Milliman

Demonstrating Causation: Does Dual Eligible Status Result in a Lower Star Rating?

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APPENDICES

I. EXECUTIVE SUMMARY

The Centers for Medicare and Medicaid Services (CMS) released a Request For Information (RFI)[1] pertaining to demonstration of a causal relationship between dual eligible enrollment and Star ratings. Dual eligible members are defined as those entitled to both Medicare and Medicaid. The Star rating is the primary indicator of the quality performance of a Medicare contract and is calculated annually based on prescribed metrics measuring medical outcomes, intermediate outcomes, patient experience, access to care, and processes. UnitedHealthcare (UHC) engaged Milliman to assist in its response to this RFI by performing a study analyzing this potentially causal relationship between dual enrollment and Star ratings.

The Bradford Hill criteria[2] were utilized to investigate a potential causal relationship. This framework, often used in epidemiological and public health settings, includes a set of nine conditions that together can provide evidence of a causal relationship between a cause and an effect when a direct proof of causation is impossible or impractical. Keep in mind that this framework, even when all nine criteria are clearly met, does not prove the existence of a causal relationship in an absolute sense. Rather, as more of these criteria are shown to be met, the likelihood of causality becomes relatively stronger, analogous to building a court case by assembling various types of circumstantial evidence. Below are brief descriptions of each condition:

Association Strength: The greater the association (correlation), the more likely the relationship is causal.

Specificity: Causation is likely when other external variables are controlled for, such that the remaining cause / effect relationship still exists.

Gradient: Larger exposure of the cause should produce a greater incidence of the effect.

Temporality: The effect occurs after the cause.

Consistency: Consistent findings by multiple sources strengthen the likelihood of causation.

Plausibility: The cause / effect relationship is strengthened if it is generally plausible.

Coherence: The cause / effect relationship should not be in conflict with generally known facts.

Experiment: Reproducing the cause / effect relationship via experimentation increases the causal likelihood.

Analogy: The causal relationship may be inferred by analogy when similar cause / effect relationships exist.

We performed various statistical analyses of UHC's historical experience in examining four of these criteria (association strength, specificity, gradient, and temporality), performed a literature review for another (consistency), and discuss the other four from a qualitative perspective.

The results of the four statistical analyses were as follows. Based on UHC's historical experience, the association strength analysis suggested correlation between dual enrollment and lower Star ratings at the member level. The gradient analysis suggested contracts with a higher proportion of dual enrollment had lower Star ratings. The member-level dual enrollment / Star rating relationship yielded mixed results when external variables were controlled for via the specificity analysis, though the majority of the

[1] http://www.cms.gov/Medicare/Prescription-Drug-Coverage/PrescriptionDrugCovGenIn/Downloads/Request-for-Information-About-the-Impact-of-Dual-Eligibles-on-Plan-Performance.pdf, (accessed October 7, 2014).
[2] Hill, Austin Bradford (1965). "The Environment and Disease: Association or Causation?" Proceedings of the Royal Society of Medicine 58 (5): 295–300, http://www.edwardtufte.com/tufte/hill (accessed October 6, 2014).

evidence again supports the proposed causal link. Additionally, based on the concurrent nature of the relationship and UHC's historically minimal change in dual enrollment by contract from year to year, our analysis of the available dataset did not allow us to draw significant conclusions regarding temporality.

Of the remaining Bradford-Hill criteria, we found research from other sources (consistency criterion) supported a relationship between dual enrollment and lower star ratings. The plausibility, coherence, and analogy criteria were met. However, due to the nature of the relationship, satisfying the experimentation criterion was not feasible.

In summary, six of the nine Bradford Hill criteria were met[3], one criterion (specificity) yielded mixed results but on balance supported the potential causal link, conclusions could not be drawn from another criterion (temporality), and assessing one criterion (experiment) was infeasible. **While not all Bradford Hill criteria were satisfied, the overall results appear to be consistent with a causal relationship between dual enrollment and lower star ratings.**

[3] Association strength, gradient, consistency, plausibility, coherence, and analogy.

II. BACKGROUND

CMS released an RFI[4] pertaining to demonstration of a causal relationship between dual eligible enrollment and Star ratings. Specifically, CMS is interested in analyses showing that dual eligible status *causes* lower Star ratings. UHC engaged Milliman to analyze its historical experience regarding dual eligible enrollment and Star ratings to assist with its response to this CMS RFI.

STAR RATINGS

CMS developed the Star rating system to measure the overall quality of a given plan. Medicare plans are assigned Star ratings each year at the contract level, based on experience from two years prior (e.g., the 2015 Star rating is based primarily on 2013 experience). Star ratings are assigned in increments of 0.5 on a scale from 1.0 to 5.0, with 5.0 being the most favorable rating. Currently, a plan's Star rating has three specific impacts:

1. The level of Star rating determines the amount of revenue a plan will receive from CMS. This impact is seen in the benchmark payment, where plans with 4.0 Stars and above receive a 5% bonus (10% bonus for double bonus counties), and in the rebate amount, where the rebate percentage increases as the Star rating increases.

2. Plans' Star ratings have marketing impacts. Every Medicare contract's Star rating appears on the Medicare Plan Finder website, where members may alter their purchasing decisions based on the quality (i.e., Star rating) of each plan. Additionally, only 5.0 Star contracts may be marketed to potential members continuously throughout the year, as opposed to only during open enrollment[5].

3. CMS has the right to terminate Medicare contracts failing to achieve 3.0 Stars (in either the Part C or Part D Star rating) in each of the prior three years.

The calculation of a plan's Star rating is defined by CMS and is based on a number of metrics measuring medical outcomes, intermediate outcomes, patient experience, access to care, and processes at the contract level. Each metric is assigned a weight and the weighted average across all metrics determines a plan's overall Star rating. Currently, the Star rating for plans covering a significantly high portion of dual eligible members is calculated using the same formula as for other Medicare Advantage plans with primarily non-dual eligible enrollment.

DUAL ELIGIBLE

CMS defines "dual eligibles" as "individuals who are entitled to Medicare Part A and / or Part B and are eligible for some form of Medicaid benefit[6]." There is a similar, yet different, concept used in other Medicare related contexts known as "DE#" members. DE# members are a subset of dual eligible members, defined as dual eligible beneficiaries not subject to full Medicare cost sharing. However, DE# indicators were not readily available in the member-level dataset provided by UHC and analyzed for this study. For the purpose of this report, "dual eligible" refers to the former, more encompassing definition.

[4] http://www.cms.gov/Medicare/Prescription-Drug-Coverage/PrescriptionDrugCovGenIn/Downloads/Request-for-Information-About-the-Impact-of-Dual-Eligibles-on-Plan-Performance.pdf (accessed October 7, 2014).
[5] Special Needs Plans (SNPs) are an exception to this rule, as members eligible for SNPs can enroll throughout the year regardless of Star rating.
[6] https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/MedicareEnrpts/downloads/Buy-InDefinitions.pdf (accessed October 17, 2014).

III. RESULTS

This report examines the degree to which the proportion of dual eligible members in a Medicare contract might impact its Star rating. Five key elements of the Bradford Hill criteria for causation were analyzed in detail to determine whether a link between dual eligible enrollment and Star ratings exists. Additional details relating to the data and these five criteria are provided in Sections IV (Data Selection and Potential Dataset Limitations) and V (Methodology). The results for each of these criteria are discussed below. **Overall, the outcomes of the studies performed on each of these criteria support the causal relationship between dual eligible status and lower Star ratings.**

ASSOCIATION STRENGTH

As discussed in Section V (Methodology), this analysis tests for the correlation between dual eligible status and the resulting rating for fifteen metrics contributing to the overall Star rating. The following table contains the results of our analysis.

Table 3.1

CMS Star ID	Description	2015 Star Rating Weight	Dual Eligible Rating	Non-Dual Eligible Rating	Non-Dual Eligible vs. Dual Eligible Difference	P-Value
C01	Colorectal Cancer Screening	1.0	51.3%	56.8%	5.5%	<0.0033
C02	Cardiovascular Care – Cholesterol Screening	1.0	84.9%	88.8%	3.9%	<0.0033
C08	Adult BMI Assessment	1.0	56.7%	43.1%	-13.5%	<0.0033
C10	Care for Older Adults – Medication Review	1.0	53.0%	57.8%	4.8%	<0.0033
C11	Care for Older Adults – Functional Status Assessment	1.0	50.8%	53.3%	2.5%	<0.0033
C12	Care for Older Adults – Pain Assessment	1.0	42.4%	41.8%	-0.6%	0.386
C13	Osteoporosis Management in Women who had a Fracture	1.0	21.4%	27.3%	5.9%	<0.0033
C14	Diabetes Care – Eye Exam	1.0	54.5%	58.2%	3.7%	<0.0033
C15	Diabetes Care – Kidney Disease Monitoring	1.0	89.1%	91.0%	1.9%	<0.0033
C16	Diabetes Care – Blood Sugar Controlled	3.0	68.8%	62.4%	-6.4%	<0.0033
C17	Diabetes Care – Cholesterol Controlled	3.0	26.1%	30.5%	4.4%	<0.0033
C19	Rheumatoid Arthritis Management	1.0	73.5%	73.7%	0.2%	0.847
D11	Medication Adherence for Diabetes Medication	3.0	72.2%	75.0%	2.8%	<0.0033
D12	Medication Adherence for Hypertension (RAS Antagonists)	3.0	72.4%	77.4%	5.0%	<0.0033
D13	Medication Adherence for Cholesterol	3.0	69.1%	72.9%	3.7%	<0.0033

Twelve of the fifteen measures contained lower dual ratings on average than the corresponding non-dual ratings. Applying a binomial test, eleven of these twelve measures were highly significant, with individual p-values less than 0.0033 (consistent with an overall p-value of 0.05)[7]. P-value is a measure of the degree of significance and is defined as the probability that the difference is due to random chance. The p-values shown above are two-tailed, meaning that they test for the likelihood that that the Star rating difference of the two populations is significant in either direction (positive or negative). The corresponding one-tailed p-values (i.e., p-values that test the likelihood of the difference being more extreme in one specific direction) would be even lower than what is shown in the preceding table. In other words, it is more difficult to demonstrate significance using two-tailed p-values, so our identification of significant measures is more conservative than if we used one-tailed p-values.

Of the three measures containing a dual rating higher than the corresponding non-dual rating, one was not significant with a p-value of 0.386 after applying the same binomial test. In summary, thirteen measures were statistically significant, and of these, eleven measures contained lower ratings for the dual population. Please refer to Section IV (Data Selection and Potential Dataset Limitations) for a more detailed discussion of the member-level dataset used for this analysis, as not all of the above measures had the same number of observations available for study. The p-values reflect the amount of data available though, so even for measures with relatively few observations, a p-value less than 0.0033 is considered significant. This should be taken into consideration when reviewing the results.

Since the large majority (eleven of thirteen) of the statistically significant Star rating measures analyzed contained lower ratings for duals, we conclude that in UHC's experience, dual enrollment is significantly correlated with lower Star ratings.

SPECIFICITY

The specificity analysis employs a more sophisticated statistical methodology to determine if the strong association between dual eligibility and Star rating related outcomes still holds when controlling for potentially confounding variables. This methodology is described in more detail in Section V (Methodology). Logistic regression models were established for each of fifteen Star-related measures (dependent variables), and the results indicated dual eligibility was significantly related to eight of the fifteen dependent measures when controlling for other significant variables (again applying an individual measure significance level of p = 0.0033). Of these eight, six had an odds ratio[8] greater than one, meaning non-dual members were more likely to have favorable Star-related measure scores than dual eligible members.

[7] See Section V (Methodology) for more information on how the individual measure significance level of p = 0.0033 was selected.

[8] In general, an odds ratio can be interpreted as the estimated increase in the probability of success associated with a one-unit change in the value of the predictor variable. In this case, "success" is a favorable STAR-related outcome, and the change in the predictor variable is going from dual eligible member to non-dual.

Table 3.2

ID	Description	Star Rating Weight	Odds Ratio	P-Value	C-Stat.	Obs. Used
C01	Colorectal Cancer Screening	1	1.395	<.0033	0.616	203,810
C02	Cardiovascular Care - Cholesterol Screening	1	1.264	<.0033	0.647	25,647
C08	Adult BMI Assessment	1	0.912	<.0033	0.640	178,530
C10	Care for Older Adults - Medication Review	1	2.066	<.0033	0.660	11,137
C11	Care for Older Adults - Functional Status Assessment	1	1.599	<.0033	0.663	11,137
C12	Care for Older Adults - Pain Assessment	1	0.416	<.0033	0.797	11,137
C13	Osteoporosis Managing in Women who had a Fracture	1	1.284	0.0728	0.622	2,087
C14	Diabetes Care - Eye Exam	1	1.198	<.0033	0.598	75,878
C15	Diabetes Care - Kidney Disease Monitoring	1	1.340	<.0033	0.910	75,878
C16	Diabetes Care - Blood Sugar Controlled	3	0.988	0.5824	0.626	75,878
C17	Diabetes Care - Cholesterol Controlled	3	1.027	0.2310	0.634	75,878
C19	Rheumatoid Arthritis Management	1	1.001	0.9914	0.523	3,359
D11	Medication Adherence for Diabetes Medications	3	0.964	0.2674	0.601	40,386
D12	Medication Adherence for Hypertension (RAS antagonists)	3	1.022	0.3027	0.579	116,978
D13	Medication Adherence for Cholesterol (Statins)	3	0.935	0.0116	0.590	49,303

Note in the above table that the difference in the number of observations used for each measure ("Obs. Used" column) is due to the fact that any one particular member is only considered to be in the denominator for a given measure if they meet criteria specific to that measure. Therefore, some of the higher p-values are not unexpected for measures with relatively few observations, such as C13 (Osteoporosis Managing in Women who had a Fracture) and C19 (Rheumatoid Arthritis Management). Please refer to Section IV (Data Selection and Potential Dataset Limitations) for a more detailed discussion of the member-level dataset used for this analysis.

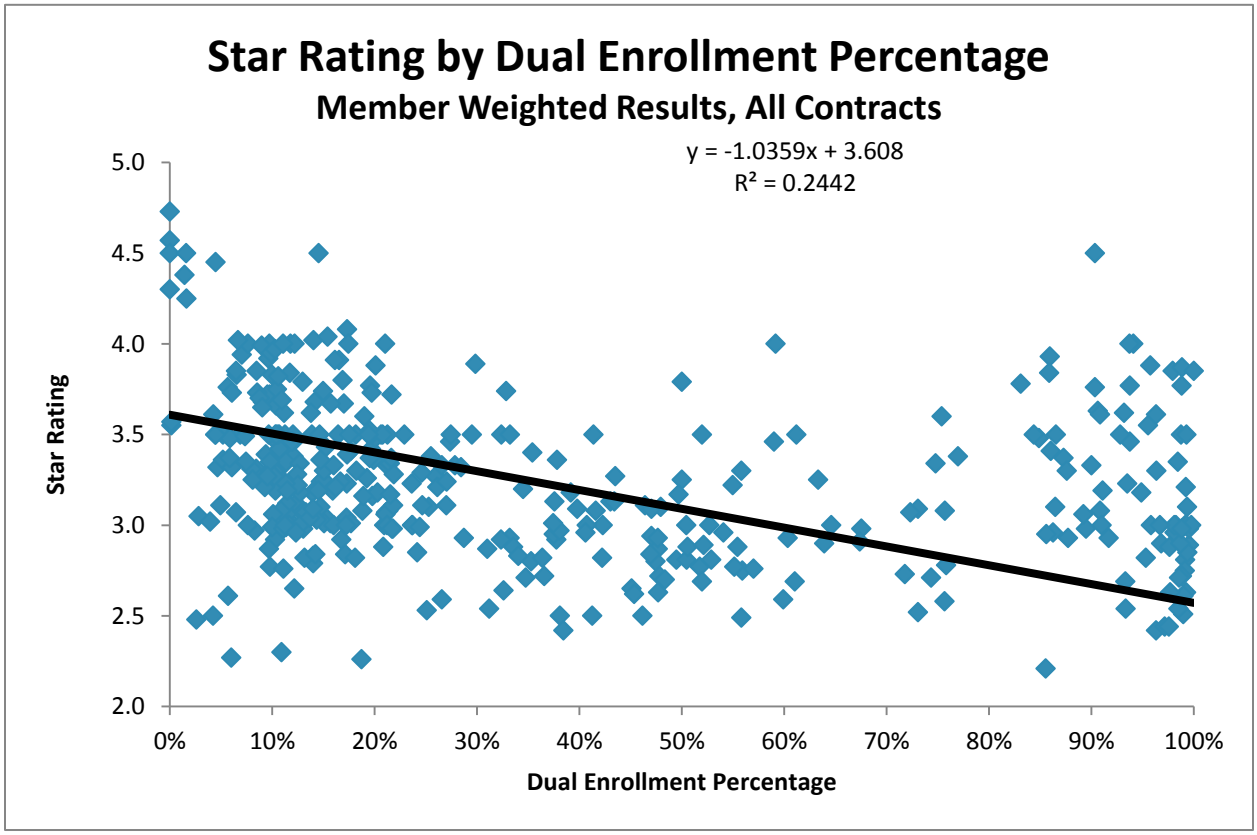
The model with the highest c statistic[9] (0.91) was for Diabetes Care – Kidney Disease Monitoring, which showed dual members were more likely to receive a worse rating in this specific category. The model with the largest observation size, Colorectal Cancer Screening, also showed dual members were more likely to receive a worse rating for this category. Tables A.1 – A.15 provided at the end of this report in Appendix A provide additional statistical measures associated with each of the fifteen logistic regression models. Additional details related to the results of these logistic regression models can be made available upon request.

The results are somewhat mixed, as some measures were not statistically significant, and significant measures were split between indicating higher scores for duals versus non-duals. However, when taking into account the weights these measures receive within the Star rating formula, the majority of the evidence indicates dual eligibles tend to receive lower scores on these metrics, leading to lower Star ratings.

[9] The c statistic is a measure of how much a model predicts better than random chance. A value of 0.50 indicates the model is no better than chance, and a value of 1.00 indicates the model is a perfect predictor of the dependent variable.

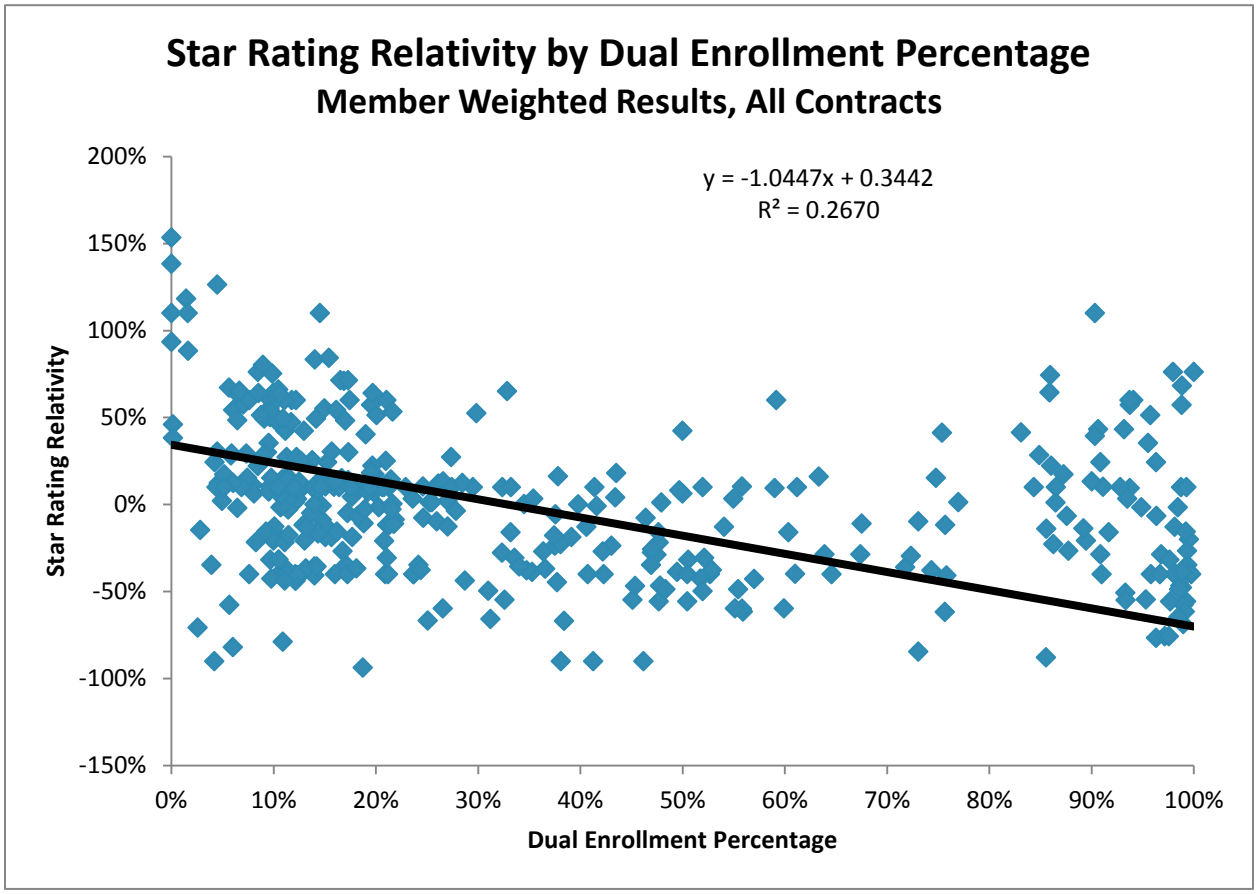
GRADIENT

The purpose of the gradient analysis is to identify whether contracts with higher dual enrollment have relatively lower Star ratings and whether contracts with lower dual enrollment have relatively higher Star ratings. The scatter plot below summarizes UHC's contract-level experience for 2011 to 2015 Star ratings. Note that the regression line shown in this graph is member-weighted, reflecting the fact that some of the data points (contracts) in the scatter plot have relatively fewer members than others and, therefore, should have less impact on the regression line. This member-weighted approach results in a steeper regression line, which implies that relatively larger contracts are in the bottom right of the graph (high dual enrollment percentage and low star rating) and in the top left of the graph (low dual enrollment percentage and high star rating). The regression line developed using a non-member weighted approach (i.e., all data points receive the same weight) is shown in Appendix C. Immediately following is the scatter plot diagram as described above.



