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## Stepwise Methodology for Creating the MassHealth Caseload Member Month Forecast

### Introduction

The following narrative outlines the step by step process of caseload forecasting presented to MassHealth on March 15<sup>th</sup> 2004 and is a supplement to the “*MassHealth Caseload and Expenditure Analysis: Final Caseload Analysis Deliverable*,” to be presented to MassHealth budget personnel on August 2, 2004. This methodology is dependent on a number of factors as outlined below. There are four primary steps in the proposed forecast methodology. The narrative will follow these incremental steps and each will be explained in detail. Examples will be provided so as to provide further understanding as to the complex assumptions analysts must employ.<sup>1</sup> This is a draft for policy discussion only.

### Step 1: “Completing” the Most Recent Eligibility (member) Months

**Rationale:** Step 1 explains the process by which “completion” factors are calculated for the most recent five months of eligibility data assuming that the sixth month is complete.

**Required Data:** Eligibility days per month going back at least 12 months as seen in 12 consecutive months for each of the budget groups

**Tool:** Completion Factors Worksheet

**Example:** “Caseload Narrative Examples” Ex1

The first step in the forecasting process is confirming the accuracy of the most recent data. This process, generally called “completion,” addresses the issue of variance in eligibility data based on the effects of redeterminations, retroactive eligibility, application verification, eligibility appeals and the movement among aid categories. The process utilizes past eligibility figures as seen in up to 12 months to create multipliers that act to increase or decrease eligibility in each budget group based on the historical “completion” percentages.

When creating trend-based eligibility projections, one of the most crucial issues is where to start the trend. As with any projection, the further into the future the forecast moves, the less reliable it becomes. This is magnified by inaccuracies in the starting point of the trend. If started in the wrong place, the forecast will only prove to be less and less accurate. Completion factors allow for a more accurate starting place to begin the forecast. By “completing” the most recent months of data (rather than simply disregarding them, as was previously done), this current/relevant data becomes accessible and will result in more accurate projections into the future.

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<sup>1</sup> This narrative has been updated from the last version distributed to MassHealth on March 15, 2004, to include the creation of completion factors.

### A. Calculating Completion Factors

The analyst must begin by organizing the eligibility days collected for each budget group going back 12 months, as seen in each of the twelve months, by group code, month, and “as of” date. This can be accomplished by employing the Excel “sort” function. An example of the organization of the data and the calculation of the completion factors can be found in *Caseload Narrative Examples: Ex1*. This organization provides the analyst with a list of eligibility days by month, and seen in up to 12 months.

From this list there will be seven months from which there have been six “as of date” observations, as seen in Table 1.

**Table 1: Example of Data Required to Calculate Completion Factors**

As of Date	Group Code	Month	Eligibility Days	Multiplier (month 6/ month 'n')
Nov 2003 (month1)	40	Nov 2003	13246	.846
Dec 2003 (month 2)	40	Nov 2003	12248	.915
Jan 2004 (month 3)	40	Nov 2003	11340	.988
Feb 2004 (month 4)	40	Nov 2003	11090	1.01
Mar 2004 (month 5)	40	Nov 2003	11270	.995
Apr 2004 (month 6)	40	Nov 2003	11210	1.0

The calculation of completion factor multipliers requires the assumption that the 6<sup>th</sup> “as of date” observation is complete.<sup>2</sup> The multipliers are developed by dividing the eligibility days of the sixth month by the eligibility days of each month previous to it (5<sup>th</sup>, 4<sup>th</sup>, 3<sup>rd</sup>, 2<sup>nd</sup>, and 1<sup>st</sup>). The resultant figures represent the factor by which each previous month differs from the 6<sup>th</sup> month observation (see Table 1). CHPR recommends that seven months (including 6 “as of dates” each) of data for each budget group (going back a total of 12 months from the current date) be used to calculate the completion factors.<sup>3</sup>

<sup>2</sup> CHPR found in its analysis that a 6 month completion time frame (event horizon) provided the sufficient level of completion for a quarterly forecasting period without over burdening the analysis. The average % completion of the 6 month completion factors for all budget groups was 98%. There are some budget groups that continue to complete up to 18 months. For these budget groups, (FFS, TPL, and Other) the analyst needs to utilize historical knowledge of budget group behavior to assess the value of the completion factor.

<sup>3</sup> Utilizing more than 12 months of historical data may skew the completion factors based on policy and environmental conditions that predominated historically. As completion factors are calculated on a regular basis and data is conserved, MassHealth will have the ability to assess the consistency of the calculations over time and adjust the current factors accordingly.

The seven sets of factors developed for “month 1” through “month 5” (“month 6” will always equal one and therefore does not need to be included), need to be averaged. In addition the standard deviation and confidence interval need to be calculated. The formulas for these calculations are available in M.S. Excel. Once the confidence interval has been developed, the analyst can calculate the range (Low and High) by adding the confidence interval to the average for that month, respectively, see Table 2.

**Table 2: Completion Factor Calculation**

6 Month Completion Analysis								Average ("COMPLETION FACTOR")	Std Dev.	Confidence Interval	Range of Confidence	
Monthly Multipliers											Low	High
Month1	0.801	0.771	0.788	0.837	0.853	0.855	0.846	0.822	0.034	0.025	0.796	0.847
Month2	0.860	0.886	0.888	0.928	0.923	0.940	0.915	0.906	0.028	0.021	0.885	0.927
Month3	0.975	0.975	0.990	1.003	1.002	1.001	0.989	0.991	0.012	0.009	0.982	1.000
Month4	1.002	0.993	0.998	1.008	1.007	1.008	1.011	1.004	0.006	0.005	0.999	1.009
Month5	1.000	0.996	1.002	1.008	0.999	1.017	0.995	1.002	0.008	0.006	0.997	1.008
Month6	1	1	1	1	1	1	1	1.000	0			

Once the range of confidence is developed the analyst can then make the judgment as to which multipliers to include. If the value “1” is included in the range of confidence, then the difference between that month and the 6<sup>th</sup> month is not significant and therefore does not need to be “completed”.

The analyst can utilize the range of confidence to make judgments on the level at which the most recent months of a particular budget group, are to be “completed”. The range of confidence represents the statistical range that the multiplier is expected to reside within. This provides the analyst the opportunity to adjust the multiplier, based on institutional knowledge of the budget group behavior. In the absence of this level of institutional knowledge, CHPR recommends that the “average” value of the seven month multipliers, be employed as the completion factor for that month of the budget group.

