Modeling the Impact of the Great Unwinding on State Medicaid Programs

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Modeling the Impact of the Great Unwinding on State Medicaid Programs

Technical User Guide

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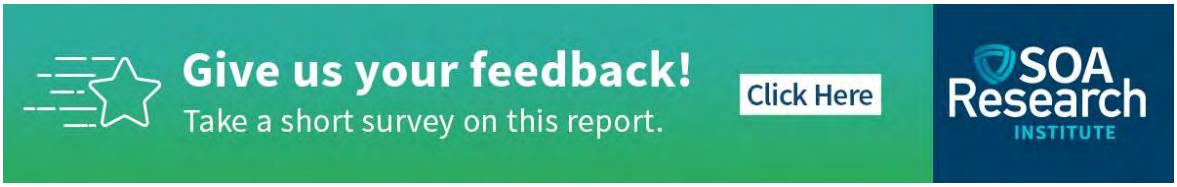

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Modeling the Impact of the Great Unwinding on State Medicaid Programs

Model Technical Documentation

Background

This document provides actuaries and other professionals working in Medicaid and health care finance with a technical overview of the Medicaid Unwinding model (the Model) that is used to project changes in acuity and enrollment for both Medicaid and Children's Health Insurance Program (CHIP). Information is critically important at the time of this writing as states recently began to terminate Medicaid and CHIP beneficiaries due to ineligibility for the first time in over three years.

During the COVID-19 public health emergency (PHE), Maintenance of Effort (MOE) requirements were put forth on Medicaid programs to allow states to receive additional federal funding. This meant that Medicaid members could not be terminated unless they passed away, moved out of state, or voluntarily withdrew from coverage. The result of this was a 30% increase in Medicaid enrollment from the start of the pandemic to December 2022, with that number expected to restate slightly higher as of March 2023, the final month before the unwinding.[1] This resulted in a significant volume of beneficiaries that could be expected to disenroll and a potentially changing risk profile for those who stay in the program.

As a result of this research project, the Model is being made publicly available by the Society of Actuaries (SOA). Due to its complexity, an appropriate background and knowledge of the topic are required to understand its results. The user should have knowledge in or be advised by someone with experience in actuarial science or health care modeling, as well as an understanding of Medicaid eligibility and redetermination rules.

Section 1: Base Data

This section provides an overview of the data used to run the Model, including what could best be viewed as "base data" for a projection. Because the Model isn't designed to forecast total health care expenditures, there is little need for underlying claims data. Instead, available data sources for changes in average costs were used to determine reasonable acuity factors that vary by duration of enrollment. A more crucial element of the base data is monthly enrollment feeds, which have been sourced primarily from CMS.

1.1 ENROLLMENT DATA

The Model standard that is available for all 50 states and the District of Columbia is the monthly Medicaid and CHIP enrollment data from CMS. The source documentation for these datasets can be found at https://www.medicaid.gov/medicaid/national-medicaid-chip-program-information/medicaid-chip-enrollment-data/index.html.

CMS data is used in two different areas of the Model:

Dataset #1: CMS Monthly Enrollment for Medicaid and CHIP
Source: https://data.medicaid.gov/datasets?theme%5B0%5D=Enrollment
Table: State Medicaid and CHIP Applications, Eligibility Determinations, and Enrollment Data

- Data in the Model spans January 2019 through January 2023 and includes retroactive eligibility.
- Linear regression was used for enrollment data in the months spanning February 2023 to the month before terminations start during the unwinding (controlled by the user). In a given month where enrollment is estimated in this manner, the regression is based on the previous 12 months of enrollment using the FORECAST.LINEAR function in Excel.
- Per CMS, figures are point-in-time counts of total program enrollment and not solely counts of those newly enrolled during the reporting period. These figures include only those individuals who are eligible for comprehensive benefits.
- Medicaid beneficiaries who are eligible only for emergency Medicaid, family planning-only coverage or other limited benefits are excluded from this CMS dataset.
- Medicaid enrollment was not broken down by eligibility type.
- There are noticeable discrepancies* with the following four fields:
    - new_applications_submitted_to_medicaid_and_chip_agencies
    - total_applications_for_financial_assistance_submitted_at_st_d6fa
    - individuals_determined_eligible_for_medicaid_at_application
    - individuals_determined_eligible_for_chip_at_application
- All states (including the District of Columbia) are required to provide data to CMS on a range of indicators related to key application, eligibility and enrollment processes for Medicaid and CHIP. CMS states that the datasets reflect enrollment activity for all populations receiving comprehensive Medicaid and CHIP benefits in all states, as well as state program performance. This means that those with partial benefits (emergency coverage, some dual eligible) are excluded.

**Examples of discrepancies include situations where individuals determined to be eligible exceed the number of applications or where data were completely unavailable for a state.*

Dataset #2: T-MSIS Monthly Enrollment by Major Eligibility Group (MEG)
Source: https://data.medicaid.gov/datasets?theme%5B0%5D=Enrollment
Table: Major Eligibility Group Information for Medicaid and CHIP Beneficiaries by Month

- Data in the Model spans January 2019 through December 2020.
- Enrollment is allocated by the following populations:
  - Children
  - Expansion
  - Adult
  - Aged
  - Disabled
  - COVID Newly Eligible
  - Unknown
- Population allocations appear to be inconsistent among states. The research team suspects that some states may classify some populations in differing manners. For example, disabled children may be categorized as Children in one state and Disabled in another. Furthermore, COVID Newly Eligible and Unknown aren't used by all states.
- Per CMS, these metrics are based on data in the T-MSIS Analytic Files (TAF). Some states have serious data quality issues for one or more months, making the data unusable for calculating these measures. To assess data quality, CMS analysts adapted measures featured in the DQ Atlas. Data for a state and month are considered unusable or of high concern based on DQ Atlas thresholds for the topic Eligibility Group Code. Information on the DQ Atlas can be found at http://medicaid.gov/dq-atlas along with more information about data quality assessment methods.

As already stated, beneficiaries who do not have full benefits are excluded from the base data. Examples would be those with emergency Medicaid, family planning-only coverage or other limited benefits. Dual-eligible beneficiaries are included.

1.2 ENROLLMENT AND POPULATION ALLOCATION

The Model has nine populations that can be modeled. By default, the CMS data are categorized into eight of these nine populations with CHIP as the first and the seven enrollment groupings from the CMS MEG data as the remaining populations.

The user has complete control to customize each population by assigning names and modifying the historic enrollment through the OVERRIDE functionality. This is controlled by INPUT #5 in the "Inputs" tab as shown in Figure 1-1.

Figure 1-1
POPULATION ALLOCATION

INPUT #5: Population Selection				
#	Default	Override	Used	Agg.
Population 1	CHIP		CHIP	1
Population 2	Children		Children	1
Population 3	Expansion		Expansion	1
Population 4	Adult		Adult	1
Population 5	Aged		Aged	0
Population 6	Disabled		Disabled	0
Population 7	COVID New		COVID New	1
Population 8	Unknown		Unknown	1
Population 9				0
Use Override?	No	Aggregate Group Name:	Non-ABD	

If Yes is selected for Use Override? then the naming conventions in the Override column (third column of this section) will be used for each population. Actual enrollment data is then controlled by data entries in the "Override" tab.

Figure 1-2, a screenshot from this tab, shows an illustrative example where the user has manually entered overrides for a specific population. For the per member per month (PMPM) override, CHIP is the only population in this demonstration to be overridden. However, enrollment adjustments were utilized for the first six populations. The "Override" tab also contains the enrollment data from CMS, which can be freely referenced via formulas. This override feature was implemented for the purpose of tailoring the inputs to state-specific data. For instance, a Medicaid managed care organization (MCO) may use simple percentages of the total state data based on its market share if a quick analysis is preferred, or it may instead manually input detailed data if customized modeling is needed.