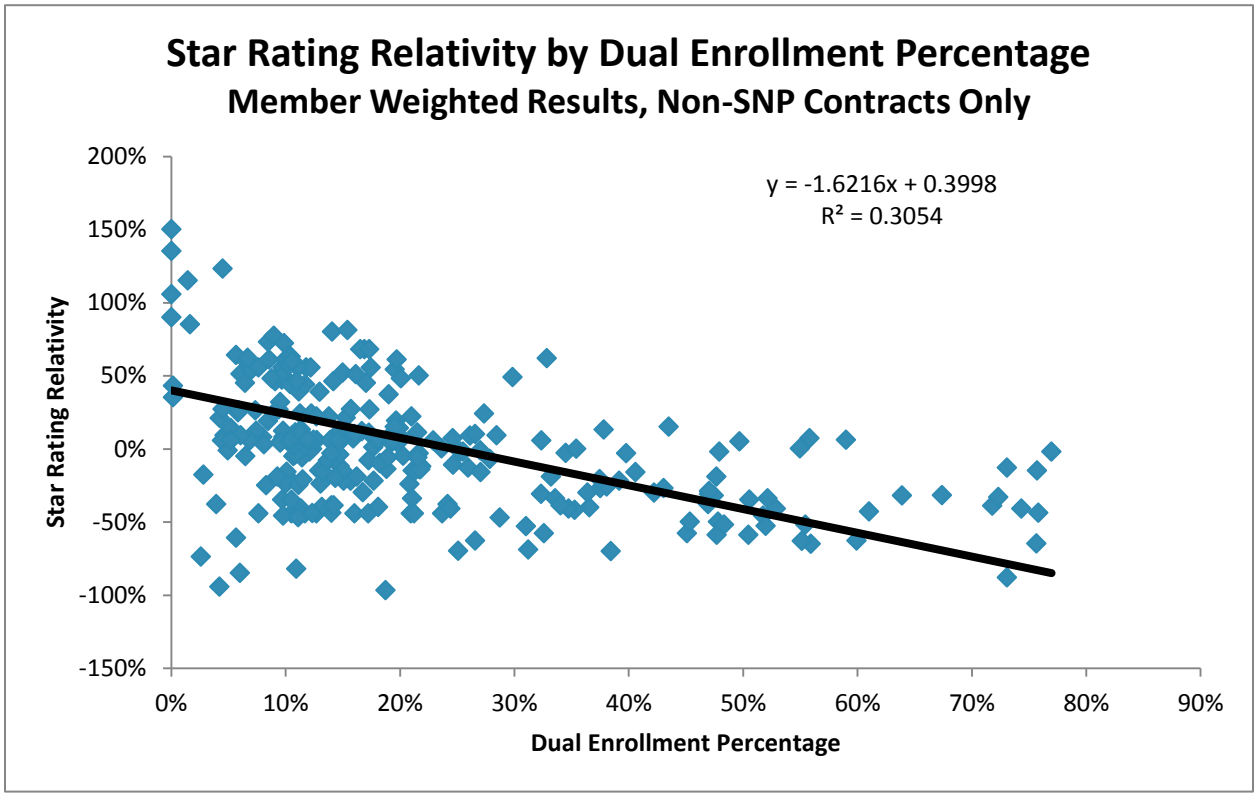
The trend line in the scatter plot shown above has a negative slope, indicating a decline in Star rating as the proportion of duals increases. However, the slope relatively steep (e.g., a ten-point increase in the proportion of dual enrollment yields a 10.4% decrease in the projected Star rating) and the R-squared, which is a measure of the proportion of total variation in the Star rating explained by the dual enrollment percentage, is 0.2442. Note that an R-squared of 1.0000 indicates a perfect linear relationship between the Star rating and the dual enrollment percentage (i.e., all data points are on the trend line).

As discussed in Section V (Methodology), Star ratings have been generally increasing over time throughout the industry. This has the potential to skew the results. The following graph is adjusted for this effect by using the Star rating relativity, which is the ratio of a contract's Star rating for a given year divided by UHC's average Star rating across all contracts for the same year. This scatter plot diagram can be found on the following page.



The normalized results are fairly similar to the original results. The slope of the trend line is slightly steeper (-1.0447 versus -1.0359) and the R-squared is slightly larger (0.2670 versus 0.2442).

In analyzing this experience, we found Special Needs Plans (SNPs) exhibiting different behavior, perhaps flattening the trend line. This can be seen in the prior graph. In the contract-level dataset, UHC's SNPs are primarily concentrated in the 90% to 100% dual enrollment range. This was true of Dual SNPs, as well as Institutional SNPs and Chronic SNPs. From the graph, it appears the SNPs have a somewhat higher Star rating relativity than the trend line average. This may imply that duals enrolled in SNPs behave differently than duals enrolled in non-SNPs. For example, SNPs may have special programs to better accommodate the needs of dual members relative to general enrollment plans which could contribute to their relative success with Star ratings. The following graph eliminates contracts containing SNPs from the analysis to normalize for this potential effect. This scatter plot diagram can be found on the following page.



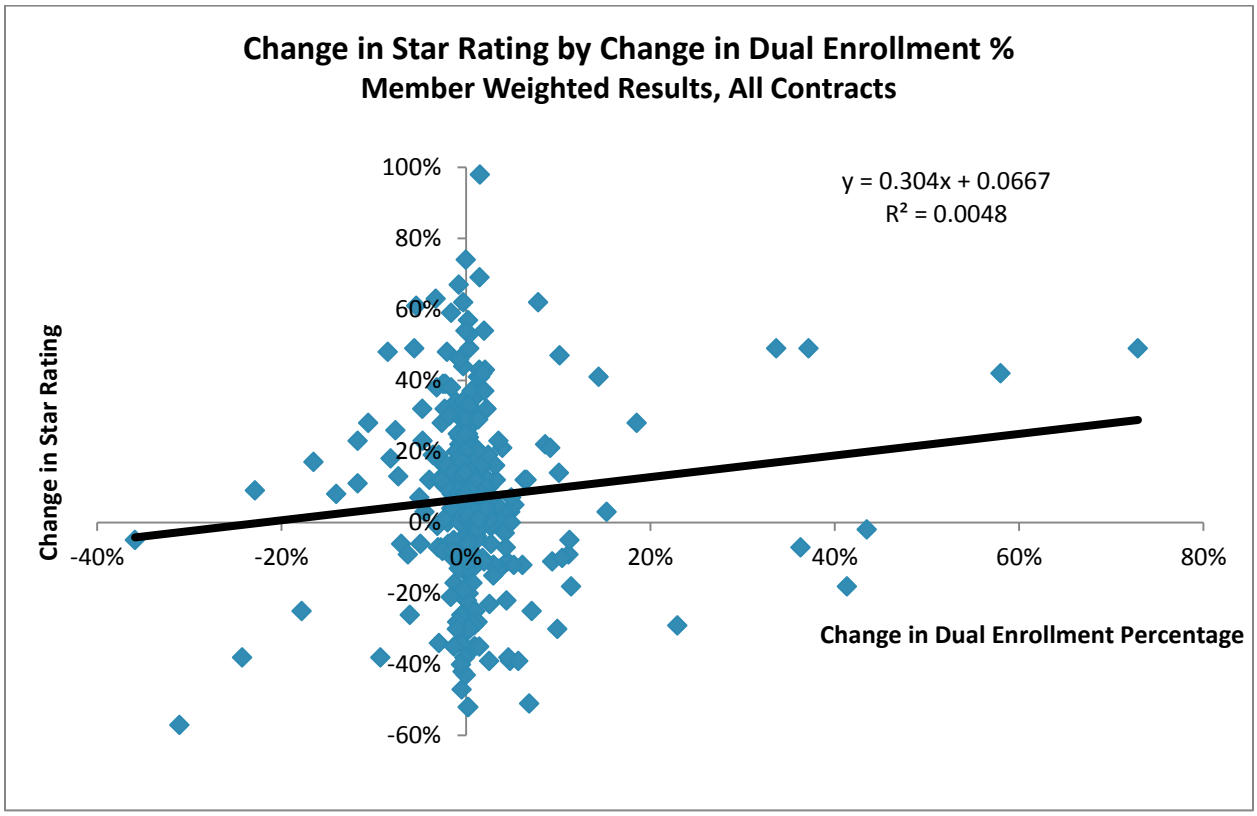
When SNPs are removed from the analysis, the results appear to show a more significant relationship between dual eligibility and Star ratings. The R-squared improves to 0.3054. The slope of the dual / Star rating relationship steepens and the trend line predicts a Star rating decline of 16% for a ten-point increase in the dual enrollment percentage.

Based on the gradient analysis discussed above, UHC's contract level experience for non-SNPs exhibits an inverse relationship between the proportion of duals and level of Star rating.

TEMPORALITY

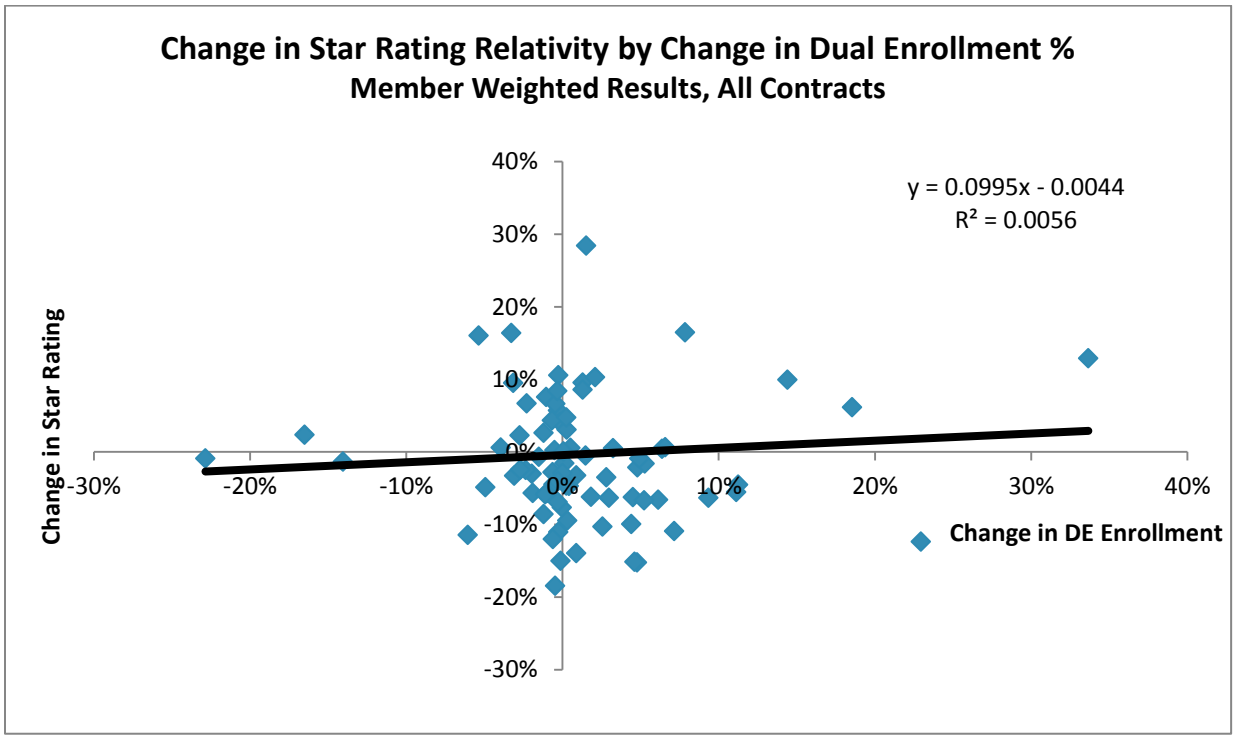
As discussed in Section V (Methodology), the temporality criterion attempts to assess whether the consequence occurs after the incidence. We reviewed UHC's 2011 to 2015 Star rating experience to assess whether the change in dual enrollment percentage results in an inverse change in Star ratings. This analysis is not perfect in the sense that dual enrollment and Star ratings are changing concurrently and are measured in year-long increments, whereas the Bradford Hill concept of temporality is more suited to analyzing an if/then relationship between two discrete events at different points in time. This distinction should be considered when reviewing results.

Using the process described in Section V (Methodology), UHC's experience for all contracts is summarized in the following graph. This scatter plot diagram can be found on the following page.



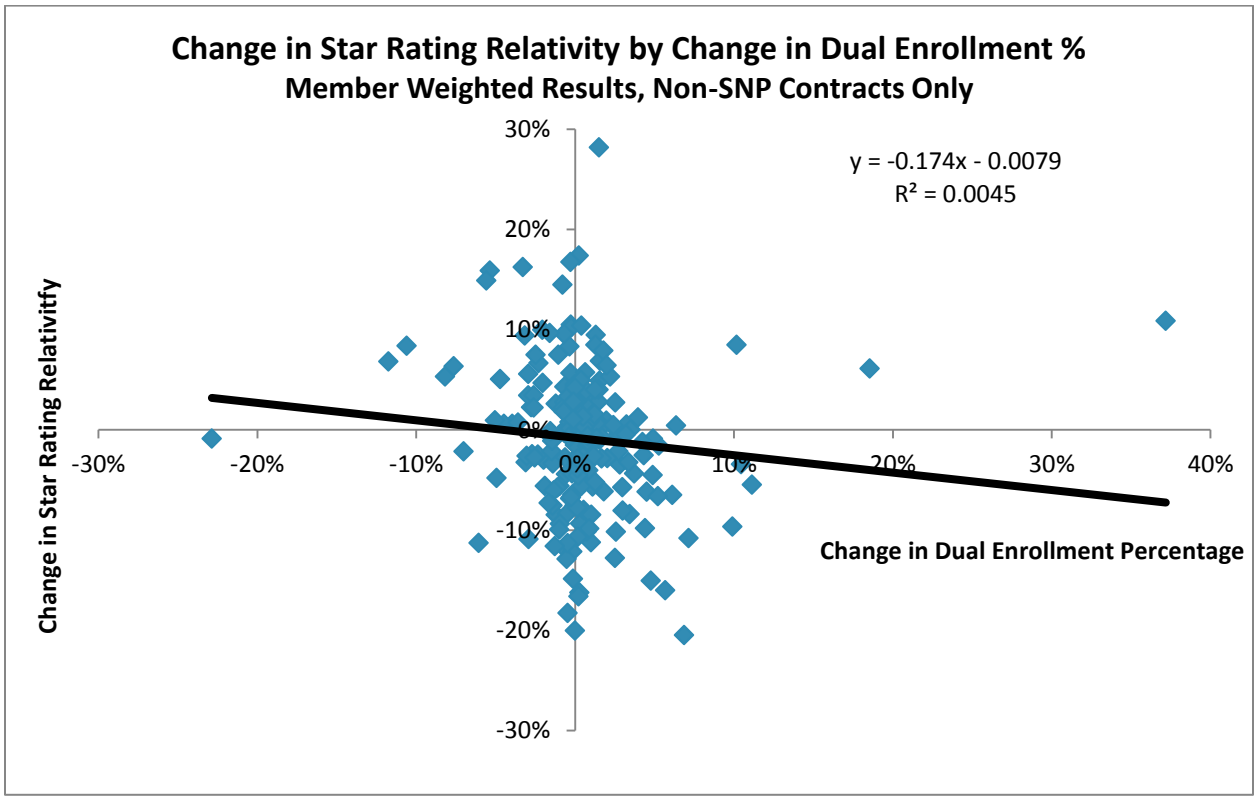
There are a couple important observations to note from the preceding graph. First, nearly all of UHC's contracts had very minimal changes in their dual enrollment percentage from year to year (i.e., most changes are between -6% and 6%). This is expected but makes it extremely difficult to infer a relationship between the two variables. Second, the R-squared is very low at 0.0048. This also supports the lack of ability to identify a relationship between the two variables, as most of the data points are not explained by the trend line. Third, the trend line contains a positive slope, which would normally imply a positive relationship between the variables (e.g., as the change in dual enrollment percentage increases, the change in Star ratings also increases). However, because of the lack of data points with greater than minimal changes in dual enrollment percentages and the low R-squared value, the trend line and corresponding positive slope are somewhat meaningless and should not be relied upon. Finally, there were effects identified in the gradient analysis that should be considered when determining effects to normalize for in this temporality analysis – the general increase in Star ratings over time and the impact of SNPs.

The following graph normalizes for the impact of Star ratings generally increasing over time by comparing the change in dual enrollment percentage with the change in the Star rating relativity (described above in the discussion of the Gradient analysis). This scatter plot diagram can be found on the following page.

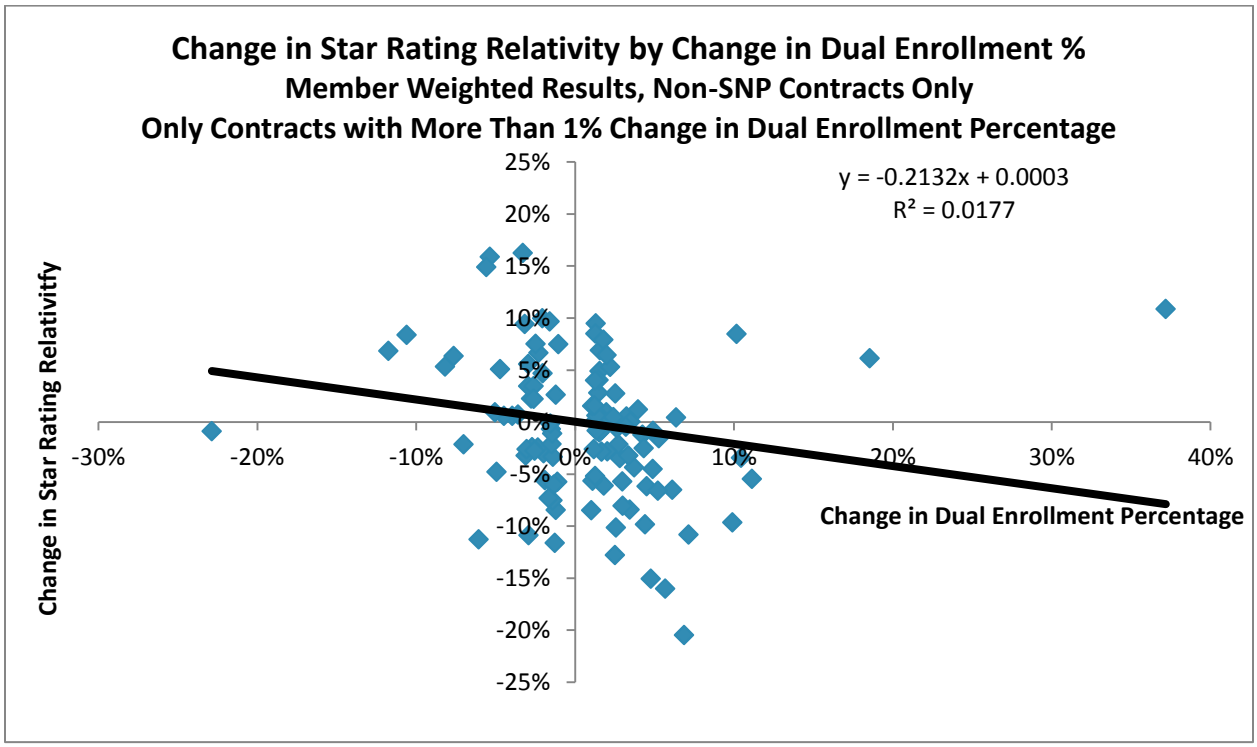


The above graph looks very similar to the prior unadjusted temporality graph, and the same comments hold true.

The following graph compares the change in dual enrollment percentage with the change in the Star rating relativity and also limits UHC's experience to only those contracts without SNPs. This scatter plot diagram can be found on the following page.



Eliminating SNPs from the analysis caused the relationship to become inverse with a slope of -0.174 (i.e., as the change in dual enrollment percentage increases, the change in Star rating relativity decreases). However, the R-squared remains very low at 0.0045, which indicates the trend line still does not explain most of the data points. As previously noted, many contracts had little to no change in their dual enrollment percentage from year to year. These data points could potentially distort the relationship and/or understate the R-squared, by creating "noise" in the above graph. Contracts that had less than 1% change (positive or negative) in their dual enrollment percentage are removed in the following graph. This scatter plot diagram can be found on the following page.



When contracts with less than 1% change in dual enrollment percentage are removed, the slope of the relationship does not change significantly (-0.2132 versus -0.174). However, the R-squared improves nearly four-fold from 0.0045 to 0.0177. In other words, when the "noise" is removed, the relationship still holds true and is strengthened. In spite of this, the R-squared of 0.0177 is relatively low and there is a significant amount of volatility in the data that is not explained by the trend line. This should be taken into account when analyzing the results and discussing the slope of the relationship shown in the preceding graph.

In summary, since most of UHC's contracts experienced very little change in dual enrollment from year to year, no significant conclusions regarding the relationship between dual enrollment and Star rating changes over time can be drawn from this analysis. It is important to note that inconclusive findings for a given criterion do not support the counterargument that there is no causal relationship between dual eligible status and a lower star rating. Rather, this indicates that further investigation may be warranted to fully satisfy all of the Bradford Hill criteria.

CONSISTENCY

Four sources were reviewed for consistency with the findings described in this paper. Each of the sources are described below.

National Quality Forum Paper

The National Quality Forum released a paper[10] in August of 2014 exploring the possibility of including sociodemographic factors, such as income, education, health literacy, race, and others, in determining performance measures. An Expert Panel on Risk Adjustment for Sociodemographic Factors (Expert Panel) was developed to investigate and discuss the issue. Their conclusion indicated the adjustment for sociodemographic factors is appropriate under certain conditions for the purposes of comparative performance assessment. While the Expert Panel made ten recommendations, two of them are directly applicable to this report:

- When there is a conceptual relationship between sociodemographic factors and outcomes and empirical evidence that the factors affect an outcome, the sociodemographic factors should be included in the adjustment of the performance score.

- The following guidelines may be applied in selecting sociodemographic factors to be included in the calculation of the performance score[11]:

  - Clinical / conceptual relationship with the outcome of interest
  - Empirical association with the outcome of interest
  - Variation in prevalence of the factor across the measured entities
  - Present at the start of care
  - Is not an indicator or characteristic of the care provided (e.g., treatments, expertise of staff)
  - Resistant to manipulation or gaming
  - Accurate data that can be reliably and feasibly captured
  - Contribution of unique variation in the outcome (i.e., not redundant)
  - Potentially, improvement of the risk model (e.g., risk model metrics of discrimination, calibration)
  - Potentially, face validity and acceptability

Health Affairs Article

Health Affairs published an article[12] in January of 2014 discussing the results of a series of analyses focusing on the relationships between socioeconomic factors and the adherence ratings for oral medications for diabetes, high blood pressure, and high cholesterol, which are used in the calculation of the Star rating. The analyses were based on the 2012 experience for all of CMS' contracts with complete data on performance measures and socioeconomic characteristics, which resulted in the consideration of 478 contracts. While many of these analyses were interesting, one was particularly applicable to the relationship between dual eligible status and Star ratings. The authors divided the contracts into three groups based on the proportion of enrollees with a low-income subsidy: 0.3%-10.2%, 10.3%-34.3%, and 34.4%-100.0%. A univariate analysis was conducted to determine the level of compliance for each of the adherence measures, within each of the three low-income subsidy percentage buckets. For each of the three adherence measures, the adherence decreased as the percentage of low-income subsidies increased. Since several pharmacy adherence measures are components of the Star rating calculation and members with low-income subsidies are highly correlated with dual eligible status, the results imply that Star ratings decrease as dual eligible enrollment increases.

[10] National Quality Forum, "Risk Adjustment for Socioeconomic Status or Other Sociodemographic Factors," August 15, 2014.
[11] National Quality Forum, "Risk Adjustment for Socioeconomic Status or Other Sociodemographic Factors," August 15, 2014, page vii.
[12] Gary J. Young, Nathaniel M. Rickles, Chia-Hung Chou and Eli Raver, "Socioeconomic Characteristics Of Enrollees Appear To Influence Performance Scores For Medicare Part D Contractors," Health Affairs, 33, no.1 (2014):140-146, http://content.healthaffairs.org/content/33/1/140.full.html.