To implement the “completion factors” the analyst must multiply the most recent months of eligibility data in the “Member Month” data set by the factors developed above. The resultant figures will represent “completed” member months that can then be utilized in the development of the eligibility forecast.

## Step 2: The Establishment of the Historical Months to Forecast in each Budget Group

**Rationale:** Step 2 outlines the methodology through which historical member month eligibility data is used to develop future forecast eligibility. This methodology presents the analyst a number of tools that expose the essential features of past eligibility patterns that will have an effect on future eligibility.

**Required Data:** Most Recent “Member Month FY##Q#” Dataset

**Tool:** Triangle Analysis Worksheet

**Example:** “Caseload Narrative Examples” Ex2 and Ex3

The second and most complex step in forecasting requires the establishment of the number of historical months to include in the forecast. The forecast is based on variations upon a historical trend, therefore the number of member months included within the forecast, both recent and past, can yield extremely different results. Therefore, the analyst must use caution and where available any internal information (such as past and present policy decisions, future policy changes, and the effects of similar changes on caseload numbers in the past) to augment the methodology presented within this narrative, and to make informed decisions upon the member months to be included within the current forecast.

Based on CHPR analysis, it has been found that the calculation of Compounded Monthly Growth Rates (CMGRs) within each budget group is an excellent means, both mathematically and visually, by which to gain insight as to the behavior of caseload eligibility over time. CMGRs represent the weighted month-to-month growth percentage of a particular budget group as a function of the most recent member month included in the calculation. The usefulness of the calculation is in its ability to expose a linear extrapolation and visual representation of the growth of the particular budget group for particular months of analysis. From the comparison and analysis of the CMGR linear extrapolation of up to four of the most recent months, the analyst can identify specific historic points to be included within the forecast.

The CMGRs are calculated for each month in every budget group according to the methodology presented below. These CMGRs are then graphed and utilized to choose a historical date at which to begin the trend function of the forecast.

### A. The Calculation and Utilization of CMGRs

Utilizing data from the most recent “Mem Months \_\_\_\_\_” worksheet in the most recent “Member Month FY##Q#” dataset, calculate the sequential Compound Monthly Growth Rates (CMGR) for up to 32 months in each budget group (this number is based on the number of months available; as of FY04Q1 32 months were available). No less than 18 months should be calculated. The calculations are easily made in Microsoft Excel and the attached **Triangle Analysis Worksheet** (both text and electronic) have

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been designed to assist in the development of this methodology. The formula for the CMGR calculation is as follows:

- **CMGR =  $[(X_t/X_{t-n})^{(1/n)}]-1$**  where X=member month, n=1...32 (number of time increments), and t=initial month

This formula will be applied sequentially to the most recent member month eligibility data and all member months previous to it resulting in up to 32 columns (equal to the number of months used in the data set) of growth rates.<sup>4</sup> The most recent consisting of up to 32 growth rates, the next most recent consisting of up to 31 growth rates. See Table 1.

**Table 1. Example of Consecutive CMGR Calculation**

Month	Mem-Months	CMGRs March	CMGRs April	CMGRs May	CMGRs June
Jan 03	ff				
Feb 03	ee				$=[(aa/ff)^{(1/5)}]-1$
Mar 03	dd			$=[(bb/ff)^{(1/4)}]-1$	$=[(aa/ee)^{(1/4)}]-1$
Apr 03	cc		$=[(cc/ff)^{(1/3)}]-1$	$=[(bb/ee)^{(1/3)}]-1$	$=[(aa/dd)^{(1/3)}]-1$
May 03	bb	$=[(dd/ff)^{(1/2)}]-1$	$=[(cc/ee)^{(1/2)}]-1$	$=[(bb/dd)^{(1/2)}]-1$	$=[(aa/cc)^{(1/2)}]-1$
Jun 03	aa	$=[(dd/ee)^{(1/1)}]-1$	$=[(cc/dd)^{(1/1)}]-1$	$=[(bb/cc)^{(1/1)}]-1$	$=[(aa/bb)^{(1/1)}]-1$

These calculations will result in month to month growth percentages representing the compounded growth expected from the month analyzed to the most recent month data is available. Comparison of these growth rates allows for an understanding of the minute growth changes reflected by the month to month eligibility figures.

The *Triangle Analysis Worksheet* includes all the formulas necessary to calculate 32 consecutive month CMGR columns. The data analyst must paste the date (Column A) and member month eligibility (Column B) into the worksheet making sure that the data is ordered top down from past to present with the most recent/current month data residing at the bottom of the Column (Row 36). If copied correctly, the table to the right will display the month-to-month sequential CMGR percentages for each of the dates analyzed in a separate column.

The primary reason for making these calculations sequentially in columns is that it is the comparison of the sequential rates which allows for the choice of historical months to be included in the forecast.<sup>5</sup>

<sup>4</sup> In the absence of completion factors, the three most recent member months must be dropped from (not included in) the forecast due to a lack of completeness caused by retro-active eligibility and redetermination effects. There may be a need to drop/not include additional months based on the CMGR analysis. Further discussion on this topic is presented below.

<sup>5</sup> A methodology for assessing the completeness of the most recent member months based on CMGR analysis was included in the March 15<sup>th</sup> version of this document. As it is the CHPR recommendation that completion factor analysis be conducted (as it is more accurate), this section has been removed from this version of the document.

## B. Choosing the Historical Period to Forecast

From the sequential CMGR calculations, the most recent four months (entire columns) should be charted together with the date acting as the X axis, the growth percentage as the Y axis, and each of the Sequential CMGR columns acting as individual series. An example of this can be seen in *Caseload Narrative Examples Ex2, Chart 1: Group 09 Consecutive CMGRs*.<sup>6</sup>

Utilizing the charted sequential CMGRs for four of the most recent consecutive months allows the analyst to view a linear extrapolation of each budget group in terms of its month-to-month growth. From this linear extrapolation the analyst must make a choice as to the extent to which historical months are included in the forecast. There are points in the past at which no drastic policy change was occurring, yet the behavior of the budget group changed substantially. This change will result in an obvious disruption in all four of the CMGR lines. This point is called a node of inflection.

