**Design Document and Analysis Plan**

Project Name: Outreach and Maintenance of Medicaid Enrollment: Evidence from Wisconsin’s Navigator Program

Date of Pre-Analysis Plan: November 22, 2022

This document serves as a basis for distinguishing between planned (confirmatory) analysis and any unplanned (exploratory) analysis that might be conducted on project data. Documenting these planned analyses is crucial to ensuring that the results of statistical tests will be properly interpreted and reported. For the Analysis Plan to fulfill this purpose, it is essential that it be finalized and date-stamped before we begin looking at outcome data.

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**1. Project Objective and Research Questions**

***Overview and Project Objective.*** For many government safety net programs, beneficiaries must regularly demonstrate eligibility to avoid losing benefits. The objective of this field experiment is to identify the effect of outreach strategy on beneficiaries’ maintenance of Medicaid enrollment. The topic is timely because an upcoming policy change after the end of the COVID-19 public health emergency (PHE) will increase demonstration of eligibility requirements for Medicaid beneficiaries nationwide. The experimental population includes an estimated 168,000 cases (members of a household who applied for Medicaid together) in Wisconsin enrolled in fee-for-service Medicaid who must renew or lose their coverage after the end of the public health emergency. The implementing organization is Covering Wisconsin, the navigator organization contracted by the Wisconsin Department of Health Services to conduct outreach to these beneficiaries. Experimental arms will vary the modality of outreach, content of the outreach, number of outreach messages, and use of an address and phone number updating service prior to outreach. This research will identify novel, scalable outreach methods to help low-income people maintain access to benefits.

***Research Questions.*** The research questions are as follows:

1. What are the enrollment and application impacts of sending Medicaid enrollees text messages, postcards, or outbound calls to connect them with assistance? What impact does this have on the composition of enrollees?
2. How does modality of assistance offered (connecting with a chatbot via text vs. speaking with an assister by telephone) impact application rates, enrollment rates, and the composition of enrollees?
3. How does a second reminder message impact enrollment and application rates and the composition of enrollees?
4. While these interventions are designed to increase continuity of Medicaid enrollment, are there spillover impacts on secondary outcomes such as workforce participation and SNAP enrollment?
5. How will using an address and phone number updating service prior to outreach impact enrollment and application rates and the composition of enrollees?

**2. Evaluation Design**

**2.1 Overview**

This field experiment will test methods to increase maintenance of Medicaid enrollment by connecting beneficiaries with navigators, a group of professionals publicly funded since 2014 to help consumers enroll in coverage.1 The intervention will be implemented by Covering Wisconsin, a navigator grantee with a staff of more than a dozen professional assisters. Covering Wisconsin was contracted by the Wisconsin Department of Health Services (DHS) to conduct outreach to fee-for-service Medicaid beneficiaries after the end of the PHE.

As detailed further below in section 2.4, the intervention arms will vary the modality of outreach, number of outreach messages, content of the outreach, and use of an address and phone number updating service prior to outreach. These interventions will be repeated after the renewal window closes for people who lost their coverage. All beneficiaries will also be sent standard outreach messages by Wisconsin DHS.

Wisconsin administrative data will be used to measure the application rates and maintenance of Medicaid enrollment over the 12 months following each case group’s redetermination deadline, as well as changes in the composition of Medicaid enrollees after the redetermination deadlines have passed. See section 3.1 for a detailed description of the data.

**2.2 Background on Medicaid redetermination**

Each year, millions of low-income individuals must demonstrate their eligibility for safety net programs to avoid losing their benefits.2,3While the goal of this requirement is to restrict benefit receipt to those who are eligible, the associated time and hassle costs mean many eligible individuals do not complete the required processes. Compliance costs reduce benefit receipt across a range of safety net programs.4–10 Data from Illinois suggest that 80% of people disenrolled from Medicaid lost their coverage because they did not return the requested information.11

An upcoming policy change will increase demonstration of eligibility requirements for the Medicaid program, placing beneficiaries at risk of losing coverage.12During the COVID-19 public health emergency (PHE), the federal government’s maintenance of eligibility meant that states did not require Medicaid beneficiaries demonstrate their eligibility regularly, because they generally could not be disenrolled.13 During this period, Medicaid enrollment increased by 25% nationally.14–16 Once the PHE ends, states will have 14 months to redetermine the eligibility of their entire caseload of Medicaid beneficiaries.17 It is estimated that 16 million people nationwide will lose Medicaid coverage during this process, even though Wisconsin data suggest that 90% of beneficiaries will still be Medicaid eligible.3,14 High rates of address and phone number churn among beneficiaries may contribute to coverage losses. In 2010, 18% of SNAP cases experienced a change of address, and only 3% of those with an address change successfully recertified.18 Contact information was disrupted more often among SNAP recipients without stable housing, contributing to higher rates of churn and missed recertification.18

The majority of people disenrolled from Medicaid do not transition to another identified insurance and become uninsured.20,21 Losing Medicaid reduces access to care and raises the risk of impoverishment due to medical debt.22–26 Despite evidence on the impacts of outreach on new Medicaid enrollment, little is known on how to support maintenance of enrollment.27,28 In Centers for Medicare and Medicaid Services materials for states about the PHE Medicaid policy, there is limited guidance on outreach to enrollees during the redetermination process.29 To avoid loss of coverage among eligible individuals, it is crucial to identify strategies to help enrollees complete redetermination.

**2.3 Study Sample**

The study population includes all fee-for-service Medicaid beneficiaries in Wisconsin, except those who prefer a language other than English or Spanish, who lack any phone number, or who are missing a mailing address.

***Total Number of Observations.*** According to data from Wisconsin DHS and Covering Wisconsin, phone numbers are missing for only 4% of the fee-for-service Medicaid population and the experimental population will include 224,000 beneficiaries, about 25% of whom prefer Spanish. Our analysis of data from Wisconsin fee-for-service Medicaid enrollees found a case to individual ratio of 0.75, suggesting there will be 168,000 cases (members of a household who applied for Medicaid together).

**2.4 Treatment Arms**

The experimental arms will vary the modality of the outreach (postcard or text message, in some cases supplemented with an outbound call), content of the outreach (encouraging a call to a hotline vs. encouraging a text message that connects them with a chatbot) offered, the number of outreach messages (1 vs. 2), and the use of an address and phone number updating service prior to outreach to beneficiaries whose redetermination window begins each month. Sample message content of the messages is as follows, with the bracketed Call to Action text varying across arms: “Hi, this is nonprofit Covering WI, for the WI Dept of Health Services. Time to renew your BadgerCare or Medicaid! To get free, local help, [*Call to Action*] or visit www.coveringwi.org. STOP to end.”

The outreach treatment arms will be as follows:

*Postcard Arms:*

*Arm A:*These consumers will be sent a postcard inviting them to speak with an assister by calling a hotline. The Call-to-Action text will be “call ###.”

*Arm B:*These consumers will be sent the same postcard as arm A. They will also be placed on a waitlist to potentially receive an outbound call.

*Text Message Arms with Hotline Call to Action:*

*Arm C:*These consumers will be sent a text message inviting them to speak with an assister by calling a hotline. The Call-to-Action text will be “call ###.”

*Arm D:* These consumers will be sent the same text message as in arm C. They will also be sent a second reminder message two weeks after the initial message.

*Arm E:* These consumers will be sent the same text message as in arm C. They will also be placed on a waitlist to receive an outbound call.

*Arm F:* These consumers will be sent the same text message as in arm C. They will also be placed on a waitlist to receive an outbound call *and* sent a second reminder message two weeks after the initial message.

*Text Message Arms with Text Call to Action:*

**Arm G:** These consumers will be sent a text message inviting them to send a reply by text, which will connect them with a chatbot. The Call-to-Action text will be “text COVER to 920-###-####.”

*Arm H:* These consumers will be sent the same text message as in arm G. They will also receive a second reminder message two weeks after the first.

*Arm I:*These consumers will be sent the same text message as in arm G. They will also be placed on a waitlist to receive an outbound call.

*Arm J:* These consumers will be sent the same text message as in arm G. They will also receive a second reminder message *and* be placed on a waitlist to receive an outbound call.

