SOCIETY OF ACTUARIES

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Health Section News

"For Professional Recognition of the Health Actuary"

Genetic Testing, Medical Progress and the Health Insurance Industry

by Bruce S. Pyenson

Genetic testing promises to be an important healthcare technology and it can profoundly affect the insurance industry. Public policy experts, ethicists and legislators have spent a lot of effort discussing how to regulate genetic testing, but the insurance industry and actuaries play almost no role at all in that public debate. For reasons I will describe, I fear that without actuarial input, we could end up with regulations that poorly serve both the public and the insurance industry.

This article is taken from a presentation I gave at the SOA's Boston meeting in Fall 2002. That session focused on genetic testing and health insurance as will this article. A United States Senate Republican staffer spoke on genetic testing legislation, and a technical researcher who has been active in ethics spoke on why the technology of genetic testing poses unusual social issues. The text of presentations will appear in a forthcoming *Record*.

The American Academy of Actuaries (AAA) recently issued few statements on genetic testing as it relates to long-term care insurance (LTC) and health insurance, and a recent article in *Contingencies* addressed related life insurance issues. However, the genetic testing debate has been gone for years. Some of the genetic testing discussion documents available through the National Institute of Health and on various Web sites are more than a

decade old. Academics and other professionals have built whole careers on the topic. I hope this paper will help inform you on this important issue, so the profession will have the member support to get involved.

Genetic testing involves identifying "misspellings" in DNA. Some misspellings are very specific—all of the people with that flaw get the disease—while others define a susceptibility that also depends on environmental factors. Some genetic diseases manifest themselves at younger ages, while others may not appear until old age. As we will see, the specificity issue can have important impact on insurance.

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Chairperson's Corner

by John P. Cookson

We are beginning a new year for the Health Section Council, with some new members and new officers. I would like to thank Dan Wolak for a job well done as outgoing Chair. Dan will continue on the council for one more year. Cindy Miller will move up to Vice Chair and Karl Volkmar will take over as Secretary/Treasurer. Cindy will spearhead the Council's research efforts, and Karl is the Program Chair for the 2003 Spring Meeting in Vancouver.

I would also like to extend our appreciation to the outgoing members who have completed their three years: Tony Wittmann, Bob McGee and Dan Skwire (we still need volunteers, guys!).

Health Section Council Focus

The Council will continue to focus our efforts in three major areas:

1. Developing and carrying out the health portion of the programs for the Spring and Annual SOA Meetings.
2. Continuing to solicit and publish timely and useful articles in the *Health Section News*.
3. Supporting research projects that will be useful to our members.

We also try to maintain close cooperation with the Health Benefits Systems Practice Advancement Committee of the SOA.

Health Web Page and Membership Communication

The Health Section has a good web page on the SOA Web site. This site has useful information and links for our members and other interested parties. We would like to encourage more use of the Discussion Forums by our members, or a reenergizing of the Health Section List Serve. We would like your feedback on this. I urge you to review both the SOA Discussion Forum (on the SOA web page) and the Health Section List Serve. Personally, I prefer the List Serve, but we need to get interested members to sign up and then we need to provide or seed the List Serve with interesting topics on which everyone can comment. It shouldn't be too hard to find topics of interest given the current state of the Health Care System.

Greater Actuarial Role

I believe our membership has the talent and expertise to contribute in a substantial way to helping solve some of the problems of the health care system. I would like to see us take a more proactive posture on these issues rather than being in a reactive mode. Instead of being just users and evaluators (both important roles) of the next "Health Risk Adjusters," I would prefer to see our profession participate in developmental phases of such projects in the future.

The following is a list of areas that I think fall within this category (undoubtedly there are many others):

1) Disease management
2) Measurement of provider differences including quality and efficacy of care
3) Economic aspects of health care including the tax structure and benefits design
4) Balancing the competing interests of the various constituencies of the health care system
5) The impact of long term trends on employer liabilities for retiree medical.

Please let us know what you think.

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Letter from the Editor

by Jeffrey D. Miller

Greetings, and welcome to 2003. One of the greatest gifts a young actuary can receive is strong mentoring. One of my early mentors told me that the consulting actuarial business keeps building, and building, and building to a crescendo that never happens. I believe this is also true of the health business in general. As we go into 2003, health actuaries see many challenges and many opportunities, and the crescendo is nowhere in sight.

This edition includes six articles. I found each of them to be interesting and useful. Two of the articles deal with claim liabilities, a topic whose importance can never be underestimated. Both look at the challenge of reflecting changing inventories in received but unpaid claims. David Axene's article on healthcare affordability introduces a new measure to the dialogue on healthcare costs. I encourage you to visit the E&Y Web site to see the background material behind the indexes he uses. Genetic testing and small-group underwriting also are topics of discussion, and both will be interesting for many years to come. Finally, we have a strong article on hospital costs that follows up on some misleading discussions in the press.

One of the challenging topics I've addressed recently is a limited-benefit medical plan. Comprehensive major medical plans are no longer affordable for a large segment of the working population. Basic benefit plans have emerged as an alternative in many markets. Such plans range from merely a PPO discount card to base plans reminiscent of the old base plus major medical days. Some key questions that arise in developing these plans include:

1. How large can the premium be?
2. What are realistic provisions for commissions and expenses given that the premiums are low but administration might not be significantly reduced?
3. What sort of underwriting, if any, is optimal?
4. Do traditional claim patterns by traditional risk characteristics, such as age and sex, change?
5. Can these plans work on both a voluntary and an employer-paid basis?
6. What will happen to the healthcare system if these plans really take off?

Regarding the last question, I've been surprised at some favorable reaction in the healthcare provider community. While the cardiologists might not be thrilled, family practice physicians are enthusiastic about these plans because something is better than nothing.

I think we all might want to stay tuned and watch the development of these plans carefully.

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Figure 1: Remarkable Improvements in Life Span Expectancy at Birth

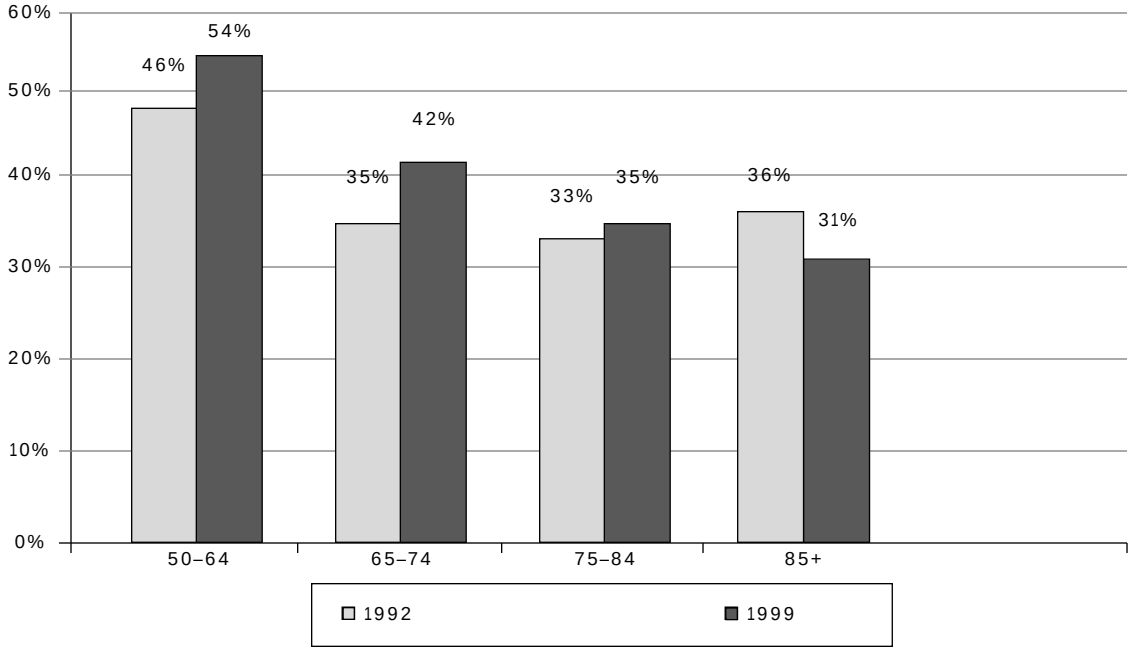
Year	Males	Females
1900	46.3	48.3
1925	57.5	60.6
1950	65.6	71.1
1975	68.8	76.6
1990	71.8	78.8
1999	73.9	79.4

Similar pattern for people age 65 and 75

National Vital Statistics System: *Health, United States*, 2002, Table 28, p. 116

Figure 2: Americans Are Getting Healthier

Total Population Who Self-Reported Excellent or Very Good Health, 1982 and 1999



AARP, Beyond 50.02; *A Report to the Nation on Trends in Health Security*, Source: National Center for Health Statistics, Trends in Aging Database, unpublished data, August 2001

Disease-specific genetic research usually starts with identifying the particular genetic misspellings associated with that disease. Genetic testing for those flaws can follow quickly. Identifying the flaws provides the leads for understanding the disease, which brings the promise of treatments and cures.

Genetic Testing in the Context of Medical Progress

In my opinion, genetic testing and, more broadly, the genomic revolution are the next steps in the amazing story of society's improving health. What we now call life science has fundamentally changed medical care. That story shows accelerating progress from roughly the middle of the 1800s—the great chemist Louis Pasteur and germ theory, the development of antibiotics—to more recent developments—hormone replacements (including insulin) and the emergence of specialized medical devices. Today the revolution continues with computer chips and microdevices, and as new pharmaceuticals move from today's breakthrough enzyme-based medicines and into genomics and proteomics. The improvements in medical care and public health are truly amazing.

As Figure 1 on page 4 shows, the life expectancy at birth has profoundly increased through the 20th century. Evidently, living in an industrial society is good for your health, and for both males and females, life expectancy has increased dramatically. This, in fact, is the case throughout the world. The United Nations recently stated that mortality rates are improving throughout the world. The same pattern holds in the United States for people in the oldest cohorts—age 65, age 75 and so forth. Life expectancy is improving across the board, and mortality experts predict it will continue to improve. Sanitation, better food and housing, a safer society have played vital roles in that progress along with what we more narrowly consider medical practice improvements.

Health status seems to be improving along with longevity. About 20 years ago a controversial theory was aired called the compression of morbidity. The theory says that we're living longer to actually spend less time disabled. The dismal, if common sense view is that we are living longer but spending more time disabled and sick. Happily, statistics support the compression of morbidity theory.

Figure 2 on page 4 is based on Centers of Medicare and Medicaid Services (CMS) statistics. It shows the population who reported "excellent" or "very good" health, compared over a course of roughly 20 years. More people are saying they're healthier. The statistics for nursing home stays shows the same phenomenon.

Insurance and Progress in Healthcare

There have been dramatic improvements in Americans' health, even recently, and certainly over the 20th century. I believe the role of insurers in that improvement has been very important and largely unappreciated.

These days, it seems to be part of popular culture to hate health insurers and pharmaceutical companies, but the fact is that a lot of the progress that has come in the course of the last 40 or 50 years has been due to pharmaceutical and insurance programs, including Medicare—the largest insurance company in the world (as it sometimes describes itself). I want to elaborate on how insurers, especially, have promoted better health and ask whether insurer use of genetic testing may also lead to better public health.

One example of insurers' public health role is disease management programs. Today, disease management is a billion-dollar industry—spent

(continued on page 6)

through insurance companies and disease management outsource companies. Disease management is performed directly for employers, sold to insurers or performed by insurers themselves.

Today, it is largely the pharmaceutical industry salespeople and the insurance company medical staff performing disease management that educated the medical profession to adopt this standard of practice. I believe that the actions of these two "hated" industries—the pharmaceutical industry and the health insurance industry—have changed the treatment pattern for asthma for the better—towards evidence-based medicine.

Information from genetic testing can threaten the stability of certain kinds of insurance.

Improving physician practices is also implicit in the Health Employer Data Information Set (HEDIS) measures. HEDIS measures include the appropriate use various pharmaceuticals and other basic evidence-based medicial practices. These apply to chronic conditions such as asthma, coronary artery disease, congestive heart failure and diabetes. These quality measures represent a huge expenditure on the part of the insurance industry, employers and to some extent, the federal government. The HEDIS focus is one example of how the insurance industry promotes new technology and better physician practices.

The growing use of much medical technology is linked to reimbursement. This isn't the place to discuss the abuse of technology, which is real. But stable reimbursement has promoted beneficial new technology. Medicare has been fairly consistent about adjusting RBRVS (Resource Based Relative Value Schedule) as well as creating HCPCS codes for new devices, and the American Medical Association has been fairly consistent about adding new CPT, common procedural terminology) codes for new technology. Funding has been available for new technology.

Payment for tests and vaccinations is an important public social issue. The government, through regulations and reimbursement policy, requires some services (such as child vaccinations) and encourage others through benefit mandates and reimbursement.

Insurers are even promoting genetic testing in a non-controversial way. It is mostly associated with diagnosing particular kinds of cancer to fine-tune the chemotherapy or other treatment. Most of you people in the audience work in health insurance. If your company is paying claims for patients with leukemia or other kinds of cancer, your company is probably paying for tissue testing for genetic markers.