In a single CMGR chart there may be multiple nodes of inflection. In order to choose the most relevant point, CHPR recommends that analysts only consider nodes of inflection that go back six “completed” months or more. Due to the lack of reliability of the most recent data juxtaposed with its relevance for the trend start point, it was found that six months (in the absence of significant policy changes) was the minimum number of the most recent months to include within the trend function.<sup>7</sup> Caution is suggested when using a time period of eighteen months or more, because the distant eligibility figures will be weighted more heavily.<sup>8</sup> Charts 1 through 3 demonstrate nodes of inflection identified in previous forecasts and utilized as the historical date at which the forecast trend was started.

Nodes of inflection offer a point at which a change occurred in the growth behavior of the budget group. Based upon this, if chosen correctly, the eligibility data more recent (to the right) of the node is a better predictor of the future than the data previous to it. The node represents the change point, however analysts can choose a point before or after the node to reflect their awareness of policies that may have been affecting the budget group, without changing the slope of the forecast trend substantially.

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<sup>6</sup> If the most recent month(s) is considered “incomplete” and dropped from the forecast period, it should not be charted in as part of the historical period choice, as it will cause a drastic change in CMGR values and not allow for accurate historical period choice. See ***Caseload Narrative Examples Ex3***.

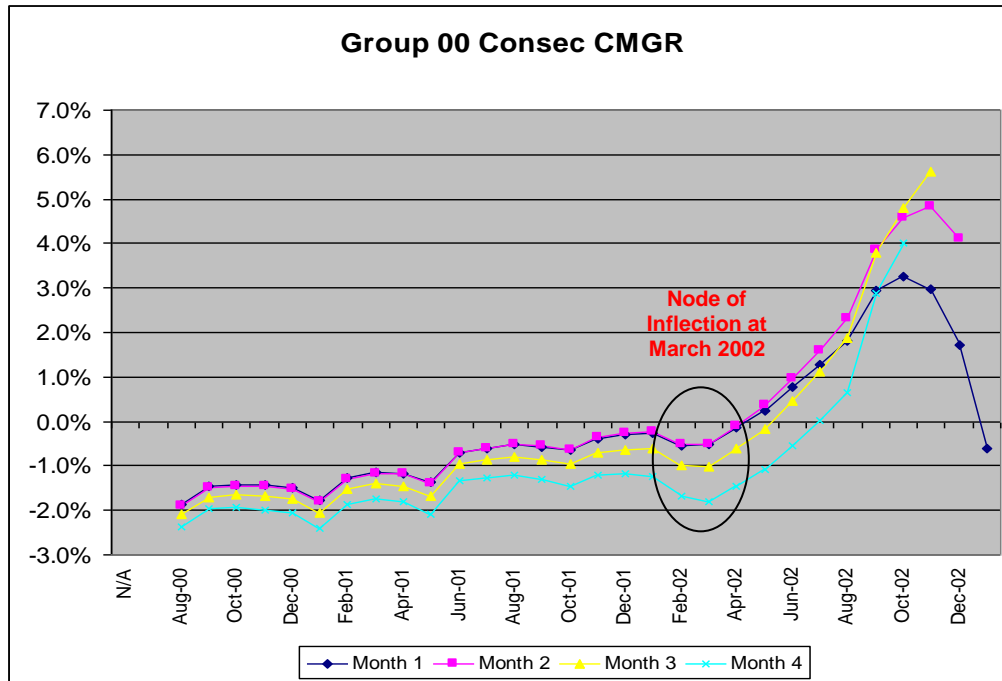
<sup>7</sup> Often, in the case of recent policy changes, the analyst is forced to use less historical information. This will be discussed in more detail in Section D.

<sup>8</sup> When more than 18 previous months are used, actual eligibility for the forecast period should be charted and carefully scrutinized to assure consistency of the trend.

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Mathematical models are available that can statistically determine the “change point” based on complex quangle analyses.<sup>9</sup> Due to significant amount of time and effort required to produce such analyses, the relative accuracy of the procedure outlined above, and the request by MassHealth for operational tools that can easily be implemented into the forecast methodology, these models were not implemented during this analysis.

**Chart 1: Example of a Node of Inflection in a Sequential CMGR Chart <sup>10</sup>**

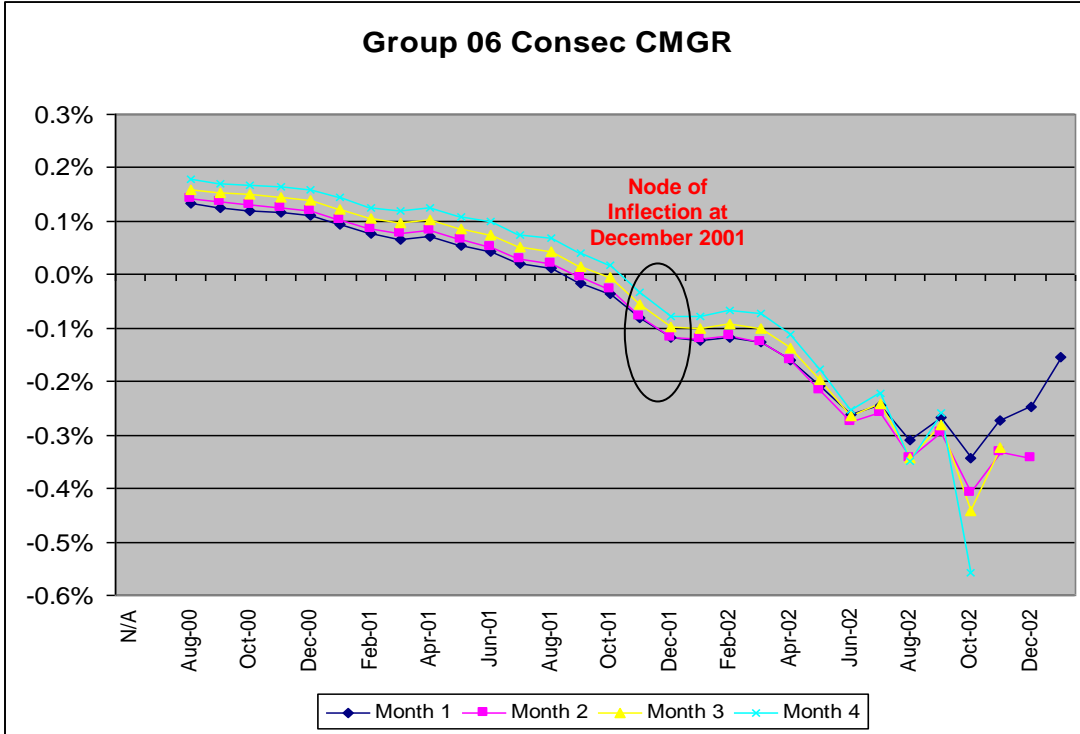


<sup>9</sup> Quangle analysis plots a range of data along a 360 degree axis. Although complex in calculation, this process is often used to determine change points.

