	173	128	301	88	35	123	261	163	424
Marshall	93	99	192	35	22	57	128	121	249
Mason	82	73	155	47	14	61	129	87	216
McDowell	53	30	83	36	23	59	89	53	142
Mercer	157	117	274	98	59	157	255	176	431
Mineral	137	104	241	26	11	37	163	115	278
Mingo	45	42	87	37	31	68	82	73	155
Monongalia	466	112	578	79	28	107	545	140	685
Monroe	108	126	234	20	8	28	128	134	262
Morgan	103	90	193	17	4	21	120	94	214
Nicholas	88	112	200	33	38	71	121	150	271
Ohio	129	98	227	53	24	77	182	122	304
Pendleton	94	117	211	4	8	12	98	125	223
Pleasants	107	88	195	2	6	8	109	94	203
Pocahontas	111	100	211	12	10	22	123	110	233
Preston	147	102	249	47	31	78	194	133	327

County	Respondents								
	ABS			Medicaid Administrative			All		
	Web	Paper	Total	Web	Paper	Total	Web	Paper	Total
Putnam	158	95	253	47	27	74	205	122	327
Raleigh	153	116	269	104	64	168	257	180	437
Randolph	92	98	190	37	27	64	129	125	254
Ritchie	94	88	182	17	10	27	111	98	209
Roane	84	108	192	33	14	47	117	122	239
Summers	92	82	174	30	11	41	122	93	215
Taylor	122	100	222	16	13	29	138	113	251
Tucker	130	128	258	9	6	15	139	134	273
Tyler	102	81	183	10	3	13	112	84	196
Upshur	118	112	230	35	22	57	153	134	287
Wayne	71	65	136	55	27	82	126	92	218
Webster	113	103	216	23	14	37	136	117	253
Wetzel	80	96	176	30	12	42	110	108	218
Wirt	102	80	182	9	4	13	111	84	195
Wood	271	179	450	106	68	174	377	247	624
Wyoming	75	71	146	29	18	47	104	89	193
TOTAL	7048	5613	12661	2287	1237	3524	9335	6850	16185

Abbreviation: ABS, Address Based Sample

2.7 Incentive Experiment

Introduction

MATCH has two primary objectives: (1) to collect representative data at the county level, and (2) to obtain an accurate representation of the health needs of the state’s minority populations. For MATCH to achieve these objectives, it was imperative to obtain a survey response rate that ensures a representative sample and stable estimates.¹ Therefore, the MATCH survey offered a monetary incentive to all sample members, as increases in response rates associated with monetary incentives have been well documented in literature.^{1,2} However, a literature gap exists on how rural, Appalachian populations respond to different levels of monetary survey incentives.

The most documented incentive design structure is either a \$1- or \$2-dollar prepaid monetary benefit mailed to the survey respondent.³ Prepaid monetary benefits elicit a stronger response than postpaid promised future benefits after survey completion, according to the literature on incentive structure.^{1,2} Prepaid incentives also improve response rates regardless of the survey mode e.g., PAPI, CAWI, computer-assisted telephone interview [CATI]). However, response rate improvements vary by the survey target population and there are few studies on survey incentive structures conducted among the rural WV population.³⁻⁵

This incentive experiment was designed and incorporated into the first phase of the MATCH survey fielding to address the gaps in survey incentive research among the rural WV population. It also ensures that the most conservative monetary incentive eliciting the best survey response would be utilized in future MATCH fieldings.

MATCH Incentive Experiment

Design

To improve response rates, the MATCH survey offered a monetary incentive to all participants. However, being the first project of this kind (i.e., population health survey using a self-administered mode) to be conducted in WV, the optimal incentive amount (i.e., the incentive amount that best balances maximizing response rates and project costs) was unknown. Health Affairs, in discussion with WV DHHR, developed a three-arm experiment option to test the effectiveness of three incentive protocols that formed the MATCH incentive experiment. The arms were as follows:

- Arm 1: \$2 (cash) pre-incentive included with the initial invitation
- Arm 2: \$10 (cash or gift card) post-incentive only
- Arm 3: \$2 (cash) pre-incentive included with the initial invitation and \$10 (cash or gift card) post-incentive

The pre-incentive (i.e., an unconditional incentive) was an incentive given to all participants regardless of whether or not they would respond to the survey. The post-incentive (i.e., a conditional incentive) was an incentive given to a participant only after they completed the survey. The three incentive arms were selected based on the desire to understand which would be most cost-efficient in improving survey response while being as fiscally conservative as possible.

Recommendations

Based on vendor analysis and recommendation, the decision was made that Arm 3, \$2 pre-incentive and \$10 post-incentive, was worth the additional cost due to significantly improved response rates. Furthermore, incentives of value equal to or greater than the combined \$2 pre- and \$10 post-incentive arm were recommended for future MATCH projects.

3 Questionnaire

3.1 Survey Instrument Development

This section outlines the procedures used to design, program, and test the CAWI and PAPI survey instruments. In addition, Sections 3.2 and 3.3 discuss the two pretests that were used to refine and finalize the questionnaire: the Cognitive-Usability Test and the Pilot Test.

Designing the Survey Instrument

Development of the survey instrument began as a collaboration between Health Affairs and WV DHHR. Health Affairs and WV DHHR drafted a base copy of the survey instrument, utilizing a combination of original questions and questions derived from established surveys from various sources. The primary established sources used include the following:

- American Housing Survey, United States Census Bureau
- American National Election Studies, Stanford University, University of Michigan, National Science Foundation
- Behavioral Risk Factor Surveillance System, Centers for Disease Control and Prevention
- Consumer Assessment of Health Providers and Systems, Agency for Healthcare Research and Quality
- Census Pulse Survey, United States Census Bureau
- California Health Interview Survey, The University of California, Los Angeles Center for Health Policy Research
- Health and Retirement Survey, University of Michigan
- Health Reform Monitoring Survey, Urban Institute
- National Health Interview Survey, Centers for Disease Control and Prevention
- National Survey on Drug Use and Health, Department of Health and Human Services
- New York Community Health Survey, New York Division of Epidemiology, Bureau of Epidemiology Services
- Ohio Medicaid Assessment Survey, Ohio Department of Medicaid, Ohio Colleges of Medicine Government Resource Center
- Oregon Youth Substance Use Project, National Institute of Drug Abuse
- Sinai Community Health Survey 2.0, Sinai Urban Health Institute
- Williams Institute's Sexual Minority Assessment Research Team Report, The University of California, Los Angeles Williams Institute

The project team met regularly during the survey development period, with WVU staff consulting with WV DHHR throughout the process. After WVU developed a preliminary draft of the survey instrument (as CAWI specifications), a paper version was prepared for the Cognitive-Usability Test, which would be the first of two pretests (the second being the Pilot Test). Preparing the cognitive-test version required:

- Adding section transition statements
- Modifying question wording
- Finalizing response options
- Preparing skip logic instructions

The survey was organized into eight sections. Questions within these sections examined the main topics shown in **Table 3-1**.

Table 3-1: Questionnaire Content

Questionnaire Section	Contents of Section
Section 1: Your Health	<ul style="list-style-type: none"> ▪ Overall health ▪ Difficulty in performing daily activities ▪ Diagnoses of common chronic conditions
Section 2: Healthcare Access	<ul style="list-style-type: none"> ▪ Insurance status and type ▪ Prescriptions filled and difficulty with acquiring them ▪ The need for medical care and reasons for not seeking needed medical care, if applicable ▪ Telehealth usage
Section 3: Mental Health	<ul style="list-style-type: none"> ▪ Overall mental health ▪ How emotions have impacted their daily activities ▪ Mental health over the past 2 weeks ▪ The need for mental health care and reasons for not seeking mental health care, if applicable ▪ Mental health prescriptions filled and difficulty with acquiring them
Section 4: Lifestyle	<ul style="list-style-type: none"> ▪ Difficulty in meeting financial obligations ▪ Food purchasing and consumption habits ▪ Reasons for being treated unfairly by a health care provider and actions taken in response
Section 5: About You	<ul style="list-style-type: none"> ▪ Age ▪ Gender ▪ Race/ethnicity ▪ Marital status ▪ Living situation ▪ Household composition and number of children in the household ▪ Educational attainment ▪ Employment status and occupation ▪ Use of public assistance programs
Section 6: COVID-19	<ul style="list-style-type: none"> ▪ Impact of COVID-19 on employment ▪ Impact of COVID-19 on financial well-being ▪ Experience with Long COVID
Section 7: Substance Use	<ul style="list-style-type: none"> ▪ Alcohol consumption ▪ Smoking status ▪ Cannabis usage ▪ Usage of common substances (opioids, benzodiazepines, over-the-counter and prescription stimulants, cocaine, methamphetamine, heroin, MDMA) ▪ Attempts to decrease use of common substances ▪ Withdrawal experiences from decreasing use of common substances ▪ Usage and purpose of use of opioids ▪ Overdose experiences and use of Narcan ▪ The need for substance use treatment and reasons for not seeking substance use treatment, if applicable

Questionnaire Section	Contents of Section
	<ul style="list-style-type: none"> ▪ Use of medications designed to reduce/stop the use of drugs or alcohol ▪ Impact of substance use on life events
Section 8: Other Topics	<ul style="list-style-type: none"> ▪ Outlook towards life ▪ Physical activity and access to physical activity resources ▪ Sexual orientation ▪ Family members in the household ▪ Income level ▪ Thoughts/actions pertaining to suicide ▪ Consent to be recontacted by Health Affairs in the future

Abbreviation: COVID-19, Coronavirus Disease 2019

Choice of Modes

The MATCH survey used a combination of a web-based survey instrument (CAWI) and a paper-based (PAPI) as the primary modes, with the additional option for a respondent to call in and complete the survey by telephone. The decision to emphasize self-administered modes (CAWI and PAPI) was made for several reasons. First, both modes work well with the ABS design. Second, the self-administered modes were preferred for collecting sensitive content. Third, CAWI and PAPI modes are more cost-efficient than computer-assisted telephone or in-person interviewing.

However, there are sample members (especially ones with lower reading comprehension) willing to complete a survey but unable to do so on their own because CAWI and PAPI are self-administered modes. To address this, MATCH provided the option for a respondent to call a toll-free telephone number to complete the survey by telephone. Telephone interviews accounted for only 179 completed surveys or 1.1% of the total number of completed survey.

CAWI

The MATCH survey used Voxco CAWI software for the web survey instrument. If a respondent completed the survey on a mobile device, Voxco automatically utilized a mobile version of the survey, with text fonts, spacing, and sizes designed for optimal legibility on a mobile device with a touch-oriented interface. The Voxco survey instrument automatically controlled skip and fill logic, and validation range checks on numeric data, so that respondents did not have to manually navigate skip logic as is the case with paper forms. In addition, if a respondent tried to skip a question, they were presented with an error message in red font that said, “Please answer the question”—if the respondent attempted to skip the question a second time, the system allowed them to then skip and proceed to the next question without providing an answer. This soft-prompt refusal aims to reduce item-missing data without encouraging breakoff. If a respondent discontinued the survey midsession and then returned to the survey at a later point in time, the Voxco survey instrument would automatically pick up at the last question the respondent completed, even if the respondent continued the survey on a different device. Web responses were collected in a high-security network environment.

CAWI Testing

After programming the survey, Health Affairs performed internal survey instrument testing. Testing followed an iterative process where the programmer would first program the survey instrument, and

testers would then perform testing of the survey instrument, checking for components such as text accuracy, logic functionality, range checking, and mobile functionality. As testers found issues with the survey, this information was stored in a test log. After testing, the log was used to resolve issues and update survey instrument specifications and the program. These iterations continued until no further outstanding issues remained.

After testing was completed, the updated specifications and the CAWI were delivered to Health Affairs for their own internal testing. Health Affairs recruited staff volunteers to read through the survey instrument and provide recommendations on improving question wording. Health Affairs staff then logged any suggestions or discrepancies in a testing change log. Recommendations provided by Health Affairs staff were discussed with the full MATCH project team and were either approved or rejected for the final survey instrument. Health Affairs then made the final updates, performed final pre-pilot testing, and then delivered the final CAWI specifications.

Spanish-Language Option

After the English survey instrument was programmed, the specifications were translated to Spanish. This translation was reviewed by bilingual testers and then the Spanish translation survey instrument was programmed. The survey instrument was configured to have a visible toggle switch that would allow a respondent to toggle between English and Spanish questions and answers.

CAWI Landing Page

Based on initial specification requirements, Health Affairs designed and created a landing page for the survey, TakeMATCHsurvey.org. Those respondents who wished to complete the survey by web upon receiving an invitation letter, were instructed to visit this website. They would then be presented with a text entry field to enter the Survey Access Code that they received in all of the mailing materials. After entering this Survey Access Code and clicking/tapping “Submit,” the respondent would be taken to the first page of the survey.

[PAPI](#)

The final PAPI was used to program the OpenText TeleForm software. TeleForm is a type of automated data capture, capable of performing Optical Mark Recognition (OMR), and Intelligent Character Recognition (ICR). OMR is capable of reading marks such as checks, Xs, circles, or bubbles, and ICR is capable of reading handwritten numbers or printed text. Paper surveys were checked into the system and then scanned using a high-capacity, high-resolution scanner. After scanning, the TeleForm software performed the OMR and ICR processing. After OMR/ICR processing, data capture specialists reviewed anomalies and finalized the digital representation of the PAPI response.

PAPI Testing

After the PAPI was programmed in TeleForm, the team tested the system with mock forms that used “less than ideal” markings (for example, while respondents are asked to use black or blue pen, the system is capable of accurately capturing responses made with light pencil, felt-tipped marker, and colored pens, and these scenarios are tested to ensure proper functionality). These tests compared what was marked on the test forms to what the system ultimately captured to its database, to ensure

that values were correctly recorded. Finally, Health Affairs also employed the use of production testing of proofs, to ensure that the final form would function as anticipated.

Telephone

Interviewers recorded responses in CAWI from the MATCH sample members who called in for a telephone interview. A separate CATI system was not developed for MATCH. Additional details on telephone operations are discussed in Section 4.

3.2 Cognitive-Usability Testing

The Cognitive-Usability Test was conducted in the spring of 2021.

Goals of the Test

The goals of the Cognitive-Usability Test were to examine question/response wording and ordering to increase understanding and improve the quality of responses, and to better understand the willingness of target sample members to answer potentially sensitive questions. Accomplishing these goals necessitated more interaction with respondents than a Pilot Test alone could provide.

Design and Administration

MATCH was administered during the height of the COVID-19 pandemic and consequently all cognitive interviews were conducted by videoconference or telephone.

A total of 16 individuals in a small convenience sample were contacted to participate in the Cognitive-Usability Test. Of this group, 13 interviews were scheduled and 12 were completed. After a participant agreed to be interviewed, a packet was mailed to that individual. This packet contained a personalized invitation, a document that provided a generalized overview of the project and interview, and a copy of the survey, which was inside its own envelope. The participant was asked not to open the envelope containing the survey until the interview began.

Each interview with an individual participant was led by an interviewer, who was joined by a notetaker who did not speak during the interview. The interviewer, the notetaker, and the participant who completed the survey were all linked via a three-way conference call by telephone or Zoom. During the interview, interviewers had the participant open the survey packet and complete the survey, reading the questions and all response options out loud, and then speaking their answers. Interviewers and notetakers both recorded responses and notes using a template that allowed them to record indicators of problems, such as if the participant:

- Read the same question multiple times
- Got stuck on certain words
- Asked the interviewer for guidance
- Refused to answer the question
- Was not able to answer the question, having forgotten or having never known the requested information
- Talked out loud using a train of thought that is different than the anticipated cognitive processes
- Made mistakes in following skip logic

The template also provided specific “probes” designed to illuminate and amplify thought processes and concerns driving respondent behaviors.

Interviewers asked participants several general questions about their experience responding to the survey. The key topics these questions examined were:

- How likely the respondent was to complete the survey if they received it in the mail
- The overall reaction to the survey
- Thoughts on the visual formatting, such as font size, spacing, layout, and use of emphasized text
- How easy or difficult it was to follow instructions and skip logic
- The reaction to the survey’s length
- Whether any items seemed too personal or sensitive, and what might be done to increase the respondent’s willingness to respond to these sensitive questions
- If any major changes were recommended for other reasons not previously discussed

Upon completion of the interviews, responses were reviewed along with comments and the navigational path taken through the survey instrument by the respondent for any potential logic or instruction issues. All participants were compensated with \$25 cash upon completion of the interview.

