Society of Actuaries Research Project:

"Evaluating the Results of Care Management Interventions: Comparative Analysis of Different Outcomes Measures"

May 14, 2007

Agenda

1. Background to our research.
2. Care Management Background.
3. Review of the SOA research.
4. Questions?

Background to our research

- Traditionally, actuaries have been involved in *financial*, rather than clinical topics;
- Managed Care brings these two streams together: managing clinical activities and interventions for a financial outcome;
- Actuaries have begun to be more involved in the care management/outcomes side of the business;
- Creates a *need* for actuaries to learn a new vocabulary and new techniques;
- Creates *opportunity* for actuaries to demonstrate application of our skills in a new area.

- SOA Health Section called for proposals for projects in 2003.
- Awarded a project to research: "*Evaluating the Results of Care Management Interventions: Comparative Analysis of Different Outcomes Measures*".
- Includes <u>all</u> Care Management Interventions although focus is on Disease Management.
- Total of 9 papers published, including trend paper in NAAJ.
- Rigorous peer-review process with Project Oversight Group.

The 9 papers on Care Management:

1. Programs and Interventions – description of different types of care management interventions.
2. Actuarial Issues in Care Management.
3. A review of the Literature on Program Evaluations.
4. Understanding the Economics of Intervention programs.
5. Measuring Disease Management Savings Outcomes.
6. An actuarial methodology for assessing Disease Management Outcomes.
7. A comparative analysis of Chronic and Non-chronic Member Cost Trends.
8. Practical application of different measurement methodologies.
9. Summary and Conclusions.

Acknowledgements

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- My colleague, Rebecca Owen, FSA, for analysis.
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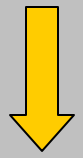
- Ronora Stryker and the SOA's Research Staff for their support and encouragement.
- And last but not least:
- The SOA Health Section and the Committee on Knowledge Extension Research for their financial support.

Background on Care Management

- Realization that a small % of members consume a large % of resources, AND
- Role of the member: how do you encourage the Member to take more responsibility for own care?



- Result is Disease Management: a set of interventions that recognize the role of the PATIENT in their own care.

Background on Care Management

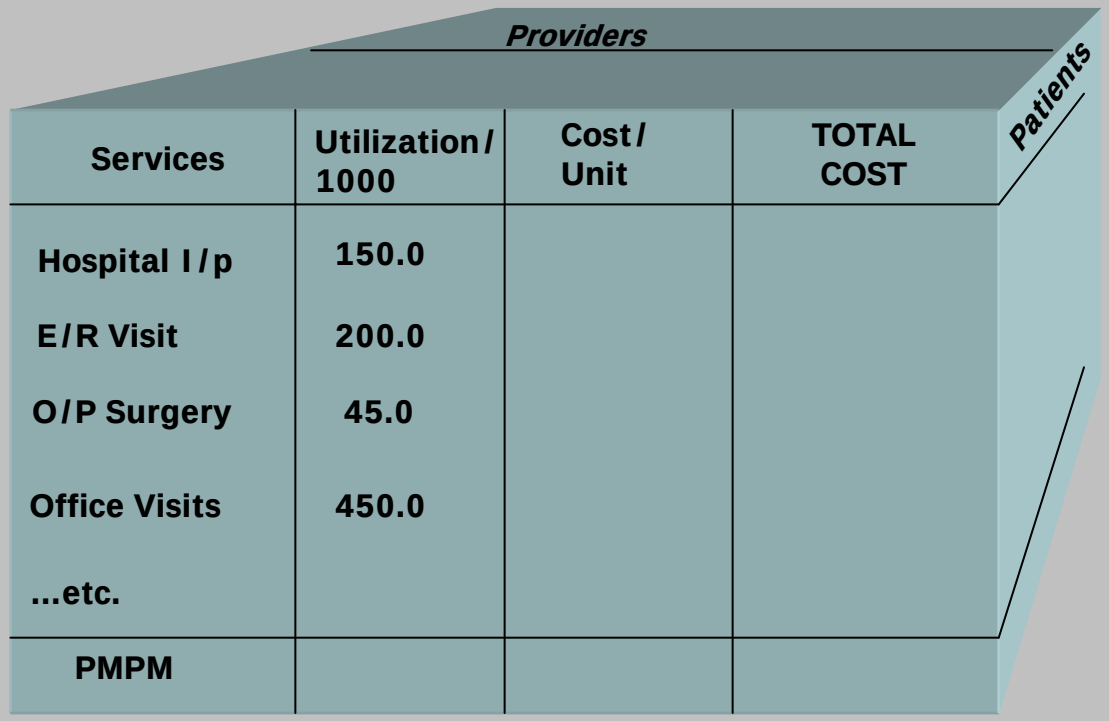
All these interventions raise questions for actuaries:

- Medical Management Departments are Expensive Resources.
- They tend to be under different management structures than actuaries.
- It is hard to measure their productivity and performance.
- They tend to get a “bye” financially because they demonstrably “do good”.

Background on Care Management

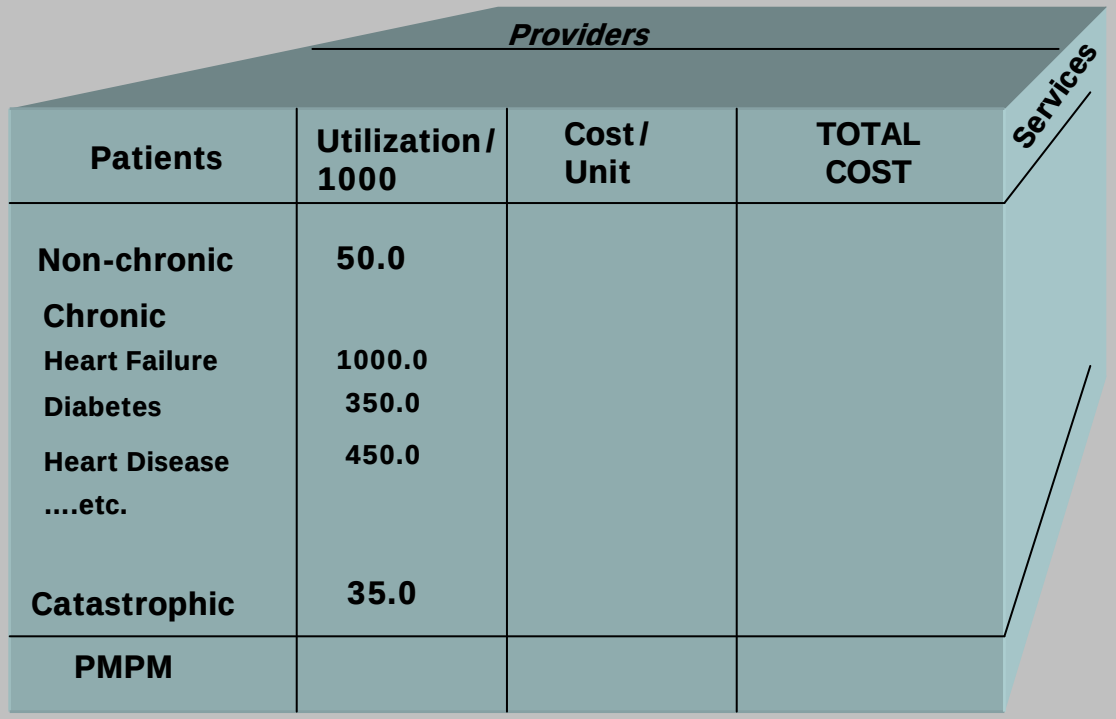
- As the number and cost of intervention programs has risen, managements have begun to turn to their traditional financial advisors, the actuaries.
- Clinical metrics and evaluations are not part of the traditional actuarial syllabus.
- Change in focus: traditionally, actuaries have focused on services (inpatient, outpatient, Rx, etc.). Focus is shifting to the member, the member's condition.
  - What is a reasonable cost for a member with a particular condition?
  - What is the increase in cost (trend) for member with a particular condition?