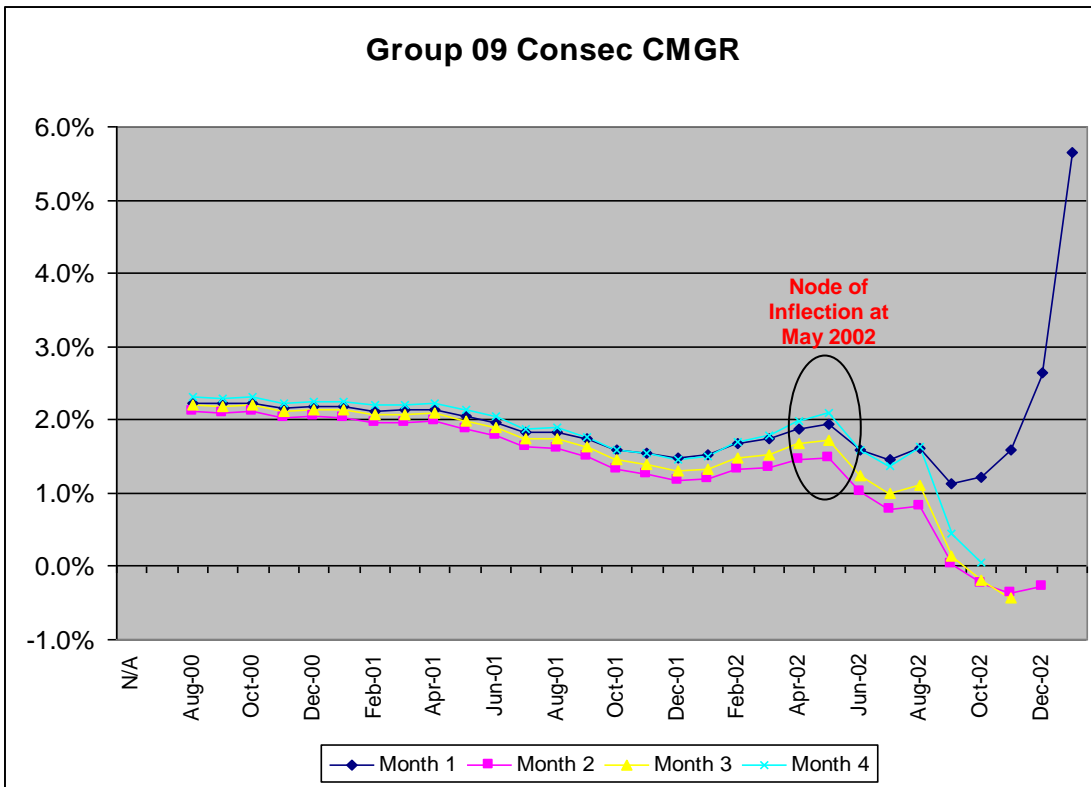
<sup>10</sup> All data from Member Month FY03Q3 and FY04Q1 Data Sets, provided by Miguel Vargas-Ramirez and applied to CHPR methodology presented 3-15-04 in “Forecasting MassHealth Caseload – Comparative Analysis of Methodologies”.



**Chart 2: Example of a Node of Inflection in a Sequential CMGR Chart**



**Chart 3: Example of a Node of Inflection in a Sequential CMGR Chart**



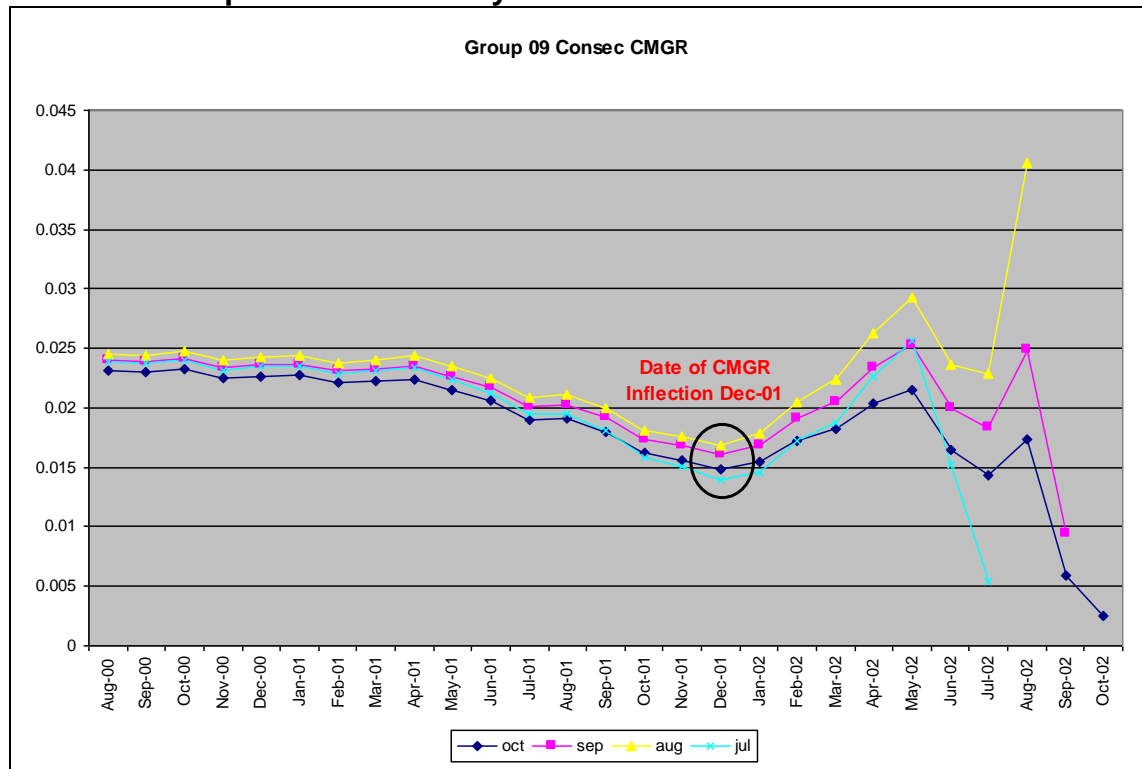
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The three examples above demonstrate the choice of a node of inflection based upon an apparent change in growth pattern. There are instances where there are ambiguous changes in the pattern of growth over time, therefore the analyst must make a subjective decision as to the most relevant historical date to begin the forecast. This subjective choice demonstrates the difficulty of the forecasting process and exemplifies the need for checks and balances