Major Findings

The general findings from the interviews were:

- Most participants liked the visual layout
- Almost all participants commented on the survey’s length, which was 155 numbered questions (at that point), but 240 questions when factoring in grid responses. Some participants showed signs of fatigue through the interview
- Many participants also noted issues pertaining to the survey’s cognitive complexity
- Although multiple participants noted that they found the content interesting overall, some also noted that they felt some of the questions were excessively sensitive
- All participants felt confident about their ability to follow the survey’s skip logic. However, multiple participants missed skips, sometimes answering questions they should not have, and other times not answering questions they should have

Changes Made to the Survey Instrument

Based on the general and question-specific findings, Health Affairs, in collaboration with WV DHHR, revised the survey instrument to reduce the length, complexity, and sensitivity prior to the Pilot Test. Major changes included the following:

- Making minor grammatical/wording edits to numerous questions to reduce length
- Rewording any response options that said, “N/A” in the Cognitive-Usability project to say, “Does not apply” in the Pilot to account for respondents who may not recognize the meaning of “N/A”
- Reorganizing the location of questions in the mental health section, deleting several questions about suicide, and moving the location of the remaining suicide question toward the end of the form
- Reorganizing the location of questions in the substance use section and slightly modifying the wording of numerous substance use questions

- Deleting an entire section of questions derived from the Adverse Childhood Experience Questionnaire for Adults that contained numerous sensitive questions to reduce the length of the form and decrease the number of potentially intrusive questions
- Changing the income question from a numerical entry to a categorical response format to try to increase the number of respondents willing to answer the question

3.3 Pilot Testing

After making survey instrument updates from the Cognitive-Usability Test findings, Health Affairs further tested the survey instrument during the Pilot Test.

Goals of the Test

Whereas the Cognitive-Usability Test had objectives that were primarily centered on survey instrument evaluation, the Pilot Test aimed to not only further evaluate the survey instrument, but also test the mechanisms to be used for full-scale survey data collection. The primary objectives were to:

- Examine question flow and identify questions that respondents may struggle with or refuse to complete
- Evaluate respondent understanding of survey terms
- Gauge how successful respondents were in following skip instructions on the paper form
- Estimate timing to complete the web survey
- Identify potential fielding issues
- Develop an improved understanding of call-in interviewer training needs

Design and Administration

The Pilot Test sample was a random subset of 1,500 addresses from the ABS frame. Sample members chosen were excluded from the main project sample. Pilot Test sample members were sent a 9"x12" envelope packet with a survey invitation letter, a PAPI, a self-addressed and postage-paid business return envelope, and a \$2 bill. This invitation letter also contained the information needed to complete the CAWI or to complete the survey by calling RTI directly. Mailing of the survey packets began on July 9, 2021, and was completed on July 12, 2021. All mailings were sent from RTI's Research Operations Center in Raleigh, North Carolina. Inbound calls were answered at this location as well. While the Pilot Test was able to evaluate a variety of aspects necessary to prepare for the larger main project, one limitation is that it did not test the full mailing protocol, and so it could not fully assess efficacy.

Results

In total, between July 12, 2021 and July 26, 2021, the Pilot Test achieved 216 completed surveys, equating to a 14.4% response rate. Of these 216 completed surveys, 160 (74%) were by paper and 56 (26%) were by web. Only 1 of the 56 web completions was by phone, suggesting the project would see only a very small number of phone completion requests with the planned concurrent design. During the Pilot Test, the average web completion time was 19.0 minutes, and the median completion time was 15.9 minutes.

Pilot Test PAPI returned included some significant item nonresponse as demonstrated in **Table 3-2**.

Table 3-2: Pilot Paper-and-Pencil Interviewing Item Nonresponse

Pilot Question #	Description	Missing	Percent of total PAPI
Q6	Any Health Insurance	14	8.8
Q10	Needed Medical Care	5	3.1
Q13	Telehealth Visits	5	3.1
Q51	Age	2	1.3
Q52	Sex	2	1.3
Q53	Hispanic	5	3.1
Q54	Race	3	1.9
Q73	Drinks in Past 30 Days	2	1.3
Q74	Number of Drinks	1	0.6
Q79	Opioids Use	3	1.9
Q87	OTC Stimulants Use	1	0.6
Q88	Prescription Stimulants Use	1	0.6
Q92	Cocaine Use	1	0.6
Q95	Methamphetamine Use	1	0.6
Q98	Heroin Use	2	1.3
Q102	Overdose	2	1.3
Q121	Family Mem Supported by Income	4	2.5
Q124	Income	12	7.5
Q125	Suicide	3	1.9

Note: These question numbers apply to the Pilot Survey instrument, which had different numbering from the survey instrument fielded for the main project.

Abbreviations: PAPI, Paper-and-Pencil-Interviewing; OTC, Over the counter

Item nonresponse for Question 6 was the most pronounced; an image of what Question 6 looked like on the PAPI Pilot is shown in **Figure 3-1**.

Figure 3-1: Pilot Paper-and-Pencil Interview Question 6

Section 2: Healthcare Access

6. The next questions are about health insurance and healthcare.

Do you have any kind of health insurance coverage, including private health insurance or government plans such as Medicare or Medicaid?

Medicare is a health insurance program for people 65 and older or persons with disabilities.

Medicaid is a health insurance program for people whose income and resources cannot cover the costs of healthcare.

Yes
 No → Go to 8

7. What kinds of health insurance or healthcare coverage do you have? *Select all that apply.*

Upon review, Health Affairs concluded that the non-response issue was likely the result of a navigational error respondents were making because of the visual presentation of Question 6. This problem was corrected, and the item was changed to the following, as shown in **Figure 3-2**.

Figure 3-2: Main Project Paper-and-Pencil Interview Question 7 (Formerly Question 6 on the Pilot Paper-and-Pencil)

Section 2: Healthcare Access

7. The next questions are about health insurance and healthcare.

Do you have any kind of health insurance coverage, including private health insurance or government plans such as Medicare or Medicaid?

Yes
 No → **Go to 9**

8. *(If yes)* What kinds of health insurance or healthcare coverage do you have? *Select all that apply.*

A plan purchased through your or someone else's employer or union

Recommendations

Upon completing the project, Health Affairs developed the Pilot Test Report, which included several key recommendations. In addition to item-level modifications, the primary recommendations were as follows:

- Reduce the length of the survey invitation letter to remove repetitive language already in the introduction of the survey
- Further examine the substance use and mental health sections in particular to reevaluate if any questions can be dropped to simplify navigation and reduce respondent burden
- Revise the suggested completion time to 20–25 minutes
- Reformat Question 6 and Question 7 to change the visual appearance of these questions on the PAPI so that respondents do not miss Question 6, which they did in the Pilot Test

Modifications for the Main Survey

Health Affairs, in collaboration with WV DHHR, revised the survey protocol and survey instrument for the main project. Major changes included the following:

- Using a sequential, not concurrent, push-to-web design to reduce the number of PAPI responses
- Updating the invitation letter to reduce the amount of text
- Removing several questions deemed unnecessary to the analysis
- Adding an occupation question and two questions about caretakers
- Reorganizing the substance use section from standalone questions to a grid design to reduce navigational errors and to simplify the response tasks
- Revising Question 6 to address the nonresponse referenced above by reducing the text and better emphasizing the response task. An image of the PAPI’s updated Question 6 is shown above in **Figure 3-2** (please note that Question 6 became Question 7 in the main project)

Upon completing the Pilot Test, Health Affairs programmed and then retested the final versions of the CAWI and PAPI forms and prepared for fielding in the main project.

4 Data Collection and Procedures

4.1 Procedures

This section considers the implementation protocol used for the survey, covering the schedule, outlining the mailing materials and selection process, and overviewing various completion options. In addition, it discusses the incentive experiment used in Phase 1 and the telephone support utilized for survey completion and customer service inquiries. This section also includes the differences between the two phases, how surveys were determined to be complete, and how partial completions were treated. Finally, it presents the final response rates.

Implementation Protocol

Mailing Materials

In the first two mailings, respondents were encouraged to complete the survey by web, and both the invitation letter and the postcard reminder contained CAWI login credentials (a link to the landing page, www.TakeMATCHsurvey.com, a Survey Access Code, and the number to call to complete the survey by phone. The initial invitation letter also contained a \$2 prepaid cash incentive, where applicable (See Section 2.7 for additional details on the incentive experiment). The third mailing included the PAPI

packet with a printed questionnaire. The fourth and final mailing included a second PAPI packet. See **Appendix B: ABS Materials** for a copy of these mailing materials.

The full list of materials is listed below with a more detailed description of each:

- **Mailing 1: Invitation Letter:** This letter was mailed in a 6"x9" WVU-branded envelope with the invitation letter inside it and a \$2 prepaid cash incentive, where applicable. The letter explained the purpose of the project, inviting the respondent to participate, and provided a URL (www.TakeMATCHsurvey.com) for the respondent to take the survey, a Survey Access Code for the respondent to enter once they go to that URL, and a QR code that they could scan to be instantly taken to the website without having to manually type in the address. Select sample members (depending on incentive group in Phase 1) were informed about the \$10 incentive upon completion. In addition, contact information was provided should the sample member have any questions about the project or wish to complete the project by phone.
- **Mailing 2: Reminder Self-Mailer (Postcard):** A fold-over postcard was sent after the invitation letter. It included the same URL and QR code, and the Survey Access Code and contact information, and reminded respondents to complete the survey if they had not done so already.
- **Mailing 3: PAPI Packet:** This 8"x12" mailing packet contained an external Health affairs-branded envelope. Inside was an invitation letter, a paper survey with a cover, and a postage-paid and self-addressed business return envelope that the respondent could use to send the survey back free of charge to RTI.^j The invitation letter asked respondents to complete the survey either by web or by mail. The URL, QR code, and Survey Access Code were all provided in this letter as well, and the post-incentive amount (if applicable) was prominently displayed along with contact information.
- **Mailing 4: Second PAPI Packet:** This final mailing was an additional PAPI packet, similar to that of Mailing 3, reminding respondents one last time about the project and requesting their participation.

Because the MATCH survey used both an ABS (household-level) sample and a Medicaid (person-level) sample, there were two variations of each of the above materials. For the ABS sample, the mailing materials were addressed to "West Virginia Resident," and each mailing material included instructions on the selection process of which household member should complete the survey, which is discussed in greater detail below. For the Medicaid sample, the mailing materials were addressed to the specific individual in the sample file, and all mailing materials omitted the selection criteria on the ABS mailing materials.

Gaining insight from Phase 1, there were minor differences between the mailing materials used for Phase 1 and Phase 2 sample members. These differences are discussed in detail in Section 4.2.

Mailing Schedule

The mailing protocol for the main project was changed to a push-to-web design, even though the initial plans aimed for a concurrent choice design. This decision was made to increase the number of CAWI

^j Note that with Phase 2 PAPIs, there was a small subsample where the return address on the return envelope was WVU's facility and not RTI's facility. This difference is discussed in greater detail in Section 4.2.

completions, decrease the amount of item-missing data, and to allow additional timing for PAPI content finalization and printing, while still enabling an August 31 start date.

The first invitation letter was sent to Phase 1 sample members on August 31, 2021. The first invitation letter was sent to Phase 2 sample members on November 4, 2021. The full mailing schedule is shown in **Table 4-1**.

Table 4-1: MATCH Mailing Schedule, All Phases

Mailing	Phase 1		Phase 2	
	Date	Interval Between Mailing	Date	Interval Between Mailing
Mailing 1: Invitation Letter	August 31		November 4	
Mailing 2: Reminder Self-Mailer	September 7	7 days	November 9	5 days
Mailing 3: PAPI Packet 1	September 13	6 days	November 29	21 days
Mailing 4: PAPI Packet 2	October 11	28 days	January 4	36 days
Data Collection Close	February 28	N/A	February 28	N/A

The time intervals between mailings used for Phase 1 and Phase 2 differed slightly, with a longer interval between Mailing 2-3, and Mailing 3-4 being used with Phase 2. This different interval was utilized to allow more time for respondents to complete and return the survey to reduce the number of duplicate completions. This change is discussed in greater detail in Section 4.2.

Undeliverable Mail

All Phase 1 mailing materials used a return-to-sender address of RTI’s North Carolina facility, and all Phase 2 materials contained a return-to-sender address to Health Affairs (who forwarded these materials to RTI). RTI scanned the barcode on returned, undeliverable mailing materials, which then logged the undeliverable mail item into the system that managed respondent Case Identifications. The household, which used a Case ID as its unique identifier, was then classified as an ineligible unit. At that point, the household was removed from future mailings. Undeliverable items were then stored under lock and key at RTI’s Research Operations Center in North Carolina, pending secure destruction.

Proxy Completions

The MATCH CAWI and PAPI instruments contained a question at the beginning of the survey that asked, “Are you completing this survey for yourself or for someone else in your household?” If a CAWI respondent selected “for someone else on their behalf,” they were shown a conditional message that read, “As we continue the survey, please provide responses for the adult (age 18 or over) in your household with the most recent birthday. The words ‘you’ and ‘your’ refer to that person.”

If a PAPI respondent selected “for someone else on their behalf,” arrows directed them to a message that read, “If you are completing this survey for someone else, the words ‘you’ and ‘your’ refer to that person.”

In total, 988 proxy respondents (6%) completed the MATCH survey on behalf of the sampled individual.

Spanish-Language Option

The MATCH survey offered respondents the option of completing the instrument in Spanish by web or by telephone.

When a respondent accessed the web instrument, they were presented with a toggle switch that allowed them to alternate between English and Spanish text. When the MATCH respondent called the 800-number they were provided the option to complete the survey with a bilingual interviewer. In total, four MATCH surveys were completed in Spanish.

Incentives

Respondents who received the \$2 prepaid incentive were sent a \$2 bill with the Mailing 1 Invitation Letter.

The delivery mechanism of the promised incentives varied by mode. Respondents who completed the CAWI and were eligible for the incentive could choose between a \$10 electronic Visa card (delivered by email) or \$10 cash (sent by U.S. Postal Mail). They could also decline the incentive. To deliver the electronic VISA, the respondent needed to enter their email address twice, and the Voxco system automatically verified that the emails matched. These incentives were delivered almost instantaneously. To deliver the \$10 by mail, the respondent did not need to provide a name or an address; the incentive was mailed to the same address as the survey, and, for privacy purposes, the respondent was addressed as, “The Adult of the Household, Age ##, Who Completed the WV MATCH Survey.”

Respondents who completed the PAPI and who were eligible for the \$10 post-incentive were offered cash only, and they could select or decline the incentive. As with the CAWI, the respondent did not need to provide an address or name to receive the incentive.

As noted previously, MATCH Phase 1 used an incentive experiment where different respondents were offered different incentive conditions. The details are discussed in Sections 2.7.

Telephone Completion and Support

The dedicated MATCH project phone number (1-877-267-2909) was offered to sample members for support in both English and Spanish. When a sample member called the number, it was answered by quality experts working at RTI’s Research Operations Center. If quality experts were not available to answer the call, callers were directed to leave a voicemail message, which was returned within 24 hours. Two follow-up attempts were made when returning a voicemail message.

Calls were logged using the MATCH Issue Tracker that was built with the SaaS platform, Smartsheet. This Issue Tracker utilized an Issue Submission Form, where project team members (Health Affairs or RTI) could enter a respondent’s name, contact information, and the nature of the issue, and then submit this (encrypted) information to the Issue Tracker. Upon entry into the Issue Tracker, the issue was attended to and maintained by quality experts and Health Affairs at RTI, and the Issue Tracker allowed RTI staff to record the progress of attending to individual issues. For calls or emails that were received by Health Affairs but necessitated RTI’s action, the Issue Submission Form provided a secure way to relay that information.

During the survey, 819 issues were logged in the Issue Tracker; of those, 732 (89%) were unique issues (i.e., corresponded to a different individual). Of those, 508 (69%) were requesting assistance with completing the survey; the number of call-in requests to complete the survey by phone was substantially greater than the Pilot Test suggested due to the change in protocol that included push-to-web design. Ultimately 202 (40%) of those respondents completed the survey, 152 with an interviewer. In all, 261 hours were dedicated by quality experts at RTI to answering and responding to inquiries to the toll-free number. **Table 4-2** shows the number of unique issues logged in the Issue Tracker by phase and in total.

Table 4-2: MATCH Issue Tracker Inquiries by Phase (Unique Entries)

Issue Type	Count		Total	
	Phase 1	Phase 2	Count	Percent
Complaint	11	3	14	1.9
Incentive	38	25	63	8.6
Needs Remailing	2	8	10	1.4
Help Completing by Web	20	2	22	3.0
Help Completing by Telephone	270	238	508	69.4
Project Information	10	2	12	1.6
Access Code Lookup	6	4	10	1.4
Other, Requested Callback	48	45	93	12.7
<i>Total</i>	<i>405</i>	<i>327</i>	<i>732</i>	<i>100.0</i>

Most requests (508) were inquiries about completing the survey by telephone. **Table 4-3** shows the final outcomes of those 508 inquiries, where 152 respondents completed via telephone, 50 respondents confirmed they had completed the survey via CAWI/PAPI, and the remaining 306 individuals did not provide sufficient information to determine their status.