Health Risk Management – Traditional View



Services	Utilization / 1000	Cost / Unit	TOTAL COST
Hospital I/p	150.0		
E/R Visit	200.0		
O/P Surgery	45.0		
Office Visits	450.0		
...etc.			
PMPM			

Health Risk Management – New View



Review of the SOA Research

Paper 1: Introduction to Care Management Interventions.

An introduction (for those not familiar with them) to common types of care management programs.

- Pre-Authorization Reviews
- Concurrent Review
- Case Management
- Demand Management
- Disease Management
- Specialty Case Management
- Population Health Management

Paper 2: Actuarial Issues in Care Management

- Covers Measurement Principles, Study Design Issues and Risk Factors.
- Addresses some issues of particular importance including Regression to the Mean, Risk Adjustment, the need for control and reconciliation of data, and operational issues.

Paper 2: Results of Interventions - Financial Jury is Out

The industry measures financial outcomes differently than we are accustomed to (ROI rather than pmpm).

- Unrealistic Claims.
- No GAAP for Financial Measurement.
- Poor Reconciliation Controls.
- Lack of understanding of, and attention to, the key drivers of financial outcomes.
- “So how come, if you saved me all this money, my trend is continuing to increase?”

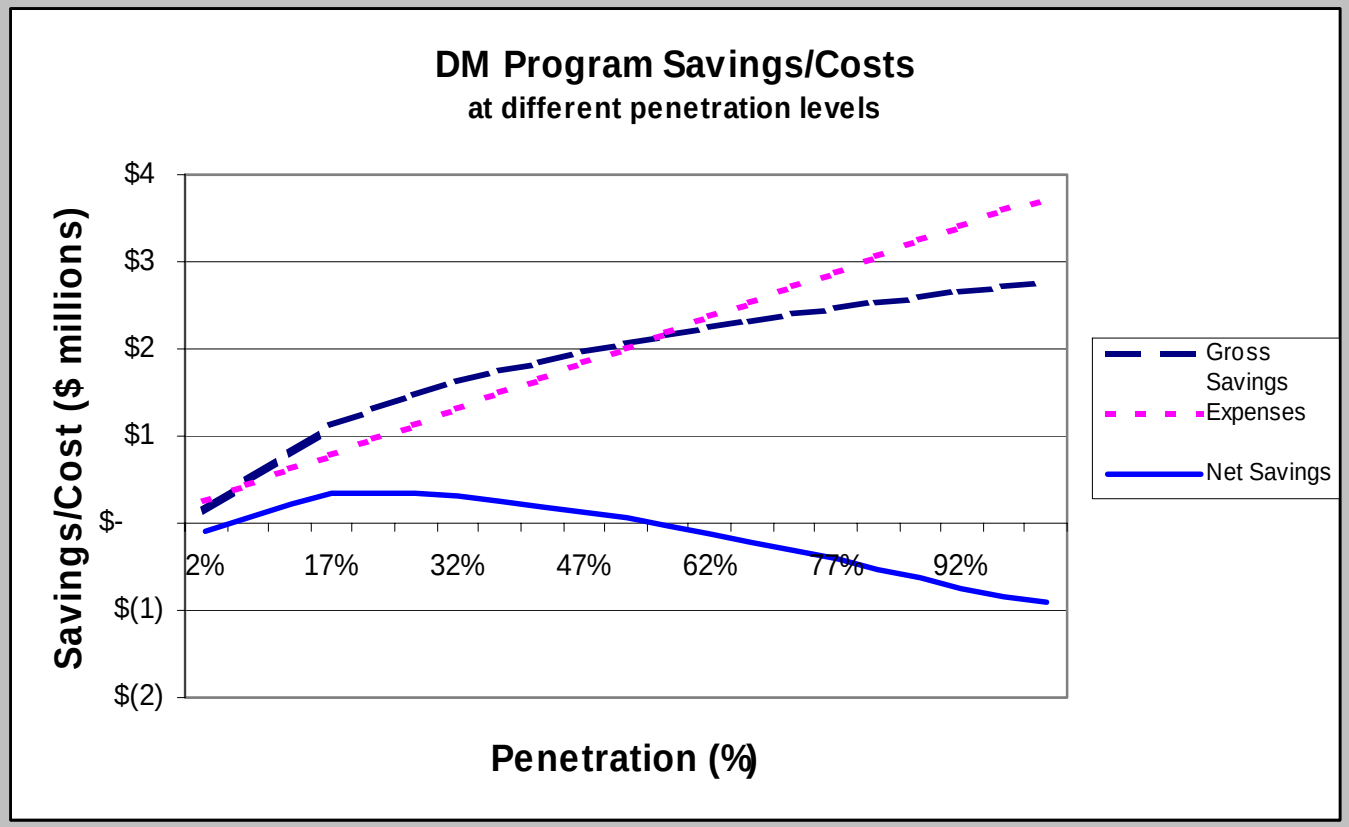
Paper 3: Review of Published, Peer-reviewed literature