Inovalon Paper

Inovalon released a paper[13] in October of 2013 analyzing the relationship between dual eligible members and Star ratings. Inovalon first demonstrated correlation between dual eligible enrollment and lower Star ratings (Association Strength) and then took the analysis a step further to control for a number of other risk factors, after which the dual eligible/lower Star rating relationship persisted (Specificity). Both of these analyses are discussed below.

Inovalon first conducted an analysis exploring the relationship between dual eligible enrollment and ten Star rating measures. These ten Star rating measures were used as a proxy for the overall Star rating and comprised 25% of the overall Star rating for plans covering both Part C and Part D and 48% of the overall Star rating for plans covering only Part D, and are listed below:

1. Rheumatoid Arthritis Management (ART)
2. Breast Cancer Screening (BCS)
3. Glaucoma Testing (GSO)
4. Osteoporosis Management in Women who had a Fracture (OMW)
5. Plan All-Cause Readmissions (PCR)
6. Diabetes Treatment (BPD)
7. High Risk Medication (HRM)
8. Medication Adherence for Cholesterol (Statins) (MA-C)
9. Medication Adherence for Oral Diabetes Medications (MA-D)
10. Medication Adherence for Hypertension (RAS antagonists) (MA-H)

Inovalon utilized their member-level Medical Outcomes Research for Effectiveness and Economics Registry (MORE^2 Registry). Specifically, 2012 experience for 1.6 million enrollees on 80 contracts were selected for analysis.

The study found that for nine of the ten measures, dual eligible members had lower ratings than non-duals, which supports a correlation between dual eligible enrollment and lower Star ratings. The diabetes treatment (BPD) measure was the only measure higher for dual eligible members than non-dual eligible members. However, the total rate for this measure is very high at 85-90%, which means almost all members are in compliance with this measure, regardless of dual eligibility status. The results are summarized in the table below.

Table 3.3

Measure	Description	% Difference between Duals and Non-Duals
ART	Rheumatoid Arthritis Management	-20%
BCS	Breast Cancer Screening	-4%
GSO	Glaucoma Testing	-8%
OMW	Osteoporosis Management in Women who had a Fracture	-24%
PCR	Plan All-Cause Readmissions	-10%
BPD	Diabetes Treatment	3%
HRM	High Risk Medication	-5%
MA-C	Medication Adherence for Cholesterol (Statins)	-1%
MA-D	Medicare Adherence for Oral Diabetes Medications	-5%
MA-H	Medicare Adherence for Hypertension (RAS antagonists)	-27%

[13] Inovalon, "The Impact of Dual Eligible Populations on CMS Five-STAR Quality Measures and Member Outcomes in Medicare Advantage Health Plans," October 30, 2013.

To further investigate the dual eligible and Star rating relationship, Inovalon performed a multivariate regression analysis. A number of additional variables were included in the analysis, such that the effects of those variables were removed and the remaining difference was attributed to differences in dual eligible status. The additional variables accounted for include: age, sex, region, plan type, reason for entitlement, Charlson comorbidity severity score[14], and CMS MA risk score. The same data described in the above analysis was utilized; however, 2011 experience was added in addition to the 2012 experience for the multivariate regression analysis. The following table shows the difference between the ratings for the dual eligible and non-dual eligible members after removing the effects of the additional variables.

Table 3.4

Measure	Description	% Difference between Duals and Non-Duals
ART	Rheumatoid Arthritis Management	-17.5%
BCS	Breast Cancer Screening	3.1%
GSO	Glaucoma Testing	-7.7%
OMW	Osteoporosis Management in Women who had a Fracture	-24.8%
PCR*	Plan All-Cause Readmissions	2.0%
BPD	Diabetes Treatment	10.9%
HRM*	High Risk Medication	11.4%
MA-C	Medication Adherence for Cholesterol (Statins)	-2.8%
MA-D	Medicare Adherence for Oral Diabetes Medications	-0.4%
MA-H	Medicare Adherence for Hypertension (RAS antagonists)	-2.9%

* *PCR and HRM measures are inverse, so a positive difference means the dual eligible members had lower ratings than non-dual eligible members*

After accounting for other risk factors, the results again suggested dual eligible members have lower ratings for all but two of the ten measures (BCS and BPD). This analysis provides further support for a causal relationship, since the relationship persisted even after a large number of other potentially confounding variables were accounted for.

Milliman Paper

Milliman released a paper[15] in December of 2011 that analyzed the ability of external factors to predict Star ratings. The 2011 and 2012 Star ratings for 374 contracts formed the basis of the analysis. Milliman utilized logistic regression to analyze the impacts of a significant number of external variables. After revising and pairing down the list of variables for multicollinearity and statistical significance, a final list of external variables was created:

- Low income subsidy membership
- Tax status
- Diseased population based on diabetes prevalence
- Member weighted double bonus counties
- Years as an MA plan
- Number of states served
- Education level (high school graduation rate)
- Corrective action plan history
- Race: white population (all ages)

[14] The Charlson comorbidity index "provides a weighted score of a person's disease severity that accounts for both the number and severity level of comorbid conditions as they relate to the risk of mortality," Inovalon paper, page 8.
[15] Milliman's paper was provided in response to a client's request and was not publicly released; no reference is available.

Milliman's analysis utilizing the above variables resulted in a c statistic of 0.854, which indicates that for 85.4% of all possible pairs of Star ratings, the model accurately assigns a higher probability to those with a higher Star rating. Note that a c statistic of 0.5 indicates no relationship between the independent and dependent variables, whereas a c statistic of 1.0 indicates perfect association between the independent and dependent variables. In other words, the model was fairly good at predicting Star ratings using external variables.

The low income subsidy membership variable, which is of particular importance to our paper since low income members are in many cases also dual eligible, was organized into the following groups:

- Min LI: 0% – 30% LIS Members
- Mixed LI: 30% – 60% LIS Members
- Mostly LI: 60% – 90% LIS Members
- LI: 90% – 100% LIS Members

Based on Milliman's analysis, the low income subsidy membership variables resulted in the following odds ratios:

Table 3.5

Measure	Odds Ratio Point Estimate
LI vs. Min LI	0.583
Mixed LI vs. Min LI	0.395
Mostly LI vs. Min LI	0.160

All of the odds ratios are less than 1.00, which indicates if the contract contains more than 30% LIS members, the Star rating is projected to decrease. This is consistent with the findings in this report. An update to this report based on 2012 and 2013 Star ratings was produced by Milliman in February 2013 and produced findings consistent with the original report, providing further evidence of the strong correlation between low-income membership and Star ratings.

IV. DATA SELECTION AND POTENTIAL DATASET LIMITATIONS

2015 member-level Star rating data was provided by UHC, which formed the basis of the association strength and specificity analyses. This dataset spanned seven UHC contracts during calendar year 2013, and included fifteen member-level Star-related outcome measures.

Our member-level dataset included approximately 580,000 members within seven of UHC's 81 MA contracts for Star year 2015 (experience from calendar year 2013). The dataset includes membership in different geographical markets, from multiple sizes of contract, and varying dual eligible percentages, in order to be representative of UHC's MA experience as a whole. The seven contracts selected and their corresponding 2013 membership are shown in the following table.

Table 4.1

Contract	Area	2013 Members	2013 Members with HEDIS / Drug Adherence Measures	2013 Dual % (Members with HEDIS/Drug Adherence Measures)
H0151	Alabama	41,691	32,971	39%
H0543	California	369,739	290,149	8%
H2111	Mid-Atlantic States	5,195	2,594	96%
H3209	New Mexico	3,186	1,503	97%
H3456	North Carolina	94,511	75,122	24%
H4590	Texas	190,923	153,033	17%
R3444	Arkansas / Missouri	41,510	25,866	62%
Total		746,755	581,238	17%

The Star-related member-level measures[16] selected for our analysis were determined by process of elimination. Star-related measures not selected and the reasons for exclusion are listed below:

- 2015 Star measure C03 (Diabetes Care – Cholesterol Screening) was excluded because we expected it to have significant overlap with two other measures, C02 (Cardiovascular Care – Cholesterol Screening) and C17 (Diabetes Care – Cholesterol Controlled).
- Consumer Assessment of Healthcare Providers and Systems (CAHPS) measures were eliminated because (A) the individuals participating in the CAHPS survey are unknown to UHC, (B) non-surveyed members would not provide any outcome data, leading to a sample size problem, and (C) these measures already incorporate a case-mix adjustment. This includes 2015 Star measures C04, C23-C28, D06, and D07.
- Health Outcomes Survey (HOS) measures were eliminated due to the difficulty of matching results to the members who were actually surveyed. This includes 2015 Star measures C05-C07, C20, and C21.
- The Special Needs Plan (SNP) Care Management and High Risk Medications measures were eliminated from consideration because details in their calculation make them more difficult to study. These are 2015 Star measures C09 and D09.

[16] Details related to the 2015 Star rating measures are provided in the "Medicare 2015 Part C & Part D Star Rating Technical Notes," http://www.cms.gov/Medicare/Prescription-Drug-Coverage/PrescriptionDrugCovGenIn/PerformanceData.html, (accessed October 28, 2014).

- 2015 Star measure C18 (Controlling Blood Pressure) is a chart-dependent measure and is entirely unobservable in administrative data. It was not actively excluded, but the UHC dataset contains no information regarding who is in the numerator.

- Readmissions, Medicare Plan Finder price accuracy, and the improvement measures were not included due to the difficulty of isolating a single member's contributions to the overall score of a contract. This includes 2015 Star measures C22, C31, D05, and D08.

- The complaints measures were excluded because they rarely tie out between UHC's internally recorded data and the CMS official values (due to hidden complaints, disputes over inclusion of individual complaints, and other CMS adjustments). Furthermore, the complaints measures' data time frame will be expanded after Star year 2015 to include an entire year of complaints, and thus inferences gleaned from current data would not be as directly applicable to future Star years. This includes 2015 Star measures C29 and D03.

- Part C and D disenrollment was ruled out because significant differences exist between UHC's tracking methods and those used by CMS, making the data unsuitable for this exercise. This includes 2015 Star measures C30 and D04.

- Appeals and grievances measures were excluded because the timeliness and fairness of appeals is known already to be independent of dual eligible status. This includes 2015 Star measures C32, C33, D01, and D02.

- 2015 Star measure D10 (Diabetes Treatment) was excluded because most of the industry (over 70%) receives scores between 84%-89%, and explaining the remaining variability within that small range using the variables in the UHC dataset seemed unlikely, especially when considering that this measure also has a relatively small sample size (a member must be both diabetic and hypertensive to be included).

- Finally, we eliminated display measures such as breast cancer screening from consideration because they received zero weight in the 2015 Star rating calculation. This includes all 2015 Star measures beginning with "DMC" or "DMD."

This process of elimination left us with the fifteen member-level 2015 Star measures used in our analysis (C01, C02, C08, C10-C17, C19, and D11-13). Note that several of these are Healthcare Effectiveness Data and Information Set (HEDIS) measures not completely visible in administrative data, as they are reliant upon chart audits for selected members. Therefore our member-level dataset contains relatively few observations for these measures, which include C08 (Adult BMI Screening), C10-C12 (the Care for Older Adults measures), C16 (Diabetic Care – Blood Sugar Control), and C17 (Diabetic Care – Cholesterol Control).

In addition, measures such as C13 (Osteoporosis Management in Women who had a Fracture) and C19 (Rheumatoid Arthritis Management) are associated with conditions with relatively low prevalence in UHC's enrolled population, and consequently have relatively few observations in the underlying experience. Before performing any analysis, we recognized these measures would likely have a lower a priori probability of yielding a statistically significant relationship due to lack of statistical power. However, we decided to err on the side of inclusiveness to avoid inadvertently excluding information that could have predictive value, and therefore included all fifteen of these measures in the Association Strength and Specificity analyses.

2011 to 2015 contract-level Star rating data was also provided by UHC for all of their contracts for the gradient and temporality analyses. The Star ratings in this data set were based on raw Star ratings calculated by UHC, according to CMS' technical notes and are, therefore, unrounded ratings (whereas official Star ratings are rounded to the nearest 0.5 stars). When providing the contract-level dataset, UHC disclosed that their calculated i-factor, which is a part of the raw Star rating, is slightly different than the official CMS i-factor in some cases. This is a known area of discrepancy between UHC's data and the official CMS data, as the precise i-factor methodology used by CMS is not publicly known or available. Additionally, CMS recently released an updated version of the historical Star rating data that in some cases may correct for errors in the prior dataset, which forms the basis of the data provided by UHC. However, we determined these minor potential limitations to be unlikely to materially impact our results and conclusions. We relied on UHC's Star ratings as provided and accepted them without audit.

V. METHODOLOGY

BRADFORD HILL CRITERIA FRAMEWORK

The question we were tasked with answering was not only *if* a relationship existed between dual eligible enrollment and Star ratings, but whether the presence of dual eligible enrollment *caused* Star ratings to decrease. To develop an answer to this question, we utilized the Bradford Hill criteria[17], which is a set of nine conditions that together provide evidence of a causal relationship between a variable and a response:

Association Strength: The greater the association, the more likely the relationship is causal.

Specificity: Causation is likely when other external variables are controlled for, such that the remaining cause / effect relationship exists.

Gradient: Larger exposure of the cause should produce a greater incident of the effect.

Temporality: The effect occurs after the cause.

Consistency: Consistent findings by multiple sources strengthen the likelihood the relationship is causal.

Plausibility: The cause / effect relationship is strengthened if it is generally plausible.

Coherence: The cause / effect relationship should not be in conflict with generally known facts.

Experiment: Reproducing the cause / effect relationship via experimentation increases the causal likelihood.

Analogy: The causal relationship may be inferred by analogy when similar cause / effect relationships exist.

The idea behind the Bradford Hill criteria is to come at the relationship in a number of different ways. The greater the number of criteria met, the more the analyst may feel comfortable that a causal relationship does in fact exist. Each of these nine criteria builds further support for the causal relationship.

Keep in mind that this framework, even when all nine criteria are clearly met, does not prove the existence of a causal relationship in an absolute sense. Rather, as more of these criteria are shown to be met, the likelihood of causality becomes relatively stronger, analogous to building a court case by assembling various types of circumstantial evidence. In performing this analysis, we recognize that Bradford Hill is limited in this way, and therefore does not necessarily *prove* causation, but it certainly can help to demonstrate that the proposed causal relationship is likely.

The methodology for each of the nine criteria is described below. Due to the limited time available to UHC to respond to the RFI, in some cases, we were limited in the scope of the data we could acquire and the analyses we could complete. At the end of this section, we include a brief description of additional analyses and potential future improvements to further investigate the dual enrollment/Star rating relationship.

[17] Hill, Austin Bradford (1965). "The Environment and Disease: Association or Causation?" Proceedings of the Royal Society of Medicine 58 (5): 295–300, http://www.edwardtufte.com/tufte/hill (accessed October 6, 2014).

ASSOCIATION STRENGTH

One of the first steps in supporting a potential causal relationship using Bradford Hill criteria is to establish a significant correlation between the assumed incidence and consequence. As discussed in Section II (Background), Star ratings are calculated based on a number of member-level measures, including measures related to medical outcomes, intermediate outcomes, patient experience, access to care, and processes. Fifteen specific measures were selected to approximate the relative impact on 2015 Star ratings. These measures included:

Table 5.1

CMS Star ID	Star Rating Weight	Star Rating Measure	Denominator	Numerator[18]
C01	1.0	Colorectal Cancer Screening	Most members age 50 to 75	Members that are up to date on their screening
C02	1.0	Cardiovascular Care – Cholesterol Screening	Members with heart disease	Members with a test for "bad" (LDL) cholesterol within the past year
C08	1.0	Adult BMI Assessment	Members with outpatient visit	Members with their Body Mass Index (BMI), calculated from their height and weight, recorded in their medical records
C10	1.0	Care for Older Adults – Medication Review	SNP members age 66 and older	Members with a professional medication review during the data year and a medication list in their medical record
C11	1.0	Care for Older Adults – Functional Status Assessment	SNP members age 66 and older	Members with a professional functional status assessment during the data year
C12	1.0	Care for Older Adults – Pain Assessment	SNP members age 66 and older	Members with a pain screening or pain management plan during the data year
C13	1.0	Osteoporosis Management in Women who had a Fracture	Female members age 67 and older who suffered a fracture	Members with a bone mineral density screening or treatment for osteoporosis within 6 months of the fracture
C14	1.0	Diabetes Care – Eye Exam	Members with diabetes	Members with an eye exam to check for damage from diabetes during the year
C15	1.0	Diabetes Care – Kidney Disease Monitoring	Members with diabetes	Members with a kidney function test during the year
C16	3.0	Diabetes Care – Blood Sugar Controlled	Members with diabetes	Members with an A-1-C lab test during the year that showed their average blood sugar is under control
C17	3.0	Diabetes Care – Cholesterol Controlled	Members with diabetes	Members with a cholesterol test during the year that showed an acceptable level of "bad" (LDL) cholesterol
C19	1.0	Rheumatoid Arthritis Management	Members diagnosed with Rheumatoid Arthritis during the year	Members that received at least one prescription for an anti-rheumatic drug
D11	3.0	Medication Adherence for Diabetes Medication	Members age 18 and older with at least two fills of medication(s) across any of the drug classes during the year	Members with a proportion of days covered at 80% or over for the specified drug class
D12	3.0	Medication Adherence for Hypertension (RAS Antagonists)	Members age 18 and older with at least two fills of medication(s) across any of the drug classes during the year	Members with a proportion of days covered at 80% or over for the specified drug class
D13	3.0	Medication Adherence for Cholesterol	Members age 18 and older with at least two fills of medication(s) across any of the drug classes during the year	Members with a proportion of days covered at 80% or over for the specified drug class

[18] Numerator is a subset of Denominator

In total, these fifteen measures comprise a weight of 25.0 out of a possible 87.0, or 29% of the overall Star rating for plans covering both Part C and Part D.

The relationship between dual eligible enrollment and Star ratings was analyzed by using UHC's 2013 member-level experience. Seven contracts, consisting of over 580,000 members, were selected by UHC for review. We did not audit the selection of plans provided by UHC and assume they fairly represent an average cohort of UHC's MAPD business. The experience was grouped by dual status (i.e., duals versus non-duals) and by the fifteen Star rating measures. The resulting rating was calculated for each cell. For each Star rating measure, we calculated the difference between the non-dual and dual rating and the associated p-value. The p-value is a measure of the degree of significance and is defined as the probability that the difference is due to random chance.

In this analysis, we performed multiple comparisons (i.e., fifteen Star rating measures). This makes it more likely that one or more of the individual measures could appear to be significant simply by random chance, which impacts the way the p-values should be considered. We utilized the Bonferroni approach to adjust for this possibility. The Bonferroni approach states that if k tests are performed that individually have a p-value no greater than α/k, the total p-value will not exceed α. Applying this concept to the Association Strength analysis, if each individual Star rating measure is significant at $p = 0.0033$ (0.05/15), the total p-value across all the Star rating measures will not exceed 0.05. Our targeted error rate threshold across all Star rating measures is 0.05, therefore, we have reviewed individual Star rating measures for p-value significance at 0.0033 or less. Note the Bonferroni approach is fairly conservative in this application because it is intended for multiple comparisons of variables that are independent from each other. In our analysis, the individual Star measures are likely somewhat correlated, and therefore an individual p-value target of 0.0033 is likely to be consistent with an overall p-value less than 0.05. This inherent conservatism means that our tally of significant variables could be understated, but is highly unlikely to be overstated.

SPECIFICITY

The purpose of the specificity criterion is to control for various external variables and determine if there is still a significant relationship between the independent and dependent variables in question. To illustrate this, the member-level data (described in the above discussion of the Association Strength analysis) was combined with county level census data and used to perform a logistic regression on fifteen different measures (modeled individually).

To begin the testing, 21 variables were chosen as control variables to be modeled along with the independent variable (dual eligibility) within each of the logistic regression models (one model per dependent variable). The modeled control variables included age, gender, income, geographic indicators, and a number of health related variables as well as a few proxy variables indicating the presence of disease states such as COPD and hypertension. Note that the determination of which control variables to include in the final model for each dependent variable was independent from those selected for any other dependent variable. Therefore, not all control variables were selected for the final models for each dependent variable. See the table below for a full listing of variables used and the dependent variables whose models controlled for each of them.

Table 5.2

Variable Name	Description	County Census Data (Y/N)	Dependent Variables Modeled With
med_hhld_inc_CFY	Median Household Income	Y	All
white_pct_CFY	White Population Percentage	Y	All
AVGHHSZ_CFY	Average Household Size	Y	All
RISK_ADJ_FCTR_A	Risk Adjustment Factor	N	All
RISK_ADJ_FCTR_D	Risk Adjustment Factor	N	All
DERIVED_MCAID_ STATUS_FLG	Dual Eligible (Y/N)	N	All
age	Numeric Age	N	All
gender	Male or Female	N	All but C13
contract	7 contract categories	N	All
areatype	Urban, Large Rural, Small Rural, Isolated	N	All
race_white	Indicator for a member being white (0 or 1)	N	All
htn_proxy	Indicator for hypertension (0 or 1)	N	All but D12
cvd_proxy	Indicator for cardiovascular disease (0 or 1)	N	All but C02
copd_proxy	Indicator for COPD (0 or 1)	N	All
chemdep_proxy	Indicator for alcohol/drug abuse (0 or 1)	N	All
statin_prescr	Indicator for statin prescription (0 or 1)	N	All but D13
RAS_prescr	Indicator for RAS antagonist prescription (0 or 1)	N	All but D12
OD_prescr	Indicator for oral diabetes prescription (0 or 1)	N	All but D11
HRM_FLG	Indicator for one or more medications on the Beer's list (0 or 1)	N	All
BCS	Breast Cancer Screening	N	C13
C14_CDCEYE	Diabetes Care - Eye Exam	N	D11
C15_CDCNEP	Diabetes Care - Kidney Disease Monitoring	N	D11
C16_CDCA1C9	Diabetes Care – Blood Sugar Controlled	N	D11
C17_CDC100	Diabetes Care – Cholesterol Controlled	N	D11, D13

In each model, these control variables were tested for multicollinearity, which occurs when independent variables are highly correlated with each other and can lead to misleading and inaccurate results. Variables with high variance inflation factors (VIF[19]) were removed, using a common cutoff of 5 as the maximum allowed value. The only variable removed for all the models was contract type (which was correlated with area type).

Once the control variable list was finalized, a stepwise logistic regression was run to model each of the sixteen dependent measures, keeping only the significant control variables (using a level of significance of 0.05). In these regression models, any entries with missing values for the dependent or independent variables were not used. In a stepwise regression, independent variables enter the model one at a time if they are significant at the five percent level. Variables can be removed each step if they are no longer significant predictors at the five percent level. In this analysis, the variable for dual eligibility was forced to be included in each model, whether or not it was significant. While stepwise regression was utilized to select the final independent variables, judgment was also employed to ensure the variable selection minimized the possibility of collinear relationships. For example, low income status was a characteristic

[19] VIF = $1/(1-R^2)$, where R^2 is the coefficient of determination obtained by regressing the independent variable against all other independent variables. A VIF of 5 implies an R^2 of 0.80 between the independent variable in question and all other regressors.

available in the dataset. However, we chose not to include it in the stepwise process due to the high correlation between members that are both low income and dual eligible.