Table 4-3: MATCH Issue Tracker Outcomes of Request to Complete by Phone by Phase (Unique Entries)

Issue Type	Count		Total	
	Phase 1	Phase 2	Count	Percent
Completed by Phone	61	91	152	29.9
Completed by PAPI (Respondent Confirmed)	20	23	43	8.5
Completed by CAWI (Respondent Confirmed)	2	5	7	1.4
Insufficient Information to Determine Status	187	119	306	60.2
<i>Total</i>	<i>270</i>	<i>238</i>	<i>508</i>	<i>100.0</i>

4.2 Protocol Changes to Phase 2

Several changes were made to the project design for Phase 2, based on Phase 1 findings. Some of these topics have already been discussed but will be considered here in greater detail.

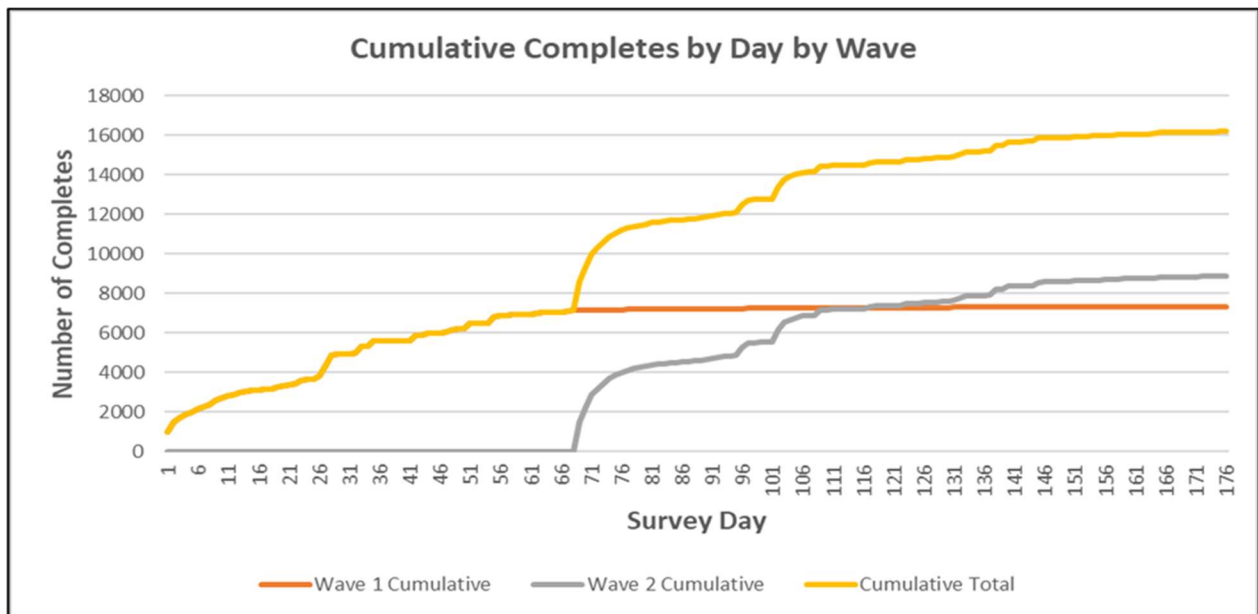
Timeline

Time was added to the mailing intervals in Phase 2 based on the results of Phase 1, where some respondents completed a duplicate PAPI due to mailing delays. The Phase 2 timeline was extended, and the end date of data collection was extended to February 28, 2022.

Although duplicate completions did not impact the final data, to reduce the number of duplicate completions, the decision was made to allow more time for respondents to complete and return the survey, which also allowed more time for them to be removed from the mailing list. The interval between Mailing 2 and Mailing 3, and Mailing 3 and Mailing 4 were both extended.

Figure 4-1 indicates the cumulative receipt of the MATCH survey responses, separated by Phase.

Figure 4-1: MATCH Survey Completions Overview



Incentive Experiment

Based on the results of Phase 1, all Phase 2 respondents received only the \$2 prepaid and \$10 post-incentive. Full details on the results of the incentive experiment are discussed in Section 2.7.

Mailing Materials

Minor updates were made to several mailing materials for Phase 2. First, for Phase 2, all sample members were sent mailing materials offering the \$10 incentive if they completed the survey. Second, all sample members in Phase 2 were sent the \$2 pre-incentive (cash). Third, all Phase 2 sample members

received the version of the paper survey that included the question that asked respondents if they wanted the \$10 incentive. Finally, to further reduce the chance of duplicate completions, a note was added on the outside of the PAPI packet envelopes that read: “YOU MAY HAVE ALREADY COMPLETED THE ENCLOSED SURVEY ONLINE OR BY MAIL. IF YOU HAVE, THANK YOU VERY MUCH (please just recycle this mailer). IF YOU HAVE NOT COMPLETED THE MATCH SURVEY - PLEASE HELP YOUR COMMUNITY AND STATE BY COMPLETING AND SENDING IT IN TODAY.”

Using a WV Undeliverable Return Address

Phase 1 mailing materials all used RTI’s North Carolina location for the return address. For Phase 2, the project team changed materials to use a WV return address on these materials. This resulted in undeliverable mail being sent to Health Affairs, who then forwarded to RTI for processing.

PAPI Subsample

All of Phase 1 business reply envelopes used by respondents to return PAPI surveys were addressed to RTI’s North Carolina research facility. In Phase 2, 2,000 randomly selected addresses were sent business reply envelopes addressed to Health Affairs’ mailing address if they had not completed the survey prior to the PAPI mailing. As shown in **Table 4-4**, this experiment resulted in a 3% higher completion rate than the regular treatment used for business reply envelopes in the PAPI packets.

Table 4-4: MATCH Phase 2 Cases by Pen-and-Paper Interview Survey Instrument Experiment

Phase 2	Sampled	Complete		Mailed PAPI	Complete	
		Total	Percent		PAPI	Percent
PAPI Experiment	2,000	463	23.2	1,802	199	11.0
Regular Treatment	42,002	8,415	20.0	38,138	3,251	8.5

4.3 Defining a Completed Survey

A survey was considered complete when the respondent or knowledgeable proxy completed Question 64, which marks the end of the About You (demographic) questions in Section 5. The remaining sections in the survey are Section 6: COVID-19 (Q65–68), Section 7: Substance use (Q69–94), and Section 8: Other topics including income (Q95–102).

The decision to use Question 64 in Section 5 as the point for a completed survey was made for two reasons. First, a substantial amount of key data has been captured on the respondent’s overall health status upon reaching this point—both health care and health behaviors/conditions. Secondly, once this section is completed, a substantial amount of demographic information has been captured, which not only has analytical benefits, but also provides data that can be used for weighting.

Although an interview that reached question 64 was considered complete from a data perspective, respondents needed to complete the entire survey to be sent the \$10 incentive if they were in Phase 2 or an applicable incentive group in Phase 1.

4.4 Outreach

Reaching all 55 counties in WV, especially regions with low internet connectivity, requires a flexible strategy designed to adjust for the novel nature of outreach for a population-based survey in a rural state. The strategy includes understanding the geography, demographics, and other unique characteristics that define the project population.

The purpose of the outreach efforts is twofold: (1) To ensure connections with trusted partners (e.g., civic organizations, newspapers, churches, local schools) who can assist with amplifying the MATCH message in their communities and create awareness of the survey, and (2) to establish deep organizational partnerships with local communities that facilitates trust, connection, and future collaboration on survey fielding.

Organizations were strategically targeted with the intent of capturing a diverse mix of potential community connections. To effectively connect with these partners, various outreach methods were utilized (e.g., call, mail, email, social media). This approach engaged a broad audience of partners that helped amplify the MATCH message in their respective communities, and it helped keep overall costs at a minimum. **Table 4-5** summarizes the types of groups that were engaged, the number of each group type that was contacted, how they promoted MATCH, how many times they were contacted, and associated costs, if any. The table reflects the total cost of marketing efforts.

Table 4-5: Summary of Outreach Efforts

Group Type	#	Outreach Method	Contact Frequency	Marketing Cost, \$
Public Schools	242	Backpack flyers and digital messaging on school iPads	1-2 times per school	18,888.43
Newspapers	77	Online and print ads	1-5 times per paper	2,128.25
Metro News Radio	1	200,000 impressions per month (multiple sporting events)	10-20 times	59,866.00
Paid Advertisements	2	Facebook post boosts & Morgantown Opera ads	1 time	700.00
Chambers of Commerce	55	Distributed flyer in e-news letter to all county chambers	1-3 times	0.00
State Resources (EDA ^a , RPDC ^b , Gov, etc.)	36	Shared digital flyer on website, social media, and hard copies upon request	1-3 times	0.00
Local Health Departments	34	Shared digital flyer on website and social media page	2 times per department	0.00
Churches	29	Shared message with congregants in bulletin	2 times	0.00
WVU Football/ Basketball In-game Ads	57 ^a	In-game announcements and digital displays	1-3 times	30,000.00

Group Type	#	Outreach Method	Contact Frequency	Marketing Cost, \$
Extension Services (WVU Downtown Office)	55	Distributed flyer in e-news letter to all county offices	1-2 times	300.00
State Legislature	1	Shared message with Delegates and Senators	1-2 times	0.00
Nonprofit	23	Shared digital flyer on websites and social media pages	1-2 times	0.00
Foundations/Grant Making	5	Shared digital flyer on websites and social media pages	1-2 times	0.00
Total Outreach Cost:				111,882.68

^aRefers to unique events.

Abbreviations: ECA, Economic Development Authority; RPDC, Regional Planning and Development Council

A data-driven approach was used to reach all WV counties and underserved populations. Certain counties/regions present unique challenges regarding the use of internet/digital outreach tools, particularly in the southern part of the state. Each week, maps detailing survey response rates by county were examined and outreach efforts were adjusted accordingly. Examples of the kinds of data reviewed weekly are shown in **Figure 4-2**. Data on completion by mode, undeliverable mail, and completion by internet access were also considered.

In the 12 counties with fewer than 30% of households had an internet subscription, outreach efforts that did not require internet (e.g., phone calls, mailings, and print advertisements) were used to reach residents. For example, instead of emailing a press release to newspapers with a digital version, advertisements in print newspapers were purchased and connections were made with local resources that could help distribute paper MATCH flyers throughout their community (e.g., local grocery stores, gas stations, banks).

Recommendation for Next MATCH Fielding

The outreach efforts for this fielding of the MATCH survey are thoroughly documented and will inform outreach for the next fielding. The following are lessons learned and recommendations for the next outreach plan:

- Ensure that a well-developed “ground game” is established early on that utilizes local leaders and other organizational assets to help prime the MATCH message well in advance of the first mailing. These contacts are crucial for communicating advanced messaging to their respective communities and ensuring that survey recipients are adequately informed. The sooner these connections can be solidified and leveraged, the sooner a reliable and community-centric pipeline for future messaging can be built.
- The outreach approach must acknowledge and adapt to the unique nature of the region. For example, connecting with more-rural areas that lack ubiquitous broadband/internet access requires a different strategy than would be used in a more urban area with robust infrastructure. Rural areas that lack sufficient internet coverage require more traditional forms of outreach, such as phone calls, mailings, and print advertisements, that help reach the target but generally cost more than digital marketing. In counties with low internet access, consider the following:
 - Utilizing billboard, radio, and newspaper ads
 - Building on and expanding the network of community leaders to distribute flyers to high traffic places in lieu of sending paper flyers to schools for distribution
 - Developing more free press tools, like letters to the editor for newspapers, or interviews of the MATCH Team
 - Designing a poster-sized flyer that can be sent to health departments, churches, senior centers, and other places with high visibility to help drive the MATCH message
- Identify one or two quality leads in an organization who can communicate the message in a “top-down” manner rather than a multitude of individuals spread throughout who may or may not have the authority or ability to effectively convey the message. For example, connecting with key decision makers (executive directors, marketing managers, office managers, etc.) who have access to company listservs, monthly digital newsletters, and other modes of officewide communication can disseminate important information in a timely and cost-effective manner.

4.5 Response Rates

Response rates^k are indicators of survey and sample performance and response. American Association for Public Opinion Research (AAPOR) standard definitions of response rate #2 (RR2, Equation 4-1) and response rate #6 (RR6, Equation 4-2) were calculated for the ABS sampling frame. RR2 were calculated for both ABS and Medicaid Administrative sampling frames separately for comparing rates between the two sampling frames.⁶ All response rates are affected by the procedure of assigning final status dispositions. The results of each mail attempt were assigned a disposition status according to AAPOR standard guidelines.⁶

Completed surveys (*S*) were defined as respondents that completed the entire survey. Partially completed surveys (*P*) were defined as respondents that completed the survey through section 5 (question 64) but did not complete the entire survey. Refusals (*R*) were defined as anyone who began a survey but did not complete all questions through section 5. Noncontacts (*NC*) were defined as cases that did not respond to any survey invitations. Ineligibility and unknown eligibility had precedence over *R* and *NC* in terms of designations. Cases where occupancy of the housing unit was unknown were classified as 'UH'. Based on these, the equations for RR2 and RR6 are as follows:

Equation 4-1

$$RR2 = \frac{S + P}{(S + P) + (R + NC + O) + (UH + UO)}$$

and

Equation 4-2

$$RR6 = \frac{S + P}{(S + P) + (R + NC + O)}$$

In the ABS frame, cases where one or more undeliverable messages from USPS were received and were not categorized as vacant^l were considered as unknown eligibility. The RR2 calculation treats these addresses of unknown eligibility as if they were eligible and RR6 calculation treats them as if they were not eligible, so both calculations are presented for comparison. **Table 4-6** presents the number of undeliverable cases across the four mailings by reason for being undeliverable.^m Cases with an undeliverable message received from USPS indicating the address is vacant were considered not eligible.

^k Calculated response rates were unweighted.

^l Categories from the USPS include: Temporarily Away, Not Delivered – No Forwarding, Attempted – Not Known, No Such Number, Insufficient Address, No Mail Receptacle, Refused, Other.

^m Across the four mailings, 260,107 invitations were sent, of which 11,548 (4.4%) were returned as undeliverable.

In the Medicaid Administrative frame,ⁿ the Medicaid member was selected and not the address. Cases with one or more undeliverable messages from USPS were presumed eligible because the Medicaid member was eligible for the survey even if their address information was not valid. For this reason, RR2 is the reported computation for Medicaid. Additionally, cases that had a nursing home address were deemed not eligible and out of scope for MATCH.

Table 4-6: Number of Undeliverable Mailings by Reason for Being Undeliverable Across All Mailings

USPS Item Undeliverable Type	Number of Occurrences in Up to Four Mailings
Vacant	6,614
Temporarily Away	53
Not Del., Not forwarded	6,473
Attempted, Not Known	581
No Such Number	1,511
Insufficient Address	558
No Mail Receptacle	979
Refused	106
Other Undeliverable	136

Details on the final distribution for each case are in **Table 4-7**.

Table 4-7: MATCH Cases by American Association for Public Opinion Research Disposition and Frame

Label	Count		
	Frame		All Records
	ABS	Medicaid Administrative	
Complete (full interviews)	12,583	3,498	16,081
Partial Complete (through Q64)	78	26	104
Eligible (Refusal and Noncontact)	46,191	12,073	58,264
Unknown (General Undeliverable)	4,934 ^a	1,690	6,624
Not Eligible	6,614 ^b	317	6,931

^aCases with undeliverable message from United States Postal Service including: Temporarily Away, Not Delivered – No Forwarding, Attempted – Not Known, No Such Number, Insufficient Address, No Mail Receptacle, Refused, Other.

^bCases with a vacant undeliverable message from the USPS.

ⁿ As detailed in Section 5.3, a small number of Medicaid Administrative frame addresses were identified as being associated with a nursing home. These cases were deemed ineligible for the MATCH survey and therefore not included in the count of eligible nonresponding cases.

From the table, we see that for the ABS sample, the RR2 was 19.8% and RR6 was 21.5%. For the Medicaid Administrative frame the RR2 was 20.4%. Overall, the combined ABS and Medicaid had an RR2 of 20.0%.

Response rates by region, survey strata, and county can be found in Appendix B.

5 Data Processing and Analysis

5.1 The 2021 MATCH Dataset

The Voxco survey management system stored MATCH web disposition data, sample data, survey response data, and data that the survey management system created into a centralized database. Paper surveys were processed and incorporated into the web data collected in Voxco. The final raw dataset was created using the SAS statistical program produced directly from the meta and survey data collected in Voxco with modifications to account for project-specific needs and updates (labels, formats, and variable cleaning) to incorporate the PAPI responses. The final dataset contains sample information and survey responses but does not include the respondent's address or name to preserve respondent confidentiality.