Why Genetic Testing Can Threaten the Insurance Industry

While genetic testing promises huge advances in treatment, it may also cause adverse selection. Traditionally, insurers assume that the applicant may knows of risks that the insurer doesn't know about, and the applicant makes decisions based on that. The example everyone uses is the applicant knows his or her house is on fire, but the insurance company doesn't know it. The traditional ways of protecting include policy terms, underwriting, Medical Information Bureau checks, risk classification and risk rating.

Information from genetic testing can threaten the stability of certain kinds of insurance. For example, the people who test positive for diseases needing long-term care are more likely to buy LTC insurance. The technology for that to happen probably does not yet exist. However, a strong, predictive test for Alzheimer's, combined with a ban on insurers having access to that information, could cause insurers to stop selling LTC insurance.

So, if you're a health benefits insurer, in the future you will likely be paying for genetic tests for someone who wants to see if he or she is inclined to get Alzheimer's. The person likely to get Alzheimer's can then invest in long-term-care insurance, perhaps even from the company that paid for the genetic test! Insurance 101 teaches that a stable and competitive insurance industry is good for society, but *future* genetic testing could sharply reduce the availability of LTC insurance or other types of insurance.

Potential Societal Benefits of Underwriting

I'd offer another kind of social benefit of underwriting—beyond enabling a stable insurance industry. Underwriting can serve the public by identifying hidden but treatable conditions.

Currently, life insurers routinely test for hepatitis C—HCV. HCV infects approximately 2 percent of American adults under age 65. The disease can remain asymptomatic for decades, but it can progress to liver failure and death. HCV is largely undiagnosed because it's often asymptomatic for long periods.

Life insurance testing is one of the main ways people discover they have HCV. The disease is treatable and potentially curable through pharmaceuticals. Lifestyle changes, including giving up alcohol, can have a profound impact on the infected individuals' health. This is an example of how underwriting and individual's is in the public health interest.

I believe that the overlap of underwriting and the public good for HCV may extend more broadly to genetic testing. Genetic testing can help identify treatable or avoidable risks—which sounds like it's in the public interest. That commonality may very well exist, but if we don't discover it, we could face poorly conceived legislation that discourages genetic testing and hurts both the insurance industry and public health.

I think that genetic testing will be part of the routine physical of the 21st century. If I'm right, we need to add the results of genetic tests to the list of what the applicant can know about but the insurer doesn't. That can certainly lead to adverse selection, as individuals imminently facing some particular high risk choose to insure themselves against that risk. However, as described below, several factors may moderate the risk of adverse selection.

My view is that genetic tests are going to be followed fairly closely by effective treatments, given the rapid acceleration of medical technology and medical treatments. The connection between the two and the incredible acceleration in the progress of medicine suggests treatment or medical risk-amelioration will quickly follow many of the identified genetic conditions.

How Big a Risk?

Can genetic tests really tell the future? I think for most diseases the answer today is "No," and it's going to continue to be "No." The public is likely to overreact to the results of genetic tests. That could actually be a good thing for the insurance industry, depending on what kind of insurance you're selling. I use the term "likely low specificity." The technical term among genetic scientists is "low penetrance." That is, someone who gets genetic test results saying he or she is likely to die of heart failure or cancer (I could probably guarantee that now for most readers) is likely to overreact and run out and buy insurance. Genetic testing could lead to a surge of insurance buying!

I think that genetic testing will be part of the routine physical of the 21st century.

On the other hand, depending on what kind of insurance you're selling, this is potentially a huge threat. If you're in long-term care, if you're in long-term disability, people with the "clean" tests will avoid buying some kinds of insurance, especially if they also have healthy lifestyles. People who test positive for some of those conditions, or can cause adverse selection.

Particularly scary to me are unintended consequences of well-meaning legislation. We're close to the 35th anniversary of the federal Medicare program. Medicare benefits are still based on the benefit wisdom of the 1960s—there is no prescription drug benefit in Medicare because prescription drugs were not a big issue in the 1960s. The rules now being set for genetic testing, an emerging science, could be with us for a very long time. These rules could profoundly affect what insurers are allowed to do, the kinds of products they sell and the profitability of different lines of business.

Our industry, our profession, needs to identify a common ground for this emerging science that is, I hope, an unqualified good for public health, the future of our individual health and the insurance industry. To identify people at risk for treatable diseases is a common public good. Please support the efforts of the AAA to get actuaries involved in this great issue of our times.

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Incurred Health Claims:

One Lag Report is Not Enough

by Hank Frantz

Overview

The development (or lag) method is the preferred method among health insurance actuaries for making estimates of the unpaid claim liability (UCL) for medical benefit plans and other "short-term" health insurance plans. The starting point for the lag method is usually a single claim lag report, one that distributes the claims *paid* during an experience period on the basis of both the incurred date and the *paid* date of the claim. The standard output of the development method is in an estimate, or several estimates of the UCL, usually without a distribution of the UCL into its component parts: the liability for claims reported but not paid (RBNP) and the liability for claims incurred but not reported (IBNR).

This article illustrates a variation of the development method that utilizes additional claim lag reports, ones which distribute *reported* claims on the basis of incurred date and *reported* date and that incorporates an estimate of the RBNP as a key step toward evaluating the total UCL. The article also discusses information that is often available for purposes of estimating the RBNP and concludes with an opinion concerning appropriate disclosure and actuarial standards of practice with regard to the estimation of the UCL.

Tradition of Using Paid Claim Data

The actuarial literature includes numerous papers describing variations of the development method. The earliest SOA publication on the development method appears to date from the mid-1960s. Several informative articles and SOA meeting transcripts focusing on the development method were published by the Society in 1985 through 1990. During the 1990s the Casualty Actuarial Society continued to publish articles on the development method that incorporated credibility calculations and statistical concepts into the estimation process.

In all of the published SOA sources that I reviewed, the development method clearly refers to a method relying on a single claim lag report which distributes claims paid in an experience period on the basis of date incurred and date paid, usually month incurred and month paid. That observation is consistent with discussions that I have had over the years with colleagues, with the current SOA study note on health reserves and with the definition of the development method that was included in the first two editions of Actuarial Standard of Practice No. 5:

> *…methods under which historical claim data, such as the number and amount of claims for the subject line of business, are recorded by period incurred and period paid, and this development pattern is used to estimate the future development of existing claims as of the valuation date.*

The current version of ASOP No. 5, thanks to the comments of an actuary who reviewed the exposure draft of this standard, makes it clear that the development method may be based on reported claims as well as paid claims. The standard goes on to say that when applying the development method:

> *[t]he actuary should consider processing fluctuations due to seasonality, claims processing practices, inflation, or significant changes in medical practices.*

ASOP No. 5 does not offer any suggestions as to how one should "consider" those fluctuations.

What's Normal vs. What's Perfect

Practicing health care actuaries know that there are many factors influencing the utility of a paid claim lag report. Many of these factors are enumerated in all three editions of ASOP No. 5 and in the actuarial literature. The health care actuary who attempts to employ the development method by starting with a claim lag report based on incurred dates and paid dates often poses questions that begin with:

> "What would this lag report have looked like, if…"

and end with a description of some type of disruption that has occurred in the "normal" processing of claims. For example, the disruptions may involve employee turnover in the claims department, problems in the mail room or, perhaps the most traumatic of all disruptive forces, computer system-related problems.

In many cases, a better question for the actuary to ask is:

> "What would this lag report have looked like if all the valid claims were paid the same day they were received?"

That question can be answered, at least approximately, without trying to decide what the "normal" payments might have been. The answer is that the

claim lag report would resemble the sum of two claim lag reports, each based on incurred dates and reported dates:

Claims paid in the experience period.

Claims reported that remain unpaid as of the end of the experience period (i.e. RBNP claims).

The challenge, of course, would be to estimate both the size of the RBNP (or "claims inventory" or "claims backlog") and its distribution by incurred date. Fortunately it is a challenge that can be met for many claims processing operations.

Since this enhanced development method uses three dates, I refer to it as the "3D method."

The 3D Method: An Example

This numerical example, comparing the 3D method with the traditional 2D method, is based on information for the commercial group business of an HMO that had experienced considerable growth over a short period of time and was having difficulty in paying claims in a timely manner. I have condensed the original claims information into 12 months, rather than the 24 months that were available.

Table 1 on page 10 is the traditional claim lag report that distributes, on the basis of month incurred and month paid, the $97.5 million of claims paid in the 12-month experience period ending 10/31/2001, while Table 2 on page 10 distributes the same claims on the basis of month incurred and month reported. Table 3 on page 11 distributes the estimated $11.1 million of claims RBNP as of 10/31/2001 on the basis of month incurred and month reported. Methods for estimating these claims are discussed in a separate section of this article. For example, when submitted charge information is available, estimates of claim-to-charge ratios may be used to estimate the company's liability for those claims.

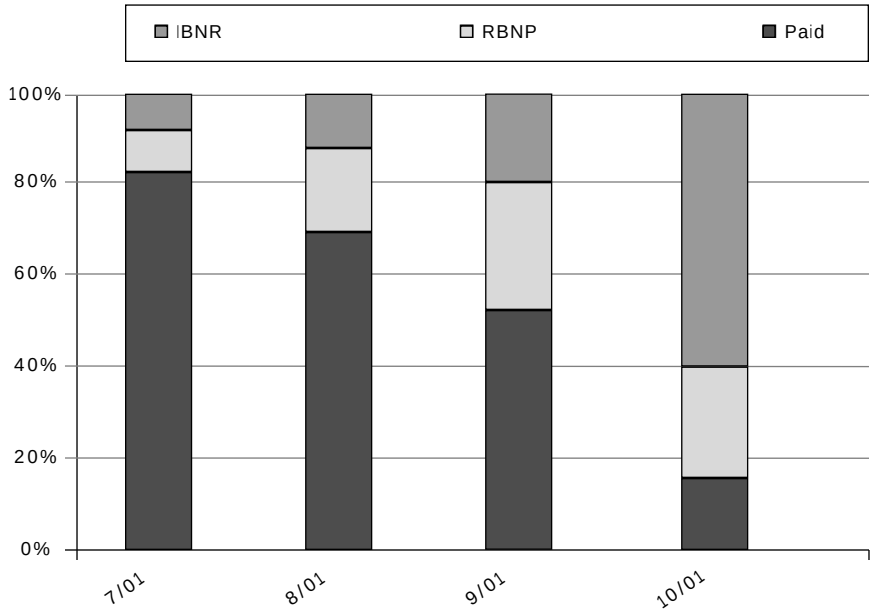
Reported But Not Paid Claims

The first fruits of the 3D method are shown in column 9 of Table 4 on page 11: an estimate of the RBNP at the beginning of the experience period and at the end of each month in the experience period. The numbers required for these estimates are derived from Tables 1, 2 and 3 by summing the appropriate rows of those tables and inserting them in columns 2, 3 and 7, respectively, of Table 4. After converting the monthly totals to a cumulative basis (columns 4, 5 and 8), the RBNP at the end of each month is simply the difference between what has been reported (columns 5 and 8) and what has been paid (column 4).

At this point, the actuary using the 3D method should compare the estimated RBNP shown in column 9 with end-of-month claims inventory information that was available during the experience period. For example, if end-of-month counts of claims or claim submission forms are available, do the implied average claim sizes or average claims per claim form make sense? If end-of-month submitted charges are available, do the implied paid-to-billed charges make sense?

Incurred Claims: 3D Method

Distribution of Incurred Claims by Month



(continued on page 10)

Table 1
CLAIMS PAID 11/2000 - 10/2001 BY MONTH INCURRED AND MONTH PAID [Total Payments: $97,481,133]

Month	Month Incurred												
Paid	Pre-Nov 00	11/2000	12/2000	1/2001	2/2001	3/2001	4/2001	5/2001	6/2001	7/2001	8/2001	9/2001	10/2001
11/2000	5,130,889	248,344	0	0	0	0	0	0	0	0	0	0	0
12/2000	3,465,586	1,349,610	259,892	0	0	0	0	0	0	0	0	0	0
1/2001	1,546,097	2,977,460	1,750,259	238,791	0	0	0	0	0	0	0	0	0
2/2001	884,005	768,626	1,903,759	1,737,043	307,053	0	0	0	0	0	0	0	0
3/2001	548,021	480,338	1,845,867	2,904,971	2,289,810	835,362	0	0	0	0	0	0	0
4/2001	382,164	380,989	348,246	1,027,147	2,093,904	2,177,188	814,215	0	0	0	0	0	0
5/200	372,511	90,721	116,112	421,713	479,781	2,425,220	2,275,012	672,211	0	0	0	0	0
6/2001	195,296	148,325	58,180	101,771	485,445	609,740	1,712,339	1,668,060	423,563	0	0	0	0
7/2001	-176,446	6,742	12,128	48,536	120,460	459,916	886,973	4,333,492	2,082,953	791,360	0	0	0
8/2001	-140,647	-5,430	7,575	13,046	66,353	149,282	405,293	2,673,965	5,081,060	2,000,996	953,356	0	0
9/2001	94,128	25,294	24,219	118,719	109,600	119,301	100,990	857,451	1,578,674	3,597,852	1,948,891	733,247	0
10/2001	38,356	20,666	10,575	29,392	34,698	79,448	126,432	541,552	1,379,658	3,576,636	6,651,652	3,848,747	1,112,352
Total	$12,339,961	$6,491,685	$6,336,813	$6,641,129	$5,987,106	$6,855,458	$6,321,254	$10,746,731	$10,545,908	$9,966,844	$9,553,899	$4,581,994	$1,112,352