The stepwise logistic regression yields an odds ratio comparing non-dual members to dual members, which shows whether there is a relationship between dual eligibility and the rating in each of the dependent measures when controlling for the other significant variables. When the odds ratio is greater than one, the model indicates non-dual eligibles perform better than dual eligibles for the dependent variable or Star-related outcome measure in question. When the odds ratio is less than one, the relationship is reversed and indicates dual eligibles are statistically more likely to perform well for that particular outcome measure.

GRADIENT

The premise of the gradient criterion is that greater exposure to the incidence should generally lead to greater presence of the consequence. In our case, this should mean the Star rating scales based on the level of dual enrollment, so for example a contract with 90% duals should tend to have a lower Star rating than a contract with 65% duals.

To test this criteria, we utilized UHC's contract level data for 2011 to 2015 Stars (based on 2009 to 2013 experience), which was comprised of over 400 contract years and over 5 million member years. The dual enrollment percentage and Star rating were reported for each contract and year. A scatterplot varying by Star rating to dual enrollment percentage was created using these data points. Simple linear regression was used to fit a trend line to the data and the resulting slope of the trend line indicated the relationship between the dual enrollment percentage and Star ratings. Finally, statistical measures such as R-squared were calculated to identify the degree of fit of the trend line. Note that both the trend line and R-squared were calculated two ways. First, a trend line was fit to the data giving equal weight to all data points. Second, a trend line was fit to the data using the member year weights of each data point (e.g., a contract that had ten times the membership of another contract was assigned ten times the weight when determining the trend line). The weighted results are discussed in the body of this report and the non-weighted results are included in Appendix C.

We then considered the fact that average Star ratings across the industry have increased over time. We attempted to mitigate the impact of this secular trend by creating an adjusted view of the gradient analysis. A new variable was created representing a contract's Star rating relative to the average Star rating for that same year (e.g., the contract's 2011 Star rating divided by the average Star rating for all of 2011). By using this Star rating relativity variable, the effects of Star ratings generally increasing each year have been minimized. The adjusted gradient analysis utilizes an identical approach to that described above. The only difference is the use of the Star rating relativity variable.

TEMPORALITY

The temporality criterion states the consequence must occur after the incidence. For example, if the incidence (dual enrollment) increases over time, we would expect the consequence (Star ratings) to decrease over time, and the reverse must also be true (contracts with declining dual enrollment over time must tend to show increases in Star ratings).

An approach very similar to the one utilized in the gradient analysis was taken. Using the same data, we calculated the incident as the year-to-year change in dual enrollment percentage (e.g., 2012 dual enrollment percentage less the 2011 dual enrollment percentage) and the consequence as the year-to-year change in Star rating (e.g., 2012 Star rating divided by 2011 Star rating less 1). Using these metrics, a scatterplot, trend line, and statistical measures were developed. The weighted results are discussed in the body of this report and the non-weighted results are included in Appendix D.

Similar to the gradient analysis, we again attempted to normalize for the overall increase in risk scores over time by creating a Star rating relativity metric. The year-to-year change in this metric was used to create an adjusted temporality analysis.

CONSISTENCY

The consistency criterion indicates further support for a causal relationship if additional sources reach the same conclusion. UHC performed the literature search and provided Milliman with the four sources described in Section III (Results), which were reviewed for consistency with the findings described in this report.

PLAUSIBILITY

The plausibility criterion seeks to identify a plausible mechanism(s) between dual eligible enrollment and Star ratings to rule out spurious correlations. Duals and non-duals are two distinct populations with a number of significantly different characteristics. For example, on average, duals are a higher risk health status population than non-duals, as we see this through their HCC risk scores. These differences in characteristics may also lead to behavior differences. Because of this potential behavior difference, it is plausible that the Star ratings are inherently biased in such a way that the outcomes measured favor contracts with lower dual enrollment.

COHERENCE

The coherence criterion states consistency with laboratory findings and generally known facts increases the likelihood of a causal relationship. Given the nature of the relationship we are studying, there are no laboratory findings to compare to, nor are such examples feasible. Additionally, the literature provided by UHC did not include any papers, reports, or research attempting to prove the relationship does not exist.

EXPERIMENT

The experiment criterion states it may be possible to appeal to experimental evidence, and if so, the causal relationship would be further supported. However, it would be extremely impractical to try to set up an experiment to test for the relationship we are studying here. For example, randomly assigning seniors to be low-income or non-low income for a period of time and then studying their quality outcomes to test for differences is highly implausible.

ANALOGY

The analogy criterion requires the identification of a similar relationship. CMS' HCC risk score models include adjustment factors to differentiate between duals and non-duals and between low income and non-low income members, recognizing that these variables have an impact on the outcome. Based on this precedent, it may be reasonable to also expect duals to have different outcomes in the Star rating model and, therefore, to be handled differently from the non-duals.

POTENTIAL AREAS FOR FURTHER STUDY

Due to time constraints, the scope for the analyses described above may have been limited in some cases. In this section, we describe additional analyses and potential future improvements to further investigate the dual enrollment/Star rating relationship.

Association Strength

We identified several potential enhancements which could be made to the existing analysis of association strength. The current analysis is based on seven of UHC's Medicare contracts for the 2015 star rating year. The analysis could be expanded to include multiple years of data (e.g., 2011 to 2015 star rating experience), as well as extended to all of UHC's contracts. Additionally, this experience could be separated by plan type (e.g., DSNP, ISNP, and non-SNPs) to investigate whether the relationship varies by plan type. A separate comparison could be made between dual eligibles from contracts with high Star ratings and those from contracts with low Star ratings to see if there is any significant difference in the outcomes for the dual population driving the Star rating difference (as opposed to being caused by the difference in mix of duals and non-duals). The membership could also be separated into a more granular set of income categories – rather than the simple dual versus non-dual distinction, a greater number of income-based cohorts could potentially be created and studied. Finally, additional Star rating measures, in addition to the twelve currently considered, could be incorporated to capture a more complete picture of the outcomes impacting the Star rating calculation assuming the data is available for such an expanded study.

Specificity

The current specificity analysis could be improved by utilizing expanded UHC data and additional Star rating measures, as described above for the association strength analysis. However, as discussed above, the largest barrier to expanding this analysis to additional measures lies in obtaining usable data with adequate sample size and sufficient time to compile and review the results. Additional control variables could also be considered (e.g., risk scores, certain diagnoses, etc.).

Gradient

A more rigorous statistical approach could be taken to model the dual enrollment and star rating contract-level relationship, by using logistic regression to control for a number of external variables. These control variables could include effects such as year, plan type (DSNP, ISNP, non-SNP), presence of certain diseases, and risk score, among others. In addition, the distinction between dual eligible and non-dual eligible enrollees could perhaps be further broken down into various income-based cohorts to analyze changes in Star ratings as enrollment of certain cohorts goes up or down.

Temporality

Improvements similar to those described for the gradient criterion could be made in the Temporality analysis as well. In addition, we note that the last graph in the Section III (Results) discussion of the Temporality analysis only removed those contracts with less than 1% change in dual eligible enrollment year over year. There were not sufficient observations within the contract-level UHC dataset to widen this range and only look at contracts with a more significant change in dual eligible enrollment (e.g. +/- 5% or even +/- 10%). One possible area for further study would be to look at contract-level data across the industry, increasing the number of observations with at least 5% or even 10% change. There are files publicly available from CMS that show industry-wide Star ratings by contract and low-income membership percentage by plan which could be used for this analysis, though the definition of "low-income" membership may differ slightly from the dual eligible definition used throughout this report.

VI. CAVEATS AND LIMITATIONS

The information presented in this report is intended for the internal use of UHC and it should not be distributed, in whole or in part, to any external party without the prior written permission of Milliman. We do not intend this information to benefit any third party even if we permit the distribution of our work product to such third party. We acknowledge that the report will be provided to the Centers for Medicare and Medicaid Services (CMS) as an attachment to a UHC-drafted letter in response to a Request For Information (RFI) on this topic, and hereby consent to this specific distribution of this report.

This information is designed to provide UHC with a summary of the analysis conducted by Milliman related to UHC's dual eligible enrollment and Star rating historical experience. This information may not be appropriate, and should not be used, for other purposes.

UHC's future actual results will likely differ from the historical experience in this report. In preparing this report, we relied on information provided by UHC and publicly available information from CMS. We accepted this information without audit. Our results and conclusions may not be appropriate if this information is not accurate.

Guidelines issued by the American Academy of Actuaries require actuaries to include their professional qualifications in all actuarial communications. We are members of the American Academy of Actuaries and meet the qualification standards for performing the analyses in this report.

The terms of Milliman's Consulting Services Agreement with UHC effective September 9, 2005, apply to this information and its use.

APPENDIX A

SPECIFICITY LOGISTIC REGRESSION RESULTS SUMMARY

Table A.1 – Colorectal Cancer Screening			
Effect	**Odds Ratio Point Estimate**	**95% Wald Confidence Limits**	
DERIVED_MCAID_STATUS N vs Y	1.395	1.354	1.437
GENDER F vs M	1.072	1.053	1.092
AreaType Isolated vs Urban	0.791	0.708	0.883
AreaType Large Rural vs Urban	0.799	0.767	0.833
AreaType Small Rural vs Urban	0.738	0.686	0.794
htn_proxy 0 vs 1	0.845	0.821	0.869
cvd_proxy 0 vs 1	1.135	1.102	1.170
copd_proxy 0 vs 1	1.447	1.304	1.606
chemdep_proxy 0 vs 1	0.907	0.854	0.964
statin_prescr 0 vs 1	0.746	0.731	0.761
RAS_prescr 0 vs 1	1.102	1.072	1.133
OD_prescr 0 vs 1	1.148	1.118	1.178
HRM_FLG 0 vs 1	0.951	0.929	0.975
med_hhld_inc_CFY	1.000	1.000	1.000
AVGHHSZ_CFY	1.513	1.464	1.564
RISK_ADJ_FCTR_A	0.966	0.950	0.981
RISK_ADJ_FCTR_D	2.007	1.929	2.087
age	1.079	1.076	1.083

Table A.2 – Cardiovascular Care - Cholesterol Screening			
Effect	**Odds Ratio Point Estimate**	**95% Wald Confidence Limits**	
DERIVED_MCAID_STATUS N vs Y	1.264	1.129	1.415
AreaType Isolated vs Urban	0.674	0.441	1.030
AreaType Large Rural vs Urban	0.664	0.565	0.781
AreaType Small Rural vs Urban	0.663	0.511	0.861
htn_proxy 0 vs 1	0.686	0.625	0.754
copd_proxy 0 vs 1	2.276	1.810	2.861
statin_prescr 0 vs 1	0.446	0.411	0.485
OD_prescr 0 vs 1	0.652	0.582	0.730
white_pct_CFY	1.008	1.005	1.012
AVGHHSZ_CFY	1.601	1.373	1.868
RISK_ADJ_FCTR_A	0.902	0.865	0.941
RISK_ADJ_FCTR_D	1.340	1.162	1.545
age	1.019	1.004	1.034

Table A.3 – Adult BMI Assessment			
Effect	**Odds Ratio Point Estimate**	**95% Wald Confidence Limits**	
DERIVED_MCAID_STATUS N vs Y	0.912	0.883	0.942
GENDER F vs M	1.076	1.055	1.098
AreaType Isolated vs Urban	0.768	0.682	0.864
AreaType Large Rural vs Urban	0.842	0.805	0.882
AreaType Small Rural vs Urban	0.772	0.713	0.835
race_white 0 vs 1	1.059	1.033	1.085
htn_proxy 0 vs 1	0.898	0.871	0.926
cvd_proxy 0 vs 1	1.052	1.019	1.085
chemdep_proxy 0 vs 1	1.118	1.051	1.190
statin_prescr 0 vs 1	0.916	0.897	0.935
RAS_prescr 0 vs 1	1.032	1.003	1.063
OD_prescr 0 vs 1	1.086	1.057	1.116
HRM_FLG 0 vs 1	0.972	0.948	0.997
med_hhld_inc_CFY	1.000	1.000	1.000
white_pct_CFY	1.006	1.005	1.007
AVGHHSZ_CFY	2.313	2.224	2.405
RISK_ADJ_FCTR_A	1.067	1.050	1.085
RISK_ADJ_FCTR_D	1.686	1.619	1.756

Table A.4 – Care for Older Adults - Medication Review			
Effect	**Odds Ratio Point Estimate**	**95% Wald Confidence Limits**	
DERIVED_MCAID_STATUS N vs Y	2.066	1.777	2.400
race_white 0 vs 1	1.280	1.171	1.400
cvd_proxy 0 vs 1	1.175	1.041	1.326
chemdep_proxy 0 vs 1	1.512	1.223	1.870
statin_prescr 0 vs 1	0.839	0.774	0.910
med_hhld_inc_CFY	1.000	1.000	1.000
white_pct_CFY	1.013	1.010	1.016
AVGHHSZ_CFY	0.545	0.435	0.683
RISK_ADJ_FCTR_A	1.154	1.095	1.215
RISK_ADJ_FCTR_D	1.985	1.761	2.237

Table A.5 – Care for Older Adults - Functional Status Assessment			
Effect	**Odds Ratio Point Estimate**	**95% Wald Confidence Limits**	
DERIVED_MCAID_STATUS N vs Y	1.599	1.382	1.850
race_white 0 vs 1	1.399	1.279	1.530
chemdep_proxy 0 vs 1	1.863	1.494	2.323
statin_prescr 0 vs 1	0.826	0.760	0.896
OD_prescr 0 vs 1	1.126	1.025	1.237
med_hhld_inc_CFY	1.000	1.000	1.000
white_pct_CFY	1.013	1.009	1.016
AVGHHSZ_CFY	0.210	0.167	0.264
RISK_ADJ_FCTR_A	1.159	1.101	1.220
RISK_ADJ_FCTR_D	1.966	1.744	2.217

Table A.6 – Care for Older Adults - Pain Assessment			
Effect	**Odds Ratio Point Estimate**	**95% Wald Confidence Limits**	
DERIVED_MCAID_STATUS N vs Y	0.416	0.326	0.531
AreaType Isolated vs Urban	1.598	1.087	2.349
AreaType Large Rural vs Urban	1.354	1.135	1.615
AreaType Small Rural vs Urban	1.963	1.540	2.501
race_white 0 vs 1	1.720	1.551	1.907
chemdep_proxy 0 vs 1	1.525	1.173	1.983
OD_prescr 0 vs 1	1.159	1.037	1.296
med_hhld_inc_CFY	1.000	1.000	1.000
white_pct_CFY	1.006	1.002	1.010
AVGHHSZ_CFY	0.005	0.004	0.007
RISK_ADJ_FCTR_A	1.157	1.093	1.224
RISK_ADJ_FCTR_D	2.142	1.878	2.444

Table A.7 – Osteoporosis Managing in Women who had a Fracture			
Effect	**Odds Ratio Point Estimate**	**95% Wald Confidence Limits**	
DERIVED_MCAID_STATUS N vs Y	1.284	0.977	1.688
chemdep_proxy 0 vs 1	0.649	0.425	0.991
BCS 0 vs 1	0.479	0.387	0.593
white_pct_CFY	1.011	1.001	1.021
AVGHHSZ_CFY	2.283	1.536	3.394

Table A.8 – Diabetes Care - Eye Exam			
Effect	**Odds Ratio Point Estimate**	**95% Wald Confidence Limits**	
DERIVED_MCAID_STATUS N vs Y	1.198	1.149	1.249
GENDER F vs M	1.203	1.167	1.240
AreaType Isolated vs Urban	0.591	0.496	0.705
AreaType Large Rural vs Urban	0.803	0.750	0.859
AreaType Small Rural vs Urban	0.701	0.625	0.787
race_white 0 vs 1	1.070	1.033	1.108
htn_proxy 0 vs 1	0.891	0.844	0.940
cvd_proxy 0 vs 1	1.070	1.024	1.119
copd_proxy 0 vs 1	1.657	1.425	1.927
chemdep_proxy 0 vs 1	1.125	1.018	1.244
statin_prescr 0 vs 1	0.758	0.734	0.782
RAS_prescr 0 vs 1	0.898	0.858	0.940
OD_prescr 0 vs 1	0.885	0.858	0.912
white_pct_CFY	1.003	1.002	1.005
AVGHHSZ_CFY	1.800	1.698	1.909
RISK_ADJ_FCTR_A	0.937	0.918	0.957
RISK_ADJ_FCTR_D	1.725	1.625	1.831
age	1.039	1.033	1.044

Table A.9 – Diabetes Care - Kidney Disease Monitoring			
Effect	**Odds Ratio Point Estimate**	**95% Wald Confidence Limits**	
DERIVED_MCAID_STATUS N vs Y	1.340	1.227	1.463
AreaType Isolated vs Urban	0.641	0.456	0.901
AreaType Large Rural vs Urban	0.704	0.616	0.805
AreaType Small Rural vs Urban	0.613	0.493	0.762
race_white 0 vs 1	1.093	1.017	1.174
htn_proxy 0 vs 1	0.771	0.723	0.821
copd_proxy 0 vs 1	1.488	1.144	1.936
statin_prescr 0 vs 1	0.694	0.651	0.739
RAS_prescr 0 vs 1	0.003	0.002	0.004
OD_prescr 0 vs 1	0.796	0.747	0.849
med_hhld_inc_CFY	1.000	1.000	1.000
white_pct_CFY	1.006	1.003	1.009
AVGHHSZ_CFY	2.240	1.986	2.526
RISK_ADJ_FCTR_A	1.161	1.111	1.214
RISK_ADJ_FCTR_D	1.629	1.454	1.825
age	1.012	1.001	1.022

Table A.10 – Diabetes Care - Blood Sugar Controlled			
Effect	**Odds Ratio Point Estimate**	**95% Wald Confidence Limits**	
DERIVED_MCAID_STATUS N vs Y	0.988	0.948	1.031
GENDER F vs M	0.945	0.917	0.974
AreaType Isolated vs Urban	1.995	1.625	2.449
AreaType Large Rural vs Urban	1.512	1.404	1.627
AreaType Small Rural vs Urban	1.562	1.374	1.775
race_white 0 vs 1	1.063	1.026	1.101
htn_proxy 0 vs 1	1.068	1.009	1.129
cvd_proxy 0 vs 1	0.831	0.795	0.868
copd_proxy 0 vs 1	0.684	0.580	0.807
statin_prescr 0 vs 1	1.148	1.111	1.186
RAS_prescr 0 vs 1	1.098	1.048	1.150
OD_prescr 0 vs 1	1.253	1.214	1.292
HRM_FLG 0 vs 1	0.886	0.857	0.915
med_hhld_inc_CFY	1.000	1.000	1.000
white_pct_CFY	0.992	0.991	0.994
AVGHHSZ_CFY	0.254	0.238	0.270
RISK_ADJ_FCTR_A	0.895	0.881	0.909
age	0.980	0.975	0.985

Table A.11 – Diabetes Care - Cholesterol Controlled			
Effect	**Odds Ratio Point Estimate**	**95% Wald Confidence Limits**	
DERIVED_MCAID_STATUS N vs Y	1.027	0.983	1.073
GENDER F vs M	0.890	0.862	0.918
AreaType Isolated vs Urban	0.663	0.542	0.811
AreaType Large Rural vs Urban	0.712	0.660	0.769
AreaType Small Rural vs Urban	0.661	0.579	0.755
race_white 0 vs 1	0.917	0.884	0.952
htn_proxy 0 vs 1	0.866	0.815	0.920
copd_proxy 0 vs 1	1.425	1.197	1.696
statin_prescr 0 vs 1	0.495	0.477	0.513
RAS_prescr 0 vs 1	0.894	0.851	0.940
OD_prescr 0 vs 1	0.866	0.838	0.895
HRM_FLG 0 vs 1	1.082	1.046	1.119
med_hhld_inc_CFY	1.000	1.000	1.000
white_pct_CFY	1.008	1.007	1.010
AVGHHSZ_CFY	2.337	2.191	2.492
RISK_ADJ_FCTR_A	1.127	1.109	1.145
age	1.019	1.014	1.025

Table A.12 – Rheumatoid Arthritis Management			
Effect	**Odds Ratio Point Estimate**	**95% Wald Confidence Limits**	
DERIVED_MCAID_STATUS N vs Y	1.001	0.805	1.245
copd_proxy 0 vs 1	2.158	1.139	4.091
RISK_ADJ_FCTR_A	0.883	0.818	0.952

Table A.13 – Medication Adherence for Diabetes Medications			
Effect	**Odds Ratio Point Estimate**	**95% Wald Confidence Limits**	
DERIVED_MCAID_STATUS N vs Y	0.964	0.903	1.029
GENDER F vs M	0.939	0.896	0.985
race_white 0 vs 1	0.734	0.699	0.772
htn_proxy 0 vs 1	0.908	0.828	0.994
chemdep_proxy 0 vs 1	1.512	1.284	1.780
statin_prescr 0 vs 1	0.674	0.641	0.708
RAS_prescr 0 vs 1	0.812	0.754	0.875
HRM_FLG 0 vs 1	0.901	0.858	0.946
C14_CDCEYE 0 vs 1	0.755	0.721	0.792
C16_CDCA1C9 0 vs 1	0.937	0.885	0.991
C17_CDC100 0 vs 1	0.747	0.703	0.793
med_hhld_inc_CFY	1.000	1.000	1.000
RISK_ADJ_FCTR_A	0.923	0.898	0.948

Table A.14 – Medication Adherence for Hypertension (RAS antagonists)			
Effect	**Odds Ratio Point Estimate**	**95% Wald Confidence Limits**	
DERIVED_MCAID_STATUS N vs Y	1.022	0.981	1.064
race_white 0 vs 1	0.702	0.680	0.724
cvd_proxy 0 vs 1	1.070	1.026	1.116
copd_proxy 0 vs 1	1.381	1.199	1.590
chemdep_proxy 0 vs 1	1.350	1.243	1.466
statin_prescr 0 vs 1	0.711	0.691	0.732
OD_prescr 0 vs 1	0.906	0.877	0.935
HRM_FLG 0 vs 1	1.070	1.038	1.102
med_hhld_inc_CFY	1.000	1.000	1.000
AVGHHSZ_CFY	1.089	1.035	1.146
RISK_ADJ_FCTR_A	0.894	0.879	0.908
age	1.012	1.007	1.017

Table A.15 – Medication Adherence for Cholesterol (Statins)			
Effect	**Odds Ratio Point Estimate**	**95% Wald Confidence Limits**	
DERIVED_MCAID_STATUS N vs Y	0.935	0.888	0.985
GENDER F vs M	0.860	0.827	0.896
race_white 0 vs 1	0.713	0.683	0.744
chemdep_proxy 0 vs 1	1.331	1.165	1.521
RAS_prescr 0 vs 1	0.811	0.775	0.850
OD_prescr 0 vs 1	0.874	0.840	0.909
C17_CDC100 0 vs 1	0.649	0.622	0.677
med_hhld_inc_CFY	1.000	1.000	1.000
age	1.016	1.009	1.023