5.2 Data Processing

Cleaning the Data

PAPI Skip Logic Cleaning

In the CAWI Voxco program, skip logic for the survey questions is programmed into the instrument, so the respondent is only shown the survey questions that are applicable to their responses. On the PAPI survey, the logic is printed on the survey, but often a respondent may not fully follow the logic. This can result in responses to survey questions that are not applicable based on prior survey responses. To correct for these types of skip logic issues, RTI developed cleaning rules for the PAPI surveys based on the skip logic in the survey. The general rule used was to accept the gate response (the question that defines the skip logic) and alter the follow-up questions accordingly (i.e., if the gate indicated a respondent should not have answered the follow-up items, then the follow-up item responses were set to blank). However, there were a few exceptions to this rule where if the follow-up had a response, the gate was cleaned. This was done for questions where the follow-up was asking details of the gate questions and thus the response to the gate question could be implied based on the follow-up. The items in MATCH that followed the exception to the rule were Q7, Q30, Q76, and Q77. For Q8, if the gate (Q7) was yes, but all of the individual categories were no, the Q8 responses were set to missing.

Outliers—Out-of-Range Responses

On the MATCH survey, there are several questions (Q48, Q69, Q70, Q71, and Q75) that require a numeric response. In the CAWI Voxco program, these questions have bounds that restrict the number that the respondent provides. However, in the PAPI survey, while there are instructions that guide the respondent what the valid range is for the question, they may not follow those instructions and provide a response that is out of range. When an out-of-range value was provided, the value was coded to missing.

Missing Values

The MATCH survey has skip logic for survey questions throughout the survey. To reflect these situations in the data, the missing values were converted to a user-defined missing, “.s”, and formatted to distinguish the values as “Not applicable.”

Coding Open-Ended Responses

Question 62, “Which category best describes the main type of work you have done *in your lifetime*?” provided respondents with 16 occupational response categories and an additional open-ended option “other” which asked respondents to specify their main type of work. All open-ended responses to “other” were output from Voxco into a Microsoft Excel spreadsheet for coding. In total, there were 2,621 text responses coded into 25 occupational categories: the 17 existing categories from the survey and eight new categories. The “other” category from the initial set of response options was kept for cases which truly did not fit in any occupational category. Secondary codes were created for cases in which the respondent provided more than one occupation. Only the first and second occupations listed by a respondent were coded into a “primary” and “secondary” code.

The coding process began with two RTI staff coding 200 cases together and developing a codebook. RTI then provided Health Affairs with the codebook for their review. Health Affairs used this coding template, along with O*NET, a website that houses a database on standardized and occupation-specific descriptors⁷ of the Bureau for Labor Statistics 2018 Standard Occupational Categories (SOC), to code the remaining cases in the dataset. To do this, Health Affairs divided each response into substrings to capture and code responses listing multiple occupations. Health Affairs identified potential cases with multiple occupations by splitting cases along semicolons, commas, ampersands, the word “and,” hyphens, and backslashes. Each response, or substring, was then compared against user-defined terms for common nonoccupation responses and responses that were not well characterized by O*NET. The original responses and substrings were then sent to onetonline.org and the top match from O*NET was assigned. Duplicate matches were removed for responses with multiple substrings. Health Affairs then performed manual spot checking and data cleaning in a Microsoft Excel spreadsheet by checking all exact string matches and rows with three or more jobs listed.

A limitation of this approach, identified by Health Affairs, is that SOC assumes highest-ranking position rather than lowest. Probabilistically, it is more likely that a respondent has a lower-skill job. For example, “Retail” is statistically more likely to correspond to “Retail Salespersons” rather than the first two choices from O*NET: “Wholesale and Retail Buyers, Except Farm Products ” or “First-line Supervisors of Retail Sales Workers.” Also, because the data were only spot-checked, there were a number of cases that were coded incorrectly by O*NET. After Health Affairs completed coding the open-ended responses, the file was returned to RTI to finalize.

Given the limitations of using O*NET, three RTI staff recoded the data starting with a training set of 125 cases that were coded independently by all three staff. After this initial round of coding, the coders met to discuss their coding discrepancies among those cases and necessary updates to the codebook. Their final coding decisions for the training set, revisions to the codebook, and notes of coding differences between RTI and Health Affairs were then shared with Health Affairs for another round of feedback. Once RTI received and incorporated Health Affairs’ feedback on the training set, the three coders

independently coded another set of 125 cases and met again to discuss discrepancies and necessary codebook updates. Throughout the coding process, RTI referenced the Census' occupational classifications for cases that did not clearly fit the definitions or examples in earlier iterations of the codebook. The Census occupation codes are used by the Current Population Survey when collecting occupational data and each code has a 2018 SOC equivalent. RTI indicated all codebook changes, primarily the addition of new occupational examples, in red for Health Affairs' review.

After training on 250 cases, the remaining open-ended responses were divided into 5 equivalent coding batches with approximately 474 cases in every batch. The batches were then split evenly among the three RTI coders, with coders overlapping on 5% of cases in each batch (~23 cases). After coding each batch and before proceeding to the next batch, RTI performed a reliability and validity check on the overlapping cases, with the goal of reaching 80% agreement among all three coders. Any discrepancies were discussed until unanimous agreement was reached, and then updates were made to the codebook or previously coded cases. At every batch check, each coder asked the other two coders to weigh in on difficult cases that were assigned solely to them or on any case they thought should remain coded as "other." All cases that remained coded as "other" (~4% of all text responses), were reviewed by all three coders. Examples included responses like, "Worked at several different jobs" and "USA—Land of Opportunity." After all cases were coded, the coders met for a final time to do a quality check on the entire dataset, which included a keyword search for a list of occupations in which coding decisions may have evolved during the process. Health Affairs then reviewed RTI's coding and coding notes and made final decisions on the cases in which RTI made a different coding decision than Health Affairs. Health Affairs' final decision on the coding values were then uploaded into the final weighted and imputed dataset as composite variables.

Final coded verbatim data were merged back into the SAS dataset for delivery. The primary code was incorporated to the survey response to the original question (Q62) on the survey. The second occupation code was appended as a new standalone variable to the file. The two new variables with the open-ended responses in the final dataset are Q62_OCCUPATION_REC_1 and Q62_OCCUPATION_REC_2.

Recoded and Derived Variables

In MATCH, several variables were created to make data analysis easier, so the data user does not have to create them and they are standard on the file. These variables come in two forms:

- Recoded variable
- Derived variable

Recoded Variables

Recoded variables are variables that are exact replicates of a survey item, renamed to something with a more literal or meaningful name or recoded to have values that are more intuitive to the user. **Table 5-1** lists the recoded variables in the 2021 MATCH dataset including the variable the recoded variable is a copy of and its label. The survey contained one question (Q62) with open-ended responses that have been assigned to (1) an existing category, (2) a newly created category because of a large propensity of open-ended responses with a response not provided to respondents, or (3) an "other" category. These

variables were created for the items of analytic importance that can be directly linked to only one survey question.

Table 5-1: Recoded Variables in the 2021 MATCH Dataset

Recoded Variable	Original Variable	Variable Label
Insurance_Q7	Q7	Do you have any kind of health insurance coverage, including private health insurance or government plans such as Medicare or Medicaid? Direct recode of Q7
Medicaid_Q8_5	Q8_5	What kinds of health insurance or healthcare coverage do you have? Medicaid or Medical Card provided by Mountain Health Trust (Aetna, Health Plan, Unicare), Direct recode of Q8_5 using Q7 for no
Smoke_Stat_Q72	Q72	How often do you now smoke cigarettes? Direct recode of Q72
Hisp_A_Q51	Q51	Are you of Hispanic, Latino, or Spanish origin? Direct recode of Q51
Gender_Q49	Q49	What was your sex at birth? Direct recode of Q49
Marital_Status_Q53	Q53	What is your current marital status? Direct recode of Q53
RX_MH	Q33	In the past 12 months, did you have a prescription for any medicines for problems with your mental health, emotions, or nerves? Direct Recode of Q33
RX_Opioids_YN	Q79	(If you have used prescription opioids in the past 12 months) At any time in the past 12 months, have you used prescription opioids, in any way a doctor did not direct you to use it, Direct recode of Q79
Q21 (series) Rec	Q21 (series)	In the past 12 months, thinking about when you were at your worst emotionally, how much did your emotions interfere with: ... Recoded Rating 0-2
Q22 (series) Rec	Q22 (series)	In the past 2 weeks, how often have you felt: ...; Recoded Rating 0-4
Q94 (series) Rec	Q94 (series)	In the past 12 months, have you experienced these events? ...; Recoded Rating 0/1/777

Derived Variables

Derived variables are variables that are created from one or more survey items. These items often involve categorizing a variable to be used in analysis. **Table 5-2** lists select derived variables created for the 2021 MATCH dataset and their corresponding labels.

Table 5-2: Derived Variables in the 2021 MATCH Dataset

Derived Variable	Label
Chronic_Cond	Number of chronic conditions in Q5, categorical
Race5_Cat	Combined Race/Ethnicity, 5 levels
Race3_Cat	Combined Race/Ethnicity, 3 levels
Race_Cat	Combined Race, 4 levels

Derived Variable	Label
Alcohol_Qty	Alcohol consumed in a month (days having at least one drink in a month times average number of drinks); Derived Q69*Q70
Binge_Drink	Binge drinking days Q71, categorical
Alcohol_Qty_Binge	Yes/No: Men 56 or more drinks in a month, Women 28 or more drinks in a month. Derived from monthly alcohol consumption (Alcohol_Qty = Q69*Q70)
Educ_Status	What is the highest grade or year of school you completed? Derived, Q60, categorical
ER_VT	In the past 12 months, how many different times have you gone to an emergency room to receive medical care for yourself? Derived, Q18, categorical
MH_Prov_Need	Need to see a mental health provider, Derived, Q28 and Q87
PUB_Benefits	Received any public benefits in household, Derived, Q63 series (In the past 12 months, has anyone in your household received any of the following public benefits?)
Alch_Binge_YN	Any Binge drinking days, Derived, Q71
Drugs_YN	In the past 12 months, have you used drugs? Derived, Q76 series
Overdose_YN	OVERDOSE_YN - Self or Family ever overdosed, Derived, Q83 and Q86
FPL100_20	2020 Annual Poverty Threshold by Persons in Household
FPL_Pct	2020 Annual FPL percent, Continuous
FPL_Cat_20	2020 Annual Categorical FPL Level, 7 levels
Poverty_20	2020 Annual Categorical Poverty Level, 5 levels
FPL100_Flag_20	2020 Annual Income Below 100% FPL

Abbreviation: Federal Poverty Limit

Quality Review

RTI conducted extensive tests of the integrity of the final data to verify accuracy and completeness. RTI programmers developed SAS scripts that tested the integrity of all survey responses against the CAWI logic and against the recoded, derived, and auto-coded variables. These scripts attempted to flag cases that violated any logic rules. Inconsistencies were logged in an output file and checked by data processing staff to see whether any of the data processing programs needed to be corrected.

After the final set of variables was recoded and created and analytic weights were produced, the data were reviewed for quality assurance (i.e., verifying the data and all post data collection processing was done completely and accurately). Quality assurance is a way to ensure the quality and accuracy of the final data. A set of checks was implemented to verify the key components of the data:

- Frequencies of derived variables with their source survey variables to ensure appropriate assignments
- Verification of universe totals (i.e., those eligible for an item) for each survey and derived variable
- Verification that all imputed variables had no item nonresponse after imputation
- Verification that the imputed variables had expected distributions
- Verification that all survey weights were positive and greater than one

- Verification that survey weight totals summed to expected control totals
- Prior to data delivery, all quality assurance checks were verified and confirmed complete (no issues appearing)

Health Affairs constructions and imputations followed the pattern of double programming. Specifications were given and two independent programmers created the datasets using SAS 9.4. The datasets were compared using proc compare to assure there were no differences in values. Program logs for the development programs were checked to make sure there were no errors indicating a problem. In addition, crosstabs of constructed variables were reviewed. A quality review for the final post-stratification of the weighting is described below. It followed a distinct process due to the complexity of the post-stratification construction and selection.

Data Formatting

The final SAS dataset has an associated SAS format library that contains variable labels to help users understand the source and content of the variable. The formats used indicate skip logic and distinguish between cases that are missing because of skip logic or nonresponse.

Imputation

Imputation was done in two parts, an initial and a second imputation. The second imputation was performed between the initial and final post-stratification (if needed for the calibration) or after the final post-stratification (if not needed for calibration) due to minor changes in constructions for the weighting variables. Certain variables, such as income, were not imputed a second time as they were not needed in the weighting and their quality was considered high enough.

Variables Imputed

Key survey variables for which a respondent did not provide an answer were imputed to allow for a complete analysis data file. These variables were identified for one of two reasons: (1) their necessity in the weighting process, and (2) the need to be part of a complete data file to ensure that records with a missing value in one of these variables could still be included in analyses using these variables. Such variables are identified in the final dataset with the *_imp* suffix in the variable name. All variables, with the exclusion of continuous annual income, were imputed with an unweighted or weighted sequential hot-deck (UWSHD and WSHD) approach that uses variable correlates for the formation of imputation cells and the sorting of donor and recipient cases within those cells. The main imputed variables are:

- Medicaid_Q8_5 (UWSHD)
- Q48_Age (UWSHD)
- Gender_Q49 (UWSHD)
- Race5_Cat – indirectly through imputation of Hisp_A_Q51 (UWSHD) and Race_Cat (UWSHD)
- Marital_Status_Q53 (UWSHD)
- Educ_Status (UWSHD)
- Q99_FAMSUPPORT (family members supported by income) – from initial imputation
- Q101_INCOME2 (categorical annual income) – from initial imputation
- HHINCY_IMP (continuous annual income) – from initial imputation

Prior to the UWSHD imputation, the Q48_Age was first imputed with age in the Medicaid Administrative frame (if non-missing) for Medicaid participants in an intermediary variable.

WSHD (and UWSHD) Imputation

WSHD imputed missing values by pairing item nonrespondents with donors who have similar values for auxiliary variables related to the variable being imputed.⁸ This occurred in two ways:

- Sets of item respondents and nonrespondents were grouped based on the values of one or more variables that were important predictors of the variable in question (e.g., demographic characteristics); this cross-classification of predictors defined the “imputation cell.”
- Within imputation cells, respondents and nonrespondents were sorted in an identical fashion, which makes it more likely (but not guaranteed) that nonrespondents will be paired with respondents who have similar values of the sorting variables.

The actual pairing of records within cells occurs randomly, with pairing probabilities determined by the amount of overlap between cases’ scaled weight sums. Scaled weight sums are calculated by separately and cumulatively^o summing respondents’ and nonrespondents’ nonresponse adjusted weights and dividing each record’s cumulative weight sum by the overall sum (among respondents or nonrespondents) for the cell. These scaled weight sums are greater than 0 and less than or equal to 1. These scaled weight sums can also be used to set scaled weight ranges, which are defined as the range between the previous case’s scaled weight sum^p and that of the case in question.

For example, consider the case where the first nonrespondent in an imputation cell has a scaled weight sum value of 0.3. This record therefore has a scaled weight range from 0.0 to 0.3. If the first two respondents in this cell have scaled weight sum values of 0.2 and 0.5, they are the only potential donors for the nonrespondent in question (they are the only ones with weight ranges overlapping that of the nonrespondent in question, having ranges from 0.0 to 0.2 and 0.2 to 0.5, respectively). Although the second respondent has a wider weight range ($0.5 - 0.2 = 0.3$) relative to the first ($0.2 - 0.0 = 0.2$), it is less probable that it will be the donor record for the first nonrespondent because the entire range of the first respondent overlaps with that of the nonrespondent, covering two-thirds of the nonrespondent’s range. The remaining one-third of the nonrespondent’s range is covered by the second respondent. Therefore, in this example, the first respondent will be selected as the donor with twice the probability of the second, despite having a smaller weight.

The UWSHD is simply the WSHD with weight equal to 1 for all observations.

Table 5-3 and 5-3b presents the imputation cells and sorting criteria varied across variables; the cell variables and sorting variables are denoted with a *C* for a variable included in formation of the imputation cell and *S* for a variable used for sorting. Imputation proceeded in the order in which the variables are presented in the table. The selection of characteristics for imputation cells was based on

^oBecause the weight sums are calculated cumulatively, the way in which the cells are sorted largely determines which records can be paired.

^pThe previous case refers to the ordering the sorting criteria imposed. The left endpoint on the scaled weight range for the first case in a cell is zero.

availability (i.e., already imputed or universally available), perceived relevance, and all cells contain an eligible donor for the hot-deck selection.

