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Understanding the Economics of Disease Management Programs

by Ian Duncan

As managed care and health insurance organizations struggle to control their enrollees' utilization of medical resources, they seek less obtrusive and more cost-effective ways to reduce costs and improve patient outcomes. Disease Management (DM) is a widely-proposed solution for cost-reduction and quality improvement. Despite the interest in DM, and the number of programs that have been implemented in different health plans, the reaction to DM on the part of health insurers and other payers remains skeptical. Why has DM not proven to be the universal success that its proponents believe it to

be, and why is there so much skepticism about it? Vendors and carriers seldom discuss their programs without claims of positive savings and Return on Investment (ROI), yet somehow the buyers seem unconvinced.

Some of the skepticism arises because it is difficult to reconcile savings claims with health plan trends that move inexorably upwards. Two things are necessary to close the gap: a better understanding of the economics of DM programs, (so that more-realistic expectations may be set) and more rigorous and scientific outcomes measurement.

A health plan is not a laboratory environment, and there are so many moving parts in a DM program that it becomes extremely difficult to set up a program and measure its outcomes with sufficient scientific rigor to convince the skeptics. Within the DM community, work is currently being done to develop a methodology that will both gain the support of the vendors and purchasers of DM services, and be practical to implement. I will be chairing a session on measurement methodologies and results at the SOA Spring meeting in Vancouver ("Disease Management: Substituting Facts for Assumptions," Monday June 23rd, 2.00 p.m.). Speakers will include Dr. Thomas Wilson, the principal author of the outcomes measurement methodology research sponsored by the Disease Management Association of America (DMAA), and David Wennberg, MD, MPH, of Dartmouth University and the Maine Medical Center, a respected researcher in this area.

But there is more to understanding ROI than measuring outcomes. This brief article is an introduction to understanding the economics of DM programs. Although both vendors and health plans focus discussion on ROI, a more important measure to a health plan is total savings. After all, if a plan achieves a high ROI but manages only 100 members, the total savings will have no impact on health plan trend, and probably will not cover the fixed costs of implementation. Total savings is the appropriate bottom-line measure for the health plan to aim to achieve.

A further distinction needs to be made between marginal and average ROI: average ROI tells the sponsor whether a program is profitable, overall, while marginal ROI is critical for deciding what kind of program to implement, how large it should be and whether the marginal intervention is economically justifiable.

The Risk Management Economic Model

The Risk Management Economic model was developed to help sponsors and providers of programs do several things:

- Understand the economics of DM programs, and develop a common framework for use in discussions of programs and their economics

- Understand the sensitivity of the financial bottom-line to different assumptions and variables and

- Perform DM program projections that may then be compared with actual outcomes. Because it often takes a long time for results of DM programs to emerge, sponsors can determine interim results by measuring components and inputs (such as number of members managed), rather than outputs.

The Risk Management Economic Model—Key Components

- Risk Stratification: Identification of risk level through claims, surveys or other tools. "Risk" is defined as the probability of unfavorable economic outcome (high cost event) in the next 12 – 18 months. It is essential to have a good predictive model that risk-ranks all members,

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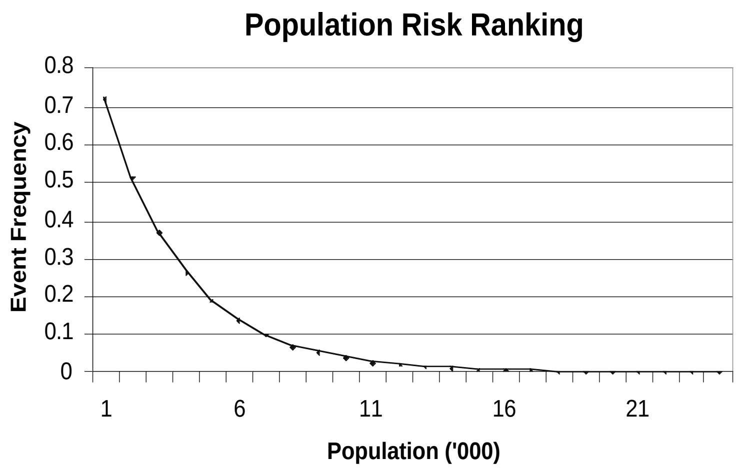
Figure 1.



insolvent or financially impaired from its share of group life claims from 9/11.