Table 2
CLAIMS PAID 11/2000 - 10/2001 BY MONTH INCURRED AND MONTH REPORTED [Total Payments: $97,481,133]

Month	Month Incurred												
Reported	Pre-Nov 00	11/2000	12/2000	1/2001	2/2001	3/2001	4/2001	5/2001	6/2001	7/2001	8/2001	9/2001	10/2001
Pre-Nov 00	6,517,377	0	0	0	0	0	0	0	0	0	0	0	0
11/2000	3,805,538	2,286,775	0	0	0	0	0	0	0	0	0	0	0
12/2000	862,967	2,965,281	2,382,922	0	0	0	0	0	0	0	0	0	0
1/2001	502,642	620,400	2,887,974	2,720,349	0	0	0	0	0	0	0	0	0
2/2001	356,556	290,379	790,386	2,589,548	2,205,323	0	0	0	0	0	0	0	0
3/2001	152,270	119,215	162,915	810,096	2,756,064	3,073,811	0	0	0	0	0	0	0
4/2001	49,291	131,528	69,497	252,995	568,433	2,815,937	2,864,386	0	0	0	0	0	0
5/2001	33,996	36,494	17,631	134,556	357,021	667,301	2,782,067	4,509,465	0	0	0	0	0
6/2001	20,422	4,674	12,010	89,026	52,653	114,179	453,814	4,979,034	4,842,610	0	0	0	0
7/2001	18,690	6,027	6,873	17,701	30,195	104,638	158,112	857,596	4,639,012	4,745,903	0	0	0
8/2001	15,838	20,186	5,640	20,906	11,488	73,054	42,977	338,521	859,537	4,650,572	5,190,355	0	0
9/2001	2,182	9,111	793	4,675	5,047	4,755	16,435	43,779	186,519	460,185	4,179,136	3,137,439	0
10/2001	2,190	1,616	171	1,278	883	1,783	3,462	18,335	18,230	110,184	184,407	1,444,555	1,112,352
Total	$12,339,961	$6,491,685	$6,336,813	$6,641,129	$5,987,106	$6,855,458	$6,321,254	$10,746,731	$10,545,908	$9,966,844	$9,553,899	$4,581,994	$1,112,352

Table 3
ESTIMATED CLAIMS REPORTED BUT NOT PAID [RBNP] AS OF 10/31/01, BY MONTH INCURRED AND MONTH REPORTED [Estimated Claims: $11,055,531]

Month	Month Incurred												
Paid	Pre-Nov 00	11/2000	12/2000	1/2001	2/2001	3/2001	4/2001	5/2001	6/2001	7/2001	8/2001	9/2001	10/2001
11/2000	0	0	0	0	0	0	0	0	0	0	0	0	0
12/2000	0	0	0	0	0	0	0	0	0	0	0	0	0
1/2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2/2001	0	0	0	0	0	0	0	0	0	0	0	0	0
3/2001	0	0	0	0	0	0	0	0	0	0	0	0	0
4/2001	0	0	0	0	0	0	0	0	0	0	0	0	0
5/2001	0	0	0	0	0	0	0	0	0	0	0	0	0
6/2001	122	191	61	0	0	0	34	13,676	56,265	0	0	0	0
7/2001	382	0	0	13,054	0	41	0	28,487	68,367	3,367	0	0	0
8/2001	11,112	1,602	25,364	12,900	1,494	4,460	2,499	513,613	71,142	304,432	187,746	0	0
9/2001	30,846	14,108	6,111	22,669	11,335	24,247	123,454	333,051	107,525	322,261	1,396,297	552,833	0
10/2001	69,942	120,054	23,105	60,143	15,525	40,603	76,354	173,502	255,113	733,580	1,003,004	2,041,573	2,177,877
Total	$112,404	$135,956	$54,641	$108,766	$28,354	$69,351	$202,342	$1,062,328	$558,412	$1,363,649	$2,587,047	$2,594,406	$2,177,877

Table 4: HINDSIGHT ANALYSIS: RBNP CLAIMS

	Paid Claims Information					RBNP as of 10/31/01		
	Paid claims By Month		Cummulative Through End of Month			Estimated	Estimated	Estimated
Month	Paid In Month	Reported In Month	Paid	Reported	RBNP End of Month	Reported thru Month	Reported Thru Month	RBNP As of End of Month
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Pre-Nov00	-	6,517,377	-	6,517,377	6,517,377	0	0	$6,517,377
11/2000	5,379,233	6,092,313	5,379,233	12,609,690	7,230,457		0	$7,230,457
12/2000	5,075,088	6,211,170	10,454,322	18,820,861	8,366,539	0	0	$8,366,539
1/2001	6,512,606	6,731,365	16,966,928	25,552,226	8,585,298	0	0	$8,585,298
2/2001	5,600,486	6,232,192	22,567,414	31,784,419	9,217,005	0	0	$9,217,005
3/2001	8,904,370	7,074,370	31,471,784	38,858,788	7,387,005	0	0	$7,387,005
4/2001	7,223,853	6,752,067	38,695,636	45,610,855	6,915,219	0	0	$6,915,219
5/2001	6,853,280	8,538,531	45,548,917	54,149,386	8,600,470	0	0	$8,600,470
6/2001	5,402,720	10,568,423	50,951,637	64,717,810	13,766,173	70,349	70,349	$13,836,522
7/2001	8,566,115	10,584,747	59,517,751	75,302,557	15,784,806	113,708	184,056	$15,968,862
8/2001	11,204,849	11,229,072	70,722,600	86,531,629	15,809,030	1,136,364	1,320,420	$17,129,450
9/2001	9,308,367	8,050,057	80,030,967	94,581,686	14,550,719	2,944,736	4,265,156	$18,815,875
10/2001	17,450,165	2,899,446	97,481,133	97,481,133	0	6,790,374	11,055,531	$11,055,531

(continued on page 12)

Unpaid Claim Liability Estimates: 3D vs. 2D

Table 5 on page 13 consists of all relevant reported claims and is the sum of Tables 2 and 3. *This* is the claim lag report that is used to estimate claims incurred through 10/31/2001. Table 6 on page 13 is derived from Table 5 by converting the claims incurred each month to a cumulative and "reporting duration" or "lag month" basis. For purposes of calculating completion factors, let $CR(i, d)$ = claims incurred in month i that were reported through reporting duration d, with i = 1 through 12 (11/2000 through 10/2001) and d = 0 through 11.

Table 6A on page 15 includes only claims paid in the experience period and is the incurred date-paid date version of Table 6. It is derived from Table 1. Let CP(i,d) = claims incurred in month i that were paid through "paid duration" d, with i and d as previously defined.

At this point, the actuary should apply his favorite method for calculating completion percentages, keeping in mind that the percentages used with the 3D method represent the percentage of claims incurred that have been *reported* through a given reporting duration. I chose to use the "chain-ladder" method and have included the details in Table 7 on page 15, with reported completion factors calculated in the left half of the table and paid completion factors calculated in the right half. For example, the reported completion ratio for duration 10 is CR(1,10)/CR(1,11), the completion ratio for duration 9 is [CR(1,9)+CR(2,9)]/[CR(1,10)+CR(2,10)], etc. The completion factors for duration 11 and higher are assumed to be 1.000, while the completion factor for duration n < 11 is the product of the completion ratio for duration n times the completion factor for duration n+1 (for n>=0). The paid completion ratios and factors are calculated in a similar way from the various CP(i,d)'s.

Table 8 on page 16 continues the calculation by dividing the appropriate completion factors developed in Table 7 into the appropriate cumulative claims. Note that for comparison purposes, two estimates are obtained, with Estimate 1 based on the 3D method and Estimate 2 based on the 2D method. Performing the usual arithmetic results in two estimates of the UCL and two estimates of monthly claims incurred PMPM.

At this point in the estimation process most actuaries will adjust the estimated incurred claims for "reasonableness" or some other criteria, such as completion percentages that seem too low or too volatile to be useful, especially if the implied claims PMPM for "recent" months do not meet hopes or expectations. In this case, the estimated claims for October would probably be adjusted by most actuaries on the basis of low completion percentages, low claims PMPM (3D method) or high claims PMPM (2D method). The results for August and September also look suspect and appear too high or too low, depending on the method. On the other hand, with reported claim completion percentages in excess of

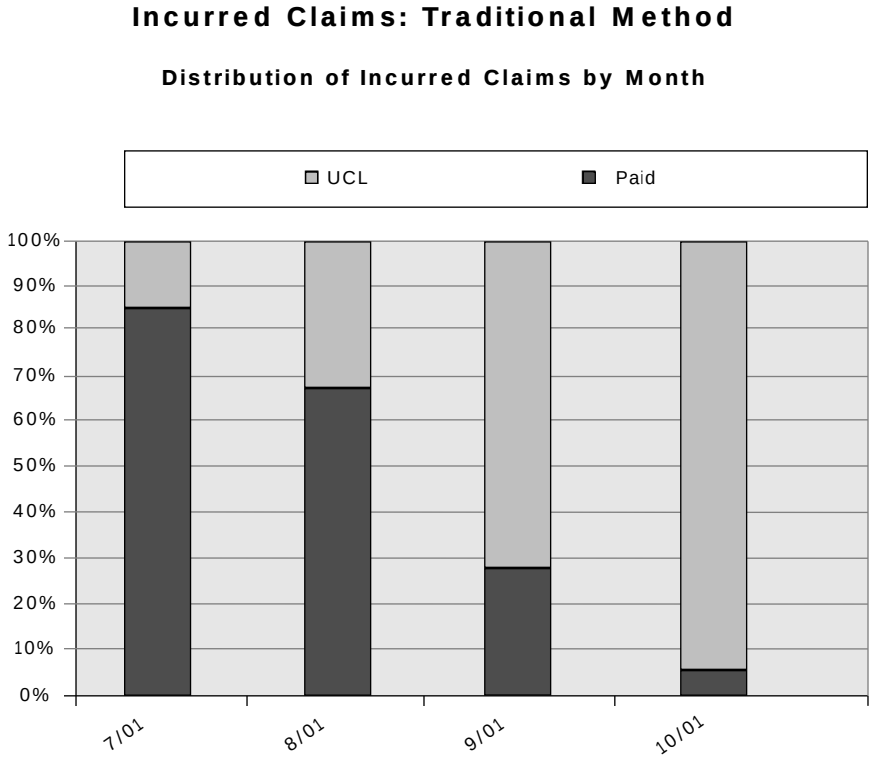


Table 5
REPORTED CLAIMS (PAID OR RBNP) AS OF 10/31/2001, BY MONTH INCURRED AND MONTH REPORTED [Total Estimated Claims: $108,536,663]

Month	Month Incurred												
Reported	Pre-Nov 00	11/2000	12/2000	1/2001	2/2001	3/2001	4/2001	5/2001	6/2001	7/2001	8/2001	9/2001	10/2001
Pre-Nov 00	6,517,377	0	0	0	0	0	0	0	0	0	0	0	0
11/2000	3,805,538	2,286,775	0	0	0	0	0	0	0	0	0	0	0
12/2000	862,967	2,965,281	2,382,922	0	0	0	0	0	0	0	0	0	0
1/2001	502,642	620,400	2,887,974	2,720,349	0	0	0	0	0	0	0	0	0
2/2001	356,556	290,379	790,386	2,589,548	2,205,323	0	0	0	0	0	0	0	0
3/2001	152,270	119,215	162,915	810,096	2,756,064	3,073,811	0	0	0	0	0	0	0
4/2001	49,291	131,528	69,497	252,995	568,433	2,815,937	2,864,386	0	0	0	0	0	0
5/2001	33,996	36,494	17,631	134,556	357,021	667,301	2,782,067	4,509,465	0	0	0	0	0
6/2001	20,544	4,865	12,071	89,026	52,653	114,179	453848	4,992,710	4,898,875	0	0	0	0
7/2001	19,072	6,027	6,873	30,755	30,195	104,679	158,112	886,083	4,707,380	4,79,279	0	0	0
8/2001	26,950	21,788	31,004	33,806	12,982	77,515	45,477	852,134	930,678	4,955,004	5,378,101	0	0
9/2001	33,028	23,219	6,904	27,343	16,382	29,002	139,890	376,830	294,043	782,446	5,575,433	3,690,272	0
10/2001	72,132	121,670	23,277	61,421	16,408	42,386	79,817	191,836	273,343	843,764	1,187,411	3,486,128	3,290,229
Total	$12,452,364	$6,627,641	$6,391,454	$6,749,895	$6,015,460	$6,924,809	$6,523,596	$11,809,059	$11,104,319	$11,330,492	$12,140,945	$7,176,399	$3,290,229

Table 6
CUMMULATIVE REPORTED CLAIMS BY INCURRED MONTH AND REPORTING DURATION

Reporting	Month Incurred											
Duration	11/2000	12/2000	1/2001	2/2001	3/2001	4/2001	5/2001	6/2001	7/2001	8/2001	9/2001	10/2001
0	2,286,775	2,382,922	2,720,349	2,205,323	3,073,811	2,864,386	4,509,465	4,898,875	4,749,279	5,378,101	3,690,272	$3,290,229
1	5,252,056	5,270,897	5,309,896	4,961,387	5,889,747	5,646,453	9,502,175	9,606,255	9,704,282	10,953,534	$7,176,399	-
2	5,872,456	6,061283	6,119,993	5,529,819	6,557,049	6,100,301	10,388,259	10,536,933	10,486,729	$12,140,945	-	-
3	6,162,835	6,224,197	6,372,988	5,886,841	6,671,227	6,258,413	11,240,392	10,830,977	$11,330,492	-	-	-
4	6,282,050	6,293,695	6,507,544	5,939,494	6,775,907	6,303,889	11,617,222	$11,104,319	-	-	-	-
5	6,413,578	6,311,326	6,596,570	5,969,689	6,853,421	6,443,779	$11,809,059	-	-	-	-	-
6	6,450,072	6,323,396	6,627,324	5,982,670	6,882,423	$6,523,596	-	-	-	-	-	-
7	6,454,937	6,330,270	6,66,130	5,999,052	$6,924,809	-	-	-	-	-	-	-
8	6,460,964	6,361,273	6,688,473	$6,015,460	-	-	-	-	-	-	-	-
9	6,482,752	6,368,177	$6,749,895	-	-	-	-	-	-	-	-	-
10	6,505,971	$6,391,454	-	-	-	-	-	-	-	-	-	-
11	$6,627,641	-	-	-	-	-	-	-	-	-	-	- -

(continued on page 14)

80 percent, the incurred claim estimates obtained from the 3D method should probably be assigned a high credibility.