Intervention	# Studies
Preauth/Utilization Review	9
Concurrent Review	5
Case Management	22
Specialty Case Mgmt	5
Demand Management	6
Population Management	7
Disease Management	52
TOTAL	106

Paper 3: Review of Published, Peer-reviewed literature

Intervention	Total Number of Studies	Major Findings
Preauthorization/ Utilization Review	9	Early studies show admission and bed-day reductions from UR in the range of 10% to 15%. Recent International studies of data not subject to managed care show considerable opportunity for utilization reduction. Early gains were not maintained as medical management models changed; there is also evidence of increased outpatient utilization due to inpatient UR. More recently these reductions are in the range of 2% to 3%; savings are estimated at between $25 and $74 per member per year; we estimate ROI of 4.60 based on reported intervention cost of $16/member for this study.
Concurrent Review	5	Early gains due to Concurrent Review were not maintained as medical practice patterns changed. Current evidence that Concurrent Review can reduce bed-days by 2% to 3%. One study in a hospital setting showed ROI of 0.9 (savings < cost of review).
Case Management	22	Reported results are variable (depending on target condition and program). Evidence exists of clinical improvement and reduction in utilization due to CM, particularly for heart disease. A survey of CM financial outcomes for Diabetes found no valid studies. ROIs in the range of 1.37 to 3.74 reported.
Specialty Case Management	5	Relatively few studies. Prevalence of members with target conditions makes them a poor candidate for randomized control trials. Evidence shows support for financial outcomes in mental health and some high-cost diseases, such as Renal Diseases.
Demand Management	6	Evidence exists that Demand Management reduces unnecessary physician and ER visits. Financial results indicate a return of between 1.37 to 3.86 to 1.0.
Population Management	7	Evidence reported of dollar savings within population wide programs. One study reported an ROI of 5.0 to 1.0. Studies of programs to intervene within entire chronic condition sub-populations report measureable pmpm savings.
Disease Management	52	For one population (multi-disease) program that reported pmpm savings, gross savings are estimated around $1.45 pmpm. For programs that report ROI, the range is 1.2 to 6.4. Highest savings are reported for heart diseases. Moderate savings are reported in diabetes and mixed results (in some cases no savings) for Asthma. A recent study using a randomized control showed no discernible savings.
TOTAL	106	

Paper 4: The Economics of Care Management



Paper 5: Evaluating Savings Methodologies

What makes for a good savings estimate?

- Reference Population: Outcomes measurement requires a reference population against which to evaluate the statistic(s) of interest.
- Consistent Statistics: The outcome variable(s) should be measured identically in the reference and intervention populations.
- Appropriate Measurement: Measure only what the intervention is designed to manage.
- Exposure: The calculation of an actuarial statistic requires clear definition of the numerator and denominator = clear definitions of categories of members and time-periods.