Figure 1-2
OVERRIDE TAB

State: Pennsylvania
Unwinding: 5/1/23

2019 PMPM	$133.03	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

	Monthly Enrollment Override									CMS Enrollment Data					
Duration	CHIP	Children	Adult expansion group	Adult	Aged	Persons with disabilities	COVID newly-eligible	Unknown		CHIP	Children	Adult expansion group	Adult	Aged	
12/1/23										-	-	-	-	-	
11/1/23										-	-	-	-	-	
10/1/23										-	-	-	-	-	
9/1/23										-	-	-	-	-	
8/1/23										-	-	-	-	-	
7/1/23										-	-	-	-	-	
6/1/23										-	-	-	-	-	
5/1/23										-	-	-	-	-	
4/1/23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3/1/23	100,422	428,113	434,030	125,443	130,276	262,811	-	-	-	251,055	1,070,282	1,085,074	313,608	325,690	6
2/1/23	100,758	426,869	432,768	125,079	129,897	262,048	-	-	-	251,895	1,067,172	1,081,921	312,697	324,743	6
1/1/23	101,511	425,210	431,086	124,593	129,392	261,029	-	-	-	253,778	1,063,024	1,077,716	311,482	323,481	6
12/1/22	101,957	424,082	429,943	124,262	129,049	260,336	-	-	-	254,892	1,060,204	1,074,857	310,655	322,623	6
11/1/22	101,632	422,354	428,192	123,756	128,524	259,276	-	-	-	254,079	1,055,886	1,070,479	309,390	321,309	6
10/1/22	101,648	420,011	425,816	123,070	127,810	257,838	-	-	-	254,120	1,050,028	1,064,540	307,674	319,526	6
9/1/22	103,664	417,713	423,486	122,396	127,111	256,427	-	-	-	259,161	1,044,283	1,058,715	305,990	317,778	6
8/1/22	103,826	419,119	424,912	122,808	127,539	257,290	-	-	-	259,566	1,047,798	1,062,280	307,020	318,848	6
7/1/22	103,895	416,992	422,755	122,185	126,892	255,984	-	-	-	259,738	1,042,480	1,056,888	305,462	317,229	6
6/1/22	104,003	414,969	420,704	121,592	126,276	254,742	-	-	-	260,007	1,037,423	1,051,761	303,980	315,690	6
5/1/22	104,454	413,250	418,962	121,088	125,753	253,687	-	-	-	261,134	1,033,125	1,047,404	302,721	314,382	6
4/1/22	104,927	411,799	417,490	120,663	125,312	252,796	-	-	-	262,317	1,029,498	1,043,726	301,658	313,279	6

1.3 PMPM WEIGHTING

The one area in the Model where the PMPMs are used to impact model output is in the weighting of acuity factors across populations to calculate an aggregate acuity number. For all applicable populations governed by the calculation (e.g., custom aggregate roll-up, or all populations), the result is the cross-product of the acuity, PMPM and enrollment across those populations. These amounts are mostly included for illustrative

purposes to show how an acuity factor would change the expected cost. True PMPM projections for Medicaid and CHIP populations would require encounters, claims, eligibility data, financial data and a complex amount of information needed to reprice the data, which is not feasible for this research project.

Data were sourced from Medicaid.gov for historical per capita expenditures by state. Medicaid Per Capita Expenditures, per the webpage, represent the state per capita expenditures and provide information about each state's Medicaid program as well as all the populations served. The estimates rely on total spending reported by states to the Medicaid Budget and Expenditure System (MBES) and the number of enrollees. Their expenditures were reported by states in the Transformed Medicaid Statistical Information System (T-MSIS). The calculations exclude all CHIP spending and enrollment through both Medicaid CHIP and separate CHIP programs.

Average annual Medicaid expenditures per enrollee for calendar years 2018 and 2019 by state were taken for five eligibility groups:

- Children
- Adults: non-expansion, non-disabled, under age 65
- Aged
- People with disabilities
- Adults: ACA Medicaid expansion

The state-by-state PMPMs from these five populations were aligned to the eight default populations in the following manner:

- CHIP = 85% of the PMPM of Children (assumption by the research team)
- Children = Children
- Expansion = Adults: ACA Medicaid expansion
- Adult = Adults: non-expansion, non-disabled, under age 65
- Aged = Aged
- Disabled = People with disabilities
- COVID New = weighted average of the original five groupings by calendar year 2019 membership
- Unknown = COVID newly eligible

It is important for the user to recognize that these default populations do not have PMPMs that inherently reflect changes in rate cell mix since 2019. If further specificity is desired at the rate cell level, then the OVERRIDE custom population functionality can be used with one's own data sources.

1.4 ADJUSTMENTS

A separate tab named "Adjustments" will appear similar to OVERRIDE's functionality, but it has a different impact on the enrollment data used in the Model. Any enrollment figures, positive or negative, included in this tab will be added as joiners in the respective month of the projection. This allows the user to forecast program expansions, contractions or sudden enrollment shifts. The beneficiary counts that are included only need to be added once. For example, if a new expansion state wants to account for 100,000 beneficiaries joining each of the first six months of 2024, the user can enter 100,000 in each of those months. The Model will add those beneficiaries into the projection and have them flow through the matrix of enrollment that is described in Section 4.2.

Section 2: Inputs

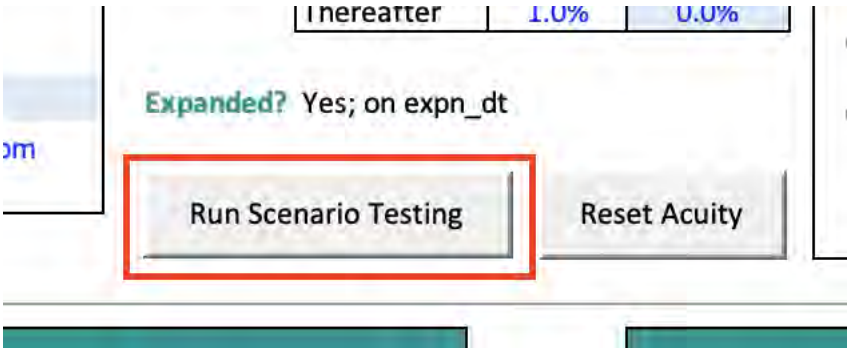
The Model's outcomes are influenced not only by the base data but also by a range of various user-defined inputs. These inputs play a crucial role in shaping and refining the results. Within the "Inputs" tab, users will find 10 distinct groupings, designated as INPUT #1 through INPUT #10, presented in sequential order. By thoroughly understanding this section, users may customize the Model inputs to best predict the impact of the unwinding in a given state or run a national projection.

2.0 SCENARIO TESTING

Scenario testing is used within the Model's projections to understand the range of possible outcomes by changing several of the assumptions in one direction or another by a stipulated amount dictated by the user inputs. The research team included this in the methodology to model the uncertainty of how each state's populations will be impacted during the unwinding.

Clicking the Run Scenario Testing button (see Figure 2-1) initiates a process that recalculates the workbook, stores the values that are output and runs through each of the three scenarios. Each scenario differs based on the variables that change with respect to that particular simulation, including Months Lag for Churn, Enrollment Growth, Percentage of Population that Lost Coverage and Post-Unwinding Acuity Curves. Each of those variables has its own randomized probability distribution to determine the resultant input. The values are called into the workbook via the SIMVALUES function, which averages together the final projections that were stored.

Figure 2-1
SCREENSHOT OF BUTTON TO RUN SCENARIO TESTING



It is recommended that the user run the Scenario Testing simulation each time the Model is opened. The simulation results are stored temporarily while the Model is open and therefore need to be refreshed every time the Model is accessed. However, it is important that before running the Scenario Testing, the user should appropriately configure the inputs to reflect their desired customization. Any of the inputs in the following tables that are shaded with a light blue background color affect the Scenario Testing. Therefore, careful consideration of these inputs is essential for testing the desired range of results.

Figure 2-2
INPUT VARIATION IN SCENARIO TESTING

	Enrollment Scenario		
Input	Low	Mid	High
Months Lag for Churn	Higher	Base Input	Lower
Enrollment Growth	Lower	Base Input	Higher

% Lost Coverage	Higher	Base Input	Lower
Post-Unwinding Acuity Curve	Lower	Base Input	Higher

As Figure 2-2 shows, the inputs that change during the scenarios do not all change in the same direction. This is to maximize variation in the projected enrollment such that if enrollment will be higher with a certain input, then another input should affect the enrollment in a similar manner. The following rationale was used for each of these inputs:

- Months Lag for Churn—In a low enrollment scenario, this input will be higher (base input plus the variation) as it would result in the projection taking longer for enrollees to return to the populations.
- Enrollment Growth—In a low enrollment scenario, this input will be lower (base input less the variation), which will result in less enrollment growth.
- % Lost Coverage—In a low enrollment scenario, this input will be lower (base input plus the variation) because a higher loss of coverage results in more beneficiaries losing coverage and enrollment being lower.
- Post-Unwinding Acuity Curve—This input will have no impact on enrollment. The research team assumes that in a lower enrollment projection, there are fewer beneficiaries returning to the program and therefore a lower frequency of resets in acuity curves. Thus, the lower enrollment scenario uses the lowest of the simulated acuity curves.

2.1 INPUT #1: SCENARIO SELECTIONS

The following list describes each of the ten inputs aligning with the order shown in Figure 2-3.