A point to consider is that few, if any, group life carriers purchase enough catastrophe coverage to remain solvent in the face of a truly catastrophic event resulting in multi-billions of dollars of claims. The purpose served by the catastrophe cover is to reduce or eliminate the financial statement impact of a significant event. But in the case of a truly large-scale event impacting a city, claims would exceed the limit of coverage provided by catastrophe reinsurance. Claims in excess of these limits would then revert back to the carriers.

The ACLI, in its response to the US Treasury, stated that an analysis prepared by the ACLI calculated that an event that resulted in a 2.5 percent mortality rate in the county of Los Angles would likely cause the insolvency of at least one insurance company. A catastrophe with mortality rate of 30 percent of the population of Los Angeles County would destroy 100 percent of the life insurance industry surplus. So if we look at the terrorism issue as it relates to group writers, it all boils down to a solvency risk.

At the Vancouver Meeting I moderated a session to delve into some of the pricing and solvency issues that we are now faced with. I hope that this session provided the attendees with a good platform to return to their respective group companies and consider how better to address the new risks we face in the 21st century.

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according to their probability of experiencing the targeted event. An example of the risk distribution of a population is shown in Figure 1 on page 15. In this example, approximately 8 percent of thepopulation experiences events at a rate of 50 percent or more.

- Targeting: identification and prioritization of target members, and association of different outreach campaigns with member cohorts; (as the risk ranking declines, so the proportion that it is economic to reach falls).

- Contact Rate: the rate at which targeted members respond to the outreach effort.
- Member Re-stratification rates, based on the Nurse's assessment of:
  - Risk

  - Intervenability of condition(s)
  - Receptivity / Readiness to change
  - Self-management skills

- Engagement Rate (also called enrollment rate): the rate at which members are selected for ongoing coaching and management (<100 percent because of non-intervenable conditions and good member self-management skills).

- A definition of the proposed program, including metrics and cost-structure, such as:

a. Number and risk-intensity of members to be targeted;

The number of target members is important because without critical mass, a program will not achieve sufficient savings to justify its implementation. However, not all members are equally likely to experience adverse events, and targeting all members with a costly program is not economic.

b. The number of nurses and other staff required to deliver the program and their cost, and other program costs (such as materials or equipment);

One fact of life in these programs is that clinical staff are a costly resource, and can only manage a relatively small patient load. For example, assuming that the (loaded) annual cost of a nurse is $100,000, and 200 is the caseload that can be managed by a telephonic intervention nurse at one time, this implies an annual cost of the nurse component of $500 per member managed. Assuming that the frequency of events in the managed population is 25 percent and that nurses manage to avoid 25 percent of these events, this implies a nurse cost of $8,000 per member whose event is avoided. This amount is significant, compared to the cost of the hospital admission that is avoided.

Some proponents of programs look for savings in areas other than hospital admissions, and these may be obtained (for example, in emergency room visits). However, since the objective of many programs is increased compliance with

Figure

Population Risk Management ECONOMIC MODEL

GROSS SAVINGS		COSTS		NET SAVINGS
AUTOMATED	$ 240,111	AUTOMATED	$ 128,072	$ 112,040
NURSE	$ 131,206	NURSE	$ 100,000	$ 31,206
		FIXED		$ (30,000)
TOTAL	$ 371,317	TOTAL	$ 228,072	$ 113,246
		ROI (per $):		$ 1.63

AUTOMATED		Control Group	Lives	Cost Per Mailing
Cost/ Target	$50	0%	25,000	$50
Contact %	25			
% Effectiveness	10			