Paper 5: Evaluating Savings Methodologies

Evaluating different designs

- Validity/rigor.
- Familiarity.
- Replicability (ability for the client to reproduce the results).
- How the method is applied in practice.
- Other issues and comments on the use of the design.

	Method Type	Method	Validity/ Scientific Rigor	Famil-iarity	Replicability/ Auditability	Application	Evaluation of Methodology	Other issues
1	Control Group Methods	Randomized control	High	High	Difficult to replicate and audit; need another randomized group.	Requires untouched, randomized, control group. Metric in the Intervention group is compared with the same metric in the control group, and the difference is assigned to the effect of the intervention.	"Gold Standard" method, although requires demonstration of equivalence. Need for incurred claims results in delays in evaluations.	Practical to implement and avoids adjustment issues, although requires sufficient number of members. Viewed by health plans as difficult to implement and potentially unethical. Randomization must occur at the population level if results are to be applied to the population.
2		Temporal (Historical) control	High	High	Replicable and auditable	Requires population drawn according to identical rules from two periods. Metric from the Intervention period is compared with the same metric from the Baseline period, adjusted with trend. Requires adjustment of the comparison population to be equivalent to the Intervention population.	Becoming the most widespread methodology in the industry. Need for incurred claims results in delays in evaluations.	Implicit assumption that regression to the mean is uniformly distributed in the Baseline and Intervention periods, and that a robust trend estimate is available.
3		Geographic or product line controls	High/Medium	High/ Moderate	Replicable and auditable	Requires population drawn according to identical rules from two different groups (e.g. geographies). Metric from the Intervention period is compared with the same metric from the control, adjusted for all appropriate risk-factor differences.	Not widely used.	Sometimes difficult to adjust for the many risk factors that affect a population and its utilization (see Paper 2).
4		"Patient as their own control"	Low	High	Replicable and auditable	Patients are identified pre-intervention and then followed post-intervention. Pre-intervention metric is compared with post-intervention metric.	Widely used, but regression to the mean issues are causing purchasers to re-evaluate (see Paper 2).	Theoretically possible to correct for the effect of regression, but no method has yet been developed to do so.
5		Participant vs. Non-participant	Low	High	Replicable and auditable	Patients are invited to enroll in a program. Those who choose to enroll are subject to treatment; those who choose not to enroll form the control group.	Widely used, but selection bias causes this methodology to be highly suspect.	Theoretically possible to correct for the effect of selection bias, the effect of a member's "willingness to change" is unmeasurable.

	Method Type	Method	Validity/ Scientific Rigor	Famil-iarity	Replicability/ Auditability	Application	Evaluation of Methodology	Other issues
6	Non-Control Group Methods	Services Avoided (also called pre-Intent/post-Intent)	Moderate	High	May be difficult to replicate; auditable.	Record intent of different patients, track for a period of time to determine actual outcome, and assign a dollar value to the avoided event (adjusted for alternative treatment, if any).	Frequently used for small, highly-specialized programs (such as case management).	Two issues: participant bias (participants who are more likely to change their minds seek information and support) and evaluation and recording of intent is subjective.
7		Clinical improvement methods	Moderate	Moderate	Difficult to replicate; difficult to assemble comparable clinical trial data.	Measure clinical improvement and estimate financial savings using a model based on the difference in cost of well-managed and other patients.	Useful for small volume studies and when a result is required more quickly than data-based evaluations.	Requires review of the significant literature on clinical improvement, and a method for projecting financial from clinical improvement. To our knowledge there is no comparative study of results of clinical improvement and other methods.
8	Statistical Methods	Regression-discontinuity	Unknown	Low	Replicable and auditable	A regression line is fitted on the relationship between Year 1 and Year 2 costs in a population; Year 1 and Year 2 costs for the intervention group are then fitted and compared. A "shift" in the regression line indicates that the intervention has had an effect.	Highly-regarded as a theoretical method in the scientific literature, but we are not aware of a specific practical DM application.	To be determined.
9		Time-series	Low	Low	Replicable and auditable	Extension of the Adjusted historical control methodology to multiple periods.	Not widely used in commercial evaluations.	The effect of changes in risk-factors (often reflected in variations in Trend) is compounded over a period of years, making it very difficult to control this calculation.
10		Benchmark	Low	Low	Replicable; difficult to assemble valid comparison data	Metric in the intervention group is compared with the same metric in another population. The difference is assigned to the effect of the interventnion and savings are estimated accordingly.	Occasionally encountered in commercial applications.	Comparison populations are unlikely to be described in sufficient detail to determine their degree of comparability (or the extent to which adjustment is required).