Table 5-3: Classification and Sorting Order for Imputation Variables – Initial Imputation

Imputation Variables	Survey Mode	Frame	Age ^a	Gender	Race	Number Supported by Income
Q99_FAMSUPPORT	C	C	C	C	S	
Q101_INCOME2	C	C	C	C	S	C

C – Variable used in formation of imputation cells.

S – Variable used for sorting within imputation cells.

^a Age in years was collapsed into six levels (18–24, 25–34, 35–44, 45–54, 55–64, 65+).

Table 5-4b: Classification and Sorting Order for Imputation Variables – Second Imputation

Imputation Variables	Survey Mode	Frame	Region ^a	Age ^b	Gender	Ethnicity	Race	Marital Status	Medicaid
Q48_Age	C	C	C						
Gender_Q49	C	C	C	C					
Hisp_A_Q51 ^c	S	S	C	C	C				
Race_Cat ^c	S	S	C	C	S	C			
Marital_Status_Q53	S	S	S	C	C		C ^d		
Medicaid_Q8_5	S	C	S	C	C		S ^d	C	
Educ_Status	S	S	S	C	C	S	C ^e	C	C

C – Variable used in formation of imputation cells.

S – Variable used for sorting within imputation cells.

^a Behavioral Health Regions.

^b Age in years was collapsed into six levels (18–24, 25–34, 35–44, 45–54, 55–64, 65+).

^c Imputed ethnicity and race category were only intermediary variables used in the construction of the imputed race/ethnicity variable and did not appear in the final dataset.

^d Race (exclusive) and ethnicity (inclusive) categories (White, Black, Hispanic, Asian, Other – including multi-racial).

^e Race, exclusive categories (White, Black, Asian, Other – including multi-racial).

Imputation for Last Year’s Household Income

Annual income is an extremely important variable for analysis and measuring poverty that is also subject to relatively high rates of missingness. The income question asked in the survey (Q101) asked respondents to provide a categorical income value. To calculate poverty, which is needed for analysis, continuous income is also needed. This resulted in a multistep imputation process. The income imputation strategy employed is detailed in the following steps:

- Impute categorical income using WSHD
- Impute continuous income (HHINCY_IMP) using percentile-constrained lognormal interpolation.⁹ The number of family members supported by income (Q99_FAMSUPPORT_IMP) was capped at 8 due to lower response at that level and above in order to perform the

lognormal interpolation. This imputed the continuous income number to fall within the reported or imputed categorical income level for a specific respondent

Amount of Item Nonresponse

Across all the variables imputed, the level of missing data ranged from less than 0.1% (Medicaid) up to 5.2% (Income). In general, of the eight items imputed, excluding income, the variables had fewer than 3% of responses missing. **Table 5-4** shows the number and percentage of missing data for each item imputed.

Table 5-5: Number and Percentage of Missing Data for Imputed Variables

Variable	Nonrespondents	Respondents	% Missing
Q48_Age	135	16,050	0.8
Gender_Q49	57	16,128	0.4
Race5_Cat	194	15,991	1.2
Marital_Status_Q53	107	16,078	0.7
Medicaid_Q8_5	586	15,599	3.6
Educ_Status	129	16,056	0.8
Q99_FAMSUPPORT	467	15,718	2.9
Q101_INCOME2	843	15,342	5.2

5.3 Weighting

Weighting Strategy

The weighting strategy for MATCH comprised three broad steps:

1. **Weight the ABS frame respondents to the population.** In this step, survey weights are created to allow the ABS frame respondents to represent their target population—in this case, household residents of WV.
2. **Weight the Medicaid Administrative frame respondents to the population.** In this step, survey weights are created to allow the Medicaid Administrative frame respondents to represent their target population—in this case, Medicaid enrollees not living in group quarters (e.g., nursing homes) in WV.
3. **Combine and adjust the weighted ABS and Medicaid Administrative frame respondents to the project target population.** In this step, the respondents from the two frames are combined and the frame specific weights blended together. This step involves adjusting the weights in the two prior steps to ensure that the portions of the frame that overlap accurately represent the overlapping portion of the population—in this case, the portion of the population with Medicaid.

Weighting the ABS Sample

The ABS frame weighting process has five steps:

1. Create base weight
2. Eligibility adjustment

3. Nonresponse adjustment
4. Person-level design weight
5. Coverage adjusted weight through poststratification⁹

In this section, each step in the weighting process for the ABS sample is described.

Create Base Weight

Purpose of this weight. The purpose of the base weight (sometimes referred to as the design weight) is to represent the population based on the sample design. The base weight is often defined as the inverse probability of selection.

Who this weight represents. The base weight will represent the number of households within each stratum. Because strata represent a county or a subset of a county, the base weights will represent the number of households within each county.

How this weight is constructed. The ABS frame used a stratified simple random sample to select housing units within each of the 102 sampling strata (*h*). As such, the base (design) weight (WT_HH) was computed as:

$$WT_{HH} = \frac{N_h}{n_h}$$

Where N_h is the number of housing units within stratum *h* and n_h is the number of housing units sampled within stratum *h*.

Eligibility Adjustment

Purpose of this weight. The purpose of the eligibility adjusted weight is to adjust the weights to account for the fact that some frame members are not actually a part of the target population.

Who this weight represents. The eligibility adjusted weight will represent the number of eligible households in the population. As such, the adjustment was conducted within each stratum maintaining the representation of households at the county level.

How this weight is constructed. The ABS protocol consisted of up to four mailings to each sampled address. During each mailing, the postal service could identify a sampled address as being “undeliverable.” An undeliverable address means the property is vacant or does not exist.

Cases with one or more undeliverable address mailings were coded as “out-of-scope” for the project. As such, these sampling units were ineligible for the project. However, any other housing unit where no residency was confirmed was considered eligible. Therefore, an eligibility adjusted weight (WT_HH_E) was defined as follows:

$$WT_{HH_E} = \begin{cases} 0 & \text{if undeliverable} \\ WT_{HH} & \text{otherwise} \end{cases}$$

⁹ Poststratification is referring generically to calibration of weights to population totals.

Nonresponse Adjustment

Purpose of this weight. The purpose of the nonresponse adjusted weight is to adjust the weights to account for sample members (households) who do not respond to the survey.

Who this weight represents. The nonresponse adjusted weight will represent the number of eligible households in the population. As such, this weight is representative of the number of households within each county.

How this weight is constructed. To correct for nonresponse, the eligibility adjusted weight for responding households was adjusted to account for the weight of eligible nonresponding households. For this step, because little about the composition of each household was known with certainty and strata already account for high-density areas of Black or African Americans or low-income persons, a simple ratio adjustment within each stratum was used. As such, the nonresponse adjusted weight (WT_HH_NR) was calculated for household i in strata h as:

$$WT_HH_NR_{ih} = WT_HH_E_{ih} \times \frac{\sum_h WT_HH_E_{ih}}{\sum_h (WT_HH_E_{ih} \times I_{ih})} \times I_{ih}$$

Where I_{ih} is an indicator of response for household i in stratum h (i.e., $I_h = 1$ indicates a responding household and $I_h = 0$ indicates a nonresponding household).

Person-level Design Weight

Purpose of this weight. The purpose of the person-level design weight is to adjust the nonresponse adjusted household-level weight to represent persons in the population—the desired level of inference for the sample.

Who this weight represents. The person-level design weight represents the estimated number of persons within each stratum. Because this weight is constructed at the stratum level, the weight will approximate the number of eligible persons residing in each county.

How this weight is constructed. Under the MATCH ABS protocol, one adult per address was randomly selected to participate in the survey. Responding adults indicate the number of adults in the household (n_{ia}). The person-level design weight adjusts the household nonresponse weight to account for the number of adults in each household. The weight was calculated as follows:

$$WT_A1 = WT_HH_NR_h \times n_{ia}$$

Because the MATCH survey does not directly ask the respondent to provide the number of adults residing in the household, the number of adults needed to be imputed. The imputation of number of adults utilizes survey item Q54 (With whom do you currently live?). The imputed Q54 variable used in the adjustment was capped at 4 to minimize the effects of high unequal weighting on the precision of estimates. It was created by using internal information from the survey. First, the responses for Q54 were summed. However, because Q54 only asks who the respondent lives with (e.g., spouse, other relative) and not how many of each type of person, some cases resulted in a range of two to four possible persons. In those situations, the number of adults derived from Q99 (income-supported persons) minus Q100 (dependent children) was used to further define the number of adults. For the

cases that remained with each refined set of estimated adults, the number of adults was randomly selected within the estimated range of adults.

Coverage Adjusted Weight through Poststratification

Purpose of this weight. The purpose of the coverage adjusted weight is to adjust the design-based person-level weight for any potential coverage bias. Coverage bias can occur if the respondent sample does not accurately reflect the population.

Who this weight represents. The coverage adjusted weight represents the target population. The coverage adjustment is made at the state and, where possible, substate level.

How this weight is constructed. The final weight adjustment was to correct the person-level design weight for any coverage deficiencies through a poststratification adjustment. In this step, a calibration model was created. The calibration totals used in these models came from two external sources:

- **2020 5-year ACS.**^r The 2020 ACS was used to obtain population distributions for key population characteristics such as age, race, sex, marital status, and education level. To obtain all the population totals used in the coverage adjustment step, two sources of the ACS were used: (1) Census.data.gov tables, and (2) Public Use Microdata Sample (PUMS). **Table 5-5** indicates which source was used for which control total. The overall population in WV aged 18 years or older living in non-group quarters based on the ACS was 1,442,573 persons.^s
- **Medicaid Enrollment file.** The Medicaid Enrollment file was used as the control total for the Medicaid population. The Medicaid population used in this step was adjusted to correct for ineligible nursing home enrollees on the frame. The July 2021 frame contained 380,745 persons aged 18 years or older. After accounting for nursing home residents, the frame was estimated to contain 373,766 persons aged 18 years or older.^t

The calibration model post stratified respondents based on population totals by key population characteristics. Because of the small sample size of some counties, the poststratification was conducted simultaneously controlling for state- and substate-level totals. Substate levels consisted of a county or group of counties depending on the respondent sample size. To maximize the number of parameters in the model, a step-wise modeling approach was used to determine the final set of model parameters. That is, the initial model was a maximal model containing all possible covariates. If that model failed to converge, then parameters were removed until model convergence was achieved. Once an initial convergent model was obtained, some reduced parameters were added back to determine if the model

^r The 2020 5-year ACS was the most current file publicly available at the time the weights were produced.

^s The 5-year 2020 ACS population of person aged 18 years or older in WV obtained through census.gov is 1,442,209. This slightly differs from the 1,442,573 persons obtained through the PUMS. An adjustment was made to counts obtained through census.data.gov so that all control totals equaled the PUMS total.

^t The nursing home population was estimated based on the Medicaid sample provided to Health Affairs. Of the 41,409 persons sampled, 768 (1.8% of the total sample) were identified as having an address associated with a nursing home. Using their design-based weight, these 768 people represented 6,979 total persons on the Medicaid Administrative frame.

could handle additional covariates. The final model was the model containing the largest set of parameters that still allowed for model convergence. **Table 5-5** presents the final model parameters.

Table 5-6: Characteristics Included in the Address Based Sample Frame Coverage Model

Population Characteristic	Definition	Source
Gender	Male, Female	PUMS
Age in years category	18-24, 25-34, 35-44, 45-54, 55-64, 65+	PUMS
Race/ethnicity	White, non-White (Hispanics are classified as non-White)	PUMS
Education level	Less than High School, High School, Some College, College or more	PUMS
Marital status	Married (includes Living with Partner), Widowed, Divorced, Separated, Never married	PUMS
Medicaid status	Yes, No	Medicaid Administrative
County	55 individual counties of West Virginia	ACS Census.data.gov
Gender by Race/ethnicity	Male, Female by White, non-White	PUMS
Race/ethnicity by Age in years category	White, non-White by 18-24, 25-34, 35-44, 45-54, 55-64, 65+	PUMS
Gender by Medicaid status	Male, Female by Yes, No	PUMS
Age in years category by Medicaid status	18-24, 25-34, 35-44, 45-54, 55-64, 65+ by Yes, No	Medicaid Administrative
Race/ethnicity by Medicaid status	White, non-White by Yes, No	Medicaid Administrative

Abbreviation: Public Use Microdata Sample

The resulting weights from the poststratification model is WT_A_ABS.

Weighting the Medicaid Sample

The Medicaid Enrollment file protocol was identical to the ABS protocol with one exception: the Medicaid sample specified the person being sampled. Therefore, unlike the ABS protocol, there is no within-household selection of a respondent. Therefore, the weighting process consisted of the following four steps:

1. Create base weight
2. Eligibility adjustment
3. Nonresponse adjustment
4. Coverage adjusted weight through poststratification

In this section, each step in the weighting process for the Medicaid sample is described.

Create Base Weight

Purpose of this weight. The purpose of the base weight (sometimes referred to as the design weight) is to represent the population based on the sample design. The base weight is often defined as the inverse probability of selection.

Who this weight represents. The base weight will represent the number of persons with Medicaid within each stratum. Because strata represent a county or a subset of a county, the base weights will represent the number of persons with Medicaid within each county.

How this weight is constructed. The Medicaid Administrative frame used a stratified simple random sample to select housing units within each of the 62 sampling strata (h). As such, the base (design) weight (WT_MED_B) was computed as:

$$WT_MED_B = \frac{N_h}{n_h}$$

Where N_h is the number of persons within stratum h and n_h is the number of persons sampled within stratum h .

Eligibility Adjustment

Purpose of this weight. The purpose of the eligibility adjusted weight is to adjust the weights to account for the fact that some frame members are not actually a part of the target population.

Who this weight represents. The eligibility adjusted weight will represent the number of eligible persons in the population. As such, the adjustment was conducted within each stratum maintaining the representation of persons with Medicaid at the county level.

How this weight is constructed. There were two ways in which a sampled person from the Medicaid Administrative frame was determined to be ineligible. First, the Medicaid protocol consisted of up to four mailings to each sampled person. During each mailing, the postal service could identify the address associated with the sampled person as being “undeliverable.” An undeliverable address means the property is vacant or does not exist. Cases with one or more undeliverable address mailings are coded as “out-of-scope” for the project. Second, the Medicaid Administrative frame included persons living in nursing homes. Because nursing homes are ineligible for this project, these people were identified as ineligible.^u

After identifying ineligible sample members, the eligibility adjusted weight (WT_MED_E) was defined as follows:

$$WT_MED_E = \begin{cases} 0 & \text{if undeliverable} \\ WT_MED_B & \text{otherwise} \end{cases}$$

^u An analysis of the addresses of all sampled Medicaid persons was conducted to identify nursing homes. The assessment identified 317 sampled persons living in nursing homes. Of these 317, 27 had already responded to the survey. All 317 cases were identified as ineligible and excluded from the frame.

Nonresponse Adjustment

Purpose of this weight. The purpose of the nonresponse adjusted weight is to adjust the weights to account for sample members who do not respond to the survey.

Who this weight represents. The nonresponse adjusted weight will represent the number of eligible persons with Medicaid. Because this weight is based off of the eligibility adjusted weight, this weight is representative of the number of persons within each county that receive Medicaid and are eligible for the survey.

How this weight is constructed. A ratio adjustment within each stratum was used to adjust for nonresponse.^v The adjustment was calculated as:

$$WT_MED_NR = WT_MED_E \times \frac{n_{he}}{n_{he_nr}}$$

Where n_{he} is the number of eligible sampled persons in stratum h and n_{he_nr} is the number of eligible responding sampled persons in stratum h .

Coverage Adjusted Weight through Poststratification

Purpose of this weight. The purpose of the coverage adjusted weight is to adjust the nonresponse adjusted weight for any potential coverage bias. Coverage bias can occur if the respondent sample does not accurately reflect the population.

Who this weight represents. The coverage adjusted weight represents the target population (i.e., the Medicaid population). The coverage adjustment is made at the state and, where possible, substate level.

How this weight is constructed. The coverage adjustment was a calibration model raking the nonresponse adjusted weight to known Medicaid Administrative totals. The administrative totals used are based on the July 2021 Medicaid population—the population used to draw the Medicaid Administrative frame sample. This population used for the coverage adjustment was adjusted to account for persons living in nursing homes. As such, the July 2021 Medicaid population of 380,745 persons aged 18 years or older was adjusted to 373,766 to account for the estimated 6,979 persons living in a nursing home.^w **Table 5-6** lists the characteristics by which the Medicaid sample was calibrated.

Table 5-7: Characteristics Included in the Medicaid Administrative Frame Coverage Model

Characteristic	Definition
Age in years category	18-24, 25-34, 35-44, 45-54, 55-64, 65+
Gender	Male, Female

^v The nonresponse adjustment did not account for any person characteristics because the Medicaid Administrative frame did not provide any at the individual sample level.