It is worth noting that reported completion factors are not only higher than paid completion factors, they appear to have a lower variability, at least with respect to a single estimate of the RBNP. In essence, the variability in paid completion percentages caused by variations in the rate of claim payment has been replaced with the variation in estimates of the RBNP claims. In order to test the variability of the reported completion percentages, it is necessary to calculate them using alternate assumptions concerning the RBNP claims.

Hindsight Analyses

As with the 2D method, judgment must also be used with the 3D method, but in this case, judgment can be applied separately to both the RBNP estimate and the IBNR estimate. The reasonableness of the RBNP estimates were discussed when Table 4 was presented. The RBNP estimates can be subjected to additional scrutiny along with the IBNR and claims PMPM estimates. Tables 9, 10 and 11 are a three-part report package that provides hindsight estimates of the total UCL (for each available end-of-month valuation date), the split of the UCL into RBNP and IBNR parts, and a split of the IBNR into claims "run out" and a residual IBNR as of 10/31/2001.

Obtaining Table 9 on page 16 is a straightforward application of previously developed information. The function of Table 10 is to obtain information about claims that were unreported at some point during the experience period but were reported by 10/31/2001. It is calculated along the same lines as Table 4.

...insurance companies have always been required to perform an "aging analysis" that estimates the RBNP at the end of the financial reporting period...

First, take the sums of rows and columns from Tables 2 and 3 and insert in columns 2, 3 and 7 of Table 10 on page 17. Then, convert the monthly information to cumulative information to create columns 4, 5 and 8. Finally, subtract what has been reported through 10/31/2001 from what was reported through the valuation date to obtain what was reported through 10/31/2001 but was unreported as of the valuation date. The two IBNR columns (6 and 10) are transferred to Table 11.

Exposure information is included in Table 11 on page 17 to help estimate the impact of the change in enrollment on the IBNR. As is the case with the 2D method, the focus should be on recent months. The IBNR is a function of the level of incurred claims and the time lag between the incurred date and the reported date and is independent of variations in claim processing time. The time lag between incurred date and reported date can be analyzed to produce weights for the monthly enrollment prior to the valuation date. For purposes of the example, I created an exposure unit equal to the weighted average of the enrollment for the valuation month (weight = 4/7), the previous month (2/7) and the month before that (1/7). The analysis suggests that perhaps the IBNR as of 8/31/2001 is a little high while the IBNR as of 10/31/2001 may be a little low. Although we already suspected this was the case, the analysis suggests that we should check the portion of our estimated RBNP as of 10/31/2001 for claims that were incurred in August 2001 but were reported after that date.

Estimating the RBNP Claims

A key step in applying the 3D development method is to estimate the RBNP as of the end of the experience period, 10/31/2001 in the example. It is necessary to estimate both the dollar value of claims and the distribution of those dollars by their incurred dates. For statutory reporting purposes, insurance companies have always been required to perform an "aging analysis" that estimates the RBNP at the end of the financial reporting period and distributes the estimate on the basis of dates that the claims were reported to the company. There are a variety of techniques that can be used to obtain the required distribution by incurred date, depending on the available information.

The Electronic Backlog

For many companies, a combination of electronic claim submissions and scanning of manually submitted claim forms results in an RBNP database that includes submitted charges, date of service, date reported and type of claim (e.g. institutional vs. non-institutional). The appropriately quantified RBNP can be obtained by estimating a set of claim-to-charge ratios that vary by month incurred, type of service and any other promising variable (e.g. month reported). The claim-to-charge ratios are obviously influenced by applicable provider contracting arrangements and may also be influenced by more subtle factors. These factors include, for example, practices regarding the reporting of encounter data on capitated services, an increase in duplicate claims due to delays in making timely payments, changes in provider filing practices or changes in claim payment practices.

In any event, the estimated claim-to-charge ratios should be supported by a historical analysis of all claims submitted and eventually adjudicated. As is always the case, the actuary must apply judgment in using historical studies.

The Paper Backlog

Part of the claim backlog may be in a "pre-processed" state and not as quantified as the

Table 6A
CUMMULATIVE PAID CLAIMS BY INCURRED MONTH AND PAID DURATION

Paid Duration		Month Incurred											
		11/2000	12/2000	1/2001	2/2001	3/2001	4/2001	5/2001	6/2001	7/2001	8/2001	9/2001	10/2001
0		$248,344	$259,892	$238,791	$307,053	$835,362	$814,215	$672,211	$423,563	$791,360	$953,356	$733,247	$1,112,352
1		1,597,954	2,010,151	1,975,834	2,596,864	3,012,550	3,089,226	2,340,270	2,506,516	2,792,356	2,902,247	$4,581,994	-
2		4,575,414	3,913,910	4,880,805	4,690,768	5,437,771	4,801,565	6,673,762	7,587,576	6,390,208	$9,553,899	-	-
3		5,344,040	5,759,777	5,907,952	5,170,550	6,047,510	5,688,538	9,347,727	9,166,250	$9,966,844	-	-	-
4		5,824,378	6,108,023	6,329,665	5,655,995	6,507,427	6,093,832	10,205,178	$10,545,908	-	-	-	-
5		6,205,367	6,224,135	6,431,436	5,776,455	6,656,708	6,194,822	$10,746,731	-	-	-	-	-
6		6,296,088	6,282,315	6,479,972	5,842,808	6,776,010	$6,321,254	-	-	-	-	-	-
7		6,444,412	6,294,443	6,493,018	5,952,408	$6,855,458	-	-	-	-	-	-	-
8		6,451,154	6,302,019	$6,611,737	$5,987,106								
9		6,445,724	6,326,238	$6,641,129	-	-	-	-	-	-	-	-	-
10		6,471,019	$6,336,813	-	-	-	-	-	-	-	-	-	-
11		$6,491,685	-	-	-	-	-	-	-	-	-	-	-

Table 7
DEVELOPMENT OF COMPLETION FACTORS

REPORTED Completion Factors					PAID Completion Factors				
Reporting Duration	Numerator	Denominator	Completion Ratio	Reported Completion Factor	Paid Duration	Numerator	Denominator	Completion Ratio	Paid Completion Factor
11& Up		*Assumption:*	1.00000	100.00%	11 & Up		*Assumption:*	1.00000	100.00%
10	6,505,971	6,627,641	0.98164	98.16%	10	6,471,019	6,491,685	0.99682	99.68%
9	12,850,929	12,897,425	0.99639	97.81%	9	12,771,962	12,807,832	0.99720	99.40%
8i	19,510,711	19,600,824	0.99540	97.36%	8	19,364,910	19,413,091	0.99752	99.16%
7	25,445,389	25,526,171	0.99684	97.05%	7	25,184,281	25,352,015	0.99338	98.50%
6	32,265,886	32,370,198	0.99678	96.74%	6	31,677,192	32,039,740	0.98868	97.39%
5	38,588,363	38,789,482	0.99482	96.24%	5	37,488,923	37,998,446	0.98659	96.08%
4	49,719,801	50,397,421	0.98655	94.94%	4	46,724,497	48,235,654	0.96867	93.07%
3	59,647,871	60,824,120	0.98066	93.11%	3	52,432,344	57,270,405	0.91552	85.21%
2	67,652,821	70,978,363	0.95315	88.75%	2	48,951,780	62,399,188	0.78449	66.84%
1	72,096,682	79,793,766	0.90354	80.19%	1	24,823,969	58,505,678	0.42430	28.36%
0	38,759,557	79,273,082	0.48894	39.21%	0	6,277,394	29,405,963	0.21347	6.05%

(continued on page 16)

Table 8
ESTIMATES OF INCURRED CLAIMS AND UCL AS OF 10/31/2001

	Inc. In Month Reported* Through 10/31/02	Reported Completion Factor	Estimate 1 of Incurred Claims*	Inc. In Month Paid* Through 10/31/02	Paid Completion Factor	Estimate 2 of Incurred Claims*	Estimate 1 UCL As of 10/31/02	Estimate 2 UCL As of 10/31/02	Members Enrolled	Estimate 1 Incurred Claims PMPM	Estimate 2 Incurred Claims PMPM	Estimate 1 Divided By Estimate 2
Pre-Nov 00	$12,452,364	-	$12,452,364	$12,339,961	-	$12,339,961	$112,404	$0	-	-	-	-
11/2000	6,627,641	100.0%	6,627,641	6,491,685	100.0%	6,491,685	135,956	0	55,408	$119.62	$117.16	1.021
12/2000	6,391,454	98.16%	6,510,982	6,336,813	99.68%	6,357,051	174,170	20,238	54,668	119.06	116.24	1.024
1/2001	6,749,895	97.81%	6,901005	6,641,129	99.40%	6,681,049	259,876	39,921	49,862	138.40	133.99	1.033
2/2001	6,015,460	97.36%	6,178,534	5,987,106	99.16%	6,038,081	191,428	50,975	50,240	122.98	120.19	1.023
3/2001	6,924,809	97.05%	7,135,115	6,855,458	98.50%	6,959,875	279,656	104,416	53,524	133.31	130.03	1.025
4/2001	6,523,596	96.74%	6,743,447	6,321,254	97.39%	6,490,983	422,193	169,729	53,830	125.27	120.58	1.039
5/2001	11,809,059	96.24%	12,270,657	10,746,731	96.08%	11,185,270	1,523,926	438,539	92,762	132.28	120.58	1.097
6/2001	11,104,319	94.94%	11,695,625	10,545,908	93.07%	11,331,244	1,149,717	785,336	92,756	126.09	122.16	1.032
7/2001	11,330,492	93.11%	12,169,175	9,966,844	85.21%	11,697,209	2,202,331	1,730,365	93,597	130.02	124.97	1.040
8/2001	12,140,945	88.75%	13,680,593	9,553,899	66.84%	14,292,746	4,126,695	4,738,848	92,734	147.52	154.13	0.957
9/2001	7,176,399	80.19%	8,949,787	4,581,994	28.36%	16,155,349	4,367,794	11,573,355	91,677	97.62	176.22	0.554
10/2001	3,290,229	39.21%	8,392,264	1,112,352	6.05%	18,372,159	7,279,912	17,259,806	89.851	93.40	204.47	0.457
Total	$108,536,663	-	$119,707,190	$97,481,133	-	$134,392,661	$22,226,057	$36,911,528	-	-	-	-
12 Months Ending 10/31/2001		-	$107,254,825	-	-	122,052,700	-	-	870,928	$123.15	$140.14	0.879

*Less those claims paid prior to 11/1/200

Table 9
HINDSIGHT ANALYSIS: UNPAID CLAIM LIABILITY

Valuation Date	Incurred Through Valuation Date*	Inc. & Paid Through Valuation Date*	UCL as of Valuation Date	RBNP as of Valuation Date	IBNR as of Valuation Date
10/31/00	12,452,364	0	12,452,364	$6,517,377	$5,934,987
11/30/00	19,080,005	5,379,233	13,700,772	$7,230,457	$6,470,315
12/31/00	25,590,988	10,454,322	15,136,666	$8,366,539	$6,770,127
1/31/01	32,491,992	16,966,928	15,525,065	$8,585,298	$6,939,766
2/28/01	38,670,526	22,567,414	16,103,112	$9,217,005	$6,886,107
3/31/01	45,805,641	31,471,784	14,333,857	$7,387,005	$6,946,852
4/30/2001	52,549,088	38,695,636	13,853,452	$6,915,219	$6,938,233
5/31/01	64,819,745	45,548,917	19,270,828	$8,600,470	$10,670,358
6/30/01	76,515,369	50,951,637	25,563,733	$13,836,522	$11,727,211
7/31/01	88,684,545	59,517,751	29,166,793	$15,968,862	$13,197,931
8/31/01	102,65,138	70,722,600	31,642,538	$17,129,450	$14,513,088
9/30/01	111,314,925	80,030,967	31,283,958	$18,815,875	$12,468,083
10/31/01	$119,707,190	$97,481,133	$22,226,057	$11,055,531	$11,170,527