Paper 6: An actuarial methodology for DM savings evaluation

- Most commonly-used in the industry: a trend-adjusted historical control methodology.
- Trend = actuarial concept.
- Other adjustments (plan design, geography, age/sex) = actuarial concepts.

Simple Example:

Estimated Savings due to reduced pmpy =	
Baseline Cost pmpy * Cost Trend	$6,000 * 1.12 = $6,720
Minus: Actual Cost pmpy	$6,300
Equals: Reduced Cost pmpy	$420
Multiplied by: Actual member years in Measurement Period	20,000
Equals: Estimated Savings	$8,400,000

Paper 7: Trend Assumptions – Before we start

Because you are all actuaries, a trend question.....

Which of the following is True?

A. Chronic Member Trend is HIGHER than Non-chronic Member Trend.
B. Chronic Member Trend is LOWER than Non-chronic Member Trend.
C. Chronic and Non-chronic Trends are about the SAME.

Paper 7: Data/Methods

Calculated Chronic, Non-chronic and population trends for 1999 through 2002.

Ingenix data set – 1.5 million commercially insured members.

Chronic members identified with:

- **Asthma**
- **COPD**
- **CHF**
- **Diabetes**
- **IHD**

Paper 7: Trend Results

Average 3-year trends*

Chronic	5.6%
Non-chronic	13.8%
Population	16.0%

* Prospective chronic identification

Paper 7: Costs and Trends using "Prospective chronic" identification

Year	Chronic Member Months	Chronic Prevalence	Chronic Cost PMPM	Chronic Cost Trend	Total Chronic Cost ($'000)	Chronic Cost as % of Total
1999	463,196	4.1%	$ 745.87	-	$ 345,483	14.5%
2000	701,398	6.0%	$ 746.42	0.1%	$ 523,538	18.3%
2001	845,883	7.0%	$ 820.27	9.9%	$ 693,856	20.3%
2002	990,646	8.6%	$ 879.71	7.2%	$ 871,485	23.1%
3-Year Annualized				5.6%		

Year	Non-Chronic Member Months	Non-Chronic Cost PMPM	Non-Chronic Cost Trend	Total Non-Chronic Cost ($'000)	Non- Chronic Cost as % of Total
1999	10,956,779	$ 186.26	-	$2,040,836	85.5%
2000	11,067,274	$ 211.41	13.5%	$2,339,693	81.7%
2001	11,241,633	$ 242.83	14.9%	$2,729,790	79.7%
2002	10,591,169	$ 274.44	13.0%	$2,906,654	76.9%
3-Year Annualized			13.8%		

Year	Total Member Months	Total Cost PMPM	Total Cost Trend	Total Cost ($'000)
1999	11,419,975	$ 208.96	-	$2,386,319
2000	11,768,672	$ 243.29	16.4%	$2,863,231
2001	12,087,516	$ 283.24	16.4%	$3,423,646
2002	11,581,815	$ 326.21	15.2%	$3,778,138
3-Year Annualized			16.0%	

Less than 1/2

Paper 7: Trend Results - Alternatives

Adjusted for high-cost outliers

Average 3-year trends*

Chronic	**4.9%**
Non-chronic	**13.9%**
Population	**16.2%**

*** Prospective chronic identification**

Paper 7: Trend Results - Alternatives

Adjusted for chronic service mix*

Non-chronic, unadjusted	13.8%
Non-chronic, adjusted	13.2%

* Prospective chronic identification

Paper 7: Chronic vs. Non-chronic trend with retrospective classification

Chronic

Year	Mem Months	Retrospective Identification	Prospective Identification
1999	1,410,116	-	-
2000	1,440,371	15.5%	0.1%
2001	1,437,872	17.2%	9.9%
2002	1,317,536	16.3%	7.2%
Three year	annualized	16.3%	5.6%

