# WHITE PAPER



# Medicaid Credibility Analysis

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# Background

Medicaid actuaries frequently have a need to assess credibility of Medicaid experience; whether it be assigning credibility to data for purposes of projecting expenses for bidding state rates, forecasting costs internally, or for understanding PMPM trends. Generally, actuaries will blend one estimate E based on a small set of experience data, with another estimate M based on a larger, but less relevant set of manual data. The credibility-weighted estimate is ZE + (1-Z)M, where Z is a number between 0 and 1 (called the "credibility weight" or "credibility factor") calculated to balance the sampling error of E against the possible lack of relevance (and therefore modeling error) of M.

While a similar approach is usually applied among Medicaid actuaries, the credibility factors used for blending varies. Although The Office of the Actuary (OACT) at the Centers for Medicare & Medicaid Services (CMS) has provided guidelines for full credibility to be used in Medicare pricing, there are no readily available resources on Medicaid credibility thresholds.

This variance in pricing methodology and the lack of readily available literature prompted Wakely to conduct a study and develop guidelines around The goal of the classical credibility theory is to determine the number of individuals in a group that are needed to have a 95% probability of being within 10% of the expected Medicare claims amount.

Medicaid claims credibility. In determining the goals of this study, here are some of the initial questions that were asked:

- 1. Will a classical credibility theory approach and a Monte Carlo simulation method produce different estimates?
- 2. Will the credibility thresholds vary by Medicaid rate group?
- 3. What constraints do the data put on the study?



#### Methodology

As a first step in the process, Wakely attempted to recreate the Medicare Advantage (MA) full credibility threshold of 24,000 member months using the classical credibility theory outlined in 'Claims Credibility Guidelines.pdf' published by CMS. This recreation experiment was based on the 2015 Limited Data Set Files (LDS), excluding any experience for enrollees classified with end-stage renal disease (ESRD) status and hospice status. The goal of the classical credibility theory is to determine the number of individuals in a group that are needed to have a 95% probability of being within 10% of the expected Medicare claims amount. While the above referenced CMS paper on the classical credibility theory details the statistical support, the following formula is the key to this method:

Full Credibility in Member Months = Average Monthly Exposure x n,

where n = 
$$\sqrt[4]{\frac{1.96 \times \sigma\sigma}{0.1 \times \mu\mu}}^2$$

In the above equation, n is the number of individuals in the group, with mean,  $\mu$ , and standard deviation,  $\varpi$ . The 1.96 represents the z-score for the 97.5th percentile of the standard Normal distribution (97.5 is used due to the symmetrical nature of the normal distribution; i.e. 2.5% on each side of the curve). Since n is defined on a per enrollee basis, the final result is converted to member months by multiplying n by the assumed average number of months of exposure per enrollee. This recreation resulted in a full credibility threshold of 21,050 member months. While not exactly equal to the officially published CMS level of 24,000, this result was close enough for Wakely to feel comfortable that the formula was being applied consistently with the CMS application given the data set was from a different year, and only represented a 5% sample of the Medicare FFS population. Furthermore, the CMS calculations in the above referenced paper also do not equate to exactly 24,000. They conclude that the results are similar enough to warrant no change in the threshold.

Wakely also evaluated the results of the classical credibility method using an alternate approach. In order to assess whether the classical credibility theory was the best method for testing claims credibility levels for a given population, Wakely developed a Monte Carlo simulation model which relies on repetitive random samples to develop results. The model uses a probability distribution table based on total allowed dollars from the same data source (2015 LDS) as used to calculate the mean and standard deviation for the classical credibility method described above. In an effort to maintain consistency between approaches, the Monte Carlo simulator was built to test how many members are needed so that the average annual cost is within 10% of the mean (expected Medicare claims amount) 95% of the time.

The Monte Carlo simulator works as follows:

- 1. Generate X random numbers.
- Pull the associated total allowed cost for each random number based on where it falls within the probability distribution table. Each random number represents a member and their associated total allowed spend for one year.