NURSE			
Contact %	50	Cost/Nurse	$ 100,000
% Effectiveness	20	Cases/Nurse	200

Risk Rank	Population	Year 2 Event Rate	Year 2 Predicted Events	Cost Per Event	Gross Incremental Savings	Cost of Automated Intervention	Potential Incremental Savings		Projected Incremental Savings (automated)	Estimated Incremental Savings		Incremental Nurses	Projected Incremental Savings (nurse)
9	42	73.0%	30	$ 10,088	$ 7,661	$ 1,392	$ 6,269	☑	$ 6,269	$ 9,249	☑	1	$ (85,550)
8	168	51.0%	86	12,618	27,052	5,423	21,629	☑	21,629	29,764	☑	0	50,782
7	398	29.4%	117	12,489	36,556	12,116	24,439	☑	24,439	16,193	☑	0	65,973
6	742	21.2%	158	11,635	45,852	21,518	24,334	☑	24,334	(13,326)	☐	0	-
5	1,320	15.3%	202	11,263	56,818	34,442	22,376	☑	22,376	(69,277)	☐	0	-
4	2,271	10.8%	245	10,813	66,173	53,180	12,992	☑	12,992	(176,373)	☐	0	-
3	5,488	6.4%	350	11,251	98,543	116,570	(18,027)	☐	-	(1,073,843)	☐	0	-
2	8,515	4.4%	379	10,565	100,023	159,993	(59,970)	☐	-	(1,835,778)	☐	0	-
1	6,339	1.6%	103	11,455	29,615	104,949	(75,333)	☐	-	(1,517,619)	☐	0	-
Total	25,283	6.6%	1,670	$ 11,070					$ 112,040			1	$ 31,206

Risk Rank	Disease Distribution % Asthma	% CHF	%CV	% Diab
9	41.5%	14.6%	60.9%	50.6%
8	38.4%	13.7%	56.0%	49.9%
7	37.5%	12.9%	49.0%	44.0%
6	35.8%	12.1%	42.0%	42.0%
5	27.1%	7.7%	38.0%	36.0%
4	22.2%	5.1%	32.0%	28.0%
3	18.4%	4.5%	25.0%	22.0%
2	10.1%	2.4%	18.0%	19.8%
1	8.5%	0.1%	11.3%	12.5%
Total	14.9%	3.4%	21.7%	21.3%

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physician-ordered treatments, we would expect increased physician, testing, and pharmaceutical drug costs to result. In my experience, the effect of a program on "all other (non-hospital admission) costs" is, at best, a wash, and if a program achieves savings, it does so through reduced hospital admissions and length-of-stay. It is a good idea to look at the admissions experience and costs of the target population, since this, effectively, is the base of expense that any program can affect.

c. The methodology for contacting and engaging or enrolling members (telephone, provider, internet, mail, etc.).
The methodology for reaching and engaging members is critical. Each method has its own cost structure and statistical outcomes in terms of the engagement rates (and behavior change) achieved. Encouraging a member, over the telephone, to participate in a program aimed at changing behavior is like encouraging the member to change his long-distance carrier or credit-card company: in other words, not easy. My own (unpublished) research indicates that those members who are more likely to participate tend to be those who have lower event rates and costs, while the higher utilizers tend to have lower participation rates. Mail programs have low participation rates, while telephonic programs have higher rates, particularly when the caller is a nurse.

The economic model needs to include very specific assumptions and data for the number of members targeted, the number reached (don't forget to allow for data issues like bad telephone numbers or members with caller ID who will not accept a call), and the number enrolling or engaging in the program.

d. Referral/triage rules for members who need to be referred elsewhere within a care system. As we discussed earlier, clinical resources are costly, and cases should be referred to the appropriate level of management quickly and cost-efficiently. This includes members who, because they are controlling their own conditions or who clearly are not ready to comply, need to be referred to a lower-cost, "maintenance" program.

e. The predicted behavior of the target population, absent intervention, and the effectiveness of the intervention at modifying that behavior. This is the area where the whole model comes together: the combination of the variables tells us the potential for gross and net savings at each point in the risk-distribution.

f. The timing of program deployment, engagement, interventions and expected outcomes;

g. Other financial components of a program, such as guarantees, variability in outcomes, etc.