^w Nursing home residents were estimated based on the sample provided to Health Affairs by Medicaid. The sample contained 768 out of 41,409 (1.8%) persons identified as living in a nursing home. These 768 persons represented 6,909 persons on the full frame based on their design-based weight.

Characteristic	Definition
Race/ethnicity	White, Non-White (Hispanic persons are included in Non-White)
Medical Services Region	4 levels (see Appendix Figure D-1)
Behavioral Health Region	6 levels (see Appendix Figure D-2)
Ryan Brown Fund Region	7 levels (see Appendix Figure D-3)
County/Region groupings	Kanawha, Cabell, Wood, Raleigh, Mercer, Berkeley, Harrison, Marion, Fayette, Monongalia and remaining Behavioral Health Region Counts
Gender by Race/ethnicity	Male, Female by White, non-White
Race/ethnicity by Age in years category	White, non-White by 18-24, 25-34, 35-44, 45-54, 55-64, 65+
Gender by Age in years category	Male, Female by 18-24, 25-34, 35-44, 45-54, 55-64, 65+
Medical Services Region by Race/ethnicity	4 Regions by White, non-White

After the coverage adjustment, the weight totals based on the self-reported person characteristics matched the administrative totals. The coverage adjustment was the final weight and will be denoted as WT_A_MED.

Combining

The process of combining the ABS frame respondents and Medicaid Administrative frame respondents consists of three steps:

1. Assessment of blending parameters
2. Blending
3. Preliminary coverage weight through poststratification

In this section, each step in the combining process is detailed. Then, the final analytic weight through secondary poststratification process is described.

Assessment of Blending Parameters

One of the key steps in the blending of the two samples is the determination of the blending parameter. No one approach is currently standard for determining the best blending parameter. As such, several different options were considered. These different parameter options include:

- The sample ratio based on the effective sample size at the state level
- The sample ratio based on the nominal sample size at the state level
- The sample ratio based on the effective sample size at the county-level
- The sample ratio based on the nominal sample size at the county-level

County-level blending parameters were ruled out due to the small Medicaid sample size in some counties by frame. The small sample size would produce unstable parameters which may create error in the estimates. The nominal sample size was ruled out because the design effects were so different across the two frames. Without accounting for the design effect in each sample, more weight would be

given than should be to the ABS sample frame. Therefore, it was decided to use the sample ratio based on the effective sample size at the state level.

Blending

Purpose of this weight. The purpose of the blended weight is to combine the ABS frame respondents and Medicaid Administrative frame respondents and adjust the individual sample weights to account for the overlapping population the two samples represent. In the case of MATCH, only a portion of the samples overlap. Specifically, the portion of the sample identified as having Medicaid.

Who this weight represents. This weight will represent the entire target population at the state and county levels.

How this weight is constructed. The blending method utilized was a dual-frame adjustment,¹⁰ which defines the dual-frame adjustment as the following among those in the overlapping population:^x

$$WT_A_BLENDED = WT_A_ABS \times \lambda + WT_A_MED \times (1 - \lambda)$$

Where λ is called the blending parameter and $0 \leq \lambda \leq 1$.

For MATCH the blending parameter will be the proportion of the effective sample size relative to the total effective sample size coming from each frame. The effective sample size is what the sample size would have been had a simple random sample been used to draw the sample rather than a complex design. The effective sample size can be computed by dividing the nominal sample size (actual number of respondents) by the design effect for the sample. For MATCH, because only a stratified design was used, the design effect is equal to the unequal weighting effect (UWE). The UWE is defined as:

$$UWE = 1 + CV^2$$

Where CV is the coefficient of variation across the weights.

To determine the blending parameter, a UWE is calculated separately for each frame’s weighted sample. The blending parameters were based on the overlapping portion of the two frames. In this case, that is the Medicaid population. **Table 5-7** presents the nominal sample size, UWE, and effective sample size from the Medicaid portion of each individual frame sample.

Table 5-8: Effective Sample Size from Each Sample Frame

Frame	Nominal Sample Size	Unequal Weighting Effect	Effective Sample Size
ABS	2,428 ^a	4.05	600
Medicaid Administrative	3,524	1.57	2,245

^aThe ABS nominal sample size is the total number of ABS respondents who indicated they receive assistance from Medicaid. This nominal sample size is the portion of the total ABS respondents that overlap with the respondent sample selected from the Medicaid Administrative frame. It was assumed that all respondents selected from the Medicaid Administrative frame continued to receive assistance from Medicaid at the time the survey was conducted.

^x For the ABS sample, only those with Q8_5=1 (i.e., those indicating having Medicaid) will be included in the dual-frame adjustment.

Based on the effective sample sizes, $\lambda = 0.21$ (i.e., the proportion of the blended weight allocated to the ABS sample is 21% and the proportion of blended weight allocated to the Medicaid sample is 79%). The blending factor was calculated at the state level. While a parameter could have been calculated at the county level, because the Medicaid sample size by frame in some counties was small, the county-level parameters were not stable. As such, a state-level parameter was used to minimize any uncertainty in the parameter value used.

Once the blending parameter was determined the blended weight (*WT_A_BLEND*) was created. The blending parameter was only applied to the portion of the two samples that overlap. In this case, the overlapping portion of the sample is the set of persons identified as having Medicaid. For the ABS sample, Q8_5 (Type of Health Insurance = Medicaid), was used to identify the Medicaid population. For the Medicaid Administrative frame (*MAF*), it was assumed that all respondents had Medicaid. The final blended weight was calculated as:

$$WT_A_BLEND = \begin{cases} WT_A_ABS \times \lambda + WT_A_MED \times (1 - \lambda) & \text{if } Q8_5 = 1 \text{ or on } MAF \\ WT_A_ABS & \text{Otherwise} \end{cases}$$

Preliminary Coverage Weight through Poststratification

Purpose of weight. The purpose of the final coverage weight is to ensure that the blended weight accurately reflects as many subdomains in the population as possible.

Who this weight represents. This weight represents the target population including as many domains as possible at the state and county levels.

How this weight is constructed. The final weight adjustment was to correct the blended weight for any coverage deficiencies through a poststratification adjustment. Because the ABS frame poststratification model and Medicaid Administrative frame poststratification model contained a different set of parameters, a final calibration step after the blending was included to ensure the Medicaid population (i.e., the overlapping portion of the population) was fully reflected.

In this step, a calibration model similar to the ABS frame sample calibration model was created. The calibration totals used in this model came from two external sources:

- *2020 5-year ACS.*^y The 2020 ACS was used to obtain population distributions for key population characteristics such as age, race, sex, marital status, and education level.
- *Medicaid Enrollment file.* The Medicaid Enrollment file was used as the control total for the Medicaid population.

For totals that involved the Medicaid population, the population needed to be split into Medicaid and non-Medicaid persons. To create this split in the population the non-Medicaid population was calculated

^y The 2020 5-year ACS was the most current file publicly available at the time the weights were produced.

as the total state (or county) population from the 2020 ACS minus the state (or county) population from the Medicaid enrollment file.²

The calibration model poststratified respondents based on population totals by key population characteristics. Because of the small sample size of some counties, the poststratification was conducted simultaneously controlling for state- and substate-level totals. Substate levels consisted of county. To maximize the number of parameters in the model, a step-wise modeling approach was used to determine the final set of model parameters. **Table 5-8** presents the final model parameters.

Table 5-9: Characteristics Included in the Combined Coverage Model

Population Characteristic	Definition
Weighting Frame	ABS, non-Medicaid; ABS, Medicaid; and Medicaid Administrative frame
County	55 individual counties of West Virginia
Age in years category	18-24, 25-34, 35-44, 45-54, 55-64, 65+
Race/ethnicity	White, non-White (Hispanics are classified as non-White)
Gender	Male, Female
Medicaid status	Yes, No
Education level	Less than High School, High School, Some College, College or more
Marital status	Married (includes Living with Partner), Widowed, Divorced, Separated, Never married
Gender by Race/ethnicity	Male, Female by White, non-White
Gender by Age in years category	Male, Female by 18-24, 25-34, 35-44, 45-54, 55-64, 65+
Race/ethnicity by Age in years category	White, non-White by 18-24, 25-34, 35-44, 45-54, 55-64, 65+
Gender by Race/ethnicity by Age in years category	Male, Female by White, non-White by 18-24, 25-34, 35-44, 45-54, 55-64, 65+
Gender by Medicaid status	Male, Female by Yes, No
Age in years category by Medicaid status	18-24, 25-34, 35-44, 45-54, 55-64, 65+ by Yes, No
Race/ethnicity by Medicaid status	White, non-White by Yes, No

The weights from the preliminary poststratification model had a UWE of 3.57 at the state level and a UWE as high as 9.54 at the county level (Wyoming county). The full range of the weights was 0.70 to 4,888.05.

² Because the ACS population was based on an average over 5 years (2016 – 2020) and the Medicaid population was based on the Medicaid population as of July 2021, there could be some distortion in the non-Medicaid population due to the temporal difference in time period the control totals represent. Any distortion is likely covered by the sampling variation of the estimates.

Purpose of secondary poststratification. The goal of this secondary poststratification was to improve on the initial calibration – in particular to increase the precision and stability (via lower UWE) of estimates at the county level. The target was no county with a UWE higher than 4, while calibrating to a rich and nuanced collection of population counts to improve representativity of estimates at all levels.

Who this weight represents. This weight represents the target population including as many domains as possible at the state and county levels.

How this weight is constructed. The weight was constructed in two steps: (1) truncation of the weights from below and above, followed by (2) a secondary calibration.

Quality review and selection of calibration totals. Given the complexity of developing quality substate totals for the target household population (household population counts), the totals considered were developed in collaboration with a leading expert in weighting at Abt Associates. Two parallel constructions of the final weights were implemented, each with a different approach to the development of calibration counts. The one outlined below is the method used for the final weights included with the data. The second used ACS data and sub-CBG geographic designations for rescaling to the target household population and was used for the quality control weights. Two analysts developed the optimal models, under the constraints given by availability of counts and the purpose of the secondary calibration, and compared the weights. This comparison was repeated to the satisfaction of both analysts – in terms of the models and the similarity of results.

Additional information. Several variable constructions were updated in between the preliminary and secondary calibration. In particular, geocoding was performed which resulted in the change in some county assignments and correct block group assignments for the respondents (used in geographic characteristics).

Step 0: Development of calibration totals

To make sub-state (i.e., region and county) calibrations, different household population counts were developed from the same sources (*2020 5-year ACS and Medicaid Enrollment file*). There were circumstances where desired ACS totals had to be appropriately adjusted. The household counts used in this calibration fell into the following categories:

1. Direct demographic counts (direct): The counts of adult household residents were obtained either directly or by simple algebraic manipulations of ACS counts.
2. Calibrated demographic counts (calibrated): The counts of adult household residents were obtained by calibrating full adult population counts to direct counts.
3. Rescaled demographic counts (rescaled): The counts of adult household residents were obtained by rescaling full adult population counts using a factor of direct counts and full adult population counts at sub-county levels.
4. Geographic characteristic (GC) counts: These are computed geographic area (either CBG or Census tract) characteristics where the counts came from direct counts. The breakdown for the totals were approximately quartiles.

5. Rescaled Medicaid counts: Medicaid Enrollment file counts were rescaled to adult household counts.

All Application Programming Interface (API) calls for the 2020 5-year ACS (<https://api.census.gov/data/2020/acs/acs5?get=NAME>,) counts occurred between August 17, 2022, and September 19, 2022, using SAS 9.4 and proc HTTP.

Step 1: Truncation

To improve flexibility, the weights were first truncated from below. To improve stability of estimates on key sub-groups of interest and at the county level, further sequential truncations were made based on the number of standard deviations from the mean.

Table 5-9: The Order of Truncations^a

Truncation	Subgroup	Number of Observations Truncated
Lower bound of 5	Universally applied	502
Truncated at mean weight + 2.5 and - 10 standard deviations of the mean weight	County by age in years category (18-24, 25-34, 35-44, 45-54, 55-64, 65+) by birth sex (male, female)	1224
	County by age in years category (18-24, 25-34, 35-44, 45-54, 55-64, 65+)	
	County by birth sex (male, female)	
	County by age in years category (18-34, 35-64, 65+)	
	County	

^aAll truncations made were on the upper bound.

Step 2: Calibration

To improve estimates at targeted geographic designations, three geographic levels were used in calibration:

1. State
2. Region – all four Medical Services, all six Behavioral Health, and all seven Ryan Brown Fund regions (i.e., the regional classifications were not considered independently)
3. County – all 55 counties

The selection of calibration totals balanced the goal of minimizing UWE (no county level UWE above 4) while maximizing sub-state level calibrations.

5-10: Calibrations in the Final Model

Population Characteristic	Definition	Main Source
Birth sex by age in years category (6), state	Male, Female by 18-24, 25-34, 35-44, 45-54, 55-64, 65+	2020 5-year ACS ^a group(B26101), state; direct
Age in years category (3), county	18-34, 35-64, 65+ by all 55 counties	2020 5-year ACS group(B09021), county; direct
Age in years category (6), regional	18-24, 25-34, 35-44, 45-54, 55-64, 65+ by all 4 Medical Services Regions, by all 6 Behavioral Health Regions, and by all 7 Ryan Brown Fund Regions	2020 5-year ACS group(B01001), county; calibrated at county level using B26101 and B09021 totals
Birth sex, county	Male, Female by all 55 counties	2020 5-year ACS group(B01001), county; calibrated at county level using B26101 state and B09021 county totals
GC ^b Proportion of buildings in CBG ^c consisting of a single unit, state	proportion < 0.847, 0.847 ≤ proportion < 1, proportion = 1	2020 5-year ACS group(B25032), CBG; counts came from B09021 at CBG level
GC Proportion of households in CBG without internet access, state	proportion < 0.0865, 0.0865 ≤ proportion ≤ 0.2444, proportion > 0.2444	2020 5-year ACS group(B28002), CBG; counts came from B09021 at CBG level
GC Poverty rate in CBG, regional	Poverty rate < 0.0692, 0.0692 ≤ poverty rate ≤ 0.2391, poverty rate > 0.2391 by all 4 Medical Services Regions, by all 6 Behavioral Health Regions, and by all 7 Ryan Brown Fund Regions	2020 5-year ACS group(B17021), CBG; counts came from B09021 at CBG level
Race/ethnicity, regional	White alone non-Hispanic, non-White alone or Hispanic by all 4 Medical Services Regions, by all 6 Behavioral Health Regions, and by all 7 Ryan Brown Fund Regions	2020 5-year ACS group(B01001), census tract and 2020 5-year ACS group(B01001H), census tract; rescaled at census tract level with B09021
Educational level, regional	Less than high school, high school/GED ^d to associates, bachelor's degree or more by all 4 Medical Services Regions, by all 6 Behavioral Health Regions, and by all 7 Ryan Brown Fund Regions	2020 5-year ACS group(B15001), census tract; rescaled at census tract level with B09021
GC Proportion of 19-64 population in CBG	proportion < 0.0957, 0.0957 ≤ proportion ≤ 0.2865, proportion > 0.2865 by all 4 Medical Services	2020 5-year ACS group(B27010), CBG; counts came from B09021 at CBG level

Population Characteristic	Definition	Main Source
on Medicaid, regional	Regions, by all 6 Behavioral Health Regions, and by all 7 Ryan Brown Fund Regions	
GC Proportion of 19-64 population in CBG without insurance, state	proportion < 0.0370, 0.0370 ≤ proportion ≤ 0.1294, proportion > 0.1294	2020 5-year ACS group(B27010), CBG; counts came from B09021 at CBG level
GC Proportion of households in CBG without a computer, regional	proportion < 0.0605, 0.0605 ≤ proportion ≤ 0.1902, proportion > 0.1902 by all 4 Medical Services Regions, by all 6 Behavioral Health Regions, and by all 7 Ryan Brown Fund Regions	2020 5-year ACS group(B28003), CBG; counts came from B09021 at CBG level
GC Proportion of housing units in CBG occupied by a renter, regional	proportion < 0.124, 0.124 ≤ proportion ≤ 0.337, proportion > 0.337 by all 4 Medical Services Regions, by all 6 Behavioral Health Regions, and by all 7 Ryan Brown Fund Regions	2020 5-year ACS group(B25003), CBG; counts came from B09021 at CBG level
GC Proportion of housing units in CBG vacant, regional	proportion < 0.0724, 0.0724 ≤ proportion ≤ 0.2194, proportion > 0.2194 by all 4 Medical Services Regions, by all 6 Behavioral Health Regions, and by all 7 Ryan Brown Fund Regions	2020 5-year ACS group(B25002), CBG; counts came from B09021 at CBG level
Participant on Medicaid, state	Yes, No	Medicaid Enrollment file, rescaled at county level using B01001 and B09021

Abbreviations: ACS, American Community Survey; GC, Geographic Characteristic; CBG, Census Block Group; GED, Graduate Equivalency Diploma

The resulting final analytic weights (WT_A) had a UWE of 2.43 at the state level and no UWE higher than 3.33 at the county level (Gilmer County). The full range of the weights was from 1.45 to 1289.24.