Figure 2-3
SCENARIO SELECTIONS

INPUT #1: Scenario Selections	
State	Pennsylvania
Month of First Terminations	5/1/23
Months to Process Terminations	12
Unwinding Priority	Time-Based
Min. Mos. Enrollment to Disenroll (Future)	12
Months Lag for Churn	6
Simulation +/- Months Lag for Churn	4
Unwinding Distribution	Custom
Scenario Testing	1

1. State
    i. Any of the 50 states and District of Columbia can be run in the Model.
    ii. The national model can also be run by entering an asterisk (*) as the input value.
2. Month of First Terminations
    i. This is the first month of the unwinding period in which Medicaid and CHIP members are expected to be disenrolled by the state. This is typically a couple of months after the state resumes eligibility redeterminations that qualify for the unwinding.

   ii. CMS has published the anticipated month of first terminations: https://www.medicaid.gov/resources-for-states/downloads/ant-2023-time-init-unwin-reltd-ren-02242023.pdf (also found in Appendix A)

3. Months to Process Terminations
   i. Per CMS, states have up to 12 months to initiate and 2 additional months to complete a renewal for all individuals enrolled in Medicaid or CHIP. This means that terminations due to the unwinding could take up to 14 months.
   ii. However, there are no restrictions on this input to limit the duration of the unwinding process or prevent it from extending beyond a specific timeframe. This lack of restriction stems from the fact that there might be uncertainties associated with states' plans following the publication of this Model. As a result, the national model approach may be best run with a wider distribution to cover all states' unwinding plans.
4. Unwinding Priority
   i. Three options are available for this model input. The population-based and custom priority options will effectively create separate unwinding timelines for each population, whereas the time-based option will have all populations on the same unwinding time line.
   ii. Population-Based: This scenario, driven by the unwinding specifications in INPUT #6, dictates that certain Medicaid and CHIP populations have priority over others, based on which population is expected to have the most leavers during the unwinding. This means that one population will process its terminations completely before the Model processes another population; this cascading logic is further explained in Section 4.5.
   iii. Time-Based: This scenario assumes each population is simultaneously disenrolled at a constant rate (different for each population), so the time it takes each population to disenroll ineligible members is equal to the Months to Process Terminations input.
   iv. Custom Priority: This scenario allows the user to select the priority order (1 being the first population to go through terminations, 2 being second, etc.), which has terminations go through a single population before it moves to the next in that order. Thus, one population will process its terminations completely before the Model processes another population; this cascading logic is further explained in Section 4.5.
5. Minimum Months to Disenroll (Future)
   i. Input prevents members with durations of enrollment less than the minimum from being disenrolled. For example, if the input is 12, a new enrollee who joins January 2023 will not qualify for termination until January 2024. The only exception to this is if the total amount of terminations in a given month exceeds the eligible beneficiaries who have the minimum months of eligibility. This results in spillover, where terminations take place at durations less than the minimum months to disenroll.
   ii. The allowable values are any integer from 1 to 12.
   iii. In the event that the number of members with the minimum duration is less than the expected leavers for a given month, the Model has an overflow logic to disenroll members from the next highest duration until the total number of leavers is satisfied.
6. Months Lag for Churn
   i. Among the beneficiaries who are disenrolled, a portion of these individuals is expected to reenroll at a later period, a scenario often referred to as "churning back." Within this subset, different scenarios contribute to this reenrollment. Firstly, some beneficiaries may have been disenrolled for procedural reasons, despite meeting the eligibility criteria. Secondly, there are individuals who will regain eligibility at a future date due to various circumstances. The input represents the average duration, measured in months, in which a member remains disenrolled before becoming eligible again.
   ii. If a value is 1, then this would imply a beneficiary who was disenrolled in January 2024 would rejoin in February 2024. Since the Model assumes beneficiaries lose coverage at the beginning of the month, January 2024 would represent the gap in coverage for the beneficiary who churns back one month later in this example.

7. Simulation +/- Months of Churn
    i. The Scenario Testing simulates changes in values of select inputs. Of the inputs, this is the first that allows for variation in Scenario Testing.
    ii. This controls the simulation for Months Lag for Churn. The value entered in the Model for Months Lag for Churn is assumed to be the base or "midpoint" assumption.
    iii. Scenario Testing of "Months Lag for Churn" will result in this input being equal to the Months Lag for Churn plus or minus Simulation +/- Months Lag for Churn.
    iv. Simulated values are rounded to the nearest integer, so the lag is in total months rather than fractional months, which is not supported by the Model's functionality. The Model also prevents negative values.
    v. For example, if the user enters 4 for Months Lag for Churn and 3 for the Simulation +/- Months of Churn inputs, then the Scenario Testing would vary the Months Lag for Churn such that the value of this input in the three scenarios would be 1, 4 and 7.
8. Unwinding Distribution
    i. The following three options are available for this model input, which controls how many total beneficiaries are terminated in each month of the unwinding period.
    ii. Uniform: This scenario assumes the same number of beneficiaries disenrolled each month of the state's unwinding disenrollment period.
    iii. Renewals Report: With this approach, terminations are assumed to follow the same distribution as the expected distribution of eligibility redeterminations or renewals over the course of the unwinding for each state. States had to file redetermination plans with CMS, and about half of the states' plans were made public during the development of this Model. These forms are titled "State Report on Plans for Prioritizing and Distributing Renewals Following the End of the Medicaid Continuous Enrollment Provisions." Section A.1 allows each state to provide an estimated number of Medicaid and CHIP renewals that the state intends to initiate each month during its 12-month unwinding period. Renewal reports were provided in terms of either individuals or households, and the research team normalized this to individuals based on December 2022 enrollment figures from CMS. Renewal reports were published either by CMS or directly by states and tracked by The Center for Children & Families (CCF), a part of the Health Policy Institute at the McCourt School of Public Policy at Georgetown University (https://ccf.georgetown.edu/2022/09/06/state-unwinding-tracker/).
    iv. Custom: In the "Inputs" tab, there is an additional set of inputs in INPUT #4 for the percentage of members disenrolled each month across the 12-month unwinding period. The Model normalizes these entries to ensure the percentages used will then add up to 100%. These assumptions are further explained in Section 2.4.
9. Scenario Testing
    i. To have outputs reflect the base inputs, the value of this input should be set to 1, which corresponds with a midpoint enrollment projection.
    ii. The Scenario Testing macro will change this value to cycle through the three scenarios, but if the user wants to see details on any of those scenarios, then this value can be changed.
    iii. A value of 2 is for the Lower Bound (inputs decreased by the simulation +/- amount) enrollment projection.
    iv. A value of 3 is for the Upper Bound (inputs increased by the simulation +/- amount) enrollment projection.

Additionally, there is a button directly above this section of inputs that will update all inputs to match the Model's baseline assumptions for the state or national projection. Baseline assumptions that are state-specific include Month of First Terminations and Months to Process Terminations. They also include Churn Back Distribution, described further in Section 2.7, which varies only between expansion and non-expansion states.

2.2 INPUT #2: ENROLLMENT GROWTH

The Model accommodates custom enrollment growth parameters for various time periods, as enrollment growth occurs naturally within Medicaid programs. Despite the Model's primary emphasis on the unwinding process, there is significant value in examining the period beyond the unwinding phase to understand how changes in enrollment, including both growth and decline, may impact the average acuity. By considering shifts in enrollment, the Model can provide valuable insights into how fluctuations in the beneficiary population can influence the average acuity levels and therefore generate a deeper understanding of the interplay between enrollment trends and average acuity.