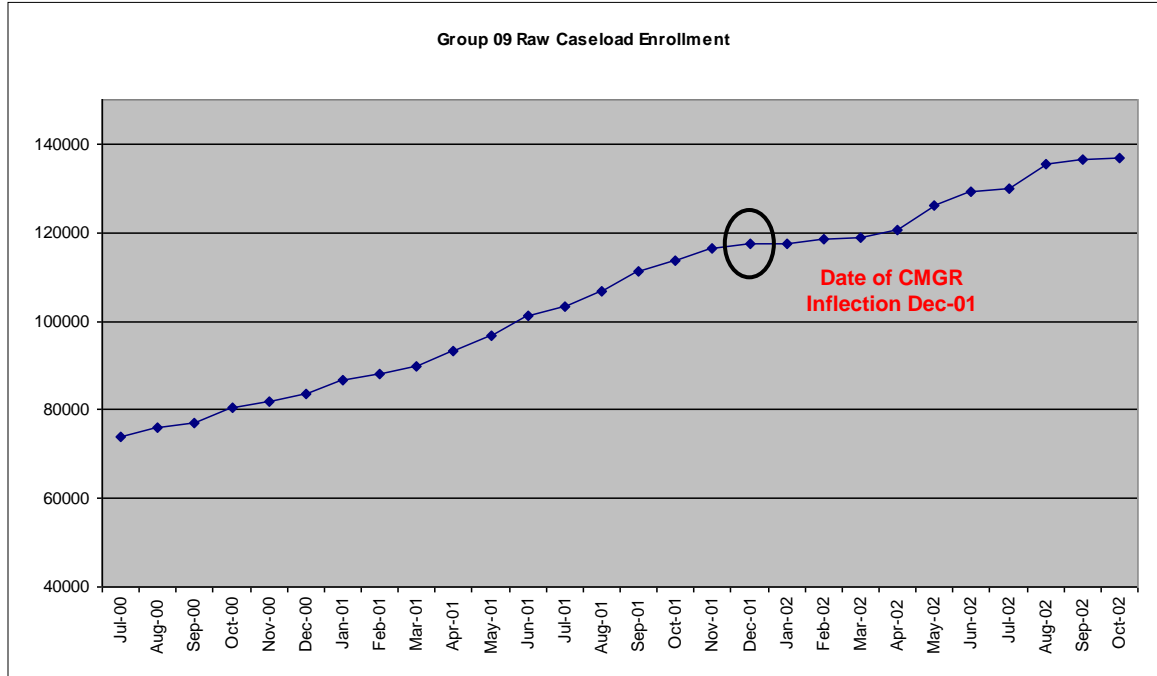
### Logical Consistency Check of Historical Month Choice

Due to the fact that CMGRs are weighted month-to-month growth rates, they do not directly reflect the observed trend when the actual caseload member month eligibility is charted. Due to this fact, it is suggested that for all budget groups, the sequential CMGR chart be directly compared to a chart of actual member month eligibility for the same monthly period. From this comparison the logical consistency of the historical month choice can be assessed against both the weighted growth and raw caseload. An example of this comparison can be found in Charts 4 and 5. In this example there are a clear node of inflection and from the raw member month eligibility chart it can be seen that previous to this point the eligibility trend had a very different slope associated with it.

**Chart 4: Example of Consistency Check**

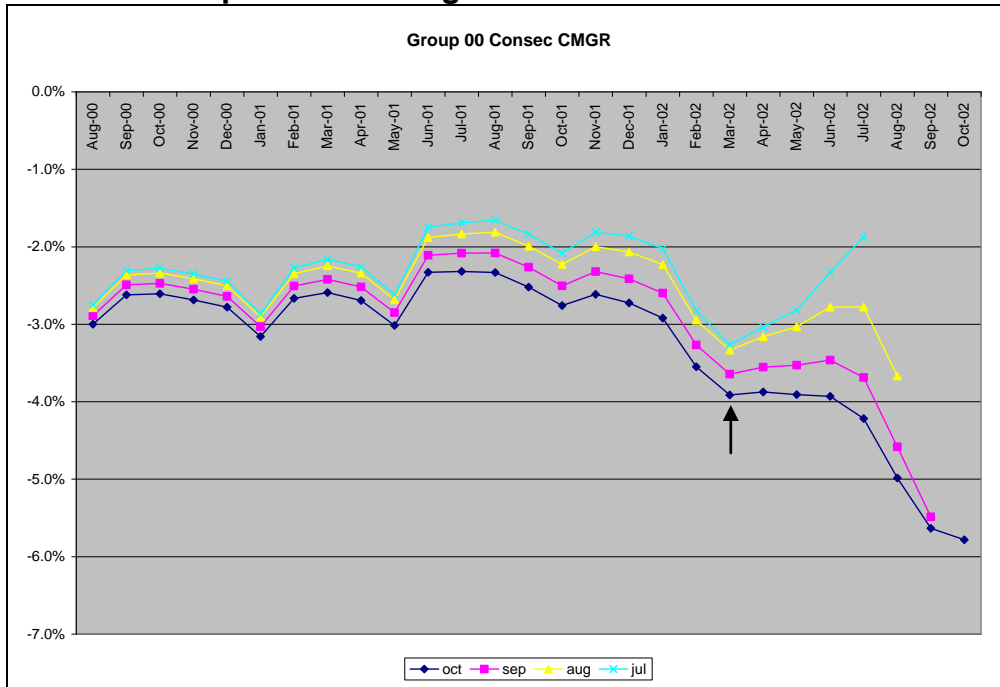


**Chart 5: Example of Consistency Check (Cont.)**



Ambiguous growth is often seen in fee for service (FFS) and other groups not clearly defined by age, disability, or provider status. The chart below (Chart 6) demonstrates an ambiguous growth situation for Group 00 (Other), a catch-all group for MassHealth members not easily categorized into an age or disability grouping.