*Address Updating.* An address updating service will be used to refresh address and phone numbers for 50% of the study sample.

*Second Round of Outreach.* There will be a second round of randomization for people who lost their Medicaid coverage because of the redetermination process. These consumers will receive a message such as the following: “Hi, this is nonprofit Covering WI, for the WI Dept of Health Services. Lost your health insurance? To get free, local help, [*Call to Action*] or visit coveringwi.org. STOP to end.” As in the first round of outreach, these consumers will be randomly assigned into treatment arms that vary modality of the outreach (postcard or text message, in some cases supplemented with an outbound call), content of the outreach (encouraging a call to a hotline vs. encouraging a text message that connects them with a chatbot) offered, the number of outreach messages (1 vs. 2), and use of an address and phone number updating service prior to outreach.

***Assignment Process.*** Assignment to treatment arms A through J and the address updating arm will occur monthly over the 12-month period after the conclusion of the PHE, to ensure each beneficiary receives outreach at the beginning of their two-month redetermination window assigned by the state. Each month, Wisconsin DHS will provide Covering Wisconsin a list of the beneficiaries whose redetermination window begins. Randomization for people in each group of monthly renewals will be clustered by case (e.g., members of a household who applied for Medicaid together) to address potential spillovers.

40% of cases will be assigned to be sent a postcard, and the remaining 60% of cases will be assigned to the text message arms, with 30% receiving a message with a text message call to action and 30% receiving a message with a hotline call to action. In addition, 30% of the full sample (10% of the group assigned to a postcard and 5% of each group assigned to a text message) will be placed on the waitlist to potentially receive an outbound call. Finally, as noted above, an address updating service will be used to refresh address and phone numbers for 50% of the study sample.

Randomization will be stratified by preferred language of the primary person on the case, Medicaid eligibility categories defined at the case level at baseline,[[1]](#footnote-1) whether there are enrolled adults over 50 or enrolled children in the case at baseline, rural/urban residency of the primary person on the case,[[2]](#footnote-2) race/ethnicity, and tribal membership of the primary person on the case; for each stratification variable, missing data will be its own stratification category. The consumers to receive address updating will be selected using stratified randomization, with additional stratification by outreach arm. Outreach messages will be sent to the primary individual on each case.

Tables 1 and 2 show the number of cases in each outreach arm for individuals due for Medicaid redetermination.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table 1. Assignment of Beneficiaries to Outreach Arms** | | | | | |
| Original Treatment Arms | Not Placed on Outbound Call Waitlist | | Placed on Outbound Call Waitlist | |
| Outreach Method of Encouragement |
| Phone and Address Updating | No Phone and Address Updating | Phone and Address Updating | No Phone and Address Updating |
| Postcard | Arm A (15%)  ~25,200 cases | Arm A (15%)  ~25,200 cases | Arm B (5%)  ~8,400 cases | Arm B (5%)  ~8,400 cases |
| Text message encouraging the recipient to connect with an assister by calling a hotline. (Call to Action: “call ###”) | Arm C: (5%)  ~8,400 cases | Arm C: (5%)  ~8,400 cases | Arm E: (2.5%)  ~4,200 cases | Arm E: (2.5%)  ~4,200 cases |
| Text message encouraging the recipient to send a text message, which leads to a chatbot. (Call to Action: “text ###”) | Arm G: (5%)  ~8,400 cases | Arm G: (5%)  ~8,400 cases | Arm I: (2.5%)  ~4,200 cases | Arm I: (2.5%)  ~4,200 cases |
| Text message encouraging the recipient to connect with an assister by calling a hotline. (Call to Action: “call ###”) + reminder text message | Arm D: (5%)  ~8,400 cases | Arm D: (5%)  ~8,400 cases | Arm F: (2.5%)  ~4,200 cases | Arm F: (2.5%)  ~4,200 cases |
| Text message encouraging the recipient to send a text message, which leads to a chatbot. (Call to Action: “text ###”) + reminder text message | Arm H: (5%)  ~8,400 cases | Arm H: (5%)  ~8,400 cases | Arm J: (2.5%)  ~4,200 cases | Arm J: (2.5%)  ~4,200 cases |

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 2: Randomization Groups** | | | |
| Postcard (40%)  A & B | |  |  | | --- | --- | | No outbound call waitlist (30%)  B | Outbound call waitlist (10%)  A | | | |
| Text (60%)  C, D, E, F, G, H, I, J | |  | | --- | | Chatbot (30%)  G, H, I, J | | Hotline (30%)  C, D, E, F | | |  | | --- | | Reminder text (30%)  D, F, H, J | | No reminder text (30%)  C, E, G, I | | |  | | --- | | Outbound call waitlist (20%)  E, F, I, J | | No outbound call waitlist (40%)  C, D, G, H | |

As noted above, a second round of randomization will be conducted to determine outreach strategy for people who lost their Medicaid coverage during the redetermination process. Cases in this group will be assigned different outreach modalities, frequencies, content, and services using the same allocation process described above.

We anticipate that randomization to a treatment group will not perfectly determine which outreach a household ultimately receives, for several reasons. First, it will likely not be possible to place calls to the full outbound call waitlist due to capacity constraints, and thus not everyone on the outbound call waitlist will receive a call. Second, people in the postcard arm may not receive a postcard because the address is invalid or the mail is returned for another reason. Third, people in the text message arms might not receive a message because the number was a landline, or because the text message bounced. This information will be tracked as a part of the study, and we hypothesize that consumers with address and phone number updating prior to outreach will be more likely to receive their postcard or text message. In the statistical analysis described below, we will plan to analyze not only the impact of randomization to specific treatment arms (intent to treat analysis) but also the impact of receiving a certain form of outreach (treatment on the treated analysis).

**2.5 Power and Effect Size**

Power analysis suggests the study is powered to detect reasonable and decision-relevant impacts on Medicaid enrollment and the composition of enrollees.

***Key Assumptions.*** Our analysis of recent Medicaid claims suggest about 90% will be eligible, so we characterize the study population as a “likely eligible” population similar to Wright et al.’s study of likely Medicaid-eligible adults.14,28 Based on findings from Wright et al.’s sample with low-touch outreach, we assume that between 38 and 41% of the sample will remain enrolled in Medicaid after receiving a text message reminder.28 We also assessed power to detect changes in the composition of the enrollee population, including language preference (our baseline data suggest 25% prefer Spanish) and a binary outcome that is unitary for 50% of the population and zero otherwise (e.g., above vs. below median income, or above vs. below median baseline Medicaid health care costs as a measure of health care need).

***Minimum Detectable Effect Size.*** The study has 80% power to detect a 0.69 percentage point change in enrollment rates, a 0.59 percentage point change in the proportion of enrollees preferring Spanish and a 0.68 percentage point change in the health care needs of enrollees due to variation in the content, modality or frequency of outreach. For comparison, prior studies found a 2 percentage point increase in SNAP recertification after receipt of a text message;31 a 3 percentage point increase in Medicaid take-up among a likely eligible group and 14.3 percentage point increase in take-up among a waitlist group after enhanced outreach;28 a 18 percentage point increase in SNAP take-up after receiving a postcard with an assistance hotline number;32 a 2.7 percentage point increase in Covered California enrollment after receiving an outbound call;33 and a 22 percentage point increase in EITC take-up after a second reminder message.34

We will consider the intervention to have a meaningful effect if we detect a statistically significant difference in our key outcomes (e.g. application and enrollment increases) between the treatment arms of the RCT. Other measures of the success of the intervention will include whether the dollarized benefit from the increases in take-up exceeds the cost of implementing the intervention, and whether the intervention is particularly effective for harder-to-reach segments of the population.

**3. Data and Key Variables**

This section describes data and variables that will be analyzed.

**3.1 Data Sources**

We will combine multiple data files for the project to measure treatment assignment, the timing of each beneficiary’s enrollment window, Medicaid application and enrollment outcomes, SNAP enrollment, and employment outcomes.