APPENDIX B

SPECIFICITY MULTICOLLINEARITY TESTING

Appendix B.1-1
Dependent Variable: C01_COL

Number of Observations Read	581238
Number of Observations Used	210263
Number of Observations with Missing Values	370975

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	26	2172.25176	83.54814	355.35	<.0001
Error	210236	49430	0.23511		
Corrected Total	210262	51602			

Root MSE	0.48489	**R-Square**	0.0421
Dependent Mean	0.56771	**Adj R-Sq**	0.042
Coeff Var	85.4112		

Parameter Estimates						
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Variance Inflation**
Intercept	1	-1.09692	0.03559	-30.82	<.0001	0
med_hhld_inc_CFY	1	4.09E-07	1.05E-07	3.88	0.0001	1.50076
white_pct_CFY	1	-0.00038641	0.00011122	-3.47	0.0005	1.60813
AVGHHSZ_CFY	1	0.0525	0.00665	7.89	<.0001	3.3863
RISK_ADJ_FCTR_A	1	-0.00729	0.00182	-4.01	<.0001	2.28325
RISK_ADJ_FCTR_D	1	0.16082	0.00443	36.3	<.0001	2.78517
mcaid_status_num	1	-0.06948	0.00355	-19.56	<.0001	1.24316
age	1	0.01745	0.00039241	44.48	<.0001	1.01422
gender_num	1	-0.01729	0.00219	-7.91	<.0001	1.0495
contract1	1	0.06618	0.01301	5.09	<.0001	7.62217
contract2	1	0.10055	0.01326	7.58	<.0001	39.22905
contract3	1	-0.22998	0.0283	-8.13	<.0001	1.25092
contract4	1	-0.03245	0.02902	-1.12	0.2635	1.19804
contract5	1	0.06127	0.01252	4.89	<.0001	17.47364
contract6	1	0.09181	0.01285	7.14	<.0001	30.38031
areatype_urban	1	0.03617	0.01072	3.37	0.0007	9.45863
areatype_lgrural	1	-0.01296	0.01159	-1.12	0.2635	5.74548
areatype_smrural	1	-0.031	0.01361	-2.28	0.0228	2.44532
race_white	1	0.00045349	0.00272	0.17	0.8677	1.14009
htn_proxy	1	0.04171	0.00337	12.36	<.0001	2.40131
cvd_proxy	1	-0.02759	0.00346	-7.96	<.0001	1.2041
copd_proxy	1	-0.08377	0.01183	-7.08	<.0001	1.01608
chemdep_proxy	1	0.01926	0.00703	2.74	0.0062	1.025
statin_prescr	1	0.06828	0.00235	29.05	<.0001	1.22919
RAS_prescr	1	-0.02316	0.00325	-7.13	<.0001	2.35505
OD_prescr	1	-0.03026	0.00303	-9.99	<.0001	1.15484
HRM_FLG	1	0.01114	0.00286	3.9	<.0001	1.1596

Appendix B.1-2
Dependent Variable: C01_COL

Number of Observations Read	581238
Number of Observations Used	210263
Number of Observations with Missing Values	370975

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	2115.88105	105.79405	449.47	<.0001
Error	210242	49486	0.23538		
Corrected Total	210262	51602			

Root MSE	0.48516	R-Square	0.041
Dependent Mean	0.56771	Adj R-Sq	0.0409
Coeff Var	85.45867		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	-1.20011	0.03247	-36.96	<.0001	0
med_hhld_inc_CFY	1	6.51E-07	9.58E-08	6.79	<.0001	1.24085
white_pct_CFY	1	-0.00021648	0.00010667	-2.03	0.0424	1.47744
AVGHHSZ_CFY	1	0.09538	0.00429	22.24	<.0001	1.4047
RISK_ADJ_FCTR_A	1	-0.00721	0.00182	-3.96	<.0001	2.27938
RISK_ADJ_FCTR_D	1	0.15659	0.00441	35.5	<.0001	2.75826
mcaid_status_num	1	-0.07751	0.00349	-22.19	<.0001	1.20049
age	1	0.01744	0.00039262	44.41	<.0001	1.01416
gender_num	1	-0.01758	0.00219	-8.04	<.0001	1.04894
areatype_urban	1	0.08374	0.00611	13.71	<.0001	3.06663
areatype_lgrural	1	0.03283	0.0074	4.44	<.0001	2.33802
areatype_smrural	1	0.01358	0.01033	1.31	0.1886	1.40717
race_white	1	0.00195	0.00272	0.72	0.4735	1.13447
htn_proxy	1	0.04215	0.00337	12.49	<.0001	2.39892
cvd_proxy	1	-0.02684	0.00346	-7.75	<.0001	1.20259
copd_proxy	1	-0.08456	0.01184	-7.14	<.0001	1.01558
chemdep_proxy	1	0.02089	0.00703	2.97	0.003	1.02404
statin_prescr	1	0.06866	0.00235	29.21	<.0001	1.22855
RAS_prescr	1	-0.02319	0.00325	-7.13	<.0001	2.3537
OD_prescr	1	-0.02986	0.00303	-9.85	<.0001	1.1541
HRM_FLG	1	0.01224	0.00285	4.29	<.0001	1.15183

Appendix B.2-1
Dependent Variable: C02_CMCSCR

Number of Observations Read	581238
Number of Observations Used	27162
Number of Observations with Missing Values	554076

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	25	104.98551	4.19942	43.31	<.0001
Error	27136	2631.17254	0.09696		
Corrected Total	27161	2736.15805			

Root MSE	0.31139	R-Square	0.0384
Dependent Mean	0.88635	Adj R-Sq	0.0375
Coeff Var	35.13154		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	0.60567	0.06495	9.33	<.0001	0
med_hhld_inc_CFY	1	-4.42E-07	1.90E-07	-2.32	0.0201	1.60487
white_pct_CFY	1	0.00043673	0.00018908	2.31	0.0209	1.60103
AVGHHSZ_CFY	1	-0.01359	0.01327	-1.02	0.3056	4.15837
RISK_ADJ_FCTR_A	1	-0.01063	0.00216	-4.92	<.0001	1.94561
RISK_ADJ_FCTR_D	1	0.02835	0.00689	4.12	<.0001	2.14309
mcaid_status_num	1	-0.02295	0.00573	-4	<.0001	1.2844
age	1	0.00165	0.00069381	2.37	0.0177	1.01702
gender_num	1	-0.0097	0.00401	-2.42	0.0154	1.07586
contract1	1	0.00697	0.02107	0.33	0.7409	8.518
contract2	1	0.06779	0.0225	3.01	0.0026	33.31239
contract3	1	0.05071	0.05886	0.86	0.389	1.14215
contract4	1	0.06667	0.06442	1.03	0.3007	1.1117
contract5	1	0.01343	0.02052	0.65	0.513	15.61673
contract6	1	0.07269	0.02137	3.4	0.0007	28.5442
areatype_urban	1	0.02823	0.01875	1.51	0.1321	11.55314
areatype_lgrural	1	-0.00513	0.02011	-0.26	0.7985	5.90975
areatype_smrural	1	0.00102	0.02304	0.04	0.9646	2.65622
race_white	1	0.00017287	0.0051	0.03	0.973	1.13846
htn_proxy	1	0.04819	0.00637	7.56	<.0001	1.68072
copd_proxy	1	-0.10066	0.01391	-7.24	<.0001	1.02299
chemdep_proxy	1	-0.00464	0.011	-0.42	0.6734	1.02339
statin_prescr	1	0.09321	0.00449	20.77	<.0001	1.05736
RAS_prescr	1	-0.00344	0.00518	-0.66	0.5072	1.72059
OD_prescr	1	0.03677	0.00469	7.84	<.0001	1.06357
HRM_FLG	1	-0.00134	0.00438	-0.31	0.759	1.11177

Appendix B.2-2
Dependent Variable: C02_CMCSCR

Number of Observations Read	581238
Number of Observations Used	27162
Number of Observations with Missing Values	554076

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	19	98.0737	5.16177	53.11	<.0001
Error	27142	2638.08435	0.0972		
Corrected Total	27161	2736.15805			

Root MSE	0.31176	**R-Square**	0.0358
Dependent Mean	0.88635	**Adj R-Sq**	0.0352
Coeff Var	35.17377		

Parameter Estimates						
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Variance Inflation**
Intercept	1	0.41069	0.05716	7.19	<.0001	0
med_hhld_inc_CFY	1	1.27E-07	1.74E-07	0.73	0.466	1.33361
white_pct_CFY	1	0.00079474	0.00018123	4.39	<.0001	1.46723
AVGHHSZ_CFY	1	0.04398	0.00785	5.61	<.0001	1.45068
RISK_ADJ_FCTR_A	1	-0.01017	0.00216	-4.71	<.0001	1.94298
RISK_ADJ_FCTR_D	1	0.02858	0.00687	4.16	<.0001	2.12783
mcaid_status_num	1	-0.02565	0.00567	-4.52	<.0001	1.25481
age	1	0.00173	0.00069433	2.49	0.0128	1.01607
gender_num	1	-0.00947	0.00401	-2.36	0.0182	1.07536
areatype_urban	1	0.0523	0.00898	5.83	<.0001	2.64391
areatype_lgrural	1	0.01018	0.0114	0.89	0.3718	1.89448
areatype_smrural	1	0.00884	0.01613	0.55	0.5835	1.29751
race_white	1	0.00051619	0.0051	0.1	0.9194	1.13563
htn_proxy	1	0.04688	0.00638	7.35	<.0001	1.67875
copd_proxy	1	-0.10333	0.01392	-7.43	<.0001	1.02205
chemdep_proxy	1	-0.00553	0.01101	-0.5	0.6155	1.02202
statin_prescr	1	0.09333	0.00449	20.79	<.0001	1.05624
RAS_prescr	1	-0.00173	0.00518	-0.33	0.738	1.71726
OD_prescr	1	0.03627	0.00469	7.73	<.0001	1.06303
HRM_FLG	1	-0.00155	0.00436	-0.36	0.722	1.09956

Appendix B.3-1
Dependent Variable: C08_ABA

Number of Observations Read	581238
Number of Observations Used	184274
Number of Observations with Missing Values	396964

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	26	4488.83739	172.64759	775.48	<.0001
Error	184247	41019	0.22263		
Corrected Total	184273	45508			

Root MSE	0.47184	**R-Square**	0.0986
Dependent Mean	0.44486	**Adj R-Sq**	0.0985
Coeff Var	106.06374		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	-0.67037	0.03939	-17.02	<.0001	0
med_hhld_inc_CFY	1	-0.00000479	1.10E-07	-43.73	<.0001	1.50846
white_pct_CFY	1	0.00092275	0.00011568	7.98	<.0001	1.61257
AVGHHSZ_CFY	1	0.55898	0.00693	80.66	<.0001	3.39346
RISK_ADJ_FCTR_A	1	0.02032	0.00187	10.89	<.0001	2.2455
RISK_ADJ_FCTR_D	1	0.0999	0.00458	21.81	<.0001	2.70312
mcaid_status_num	1	0.00281	0.0037	0.76	0.4481	1.24492
age	1	0.00060946	0.00045202	1.35	0.1776	1.01402
gender_num	1	-0.01924	0.00228	-8.44	<.0001	1.05132
contract1	1	-0.17441	0.01346	-12.95	<.0001	7.56524
contract2	1	-0.59505	0.01373	-43.35	<.0001	38.90412
contract3	1	-0.07584	0.03395	-2.23	0.0255	1.17346
contract4	1	-0.51249	0.03019	-16.98	<.0001	1.19755
contract5	1	-0.23165	0.01294	-17.9	<.0001	17.37304
contract6	1	-0.41513	0.0133	-31.22	<.0001	30.31503
areatype_urban	1	0.01458	0.01109	1.31	0.1888	9.43277
areatype_lgrural	1	0.01352	0.01199	1.13	0.2596	5.70786
areatype_smrural	1	-0.03999	0.01408	-2.84	0.0045	2.45045
race_white	1	-0.00166	0.00283	-0.59	0.5581	1.13981
htn_proxy	1	0.01809	0.00348	5.2	<.0001	2.31912
cvd_proxy	1	-0.01678	0.00357	-4.7	<.0001	1.20277
copd_proxy	1	0.00717	0.01202	0.6	0.5507	1.01657
chemdep_proxy	1	-0.0131	0.00719	-1.82	0.0683	1.0256
statin_prescr	1	0.02156	0.00242	8.92	<.0001	1.20612
RAS_prescr	1	-0.00597	0.00333	-1.79	0.0734	2.2966
OD_prescr	1	-0.01825	0.0031	-5.88	<.0001	1.14955
HRM_FLG	1	0.00134	0.00293	0.46	0.6471	1.15385

Appendix B.3-2
Dependent Variable: C08_ABA

Number of Observations Read	581238
Number of Observations Used	184274
Number of Observations with Missing Values	396964

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	3200.72507	160.03625	696.97	<.0001
Error	184253	42308	0.22962		
Corrected Total	184273	45508			

Root MSE	0.47918	R-Square	0.0703
Dependent Mean	0.44486	Adj R-Sq	0.0702
Coeff Var	107.71445		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	0.26002	0.03689	7.05	<.0001	0
med_hhld_inc_CFY	1	-0.00000786	1.01E-07	-77.68	<.0001	1.24632
white_pct_CFY	1	0.00109	0.00011256	9.64	<.0001	1.48016
AVGHHSZ_CFY	1	0.18372	0.00453	40.58	<.0001	1.40438
RISK_ADJ_FCTR_A	1	0.01598	0.00189	8.44	<.0001	2.24174
RISK_ADJ_FCTR_D	1	0.12747	0.00463	27.52	<.0001	2.67923
mcaid_status_num	1	0.02697	0.0037	7.3	<.0001	1.20468
age	1	0.00062166	0.00045905	1.35	0.1757	1.014
gender_num	1	-0.01775	0.00231	-7.67	<.0001	1.05083
areatype_urban	1	-0.13881	0.00641	-21.64	<.0001	3.05774
areatype_lgrural	1	-0.17261	0.00777	-22.2	<.0001	2.32546
areatype_smrural	1	-0.19479	0.01083	-17.98	<.0001	1.40731
race_white	1	-0.01639	0.00287	-5.71	<.0001	1.1344
htn_proxy	1	0.02428	0.00353	6.88	<.0001	2.31718
cvd_proxy	1	-0.01144	0.00363	-3.16	0.0016	1.20168
copd_proxy	1	0.02049	0.0122	1.68	0.0932	1.01609
chemdep_proxy	1	-0.02779	0.0073	-3.81	0.0001	1.02464
statin_prescr	1	0.02036	0.00245	8.3	<.0001	1.20543
RAS_prescr	1	-0.00731	0.00338	-2.16	0.0308	2.29543
OD_prescr	1	-0.01851	0.00315	-5.88	<.0001	1.14891
HRM_FLG	1	0.00313	0.00297	1.05	0.2918	1.14572

Appendix B.4-1
Dependent Variable: C10_COAMR_fix

Number of Observations Read	581238
Number of Observations Used	18529
Number of Observations with Missing Values	562709

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	25	397.79357	15.91174	69.65	<.0001
Error	18503	4227.1278	0.22846		
Corrected Total	18528	4624.92137			

Root MSE	0.47797	**R-Square**	0.086
Dependent Mean	0.51989	**Adj R-Sq**	0.0848
Coeff Var	91.93736		

Note: Model is not full rank. Least-squares solutions for the parameters are not unique. Some statistics will be misleading. A reported DF of 0 or B means that the estimate is biased.

Note: The following parameters have been set to 0, since the variables are a linear combination of other variables as shown.

Appendix B.4-1 *(continued)*
Dependent Variable: C10_COAMR_fix

contract2 =	0

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	-0.89361	0.12614	-7.08	<.0001	0
med_hhld_inc_CFY	1	-0.00000103	4.21E-07	-2.44	0.0146	2.05361
white_pct_CFY	1	0.00082805	0.00027975	2.96	0.0031	1.79587
AVGHHSZ_CFY	1	0.50343	0.03702	13.6	<.0001	3.75905
RISK_ADJ_FCTR_A	1	0.03352	0.00462	7.26	<.0001	2.20293
RISK_ADJ_FCTR_D	1	0.10989	0.01115	9.86	<.0001	2.4098
mcaid_status_num	1	-0.12071	0.01004	-12.03	<.0001	1.26021
age	1	0.00047427	0.00126	0.38	0.7073	1.00912
gender_num	1	-0.02026	0.00775	-2.61	0.009	1.1111
contract1	1	0.03358	0.02817	1.19	0.2333	6.5299
contract2	0	0	.	.	.	.
contract3	1	-0.0145	0.03452	-0.42	0.6746	3.52815
contract4	1	-0.44704	0.03416	-13.09	<.0001	2.24811
contract5	1	0.12001	0.02754	4.36	<.0001	8.72004
contract6	1	-0.23989	0.03025	-7.93	<.0001	13.74644
areatype_urban	1	0.02846	0.02632	1.08	0.2796	13.99109
areatype_lgrural	1	0.02074	0.03008	0.69	0.4905	2.98814
areatype_smrural	1	0.03284	0.03366	0.98	0.3293	1.71298
race_white	1	-0.02112	0.00882	-2.39	0.0167	1.5241
htn_proxy	1	0.02338	0.01159	2.02	0.0437	2.06718
cvd_proxy	1	-0.03412	0.01057	-3.23	0.0012	1.14096
copd_proxy	1	0.04202	0.02278	1.84	0.0651	1.02336
chemdep_proxy	1	-0.0764	0.02071	-3.69	0.0002	1.02349
statin_prescr	1	0.04171	0.00769	5.42	<.0001	1.1848
RAS_prescr	1	-0.00302	0.01021	-0.3	0.7677	2.043
OD_prescr	1	-0.00033317	0.0084	-0.04	0.9684	1.11343
HRM_FLG	1	-0.01175	0.0102	-1.15	0.2492	1.29278

Appendix B.4-2
Dependent Variable: C10_COAMR_fix

Number of Observations Read	581238
Number of Observations Used	18529
Number of Observations with Missing Values	562709

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	215.48598	10.7743	45.22	<.0001
Error	18508	4409.43539	0.23824		
Corrected Total	18528	4624.92137			

Root MSE	0.4881	R-Square	0.0466
Dependent Mean	0.51989	Adj R-Sq	0.0456
Coeff Var	93.88629		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	0.37154	0.10706	3.47	0.0005	0
med_hhld_inc_CFY	1	-8.57E-07	3.76E-07	-2.28	0.0225	1.56507
white_pct_CFY	1	0.00081893	0.00027585	2.97	0.003	1.67436
AVGHHSZ_CFY	1	-0.00535	0.02347	-0.23	0.8197	1.4484
RISK_ADJ_FCTR_A	1	0.03153	0.00471	6.7	<.0001	2.19733
RISK_ADJ_FCTR_D	1	0.13056	0.01133	11.53	<.0001	2.38522
mcaid_status_num	1	-0.10988	0.0101	-10.88	<.0001	1.22311
age	1	0.00006419	0.00129	0.05	0.9603	1.00852
gender_num	1	-0.01966	0.00791	-2.48	0.013	1.10888
areatype_urban	1	0.0215	0.01098	1.96	0.0502	2.33429
areatype_lgrural	1	0.06812	0.01895	3.59	0.0003	1.13729
areatype_smrural	1	0.09054	0.027	3.35	0.0008	1.05677
race_white	1	-0.04566	0.00891	-5.12	<.0001	1.49261
htn_proxy	1	0.0284	0.0118	2.41	0.0161	2.05438
cvd_proxy	1	-0.02774	0.01075	-2.58	0.0099	1.13251
copd_proxy	1	0.05727	0.02326	2.46	0.0138	1.02256
chemdep_proxy	1	-0.08377	0.02114	-3.96	<.0001	1.02246
statin_prescr	1	0.03964	0.00784	5.05	<.0001	1.18249
RAS_prescr	1	-0.00843	0.01042	-0.81	0.4188	2.04038
OD_prescr	1	-0.00726	0.00857	-0.85	0.3972	1.11181
HRM_FLG	1	-0.00107	0.0103	-0.1	0.917	1.26468

Appendix B.5-1
Dependent Variable: C11_COAFSA_fix

Number of Observations Read	581238
Number of Observations Used	18529
Number of Observations with Missing Values	562709

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	25	478.63842	19.14554	85.34	<.0001
Error	18503	4150.89151	0.22434		
Corrected Total	18528	4629.52993			

Root MSE	0.47364	**R-Square**	0.1034
Dependent Mean	0.48788	**Adj R-Sq**	0.1022
Coeff Var	97.08076		

Note: Model is not full rank. Least-squares solutions for the parameters are not unique. Some statistics will be misleading. A reported DF of 0 or B means that the estimate is biased.

Note: The following parameters have been set to 0, since the variables are a linear combination of other variables as shown.