* Less those claims paid prior to 11/1/2000

Table 10: HINDSIGHT: IBNR ON CLAIMS REPORTED AFTER VALUATION DATE

	Claims Paid Though 10/31/01					RBNP as of 10/31/01			
Valuation Date	Incurred Through Valuation Date *	Reported Through Valuation Date *	Cummulative Incurred Through Val. Date *	Cummulative Reported Through Val. Date *	IBNR as of Val. date Paid By 10/31/02	Estimated Incurred in Month	Estimated Incurred Through Month	Estimated Reported Through Month	IBNR as of Val. Date RBNP by 10/31/02
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
10/31/00	$12,339,961	$6,517,377	$12,339,961	$6,517,377	$5,822,583	$112,404	$112,404	$0	$112,404
11/30/00	6,491,685	6,092,313	18,831,646	12,609,690	6,221,955	135,956	248,359	0	248,359
12/31/00	6,336,813	6,211,170	25,168,459	18,820,861	6,347,598	54,641	303,001	0	303,001
1/31/01	6,641,129	6,731,365	31,809,587	25,552,226	6,257,361	108,766	411,766	0	411,766
2/28/01	5,987,106	6,232,192	37,796,693	31,784,419	6,012,275	28,354	440,121	0	440,121
3/31/01	6,855,458	7,074,370	44,652,152	38,858,788	5,793,363	69,351	509,471	0	509,471
4/30/01	6,321,254	6,752,067	50,973,406	45,610,855	5,362,550	202,342	711,813	0	711,813
5/31/01	10,746,731	8,538,531	61,720,136	54,149,386	7,570,750	1,062,328	1,774,141	0	1,774,141
6/30/01	10,545,908	10,568,423	72,266,044	64,717,810	7,548,235	558,412	2,332,553	70,349	2,262,204
7/31/01	9,966,844	10,584,747	82,232,888	75,302,557	6,930,331	1,363,649	3,696,202	184,056	3,512,145
8/31/01	9,553,899	11,229,072	91.786.787	86.531.629	5.255.157	.2,587,047	6,283,248	1,320,420	4,962,828
9/30/01	4,581,994	8,050,057	96,368,780	94,581,686	1,787,094	2,594,406	8,877,654	4,265,156	4,612,498
10/31/01	$1,112,352	$2,899,446	$97,481,133	$97,481,133	$0	$2,177,877	$11,055,531	$11,055,531	$0

* Less those claims paid prior to 11/1/2000

Table 11: HINDSIGHT ANALYSIS: IBNR

* Less those claims paid prior to 11/1/2000 ** Weighted average of enrollment for three months ending with valuation date.

Valuation Date	IBNR as of Valuation Date *	IBNR as of Val. Date, Paid by 10/31/02	IBNR as of Val. Date, RBNP by 10/31/02	Residual IBNR as of 10/31/02	Members Enrolled	IBNR Exposure **	IBNR Per Exposure **	Vs. Average IBNR Per Exposure **
8/31/00	-	-	-	-	54,033			
9/30/00	-	-	-	-	55,603			
10/31/00	$5,934,987	$5,822,583	$112,404	$0	55,590	55,371	107.19	81.9%
11/30/00	6,470,315	6,221,955	248,359	0	55,408	55,488	116.61	89.1%
12/31/00	6,770,127	6,347,598	303,001	119,528	54,688	55,023	123.04	94.0%
1/31/01	6,939,766	6,257,361	411,766	270,639	49,862	52,033	133.37	101.9%
2/28/01	6,886,107	6,012,275	440,121	433,712	50,240	50,767	135.64	103.7%
3/31/01	6,946,852	5,793,363	509,471	644,018	53,524	52,063	133.43	102.0%
4/30/01	6,938,233	5,362,550	711,813	863,869	53,830	53,230	130.34	99.6%
5/31/01	10,670,358	7,570,750	1,774,141	1,325,467	92,762	76,033	140.34	107.3%
6/30/01	11,727,211	7,548,235	2,262,204	1,916772	92,756	87,197	134.49	102.8%
7/31/01	13,197,931	6,930,331	3,512,145	2,755,455	93,597	93,237	141.55	108.2%
8/31/01	14,513,088	5,255,157	4,962,828	4,295,103	92,734	92,984	156.08	119.3%
9/30/01	12,468,083	1,787,094	4,612,498	6,068,491	91,677	92,253	135.15	103.3%
10/31/01	$11,170,527	$0	$0	$11,170,527	89,851	90,784	123.04	94.0%
					Average, 10/00 through 7/01		130.83	100.0%

* Less those claims paid prior to 11/1/00

** Weighted average of enrollment for three months ending with valuation date.

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electronic backlog. For example, there may be a delay between receipt of a claim form in the mail room and the scanning of the claim form into a nicely quantified record. Fortunately, the pre-processed portion of the total claims inventory is often only a relatively small portion of the total inventory.

It is possible that only a claim form count (by type of claim form) may be available for such claims. These pre-processed claims can be distributed by incurred date on an estimated basis by using an assumed distribution of incurred dates based on an appropriate study of the available claims history. The distributed claim counts can be converted to submitted charges or estimated claims by making assumptions about charges per claim and claim-to-billed ratios.

Almost Fully Adjudicated Claims

Part of the claim backlog may consist of claims for which a claim amount has been estimated or accurately determined. If, for example, claims are paid only once a week, there may be a substantial number of claims in which the insurance company's liability is known. For these claims it makes sense to use the estimated or actual claims amount to determine the value of the RBNP claims.

Denied Claims

Claims that have been denied are technically not part of the RBNP. However, in some situations it is a good idea to review the denied claims as well as the paid and RBNP claims. For example, if historically 10 percent of all claims submitted have been denied, but in recent months the denial rate has increased to 30 percent, then questions should be asked regarding this change. It is possible, for purposes of estimating the UCL, that the actuary should assume a certain percentage of the denials will be overturned.

Conclusion

To properly estimate the RBNP claims of an insurance company, the actuary must become very familiar with many aspects of the company's claims administration practices, the claims system itself, available claims history and any claim inventory data.

For the HMO that generated the data used in the example, there was no backlog information prior to 10/31/2001 and time did not allow for the creation of historical studies to estimate claim-to-charge ratios. Fortunately, the bulk of the inventory as of that date was an electronic backlog, including a substantial number of almost fully adjudicated claims, as described above. I tested various claim-to-charge ratios before settling on a set of ratios for different parts of the backlog (e.g., electronically submitted claims vs. manually submitted claims) that seemed reasonable.

[With the benefit of 10 months of additional hindsight, the incurred claims for the nine months ending 7/31/01 proved to be 1.8 percent lower and 2.3 percent higher than the estimates obtained using the 3D and 2D methods, respectively. The incurred claims for August 2001 proved to be one percent lower than the estimate obtained using the 3D method and more than five percent lower than the estimate obtained using the 2D method.

Actuarial Education, Standards of Practice and Disclosure

To my knowledge, neither the 3D method nor methods for quantifying the claims backlog has been part of the SOA examination syllabus. Fortunately for my own education, my early employment experience was with a company that always calculated its UCL by separately estimating the IBNR and the RBNP. In those days when estimating the UCL was largely a manual calculation done on very large sheets of paper, we did not use the 3D method as outlined here and the only available measure of the claim backlog was an item count, but at least it was always clear how we "considered" claims "processing fluctuations," as required by ASOP No. 5.

According to our Society's motto, scientists are supposed to use facts and demonstrations, not appearances and impressions. In my opinion, practitioners of the 2D method must often supplement science with appearances, impressions and "judgment" that are not supported by a quantification of backlog fluctuations. *Worrying about* is not the same as *considering* the impact of backlog fluctuations.

The ability to properly quantify the claims backlog and use that information to estimate the UCL is an achievable skill, the acquisition of which is too important to be left to chance. Appropriate material should be included in the examination syllabus.

ASOP #41, Actuarial Communications, requires that an actuarial report include any actuarial findings and also *"identify the data, assumptions and methods used by the actuary with sufficient clarity that another actuary qualified in the same practice area could make an objective appraisal of the reasonableness of the actuary's work."* I believe that since ASOP #5 requires consideration of backlog fluctuations, the actuarial report should describe *how* the backlog fluctuations were considered in establishing the UCL. If information pertaining to backlog fluctuations is not available or not reliable, then the actuary should also disclose that fact in the actuarial report.

I look forward to participating in any discussion that this article may generate.

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Looking Forward to Vancouver

by Daniel L. Wolak

The Health Section and Health Practice Area are sponsoring several forums of interest to health actuaries in conjunction with the SOA Spring Meeting in Vancouver, on June 23-25, 2003.

Dental and Group Life Half-Day Programs

Two one-half day sessions will be offered designed to give participants the opportunity to explore product line issues and potential business solutions with their peers in either the group life or group dental industries. Both of these sessions are scheduled for the morning of Wednesday, June 25. Input from registrants through the completion of an electronic survey prior to each program will determine the topics discussed at the forums. The surveys will include current hot topics in group life and/or group dental and those indicated as highest priority by forum registrants will determine the day's agenda.

For each of these programs, current topics may include:

- **Group Life Open Forum (1/2 Day)**
  - Industry outlook
  - Product design
  - Mortality and waiver of premium experience
  - Marketing trends.

- **Dental Products Open Forum (1/2 Day)**
  - Industry outlook
  - Changes in dental practice and implications on product experience
  - Provider contracting
  - Product design
  - Marketing trends
  - Network communications.

Both of these programs are designed to be highly interactive, with limited formal presentation. Attendees will have the opportunity to discuss relevant, timely and practical issues with their industry colleagues and learn alternative approaches to solving their own business problems.

Health Valuation Lunch & Interactive Forum

As was first done at last year's San Francisco meeting, the Health Section is sponsoring a Health Valuation Lunch & Interactive Forum held immediately after the conclusion of the Vancouver meeting. During lunch, several valuation case studies will be presented for discussion at each table. A moderated interactive forum will be held after lunch to discuss questions arising from the case studies and from the earlier sessions, as well as additional topics raised by attendees. Attendees gain additional insights from more in-depth discussions of health valuation issues.

To set the stage for the valuation lunch, that morning the Health Section will be sponsoring two consecutively held 90-minute sessions on valuation issues. They are:

- **Health Valuation Issues: Traditional Products**
  Facilitators will lead participants in a discussion of recent experiences and current issues regarding the valuation of medical and dental insurance and managed care products. Possible topics of discussion include:
  - Interplay between Actuarial Standards of Practice and codification requirements
  - Revision of relevant Actuarial Standards of Practice
  - Deficiency reserves: Insured versus self-insured; statutory versus GAAP
  - Compliance with actuarial opinion requirements.

At the conclusion of this session, attendees will have learned more about the hot topics regarding the valuation of traditional health products.

- **Health Valuation Issues—**
  Nontraditional Health Products
  This session will provide an overview of industry approaches to valuing the liabilities of nontraditional health products such as:
  - Specific and aggregate employer stop loss
  - Provider excess
  - Critical illness.

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Health Care Affordability:

A Valuable Concept in Understanding Our Health Care System Challenges

by David V. Axene

Overview

For more than two decades, the U.S. health care system has attracted considerable attention, both by the media and by public policymakers, as health care costs continue to rise and the uninsured population continues to grow. Rapidly increasing costs and their adverse effect on premium rates and health plan profitability continue to fuel concerns about the future of the U.S. health care system and our collective ability to pay for health care. This article takes a fresh look at the affordability of health care and offers several new insights.

What Does Affordability Mean?

Much of today's health care focus centers on the rising costs of health care. Today's challenging economic situation since 9/11 and the heightened concerns about terrorism, the financial impact of the recent recession and the fallout from the decline of the "dot com" and telecom market booms and the overall lack of confidence in the post-Enron economy has redirected much of the health care discussion to affordability, not simply health care costs.

Affordability, as a generic term, can best be defined as a measure of someone's or something's ability to purchase a good or a service. It describes whether a person or organization, with limited resources, is able to make a purchase without unacceptable or unreasonable sacrifices. Similarly, health care affordability describes whether a person or organization has sufficient income to pay for or provide for health care costs. These costs could be insurance premiums or direct health care service costs.

What Factors Should Be Included?

Since individuals, other organizations (usually employers) and the government fund most of today's health care costs, all of these should be considered. Once indices are developed, they can be compared by stakeholder or by geographic area or by a variety of other parameters.

The table on the next page was extracted from a recently published article on healthcare affordability.

To reflect all health care stakeholders, the above indices reflects a weighted average of health care affordability for each of the three key health care purchasers—employers, employees and government entities. Each component of the index can be separately reviewed to measure affordability for each stakeholder.

Variability in Health Care Affordability

Note the significant variation in affordability between various states. Although today's health care woes are often assumed to be universal, the significant variation in health care affordability suggests that the issue is much more intense in some markets. Some rather interesting results emerge when each of the regions is more thoroughly analyzed. California, one of the states with some of the most expensive health care costs expressed on a per unit of service basis, is in the most affordable category demonstrating the significant difference between "expensive" and "affordable". Louisiana and West Virginia, states often thought to be low cost states, are the least affordable as defined in the study.

What Drives Affordability?

Individual metrics can be compared to the above results to attempt to define "affordability drivers." The previously referenced study developed a correlation statistic to evaluate the potential impact of a variety of metrics to health care affordability.