5.4 Estimation

MATCH used a complex survey design. As such, special procedures (e.g., SAS PROC SURVEYFREQ, SUDAAN PROC CROSSTAB, or SPSS Complex Survey Module) are required to properly calculate the standard error of estimates. This section details the approach for proper estimation and what is needed to implement the estimation procedure.

Estimation Approach

Estimates in the 2021 MATCH can be produced through two different estimation techniques: (1) Taylor series linearization (TSL), and (2) replication. Both approaches produce similar standard errors.

TSL is a computational procedure that uses the sampling design, including strata and clusters, to estimate standard errors. For clustered designs, standard errors are estimated from the standard error among clusters; for stratified designs, such as MATCH, standard errors are estimated within each stratum. TSL estimates a linear approximation of an estimate. A variance is estimated from the approximation using a Taylor Series expansion. More information about Taylor Series variance estimation for sample survey data is available in the standard references (see for example Woodruff 1971).¹¹⁻¹⁷

Replication allows users to account for the complex survey design when estimating variances without needing to know the design. For MATCH, the replication method used was delete-a-group jackknife (DAGJK). The DAGJK method for creating replicate weights was selected because it is more practical for situations when there are a small number of respondents within a stratum as the total number of replicates is not limited. Under DAGJK, a variance for a given estimate $\hat{\theta}$ is calculated from the replicate weights as:

$$Var(\hat{\theta}) = \frac{R-1}{R} \sum_{r=1}^R (\hat{\theta}_r - \hat{\theta})^2$$

where R is the number of replicates and $\hat{\theta}_r$ is the estimate based on the r^{th} replicate. For MATCH, the number of replicates was set at 30.¹⁸

To evaluate the quality of the replicate weights, we computed and compared replicate weight estimates with TSL estimates for variances corresponding to several key categorical outcomes in the MATCH survey. The comparison found there was no indication of systematic difference between the variance estimation methods which implies that either estimation method will lead to similar results.

What is Needed to Implement Approach

To calculate the TSL standard errors, the analyst needs the stratum identifiers, cluster identifiers, and analysis weights. The required variables for MATCH are the following:

- **WT_A:** analysis weight for adults
- **PSEUDOSTRATUM:** pseudostratification indicator

The cluster identifier in MATCH is the person (or record) identification variable. Depending on the software that is used to estimate standard errors, the cluster identifier may, or may not need to be explicitly defined.

6 Appendix A. ABS Sampling Materials

- A.1. Mailing 1 - Invitation Letter Envelope
- A.2. Mailing 1 - Invitation Letter
- A.3. Mailing 2 - Reminder Self-Mailer Postcard (ABS Respondent)
- A.4. Mailing 3 and 4 - PAPI Packet Envelope
- A.5. Mailing 3 - PAPI Packet Letter 1 (ABS Respondent)
- A.6. Mailing 4 - PAPI Packet Letter 2 (ABS Respondent)
- A.7. Mailing 3 and 4 - PAPI Form

A.1. Mailing 1 – Invitation Letter Envelope



A.2. Mailing 1 – Invitation Letter



Keep the \$2,
as a thank you
for your help.

Dear [IF ABS = West Virginia Resident / IF MEDICAID = %FIRST NAME%],

I am writing to ask for your help in understanding the health needs of West Virginians. As a thank you, we will send you \$10 after you complete your survey.

[IF ABS = To make sure we hear from West Virginians from different backgrounds, please ask the adult (**age 18 or over**) in your household with **the most recent birthday** to complete the survey. If this person cannot complete the survey, someone who knows about their health may complete the survey for them. / IF MEDICAID = To make sure we hear from West Virginians from different backgrounds, please take the time to complete the survey. If you are unable to complete the survey yourself, please ask someone in your household who knows about your health to complete the survey for you.]

To complete the survey:

1. Type this web address into your browser: www.TakeMATCHSurvey.org

Or scan this QR code:



2. Then enter your Access Code: [#####]

For assistance completing online or to answer the survey by phone, call us toll-free: 877-267-2909.

If you have questions, please contact me at 304-581-1928 or WVMATCHsurvey@hsc.wvu.edu.

By taking a few minutes to share information about your health, you will be helping us improve the health care provided to West Virginians.

Many Thanks,

A handwritten signature in cursive script that reads 'Summer Hartley'.

Summer Hartley, PhD, RN
Assistant Vice President
WVU Office of Health Affairs

A.3. Mailing 2 - Reminder Self-Mailer Postcard (ABS Respondent)





HEALTH AFFAIRS



Dear West Virginia Resident,

In recent weeks, our team has asked you and other West Virginians to take a survey about your health. We plan to start reviewing the results later this month and hope to receive your response by then.

Please ask the adult (**age 18 or over**) with the **most recent birthday** to complete the survey in one of 3 ways:



Web address: www.TakeMATCHSurvey.org
or scanning the **QR code below**, and entering the following access code: **[PIN here in bold red font]**



If you prefer, you may call us toll-free to complete the survey by phone: **877-267-2909**.

Para completar la encuesta en español, llame al **877-267-2909**.



You may also respond by mailing back the survey we sent previously.

By completing this survey, you are helping us to understand the health needs of West Virginians to improve the health of people in our communities. Your answers to questions will be confidential. Taking, or not taking, the survey will not change any state benefits you may be eligible to receive now or in the future.

This is the last time we will contact you about this survey.

If you have any questions, please contact me at **304-581-1928** or WVMATCHsurvey@hsc.wvu.edu

Thank you for considering our request.

Respectfully,

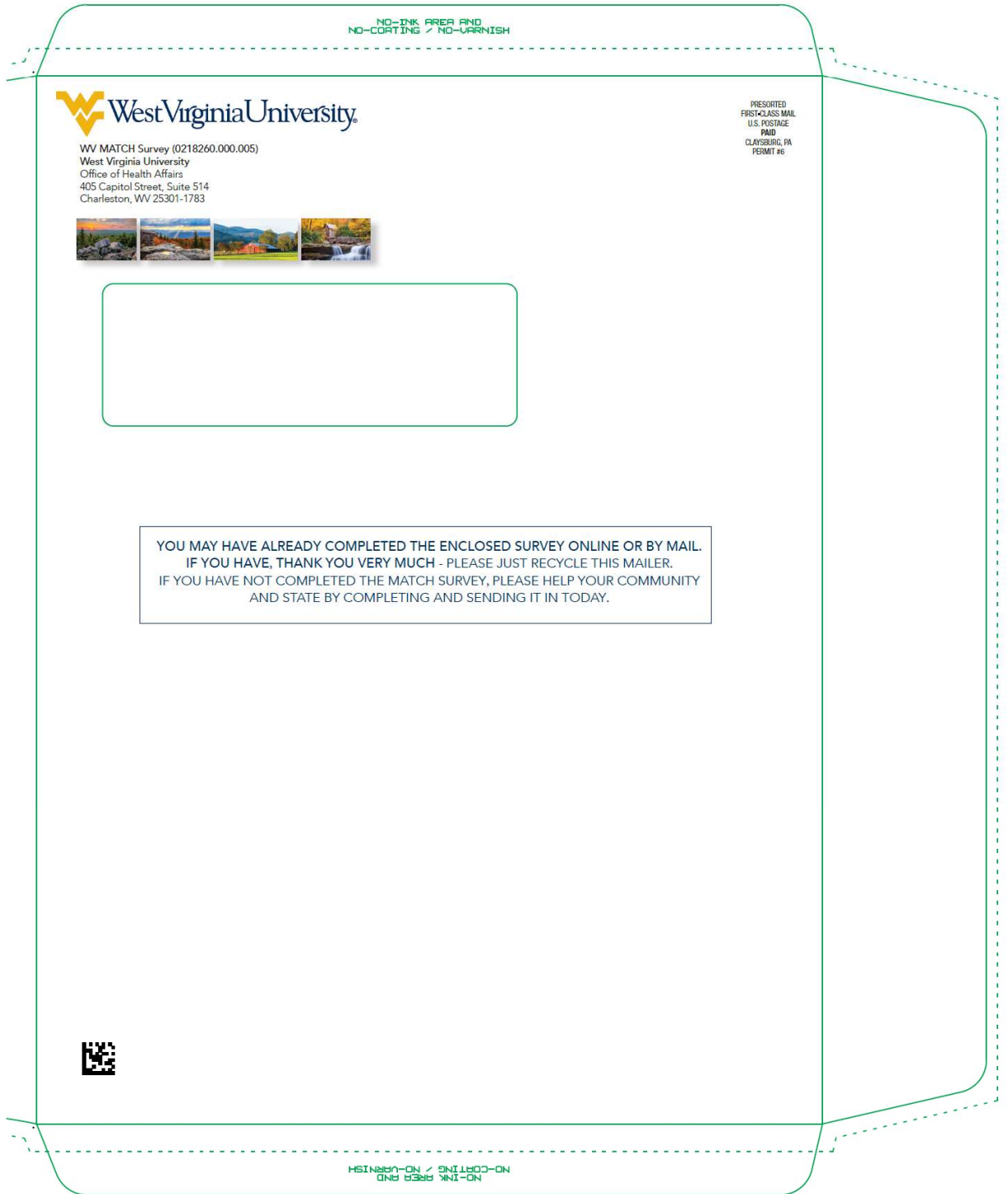
Summer Hartley

Summer Hartley, PhD, RN
Assistant Vice President
WVU Office of Health Affairs



 HEALTH AFFAIRS

A.4. Mailing 3 and 4 - PAPI Packet Envelope



A.5. Mailing 3 - PAPI Packet Letter 1 (ABS Respondent)



Dear West Virginia Resident,

West Virginia faces many health challenges including high rates of overdose death and disability, and chronic health issues. We cannot improve these issues without your help.

A couple weeks ago we invited you to take a survey. It is important that each selected household completes this survey, so that every county in West Virginia is represented. We hope the adult (**age 18 or over**) in your household with the **most recent birthday** will take the survey soon. If that person cannot complete the survey, then someone who knows about their health may complete it for them.


Please complete the survey in one of two ways:

MAIL

Complete the enclosed paper survey and mail it back in the postage paid envelope.

ONLINE

1. Type this web address into your browser: www.TakeMATCHSurvey.org

Or scan this QR code: 

2. Then enter your Access Code: [#####]

For assistance completing online or to answer the survey by phone, call us toll-free: 877-267-2909.

If you have any questions, please contact me at 304-581-1928 or WVMATCHsurvey@hsc.wvu.edu.

As a thank you, we will send you \$10, after receiving your survey. Thank you for your help with this very important issue.

Many Thanks,

A handwritten signature in cursive script that reads 'Summer Hartley'.

Summer Hartley, PhD, RN
Assistant Vice President
WVU Office of Health Affairs

A.6. Mailing 4 - PAPI Packet Letter 2 (ABS Respondent)



Dear West Virginia Resident,

In recent weeks, our team has asked you and other West Virginians to take a survey about your health. The survey findings will be used to improve health care in West Virginia. We plan to start reviewing the results later this month and hope to receive your response by then.

Please ask the adult (**age 18 or over**) in your household with the **most recent birthday** to take the survey soon. If that person cannot complete the survey, then someone who knows about their health may complete it for them.


You may choose whether to respond by mail or online:

MAIL

Complete the enclosed paper survey and mail it back in the postage paid envelope.

ONLINE

1. Type this web address into your browser: www.TakeMATCHSurvey.org

Or scan this QR code: 

2. Then enter your Access Code: [\[#####\]](#)

For assistance completing online or to answer the survey by phone, call us toll-free: 877-267-2909.

If you have any questions, please contact me at 304-581-1928 or WVMATCHsurvey@hsc.wvu.edu.

As a thank you, we will send you \$10, after receiving your survey. Thank you for considering our request.

Sincerely,

A handwritten signature in black ink that reads 'Summer Hartley'.

Summer Hartley, PhD, RN
Assistant Vice President
WVU Office of Health Affairs



Mountain State Assessment of Trends in Community Health



WVU Health Affairs is asking for your help in completing a health survey that will help West Virginians receive the health care they need

In partnership with WV DHHR and WVU Health Affairs

7 Appendix B. Response Rate

For tables B-1 to B-5, RR = response rate. The ABS lower is AAPOR RR2 and upper is AAPOR RR6. The rate reported for Medicaid is RR2. The county and region assignment were from the initial geocoding.

Appendix Table B-1. Response Rates and Control Totals by Region1 (WV DHHR Bureau for Medical Services Regions)

Region1	Frame RR, %		
	ABS Bound		Medicaid
	Lower	Upper	
1	21.0	22.4	22.0
2	16.3	17.8	18.0
3	21.7	23.1	21.0
4	18.8	21.4	21.1

Abbreviation: RR, Response rate; ABS, Address-Based Sample

Appendix Table B-2. Response Rates and Control Totals by Region2 (WV DHHR Bureau for Behavioral Health Regions)

Region2	Frame RR, %		
	ABS Bound		Medicaid
	Lower	Upper	
1	20.0	21.3	23.2
2	20.2	21.3	18.4
3	20.9	22.2	21.6
4	23.0	24.6	23.1
5	16.1	17.7	17.7
6	19.5	22.2	21.6

Abbreviation: RR, Response rate; ABS, Address-Based Sample

Appendix Table B-3. Response Rates and Control Totals by Region3 (WV DHHR Bureau for Behavioral Health Ryan Brown Fund Regions)

Region3	Frame RR, %		
	ABS Bound		Medicaid
	Lower	Upper	
1	20.0	21.3	23.2
2	20.2	21.3	18.4
3	21.0	22.4	20.9
4	23.0	24.6	23.1
5	15.0	16.4	18.6
6	19.3	22.1	20.8
7	18.7	20.5	19.1

Abbreviation: RR, Response rate; ABS, Address-Based Sample

Appendix Table B-4. Response Rates and Control Totals by County

County	Frame RR, %		
	ABS Bound		Medicaid
	Lower	Upper	
Barbour	20.5	24.1	17.6
Berkeley	17.3	17.9	16.1
Boone	13.6	14.7	17.0
Braxton	24.6	28.2	22.4
Brooke	20.0	22.2	15.0
Cabell	14.4	16.1	18.6
Calhoun	24.9	25.8	17.4
Clay	18.3	21.8	14.8
Doddridge	22.2	23.6	15.6
Fayette	18.9	20.6	25.1
Gilmer	26.0	27.6	28.4
Grant	21.9	22.9	29.0
Greenbrier	20.6	22.9	20.6
Hampshire	20.2	21.0	26.1
Hancock	17.4	18.1	22.7
Hardy	21.8	23.0	19.2
Harrison	22.2	23.6	23.3
Jackson	20.5	21.6	20.8
Jefferson	20.4	20.8	16.3
Kanawha	17.8	19.4	16.3
Lewis	22.6	24.2	27.1
Lincoln	18.5	19.3	21.4
Logan	13.1	15.3	16.3
Marion	21.3	22.3	24.7
Marshall	21.0	21.7	23.3
Mason	16.6	17.6	23.1
McDowell	10.3	15.3	18.3
Mercer	17.8	19.6	20.8
Mineral	24.7	26.3	18.4
Mingo	10.2	11.7	16.0
Monongalia	22.1	23.5	20.1
Monroe	24.4	26.3	25.2
Morgan	19.8	20.5	15.6
Nicholas	21.9	24.2	24.6
Ohio	20.5	21.9	22.7
Pendleton	21.7	25.3	22.4

County	Frame RR, %		
	ABS Bound		Medicaid
	Lower	Upper	
Pleasants	20.8	21.6	13.3
Pocahontas	24.1	27.1	25.3
Preston	25.9	26.6	27.6
Putnam	18.3	19.6	22.1
Raleigh	16.3	18.1	20.4
Randolph	20.3	21.7	23.6
Ritchie	20.6	23.2	28.3
Roane	20.2	21.1	27.3
Summers	21.2	23.6	24.2
Taylor	23.6	24.9	20.0
Tucker	26.6	29.6	27.3
Tyler	21.0	22.1	13.3
Upshur	24.6	25.2	22.5
Wayne	13.9	14.8	17.6
Webster	25.4	27.6	25.2
Wetzel	21.3	22.8	26.8
Wirt	19.9	23.4	20.6
Wood	20.4	21.2	21.8
Wyoming	16.8	21.6	17.5