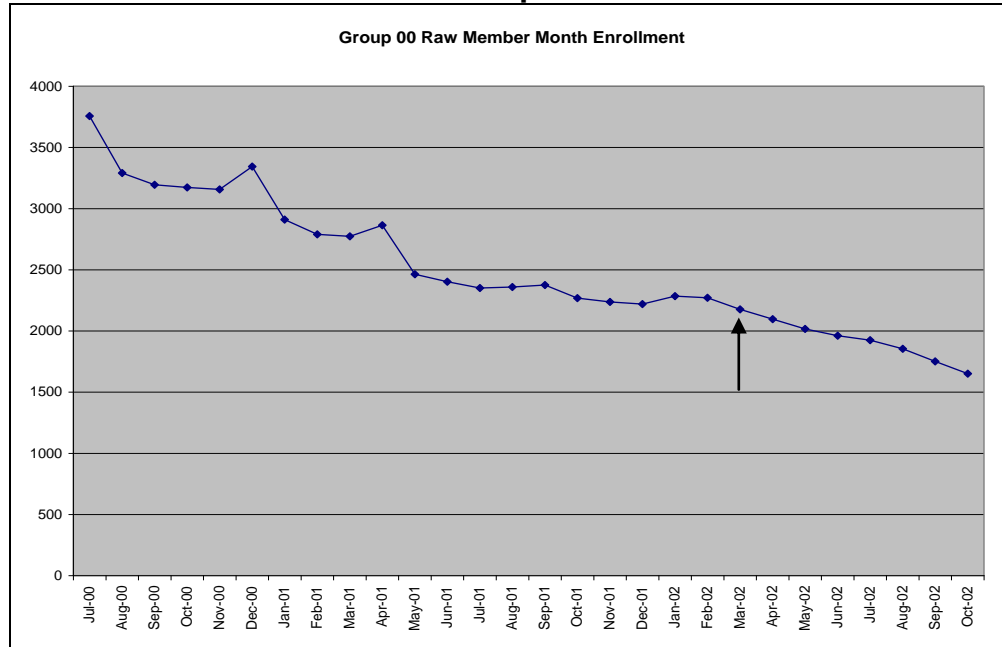
**Chart 6: Example of an Ambiguous CMGR Chart**



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It is clear from this chart that although there is some seasonal variation in the growth rates, choosing an inflection point is rather difficult. The arrow represents a possible inflection point. Charting the actual eligibility data can help to determine the historical period (see Chart 7).

**Chart 7: Raw Caseload Chart Comparison**



From Chart 7 it is clear that the growth rate is relatively stable going back to June of 2001. With the most recent data “completed”, the point of March of 2002 seems to be the logical choice as it includes at least six months of eligibility data and reflects more accurately the current trend in budget group behavior, than if more historical data were to be included.

This example demonstrates that when data supporting policy change is lacking, and there is ambiguity in the CMGR growth, that the historical behavior of the budget group becomes the most reliable predictor in the forecast. The tools presented here for the choice of historical dates to begin the forecasting period are meant to assist the analyst, yet they are all based upon historical eligibility figures. In cases where the value of these tools is decreased, the analyst is forced to make a subjective decision that requires that institutional knowledge bridge the gap.

### **C. Historical Period Choice in light of Policy Changes**

Often, policy changes are made that have significant effects on caseload eligibility. However, many of these effects are short term, as in the case of redeterminations. Based on the analyst’s familiarity with the policy change and the particular group being analyzed, different methodologies can be employed. Whenever possible, historical data should be included within the forecast function. For example, when making the FY04Q1 forecast, it was

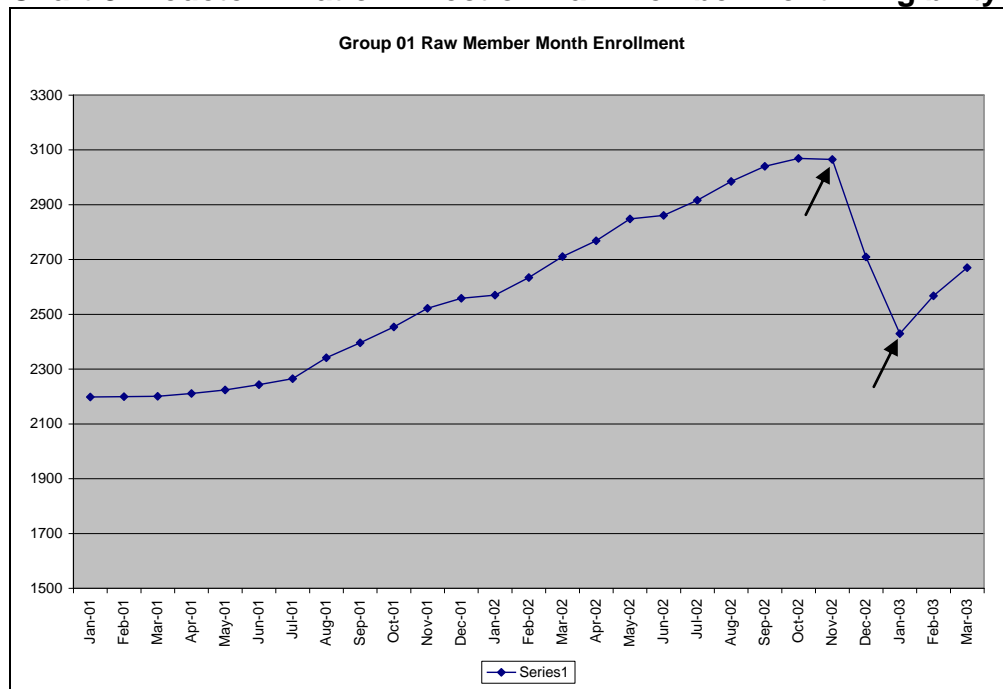
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found that between November 2002 and January 2003 a new redetermination policy was substantially decreasing member month eligibility in some budget groups. Yet from January 2002 through March of 2003, eligibility was increasing at a faster rate than before the policy change (Chart 7).