The results are:

- **Correlation to inpatient utilization:** Inpatient utilization levels are moderately correlated (Correlation = .37) to affordability. Although directly impacting cost, the impact on affordability is diminished although showing a strong relationship. Health care tends to be the least affordable where the health care system is the least efficient.
- **Correlation with managed care penetration:** There is a slight negative correlation between managed care penetration and health care affordability (i.e., Correlation = -.19) . There is a tendency for improved health care affordability

State	Affordability Index	State	Affordability Index
Delaware	0.65	Missouri	0.99
Colorado	0.78	Kansas	1.00
Nevada	0.80	Rhode Island	1.02
New Jersey	0.81	Indiana	1.03
Hawaii	0.83	New Hampshire	1.04
Minnesota	0.83	Wisconsin	1.04
Virginia	0.85	Texas	1.06
Washington	0.86	New York	1.07
California	0.87	Pennsylvania	1.07
Alaska	0.88	North Carolina	1.09
Wyoming	0.88	New Mexico	1.12
Georgia	0.88	Oklahoma	1.12
Connecticut	0.90	Vermont	1.15
Massachusetts	0.91	Arkansas	1.17
Illinois	0.91	Tennessee	1.19
Michigan	0.92	Florida	1.22
Oregon	0.93	Kentucky	1.23
Ohio	0.95	Montana	1.29
Utah	0.95	South Carolina	1.30
Idaho	0.96	Maine	1.33
Maryland	0.96	Alabama	1.35
Arizona	0.98	Mississippi	1.56
Iowa	0.98	Louisiana	1.64
Nebraska	0.98	West Virginia	1.69

Source: 2002 E&Y Health Care Affordability Index (HCAI™), published October, 2002

in regions with higher managed care penetration. This is similar to that shown above, except this comparison demonstrates the impact of more efficient care whether or not managed care plans exist.

- **Correlation to provider supply:** There is a reasonably strong correlation (Correlation = .51) with provider supply. The greater the supply of providers, the less affordable the resulting healthcare system. This is consistent with the belief that health care generally does not follow traditional supply/demand economics. Generally the communities with the highest concentration of providers have the highest health care system use rates. Many health care experts believe that an oversupply of health care providers actually increases health care costs. If true this helps to explain the affordability and provider supply relationships.

- **Correlation to average size of hospital:** The analysis shows a slight negative correlation (i.e., Correlation = -.20) to size. Many believe that the average size of a hospital can impact the overall level of its own health care costs. The smaller a facility, the less its ability to spread fixed costs and also the less equipped it could be to handle certain more complex cases. If true, one might be able to link average size of facility to health care affordability. This suggests improved affordability for communities with larger average sized facilities. Most of the states have smaller than average sized facilities, with wide dispersion of affordability.

- **Correlation to business climate:** There was a stronger negative correlation between business climate and affordability (Correlation = -.35) suggesting more affordable care where business growth and profitability is higher. Historically, there is a tendency for utilization and health costs to increase as unemployment increases and the general economic situation becomes uncertain. As the economic strength increases, it appears there is an improvement in affordability.

- **Correlation to health care affordability components:** Strong correlations of individual affordability indices with the aggregated statistics might be of interest. There was a fairly strong correlation to the employer affordability index (i.e., Correlation = .40) suggesting a connection between the employer's affordability and the overall affordability. A much stronger correlation was observed with the employee

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index (i.e., Correlation = .86) . This is somewhat unexpected since a good portion of the health-care costs are paid for by the employer. It suggests that affordability at the employee level provides a good proxy for overall health care affordability. This provides a simplifying assumption, which can be more carefully derived at a local level. However, the strongest correlation occurs between the government index and the combined index (i.e., Correlation = .95). The government index is the most difficult to determine at a local level but can be readily derived at the state and federal level. This tends to suggest that government ability to spend tax dollars on health care services is the most direct way to measure health care affordability. As the government goes, so do we all.

Based upon best estimate assumptions for the next five years, health care affordability is expected to increase 29 percent over that same five year period.

Where is Affordability Headed?

Based upon best estimate assumptions for the next five years, health care affordability is expected to increase 29 percent over that same five year period. The private sector component increases by nearly twice that. Assuming a scenario of no significant shift in the allocation of employer/employee financial responsibility, this projected increase in affordability results in significant reductions in corporate earnings to pay for increased healthcare costs (i.e., 3 percent of revenues in five years). At some point, corporations may no longer be able to fund future health care costs.

However, a more likely scenario is corporations passing more of their cost to the employees. Even a minor shift to the employee significantly impacts the overall affordability of health care. Under the assumption that an average corporation pays 80 percent of the total cost of a health care program, a transfer of half of the projected increase in affordability over the next five years more than doubles the employee affordability index. The net impact to overall health care affordability is significant.

If the projected 29 percent increase in affordability occurs in five years, all but one studied state will be above today's national average. This suggests a serious affordability issue within the next five years.

So What's Next?

First, looking back at the presented analysis:

- Provider supply has a strong correlation with health care affordability. Matching provider supply to our appropriate health care needs will likely improve our ability to pay for health care in the future.

- Business climate has a strong reverse correlation with health care affordability. A healthier economy improves our ability to pay for health care. A weakened economy quickly leads to serious health care concerns. Our health care concerns are partially resolved by an improvement in our general economy.

- Although less dramatic, the efficiency of health care providers and their relative average size, particularly of hospitals, impacts health care affordability. Elimination of unnecessary variation and inefficiencies in the way health care services are provided improves the affordability of health care and our ability to preserve the system as we know it.

As solutions to the affordability crisis are developed and considered, it is important to recognize the relationships described above. Appropriate distribution of health care providers with an appropriate supply of providers will help improve the affordability of care. An improvement in the general economy will likely lead to improved healthcare affordability. Effective managed care principles and/or their successors will also have a positive impact on healthcare affordability. Wisely spending our limited health care resources improves the affordability of care, improves the quality of care, and helps maintain a long-term viable health care system.

The health actuary needs to be involved in identifying a solution to our affordability problem. No other discipline has the breadth of knowledge it takes to find an acceptable solution. Understanding health care affordability and communicating it to our publics is just one of many issues where we can add value to the dialog.

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Liabilities for losses that have been incurred but not reported and for losses that have been reported but not paid are examined. These liabilities are considered from both insurer and reinsurer perspectives. Attendees will gain a better understanding of nontraditional health valuation methods.

Health Corporate and Chief Actuaries Forum

The SOA is providing a highly interactive program for chief and corporate actuaries working in the health insurance industry. A new format using a combination of small-group discussions, presentations, and a general luncheon keynote will capitalize upon the expertise of health insurance company senior actuaries to thoroughly explore those topics rated most critical by their colleagues. The forum will identify these key issues and provide opportunities to share solutions with colleagues.

A similar format was presented at the SOA Annual Meeting in Boston. Member input determined the topics discussed, which included:

- Medical trends
- Provider relations (contracting, profiling, communications)
- Trends in product development (defined contribution plans, supplemental products);
- Cost management issues
- Data warehousing efforts
- Adequately training future actuaries.

The audience for this forum is restricted to chief and corporate actuaries or professionals working in that capacity for health companies. The forum will be focused on specific concerns and will be highly reliant upon attendees bringing relevant experience to bear on these issues. The SOA respectfully requests that only those who fit the above description participate. Additionally, in order to promote broad representation and active participation, the SOA requests that a company register only one person. Attendees are strongly encouraged to share the work of the forum with their colleagues when they return.

Daniel L. Wolak, FSA, is senior vice president of Group Operations at GeneralCologne Re in Stamford, CT. He can be reached at dwolak@gclifere.com.

Spring Meeting Committee Liaison

Have you ever wanted to change something about the SOA's Spring health Meeting? Here's your big chance!!!

The Health Section Council is looking for one or more members to serve as the Health Section's liaison(s) to the Spring Meeting Commitee for 2004. By working with the Health Section Council to coordinate the health sessions for the 2004 spring meeting. A Spring Meeting Committee liaison gains a broader understanding of many areas of health actuarial practice, as well as the opportunity to network with health actuaries from across the country. The role is designed for those with no prior experience!

If you would like additional information, please contact Karl Volkmar at (317) 580-8661 or via e-mail at *kvolkmar@unitedactuarial.com*.

Call for Papers

There will be a panel set up by Ian Duncan at a conference on Artificial Intelligence that will be held next September in Oxford.

The conference is described in full detail online at: *http://web.comlab.ox.ac.uk/oucl/conferences/kes2003/Invited_Sessions.html*.

The specifics on Ian's session is online at: http://web.comlab.ox.ac.uk/oucl.conferences/kes2003/Duncan.pdf.

If you would like additional information, please contact Karl Volkmar at (317) 580-8661 or via e-mail at *kvolkmar@unitedactuarial.com*.

Health Record Sessions Now Online...

The Boston Annual Meeting Record Sessions are now available online at: www.soa.org/bookstore/record.html.

Further Discussion of High Hospital Charges

by John P. Cookson

I had written an article in the June 2002 issue of *Health Section News* entitled "Hospital Charges Become A Significant Issues Again" based on our analysis of FY 2000 Medicare hospital charges. As pointed out, these Medicare charges are highly correlated with commercial charges and thus, this data is representative of global hospital charges. More recently, there has been a lot of news generated about the charge levels at the Tenet hospitals and the impact on its revenue resulting from Medicare outlier payments.

There are two other important factors that these news stories have omitted. The first is that Tenet hospitals are not alone in these high charge levels. Second, the impact of high charges is felt significantly on hospital payers other than Medicare, and the full impact of these charges is often not well understood by the payers themselves.

2001 Increases

Based on recently released FY 2001 data, the range of inpatient medical/surgical charges per day, after adjusting for case-mix severity and geographic differences, is over 17 to one. This compares to a ratio of just over 14 to one in FY 2000 (based on hospitals with at least 1000 admissions reported). The highest charging hospital is nearly five times the adjusted average, and has a Medical/Surgical charge per day of nearly $19,000. The top ten hospital charge per diems increases ranged from 13 percent to 58 percent between FY 2000 and FY 2001. Seven of the 10 increases were between 23 percent and 38 percent, while the average charge per day over all hospitals increased less than 10 percent during this period.

When we look at the list of highest charging hospitals, in addition to a number of Tenet hospitals, there are also other for profits and many non-profit hospitals (including government owned). There are a couple of small non-profit chains in Pennsylvania and New Jersey that have several entries on the high charge list. Often, charges are marked up four to five times costs, or higher. Hospitals may believe they have legitimate reason for these charges, however, this divergence just points out the irrationality of the system.

The common assumption was that charges didn't mean anything since most payers had negotiated fixed price contracts. Although this may have been partially true in the mid-1990's, it is far from the truth today. Maybe this argument had been put forth since very few payers reimburse at 100 percent of charges. However, many contracts pay some portion of reimbursement based upon a specified percent of charges. And, in any event, if a hospital offers a 25 percent discount but charges three times the average, this still represents more than twice the cost of an average charge hospital with no discount.

Charge Based Reimbursement

The following is a description of common charge based reimbursements:

1. **Inpatient Outlier Provisions**
   Many HMO and PPO contracts have outlier provisions where once the charge for an admission reaches some predetermined threshold such as $35,000 or $50,000, the reimbursement (for the entire admission) then reverts to a percentage of charges (commonly 65 percent to 100 percent). In some areas and at some hospitals these cases may represents at least 50 percent to over 90 percent of inpatient charges. Thus, in many of the cases, the majority of reimbursement will be based on discount from charges

2. **Straight Discount from Charges**
   Many hospital contracts call for reimbursement based upon some specified discount from charges. Clearly, as charges increase, the reimbursement will increase proportionately. Many PPO contracts and some HMO contracts are on this basis.

3. **Outpatient Charges**
   The typical outpatient hospital reimbursement for commercial insurance is based on a percentage discount from charges. Outpatient charges are approaching 50 percent of total hospital charges on average, and are well over 50 percent in many hospitals. Individual itemized outpatient charges are the same line by line as the individual inpatient ancillary charges, and also generally have the highest mark-ups over cost compared to room and board rates. Thus, high inpatient charge hospitals are also high outpatient charge hospitals. These reimbursement contracts are common in HMOs, PPOs and Blue Cross Plans.

4. **Out-of-Network and Out-of-Area Charges**
   Many HMO and PPO networks operate in limited geographic areas and have limited participating hospitals. If patients use services out-of-area, the payer is stuck with dealing with hospital charges—especially since reasonable and customary payments limits are not well developed and are difficult for most payers to determine. This can lead to disputes in settling claims. Furthermore, the same situation would apply to out-of-network usage in-area. For out-of-network services, the patient is usually required to pay a higher co-payment, but is usually protected with an out-of-pocket limit. In fact, in most of the situations discussed above the insureds are protected from these egregious charges because of fixed deductibles and out-of-pocket limits.

One reaction by insurers to these high charges structures has been the development of tiered contracts, that vary the patient copayments by hospital charge (or reimbursement) level. However, because of the out-of-pocket limits, patients are still mostly immunized from these high charges, even with the tiered contracts.

Possible Actions

These high charges necessitate the consideration of a number of actions by insurers/payers:

1. Achieve a thorough understanding of the contracts, the reimbursements and the relative charges of hospitals. It is important to be able to compare competing facilities on an apples to apples basis. Otherwise, payers are negotiating from a weak position.

2. Consider the impact of out-of-pocket limits or out-of-network and out-of-area liabilities. Consider pegging out-of-network and out-of-area reimbursements to some relationship to Medicare payments. For example, if Medicare has a 50 percent discount, the liability could be defined by Medicare plus 20 percent based on Medicare's discount. This puts the onus on the hospital to justify higher levels. Alternatively, contractually define reasonable and customary levels that can be enforceable.

3. Consider the impact of high charges on outpatient reimbursements and contract provisions. This is a major factor. Modest discounts to charges that are marked up 400 or 500 percent or more over costs is not the way to go. Consider benchmarking to Medicare's APCs as a way to control reimbursement.