***Data File 1: Medicaid claims and CARES enrollment files***

**Summary of Information**: This is a comprehensive extract that includes every beneficiary that had Medicaid coverage in Wisconsin at the end of the public health emergency, along with attributes such as:

* + Start date of Medicaid coverage and end date of Medicaid coverage, if applicable
  + Demographic factors (gender, age, race/ethnicity)
  + Household income at the time of first application to Medicaid (measured as of March 2020 or the first month of this Medicaid enrollment spell, whichever is later)
  + Reason for Medicaid eligibility at baseline (children; aged/disabled; pregnant; parents; adults without dependent children; extensions; or other group)
  + Health care costs paid by Medicaid during the continuous coverage period of 2020-2022
  + Any visits and number of visits (overall and for the following visit types: emergency, outpatient, inpatient, dental, mental health, or psychiatric), 2020-2022
  + Number of chronic conditions according to Chronic Conditions Warehouse algorithm, 2020-2022
  + End date of Medicaid coverage, if applicable

**Universe of File and Record Granularity:** One record for each person with fee-for-service Medicaid coverage in Wisconsin at the end of the public health emergency.

***Data File 2: Access Tables***

**Summary of Information:** An extract of application data:

* Application date to redetermine/renew coverage
* Outcome from the application, if available (denied because of lack of eligibility, denied for administrative reasons, accepted)

**Universe of File and Record Granularity:** One record for each application received during the redetermination period.

***Data File 3: DHS reports to Covering Wisconsin***

**Summary of Information:** This data provides information on the characteristics of beneficiaries whose Medicaid redetermination window has just begun in the current calendar month. These characteristics include:

* Location (address, county of residence, county of administration)
* Cell phone number if available for each individual in the case
* Medicaid eligibility category at baseline in the case
* Age of each individual in the case
* Tribal membership for each individual in the case
* Case information (case number)
* Language preference for each individual in the case
* Which individual is considered the primary individual on the case

**Universe of File and Record Granularity:** Fee-for-service Medicaid beneficiaries whose Medicaid redetermination window has just begun in the current calendar month.

***Data File 4: SNAP enrollment***

**Summary of Information*:*** Administrative data on SNAP enrollment in Wisconsin:

* Enrollment in SNAP at baseline and throughout the study period

**Universe of File and Record Granularity:** One record for each household who filed for SNAP throughout the duration of the public health emergency.

***Data File 5: Employment and quarterly wages***

**Summary of Information*:*** Administrative data from unemployment insurance files in Wisconsin:

* Employed vs. unemployed at baseline and throughout the study period
* Log of quarterly wages (+$1, to avoid dropping people with no wages) at baseline
* Quarterly income at baseline

**Universe of File and Unit of Analysis / Record Granularity:** One record for each person reflected in state unemployment insurance records throughout the duration of the public health emergency.

***Data File 6: Covering Wisconsin Outbound Call Feedback***

**Summary of Information*:*** Feedback on outbound call waitlist, including:

* Validity of phone number
* Whether an outbound call was placed

**Universe of File and Unit of Analysis / Record Granularity:** One record for each person (i.e., primary person on a case) who was placed on the outbound call waitlist.

***Data File 6: Text Message Vendor Feedback***

**Summary of Information*:*** Feedback from text message vendors, including indicators for:

* Whether the phone number provided is a landline vs. not
* Bounced text message

**Universe of File and Unit of Analysis / Record Granularity:** One record for each person (i.e., primary person on a case) who was assigned to text message outreach arm.

***Data File 7: United States Postal Service Data***

**Summary of Information*:*** Data from USPS, indicating:

* Non-existent addresses
* Returned mail

**Universe of File and Unit of Analysis / Record Granularity:** One record for each primary person on a case assigned to a postcard arm.

***Data File 8: Address and Phone Number Updating Service Feedback***

**Summary of Information*:*** Data from updating service, indicating:

* Accuracy of address
* Accuracy of phone number

**Universe of File and Unit of Analysis / Record Granularity:** One record for each primary person on a case assigned to receive the address and phone number updating service.

**3.2 Key Variables**

***Outcomes of Interest****.* The primary outcome ismaintenance of Medicaid enrollment, measured on the individual level over the 12 months following each person’s redetermination deadline (e.g., at 1, 3, 6, 9, and 12 months; successful redetermination at 12 months).

Secondary outcomes focus on application activities and outcomes, measured using the following categories: no application filed; application filed but denied due to lack of eligibility; application filed but denied due to administrative reasons; application accepted. Exploratory outcomes include SNAP enrollment, employment, and logged quarterly wages (+$1, to avoid taking the log of zero for those who are unemployed). These outcomes will also be measured at 1, 3, 6, 9, and 12 months after each person’s redetermination deadline.

When analyzing data from the second round of outreach (i.e., for people who had already lost their coverage), outcomes will be measured at 1, 3, 6, 9, and 12 months after the time of the receipt of outreach messages.

***Exposures of Interest*.** Exposures of interest include the treatment group assigned (including nature of outreach, and whether randomized to a group with address updating), and successful delivery of a text message, postcard, and/or outbound call based on Covering Wisconsin data on outbound calls and vendor data on text boucebacks and returned mail.

***Variables Used in Heterogeneity Checks.*** We will conduct two types of heterogeneity analyses: a) stratifying the data into pre-specified groups, and b) assessing changes in the composition of Medicaid enrollees after the redetermination deadlines have passed, described further in section 6 below. The goal of these analyses is to assess whether the impact of the intervention varies for consumers who may face different barriers to enrollment or differ in other observable characteristics, to support improved targeting of the intervention in the future. These groups include:

* Specific racial/ethnic groups have been historically under-served (Black, Hispanic, Asian or Pacific Islander, tribal members)
* People whose preferred language is Spanish
* Age category (<18, 18-25, 26-49, 50-64, 65+), and average age for the composition analysis
* People living in rural areas, defined as a county with rating 8 or 9 in the US Department of Agriculture 2013 Rural-Urban Continuum Codes
* Reason for Medicaid eligibility at baseline (children; aged/disabled; pregnant; parents; adults without dependent children; extensions; or other group)
* Employed vs. unemployed at baseline
* On SNAP vs. not at baseline
* People with below median baseline household income
* Other household characteristics: number of enrolled childless adults with baseline household income over 50% of FPL; number of enrolled children with baseline household income over 200% of FPL; whether or not there were children in the case at baseline; average baseline household income of enrollees, for the composition analysis
* People with above-median Medicaid-covered baseline health care costs (e.g., total costs during the continuous coverage period); average baseline health care costs (raw and logged), for the composition analysis
* People with longer vs. shorter duration of prior Medicaid enrollment (quartiles of enrollment duration at the end of the public health emergency, and people who had vs had not been enrolled long enough to have been required to do a prior redetermination)
* People with Medicaid-covered usage of inpatient care during the public health emergency period
* People with Medicaid-covered usage of mental health or psychiatric care during the public health emergency period
* People with chronic conditions, measured using the Chronic Conditions Warehouse algorithm using their claims during the public health emergency period

***Covariates Used in Multivariable Modeling.*** Due to the randomization, adjustment for confounders is not required for our statistical models to obtain unbiased treatment effects. To improve power, however, we will include covariates in multivariable modeling that are predictive of our outcomes of interest. We propose to include location (county of residence) fixed effects, eligibility category at baseline, language preference (English, Spanish, missing), income at baseline (under 50% FPL, 50-100% FPL, 100-200% FPL, over 200% FPL, missing), SNAP enrollment at baseline (enrolled, not enrolled, missing), whether or not there were children in the case at baseline, whether or not members of the case had been in Medicaid long enough at baseline to have been required to a prior redetermination, and age of the individual at baseline. We will drop covariates in robustness checks.

**3.3 Treatment of Missing Data**

In the baseline model, we will model missingness using an indicator variable to avoid listwise deletion. In a robustness check, we will use listwise deletion to eliminate missing data on covariates of interest.

**4. Balance Checks**

Since random assignment is a key feature of our study, we will take great care in verifying the random assignment. We will check balance across all observable variables included in the Covering Wisconsin data at the time of randomization, and again check balance on the covariates and stratification variables used in the model that we subsequently obtain from the administrative data. Any unbalanced variables in the administrative data will be included as covariates in the model in robustness checks.