Abbreviation: RR, Response rate; ABS, Address-Based Sample

Appendix Table B-5. Response Rates by Survey Strata

Strata	Frame	Frame RR, %		
		ABS Bound		Medicaid, %
		Lower	Upper	
Barbour	ABS	17.0	19.9	—
Barbour_LowInc	ABS	21.8	25.7	—
Berkeley_LowAA	ABS	17.2	17.5	—
Berkeley_HighAA	ABS	18.2	18.9	—
Berkeley_HighAA_LowInc	ABS	16.7	17.5	—
Boone	ABS	15.1	16.2	—
Boone_LowInc	ABS	13.4	14.6	—
Braxton	ABS	24.2	28.5	—
Braxton_LowInc	ABS	25.4	27.7	—
Brooke	ABS	20.0	22.2	—
Cabell_LowAA	ABS	19.1	20.0	—
Cabell_LowAA_LowInc	ABS	14.2	16.0	—
Cabell_HighAA	ABS	10.7	12.0	—
Cabell_HighAA_LowInc	ABS	12.0	13.9	—
Calhoun	ABS	26.7	27.4	—
Calhoun_LowInc	ABS	23.2	24.2	—
Clay	ABS	19.2	22.6	—
Clay_LowInc	ABS	16.2	19.7	—
Doddridge	ABS	22.2	23.6	—
Fayette	ABS	19.6	21.4	—
Fayette_LowInc	ABS	18.4	20.0	—
Gilmer	ABS	24.3	25.8	—
Gilmer_LowInc	ABS	26.2	27.9	—
Grant	ABS	23.2	24.2	—
Grant_LowInc	ABS	19.1	20.1	—
Greenbrier	ABS	22.1	23.7	—
Greenbrier_LowInc	ABS	19.0	22.0	—
Hampshire	ABS	20.2	21.0	—
Hancock	ABS	17.7	18.3	—
Hancock_LowInc	ABS	16.9	17.8	—
Hardy	ABS	21.8	23.0	—
Harrison	ABS	22.2	23.6	—
Jackson	ABS	24.5	25.5	—
Jackson_LowInc	ABS	19.3	20.4	—
Jefferson_LowAA	ABS	20.3	20.7	—
Jefferson_HighAA	ABS	21.0	21.7	—
Kanawha_LowAA	ABS	18.8	20.0	—
Kanawha_LowAA_LowInc	ABS	16.8	18.3	—

Strata	Frame	Frame RR, %		
		ABS Bound		Medicaid, %
		Lower	Upper	
Kanawha_HighAA	ABS	19.7	21.8	—
Kanawha_HighAA_LowInc	ABS	16.8	19.1	—
Lewis	ABS	20.9	22.6	—
Lewis_LowInc	ABS	24.3	25.8	—
Lincoln	ABS	17.9	18.9	—
Lincoln_LowInc	ABS	18.8	19.5	—
Logan	ABS	13.7	16.1	—
Logan_LowInc	ABS	12.1	14.0	—
McDowell_LowAA	ABS	10.5	14.5	—
McDowell_LowAA_LowInc	ABS	8.7	11.0	—
McDowell_HighAA	ABS	7.5	13.0	—
McDowell_HighAA_LowInc	ABS	11.6	19.8	—
Marion	ABS	23.4	24.3	—
Marion_LowInc	ABS	17.2	18.4	—
Marshall	ABS	23.2	23.8	—
Marshall_LowInc	ABS	17.7	18.5	—
Mason	ABS	18.7	19.7	—
Mason_LowInc	ABS	14.1	15.1	—
Mercer	ABS	22.4	23.8	—
Mercer_LowInc	ABS	17.2	19.1	—
Mineral	ABS	24.7	26.3	—
Mingo	ABS	11.3	13.8	—
Mingo_LowInc	ABS	9.7	10.9	—
Monongalia_LowAA	ABS	25.3	26.2	—
Monongalia_LowAA_LowInc	ABS	20.5	22.1	—
Monongalia_HighAA	ABS	24.8	25.4	—
Monongalia_HighAA_LowInc	ABS	18.6	20.9	—
Monroe	ABS	24.4	26.3	—
Morgan	ABS	19.8	20.5	—
Nicholas	ABS	21.9	24.2	—
Ohio	ABS	20.9	21.8	—
Ohio_LowInc	ABS	20.0	22.1	—
Pendleton	ABS	21.7	25.3	—
Pleasants	ABS	20.8	21.6	—
Pocahontas	ABS	24.1	27.1	—
Preston	ABS	25.9	26.6	—
Putnam	ABS	18.3	19.6	—
Raleigh_LowAA	ABS	15.1	16.3	—
Raleigh_LowAA_LowInc	ABS	16.7	18.3	—

Strata	Frame	Frame RR, %		
		ABS Bound		Medicaid, %
		Lower	Upper	
Raleigh_HighAA	ABS	15.8	18.9	—
Randolph	ABS	22.7	24.5	—
Randolph_LowInc	ABS	18.8	20.0	—
Ritchie	ABS	20.6	23.2	—
Roane	ABS	17.1	17.6	—
Roane_LowInc	ABS	21.3	22.3	—
Summers	ABS	23.5	26.7	—
Summers_LowInc	ABS	20.9	23.2	—
Taylor	ABS	23.6	24.9	—
Tucker	ABS	26.6	29.6	—
Tyler	ABS	22.6	23.2	—
Tyler_LowInc	ABS	20.4	21.7	—
Upshur	ABS	24.0	24.9	—
Upshur_LowInc	ABS	24.8	25.3	—
Wayne	ABS	17.9	18.8	—
Wayne_LowInc	ABS	12.2	13.0	—
Webster	ABS	28.4	31.3	—
Webster_LowInc	ABS	22.7	24.4	—
Wetzel	ABS	20.2	22.0	—
Wetzel_LowInc	ABS	24.0	24.8	—
Wirt	ABS	19.9	23.4	—
Wood	ABS	21.0	21.7	—
Wood_LowInc	ABS	19.9	20.8	—
Wyoming	ABS	13.8	19.0	—
Wyoming_LowInc	ABS	17.1	21.9	—
Barbour	Medicaid	--	--	17.6
Berkeley_White	Medicaid	--	--	19.2
Berkeley_NonWhite	Medicaid	--	--	14.4
Boone	Medicaid	--	--	17.0
Braxton	Medicaid	--	--	22.4
Brooke	Medicaid	--	--	15.0
Cabell_White	Medicaid	--	--	18.7
Cabell_NonWhite	Medicaid	--	--	18.4
Calhoun	Medicaid	--	--	17.4
Clay	Medicaid	--	--	14.8
Doddridge	Medicaid	--	--	15.6
Fayette	Medicaid	--	--	25.1
Gilmer	Medicaid	--	--	28.4
Grant	Medicaid	--	--	29.0

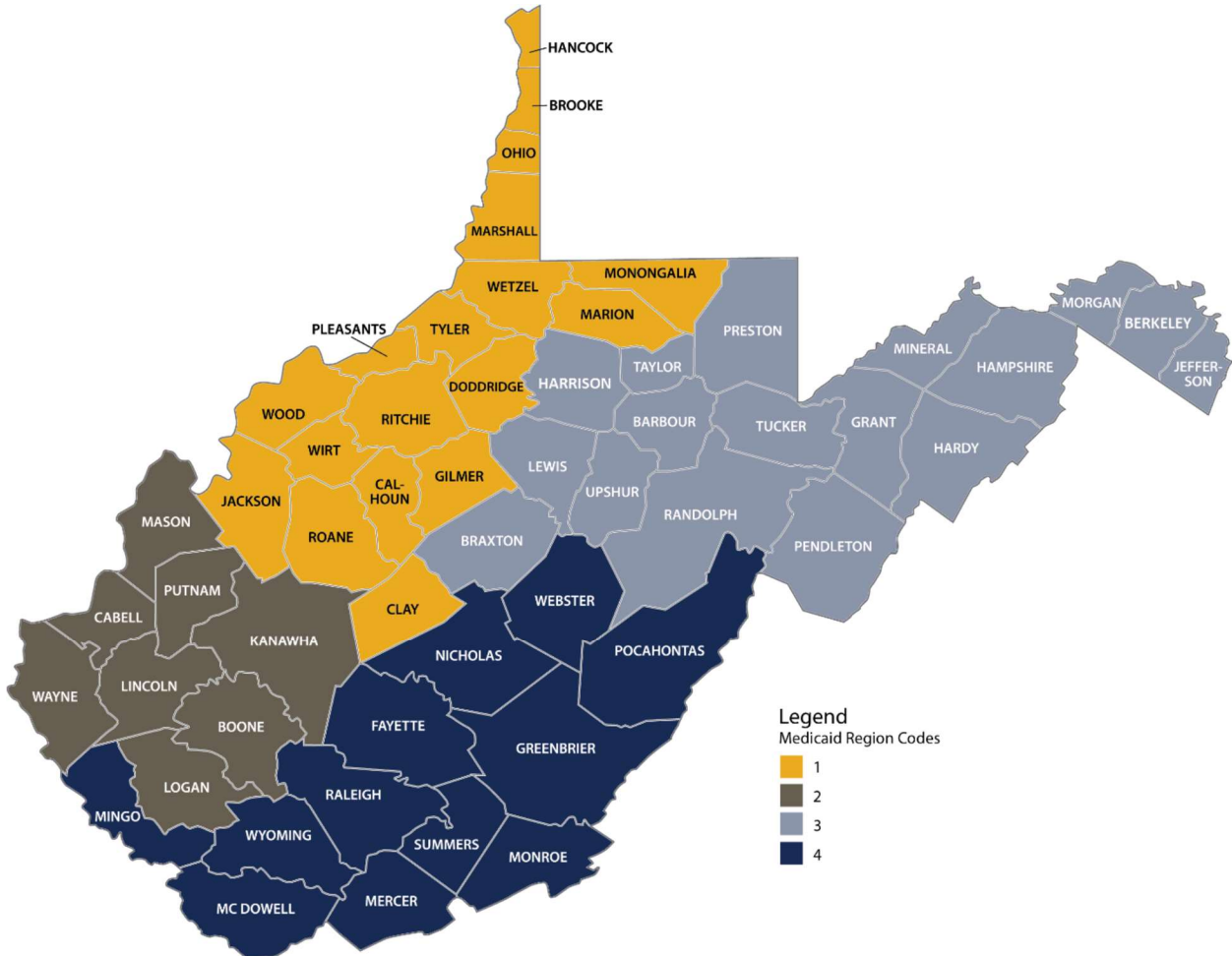
Strata	Frame	Frame RR, %		
		ABS Bound		Medicaid, %
		Lower	Upper	
Greenbrier	Medicaid	--	--	20.6
Hampshire	Medicaid	--	--	26.1
Hancock	Medicaid	--	--	22.7
Hardy	Medicaid	--	--	19.2
Harrison	Medicaid	--	--	23.3
Jackson	Medicaid	--	--	20.8
Jefferson_White	Medicaid	--	--	16.7
Jefferson_NonWhite	Medicaid	--	--	16.1
Kanawha_White	Medicaid	--	--	17.4
Kanawha_NonWhite	Medicaid	--	--	15.8
Lewis	Medicaid	--	--	27.1
Lincoln	Medicaid	--	--	21.4
Logan	Medicaid	--	--	16.3
Marion	Medicaid	--	--	24.7
Marshall	Medicaid	--	--	23.3
Mason	Medicaid	--	--	23.1
Mercer	Medicaid	--	--	20.8
Mineral	Medicaid	--	--	18.4
Mingo	Medicaid	--	--	16.0
Monongalia_White	Medicaid	--	--	23.5
Monongalia_NonWhite	Medicaid	--	--	14.4
Monroe	Medicaid	--	--	25.2
Morgan	Medicaid	--	--	15.6
McDowell_White	Medicaid	--	--	19.5
McDowell_NonWhite	Medicaid	--	--	17.0
Nicholas	Medicaid	--	--	24.6
Ohio	Medicaid	--	--	22.7
Pendleton	Medicaid	--	--	22.4
Pleasants	Medicaid	--	--	13.3
Pocahontas	Medicaid	--	--	25.3
Preston	Medicaid	--	--	27.6
Putnam	Medicaid	--	--	22.1
Raleigh_White	Medicaid	--	--	20.4
Raleigh_NonWhite	Medicaid	--	--	20.4
Randolph	Medicaid	--	--	23.6
Ritchie	Medicaid	--	--	28.3
Roane	Medicaid	--	--	27.3
Summers	Medicaid	--	--	24.2
Taylor	Medicaid	--	--	20.0

Strata	Frame	Frame RR, %		
		ABS Bound		Medicaid, %
		Lower	Upper	
Tucker	Medicaid	--	--	27.3
Tyler	Medicaid	--	--	13.3
Upshur	Medicaid	--	--	22.5
Wayne	Medicaid	--	--	17.6
Webster	Medicaid	--	--	25.2
Wetzel	Medicaid	--	--	26.8
Wirt	Medicaid	--	--	20.6
Wood	Medicaid	--	--	21.8
Wyoming	Medicaid	--	--	17.5

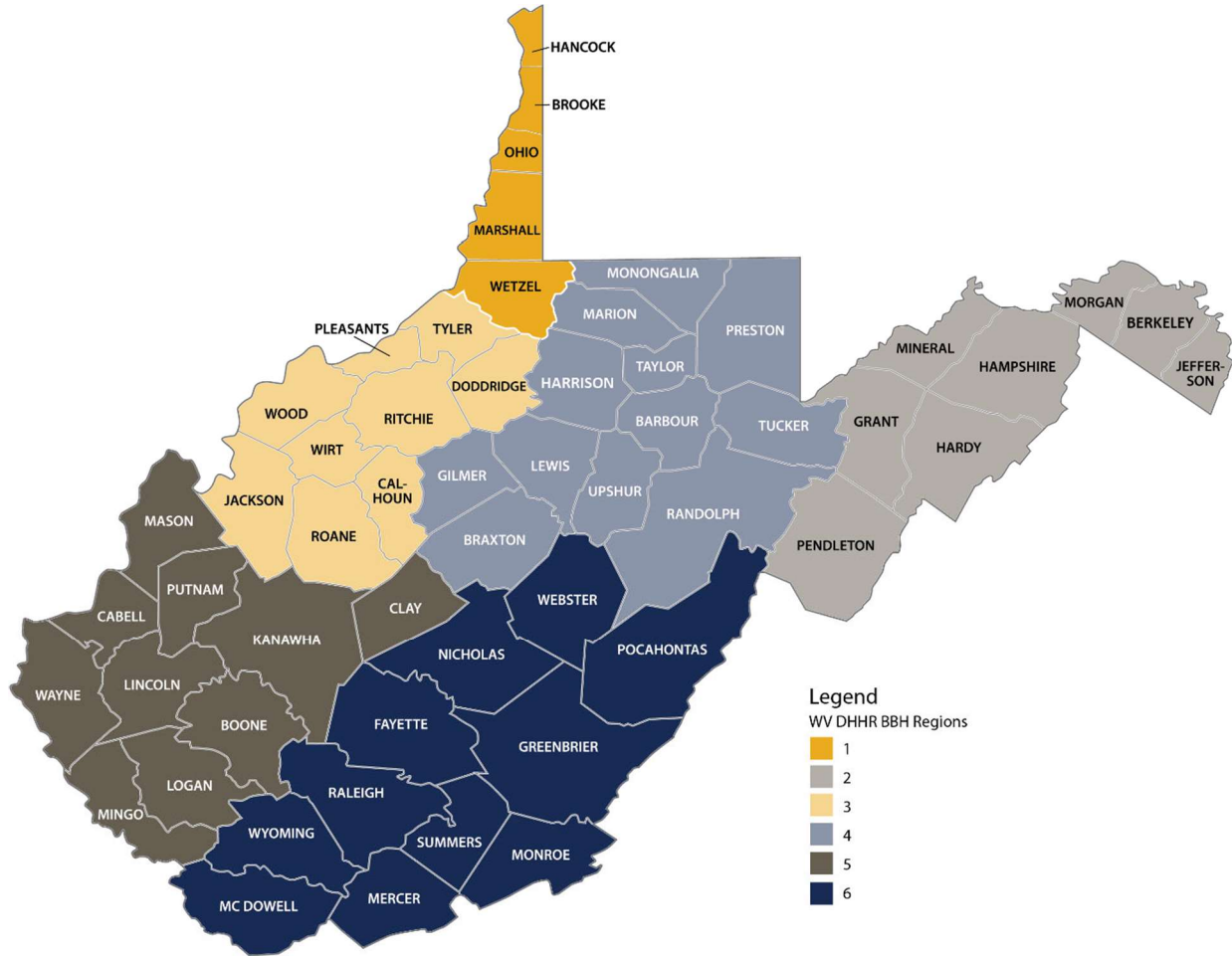
Abbreviation: RR, Response rate; ABS, Address-Based Sample

8 Appendix C. Maps

Appendix Figure C: 1 Medical Services Regions



Appendix Figure C: 2 Behavioral Health Regions



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