Appendix B.5-1 *(continued)*
Dependent Variable: C11_COAFSA_fix

contract2 =	0

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	-0.94486	0.125	-7.56	<.0001	0
med_hhld_inc_CFY	1	5.12E-07	4.17E-07	1.23	0.2196	2.05361
white_pct_CFY	1	0.00042001	0.00027722	1.52	0.1298	1.79587
AVGHHSZ_CFY	1	0.48041	0.03668	13.1	<.0001	3.75905
RISK_ADJ_FCTR_A	1	0.03501	0.00458	7.65	<.0001	2.20293
RISK_ADJ_FCTR_D	1	0.10655	0.01105	9.65	<.0001	2.4098
mcaid_status_num	1	-0.09813	0.00994	-9.87	<.0001	1.26021
age	1	0.00141	0.00125	1.13	0.2599	1.00912
gender_num	1	-0.01316	0.00768	-1.71	0.0868	1.1111
contract1	1	0.03549	0.02792	1.27	0.2036	6.5299
contract2	0	0	.	.	.	.
contract3	1	-0.06423	0.03421	-1.88	0.0604	3.52815
contract4	1	-0.45042	0.03385	-13.3	<.0001	2.24811
contract5	1	0.12038	0.0273	4.41	<.0001	8.72004
contract6	1	-0.33702	0.02998	-11.24	<.0001	13.74644
areatype_urban	1	0.01616	0.02608	0.62	0.5355	13.99109
areatype_lgrural	1	0.02794	0.02981	0.94	0.3486	2.98814
areatype_smrural	1	0.04592	0.03336	1.38	0.1687	1.71298
race_white	1	-0.0303	0.00874	-3.47	0.0005	1.5241
htn_proxy	1	0.00419	0.01149	0.37	0.7151	2.06718
cvd_proxy	1	-0.02335	0.01047	-2.23	0.0258	1.14096
copd_proxy	1	0.02324	0.02257	1.03	0.3032	1.02336
chemdep_proxy	1	-0.10028	0.02053	-4.89	<.0001	1.02349
statin_prescr	1	0.04196	0.00762	5.51	<.0001	1.1848
RAS_prescr	1	0.01048	0.01012	1.04	0.3005	2.043
OD_prescr	1	-0.01195	0.00832	-1.44	0.1509	1.11343
HRM_FLG	1	-0.02257	0.01011	-2.23	0.0256	1.29278

Appendix B.5-2
Dependent Variable: C11_COAFSA_fix

Number of Observations Read	581238
Number of Observations Used	18529
Number of Observations with Missing Values	562709

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	20	232.78104	11.63905	48.99	<.0001
Error	18508	4396.74889	0.23756		
Corrected Total	18528	4629.52993			

Root MSE	0.4874	**R-Square**	0.0503
Dependent Mean	0.48788	**Adj R-Sq**	0.0493
Coeff Var	99.90095		

Parameter Estimates						
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Variance Inflation**
Intercept	1	0.71131	0.10691	6.65	<.0001	0
med_hhld_inc_CFY	1	4.55E-07	3.75E-07	1.21	0.2255	1.56507
white_pct_CFY	1	0.00042288	0.00027545	1.54	0.1247	1.67436
AVGHHSZ_CFY	1	-0.18014	0.02343	-7.69	<.0001	1.4484
RISK_ADJ_FCTR_A	1	0.03252	0.0047	6.92	<.0001	2.19733
RISK_ADJ_FCTR_D	1	0.12916	0.01131	11.42	<.0001	2.38522
mcaid_status_num	1	-0.08181	0.01008	-8.11	<.0001	1.22311
age	1	0.00088151	0.00129	0.68	0.4936	1.00852
gender_num	1	-0.01341	0.0079	-1.7	0.0897	1.10888
areatype_urban	1	-0.00815	0.01096	-0.74	0.4573	2.33429
areatype_lgrural	1	0.06713	0.01892	3.55	0.0004	1.13729
areatype_smrural	1	0.10397	0.02696	3.86	0.0001	1.05677
race_white	1	-0.05936	0.0089	-6.67	<.0001	1.49261
htn_proxy	1	0.00824	0.01179	0.7	0.4843	2.05438
cvd_proxy	1	-0.01409	0.01074	-1.31	0.1895	1.13251
copd_proxy	1	0.04165	0.02322	1.79	0.0729	1.02256
chemdep_proxy	1	-0.11003	0.02111	-5.21	<.0001	1.02246
statin_prescr	1	0.03795	0.00783	4.84	<.0001	1.18249
RAS_prescr	1	0.00408	0.01041	0.39	0.6948	2.04038
OD_prescr	1	-0.02048	0.00856	-2.39	0.0167	1.11181
HRM_FLG	1	-0.0111	0.01029	-1.08	0.2805	1.26468

Appendix B.6-1
Dependent Variable: C12_COAPS_fix

Number of Observations Read	581238
Number of Observations Used	18529
Number of Observations with Missing Values	562709

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	25	1208.19357	48.32774	277.27	<.0001
Error	18503	3224.9998	0.1743		
Corrected Total	18528	4433.19337			

Root MSE	0.41749	**R-Square**	0.2725
Dependent Mean	0.39635	**Adj R-Sq**	0.2716
Coeff Var	105.33267		

Note: Model is not full rank. Least-squares solutions for the parameters are not unique. Some statistics will be misleading. A reported DF of 0 or B means that the estimate is biased.

Note: The following parameters have been set to 0, since the variables are a linear combination of other variables as shown.

Appendix B.6-1*(continued)*
Dependent Variable: C12_COAPS_fix

contract2 =	0

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	-0.88226	0.11018	-8.01	<.0001	0
med_hhld_inc_CFY	1	0.0000036	3.68E-07	9.78	<.0001	2.05361
white_pct_CFY	1	-0.00036663	0.00024435	-1.5	0.1335	1.79587
AVGHHSZ_CFY	1	0.44686	0.03233	13.82	<.0001	3.75905
RISK_ADJ_FCTR_A	1	0.02617	0.00403	6.49	<.0001	2.20293
RISK_ADJ_FCTR_D	1	0.08491	0.00974	8.72	<.0001	2.4098
mcaid_status_num	1	-0.04375	0.00877	-4.99	<.0001	1.26021
age	1	0.00093637	0.0011	0.85	0.396	1.00912
gender_num	1	-0.01451	0.00677	-2.14	0.0322	1.1111
contract1	1	-0.00645	0.02461	-0.26	0.7931	6.5299
contract2	0	0	.	.	.	.
contract3	1	-0.16765	0.03015	-5.56	<.0001	3.52815
contract4	1	-0.49559	0.02984	-16.61	<.0001	2.24811
contract5	1	0.07712	0.02406	3.21	0.0014	8.72004
contract6	1	-0.6965	0.02643	-26.36	<.0001	13.74644
areatype_urban	1	0.00091555	0.02299	0.04	0.9682	13.99109
areatype_lgrural	1	0.03651	0.02627	1.39	0.1646	2.98814
areatype_smrural	1	0.06087	0.0294	2.07	0.0385	1.71298
race_white	1	-0.03678	0.0077	-4.77	<.0001	1.5241
htn_proxy	1	0.00696	0.01013	0.69	0.4917	2.06718
cvd_proxy	1	-0.01337	0.00923	-1.45	0.1475	1.14096
copd_proxy	1	0.05168	0.0199	2.6	0.0094	1.02336
chemdep_proxy	1	-0.0524	0.01809	-2.9	0.0038	1.02349
statin_prescr	1	0.0222	0.00672	3.3	0.001	1.1848
RAS_prescr	1	-0.00206	0.00892	-0.23	0.8176	2.043
OD_prescr	1	-0.00279	0.00734	-0.38	0.7032	1.11343
HRM_FLG	1	0.00355	0.00891	0.4	0.6901	1.29278

Appendix B.6-2
Dependent Variable: C12_COAPS_fix

Number of Observations Read	581238
Number of Observations Used	18529
Number of Observations with Missing Values	562709

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	633.17798	31.6589	154.19	<.0001
Error	18508	3800.01539	0.20532		
Corrected Total	18528	4433.19337			

Root MSE	0.45312	R-Square	0.1428
Dependent Mean	0.39635	Adj R-Sq	0.1419
Coeff Var	114.32264		

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	2.12777	0.09939	21.41	<.0001	0
med_hhld_inc_CFY	1	0.00000358	3.49E-07	10.28	<.0001	1.56507
white_pct_CFY	1	-0.00055235	0.00025608	-2.16	0.031	1.67436
AVGHHSZ_CFY	1	-0.74793	0.02178	-34.33	<.0001	1.4484
RISK_ADJ_FCTR_A	1	0.02299	0.00437	5.26	<.0001	2.19733
RISK_ADJ_FCTR_D	1	0.11708	0.01051	11.14	<.0001	2.38522
mcaid_status_num	1	-0.01366	0.00937	-1.46	0.1449	1.22311
age	1	0.00002267	0.0012	0.02	0.9849	1.00852
gender_num	1	-0.01608	0.00734	-2.19	0.0285	1.10888
areatype_urban	1	-0.11918	0.01019	-11.69	<.0001	2.33429
areatype_lgrural	1	0.01342	0.01759	0.76	0.4457	1.13729
areatype_smrural	1	0.08495	0.02507	3.39	0.0007	1.05677
race_white	1	-0.0758	0.00828	-9.16	<.0001	1.49261
htn_proxy	1	0.00462	0.01096	0.42	0.6734	2.05438
cvd_proxy	1	0.00161	0.00998	0.16	0.8717	1.13251
copd_proxy	1	0.07897	0.02159	3.66	0.0003	1.02256
chemdep_proxy	1	-0.07164	0.01963	-3.65	0.0003	1.02246
statin_prescr	1	0.01232	0.00728	1.69	0.0906	1.18249
RAS_prescr	1	-0.01002	0.00967	-1.04	0.3002	2.04038
OD_prescr	1	-0.01671	0.00796	-2.1	0.0357	1.11181
HRM_FLG	1	0.01372	0.00956	1.43	0.1514	1.26468

Appendix B.7-1
Dependent Variable: C13_OMW

Number of Observations Read	581238
Number of Observations Used	2193
Number of Observations with Missing Values	579045

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	26	22.20615	0.85408	4.37	<.0001
Error	2166	423.80844	0.19566		
Corrected Total	2192	446.01459			

Root MSE	0.44234	R-Square	0.0498
Dependent Mean	0.28409	Adj R-Sq	0.0384
Coeff Var	155.70629		

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	-1.11701	0.36912	-3.03	0.0025	0
med_hhld_inc_CFY	1	-7.27E-07	9.67E-07	-0.75	0.4522	1.62704
white_pct_CFY	1	0.00217	0.00099961	2.17	0.0298	1.80157
AVGHHSZ_CFY	1	0.23112	0.06328	3.65	0.0003	3.85286
RISK_ADJ_FCTR_A	1	0.00216	0.01185	0.18	0.8554	2.37793
RISK_ADJ_FCTR_D	1	0.00144	0.03406	0.04	0.9663	2.8969
mcaid_status_num	1	-0.04687	0.02727	-1.72	0.0858	1.33033
age	1	0.00614	0.0043	1.43	0.1533	1.0111
contract1	1	0.08721	0.11905	0.73	0.4639	8.53889
contract2	1	0.00184	0.12098	0.02	0.9879	40.70641
contract3	1	-0.06595	0.21653	-0.3	0.7607	1.43381
contract4	1	0.01868	0.1943	0.1	0.9234	1.53791
contract5	1	0.06184	0.11539	0.54	0.5921	19.12339
contract6	1	0.02005	0.11695	0.17	0.8639	31.08434
areatype_urban	1	0.09007	0.10619	0.85	0.3964	13.86051
areatype_lgrural	1	0.04395	0.11293	0.39	0.6972	6.92731
areatype_smrural	1	0.04991	0.12388	0.4	0.6871	3.53205
race_white	1	0.00941	0.02884	0.33	0.7444	1.11642
htn_proxy	1	0.01023	0.02966	0.34	0.7302	2.30989
cvd_proxy	1	0.00963	0.02978	0.32	0.7466	1.2101
copd_proxy	1	0.08145	0.07516	1.08	0.2786	1.02229
chemdep_proxy	1	0.074	0.04412	1.68	0.0936	1.03933
statin_prescr	1	-0.00728	0.02076	-0.35	0.7258	1.20544
RAS_prescr	1	0.01866	0.02851	0.65	0.5128	2.27172
OD_prescr	1	-0.04541	0.0263	-1.73	0.0844	1.12434
HRM_FLG	1	-0.01714	0.0232	-0.74	0.46	1.24429
BCS	1	0.14731	0.0203	7.26	<.0001	1.08513

Appendix B.7-2
Dependent Variable: C13_OMW

Number of Observations Read	581238
Number of Observations Used	2193
Number of Observations with Missing Values	579045

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	21.64534	1.08227	5.54	<.0001
Error	2172	424.36925	0.19538		
Corrected Total	2192	446.01459			

Root MSE	0.44202	R-Square	0.0485
Dependent Mean	0.28409	Adj R-Sq	0.0398
Coeff Var	155.59392		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	-0.92095	0.34102	-2.7	0.007	0
med_hhld_inc_CFY	1	-0.00000132	8.82E-07	-1.49	0.1355	1.35516
white_pct_CFY	1	0.00214	0.00094883	2.26	0.0239	1.62551
AVGHHSZ_CFY	1	0.16953	0.0397	4.27	<.0001	1.51837
RISK_ADJ_FCTR_A	1	0.00155	0.01182	0.13	0.8959	2.37128
RISK_ADJ_FCTR_D	1	0.00133	0.03374	0.04	0.9685	2.84718
mcaid_status_num	1	-0.04731	0.02679	-1.77	0.0776	1.2857
age	1	0.00606	0.0043	1.41	0.1589	1.0108
areatype_urban	1	0.13848	0.04896	2.83	0.0047	2.95087
areatype_lgrural	1	0.09163	0.0602	1.52	0.1281	1.97113
areatype_smrural	1	0.10941	0.07847	1.39	0.1634	1.4194
race_white	1	0.00753	0.02866	0.26	0.7927	1.10358
htn_proxy	1	0.0116	0.02955	0.39	0.6945	2.29504
cvd_proxy	1	0.01084	0.02971	0.36	0.7153	1.20612
copd_proxy	1	0.08169	0.07504	1.09	0.2764	1.02046
chemdep_proxy	1	0.07285	0.04398	1.66	0.0978	1.03436
statin_prescr	1	-0.00742	0.02074	-0.36	0.7204	1.20416
RAS_prescr	1	0.01724	0.02844	0.61	0.5445	2.26406
OD_prescr	1	-0.04552	0.02627	-1.73	0.0832	1.12303
HRM_FLG	1	-0.0133	0.023	-0.58	0.5633	1.22475
BCS	1	0.14479	0.02014	7.19	<.0001	1.06922

Appendix B.8-1
Dependent Variable: C14_CDCEYE

Number of Observations Read	581238
Number of Observations Used	81208
Number of Observations with Missing Values	500030

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	26	657.91495	25.30442	109.36	<.0001
Error	81181	18783	0.23138		
Corrected Total	81207	19441			

Root MSE	0.48102	**R-Square**	0.0338
Dependent Mean	0.60295	**Adj R-Sq**	0.0335
Coeff Var	79.77789		

Parameter Estimates						
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Variance Inflation**
Intercept	1	-0.30056	0.05487	-5.48	<.0001	0
med_hhld_inc_CFY	1	-7.57E-07	1.72E-07	-4.4	<.0001	1.59311
white_pct_CFY	1	-0.00010417	0.0001718	-0.61	0.5443	1.68719
AVGHHSZ_CFY	1	0.04489	0.01162	3.86	0.0001	4.14294
RISK_ADJ_FCTR_A	1	-0.01583	0.00237	-6.67	<.0001	2.19185
RISK_ADJ_FCTR_D	1	0.12556	0.00651	19.27	<.0001	2.36138
mcaid_status_num	1	-0.0294	0.00478	-6.16	<.0001	1.26378
age	1	0.00825	0.00058681	14.05	<.0001	1.02294
gender_num	1	-0.04453	0.0035	-12.73	<.0001	1.06875
contract1	1	-0.11869	0.01792	-6.63	<.0001	6.15077
contract2	1	0.02994	0.01881	1.59	0.1115	29.99035
contract3	1	0.03168	0.03211	0.99	0.3239	1.43784
contract4	1	-0.03547	0.03937	-0.9	0.3675	1.20289
contract5	1	-0.04323	0.01704	-2.54	0.0112	12.32426
contract6	1	0.04487	0.01769	2.54	0.0112	24.04921
areatype_urban	1	0.06036	0.01578	3.83	0.0001	10.36306
areatype_lgrural	1	0.02469	0.01724	1.43	0.1521	4.92991
areatype_smrural	1	0.00867	0.02018	0.43	0.6674	2.19578
race_white	1	-0.02011	0.00402	-5	<.0001	1.17388
htn_proxy	1	0.03196	0.00628	5.09	<.0001	1.9715
cvd_proxy	1	-0.01131	0.00497	-2.27	0.023	1.17385
copd_proxy	1	-0.10387	0.01649	-6.3	<.0001	1.01776
chemdep_proxy	1	-0.02735	0.01161	-2.36	0.0185	1.01826
statin_prescr	1	0.06413	0.00369	17.38	<.0001	1.09082
RAS_prescr	1	0.02004	0.00523	3.83	0.0001	2.01053
OD_prescr	1	0.02816	0.00351	8.03	<.0001	1.07459
HRM_FLG	1	-0.00068198	0.00384	-0.18	0.8589	1.08904

Appendix B.8-2
Dependent Variable: C14_CDCEYE

Number of Observations Read	581238
Number of Observations Used	81208
Number of Observations with Missing Values	500030

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	571.68093	28.58405	122.98	<.0001
Error	81187	18870	0.23242		
Corrected Total	81207	19441			

Root MSE	0.4821	R-Square	0.0294
Dependent Mean	0.60295	Adj R-Sq	0.0292
Coeff Var	79.95785		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	-0.61346	0.0485	-12.65	<.0001	0
med_hhld_inc_CFY	1	1.52E-07	1.58E-07	0.96	0.336	1.33946
white_pct_CFY	1	0.00064926	0.00016303	3.98	<.0001	1.51255
AVGHHSZ_CFY	1	0.13198	0.00694	19.01	<.0001	1.47153
RISK_ADJ_FCTR_A	1	-0.0143	0.00238	-6.02	<.0001	2.18693
RISK_ADJ_FCTR_D	1	0.12567	0.00651	19.31	<.0001	2.34729
mcaid_status_num	1	-0.0326	0.00472	-6.9	<.0001	1.23072
age	1	0.00816	0.00058783	13.88	<.0001	1.02188
gender_num	1	-0.04465	0.00351	-12.74	<.0001	1.06844
areatype_urban	1	0.0394	0.00763	5.17	<.0001	2.41029
areatype_lgrural	1	-0.01074	0.0101	-1.06	0.2876	1.68518
areatype_smrural	1	-0.04393	0.01506	-2.92	0.0035	1.21661
race_white	1	-0.01659	0.00402	-4.13	<.0001	1.16617
htn_proxy	1	0.03117	0.00629	4.95	<.0001	1.96977
cvd_proxy	1	-0.0144	0.00498	-2.89	0.0038	1.17076
copd_proxy	1	-0.11068	0.01653	-6.7	<.0001	1.01703
chemdep_proxy	1	-0.02686	0.01163	-2.31	0.0209	1.01745
statin_prescr	1	0.06546	0.0037	17.7	<.0001	1.08997
RAS_prescr	1	0.02213	0.00524	4.22	<.0001	2.00934
OD_prescr	1	0.02774	0.00351	7.9	<.0001	1.07369
HRM_FLG	1	-0.00234	0.00383	-0.61	0.5403	1.07923

Appendix B.9-1
Dependent Variable: C15_CDCNEP

Number of Observations Read	581238
Number of Observations Used	81208
Number of Observations with Missing Values	500030

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	26	1338.83133	51.49351	884.45	<.0001
Error	81181	4726.44317	0.05822		
Corrected Total	81207	6065.2745			

Root MSE	0.24129	**R-Square**	0.2207
Dependent Mean	0.9187	**Adj R-Sq**	0.2205
Coeff Var	26.26425		

Parameter Estimates						
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Variance Inflation**
Intercept	1	0.5595	0.02752	20.33	<.0001	0
med_hhld_inc_CFY	1	-1.09E-07	8.62E-08	-1.26	0.2071	1.59311
white_pct_CFY	1	0.00004662	0.00008618	0.54	0.5886	1.68719
AVGHHSZ_CFY	1	-0.00177	0.00583	-0.3	0.7613	4.14294
RISK_ADJ_FCTR_A	1	0.00799	0.00119	6.71	<.0001	2.19185
RISK_ADJ_FCTR_D	1	0.03014	0.00327	9.22	<.0001	2.36138
mcaid_status_num	1	-0.01183	0.0024	-4.94	<.0001	1.26378
age	1	0.00060345	0.00029436	2.05	0.0404	1.02294
gender_num	1	-0.0034	0.00175	-1.94	0.0525	1.06875
contract1	1	0.01133	0.00899	1.26	0.2075	6.15077
contract2	1	0.06612	0.00944	7.01	<.0001	29.99035
contract3	1	-0.00209	0.01611	-0.13	0.8969	1.43784
contract4	1	-0.01214	0.01975	-0.61	0.5386	1.20289
contract5	1	0.02493	0.00855	2.92	0.0035	12.32426
contract6	1	0.06371	0.00888	7.18	<.0001	24.04921
areatype_urban	1	0.01267	0.00792	1.6	0.1094	10.36306
areatype_lgrural	1	-0.00363	0.00865	-0.42	0.6747	4.92991
areatype_smrural	1	-0.00723	0.01012	-0.71	0.4754	2.19578
race_white	1	-0.00841	0.00202	-4.17	<.0001	1.17388
htn_proxy	1	0.04947	0.00315	15.7	<.0001	1.9715
cvd_proxy	1	0.00144	0.0025	0.58	0.563	1.17385
copd_proxy	1	-0.02298	0.00827	-2.78	0.0055	1.01776
chemdep_proxy	1	0.0022	0.00582	0.38	0.7056	1.01826
statin_prescr	1	0.02425	0.00185	13.1	<.0001	1.09082
RAS_prescr	1	0.23122	0.00262	88.16	<.0001	2.01053
OD_prescr	1	0.01384	0.00176	7.87	<.0001	1.07459
HRM_FLG	1	0.00226	0.00192	1.17	0.2403	1.08904

Appendix B.9-2
Dependent Variable: C15_CDCNEP

Number of Observations Read	581238
Number of Observations Used	81208
Number of Observations with Missing Values	500030

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	20	1327.51817	66.37591	1137.43	<.0001
Error	81187	4737.75633	0.05836		
Corrected Total	81207	6065.2745			

Root MSE	0.24157	**R-Square**	0.2189
Dependent Mean	0.9187	**Adj R-Sq**	0.2187
Coeff Var	26.2947		

Parameter Estimates						
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Variance Inflation**
Intercept	1	0.41787	0.0243	17.19	<.0001	0
med_hhld_inc_CFY	1	2.55E-07	7.92E-08	3.22	0.0013	1.33946
white_pct_CFY	1	0.00028177	0.00008169	3.45	0.0006	1.51255
AVGHHSZ_CFY	1	0.0448	0.00348	12.88	<.0001	1.47153
RISK_ADJ_FCTR_A	1	0.00834	0.00119	7	<.0001	2.18693
RISK_ADJ_FCTR_D	1	0.02888	0.00326	8.85	<.0001	2.34729
mcaid_status_num	1	-0.01496	0.00237	-6.32	<.0001	1.23072
age	1	0.00059309	0.00029455	2.01	0.0441	1.02188
gender_num	1	-0.00341	0.00176	-1.94	0.0525	1.06844
areatype_urban	1	0.04003	0.00382	10.48	<.0001	2.41029
areatype_lgrural	1	0.01877	0.00506	3.71	0.0002	1.68518
areatype_smrural	1	0.0099	0.00754	1.31	0.1893	1.21661
race_white	1	-0.00672	0.00201	-3.34	0.0008	1.16617
htn_proxy	1	0.04926	0.00315	15.62	<.0001	1.96977
cvd_proxy	1	0.00106	0.0025	0.42	0.671	1.17076
copd_proxy	1	-0.02516	0.00828	-3.04	0.0024	1.01703
chemdep_proxy	1	0.00296	0.00583	0.51	0.6114	1.01745
statin_prescr	1	0.02485	0.00185	13.41	<.0001	1.08997
RAS_prescr	1	0.23182	0.00262	88.31	<.0001	2.00934
OD_prescr	1	0.01363	0.00176	7.74	<.0001	1.07369
HRM_FLG	1	0.00261	0.00192	1.36	0.1744	1.07923

Appendix B.10-1
Dependent Variable: C16_CDCA1C9

Number of Observations Read	581238
Number of Observations Used	81208
Number of Observations with Missing Values	500030

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	26	1129.03652	43.42448	195.53	<.0001
Error	81181	18030	0.22209		
Corrected Total	81207	19159			

Root MSE	0.47127	R-Square	0.0589
Dependent Mean	0.61866	Adj R-Sq	0.0586
Coeff Var	76.17539		