Non-chronic

Year	Mem Months	Retrospective Identification	Prospective Identification
1999	10,009,859	-	-
2000	10,328,301	17.8%	13.5%
2001	10,649,644	17.0%	14.9%
2002	10,264,279	16.8%	13.0%
Three year	annualized	17.2%	13.8%

TOTAL

Year	Mem Months	Retrospective Identification	Prospective Identification
1999	11,419,975	-	-
2000	11,768,672	16.7%	16.4%
2001	12,087,516	16.2%	16.4%
2002	11,581,815	15.3%	15.2%
Three year	annualized	16.0%	16.0%

Paper 7: Application of Risk Adjustment (DxCG prospective risk score)

Average 3-year trends*

Chronic	**12.5%**
Non-chronic	**11.9%**

*** Prospective chronic identification**

Paper 7: Conclusions

- Trend has a large potential impact on the results of an adjusted pre- post study.
- When chronic members are identified using a prospective methodology, neither the non-chronic nor population trend is particularly close to chronic population trend. In particular, the chronic trend is lower than either the non-chronic or population trend.
- The authors term this effect “Migration Bias”.

Paper 7: Conclusions

- Some obvious adjustments (for catastrophic claims and for differences in services) do not affect the trend differences much.
- Using a retroactive identification algorithm, chronic, non-chronic and population trends are much closer.
- Adjusting PMPM claims for changes in risk-score also causes trends to be more comparable.

Paper 7: Conclusions for DM purchasers

- Trend matters a lot.
- In some circumstances, migration can result in the use of inappropriate trend which, in turn, can overstate the calculated savings.
- Ask questions about how populations are identified and how trend is calculated.

Paper 8: Application in Health Plan DM Data

- Partnered with Highmark, Inc.
- 2-1/2 million members covered by a DM program administered by Health Dialog, Inc.
- Focused mostly on 200,000-member Medicare Advantage (over-65) members.
- Study period 10/1/2001-9/30/2003.

Paper 8: Application in Health Plan DM Data

- Base-case (per Paper 6) plus 5 alternatives.
- Alternative 1: Cohort Study.
- Alternative 2: 3 different chronic identification algorithms.
- Alternative 3: Retrospective Identification of Chronic Members.
- Alternative 4: No continuous eligibility requirement.
- Alternative 5: Commercial HMO/POS population.

Paper 8: Alternative Scenarios

Scenario Number	Scenario	Intervention Year 1 10/01 – 9/02 PMPM Savings	% change compared with Base-case	Intervention Year 2 10/02 – 9/03 PMPM Savings	% change compared with Base-case
0	Base-case	$41.54	-	$65.28	-
1.	Cohort	$39.59	(4.7%)	$57.93	(11.3%)
2a.	Medical claims only identification	$49.96	20.3%	$77.16	18.2%
2b.	Primary diagnosis only identification	$52.22	25.7%	$85.32	30.7%
2c.	Hospital claims only identification	$44.14	6.3%	$57.93	(11.7%)
3.	Retrospective identification	($0.47)	(100.0%)	$3.01	(95.4%)
4.	No continuous eligibility or “waiting period” requirement	$64.57	55.4%	$111.22	70.4%
5.	Commercial HMO Product	$35.12	n/a	$49.88	n/a

Paper 8: Application in Health Plan DM Data

- Savings results can vary considerably depending on identification, method, and assumptions.
- In order to understand specific savings results, a great deal of information and disclosure is required.
- More than one assumption can be varied: we did not test multi-variate results.
- We continue to test other assumptions: one of these is the “no requalification” assumption.
- Many purchasers want to know the results by disease.

Questions?

THANK YOU FOR YOUR PARTICIPATION

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