**5. Risks and Mitigation**

COVID-related risk is minimal as outreach will take place remotely. The sample size could be smaller than anticipated, but the study will have sufficient power to detect a 1.5 percentage point impact on Medicaid enrollment if the sample is as small as 20% of our anticipated size. For ethical reasons, all randomized participants will receive outreach; while we believe the comparisons across study arms will produce policy-relevant findings, we will also use a difference-in-differences analysis of a matched sample to compare enrollment changes in our sample vs. comparable Medicaid managed care beneficiaries who will not receive outreach from Covering Wisconsin. While spillovers are possible, our plan to randomize by cases mitigates spillover risk within households. Finally, some beneficiaries will not be eligible for Medicaid; those rejected from Medicaid will receive additional messages from Covering Wisconsin that may affect enrollment in marketplace insurance as well. Regardless, our research suggests 90% of the sample will be Medicaid eligible, so our proposed outcome of Medicaid enrollment remains highly relevant.14

**6. Statistical Models & Hypothesis Tests**

**a. Intent to Treat Analysis**

We will first examine the effects of assignment to each intervention arm on each outcome using an intent-to-treat (ITT) analysis. Our basic estimating equation will be of the form:

Where:

* represents an outcome of interest (e.g., application for Medicaid, continued enrollment in Medicaid, SNAP receipt, employment);
* captures the average outcomes associated with randomization to the postcard arm, a proxy for the status quo for locations where text messages are not used for outreach;
* represents a vector of pre-specified covariates measured at baseline, listed in section 3.2;
* is a binary variable that takes the value 1 if individual *i* (or the primary person on their case) was assigned to a treatment group that is sent any text messages;
* is a binary variable that takes the value 1 if individual *i* (or the primary person on their case) was assigned to a treatment group that is sent any text messages that invite them to send a reply text (triggering a chatbot);
* is a binary variable that takes the value 1 if individual *i* (or the primary person on their case) was assigned to a treatment group being sent an additional reminder message two weeks after the first;

* is a binary variable that takes the value 1 if individual *i* (or the primary person on their case) was assigned to a treatment group that is added to a waitlist to receive an outbound call;
* is a binary variable that takes the value 1 if individual *i* (or the primary person on their case) was randomized to have their contact information checked using an address and phone number updating service prior to outreach.

The will be the estimate of the causal effect of being randomized to a given treatment group, compared to Arm A, on our outcomes of interest, .

The research questions will be tested using hypothesis tests about combinations of the coefficients on these treatment arm indicators, as follows:

* To test the null hypothesis of no impact of being sent a text message rather than a postcard, we will test whether .
* To test the null hypothesis of no impact of being sent an offer to connect with a chatbot rather than speaking with an assister by telephone, we will test whether .
* To test the null hypothesis that being sent a second message makes no impact on our outcomes of interest, we will test whether .
* To test the null hypothesis that being on a waitlist to receive an outbound call makes no impact on our outcomes of interest, we will test whether .
* To test the null hypothesis of no effect of contact information updating among the postcard group, we will test whether .
* To test the null hypothesis of no effect of contact information updating among the text message group, we will test whether .

**b. Treatment on the Treated Analysis**

Randomization to a treatment group is not a perfect determinant of which treatment is received; as noted above, some consumers have invalid addresses or phone numbers, and it will likely not be possible to place calls to the full outbound call waitlist. Therefore, we will also estimate the treatment on the treated effect, i.e., a local average treatment effect (LATE) of receiving a text, call, etc. on our outcomes of interest.

We will construct variables for postcard receipt, text message receipt, and outbound call receipt. If consumer in the treatment group received their assigned method of outreach, the respective indicator variable equals 1 and 0 otherwise.

The structural equation estimated will be:

And the first stage will be:

Where:

* represents the receipt of assigned treatment (e.g., receiving a text message)
* is a binary variable that takes the value 1 if individual *i* was randomized to a treatment arm that offered as a treatment (e.g., randomized to a treatment arm where a text message was sent)
* represents the outcome of interest
* represents a vector of pre-specified covariates measured at baseline, listed in section 3.2.

the coefficient of interest, will capture the impact of outreach on outcomes for people who received their assigned treatment due to random assignment. We will repeat this model for each of the key exposures of interest including delivery of outbound calls, postcards, text messages, and repeated messages. In additional analyses, we will re-estimate our model comparing results for (1) those receiving a text message encouraging a call to a hotline vs. a postcard and (2) those receiving a text message connecting to a chatbot vs. a postcard.

**c. Robustness Checks**

In robustness checks, we will use logit or probit models to model binary outcomes. We will not perform any corrections for multiple hypothesis tests, and we will use two-tailed tests with p-values <= .05 to denote statistically significant effects. Standard errors will be clustered by case for all models.

**d. Composition Analysis**

In addition to the impact of the interventions on maintenance of enrollment, we are also interested in the effect of assignment to given treatment group on the characteristics of the marginal enrollee who applies for coverage or receives continued coverage because of the intervention. This analysis will repeat the models above but define the outcome variable to be a baseline characteristic of an individual (for example, a baseline measure of their household’s income). This approach to analyzing the characteristics of the marginal person affected by an intervention has been used in prior work.32

**e. Impact of Outreach to Those who Lost Coverage**

We will re-estimate the models using data only from the second round of outreach, e.g., outreach targeting people who lost their Medicaid coverage during the redetermination process. The primary analysis will focus on the same hypothesis tests listed above but reframing the follow-up time horizon to start after the second round of outreach occurred. In a secondary analysis, we will use interaction terms between first-round and second-round treatment arms to assess whether, e.g., randomization to the chatbot outreach arm in the second round was disproportionately effective for people who had been randomized to the call outreach arm in the first arm or vice versa.

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**Appendix: Sample Table Shells**

**Appendix Table 1: Balance Tests Across All Treatment Arms**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Treatment Arm Randomly Assigned | Arm A | Arm B | Arm C | Arm D | Arm E | Arm F | Arm G | Arm H | Arm I | Arm J | F-test p-value |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| *Panel A: Variables in the Covering Wisconsin data* | | | | | | | | | | | |
| Prefer Spanish |  |  |  |  |  |  |  |  |  |  |  |
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| **Age**  <18  18-25  26-49  50-64  65+ |  |  |  |  |  |  |  |  |  |  |  |
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| Live in a rural area |  |  |  |  |  |  |  |  |  |  |  |
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| Tribal Member |  |  |  |  |  |  |  |  |  |  |  |
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| **Race/ethnicity**  Any racial/ethnic minority group  Non-Hispanic White  Hispanic  Black  Asian or Pacific Islander |  |  |  |  |  |  |  |  |  |  |  |
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| **Reason for Medicaid eligibility at baseline**  Children  Aged/Disabled  Pregnant  Parents  Adult without dependent children  Extensions  Other |  |  |  |  |  |  |  |  |  |  |  |
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| *Panel B: Variables in the administrative data* | | | | | | | | | | | |
| **Duration of coverage at baseline**  Q1 (shortest duration)  Q2  Q3  Q4 (longest duration)  Enrolled long enough to have been required to do a prior redetermination  Not enrolled long enough to have been required to do a prior redetermination |  |  |  |  |  |  |  |  |  |  |  |
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| Employed at baseline |  |  |  |  |  |  |  |  |  |  |  |
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| Enrolled in SNAP at baseline |  |  |  |  |  |  |  |  |  |  |  |
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| **Income at baseline**  Below median household income  Enrolled childless adults with baseline household income > 50% FPL  Enrolled children with baseline household income >200% FPL |  |  |  |  |  |  |  |  |  |  |  |
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| **Health care costs**  Health care costs paid by Medicaid, 2020-2022  Above median Medicaid-covered healthcare costs, 2020-2022 |  |  |  |  |  |  |  |  |  |  |  |
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| **Any Medicaid Visits During 2020-2022**  Overall  Emergency  Outpatient  Inpatient  Dental  Mental  Psychiatric |  |  |  |  |  |  |  |  |  |  |  |
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| **Number of Medicaid Visits During 2020-2022**  Overall  Emergency  Outpatient  Inpatient  Dental  Mental  Psychiatric |  |  |  |  |  |  |  |  |  |  |  |
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| Number of chronic conditions according to Chronic Conditions Warehouse algorithm, 2020-2022 |  |  |  |  |  |  |  |  |  |  |  |
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| **Pooled F – stat** | . |  |  |  |  |  |  |  |  |  |  |
| ***p-value*** | *.* |  |  |  |  |  |  |  |  |  |  |
| ***N*** | *.* |  |  |  |  |  |  |  |  |  |  |