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	1.61333	0.05376	30.01	<.0001	0
med_hhld_inc_CFY	1	0.00000388	1.68E-07	23.04	<.0001	1.59311
white_pct_CFY	1	-0.00026289	0.00016832	-1.56	0.1183	1.68719
AVGHHSZ_CFY	1	-0.21246	0.01139	-18.66	<.0001	4.14294
RISK_ADJ_FCTR_A	1	-0.02179	0.00233	-9.37	<.0001	2.19185
RISK_ADJ_FCTR_D	1	0.00486	0.00638	0.76	0.4462	2.36138
mcaid_status_num	1	0.00579	0.00468	1.24	0.2162	1.26378
age	1	-0.00457	0.00057492	-7.94	<.0001	1.02294
gender_num	1	0.01399	0.00343	4.08	<.0001	1.06875
contract1	1	-0.03344	0.01755	-1.9	0.0568	6.15077
contract2	1	-0.16811	0.01843	-9.12	<.0001	29.99035
contract3	1	-0.45096	0.03146	-14.34	<.0001	1.43784
contract4	1	-0.07871	0.03857	-2.04	0.0413	1.20289
contract5	1	-0.06469	0.01669	-3.88	0.0001	12.32426
contract6	1	-0.21093	0.01734	-12.17	<.0001	24.04921
areatype_urban	1	-0.04111	0.01546	-2.66	0.0078	10.36306
areatype_lgrural	1	0.0094	0.01689	0.56	0.5778	4.92991
areatype_smrural	1	-0.00512	0.01977	-0.26	0.7955	2.19578
race_white	1	-0.00857	0.00394	-2.17	0.0297	1.17388
htn_proxy	1	-0.01996	0.00615	-3.24	0.0012	1.9715
cvd_proxy	1	0.03476	0.00487	7.13	<.0001	1.17385
copd_proxy	1	0.05754	0.01616	3.56	0.0004	1.01776
chemdep_proxy	1	-0.0152	0.01138	-1.34	0.1815	1.01826
statin_prescr	1	-0.02947	0.00362	-8.15	<.0001	1.09082
RAS_prescr	1	-0.01532	0.00512	-2.99	0.0028	2.01053
OD_prescr	1	-0.05096	0.00343	-14.84	<.0001	1.07459
HRM_FLG	1	0.02823	0.00376	7.51	<.0001	1.08904

Appendix B.10-2
Dependent Variable: C16_CDCA1C9

Number of Observations Read	581238
Number of Observations Used	81208
Number of Observations with Missing Values	500030

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	936.27237	46.81362	208.57	<.0001
Error	81187	18222	0.22445		
Corrected Total	81207	19159			

Root MSE	0.47376	R-Square	0.0489
Dependent Mean	0.61866	Adj R-Sq	0.0486
Coeff Var	76.5787		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	1.94874	0.04766	40.89	<.0001	0
med_hhld_inc_CFY	1	0.00000256	1.55E-07	16.46	<.0001	1.33946
white_pct_CFY	1	-0.00112	0.00016021	-7.01	<.0001	1.51255
AVGHHSZ_CFY	1	-0.30838	0.00682	-45.2	<.0001	1.47153
RISK_ADJ_FCTR_A	1	-0.02403	0.00233	-10.29	<.0001	2.18693
RISK_ADJ_FCTR_D	1	0.00279	0.0064	0.44	0.6625	2.34729
mcaid_status_num	1	0.00425	0.00464	0.92	0.3596	1.23072
age	1	-0.0043	0.00057766	-7.44	<.0001	1.02188
gender_num	1	0.01339	0.00345	3.89	0.0001	1.06844
areatype_urban	1	-0.13939	0.0075	-18.6	<.0001	2.41029
areatype_lgrural	1	-0.06006	0.00993	-6.05	<.0001	1.68518
areatype_smrural	1	-0.05575	0.0148	-3.77	0.0002	1.21661
race_white	1	-0.01354	0.00395	-3.43	0.0006	1.16617
htn_proxy	1	-0.01854	0.00618	-3	0.0027	1.96977
cvd_proxy	1	0.03899	0.00489	7.97	<.0001	1.17076
copd_proxy	1	0.06882	0.01624	4.24	<.0001	1.01703
chemdep_proxy	1	-0.01362	0.01143	-1.19	0.2333	1.01745
statin_prescr	1	-0.03104	0.00363	-8.54	<.0001	1.08997
RAS_prescr	1	-0.01879	0.00515	-3.65	0.0003	2.00934
OD_prescr	1	-0.04902	0.00345	-14.2	<.0001	1.07369
HRM_FLG	1	0.02668	0.00376	7.09	<.0001	1.07923

Appendix B.11-1
Dependent Variable: C17_CDC100

Number of Observations Read	581238
Number of Observations Used	81208
Number of Observations with Missing Values	500030

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	26	1004.88007	38.64923	191.97	<.0001
Error	81181	16344	0.20133		
Corrected Total	81207	17349			

Root MSE	0.4487	R-Square	0.0579
Dependent Mean	0.30932	Adj R-Sq	0.0576
Coeff Var	145.06199		

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	-0.61281	0.05118	-11.97	<.0001	0
med_hhld_inc_CFY	1	-0.00000272	1.60E-07	-16.97	<.0001	1.59311
white_pct_CFY	1	0.00041613	0.00016026	2.6	0.0094	1.68719
AVGHHSZ_CFY	1	0.14555	0.01084	13.42	<.0001	4.14294
RISK_ADJ_FCTR_A	1	0.02235	0.00221	10.1	<.0001	2.19185
RISK_ADJ_FCTR_D	1	0.00124	0.00608	0.2	0.838	2.36138
mcaid_status_num	1	-0.00886	0.00446	-1.99	0.0468	1.26378
age	1	0.00399	0.00054739	7.29	<.0001	1.02294
gender_num	1	0.02497	0.00326	7.65	<.0001	1.06875
contract1	1	0.06371	0.01671	3.81	0.0001	6.15077
contract2	1	0.1414	0.01755	8.06	<.0001	29.99035
contract3	1	0.34796	0.02995	11.62	<.0001	1.43784
contract4	1	0.05087	0.03672	1.39	0.166	1.20289
contract5	1	0.12096	0.01589	7.61	<.0001	12.32426
contract6	1	0.20438	0.01651	12.38	<.0001	24.04921
areatype_urban	1	0.02289	0.01472	1.55	0.12	10.36306
areatype_lgrural	1	-0.01405	0.01608	-0.87	0.3823	4.92991
areatype_smrural	1	-0.00627	0.01883	-0.33	0.7393	2.19578
race_white	1	0.01391	0.00375	3.7	0.0002	1.17388
htn_proxy	1	0.02866	0.00586	4.89	<.0001	1.9715
cvd_proxy	1	-0.00444	0.00464	-0.96	0.3387	1.17385
copd_proxy	1	-0.0484	0.01539	-3.15	0.0017	1.01776
chemdep_proxy	1	-0.00401	0.01083	-0.37	0.7114	1.01826
statin_prescr	1	0.13623	0.00344	39.57	<.0001	1.09082
RAS_prescr	1	0.01908	0.00488	3.91	<.0001	2.01053
OD_prescr	1	0.02942	0.00327	9	<.0001	1.07459
HRM_FLG	1	-0.01813	0.00358	-5.06	<.0001	1.08904

Appendix B.11-2
Dependent Variable: C17_CDC100

Number of Observations Read	581238
Number of Observations Used	81208
Number of Observations with Missing Values	500030

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	873.11067	43.65553	215.11	<.0001
Error	81187	16476	0.20294		
Corrected Total	81207	17349			

Root MSE	0.45049	R-Square	0.0503
Dependent Mean	0.30932	Adj R-Sq	0.0501
Coeff Var	145.64019		

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	-0.74757	0.04532	-16.5	<.0001	0
Intercept	1	-0.00000196	1.48E-07	-13.28	<.0001	1.33946
med_hhld_inc_CFY	1	0.00128	0.00015234	8.37	<.0001	1.51255
white_pct_CFY	1	0.17133	0.00649	26.41	<.0001	1.47153
AVGHHSZ_CFY	1	0.02352	0.00222	10.6	<.0001	2.18693
RISK_ADJ_FCTR_A	1	0.0042	0.00608	0.69	0.4898	2.34729
RISK_ADJ_FCTR_D	1	-0.0092	0.00441	-2.08	0.0371	1.23072
mcaid_status_num	1	0.00376	0.00054929	6.84	<.0001	1.02188
age	1	0.02548	0.00328	7.78	<.0001	1.06844
gender_num	1	0.15068	0.00713	21.14	<.0001	2.41029
areatype_urban	1	0.09099	0.00944	9.64	<.0001	1.68518
areatype_lgrural	1	0.07813	0.01407	5.55	<.0001	1.21661
areatype_smrural	1	0.01628	0.00376	4.33	<.0001	1.16617
race_white	1	0.02843	0.00588	4.83	<.0001	1.96977
htn_proxy	1	-0.00693	0.00465	-1.49	0.1366	1.17076
cvd_proxy	1	-0.05721	0.01544	-3.7	0.0002	1.01703
copd_proxy	1	-0.00684	0.01087	-0.63	0.5292	1.01745
chemdep_proxy	1	0.13709	0.00346	39.68	<.0001	1.08997
statin_prescr	1	0.02183	0.0049	4.46	<.0001	2.00934
RAS_prescr	1	0.02765	0.00328	8.43	<.0001	1.07369
OD_prescr	1	-0.01532	0.00358	-4.28	<.0001	1.07923

Appendix B.12-1
Dependent Variable: C19_ART

Number of Observations Read	581238
Number of Observations Used	3529
Number of Observations with Missing Values	577709

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	26	8.34639	0.32102	1.89	0.0042
Error	3502	594.77177	0.16984		
Corrected Total	3528	603.11816			

Root MSE	0.4121	R-Square	0.013
Dependent Mean	0.7812	Adj R-Sq	0.006
Coeff Var	52.7511		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	1.53508	0.22841	6.72	<.0001	0
med_hhld_inc_CFY	1	-1.13E-08	7.11E-07	-0.02	0.9873	1.52114
white_pct_CFY	1	-0.00119	0.00075883	-1.57	0.1158	1.75302
AVGHHSZ_CFY	1	-0.14525	0.04719	-3.08	0.0021	4.01668
RISK_ADJ_FCTR_A	1	-0.03067	0.0097	-3.16	0.0016	2.14169
RISK_ADJ_FCTR_D	1	0.0427	0.02483	1.72	0.0856	2.48863
mcaid_status_num	1	-0.01535	0.02008	-0.76	0.4447	1.30009
age	1	-0.00418	0.0024	-1.74	0.0817	1.0365
gender_num	1	-0.01423	0.01714	-0.83	0.4066	1.06367
contract1	1	-0.04412	0.07541	-0.58	0.5586	5.71995
contract2	1	0.01924	0.07636	0.25	0.801	29.98373
contract3	1	-0.10483	0.1998	-0.52	0.5998	1.17352
contract4	1	0.07255	0.11825	0.61	0.5395	1.39282
contract5	1	-0.07002	0.07054	-0.99	0.3209	11.30428
contract6	1	-0.02587	0.07166	-0.36	0.7181	23.37935
areatype_urban	1	0.05997	0.06065	0.99	0.3229	7.53082
areatype_lgrural	1	0.08955	0.06851	1.31	0.1913	4.04529
areatype_smrural	1	0.09938	0.08736	1.14	0.2554	1.95264
race_white	1	0.00945	0.0176	0.54	0.5915	1.19586
htn_proxy	1	-0.03499	0.0212	-1.65	0.0989	2.07985
cvd_proxy	1	-0.01996	0.0233	-0.86	0.3916	1.17266
copd_proxy	1	-0.13259	0.06098	-2.17	0.0297	1.03659
chemdep_proxy	1	-0.04897	0.03595	-1.36	0.1733	1.03728
statin_prescr	1	0.00263	0.0152	0.17	0.8624	1.18198
RAS_prescr	1	0.01425	0.02031	0.7	0.4827	2.14182
OD_prescr	1	0.01374	0.02054	0.67	0.5036	1.12885
HRM_FLG	1	0.01153	0.01715	0.67	0.5013	1.23875

Appendix B.12-2
Dependent Variable: C19_ART

Number of Observations Read	581238
Number of Observations Used	3529
Number of Observations with Missing Values	577709

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	7.06605	0.3533	2.08	0.0033
Error	3508	596.05212	0.16991		
Corrected Total	3528	603.11816			

Root MSE	0.4122	R-Square	0.0117
Dependent Mean	0.78124	Adj R-Sq	0.0061
Coeff Var	52.76272		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	1.32101	0.20277	6.51	<.0001	0
med_hhld_inc_CFY	1	4.74E-07	6.48E-07	0.73	0.4647	1.26275
white_pct_CFY	1	-0.00131	0.0007112	-1.84	0.0663	1.53918
AVGHHSZ_CFY	1	-0.06505	0.02847	-2.28	0.0224	1.46156
RISK_ADJ_FCTR_A	1	-0.02884	0.00967	-2.98	0.0029	2.12955
RISK_ADJ_FCTR_D	1	0.03723	0.02466	1.51	0.1312	2.45443
mcaid_status_num	1	-0.01414	0.01971	-0.72	0.4732	1.252
age	1	-0.00421	0.0024	-1.76	0.0793	1.03481
gender_num	1	-0.01619	0.01712	-0.95	0.3443	1.06077
areatype_urban	1	0.01317	0.03422	0.38	0.7004	2.39644
areatype_lgrural	1	0.04274	0.04549	0.94	0.3475	1.78236
areatype_smrural	1	0.05768	0.06951	0.83	0.4067	1.23544
race_white	1	0.01216	0.01755	0.69	0.4885	1.18864
htn_proxy	1	-0.03486	0.02116	-1.65	0.0995	2.07077
cvd_proxy	1	-0.02306	0.02326	-0.99	0.3216	1.16873
copd_proxy	1	-0.13609	0.06091	-2.23	0.0255	1.03388
chemdep_proxy	1	-0.04719	0.03589	-1.31	0.1887	1.03341
statin_prescr	1	0.00275	0.01518	0.18	0.8563	1.17843
RAS_prescr	1	0.01467	0.02026	0.72	0.469	2.1308
OD_prescr	1	0.01441	0.02052	0.7	0.4826	1.12681
HRM_FLG	1	0.00905	0.01707	0.53	0.5963	1.22706

Appendix B.13-1
Dependent Variable: D11_MAD_NUM DIAB_Adherent_Bene

Number of Observations Read	581238
Number of Observations Used	42984
Number of Observations with Missing Values	538254

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	29	222.92864	7.68719	42.7	<.0001
Error	42954	7733.60319	0.18004		
Corrected Total	42983	7956.53183			

Root MSE	0.42432	R-Square	0.028
Dependent Mean	0.75475	Adj R-Sq	0.0274
Coeff Var	56.21968		

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	0.53534	0.06749	7.93	<.0001	0
med_hhld_inc_CFY	1	0.00000107	2.06E-07	5.19	<.0001	1.59297
white_pct_CFY	1	0.00069483	0.00021057	3.3	0.001	1.67048
AVGHHSZ_CFY	1	-0.04892	0.01405	-3.48	0.0005	4.11446
RISK_ADJ_FCTR_A	1	-0.01231	0.0034	-3.62	0.0003	2.14313
RISK_ADJ_FCTR_D	1	0.00077254	0.00874	0.09	0.9295	2.29589
mcaid_status_num	1	0.00806	0.00596	1.35	0.1765	1.24573
age	1	0.00076629	0.00072144	1.06	0.2882	1.03088
gender_num	1	0.01249	0.00425	2.94	0.0033	1.0715
contract1	1	-0.02508	0.02231	-1.12	0.261	6.13017
contract2	1	0.0344	0.02329	1.48	0.1397	31.74802
contract3	1	-0.01638	0.04725	-0.35	0.7289	1.28634
contract4	1	0.04029	0.0512	0.79	0.4313	1.17698
contract5	1	-0.01376	0.02123	-0.65	0.5168	12.55078
contract6	1	-0.02324	0.02201	-1.06	0.291	25.02926
areatype_urban	1	0.00527	0.01961	0.27	0.788	10.43259
areatype_lgrural	1	0.0013	0.02136	0.06	0.9514	5.04767
areatype_smrural	1	0.01465	0.02485	0.59	0.5557	2.23611
race_white	1	0.05677	0.00485	11.71	<.0001	1.16747
htn_proxy	1	0.02049	0.00858	2.39	0.0169	2.00254
cvd_proxy	1	-0.00377	0.00639	-0.59	0.5555	1.16326
copd_proxy	1	-0.05543	0.02355	-2.35	0.0186	1.0175
chemdep_proxy	1	-0.08882	0.01594	-5.57	<.0001	1.01648
statin_prescr	1	0.07685	0.0046	16.69	<.0001	1.05957
RAS_prescr	1	0.04128	0.00718	5.75	<.0001	2.20784
HRM_FLG	1	0.02102	0.00445	4.72	<.0001	1.06395
C14_CDCEYE	1	0.05161	0.00429	12.02	<.0001	1.03499
C15_CDCNEP	1	-0.00633	0.00986	-0.64	0.5209	1.26702
C16_CDCA1C9	1	0.01109	0.00517	2.14	0.032	1.54184
C17_CDC100	1	0.05315	0.00539	9.86	<.0001	1.53356

Appendix B.13-2
Dependent Variable: D11_MAD_NUM DIAB_Adherent_Bene

Number of Observations Read	581238
Number of Observations Used	42984
Number of Observations with Missing Values	538254

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	23	207.16213	9.00705	49.93	<.0001
Error	42960	7749.36969	0.18039		
Corrected Total	42983	7956.53183			

Root MSE	0.42472	R-Square	0.026
Dependent Mean	0.75475	Adj R-Sq	0.0255
Coeff Var	56.27302		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	0.41218	0.06029	6.84	<.0001	0
med_hhld_inc_CFY	1	0.00000133	1.89E-07	7.05	<.0001	1.34041
white_pct_CFY	1	0.0002628	0.00020037	1.31	0.1897	1.50972
AVGHHSZ_CFY	1	0.00673	0.00853	0.79	0.4299	1.51263
RISK_ADJ_FCTR_A	1	-0.01175	0.0034	-3.46	0.0006	2.13712
RISK_ADJ_FCTR_D	1	-0.00378	0.00872	-0.43	0.6644	2.28368
mcaid_status_num	1	0.00644	0.0059	1.09	0.2751	1.21786
age	1	0.00095208	0.00072168	1.32	0.1871	1.0296
gender_num	1	0.0127	0.00425	2.99	0.0028	1.07132
areatype_urban	1	-0.02433	0.0096	-2.53	0.0113	2.49638
areatype_lgrural	1	-0.01287	0.01254	-1.03	0.305	1.73778
areatype_smrural	1	0.00062153	0.01847	0.03	0.9732	1.23226
race_white	1	0.05811	0.00484	12.01	<.0001	1.16045
htn_proxy	1	0.01869	0.00858	2.18	0.0294	2.00096
cvd_proxy	1	-0.00422	0.00639	-0.66	0.5093	1.16121
copd_proxy	1	-0.05294	0.02356	-2.25	0.0247	1.01694
chemdep_proxy	1	-0.08624	0.01595	-5.41	<.0001	1.01601
statin_prescr	1	0.07715	0.00461	16.75	<.0001	1.05861
RAS_prescr	1	0.04105	0.00719	5.71	<.0001	2.20759
HRM_FLG	1	0.01903	0.00443	4.29	<.0001	1.0533
C14_CDCEYE	1	0.05116	0.00429	11.93	<.0001	1.03108
C15_CDCNEP	1	-0.00632	0.00986	-0.64	0.5218	1.26484
C16_CDCA1C9	1	0.01218	0.00516	2.36	0.0183	1.53364
C17_CDC100	1	0.05179	0.00539	9.61	<.0001	1.53087

Appendix B.14-1
Dependent Variable: D12_MAH_NUM RAS_Adherent_Bene

Number of Observations Read	581238
Number of Observations Used	123119
Number of Observations with Missing Values	458119

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	24	346.20231	14.4251	83.51	<.0001
Error	123094	21263	0.17273		
Corrected Total	123118	21609			

Root MSE	0.41561	R-Square	0.016
Dependent Mean	0.77293	Adj R-Sq	0.0158
Coeff Var	53.77129		

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	0.56395	0.03864	14.59	<.0001	0
med_hhld_inc_CFY	1	7.45E-07	1.18E-07	6.31	<.0001	1.54558
white_pct_CFY	1	0.00028431	0.00012257	2.32	0.0204	1.66021
AVGHHSZ_CFY	1	-0.02796	0.00787	-3.55	0.0004	3.77426
RISK_ADJ_FCTR_A	1	-0.01937	0.00202	-9.58	<.0001	2.30712
RISK_ADJ_FCTR_D	1	-0.0000025	0.00498	0	0.9996	2.52404
mcaid_status_num	1	0.0014	0.0036	0.39	0.6983	1.26637
age	1	0.0019	0.00041621	4.57	<.0001	1.02097
gender_num	1	-0.00413	0.00246	-1.68	0.0931	1.06212
contract1	1	0.0111	0.01244	0.89	0.3723	5.86273
contract2	1	0.05391	0.01292	4.17	<.0001	29.23782
contract3	1	0.03569	0.02485	1.44	0.151	1.31898
contract4	1	-0.04207	0.03073	-1.37	0.171	1.15139
contract5	1	0.0101	0.01179	0.86	0.3916	11.91379
contract6	1	0.01159	0.01222	0.95	0.3428	23.13167
areatype_urban	1	0.00537	0.01046	0.51	0.6078	8.3494
areatype_lgrural	1	-0.00099231	0.01157	-0.09	0.9316	4.49126
areatype_smrural	1	0.0052	0.01383	0.38	0.707	2.07888
race_white	1	0.06261	0.00294	21.3	<.0001	1.17032
cvd_proxy	1	-0.00934	0.00366	-2.55	0.0107	1.16725
copd_proxy	1	-0.06569	0.01225	-5.36	<.0001	1.01685
chemdep_proxy	1	-0.06583	0.00761	-8.65	<.0001	1.02321
statin_prescr	1	0.0615	0.00252	24.4	<.0001	1.07108
OD_prescr	1	0.01786	0.00274	6.51	<.0001	1.07068
HRM_FLG	1	-0.01129	0.00269	-4.2	<.0001	1.0699

Appendix B.14-2
Dependent Variable: D12_MAH_NUMRAS_Adherent_Bene

Number of Observations Read	581238
Number of Observations Used	123119
Number of Observations with Missing Values	458119

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	18	321.24925	17.84718	103.21	<.0001
Error	123100	21287	0.17293		
Corrected Total	123118	21609			

Root MSE	0.41585	R-Square	0.0149
Dependent Mean	0.77293	Adj R-Sq	0.0147
Coeff Var	53.80152		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	0.46472	0.03451	13.47	<.0001	0
med_hhld_inc_CFY	1	0.00000101	1.08E-07	9.37	<.0001	1.29301
white_pct_CFY	1	-0.00003148	0.00011685	-0.27	0.7876	1.50703
AVGHHSZ_CFY	1	0.0172	0.00487	3.53	0.0004	1.44332
RISK_ADJ_FCTR_A	1	-0.01891	0.00202	-9.36	<.0001	2.30246
RISK_ADJ_FCTR_D	1	-0.00405	0.00497	-0.82	0.4149	2.50331
mcaid_status_num	1	-0.00080084	0.00355	-0.23	0.8217	1.23212
age	1	0.00202	0.00041629	4.86	<.0001	1.02018
gender_num	1	-0.00412	0.00246	-1.68	0.0938	1.06178
areatype_urban	1	0.00287	0.0058	0.49	0.6211	2.56152
areatype_lgrural	1	0.00747	0.00744	1	0.3157	1.85723
areatype_smrural	1	0.0142	0.01082	1.31	0.1894	1.27189
race_white	1	0.06445	0.00293	21.98	<.0001	1.16267
cvd_proxy	1	-0.00972	0.00366	-2.66	0.0079	1.16543
copd_proxy	1	-0.06599	0.01226	-5.38	<.0001	1.01609
chemdep_proxy	1	-0.06349	0.00761	-8.35	<.0001	1.02143
statin_prescr	1	0.06108	0.00252	24.24	<.0001	1.07
OD_prescr	1	0.01795	0.00275	6.54	<.0001	1.07038
HRM_FLG	1	-0.01213	0.00267	-4.54	<.0001	1.0581