4. When contract impasses occur, consider publicizing the facts about egregious charging hospitals. Generally, the providers win the sympathy vote in the press when these contractual deadlocks occur. They use images of sick patients who need help to generate support. However, the payers never get the story out about their charge levels versus other hospitals or about their demanded reimbursement versus Medicare payment levels. Let's put the payer's facts on the table.

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The Art & Science of Pricing Small Group Medical Coverage:

From Debits to Risk Factors

by Bill Lane

Rating Under Small Group Reform Laws

The rules for pricing small employer medical coverage changed when Small Group Reform laws became prevalent in the market place. In essence, for many states, the rating process became a two step process. First, a carrier calculates a manual rate for a small employer based only on "case characteristics" such as age and gender of participants, area, benefit design, industry group size, network and so forth. Second, this manual rate is multiplied by a risk factor.

The intent of the laws was to limit a carrier's ability to change premium rates based on observed or expected health status of the insureds. Some case characteristics such as age and gender of participants and industry clearly are intended to adjust for expected differences in overall health status, but even so they do not distinguish between healthier and less healthy individuals with the same characteristic.

Since manual rates have been used for many years prior to the enactment of Small Group Reform laws, this portion of the new two step process was not much changed. The development of risk factors, however, presented new challenges to carriers.

Development of Debit Manuals

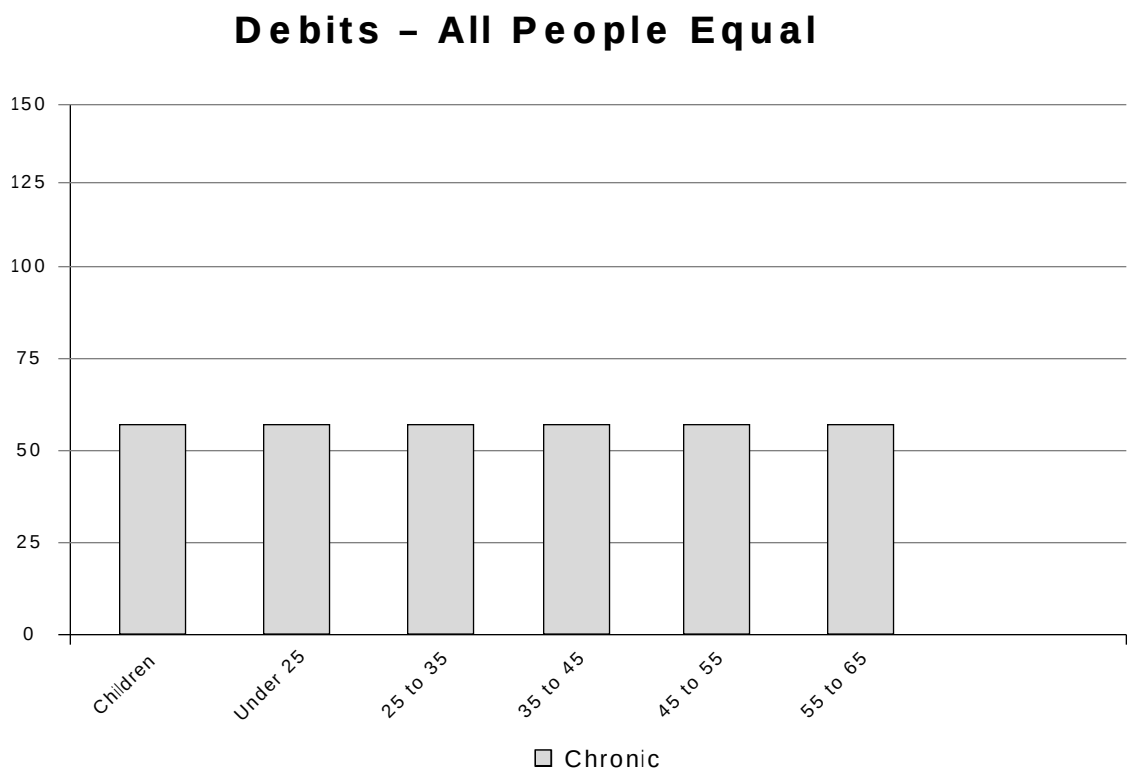
Carriers responded by creating so called "debit manuals" which assigned a relative expected cost to a particular medical condition. In many cases, these debit manuals were developed by adjusting existing underwriting manuals for individual medical insurance. These manuals assigned various rating loads to specific conditions and the translation of a rating load to a "debit" was relatively straight forward. Other conditions, however, have traditionally been viewed as "uninsurable" for individual medical coverage and the assignment of relative cost debits was more difficult for these conditions. The translation process was also made more difficult since relative cost under individual medical coverage is not necessarily equal to relative cost under small employer medical coverage.

In any event, debit manuals were developed, both by large carriers using their own data and by consulting firms using the combined data of numerous carriers.

A typical debit manual will list medical conditions by name or ICD-9 diagnosis code. It will then list various possible aspects of the conditions that can influence the relative cost. For example, a person with a presently active disease usually has a higher probability of future medical expense than a similar person who has recovered from the disease and been symptom-free for some time. Thus, for many conditions, the manual will distinguish between a person with a condition that is present, and a person who has recovered from the condition, as well as, the time frame since recovery. The manual may also distinguish between a condition that is not currently controlled and a condition that is currently controlled (and in some cases by whether or not the person must take prescription drugs to maintain control of the condition). Similar conditions with different risk expectations are shown separately such as for sickle cell anemia versus sickle cell trait.

When evaluating a prospective small employer, a carrier typically collects medical history data by using individual applications and reviews these applications for the medical conditions. In some cases, carriers are now beginning to use prescription drug histories collected from their own data or from PBM's. Debit systems based on prescription drugs have been developed that appear to offer similar risk prediction capabilities when compared to debit systems based on medical conditions.

In either case, the carrier evaluates the small employer and notes the number of "debits" which have been observed for that employer. The carrier should already have a level of debits which are considered "normal" for an average case and compares the observed debits to the expected debits. In many cases, this is as simple as dividing the total number of observed debits by the total number of insureds and comparing the result with an expected value (for example 58 debits per person).



Debits Can't Predict All Expenses

The question then becomes, given a certain number of observed debits, what should the risk factor be for the group?

Clearly the risk factor is not simply the actual debits divided by the expected or average debits. This would lead you to the incorrect conclusion that a group with no known medical conditions and no drug usage deserves a zero premium since it has no risk.

Accidents happen and they cannot be predicted by prior medical diagnoses or drug use. The same can be said for most infections. Even chronic conditions, unless they were present and noted at birth, will have an initial onset and the cost for the first year cannot be predicted by looking at conditions and drug use in the prior year.

Numerically, this can be handled by determining what percentage of total medical cost can be predicted by the debit system and what percentage cannot be predicted by the debit system. In this article, I will refer to the costs associated with potentially predictable conditions as "chronic" and the costs associated with unpredictable conditions as "acute". Note different debit systems will predict more or less accurately and, therefore, the relative number of acute versus chronic debits varies by debit system.

Risk Factors

Determining how much potential cost falls into the category of "acute" as opposed to "chronic" depends on both the debit manual itself and the aggressiveness of the underwriting process. It is possible to set a minimum percentage of acute costs, but how much chronic cost can be predicted must be established on an individual carrier basis in a process that I call "calibration".

For the moment, let us assume a debit system where the average insured is expected to have 58 debits for chronic conditions and 22 debits for acute conditions for a total expected debits of 80. This would be a very accurate debit system.

If the average number of observed debits is 58, then the risk factor should be 1.000 (since the expected number of chronic debits for an average case is 58).

If the average number of observed debits is 38, then the risk factor should be 0.75.

The risk factor of 0.75 is calculated by dividing (38 plus 22) by (58 plus 22). The denominator is the expected number of acute and chronic debits while the numerator is the observed number of chronic debits plus the expected number of acute debits. Note we use the expected number of acute debits in both the numerator and the denominator since these are the costs we cannot predict and must price on an expected basis alone.

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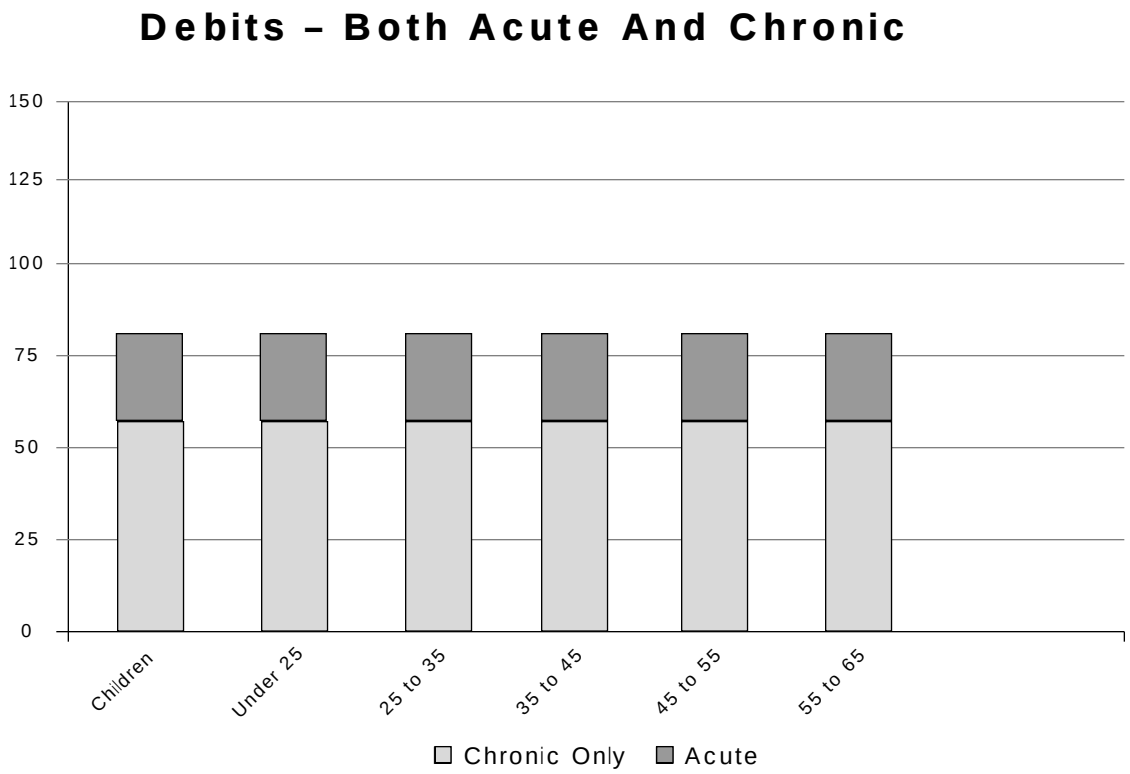


If the average number of observed debits is 78, then the risk factor is 1.25 and so on.

A typical range of allowed risk factors is 0.75 to 1.25. Many carriers, however, prefer to express this range as 1.000 to 1.667 (1.667 is equal to 1.25 divided by 0.75). Assume for the moment that when using the 0.75 to 1.25 range, the carrier is multiplying it by a manual rate of $100. This allows an actual premium of $75 to $125. When the carrier uses 1.000 to 1.667, it reduces the base premium to $75. The actual premium still fluctuates from $75 to $125. Hence the two approaches produce the same range of actual premiums.

Under this approach, an observed debit of 38 or less is then assigned the minimum factor of 1.000, an observed debit of 78 or greater is assigned the maximum factor of 1.667, and an observed debit of 58 is assigned the average risk factor of 1.3333.

Age Gender Adjustments

Anyone who has been pricing small employer medical coverage should be aware that, on average, the expected cost of a 25-year-old male is significantly less than the expected cost of a 63-year-old male. Most companies use age gender factors that adjust the premium to reflect the differences in cost based on the age and gender of the insured.