**Appendix Table 2: Balance Tests for Pairwise Comparisons, by Randomly Assigned Treatment Arm**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Difference in means and *p-*values for test of no difference in means | | | | |
| Treatment Arm Randomly Assigned | Text message vs. postcard | Invited to connect with chatbot vs. hotline | Reminder message vs. no reminder message | Outbound call waitlist vs. not on waitlist | Contact information updating service received vs. not received |
|  | (1) | (2) | (3) | (4) | (5) |
| *Panel A: Variables in the Covering Wisconsin data* | | | | |  |
| Prefer Spanish |  |  |  |  |  |
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| **Age**  <18  18-25  26-49  50-64  65+ |  |  |  |  |  |
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| Live in a rural area |  |  |  |  |  |
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| Tribal Member |  |  |  |  |  |
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| **Race/ethnicity**  Any racial/ethnicity minority group  Non-Hispanic White  Hispanic  Black  Asian or Pacific Islander |  |  |  |  |  |
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| **Reason for Medicaid eligibility at baseline**  Children  Aged/Disabled  Pregnant  Parents  Adult without dependent children  Extensions  Other |  |  |  |  |  |
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| *Panel B: Variables in the administrative data* | | | | |  |
| **Duration of coverage at baseline**  Q1 (shortest duration)  Q2  Q3  Q4 (longest duration)  Enrolled long enough to have been required to do a prior redetermination  Not enrolled long enough to have been required to do a prior redetermination |  |  |  |  |  |
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| Employed at baseline |  |  |  |  |  |
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| Enrolled in SNAP at baseline |  |  |  |  |  |
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| **Income at baseline**  Below median household income  Enrolled childless adults with baseline household income > 50% FPL  Enrolled children with baseline household income >200% FPL |  |  |  |  |  |
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| **Health care costs**  Health care costs paid by Medicaid, 2020-2022  Above median Medicaid-covered healthcare costs, 2020-2022 |  |  |  |  |  |
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| **Any Medicaid Visits During 2020-2022**  Overall  Emergency  Outpatient  Inpatient  Dental  Mental  Psychiatric |  |  |  |  |  |
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| **Number of Medicaid Visits During 2020-2022**  Overall  Emergency  Outpatient  Inpatient  Dental  Mental  Psychiatric |  |  |  |  |  |
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| Number of chronic conditions according to Chronic Conditions Warehouse algorithm, 2020-2022 |  |  |  |  |  |
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| **Pooled F – stat** |  |  |  |  |  |
| ***p-value*** |  |  |  |  |  |
| ***N*** |  |  |  |  |  |

**Appendix Table 3: Intent to Treat Results: Effects of Randomization to Treatment Groups**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | | | | *p-*values for hypothesis tests | |
| Treatment | (Randomized to Text Message)*i* | (Randomized to Chatbot vs. Hotline Text)*i* | (Randomized to Additional Reminder)*i* | (Randomized to Outbound Call Waitlist)*i* | (Randomized to Contact Info Updating– Postcard) | (Randomized to Contact Info Updating– Text Message) |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
| ***Panel A: Application and Enrollment Outcomes*** | | | | | | |
| *No application filed by end of redetermination deadline* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Application filed by end of redetermination deadline but denied due to lack of eligibility* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Application filed by end of redetermination deadline but denied due to administrative reasons* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Application accepted* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Maintenance of Medicaid enrollment at 1 month after enrollment deadline* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Maintenance of Medicaid enrollment at 3 months after enrollment deadline* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Maintenance of Medicaid enrollment at 6 months after enrollment deadline* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Maintenance of Medicaid enrollment at 9 months after enrollment deadline* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Maintenance of Medicaid enrollment at 12 months after enrollment deadline* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Successful redetermination 12 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Regained coverage 1 month after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Regained coverage 2 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Regained coverage 3 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Regained coverage 6 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Regained coverage 12 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Sample Size |  |  |  |  |  |  |
| ***Panel B: SNAP and Employment Outcomes*** | | | | | | |
| *Enrolled in SNAP at 1 month after enrollment deadline* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Enrolled in SNAP at 3 months after enrollment deadline* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Enrolled in SNAP at 6 months after enrollment deadline* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Enrolled in SNAP at 9 months after enrollment deadline* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Enrolled in SNAP at 12 months after enrollment deadline* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Employed (if adult) at 1 month after enrollment deadline* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Employed (if adult) at 3 months after enrollment deadline* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Employed (if adult) at 6 months after enrollment deadline* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Employed (if adult) at 9 months after enrollment deadline* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Employed (if adult) at 12 months after enrollment deadline* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Enrolled in SNAP at 1 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Enrolled in SNAP at 3 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Enrolled in SNAP at 6 months after outreach if lost coverage* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Enrolled in SNAP at 9 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Enrolled in SNAP at 12 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Employed (if adult) at 1 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Employed (if adult) at 3 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Employed (if adult) at 6 months after outreach if lost coverage* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Employed (if adult) at 9 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Employed (if adult) at 12 months after outreach if lost coverage* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| Sample Size |  |  |  |  |  |  |

**Appendix Table 4: Impact of Contact Information Updating on Receipt of Outreach**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | Proportion of messages not received | | | | | | | |
|  | Feedback from Contact Information Updating Vendor | | Print-Based Outreach (Postcard or Text Message) | | Postcard | | Text Messages | | Outbound Call | |
|  | Proportion of original addresses that were incorrect | Proportion of original phone numbers that were incorrect | Proportion not received under the status quo | Impact of contact information updating | Proportion not received under the status quo | Impact of contact information updating | Proportion not received under the status quo | Impact of contact information updating | Proportion of outbound calls not received under the status quo | Impact of contact information updating on successful placement of outbound call (either spoke with or left a voicemail, not a wrong number) |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| *Total Sample* | | | | | | | | | | |
| Overall |  |  |  |  |  |  |  |  |  |  |
| *Race/ethnicity* | | | | | | | | | | |
| Non-Hispanic white |  |  |  |  |  |  |  |  |  |  |
| Any racial/ethnicity minority group |  |  |  |  |  |  |  |  |  |  |
| Black |  |  |  |  |  |  |  |  |  |  |
| Hispanic |  |  |  |  |  |  |  |  |  |  |
| Asian or Pacific Islander |  |  |  |  |  |  |  |  |  |  |
| *Tribal membership* | | | | | | | | | | |
| Tribal member |  |  |  |  |  |  |  |  |  |  |
| *Language preference* | | | | | | | | | | |
| Prefer Spanish |  |  |  |  |  |  |  |  |  |  |
| *Age in years* | | | | | | | | | | |
| <18 |  |  |  |  |  |  |  |  |  |  |
| 18-25 |  |  |  |  |  |  |  |  |  |  |
| 26-49 |  |  |  |  |  |  |  |  |  |  |
| 50-64 |  |  |  |  |  |  |  |  |  |  |
| 65+ |  |  |  |  |  |  |  |  |  |  |
| *Urban/rural* | | | | | | | | | | |
| Live in rural areas |  |  |  |  |  |  |  |  |  |  |
| *Employment* | | | | | | | | | | |
| Employed at baseline if adult |  |  |  |  |  |  |  |  |  |  |
| *SNAP eligibility* | | | | | | | | | | |
| Enrolled in SNAP at baseline |  |  |  |  |  |  |  |  |  |  |
| *Income* | | | | | | | | | | |
| Below median household income |  |  |  |  |  |  |  |  |  |  |
| Case had childless adults with baseline household income >50% FPL |  |  |  |  |  |  |  |  |  |  |
| If adult, case had enrolled children with baseline household income >200% FPL |  |  |  |  |  |  |  |  |  |  |
| *Children in case* | | | | | | | | | | |
| If adult, case had any children |  |  |  |  |  |  |  |  |  |  |
| *Healthcare spending* | | | | | | | | | | |
| Baseline health care costs above sample median |  |  |  |  |  |  |  |  |  |  |
| *Reason for Medicaid eligibility at baseline* | | | | | | | | | | |
| Children |  |  |  |  |  |  |  |  |  |  |
| Aged/Disabled |  |  |  |  |  |  |  |  |  |  |
| Pregnant |  |  |  |  |  |  |  |  |  |  |
| Parents |  |  |  |  |  |  |  |  |  |  |
| Adult without dependent children |  |  |  |  |  |  |  |  |  |  |
| Extensions |  |  |  |  |  |  |  |  |  |  |
| Other |  |  |  |  |  |  |  |  |  |  |
| *Duration of coverage at baseline* | | | | | | | | | | |
| Q1 |  |  |  |  |  |  |  |  |  |  |
| Q2 |  |  |  |  |  |  |  |  |  |  |
| Q3 |  |  |  |  |  |  |  |  |  |  |
| Q4 |  |  |  |  |  |  |  |  |  |  |
| Enrolled long enough to have been required to do a prior redetermination |  |  |  |  |  |  |  |  |  |  |
| Not enrolled long enough to have been required to do a prior redetermination |  |  |  |  |  |  |  |  |  |  |