Figure 2-4
ENROLLMENT GROWTH

INPUT #2: Enrollment Growth		
Period	Input	Sim +/-
Unwinding	0.0%	0.0%
Year After	1.0%	0.0%
2 Years After	1.0%	0.0%
Thereafter	1.0%	0.0%

As shown in Figure 2-4, the Model allows for enrollment growth on a statewide basis. There are four different time periods where overall enrollment growth can be applied, where percentages are on an annual basis:

1. Unwinding (period for the state)
2. Year After
3. 2 Years After
4. Thereafter (or the remainder of the projection through June 2027)

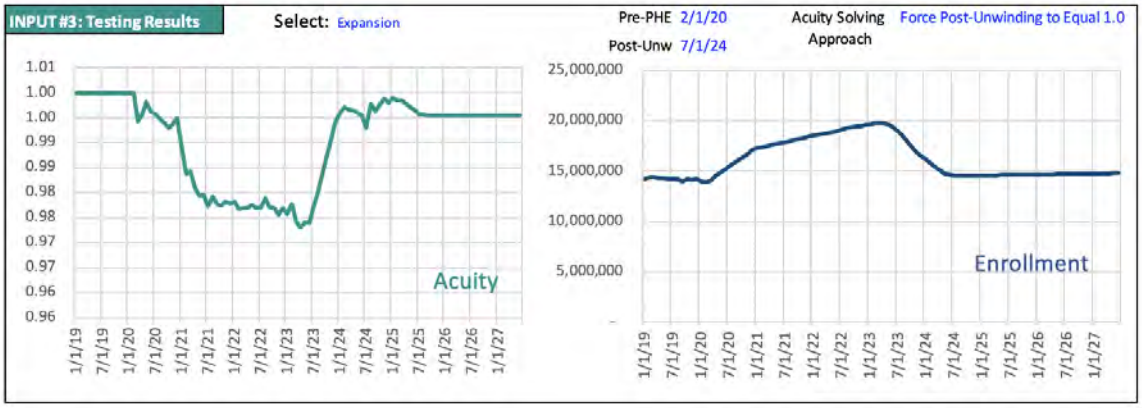
Note that any ongoing rate of leavers (or terminations) is rebalanced by incoming joiners, as discussed in Section 2.8, which enables an enrollment growth assumption of 0% to truly reflect static enrollment after the unwinding is complete. Furthermore, any shift between populations, through the use of the Churn Back Distribution (discussed in Section 2.7), will result in some populations growing and others shrinking, despite a 0% overall growth assumption. However, the aggregate results through the All Populations measures will reflect the 0% growth.

Recall from Section 2.0 that the Scenario Testing runs a macro that adjusts supported inputs up and down by the simulated value. The Sim +/- input controls the simulation for annual enrollment growth across the four time periods. For example, if the input for enrollment growth in the year after the unwinding (Year After) is 1.0% and the Sim +/- entry is 0.5%, then the Scenario Testing will use inputs of 0.5%, 1.0% and 1.5% in the three scenarios.

2.3 INPUT #3: TESTING RESULTS

This section controls how potential sensitivity testing or initial results look, so the user does not have to switch over to the "Model Results" tab just to gauge the impact of any of the inputs. The two graphs shown in Figure 2-5 plot acuity and enrollment over the course of the entire timeline of the Model. Any of the nine populations can be selected, as can a custom aggregate group (discussed in Section 2.5). Also, the last entry in the drop-down selector for populations allows for All Populations to be graphed.

Figure 2-5
TESTING RESULTS



Another element of this section comprises the definitions for pre-PHE (Model default is February 2020) and post-unwinding (Model default is July 2024). These control how the percentage in the upper right-hand corner of this section is modeled. These are also important inputs that control the acuity rebalancing that is discussed more in Sections 2.9 and 2.10. Finally, the acuity rebalancing can be set in this section to utilize one of two different approaches: (1) set post-unwinding to equal pre-PHE or (2) force post-unwinding to equal 1.0.

2.4 INPUT #4: CUSTOM DISENROLL

This section controls the distribution of terminations in the unwinding period if Custom is selected for the Unwinding Distribution input found in INPUT #1. The section allows for any input between the values of 0.0 and 1.0. The numbers in the first column denote the unwinding month, therefore the custom unwinding only supports unwinding periods up to 15 months. If the percentages do not add up to 100%, the Model normalizes all values so the total is 100%.

Figure 2-6
CUSTOM UNWINDING DISTRIBUTION

INPUT #4: Custom UD	
1	0.5%
2	2.8%
3	5.9%
4	7.6%
5	8.0%
6	9.8%
7	9.7%
8	9.1%
9	7.9%
10	7.6%
11	7.4%
12	7.9%
13	7.5%
14	5.4%
15	2.8%

Using the screenshot in Figure 2-6, if the total expected number of terminations for a state's unwinding is 200,000 beneficiaries, then this assumes 1,000 (0.5% of 200,000) are terminated in the first month of unwinding, and 5,600 are terminated in the second month, based on this custom distribution.

2.5 INPUT #5: POPULATION SELECTION

The next set of inputs manages how populations are used in the Model. This selection module was covered in Section 1.2.

Figure 2-7
POPULATION SELECTION

INPUT #5: Population Selection				
#	Default	Override	Used	Agg.
Population 1	CHIP		CHIP	1
Population 2	Children		Children	1
Population 3	Expansion		Expansion	1
Population 4	Adult		Adult	1
Population 5	Aged		Aged	0
Population 6	Disabled		Disabled	0
Population 7	COVID New		COVID New	1
Population 8	Unknown		Unknown	1
Population 9				0
Use Override?	No	Aggregate Group Name:	Non-ABD	

2.6 INPUT #6: UNWINDING SPECIFICATIONS

Unwinding specifications control critical assumptions during the unwinding period as well as churn after the unwinding. Such assumptions include the portion of each population that is assumed to lose coverage and then the portion of those beneficiaries who are expected to rejoin in several months (where the number of months is determined by the Months Lag for Churn in INPUT #1).

Figure 2-8
UNWINDING AND CHURN SPECIFICATIONS

INPUT #6: Unwinding and Churn Specifications							
Population	PHE Growth	Priority	% Lost Cov.	Sim +/-	Terminations	% Churn (UNW)	% Churn (Post)
CHIP	34.6%	6	6.4%	0.0%	3,359	51.1%	46.1%
Children	16.3%	5	23.5%	10.0%	70,460	63.7%	43.7%
Expansion	18.3%	3	30.0%	10.0%	83,813	52.4%	32.4%
Adult	30.7%	4	28.9%	10.0%	40,161	52.4%	32.4%
Aged	13.3%	7	6.4%	5.0%	3,589	25.9%	20.9%
Disabled	11.1%	8	6.4%	5.0%	3,954	39.6%	34.6%
COVID New	0.0%	1	100.0%	0.0%	774	0.0%	0.0%
Unknown	0.0%	2	100.0%	0.0%	-	0.0%	0.0%
	0.0%	9	0.0%	0.0%	-	0.0%	0.0%

This section includes further explanation for the nomenclature used across the eight columns, described from left to right:

1. **Population:** Each population can have its own unwinding and churn specifications.

2. PHE Growth: This is the total percentage growth in enrollment from February 2020 to the month before the unwinding begins for the region specified in INPUT #1.
3. Priority: If Custom Priority is selected for Unwinding Priority in INPUT #1, this is the order in which populations are terminated during the unwinding.
4. % Lost Cov.: Those who lose coverage are expected to lose it either because they were deemed ineligible or because they did not return paperwork, which is considered a procedural termination. This coverage loss assumption only applies to the unwinding period.
5. Sim +/-: The Scenario Testing, as described in Section 2.0, will support variation in the percentage of each population that loses coverage during the unwinding. This percentage is additive. Using the example in Figure 2-7, the percentage of Expansion beneficiaries that lose coverage will vary, so the results of this assumption will be 14%, 24% and 34% (24% +/- 10%).
6. Terminations: This is equal to the expected number of terminations during the unwinding for each population and is shown so the user can see the immediate impact of the percentage loss coverage assumptions.
7. % Churn (UNW): In the context of this table, churn is the portion of those who lost coverage that will return to having coverage within the next year. The exact time in which they return is determined by Months Lag for Churn as set in INPUT #1.
8. % Churn (Post): A separate churn assumption is used for the time period following the unwinding.

2.7 INPUT #7: CHURN BACK DISTRIBUTION

The seventh set of inputs control which populations' beneficiaries join soon after leaving the program.

Figure 2-9
CONTROLLING HOW ELIGIBILITY CHANGES WHEN BENEFICIARIES CHURN BACK

	INPUT #7: Churn Back Distribution								
Population	CHIP	Children	Expansion	Adult	Aged	Disabled	COVID New	Unknown	
CHIP	83.5%	13.9%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Children	5.0%	89.4%	5.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Expansion	0.0%	0.0%	97.5%	0.0%	2.2%	0.4%	0.0%	0.0%	0.0%
Adult	0.0%	0.0%	0.0%	97.5%	2.2%	0.4%	0.0%	0.0%	0.0%
Aged	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
Disabled	0.0%	0.0%	0.0%	0.0%	4.3%	95.7%	0.0%	0.0%	0.0%
COVID New	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%
Unknown	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%

In the example from Figure 2-9, 83.5% of CHIP beneficiaries who lose coverage will return to CHIP, but 13.9% will actually change coverage to Medicaid in the Children category. The Churn Back Distribution gives full control to model enrollment shifts and is applicable not only to the initial unwinding but also to the ongoing leavers, which is covered in the next subsection.

2.8 INPUT #8: MONTHLY TERMINATED RATES AS PERCENTAGE OF TOTAL MEMBERSHIP

The unwinding has its own controls for terminations as explained in Section 2.6. To account for a loss of coverage before and after the unwinding, the Model determines what percentage of total enrollment's coverage lapses each month. These "monthly termination rates" are defined as a percentage of total membership from the previous month, as shown in Figure 2-10.