In this instance the analyst expected (based upon similar results for this policy change in the past) that eligibility would increase to levels seen before the policy change. Therefore, when choosing historical months to forecast, the four sequential CMGRs occurring before the policy effects were charted (Jul, Aug, Sep, Oct; 2002), and utilized to determine a historical starting point. From this, the forecasted trend function was adjusted to allow the recent increase as well as the historical trend to have an affect. The methodology for creating forecast trends will be discussed in Step 2: Developing the Forecast.

At times policy changes will occur, and the analyst has little information as to the potential effects on caseload eligibility. In this situation, it is suggested that a forum of key stakeholders discuss potential outcomes. Even in the event of policy changes, the forecast should utilize the tools available to assess past eligibility, and establish the relevant historical period. The benefits of generating the forecast in the absence of policy change lie in the forecast's ability to capture the historical behavior of the budget group, and therefore preserve that historical behavior in the policy-adjusted forecast.

**Chart 8: Redetermination Effect on Raw Member Month Eligibility**



### Step 3: Developing the Forecast for Each Budget Group

**Rationale:** Step 2 outlines the methodology for developing the individual budget group forecasts. Outlined are simple tools through which the analyst can utilize the historical information developed in Step 1 to create the expected eligibility for each budget group.

**Required Data:** Most Recent “Member Month FY##Q#” Dataset, Historical Months Chosen in Step 1

**Tool:** MS Excel: Trend Function

MassHealth has traditionally utilized simple tools available in most spreadsheet programs to develop its short-term caseload forecast. These tools included least squared trending, fixed averages, and weighted averages. Often times these tools were augmented with growth factors calculated from past eligibility data or external environmental factors such as industry trends and unemployment. Based upon CHPR analysis it was found that the use of multiple mathematical formulas did not provide the benefits of additional accuracy between forecasted eligibility and actual eligibility figures. As past eligibility is the best predictor of future eligibility, CHPR has recommended that least squared trending and variations thereof, be the primary tools used to generate future caseload eligibility forecasts.

The MassHealth forecast has traditionally been conducted within an MS Excel spreadsheet, and all the necessary sheets are currently designed to import caseload eligibility information (Member Month Data Sets). Utilizing these sheets with the historical dates chosen in Step 2, the analyst must then create the forecast function that generates the expected eligibility for the upcoming fiscal year.<sup>11</sup> As stated above the primary tool through which the forecast is generated is the MS. Excel Trend function. This function fits a straight line to the known eligibility values (the member months chosen in Step 2), and returns the linear values for the selected future timeframe resulting in forecasted member month eligibility figures.

MassHealth has made a policy decision of not allowing for downward trends in the future forecasts, in order to prevent under budgeting. Therefore where a downward trend was exhibited by actual eligibility figures, analysts have utilized averages to stabilize the trend and prevent it from continuing on its downward slope. Based upon this policy decision, CHPR has recommended steps in the forecasting process to streamline mathematical formulas and increase the accuracy of the forecast by allowing for downward trending where applicable. These steps are outlined below.

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<sup>11</sup> Note: CHPR recommends caution when forecasting for more than 12 full months. As the extent of time forecasted increases the accuracy of the forecast decreases substantially.

## **A. Applying the Trend Forecast**

Once the historical period for the forecast is chosen, the MS Excel trend function should be applied to the member month eligibility for that period, for each budget group. The forecast projection period should be for 12 months, but may increase to 24 based upon the needs of MassHealth. Caution must be observed recommending budgetary requirements for distant future periods. The inaccuracy of the forecast projection increases as the length of time incorporated increases.

In the Member Month Data Sheet, the analyst should apply the trend function directly below the actual eligibility figures for each budget group.<sup>12</sup> By designing the sheet in this manner, individual budget group forecasts can be charted and analyzed for consistency. In addition, the analyst should document the historical period used in the forecast along with the particular trend function used.

Once the trend function is applied to each budget group for the specific time periods required (past and future), the forecasted figures must be analyzed for consistency. The manner in which this consistency is assessed is up to the analyst. The consistency should be assessed against institutional knowledge as to the policy changes affecting budget groups, stability/instability of eligibility per budget group, expected eligibility, and policy decisions on downward trending. The trend functions can be adjusted accordingly, based upon this consistency check.

## **B. Modifying Trends for Policy Changes**

Often times a policy change will significantly affect caseload member month eligibility as demonstrated above in Step 2C. At this point the analyst must utilize all institutional information available to adjust the forecast for the upcoming period. A methodology for historical month choice was demonstrated above. Based upon the policy change and the information available to the analyst, utilizing historical member month eligibility data may or may not be advantageous.

In the example presented above, redetermination had drastically decreased eligibility in particular budget groups during the months of November 2002 and January 2003 (See Chart 8). The institutional knowledge available at the time of the FY04Q1 forecast presented the expectation that eligibility in the budget group would continue to increase to levels seen previous to the policy change and that eligibility behavior would be relatively similar to that observed in the past. From this information, the analyst was able to utilize the historical period chosen in Step 2C along with the current eligibility pattern to develop a modified trend function for the future forecast. Chart 8

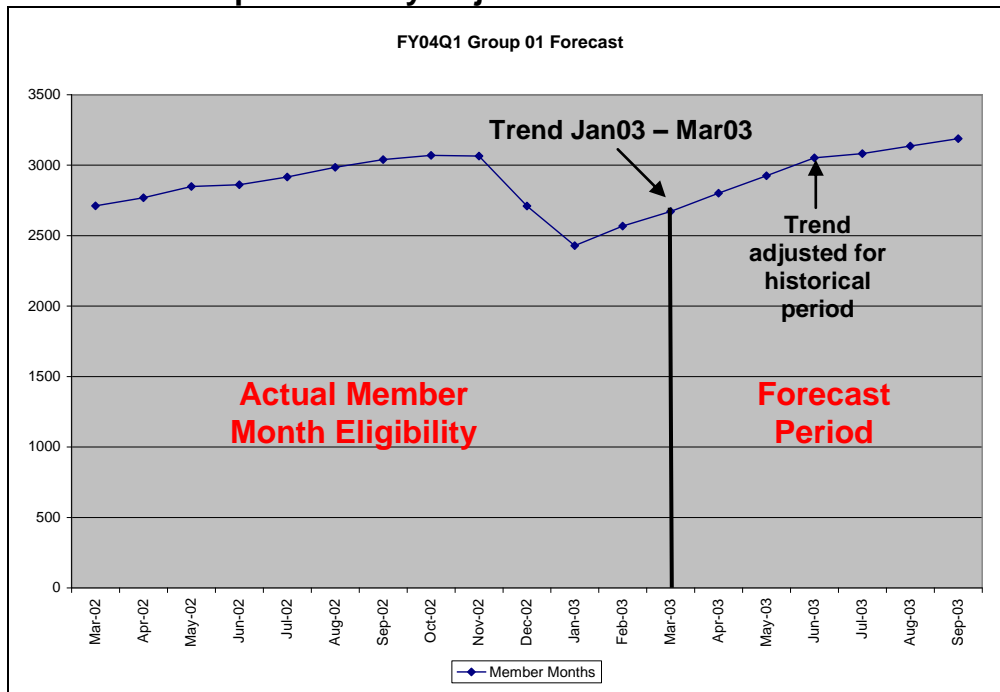
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<sup>12</sup> Electronic versions of the data sets will be provided with this document.