**Appendix Table 5: Treatment on the Treated Effects**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Treatment | Impact ofpostcard | Impact of any text | Impact of hotline text | Impact of chatbot text | Impact of additional reminder | Impact of outbound call |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
| ***Panel A: Application and Enrollment Outcomes*** | | | | | | |
| *No application filed by end of redetermination deadline* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Application filed by end of redetermination deadline but denied due to lack of eligibility* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Application filed by end of redetermination deadline but denied due to administrative reasons* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Application accepted* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Maintenance of Medicaid enrollment at 1 month after enrollment deadline* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Maintenance of Medicaid enrollment at 3 months after enrollment deadline* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Maintenance of Medicaid enrollment at 6 months after enrollment deadline* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Maintenance of Medicaid enrollment at 9 months after enrollment deadline* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Maintenance of Medicaid enrollment at 12 months after enrollment deadline* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Successful redetermination after 12 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Regained coverage 1 month after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Regained coverage 2 months after outreach* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Regained coverage 3 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Regained coverage 6 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Regained coverage 12 months after outreach if lost coverage* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| Sample Size |  |  |  |  |  |  |
| ***Panel B: SNAP and Employment Outcomes*** | | | | | | |
| *Enrolled in SNAP at 1 month after enrollment deadline* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Enrolled in SNAP at 3 months after enrollment deadline* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Enrolled in SNAP at 6 months after enrollment deadline* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Enrolled in SNAP at 9 months after enrollment deadline* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Enrolled in SNAP at 12 months after enrollment deadline* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Employed (if adult) at 1 month after enrollment deadline* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Employed (if adult) at 3 months after enrollment deadline* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Employed (if adult) at 6 months after enrollment deadline* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Employed (if adult) at 9 months after enrollment deadline* |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| *Employed (if adult) at 12 months after enrollment deadline* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Enrolled in SNAP at 1 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Enrolled in SNAP at 3 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Enrolled in SNAP at 6 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Enrolled in SNAP at 9 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Enrolled in SNAP at 12 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Employed (if adult) at 1 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Employed (if adult) at 3 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Employed (if adult) at 6 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Employed (if adult) at 9 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| *Employed (if adult) at 12 months after outreach if lost coverage* |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Sample Size |  |  |  |  |  |  |