Figure 2-10
MONTHLY RATES OF TERMINATION

INPUT #8: Monthly Termination Rates as Percentage of Total Membership										
Pre-PHE	Pre-UNW	CHIP	Children	Expansion	Adult	Aged	Disabled	COVID New	Unknown	
1.7%	0.3%	2.8%	1.5%	2.3%	2.3%	0.4%	0.7%	0.0%	0.0%	0.0%

In lieu of having eligibility data for all states, the research team leveraged this model assumption to account for the historical volume of Medicaid beneficiaries who lost coverage. It can be viewed as a turnover assumption or Rate of Leavers, where the term *leavers* is synonymous with terminations. Per Figure 2-10, the Model varies this rate for the pre-PHE period, the continuous coverage or pre-unwinding period (pre-UNW), and the period following the unwinding, the latter of which can vary by population.

The termination rates cause beneficiaries, skewed to higher durations, to drop their coverage. To reconcile historical monthly enrollment data, an adjustment to newly enrolled beneficiaries, also called joiners, is included so the net total with the joiners less the leavers is equal to the change in enrollment from one month to the next. The adjustment is also applied to joiners in future periods.

Because there is ongoing churn in Medicaid, the adjustment to joiners to balance the Rate of Leavers reflects this. If enrollment growth is set to 0%, then the joiners will fully offset the leavers to keep total enrollment constant. Note that, depending on the churn back distribution assumptions, some populations may increase or decrease, despite a total enrollment growth of 0%, but the aggregate sum of all populations should reflect the enrollment growth of 0%.

Baseline assumptions for the monthly terminated rates pre-PHE compared to the time of continuous coverage were sourced from a study that show leavers, excluding deaths, still occurred in Medicaid but were 85% lower in the 2020 study period as compared to the previous year.[2] For example, the results in this study showed that out of 7,351,000 beneficiaries enrolled as of March 1, 2019, 966,000 of them had disenrolled by October 31, 2019. The research team took the 966,000 terminations and divided it by the assumed total member months during this 8-month period, which was 8 months times 7,317,000. The lower beneficiary count as of the end of the period was used rather than the starting enrollment, as the beneficiary count was decreasing over this time, and therefore the higher beneficiary count as of March 2019 was considered too high to use. The resulting percentage for the pre-PHE period was calculated to be 1.65% for monthly terminations (displayed as 1.7% in Figure 2-10). Using a similar approach for the 2020 data from this study, the research team arrived at an assumption of 0.29% for monthly terminations (displayed as 0.3% in Figure 2-10).

2.9 INPUT #9: ACUITY PRE-UNWINDING

Acuity is the severity of illness and is a parameter considered in patient classification. Broadly in actuarial applications, it's a term used to describe the average morbidity of a population. For example, the acuity of a disabled population is expected to be higher than that of non-disabled children or adults. For the Model, acuity is measured with respect to the beneficiaries' average expected cost at different durations of enrollment compared to the overall average cost for that population. Duration is in terms of months and represents the number of months a beneficiary has been enrolled in an eligibility category (population) without a gap in coverage. The Model allows for acuity to vary by each month in the first year of eligibility (months 1 through 12), and there is an assumed acuity factor for all months after the first year (13+ months). This range of acuity factors by duration is called the acuity curve.

Regarding duration, the Model tracks beneficiary duration each month in the form of cohorts. For example, the Expansion population may have an enrollment count that varies across durations. Duration 2 could have 10,000 beneficiaries in October 2023. These 10,000 beneficiaries will then move to Duration 3 in November 2023 less the allocated leavers (those who are enrolled in October 2023 but no longer in

November 2023). Naturally, joiners only impact Duration 1, which has no carryover from the month prior. Once beneficiaries move from Duration 12 to Duration 13, they will stay in Duration 13. Note that cohorts of beneficiaries rather than individual beneficiaries are accounted for at each duration.

Therefore, the average expected acuity for a single population should be close to a value of 1.0. For this reason, acuity values should be populated in this table (see the example in Figure 2-1) in regard to average PMPM cost for that population. For example, an entry of 1.00 would represent the average cost for that population, and 1.30 would represent 30% higher costs.

Figure 2-11
ACUITY BEFORE THE UNWINDINGS

INPUT #9: Acuity Pre-Unwinding									
Duration	CHIP	Children	Expansion	Adult	Aged	Disabled	COVID New	Unknown	
1	1.039	1.089	1.559	1.753	1.000	1.000	1.000	1.000	1.000
2	1.077	1.076	1.112	1.266	1.000	1.000	1.000	1.000	1.000
3	1.069	1.068	1.098	1.182	1.000	1.000	1.000	1.000	1.000
4	0.969	0.968	1.127	1.051	1.000	1.000	1.000	1.000	1.000
5	1.147	1.145	0.977	1.037	1.000	1.000	1.000	1.000	1.000
6	1.024	1.023	1.057	1.061	1.000	1.000	1.000	1.000	1.000
7	0.936	0.935	1.005	1.039	1.000	1.000	1.000	1.000	1.000
8	0.956	0.955	1.019	1.017	1.000	1.000	1.000	1.000	1.000
9	0.986	0.984	0.974	0.996	1.000	1.000	1.000	1.000	1.000
10	0.994	0.992	0.969	0.981	1.000	1.000	1.000	1.000	1.000
11	0.996	0.994	0.971	0.960	1.000	1.000	1.000	1.000	1.000
12	0.996	0.994	0.971	0.960	1.000	1.000	1.000	1.000	1.000
+1 Year	0.996	0.994	0.971	0.960	1.000	1.000	1.000	1.000	1.000

Baseline assumptions for acuity curves are provided in the Model and were developed using data from several sources:

- Datasets from Synthetic Healthcare Database for Research (SyH-DR)[3], which has a sample of a full enrollment and claims dataset from CMS in 2016, were summarized by duration of enrollment for all beneficiaries who had new coverage beginning that year. Average PMPM claim cost by duration was compared to average PMPM for each population, which included CHIP, Medicaid Children, Adult, Expansion Adult, Disabled and Aged. Methodology from the Agency for Healthcare Research and Quality can be found at https://www.ahrq.gov/sites/default/files/wysiwyg/data/SyH-DR-Sampling-Weighting-Synthetization-Methodologies-rev.pdf.
- Publicly available data sources from select states, including actuarial rate certifications from Arizona Medicaid for the rating period of October 1, 2022, through September 30, 2023, which detail acuity factors for a significant portion of the originally scheduled end of PHE and unwinding.
- Requested data sets from Medicaid agencies in Mississippi and West Virginia.

2.10 INPUT #10: ACUITY POST-UNWINDING

The next table of acuity curves provides a data input for the assumed acuity by duration for each population during the period following the end of the unwinding as it applies for each population. Note that for the unwinding period, the Model linearly interpolates between the two acuity curves. For example, if the unwinding is 10 months long for a population, then the first month of the unwinding will have an acuity curve equal to 90% of the pre-unwinding acuity curve and 10% of the post-unwinding acuity curve.

The Model provides separate acuity curves for the post-unwinding period due to the large shift in duration that is occurring as a result of the PHE. While a large volume of beneficiaries will lose coverage, main beneficiaries will continue to maintain their coverage through the unwinding. These beneficiaries will all be

considered high duration (13+ months) in the Model. After the unwinding, the user of the Model may want to reflect their expected acuity, and this post-unwinding acuity curve is a way to do that. The research team also recognizes that acuity for populations could shift over time if there are changes in state policies, especially if they are changes in eligibility such as what was observed with the onset of the PHE. This acuity curve provides additional value in this area.

Figure 2-12
ACUITY POST-UNWINDING

INPUT #10: Acuity Post-Unwinding									
Duration	CHIP	Children	Expansion	Adult	Aged	Disabled	COVID New	Unknown	
1	1.024	1.024	1.479	1.579	1.000	1.000	0.000	0.000	0.000
2	1.061	1.061	1.054	1.141	1.000	1.000	0.000	0.000	0.000
3	1.053	1.053	1.041	1.065	1.000	1.000	0.000	0.000	0.000
4	0.955	0.955	1.069	0.947	1.000	1.000	0.000	0.000	0.000
5	1.129	1.129	0.926	0.935	1.000	1.000	0.000	0.000	0.000
6	1.008	1.008	1.003	0.956	1.000	1.000	0.000	0.000	0.000
7	0.922	0.922	0.953	0.937	1.000	1.000	0.000	0.000	0.000
8	0.942	0.942	0.966	0.917	1.000	1.000	0.000	0.000	0.000
9	0.971	0.971	0.924	0.898	1.000	1.000	0.000	0.000	0.000
10	0.979	0.979	0.919	0.884	1.000	1.000	0.000	0.000	0.000
11	0.981	0.981	0.921	0.865	1.000	1.000	0.000	0.000	0.000
12	0.981	0.981	0.921	0.865	1.000	1.000	0.000	0.000	0.000
+1 Year	0.999	0.998	0.991	0.996	1.000	1.000	1.000	1.000	1.000
Sim(1+/-)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Aside from the timeline in which the two different acuity curves are applied, there are two other differences with the post-unwinding acuity curve: (1) Scenario Testing support and (2) acuity rebalancing.