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demonstrates an increase in member month eligibility from December 2002 through the most recent month data was available; March 2003. Utilizing these figures, a trend function was developed and applied (Jan03-Mar03) until eligibility was equal to that observed before the policy change (October 2002). At this point, the trend developed from the historical period chosen in Step 2C was applied to the subsequent dates in the forecast. See Chart 9.

**Chart 9: Example of Policy Adjusted Forecast**



The above example demonstrates the use of both recent and historical information in the forecast. In this circumstance the analyst had information available to make an educated estimate of future eligibility and utilized all information available to adjust the resultant forecast. The amount of policy related information available to analysts for this forecast may not be available for all policy changes and therefore subjective adjustments will need to be made.

### Step 4: Cluster Level Forecasting

**Rationale:** Step 3 addresses the movement within, between, and among budget groups. Through the use of specific grouping tools, the analyst is provided the ability to gain insight into the populations MassHealth serves as well as achieve greater forecast accuracy.

**Required Data:** Most Recent “Member Month FY##Q#” Dataset and Individual Budget Group Forecasts

**Tool:** MS Excel: Sum and Trend Functions

CHPR recommends forecasting the MassHealth caseload eligibility in groups of age and disability related clusters. These will include disabled children, non-



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disabled children, disabled adults, non-disabled adults, seniors, and other. The recommended clusters and budget groups therein are shown in Table 2. By grouping specific related budget groups into clusters, the analyst gains insight into system-wide eligibility patterns, and how individual budget group eligibility compares to the population of related individuals.

**Table 2: Budget Group Clusters**

Non-Disabled	CHILDREN	Disabled
09 HMO	01 HMO	
11 PCC	03 PCC	
13 TPL	05 TPL	
15 FFS	07 FFS	
17 FFS Newborn	29 Common Health	
30 HMO Family Assistance		
32 PCC Family Assistance		
34 Unenrolled Family Assistance		
36 Premium Assistance		
38 Limited Children		
42 Adoption		
Non-Disabled	ADULTS	Disabled
10 HMO	02 HMO	
12 PCC	04 PCC	
14 TPL	06 TPL	
16 FFS	08 FFS	
22 HMO Basic	27 CH Working Adults	
23 PCC Basic	28 CH Non-Working Adults	
24 Unenrolled	41 LTC < 65	
31 HMO Family Assistance		
33 PCC Family Assistance		
35 Unenrolled Family Assistance		
37 Premium Assistance		
39 Limited		
40 Prenatal		
SENIORS		
	18 Community Senior	
	19 Institutional Senior	
OTHER		
	00 Other	
	44 DMH Clients	
	20 Buy-In	
	21 Buy-In	
	26 Basic Buy-In	

## Attachment C

In addition to offering a system-wide check and balance system, clustering allows the analyst to assess movements between budget groups and adjust the forecast accordingly. Therefore, CHPR has recommended allowing for trending down at the budget group level followed by an overall trend assessment and adjustment at the cluster level.

To forecast at the cluster level the analyst must arrange the budget groups and their associated forecasted trends as developed in Step 3A, into the clusters designated in Table 2. **Caseload Narrative Examples Ex8** provides an example of the FY03Q3 Cluster forecast worksheet developed in Microsoft Excel. After all the budget groups are arranged by cluster, the cluster forecast is developed by summing the member month eligibility for each budget group of the cluster in a new column within the worksheet entitled “Cluster Forecast”. Once the “Cluster Forecast” is developed for all clusters, the analyst must then assess the slope of the associated forecasts. If the trend of the forecast is increasing then that is the forecast member month eligibility that should be budgeted for. If the trend of the forecast is decreasing, then the forecast must be adjusted to prevent member month eligibility at the cluster level from decreasing.

The budget groups with downward trends should be analyzed. It is at this point that the analyst must bring into the analysis any additional institutional knowledge that may allow for the understanding of the cluster level behavior. From this knowledge, the analyst must make the subjective judgment as to which budget group(s) needs to be adjusted to facilitate an increasing trend at the cluster level. For example, if the analyst were aware of specific budget groups from which a significant decrease in eligibility was trended for in Step 2 based upon a redetermination policy. The analyst may reassess which months are included in the historical trend for these particular budget groups or they may choose to employ the “Trend/pull” function developed in Step 2. The use of either of these methods is a subjective judgment and is based upon the specific knowledge the analyst has available at that time, and the projected impact of the change on the cluster level forecast.

## Concluding Remarks

The forecasting process is complex and has subjective components. It requires a substantial level of institutional knowledge and skill in the assessment of the behavior of individual budget group populations from a mathematical and a policy perspective. This narrative is designed to assist the analyst in the forecasting process and to add to the rationale developed in the “*MassHealth Caseload and Expenditure Analysis: Final Caseload Analysis Deliverable*,” presented to MassHealth on August 2, 2004.

The methodologies outlined above were developed by the Center for Health Policy and Research (CHPR) to augment the current procedures for forecasting MassHealth caseload eligibility. Therefore the complex assumptions and caveats discussed above are also subject to the assumptions currently employed in the existing forecasting process. These recommendations for improvement are meant to add to the toolbox of the informed analyst and should not be used in a vacuum. Forecasting is a process of informed decision making and educated guessing. The mathematical process is a mechanism from which the analyst can gain the insight needed to make these decisions. Finally, these tools are meant to be fluid and adjusted as necessary as policy changes require or knowledge levels increase.