- 3. Calculate the average total allowed member spend for that randomly generated group of X individuals.
- 4. Continue simulating groups of X randomly generated individuals 1,000 times. (Note that the number of simualtions remains constant at 1,000 throughout the entire testing process. Wakely senstivity tested this assumption and determined that 1,000 simulations of X individuals was sufficient to produce consistent credibility threshold results.)
- 5. Test whether at least 950 of the 1,000 randomly generated groups of X individuals have an average total allowed spend that falls within ±10% of the mean of the total population.
- 6. If the the test result is positive, the simulation is complete and the results would indicate that X members are needed for full credibility. If the result is negative, the model will add another 1,000 random individuals and test 1,000 groups of X + 1,000 individuals. This process will continue to add members in increments of 1,000 until the credibility criteria is met.

Wakely started this process by assuming that X = 1,000 for the first simulation. By doing so, the model inherently assumes that full credibility will never be achieved with fewer than 1,000 members. This simulation exercise led Wakely to the conclusiuon that a threshold of 2,000 Medicare members is sufficient in terms of satisfying full credibility, a number that is fairly consistent with CMS credibility threshold.

# Results

Once Wakely was comfortable with the replication of the Medicare credibility threshold, the analyses were then conducted using a database of 2015 Medicaid data. The process started by aggregating the member level detail. For each unique member we calculated their total allowed spend and total member months, and determined their rate group (TANF, SSI, Child Welfare, or HIV/AIDS). Table 1 displays the total members in each rate group and the associated average months of exposure per enrollee by rate group.

**Total Members Rate Group** Average Months of **Exposure per Enrollee TANF** 3,213,120 9.0 SSI 666,763 10.4

53,720

25.600

Table 1 - Members in Underlying Data

We then calculated the mean and standard deviation of the total allowed dollars by rate group. Next, using the classical credibility formula, we solved for n. The mean, standard deviation and n values (rounded to the nearest 1,000) can be seen in Table 2.

**Child Welfare** 

**HIV / AIDS** 

6.5

9.1



Rate Group	Average Allowed (µ)	Standard Dev Total Allowed $(\sigma\sigma)$	Members (n value)
TANF	\$2,129	\$7,649	5,000
SSI	\$11,892	\$25,705	2,000
Child Welfare	\$3,855	\$14,141	5,000
HIV / AIDS	\$18,631	\$26,021	1,000

In addition to the classical credibility theory, each of the rate groups was run through the Monte Carlo simulator three times. Table 3 below compares the results of the classical credibility theory, and the three Monte Carlo simulator tests. As you can see the results are consistent.

**Table 3 - Member Results** 

Rate Group	Classical Credibility	MCS Test 1	MCS Test 2	MCS Test 3
TANF	5,000	5,000	5,000	5,000
SSI	2,000	2,000	2,000	2,000
Child Welfare	5,000	5,000	5,000	5,000
HIV/AIDS	1,000	1,000	1,000	1,000

The last step involved converting the derived members into member months by multiplying by the associated average months of exposure per enrollee. Table 4 below displays the calculated member months needed for full credibility for each of the Medicaid rate groups.

**Table 4 - Full Credibility** 

Rate Group	Members	Avg Exposure / Enrollee	MMs for Full Credibility
TANF	5,000	9.0	45,000
SSI	2,000	10.4	21,000
Child Welfare	5,000	6.5	33,000
HIV /AIDS	1,000	9.1	9,000

# Data Concerns/Caveats

The results above from all of the various testing methods are reasonable and consistent. However, there are some unanswered questions and concerns that came up through the process. In the beginning of the study, member level Medicaid claims detail was assigned to a specific rate group. There was some ambiguity of the mapping of members to rate group given the data fields provided, and there is a potential that this mapping of members could skew the results by rate group.

Wakely did not audit the data used in this study. Although the results did not vary significantly between methods, there could be variability and inconsistencies to the extent that the underlying claims data are not normally distributed. Another question that arose during the study was: what impact do partial year members have on the results? It is common to see inconsistent enrollment in the Medicaid world; for example, a member can be enrolled January through March then dis-enroll for the next several months



and continue coverage in November and December. Is there a potential that the high proportion of partial year members is skewing the results?

This study did not address these questions; they remain outstanding for further investigation.

# **Conclusion**

In summary, there are multiple ways one can calculate minimum credibility requirements; two of which are discussed in this paper. Both of these methods can be used to conclude that the credibility thresholds for Medicaid vary by rate group. TANF and Child Welfare rate groups require the most members to be credible and SSI and HIV/Aid population require the least members to be credible.

Please contact Kelsey Stevens, Rachel Stewart, Christina Byrne or your Wakely consultant with any questions or to follow up on any of the concepts presented here.