The simulation inputs for Scenario Testing are shown in the bottom row of Figure 2-12. These inputs are multiplicative rather than additive and are therefore applied as factor adjustments. For example, with an assumed acuity of 0.991 at +1 Year and a simulation input of 5.0% for Sim(1+/-), the acuity factors at that duration for that population will vary so the value will be between 0.941, 0.991 or 1.041 (.991 +/- 0.050) because 5.0% of 0.991 is 0.050. Note that there is no rounding of the acuity factors, so this example isn't limited to three decimal places. The simulation adjusts the entire curve by the randomly selected value. Each population's acuity curve has the same random probability, so their simulations change in the same direction.

For the post-unwinding acuity curve, the Model also has an option to run a macro that will allow for neutrality of acuity so the average acuity for each population at the time period immediately before the PHE and immediately following the unwinding is equivalent. The macro merely saves the acuity values that are calculated as a result of this rebalancing. This can be run by clicking the Reset Acuity button that is directly below INPUT #2 and shown in Figure 2-13. The dates used to balance the average acuity between pre-PHE and post-unwinding are found in INPUT #3. When running this macro, the post-unwinding acuity curve is adjusted upward or downward by a factor to satisfy the condition of the average acuity being equivalent between the two dates selected in INPUT #3. Alternatively, if the user selects the Acuity Solving Approach in INPUT #3 so values are forced to equal 1.0 in the post-unwinding, then an adjustment factor is applied to the acuity curve so the weighted average acuity is equal to 1.0 once the post-unwinding period begins.

Figure 2-13
RESET ACUITY BUTTON

The acuity rebalancing can be a useful tool to allow the user to assume that average acuity returns to its previous level despite a major shift in average duration between the pre-PHE and post-unwinding periods.

A number of approaches allow the user to customize their own acuity assumptions as an input in calculating acuity. One could study average claim costs on a PMPM basis for the same period of time to see how they vary by duration for a population. Acuity can be calculated as a result of a stayer / leaver / joiner analysis (see the SOA presentation[4] on this topic). Risk scores can also be used to measure acuity. In any of these approaches, it is critical that acuity be calculated by duration of enrollment so these values can be input in the Model appropriately.

Section 3: Outputs

The major outputs of the Model are projected enrollment and average acuity. These are presented in the blue tabs labeled “Monthly Outputs” and “Model Results.”

3.1 MONTHLY OUTPUTS

Monthly figures for enrollment and average acuity are presented for each population from January 2019 to the end of the projection in June 2027. As indicated in Section 2.9, the acuity curve varies by each duration used in the Model, and the average acuity in a single month is the weighted average of each duration’s acuity and the enrollment at those durations. Acuity is modeled at the population level and is tracked monthly within the Model.

3.2 MODEL RESULTS

Within the tables, results are shown for two different periods that can be controlled by the user. The Model then calculates the percentage change in enrollment and acuity between those two periods for each population, as well as the total impact for all populations combined. In the example in Figure 3-1, the inputs for Period 1 are the period starting January 2022 and lasting 12 months (calendar year 2022), and the inputs for Period 2 are the period starting January 2024 and lasting 12 months (calendar year 2024). The State is selected in the “Inputs” tab.

The only other user selection here is the population to show in the acuity and enrollment graphs, which is controlled by the population drop-down in the top left-hand corner. The tables effectively show a potential range in outcomes based on going from a high value in Period 1 to a low value in Period 2 (a low impact) or going from a low value in Period 1 to a high value in Period 2 (a high impact), covering a wide range of possibilities. If Scenario Testing has been run, the outputs for both “low” and “high” enrollment will show results.

Figure 3-1

MODEL RESULTS TAB

State: West Virginia

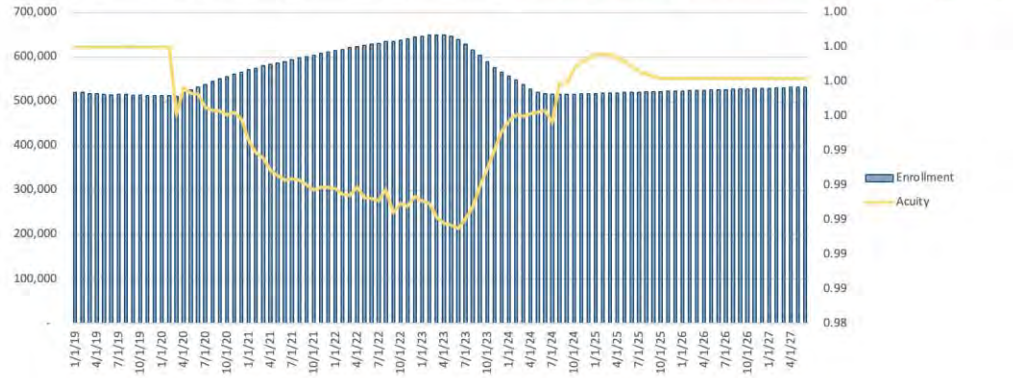
Graphs: All Populations

	MonthBeg	Months
Period 1	3/1/23	1
Period 2	7/1/24	1
Proj. Mos.	16.0	

- WEST VIRGINIA -

Base Inputs	
Month of First Terminations	4/1/23
Months to Process Terminations	15
Unwinding Priority	Time-Based
Min. Mos. Enrollment to Disenroll	12
Months Lag for Churn	6
Unwinding Distribution	Custom

	Period 1: Mar 23 to Mar 23		Period 2: Jul 24 to Jul 24		Low Enrollment Scenario		Mid Enrollment Scenario		High Enrollment Scen.	
Population	Avg. Enrollment	Acuity	Avg. Enrollment	Acuity	Enrollment	Acuity	Enrollment	Acuity	Enrollment	Acuity
CHIP	33,648	1.00	32,409	1.00	-0.8%	0.6%	-3.7%	0.6%	-6.5%	0.6%
Children	203,752	0.99	171,284	1.00	-22.5%	0.5%	-15.9%	0.5%	-11.9%	0.5%
Expansion	203,440	0.97	159,339	1.00	-27.0%	2.5%	-21.7%	2.6%	-18.4%	2.1%
Adult	65,209	0.96	51,208	1.00	-27.2%	3.9%	-21.5%	4.0%	-17.6%	3.3%
Aged	49,277	1.00	47,247	1.00	-8.6%	0.0%	-4.1%	0.0%	-0.9%	0.0%
Disabled	93,965	1.00	89,251	1.00	-9.8%	0.0%	-5.0%	0.0%	-1.5%	0.0%
COVID New	587	1.00	-	0.00	-100.0%	-100.0%	-100.0%	-100.0%	-100.0%	-100.0%
Unknown	-	0.00	-	0.00	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	-	0.00	-	0.00	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Non-ABD	506,636	0.98	414,240	1.00	-23.5%	2.1%	-18.2%	2.1%	-15.0%	1.8%
All Populations	**649,878**	**0.99**	**550,739**	**1.00**	**-20.4%**	**1.0%**	**-15.3%**	**1.0%**	**-12.0%**	**0.8%**



Section 4: Model Calculations

The "Main" tab stores most of the summary results from each of the individual models for each population as well any outputs from Scenario Testing when it was last run. The nine population tabs, labeled Population 1 through Population 9, are all identical in regard to the formulas they contain. Data flow into each population tab based on how the user governs the population in the "Inputs" tab (see Section 2.5). This section gives an overview of the major components of how enrollment changes are managed in any of the population tabs.

4.1 PHASE MANAGEMENT

Enrollment growth, leavers, and joiners are handled differently for each phase of the timeline. In the upper left-hand corner of a population tab, Phase is shown as presented in Figure 4-1.