**Appendix Table 6: Intent to Treat: Effect of Intervention on Characteristics of Enrollees**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | | | | *p-*values for hypothesis tests | |
| Treatment | (Randomized to Hotline Text Message)*i* | (Randomized to Chatbot Text Message)*i* | (Randomized to Additional Text Reminder)*i* | (Randomized to Outbound Call Waitlist)*i* | (Randomized to Contact Info Updating– Postcard) | (Randomized to Contact Info Updating– Text Message) |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
| **Panel A: Outcome: Applied for coverage by 1 month after redetermination deadline** | | | | | | |
| *Race/ethnicity* | | | | | | |
| Non-Hispanic white |  |  |  |  |  |  |
| Any racial/ethnicity minority group |  |  |  |  |  |  |
| Black |  |  |  |  |  |  |
| Hispanic |  |  |  |  |  |  |
| Asian or Pacific Islander |  |  |  |  |  |  |
| *Tribal membership* | | | | | | |
| Tribal member |  |  |  |  |  |  |
| *Language preference* | | | | | | |
| Prefer Spanish |  |  |  |  |  |  |
| *Age in years* | | | | | | |
| Average |  |  |  |  |  |  |
| <18 |  |  |  |  |  |  |
| 18-25 |  |  |  |  |  |  |
| 26-49 |  |  |  |  |  |  |
| 50-64 |  |  |  |  |  |  |
| 65+ |  |  |  |  |  |  |
| *Urban/rural (proportion)* | | | | | | |
| Live in rural areas |  |  |  |  |  |  |
| *Employment* | | | | | | |
| Employed at baseline if adult |  |  |  |  |  |  |
| Logged quarterly wages at baseline if adult |  |  |  |  |  |  |
| *SNAP eligibility* | | | | | | |
| Enrolled in SNAP at baseline |  |  |  |  |  |  |
| *Income* | | | | | | |
| Average baseline income of enrollees |  |  |  |  |  |  |
| Below median household income |  |  |  |  |  |  |
| Case had childless adults with baseline household income >50% FPL |  |  |  |  |  |  |
| If adult, case had enrolled children with baseline household income >200% FPL |  |  |  |  |  |  |
| *Children in case* | | | | | | |
| If adult, case had any children |  |  |  |  |  |  |
| *Healthcare spending* | | | | | | |
| Average baseline health care costs (raw) |  |  |  |  |  |  |
| Average baseline health care costs (logged) |  |  |  |  |  |  |
| Baseline health care costs above sample median |  |  |  |  |  |  |
| *Healthcare usage (proportion)* | | | | | | |
| Medicaid-covered usage of inpatient care during the public health emergency period |  |  |  |  |  |  |
| Medicaid-covered usage of mental health or psychiatric care during the public health emergency period |  |  |  |  |  |  |
| Chronic conditions, measured using the Chronic Conditions Warehouse algorithm using their claims during the public health emergency period |  |  |  |  |  |  |
| *Reason for Medicaid eligibility at baseline* | | | | | | |
| Children |  |  |  |  |  |  |
| Aged/Disabled |  |  |  |  |  |  |
| Pregnant |  |  |  |  |  |  |
| Parents |  |  |  |  |  |  |
| Adult without dependent children |  |  |  |  |  |  |
| Extensions |  |  |  |  |  |  |
| Other |  |  |  |  |  |  |
| *Duration of coverage at baseline* | | | | | | |
| Q1 |  |  |  |  |  |  |
| Q2 |  |  |  |  |  |  |
| Q3 |  |  |  |  |  |  |
| Q4 |  |  |  |  |  |  |
| Enrolled long enough to have been required to do a prior redetermination |  |  |  |  |  |  |
| Not enrolled long enough to have been required to do a prior redetermination |  |  |  |  |  |  |
| **Panel B: Outcome: Enrolled at 6 months after redetermination deadline** | | | | | | |
| *Race/ethnicity* | | | | | | |
| Non-Hispanic white |  |  |  |  |  |  |
| Any racial/ethnicity minority group |  |  |  |  |  |  |
| Black |  |  |  |  |  |  |
| Hispanic |  |  |  |  |  |  |
| Asian or Pacific Islander |  |  |  |  |  |  |
| *Tribal membership* | | | | | | |
| Tribal member |  |  |  |  |  |  |
| *Language preference* | | | | | | |
| Prefer Spanish |  |  |  |  |  |  |
| *Age in years* | | | | | | |
| Average |  |  |  |  |  |  |
| <18 |  |  |  |  |  |  |
| 18-25 |  |  |  |  |  |  |
| 26-49 |  |  |  |  |  |  |
| 50-64 |  |  |  |  |  |  |
| 65+ |  |  |  |  |  |  |
| *Urban/rural (proportion)* | | | | | | |
| Live in rural areas |  |  |  |  |  |  |
| *Employment* | | | | | | |
| Employed at baseline if adult |  |  |  |  |  |  |
| Logged quarterly wages at baseline if adult |  |  |  |  |  |  |
| *SNAP eligibility* | | | | | | |
| Enrolled in SNAP at baseline |  |  |  |  |  |  |
| *Income* | | | | | | |
| Average baseline income of enrollees |  |  |  |  |  |  |
| Below median household income |  |  |  |  |  |  |
| Case had childless adults with baseline household income >50% FPL |  |  |  |  |  |  |
| If adult, case had enrolled children with baseline household income >200% FPL |  |  |  |  |  |  |
| *Children in case* | | | | | | |
| If adult, case had any children |  |  |  |  |  |  |
| *Healthcare spending* | | | | | | |
| Average baseline health care costs (raw) |  |  |  |  |  |  |
| Average baseline health care costs (logged) |  |  |  |  |  |  |
| Baseline health care costs above sample median |  |  |  |  |  |  |
| *Healthcare usage (proportion)* | | | | | | |
| Medicaid-covered usage of inpatient care during the public health emergency period |  |  |  |  |  |  |
| Medicaid-covered usage of mental health or psychiatric care during the public health emergency period |  |  |  |  |  |  |
| Chronic conditions, measured using the Chronic Conditions Warehouse algorithm using their claims during the public health emergency period |  |  |  |  |  |  |
| *Reason for Medicaid eligibility at baseline* | | | | | | |
| Children |  |  |  |  |  |  |
| Aged/Disabled |  |  |  |  |  |  |
| Pregnant |  |  |  |  |  |  |
| Parents |  |  |  |  |  |  |
| Adult without dependent children |  |  |  |  |  |  |
| Extensions |  |  |  |  |  |  |
| Other |  |  |  |  |  |  |
| *Duration of coverage at baseline* | | | | | | |
| Q1 |  |  |  |  |  |  |
| Q2 |  |  |  |  |  |  |
| Q3 |  |  |  |  |  |  |
| Q4 |  |  |  |  |  |  |
| Enrolled long enough to have been required to do a prior redetermination |  |  |  |  |  |  |
| Not enrolled long enough to have been required to do a prior redetermination |  |  |  |  |  |  |
| **Panel C. Outcome: Enrolled at 6 months after outreach, if lost coverage during the redetermination process** | | | | | | |
| *Race/ethnicity* | | | | | | |
| Non-Hispanic white |  |  |  |  |  |  |
| Any racial/ethnicity minority group |  |  |  |  |  |  |
| Black |  |  |  |  |  |  |
| Hispanic |  |  |  |  |  |  |
| Asian or Pacific Islander |  |  |  |  |  |  |
| *Tribal membership* | | | | | | |
| Tribal member |  |  |  |  |  |  |
| *Language preference* | | | | | | |
| Prefer Spanish |  |  |  |  |  |  |
| *Age in years* | | | | | | |
| Average |  |  |  |  |  |  |
| <18 |  |  |  |  |  |  |
| 18-25 |  |  |  |  |  |  |
| 26-49 |  |  |  |  |  |  |
| 50-64 |  |  |  |  |  |  |
| 65+ |  |  |  |  |  |  |
| *Urban/rural (proportion)* | | | | | | |
| Live in rural areas |  |  |  |  |  |  |
| *Employment* | | | | | | |
| Employed at baseline if adult |  |  |  |  |  |  |
| Logged quarterly wages at baseline if adult |  |  |  |  |  |  |
| *SNAP eligibility* | | | | | | |
| Enrolled in SNAP at baseline |  |  |  |  |  |  |
| *Income* | | | | | | |
| Average baseline income of enrollees |  |  |  |  |  |  |
| Below median household income |  |  |  |  |  |  |
| Case had childless adults with baseline household income >50% FPL |  |  |  |  |  |  |
| If adult, case had enrolled children with baseline household income >200% FPL |  |  |  |  |  |  |
| *Children in case* | | | | | | |
| If adult, case had any children |  |  |  |  |  |  |
| *Healthcare spending* | | | | | | |
| Average baseline health care costs (raw) |  |  |  |  |  |  |
| Average baseline health care costs (logged) |  |  |  |  |  |  |
| Baseline health care costs above sample median |  |  |  |  |  |  |
| *Healthcare usage (proportion)* | | | | | | |
| Medicaid-covered usage of inpatient care during the public health emergency period |  |  |  |  |  |  |
| Medicaid-covered usage of mental health or psychiatric care during the public health emergency period |  |  |  |  |  |  |
| Chronic conditions, measured using the Chronic Conditions Warehouse algorithm using their claims during the public health emergency period |  |  |  |  |  |  |
| *Reason for Medicaid eligibility at baseline* | | | | | | |
| Children |  |  |  |  |  |  |
| Aged/Disabled |  |  |  |  |  |  |
| Pregnant |  |  |  |  |  |  |
| Parents |  |  |  |  |  |  |
| Adult without dependent children |  |  |  |  |  |  |
| Extensions |  |  |  |  |  |  |
| Other |  |  |  |  |  |  |
| *Duration of coverage at baseline* | | | | | | |
| Q1 |  |  |  |  |  |  |
| Q2 |  |  |  |  |  |  |
| Q3 |  |  |  |  |  |  |
| Q4 |  |  |  |  |  |  |
| Enrolled long enough to have been required to do a prior redetermination |  |  |  |  |  |  |
| Not enrolled long enough to have been required to do a prior redetermination |  |  |  |  |  |  |