Appendix B.15-1
Dependent Variable: D13_MAC_NUM

Number of Observations Read	581238
Number of Observations Used	52599
Number of Observations with Missing Values	528639

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	26	264.80495	10.18481	50.45	<.0001
Error	52572	10613	0.20189		
Corrected Total	52598	10878			

Root MSE	0.44932	R-Square	0.0243
Dependent Mean	0.70781	Adj R-Sq	0.0239
Coeff Var	63.47994		

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	0.37112	0.06471	5.73	<.0001	0
med_hhld_inc_CFY	1	0.00000135	1.99E-07	6.8	<.0001	1.58514
white_pct_CFY	1	0.00051897	0.00020117	2.58	0.0099	1.69613
AVGHHSZ_CFY	1	-0.05941	0.01372	-4.33	<.0001	4.15497
RISK_ADJ_FCTR_A	1	-0.00271	0.0028	-0.97	0.3334	2.24284
RISK_ADJ_FCTR_D	1	0.01726	0.00776	2.23	0.0261	2.4009
mcaid_status_num	1	0.02611	0.00548	4.76	<.0001	1.27878
age	1	0.00292	0.0006869	4.25	<.0001	1.0253
gender_num	1	0.03148	0.00407	7.73	<.0001	1.07438
contract1	1	-0.00964	0.021	-0.46	0.6461	6.15854
contract2	1	0.05812	0.02205	2.64	0.0084	30.54011
contract3	1	-0.00382	0.03687	-0.1	0.9176	1.45495
contract4	1	-0.07793	0.04669	-1.67	0.0951	1.19584
contract5	1	-0.00368	0.01992	-0.18	0.8534	12.33562
contract6	1	-0.01578	0.02073	-0.76	0.4467	24.81283
areatype_urban	1	-0.00456	0.0184	-0.25	0.8043	10.13359
areatype_lgrural	1	-0.00193	0.02016	-0.1	0.9239	4.83049
areatype_smrural	1	-0.01885	0.02353	-0.8	0.4231	2.19182
race_white	1	0.07316	0.0047	15.58	<.0001	1.17603
htn_proxy	1	0.01246	0.00833	1.5	0.1347	1.92196
cvd_proxy	1	0.00582	0.00539	1.08	0.2799	1.17228
copd_proxy	1	-0.00742	0.01981	-0.37	0.7081	1.01771
chemdep_proxy	1	-0.06642	0.01412	-4.7	<.0001	1.01606
RAS_prescr	1	0.03932	0.00651	6.03	<.0001	1.9223
OD_prescr	1	0.02912	0.00406	7.17	<.0001	1.0503
HRM_FLG	1	0.00004937	0.00429	0.01	0.9908	1.06824
C17_CDC100	1	0.08816	0.00416	21.2	<.0001	1.04118

Appendix B.15-2
Dependent Variable: D13_MAC_NUM

Number of Observations Read	581238
Number of Observations Used	52599
Number of Observations with Missing Values	528639

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	20	233.76673	11.68834	57.73	<.0001
Error	52578	10645	0.20245		
Corrected Total	52598	10878			

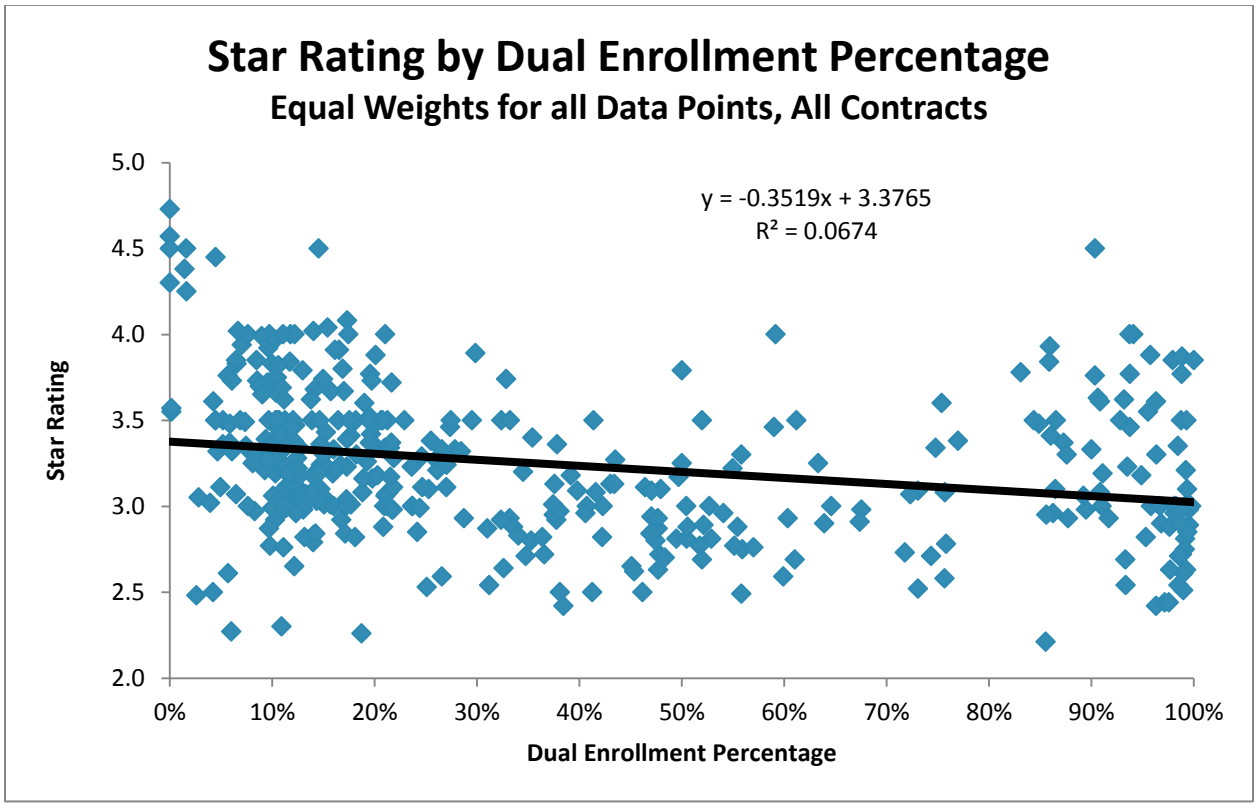
Root MSE	0.44995	**R-Square**	0.0215
Dependent Mean	0.70781	**Adj R-Sq**	0.0211
Coeff Var	63.56906		

Parameter Estimates						
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Variance Inflation**
Intercept	1	0.22271	0.05695	3.91	<.0001	0
med_hhld_inc_CFY	1	0.00000168	1.83E-07	9.2	<.0001	1.3355
white_pct_CFY	1	-0.00007845	0.00019024	-0.41	0.6801	1.51258
AVGHHSZ_CFY	1	0.00968	0.00821	1.18	0.2379	1.4823
RISK_ADJ_FCTR_A	1	-0.00233	0.0028	-0.83	0.4067	2.23695
RISK_ADJ_FCTR_D	1	0.01171	0.00774	1.51	0.1304	2.38665
mcaid_status_num	1	0.02272	0.00542	4.19	<.0001	1.24712
age	1	0.00322	0.00068735	4.68	<.0001	1.02375
gender_num	1	0.03148	0.00408	7.72	<.0001	1.07409
areatype_urban	1	-0.03137	0.00902	-3.48	0.0005	2.42894
areatype_lgrural	1	-0.00881	0.01198	-0.74	0.4619	1.70061
areatype_smrural	1	-0.02383	0.01763	-1.35	0.1764	1.22697
race_white	1	0.07509	0.00469	16.02	<.0001	1.16868
htn_proxy	1	0.01098	0.00834	1.32	0.1883	1.92073
cvd_proxy	1	0.00578	0.00539	1.07	0.283	1.16916
copd_proxy	1	-0.00453	0.01983	-0.23	0.8193	1.01695
chemdep_proxy	1	-0.06146	0.01413	-4.35	<.0001	1.015
RAS_prescr	1	0.03806	0.00652	5.84	<.0001	1.92048
OD_prescr	1	0.02949	0.00406	7.26	<.0001	1.0498
HRM_FLG	1	-0.00194	0.00427	-0.45	0.6497	1.05696
C17_CDC100	1	0.08515	0.00415	20.54	<.0001	1.03197

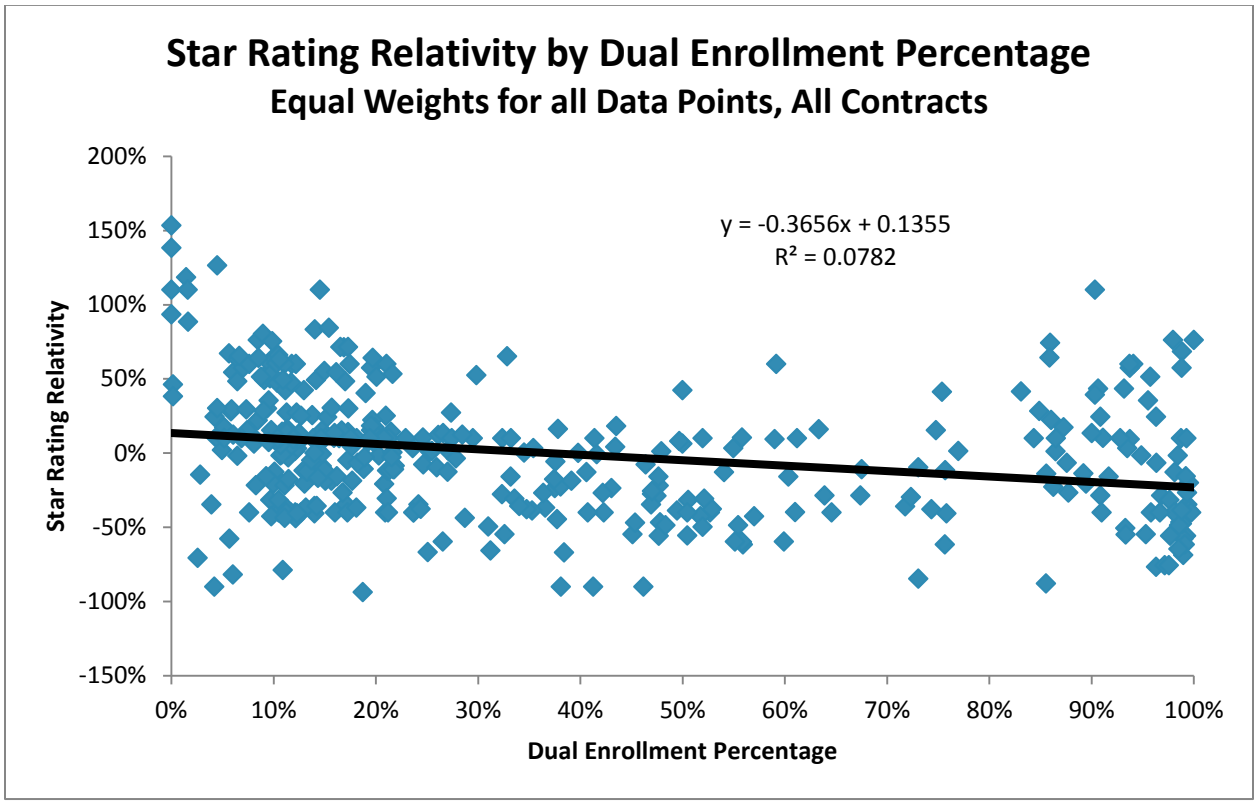
APPENDIX C

GRADIENT RESULTS WITH EQUAL WEIGHTS

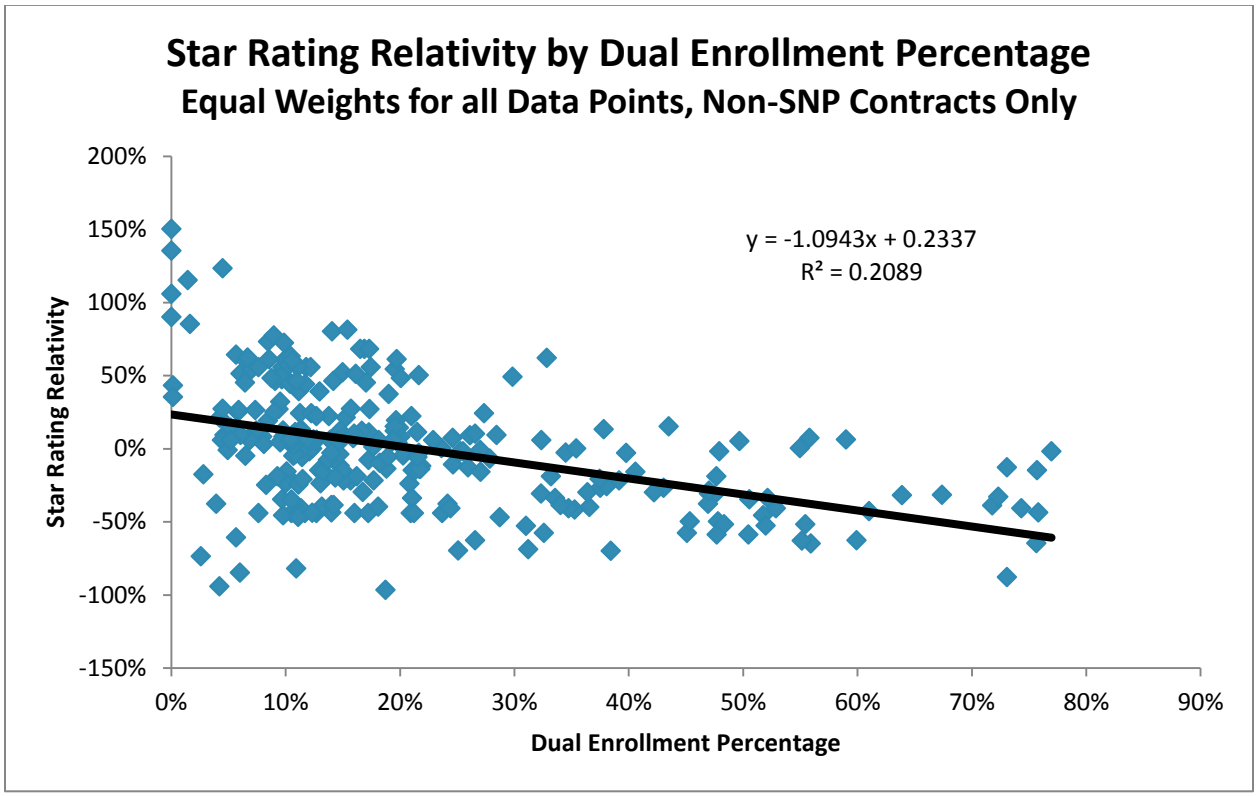
Immediately following is a scatter plot diagram showing regression results from the gradient analysis using Star rating for all contracts and developed by applying equal weight to all data points (contracts), rather than the member weighted approach used in the first scatter plot diagram from the Gradient sub-section of Section III (Results).



Immediately following is a scatter plot diagram showing regression results from the gradient analysis using Star rating relativity and developed by applying equal weight to all data points (contracts), rather than the member weighted approach used in the second scatter plot diagram from the Gradient sub-section of Section III (Results).



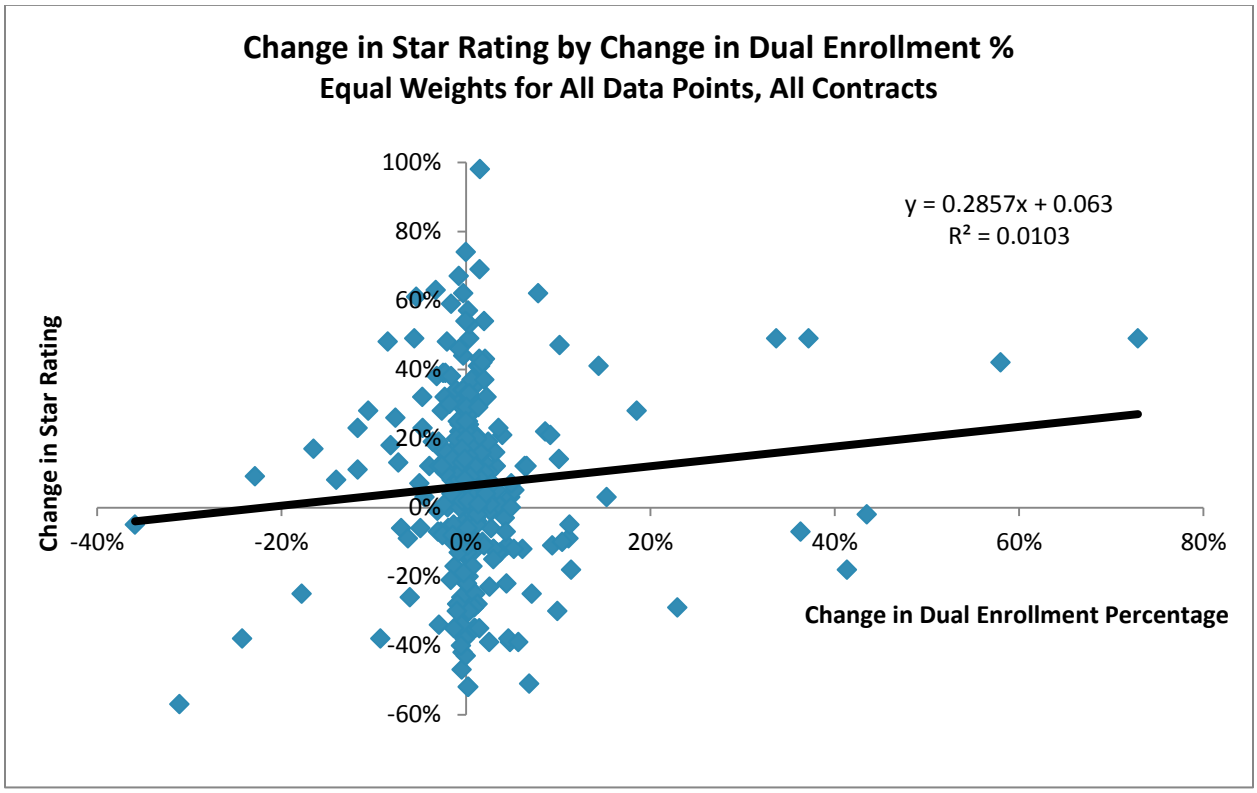
Immediately following is a scatter plot diagram showing regression results from the gradient analysis using Star rating relativity for non-SNP contracts only and developed by applying equal weight to all data points (contracts), rather than the member weighted approach used in the third scatter plot diagram from the Gradient sub-section of Section III (Results).



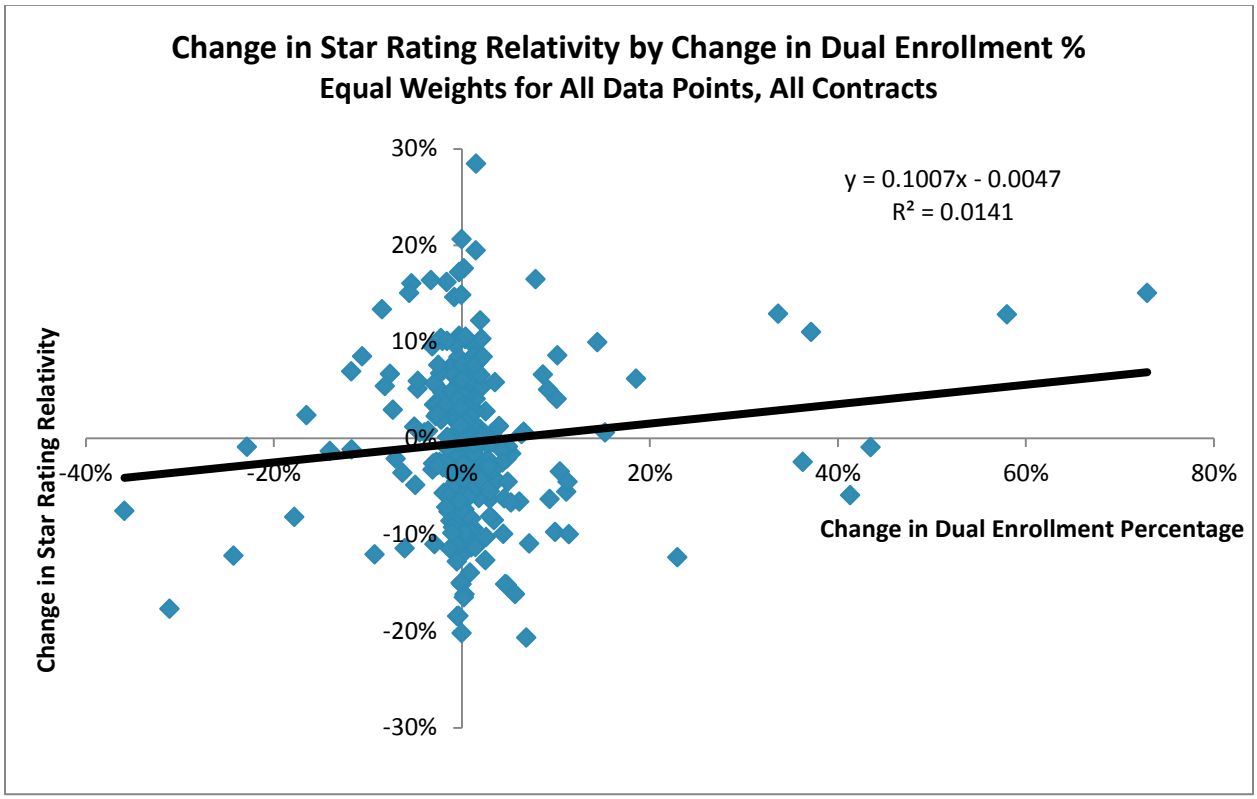
APPENDIX D

TEMPORALITY RESULTS WITH EQUAL WEIGHTS

Immediately following is a scatter plot diagram showing regression results from the temporality analysis using Star rating for all contracts and developed by applying equal weight to all data points (contracts), rather than the member weighted approach used in the first scatter plot diagram from the Temporality sub-section of Section III (Results).



Immediately following is a scatter plot diagram showing regression results from the temporality analysis using Star rating relativity and developed by applying equal weight to all data points (contracts), rather than the member weighted approach used in the second scatter plot diagram from the Temporality subsection of Section III (Results).



Immediately following is a scatter plot diagram showing regression results from the temporality analysis using Star rating relativity for non-SNP contracts only and developed by applying equal weight to all data points (contracts), rather than the member weighted approach used in the third scatter plot diagram from the Temporality sub-section of Section III (Results).