Figure 4-1
CHANGING PHASES

Population 1	CHIP		
State	WV		
Section	report_date	Phase	Members
Total Members	6/1/27	5	34,884
Total Members	5/1/27	5	34,780
Total Members	4/1/27	5	34,677
Total Members	3/1/27	5	34,573
Total Members	2/1/27	5	34,470
Total Members	1/1/27	5	34,367
Total Members	12/1/26	5	34,264
Total Members	11/1/26	5	34,161
Total Members	10/1/26	5	34,059
Total Members	9/1/26	5	33,957

There are six phases in the Model:

- Phase 0: the pre-PHE period of January 2019 through February 2020
- Phase 1: the time of continuous coverage from February 2020 through the month prior to the unwinding for a population
- Phase 2: the unwinding period for a population
- Phase 3: the one-year period after the unwinding
- Phase 4: the one-year period after Phase 3
- Phase 5: the remainder of the projection through June 2027

The remaining subsections refer to these phases as appropriate when methodologies and formulas vary by phase.

4.2 STAYER / LEAVER / JOINER BY DURATION

Two common methods to measure changes in acuity due to significant enrollment changes are Stayer / Leaver / Joiner studies and Durational Analysis. The Model effectively combines these approaches.

Stayer / Leaver / Joiner methodologies may study risk scores or average cost profiles and split them by members into each of these three categories. Stayers are cohorts of members that have coverage during the first time period and retain it all the way through the second time period. Leavers are those who had coverage during the first time period but no longer have coverage in the second. Joiners are those who were not covered in the first time period but have coverage in the second.

Each population tab contains several matrices, including a master matrix for total enrollment by month and duration. Newly enrolled beneficiaries always enter the matrix at the first month of duration as joiners and are discussed in Section 4.2. The enrollment for any durations beyond the first month is dependent upon the previous duration in the previous month, less the leavers. In the following example in Figure 4-2, there are 660 CHIP beneficiaries with 3 months duration in August 2019. These beneficiaries "move" diagonally up the matrix to duration 4 in September 2019, which results in 657 beneficiaries. The net difference is equal to 3 beneficiaries, who were leavers identified in August 2019 who didn't continue with their enrollment in this population by the beginning of September 2019.

Figure 4-2
ACUITY CHANGES AS ENROLLMENT SHIFTS

Population 1	CHIP				CHIP			
State	WV			ost-CC	1.02	1.06	1.05	0.95
				re-UNW	1.04	1.08	1.07	0.97
					1	2	3	4
Section	report_date	Phase	Members		1	2	3	4
Total Members	3/1/20	1	33,376		459	599	664	626
Total Members	2/1/20	0	33,469		600	666	629	576
Total Members	1/1/20	0	33,419		667	631	578	494
Total Members	12/1/19	0	33,300		632	580	496	526
Total Members	11/1/19	0	33,216		580	497	528	730
Total Members	10/1/19	0	33,184		498	530	733	561
Total Members	9/1/19	0	33,235		531	735	564	657
Total Members	8/1/19	0	33,250		736	565	660	588

As beneficiaries progress through higher durations, their acuity is assumed to have changed. The acuity assumptions from the "Inputs" tab (see Sections 2.8 and 2.9 on how acuity factors are set) and the evolving mix of enrollment across different durations result in a changing average acuity that is calculated in column H of any of the population tabs.

4.3 JOINERS

Joiners are the new beneficiaries for a population. However, the Model considers joiners in three distinct ways: (1) historical enrollment changes, (2) churn and (3) future enrollment growth.

With the first component, historical enrollment changes in Phases 0 and 1, joiners are calculated by taking the difference of actual enrollment from one month to the next and adding the expected leavers. An example would be enrollment figures of 110,000 in January 2020 and 113,000 in February 2020. If the expected leavers rate is the default used in the Model, which is approximately 1.7% of monthly enrollment, then the leavers calculated from January 2020 would be 1,815. This would result in a joiner calculation of 4,815 (113,000 – 110,000 + 1,815) for February 2020. The Model makes a couple of adjustments to prevent erroneous outputs. The first such adjustment is applied to joiners and takes the greater of zero and the originally calculated joiners. The second adjustment adds enough leavers to account for what would have been the negative joiners. Many examples of this can be found with the historical CMS data.

The following example in Figure 4-3 is once again for West Virginia CHIP. As shown, the default estimation for leavers is about 550 per month. For the month of March 2019, this calculation is not enough, and the Model adds enough leavers (399) to account for the larger decrease in enrollment that month. Since the leavers in March 2019 would impact the April 2019 enrollment, the joiners are then decreased by the 399-beneficiary count.

Figure 4-3
LEAVERS OFFSET FROM JOINERS

Section	report_date	Phase	Members	Base Delta	Adjustments
Leavers	2/1/20	0	552	552	-
Leavers	1/1/20	0	550	550	-
Leavers	12/1/19	0	548	548	-
Leavers	11/1/19	0	548	548	-
Leavers	10/1/19	0	548	548	-
Leavers	9/1/19	0	549	549	-
Leavers	8/1/19	0	546	546	-
Leavers	7/1/19	0	545	545	-
Leavers	6/1/19	0	543	543	-
Leavers	5/1/19	0	543	543	-
Leavers	4/1/19	0	558	558	-
Leavers	3/1/19	0	950	551	399
Leavers	2/1/19	0	551	551	-

The second way that new beneficiaries join a population is through churn. Covered in Section 2.6, the Model provides a Months Lag for Churn assumption for a portion of beneficiaries who lost coverage ultimately rejoin a number of months later. Inherently, this should be viewed as short-term churn for those who return within a year of losing coverage. Using the churn back distribution described in Section 2.7, each population tab calculates the portion of leavers who rejoin and which population they churn back to upon return. An example of this is shown in Figure 4-4, where the end of the projection in June 2027 has a baseline figure of 661 joiners, which is then supplemented by two cohorts churning back—374 from CHIP as well as 62 from Children—for a grand total of 1,097 joiners that month.

Figure 4-4
JOINERS WITH CHURN BACK

					Churn Back (UNW)	43%	3%	0%
					Churn Back (Post)	39%	2%	0%
						CHIP	Children	Expansion
					Joiners	Population 1	Population 2	Population 3
Joiners	6/1/27	5	661		1,097	374	62	-
Joiners	5/1/27	5	659		1,094	373	61	-
Joiners	4/1/27	5	657		1,091	372	61	-
Joiners	3/1/27	5	655		1,087	371	61	-
Joiners	2/1/27	5	653		1,084	370	61	-
Joiners	1/1/27	5	651		1,081	368	61	-
Joiners	12/1/26	5	649		1,078	367	61	-
Joiners	11/1/26	5	647		1,074	366	61	-

Future enrollment growth is governed by INPUT #2 in the "Inputs" tab and is covered in Section 2.2. Any enrollment growth (or shrinking) assumption is applicable only for Phases 2 (Unwinding) onward and is applied in a monthly compounded manner. An example of this would be a 4.0% enrollment growth assumption applied to the previous month's enrollment count of 90,000 beneficiaries. Since the 4.0% is on a per annum basis, the calculation for joiners due to enrollment growth is 90,000 * $(1.04^{1/12} - 1)$, which is 294.63. No rounding is applied in these calculations so as to get the best representation of expected values.

4.4 LEAVERS

Aside from the leaver offset covered in the previous section, monthly leavers are controlled by the Rate of Terminations that was discussed in Section 2.8. This simply takes the monthly terminated rate and applies that percentage to the previous month's enrollment to calculate leavers for that month. During the unwinding period, additional members are terminated above the termination assumptions. More details on these additional terminations can be found in Section 4.5.

How the leavers are distributed across different durations is another consideration within the Model. Greater probability of termination is given to the beneficiaries with higher duration. A factor is used for determining the distribution of leavers based on the product of the enrollment at each duration and the durations raised to a power.

4.5 CASCADING LOGIC

Understanding that the process and requirements for redeterminations can vary from state to state, the Model has multiple mechanisms for projecting how members are terminated during the unwinding. The user defines the order in which members are redetermined using the Unwinding Priority toggle in the INPUT #1 section of the "Inputs" tab.

If a Time-Based approach is selected for the Unwinding Priority, then beneficiaries in each population will be terminated at an equal rate every month (different for each population) so the total number of leavers each month for all populations is constant. However, if a Population-Based or Custom approach is selected, then populations will go through their own terminations, one population at a time, until all beneficiaries who are expected to lose coverage are fully terminated. A visual example of this cascading logic can be found in the screenshot in Figure 4-5, which is from the "Main" tab.