**Appendix Table 7: Treatment on the Treated: Effect of Intervention on Characteristics of Enrollees**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Treatment | Impact ofpostcard | Impact of any text | Impact of hotline text | Impact of chatbot text | Impact of additional reminder | Impact of outbound call |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
| **Panel A: Outcome: Applied for coverage by 1 month after redetermination deadline** | | | | | | |
| *Race/ethnicity* | | | | | | |
| Non-Hispanic white |  |  |  |  |  |  |
| Any racial/ethnicity minority group |  |  |  |  |  |  |
| Black |  |  |  |  |  |  |
| Hispanic |  |  |  |  |  |  |
| Asian or Pacific Islander |  |  |  |  |  |  |
| *Tribal membership* | | | | | | |
| Tribal member |  |  |  |  |  |  |
| *Language preference* | | | | | |  |
| Prefer Spanish |  |  |  |  |  |  |
| *Age in years* | | | | | | |
| Average |  |  |  |  |  |  |
| <18 |  |  |  |  |  |  |
| 18-25 |  |  |  |  |  |  |
| 26-49 |  |  |  |  |  |  |
| 50-64 |  |  |  |  |  |  |
| 65+ |  |  |  |  |  |  |
| *Urban/rural (proportion)* | | | | | | |
| Live in rural areas |  |  |  |  |  |  |
| *Employment* | | | | | | |
| Employed at baseline if adult |  |  |  |  |  |  |
| Logged quarterly wages at baseline if adult |  |  |  |  |  |  |
| *SNAP eligibility* | | | | | | |
| Enrolled in SNAP at baseline |  |  |  |  |  |  |
| *Income* | | | | | | |
| Average baseline income of enrollees |  |  |  |  |  |  |
| Below median household income |  |  |  |  |  |  |
| Case had childless adults with baseline household income >50% FPL |  |  |  |  |  |  |
| If adult, case had enrolled children with baseline household income >200% FPL |  |  |  |  |  |  |
| *Children in case* | | | | | | |
| If adult, case had any children |  |  |  |  |  |  |
| *Healthcare spending* | | | | | | |
| Average baseline health care costs (raw) |  |  |  |  |  |  |
| Average baseline health care costs (logged) |  |  |  |  |  |  |
| Baseline health care costs above sample median |  |  |  |  |  |  |
| *Healthcare usage ( proportion)* | | | | | | |
| Medicaid-covered usage of inpatient care during the public health emergency period |  |  |  |  |  |  |
| Medicaid-covered usage of mental health or psychiatric care during the public health emergency period |  |  |  |  |  |  |
| Chronic conditions, measured using the Chronic Conditions Warehouse algorithm using their claims during the public health emergency period |  |  |  |  |  |  |
| *Reason for Medicaid eligibility at baseline* | | | | | | |
| Children |  |  |  |  |  |  |
| Aged/Disabled |  |  |  |  |  |  |
| Pregnant |  |  |  |  |  |  |
| Parents |  |  |  |  |  |  |
| Adult without dependent children |  |  |  |  |  |  |
| Extensions |  |  |  |  |  |  |
| Other |  |  |  |  |  |  |
| *Duration of coverage at baseline* | | | | | | |
| Q1 |  |  |  |  |  |  |
| Q2 |  |  |  |  |  |  |
| Q3 |  |  |  |  |  |  |
| Q4 |  |  |  |  |  |  |
| Enrolled long enough to have been required to do a prior redetermination |  |  |  |  |  |  |
| Not enrolled long enough to have been required to do a prior redetermination |  |  |  |  |  |  |
| **Panel B: Outcome: Enrolled at 6 months after redetermination deadline** | | | | | | |
| *Race/ethnicity* | | | | | | |
| Non-Hispanic white |  |  |  |  |  |  |
| Any racial/ethnicity minority group |  |  |  |  |  |  |
| Black |  |  |  |  |  |  |
| Hispanic |  |  |  |  |  |  |
| Asian or Pacific Islander |  |  |  |  |  |  |
| *Tribal membership* | | | | | | |
| Tribal member |  |  |  |  |  |  |
| *Language preference* | | | | | | |
| Prefer Spanish |  |  |  |  |  |  |
| *Age in years* | | | | | | |
| Average |  |  |  |  |  |  |
| <18 |  |  |  |  |  |  |
| 18-25 |  |  |  |  |  |  |
| 26-49 |  |  |  |  |  |  |
| 50-64 |  |  |  |  |  |  |
| 65+ |  |  |  |  |  |  |
| *Urban/rural (proportion)* | | | | | | |
| Live in rural areas |  |  |  |  |  |  |
| *Employment* | | | | | | |
| Employed at baseline if adult |  |  |  |  |  |  |
| Logged quarterly wages at baseline if adult |  |  |  |  |  |  |
| *SNAP eligibility* | | | | | | |
| Enrolled in SNAP at baseline |  |  |  |  |  |  |
| *Income* | | | | | | |
| Average baseline income of enrollees |  |  |  |  |  |  |
| Below median household income |  |  |  |  |  |  |
| Case had childless adults with baseline household income >50% FPL |  |  |  |  |  |  |
| If adult, case had enrolled children with baseline household income >200% FPL |  |  |  |  |  |  |
| *Children in case* | | | | | | |
| If adult, case had any children |  |  |  |  |  |  |
| *Healthcare spending* | | | | | | |
| Average baseline health care costs (raw) |  |  |  |  |  |  |
| Average baseline health care costs (logged) |  |  |  |  |  |  |
| Baseline health care costs above sample median |  |  |  |  |  |  |
| *Healthcare usage (proportion)* | | | | | | |
| Medicaid-covered usage of inpatient care during the public health emergency period |  |  |  |  |  |  |
| Medicaid-covered usage of mental health or psychiatric care during the public health emergency period |  |  |  |  |  |  |
| Chronic conditions, measured using the Chronic Conditions Warehouse algorithm using their claims during the public health emergency period |  |  |  |  |  |  |
| *Reason for Medicaid eligibility at baseline* | | | | | | |
| Children |  |  |  |  |  |  |
| Aged/Disabled |  |  |  |  |  |  |
| Pregnant |  |  |  |  |  |  |
| Parents |  |  |  |  |  |  |
| Adult without dependent children |  |  |  |  |  |  |
| Extensions |  |  |  |  |  |  |
| Other |  |  |  |  |  |  |
| *Duration of coverage at baseline* | | | | | | |
| Q1 |  |  |  |  |  |  |
| Q2 |  |  |  |  |  |  |
| Q3 |  |  |  |  |  |  |
| Q4 |  |  |  |  |  |  |
| Enrolled long enough to have been required to do a prior redetermination |  |  |  |  |  |  |
| Not enrolled long enough to have been required to do a prior redetermination |  |  |  |  |  |  |
| **Panel C. Outcome: Enrolled at 6 months after outreach, if lost coverage during the redetermination process** | | | | | | |
| *Race/ethnicity* | | | | | | |
| Non-Hispanic white |  |  |  |  |  |  |
| Any racial/ethnicity minority group |  |  |  |  |  |  |
| Black |  |  |  |  |  |  |
| Hispanic |  |  |  |  |  |  |
| Asian or Pacific Islander |  |  |  |  |  |  |
| *Tribal membership* | | | | | | |
| Tribal member |  |  |  |  |  |  |
| *Language preference* | | | | | | |
| Prefer Spanish |  |  |  |  |  |  |
| *Age in years* | | | | | | |
| Average |  |  |  |  |  |  |
| <18 |  |  |  |  |  |  |
| 18-25 |  |  |  |  |  |  |
| 26-49 |  |  |  |  |  |  |
| 50-64 |  |  |  |  |  |  |
| 65+ |  |  |  |  |  |  |
| *Urban/rural (proportion)* | | | | | | |
| Live in rural areas |  |  |  |  |  |  |
| *Employment* | | | | | | |
| Employed at baseline if adult |  |  |  |  |  |  |
| Logged quarterly wages at baseline if adult |  |  |  |  |  |  |
| *SNAP eligibility* | | | | | | |
| Enrolled in SNAP at baseline |  |  |  |  |  |  |
| *Income* | | | | | | |
| Average baseline income of enrollees |  |  |  |  |  |  |
| Below median household income |  |  |  |  |  |  |
| Case had childless adults with baseline household income >50% FPL |  |  |  |  |  |  |
| If adult, case had enrolled children with baseline household income >200% FPL |  |  |  |  |  |  |
| *Children in case* | | | | | | |
| If adult, case had any children |  |  |  |  |  |  |
| *Healthcare spending* | | | | | | |
| Average baseline health care costs (raw) |  |  |  |  |  |  |
| Average baseline health care costs (logged) |  |  |  |  |  |  |
| Baseline health care costs above sample median |  |  |  |  |  |  |
| *Healthcare usage (proportion)* | | | | | | |
| Medicaid-covered usage of inpatient care during the public health emergency period |  |  |  |  |  |  |
| Medicaid-covered usage of mental health or psychiatric care during the public health emergency period |  |  |  |  |  |  |
| Chronic conditions, measured using the Chronic Conditions Warehouse algorithm using their claims during the public health emergency period |  |  |  |  |  |  |
| *Reason for Medicaid eligibility at baseline* | | | | | | |
| Children |  |  |  |  |  |  |
| Aged/Disabled |  |  |  |  |  |  |
| Pregnant |  |  |  |  |  |  |
| Parents |  |  |  |  |  |  |
| Adult without dependent children |  |  |  |  |  |  |
| Extensions |  |  |  |  |  |  |
| Other |  |  |  |  |  |  |
| *Duration of coverage at baseline* | | | | | | |
| Q1 |  |  |  |  |  |  |
| Q2 |  |  |  |  |  |  |
| Q3 |  |  |  |  |  |  |
| Q4 |  |  |  |  |  |  |
| Enrolled long enough to have been required to do a prior redetermination |  |  |  |  |  |  |
| Not enrolled long enough to have been required to do a prior redetermination |  |  |  |  |  |  |

1. Medicaid eligibility categories defined at the household level indicate whether anyone in the household is eligible for Medicaid through the following pathways: being a child, being aged/disabled, being pregnant, being a parent of a dependent child, or adult without dependent children who meet relevant eligibility criteria. [↑](#footnote-ref-1)
2. Rural/urban residency was determined using USDA Rural-Urban Continuum Codes.30 Counties were defined as rural if coded as 8 or 9 and defined as urban if coded 1-7. [↑](#footnote-ref-2)