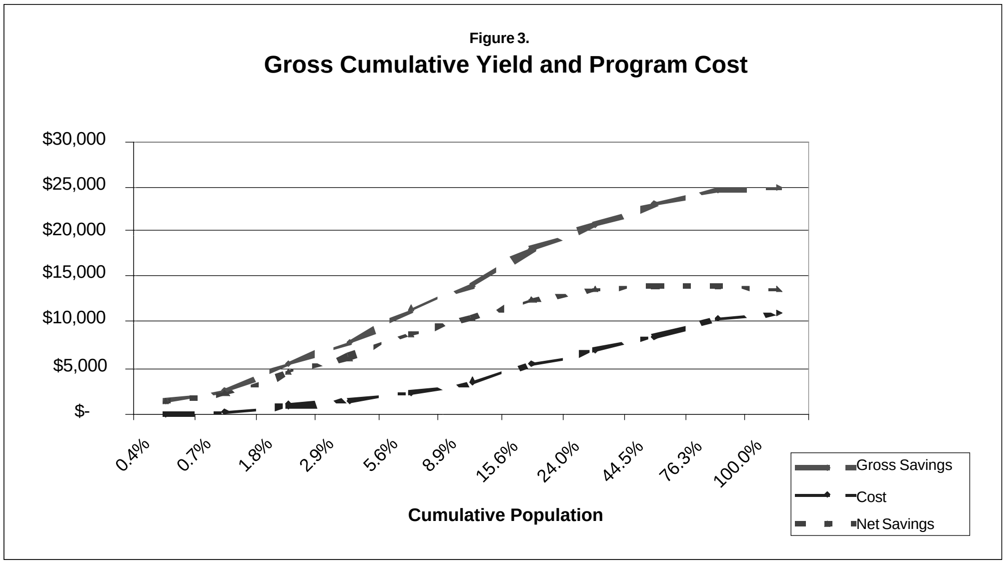

Figure 3.
Gross Cumulative Yield and Program Cost

Example of the application of the Economic Model

One relatively simple example of an economic model that allows the user to test the effect of different variables is shown below in Figure 2. on page 17. This model allows the user to optimize the level of interventions in a population (stratified into nine different strata according to risk rank, or predicted event frequency) with two different types of intervention, Automatic and Nurse-based. The total cost of these two different interventions varies, according to the number of members managed, and the risk rank to which each applies. In addition to predicting the event probability for the cohort, the prediction process also predicts the likely average event cost for the cohort (absent intervention). Applying assumptions in terms of the cost of different interventions and the outcomes, the expected financial outcomes for each type of intervention and each cohort is predicted. The user has the option of testing the result of adding different types of intervention to each cohort. Because the nurse-based intervention is relatively expensive, it is not generally economic to penetrate a population as deeply with nurse-based interventions as with automated means.

In this example, we optimize total savings from our program by implementing automated interventions down to stratum 4, while intervening with nurses in cohorts 9, 8 and 7. This program is predicted to cost $258,000 (including fixed costs) and to save a (gross) total of $371,000, for an ROI of 1.63. A higher ROI can be achieved by intervening only on higher risk-ranked cohorts, but the absolute level of savings will be smaller. A graphical example of the effect of penetration on savings is shown in Figure 3.

Designing a Program

The Economic Model allows the user to test the sensitivity of the return from different types of interventions, at different penetration levels in the population. The results may be summarized graphically in a form similar to
Figure 3 above.

Cumulative savings accrue with increased penetration into the population, though with decreasing marginal yield. In this example the cost of the intervention program increases, also at a decreased marginal rate (reflecting the greater user of automated interventions as the penetration increases). Net savings increases initially, then decreases. Highest ROI is achieved at the peak of the Net Savings curve (approximately 44 percent penetration) while absolute savings are not maximized until approximately 75 percent of the population has been targeted.

This simple approach to DM economics ignores many variables such as member turnover, timing (of interventions and events) etc. Nevertheless, understanding the simple model will provide a basis for assessing and discussing more sophisticated structures.

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