Figure 4-5
CASCADING LOGIC EXAMPLE

				Months	1	0	7	5	5	1	1	1	0
				Start Date	5/1/23	6/1/23	6/1/23	11/1/23	1/1/24	5/1/24	5/1/24	5/1/24	6/1/24
				Disenrolled	589	-	40,961	12,540	30,393	1,731	2,954	1,549	-
	Unwinding Criteria				Disenrollment Distribution (Cascading Setup)								
Month	Cont Cov?	Window	Phase	Disenrolled	COVID New	Unknown	Expansion	Adult	Children	CHIP	Disabled	Aged	
8/1/24	0	0	3	-	-	-	-	-	-	-	-	-	-
7/1/24	0	0	3	-	-	-	-	-	-	-	-	-	-
6/1/24	0	0	3	-	-	-	-	-	-	-	-	-	-
5/1/24	0	0	3	-	-	-	-	-	-	-	-	-	-
4/1/24	0	1	2	7,560	-	-	-	(0)	1,325	1,731	2,954	1,549	-
3/1/24	0	1	2	7,560	-	-	-	0	7,560	-	-	-	-
2/1/24	0	1	2	7,560	-	-	-	(0)	7,560	-	-	-	-
1/1/24	0	1	2	7,560	-	-	-	0	7,560	-	-	-	-
12/1/23	0	1	2	7,560	-	-	-	1,171	6,389	-	-	-	-
11/1/23	0	1	2	7,560	-	-	0	7,560	-	-	-	-	-
10/1/23	0	1	2	7,560	-	-	3,750	3,809	-	-	-	-	-
9/1/23	0	1	2	7,560	-	-	7,560	-	-	-	-	-	-
8/1/23	0	1	2	7,560	-	-	7,560	-	-	-	-	-	-
7/1/23	0	1	2	7,560	-	-	7,560	-	-	-	-	-	-
6/1/23	0	1	2	7,560	-	-	7,560	-	-	-	-	-	-
5/1/23	0	1	2	7,560	589	-	6,971	-	-	-	-	-	-
4/1/23	1	0	1	-	-	-	-	-	-	-	-	-	-

In this example, COVID New is the first population with any terminations expected during the unwinding, for which it takes just one month for the terminations to process, based on the distribution of terminations. Once that process is fully exhausted, the logic moves to the next population in order—Unknown in this example, which has no terminations—and then progresses to the Expansion population, which takes six months to process the terminations. This process continues until the end of the unwinding.

4.6 INITIAL DISTRIBUTION OF ENROLLMENT

The initial distribution of enrollment in January 2019 has little to do with what the distribution of enrollment looks like in February 2020 since all beneficiaries who were enrolled in January 2019 and are still enrolled in February 2020 will end up in the 13+ month duration slot. However, this does have an impact on average acuity before the pandemic, which is used in the acuity rebalancing and general comparative analysis with the acuity after continuous coverage ends. The Model assumes 60% of enrollment is in the 13+ month duration, and the remaining 40% is evenly distributed across the first 12 months of duration. This initial distribution has limited impact on Model results because the monthly acuity is set to be equal to 1.0 during Phase 0 (pre-PHE), a methodology decision made by the research team due to the unknown initial distribution.

This concludes the overview of model mechanics.

Section 5: Acknowledgments

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Appendix A: State Unwinding Expectations

For states that have "N" listed for renewal reports, the information was not made publicly available when this SOA report was being published. Enrollment is total Medicaid and CHIP enrollment data from CMS in the Model in December 2022.

State	State Renewal Report	Renewals Start	Terminations Start	Enrollment
Alabama	N	Apr. 2023	Jun. 2023	1,171,540
Alaska	N	Apr. 2023	Jun. 2023	263,656
Arizona	AZ Renewal Report	Feb. 2023	Apr. 2023	2,291,196
Arkansas	AR Renewal Report	Feb. 2023	Apr. 2023	1,041,085
California	CA Renewal Report	Apr. 2023	Jul. 2023	14,078,007
Colorado	N	Mar. 2023	Jun. 2023	1,699,630
Connecticut	N	Mar. 2023	May 2023	1,008,718
Delaware	N	Apr. 2023	Jul. 2023	300,480
District of Columbia	DC Renewal Report	Apr. 2023	May 2023	292,727
Florida	FL Renewal Report	Mar. 2023	May 2023	4,883,951
Georgia	GA Renewal Report	Apr. 2023	Jun. 2023	2,485,394
Hawaii	HI Renewal Report	Apr. 2023	Jun. 2023	459,261
Idaho	N	Feb. 2023	Apr. 2023	452,903
Illinois	N	Apr. 2023	Jul. 2023	3,788,584
Indiana	IN Renewal Report	Mar. 2023	Apr. 2023	2,011,078
Iowa	IA Renewal Report	Feb. 2023	Apr. 2023	850,906
Kansas	KS Renewal Report	Mar. 2023	Jun. 2023	503,665
Kentucky	KY Renewal Report	Apr. 2023	May 2023	1,618,816
Louisiana	LA Renewal Report	Apr. 2023	Jul. 2023	1,896,206
Maine	N	Apr. 2023	Jun. 2023	367,372
Maryland	MD Renewal Report	Apr. 2023	May 2023	1,685,151
Massachusetts	N	Apr. 2023	Jun. 2023	1,977,039
Michigan	N	Apr. 2023	Jul. 2023	3,048,240
Minnesota	N	Apr. 2023	Jul. 2023	1,380,680
Mississippi	MS Renewal Report	Mar. 2023	Jun. 2023	770,553
Missouri	MO Renewal Report	Apr. 2023	Jul. 2023	1,453,302
Montana	MT Renewal Report	Mar. 2023	Apr. 2023	324,866
Nebraska	N	Mar. 2023	May 2023	390,562

Nevada	NV Renewal Report	Apr. 2023	May 2023	870,550
New Hampshire	N	Feb. 2023	Apr. 2023	249,906
New Jersey	NJ Renewal Report	Apr. 2023	Jun. 2023	2,202,958
New Mexico	N	Mar. 2023	May 2023	884,416
New York	N	Mar. 2023	Jul. 2023	7,408,878
North Carolina	NC Renewal Report	Apr. 2023	Jul. 2023	2,283,425
North Dakota	N	Apr. 2023	Jun. 2023	130,665
Ohio	OH Renewal Report	Feb. 2023	Apr. 2023	3,365,244
Oklahoma	N	Mar. 2023	May 2023	1,294,297
Oregon	OR Renewal Report	Apr. 2023	Oct. 2023	1,380,287
Pennsylvania	PA Renewal Report	Mar. 2023	Apr. 2023	3,674,072
Rhode Island	RI Renewal Report	Apr. 2023	May 2023	362,512
South Carolina	SC Renewal Report	Apr. 2023	May 2023	1,296,844
South Dakota	N	Feb. 2023	Apr. 2023	144,718
Tennessee	TN Renewal Report	Mar. 2023	Jun. 2023	1,816,267
Texas	TX Renewal Report	Apr. 2023	Jun. 2023	5,746,388
Utah	UT Renewal Report	Mar. 2023	May 2023	482,074
Vermont	VT Renewal Report	Apr. 2023	May 2023	192,634
Virginia	N	Mar. 2023	May 2023	2,003,672
Washington	WA Renewal Report	Apr. 2023	Jun. 2023	2,168,482
West Virginia	WV Renewal Report	Feb. 2023	Apr. 2023	645,172
Wisconsin	WI Renewal Report	May 2023	Jun. 2023	1,421,699
Wyoming	N	Mar. 2023	May 2023	83,301

Endnotes

1. Corallo, Bradley, and Sophia Moreno. Analysis of Recent National Trends in Medicaid and CHIP Enrollment. *KFF*, Apr. 4, 2023, *https://www.kff.org/coronavirus-covid-19/issue-brief/analysis-of-recent-national-trends-in-medicaid-and-chip-enrollment/* (accessed Sep. 24, 2023).

2. Sun, Ran, Becky Staiger, Antonia Chan, Laurence Baker and Tina Hernandez-Boussard. 2022. Changes in Medicaid Enrollment During the COVID-19 Pandemic Across 6 States. *Medicine* 101, no. 52: e32487, *https://doi.org/10.1097/MD.0000000000032487* (accessed Sep. 24, 2023).

3. Agency for Healthcare Research and Quality. Synthetic Healthcare Database for Research (SyH-DR). AHRQ, last reviewed March 2023, *https://www.ahrq.gov/data/innovations/syh-dr.html* (accessed Sep. 24, 2023).

4. Neiman, David A., Zachary C. Aters, Henry S. Burden, Thomas J. Garrity and Taylor A. Pruisner. Key Medicaid Experience Analytics: From Data to Action. Session at the Society of Actuaries' 2018 Health Meeting, Jun. 28–27, 2018, Austin, TX, *https://www.soa.org/globalassets/assets/files/e-business/pd/events/2018/health-meeting/pd-2018-06-health-session-033.pdf* (accessed Sep. 24, 2023).

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