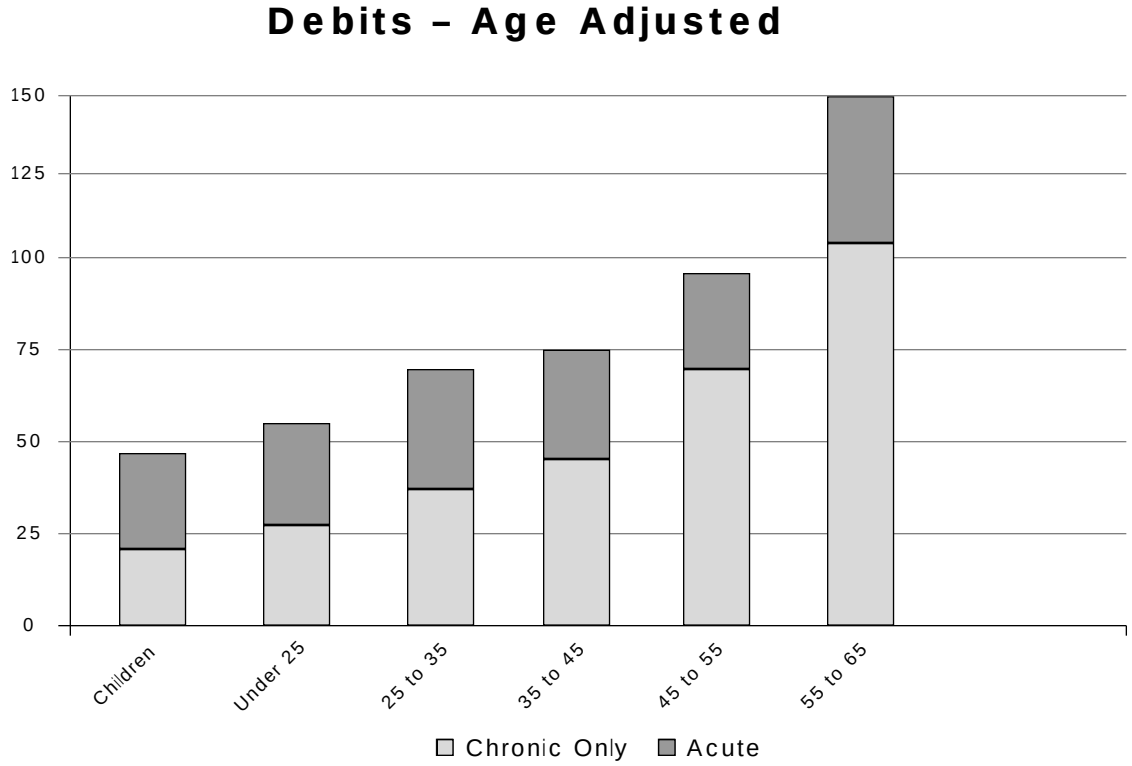
Since debits are merely another way of expressing the expected cost of an insured, expected debits also vary by age and gender. This means that the expected chronic debits of a 25-year-old male are significantly less than the expected chronic debits of a 63-year-old male. It is not just the total number of expected debits that change by age and gender. The ratio of acute to chronic debits is different for different age gender cells as well.

If the debits are adjusted by age and gender, then the average expected debits, both acute and chronic, should still be the same. However, the values by age and gender will now vary up or down based on risk for the specific age and gender under consideration.

The calculation of the risk factor remains the same as before. The risk factor equals the sum of the observed debits plus the expected acute debits divided by the sum of the expected chronic debits and the expected acute debits.

Other Considerations

Other case characteristics such as industry might also cause the relative proportion of debits to vary,



but the calculations are significantly more difficult. Some industries are given loads because their typical employment base presents a higher avocational health risk. In other words, they tend to hire people who are more likely to practice such sports as motorcycle racing and hang gliding. In such a case the relative number of acute debits should increase. Other industries receive a load because of their relative exposure to conditions that can cause a chronic health problem. Coal mining and the prevalence of black lung disease in its employment base is an example of this. In such a case, it would be the chronic debits that would need to be increased. Calibrating acute and chronic debits by industry is not an easy task and is beyond the scope of this paper.

Another factor that affects the relative distribution of acute and chronic debits is the amount of provider risk. This usually applies only to HMO and some POS contracts. When a provider is paid a flat amount on a per head basis, the cost to the carrier will not vary as much between insureds, and the experience of the carrier will look as if there were relatively more "acute" debits and relatively less "chronic" debits. How a carrier should handle this situation in pricing, especially if the carrier uses risk adjustment in its provider compensation, is also well beyond the scope of this paper. Even so, it should be noted by the pricing actuary and probably should be discussed with the providers.

For years, hospitals have been negotiating their PPO reimbursement in a manner that tends to overprice large claims and underprice small claims. This practice makes the hospital's "per diems" look good on paper while the outlier provision brings in the needed income. The net result is that the expensive conditions become even more expensive and vice versa. This practice has strongly impacted stop loss carriers whose insurance focuses on large claims. For the last year or two, some stop loss carriers have been attempting to restructure hospital reimbursement in a revenue neutral manner that removes this cost shifting. If these "stop loss friendly" reimbursement schemes become prevalent, then they will have a strong impact on debits and risk factors since the cost for the currently lower cost groups will rise while the cost for the very expensive groups will drop.

Given the legal environment for pricing small employer medical coverage in most states, accurately setting the risk factor by employer is a critical pricing function. Having a sound debit manual or other similar prospective risk adjustment process is important, but equally important is having an accurate methodology for translating from debits to risk factors.

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A Practical Method for Incorpoarting Pended Claims in Medical IBNR Estimates

by Peter K. Reilly

Introduction

Medical incurred but not reported claim reserves (IBNR) are a principal driver of reported financial results of health insurers. These reserves, while not as long tailed as long term care or disability income insurance contracts, can be quite material and the mis-estimating of these reserves can add considerable variability to reported financial results. The vast majority of this misestimating risk comes from the most recent dates of service. Traditional completion or lag factor analysis is often relied upon by valuation actuaries to set IBNR reserves and the most recent months are where these methods are least useful.

In this paper, I present a practical framework for incorporating a full set of available information into the estimation of IBNR reserves that should reduce estimation error. The practical results would be reduced capital requirements supporting the health risk business, via reduced reserve margins, and a better understanding of emerging results allowing one to more quickly take the appropriate steps to manage the business and represent a financial statement that more accurately reflect true date of service results.

Background

IBNR reserves by definition depend on a company's accounting treatment of claims payments. Two common approaches are: 1) recording a claim as paid when the payment is issued and 2) when the draft clears the banking system.

Regardless of which definition is used, the valuation actuary needs to estimate what the company's obligations are for GAAP and statutory accounting purposes. For this paper, I will assume a check issued basis. Estimation methodologies typically rely on past patterns of claim payments and how they have developed. This is done by arranging all known paid claims by date of service and month of payment into a triangle format. This is typically referred to as a lag table. With sufficient history, stable submission and claims processing times and a stable trend environment, past payment patterns can be used to make accurate IBNR estimates.

A few issues arise. First, it should be obvious that because of the definition of paid claims adopted, there are known claims that have been received and pended but not yet adjudicated and potentially processed and held pending release in an account payable (AP) account. However, the claims that have been pended but not adjudicated are not directly translatable into a resultant payment. Some of these claims will be denied or paid at an amount less than submitted. Once adjudicated, some of the claims will have differing payment levels due to contractual terms. Because of these issues, pended claims are often not brought directly into the IBNR estimation process but are instead relied on for anecdotal information only. Depending on payment patterns and whether checks are held in pended status, nearly a month's worth of claims may be on hand but essentially ignored in setting IBNR.

Completion Factor Methods

Completion factor methods rely on the premise that past payment patterns will hold on average in the future. Since it is often the case that the more recent dates of service months may only be 5 percent – 30 percent complete, there is substantial leverage in the volatility of payment patterns into the IBNR reserve. Given this, reserve actuaries will typically choose more conservative estimation methods to ensure the adequacy of the IBNR reserve.

Lets define:
$P_{i,j}$ = Paid claim for DOS $_i$, paid in period $_j$

Where DOS = Date of Service

Incurred claims for DOS $_i$

$$IC_i = \sum_{j=0}^{\infty} P_{i,j}$$

Obviously, where $j < \infty$, there exists the potential that claims are still outstanding. When $_j$ gets close to 0 the amount of outstanding claims becomes material. Incurred but not reported for DOS $_i$, held

as of time or duration incurred+$_k$

$$\text{IBNR}_{i,k} = \sum_{j=i+k}^{\infty} P_{i,j} \quad \text{where} \quad P_{i,j} \text{ is unknown}$$

Starting with DOS months where it is reasonably certain that few, if any, claims remain to be paid, this formula can be used to work backwards to estimate the balance of the lag table.

$$CF_{i,k} = \frac{\sum_{j=0}^{i+k} P_{i,j}}{IC_i}$$

where k is the payment duration and $0 < CF_{i,j+k} < 1$ ignoring recoveries.

Completion factor methods typically take values over many dates of service for particular payment duration as an estimate or predictor of current payment patterns. A six-month average method might be (^ denoting estimate)

$$\text{e.g. } \hat{CF}_{i,0} = \sum_{i=-1}^{-6} CF_{i,0} / 6$$

This would be used to estimate IC i by

$$\hat{IC}_i = \frac{P_{i,0}}{\hat{CF}_{i,0}}$$

In plain English, this means if on average we believe the prior 6 DOS were 10 percent complete, for example, after one month of payment, we can gross up the one month of payment known for the current DOS, by dividing by .1, to predict the incurred claim. The IBNR reserve would then be

$$\hat{IC} - P_{i,0}$$

Besides ignoring the known information of the pended claims, this process also breaks down when claim payment pattern changes are occurring. For example, claims may be received and processed faster due to electronic claim submission and claim auto-adjudication. Averaging methods always assume the CF will be within a specified historical range. This can be or may be an inappropriate restriction.

A Practical Method for Incorporating Pended Claims Into the IBNR

It should be apparent that if claim submission patterns remain constant, a slow down or speed up of claims adjudication will result in an increase or decrease in claims held in pended status.

Regression methods can be used to expand the CF model to incorporate this data directly. In addition, this method replaces, for better or worse, moving averages as the predictor for the CF with an ordinary least squares estimator.

The proposed models can be stated as:

$$\text{IBNR PMPM}_{i,k} = a \cdot \sum_{j=0}^{k} CumPaid\ \text{PMPM}_{i,j} + b \cdot \text{Pended dollars PMPM}_{i,k} + E_i$$

Where

IBNR PMPM $_{i,k}$ = Restated incurred but not reported reserve for date of service $_i$ after $_k$ months of payment (duration k) divided by exposure (members) at time i.

CumPaid PMPM $_{i,j}$ = paid claims for date of service i paid in duration j divided by exposure (members) at time $_i$.

Pended dollars PMPM $_{i,k}$ = dollars pended in the system payable for date of service $_i$ at time (duration) k divided by exposure (members) at time $_i$.

Each of these variables is a vector of observations whose length will depend on available data. The minimum amount of data required is a function of degrees of freedom necessary to estimate the model parameters and the desired level of statistical precision of the estimated parameters. They should be balanced against the possibility that the parameters may change over time as changes to adjudication speeds occur. It might also be possible that the coefficient b in the pended claim portion could be affected by seasonality (particularly for deductible plans), and additional data would be required to incorporate this effect.

This model jointly estimates completion factors, one for cumulative paid claims and one for pend claims held for DOS i. If b = 0, then the model reduces to the CF model where

(continued on page 32)

$$a = \left(\frac{1}{CF_{i,k}} - 1\right)$$

$$\left(IC_i = \sum_{j=0}^{k} P_{i,j} + IBNR_i\right)$$

The parameters a and b can be estimated using ordinary least square (regression) or OLS methodologies. Note that the model form does not include a constant. All the usual considerations for using OLS with time series such as uncorrelated error terms, should be considered to ensure unbiased, efficient estimation of parameters.

Model Form Variations and Other Considerations

The model described above can be augmented or have model form variations that may improve the ability to fit the data and forecast more accurately.

Natural Logarithms: Experience has shown that the pended dollars PMPM will have considerable noise and scale issues relative to the dependent variable, estimated reserve PMPM. This occurs since pended claims are not adjudicated yet and may turn into paid claims at varying rates due to contractual considerations and denial rates.

Accounts Payable (AP) Pends: If an organization pends adjudicated claims for cash flow purposes, these can be handled in two separate ways. The dependent variable can be transformed by subtracting these claims prior to modeling and the current AP pends can be added back into the predicted reserves later to get the IBNR estimated. This treats AP pends as known claims which lead to the second potential treatment. The AP pends vector for a particular duration can be added as a third predictor variable into the model.

Working Days Variable: While incurred claims typically have seasonality in medical coverages, this seasonality is embedded in both the dependent variable and the predictor variables and therefore a separate variable is usually not necessary in the model. However, there is a separate, more subtle dynamic at work in the process.

The process of generating, submitting and adjudicating claims is a continuous process for the most part. The divvying up of the data into monthly time series is somewhat arbitrary. This decision however injects some variation into the dependent variable in that different months have different lengths. More specifically, they have different numbers of days (working days, mail days, processing days, etc.) where claims are typically generated and processed. This information is NOT embedded in the snapshots of pended claims, as these should be independent of the arbitrary month end cutoffs. Cumulative paid claims will have this embedded. For example, all things held constant more claims will get processed in a longer month than in a shorter month. That may lead to over estimation of reserves, particularly in the earlier durations. The addition of a working days variable which counts the effective numbers of processing days may help adjust this out.

Experience has shown that this is only important in the first few durations as the month-to-month variations in days average out as the exposure period lengthens.

An Example

This example is based on actual company data. For confidentiality purposes, the data has been transformed. The model relationships are invariant to the transformation.

In this example, I present a process where only the most recent durations are set using this modeling approach. Later durations are set first using traditional completion factor approaches. The two most recent durations are set iteratively. The IBNR estimate for DOS one month prior at duration is set first. This last data point of course sets the restated IBNR for duration 0. The IBNR for the current month DOS at duration 0 is the set using the model prediction.

Another important issue that was previously referred to is prominent in this example, the time varying parameter problem. In the model form presented earlier, the coefficients (effectively the completion factors) are assumed to be invariant with respect to time. In other words, processing pattern changes over time are averaged out. Traditional completion factor methods attempt to deal with this problem by shortening the averaging length used in selecting completion factors in hopes of limiting the prediction error.

There are two simple ways of dealing with this issue within the modeling framework presented in this paper. The first is to limit the data used to a time period that contains roughly stable processing patterns. The second approach is similar—maintain

a longer time span of data, but segment the dependent variables into one or more sub segments that will have the parameters independently estimated. This allows for statistical tests on the hypothesis that the parameters have changed and for the ability to search for optimal points of segmentation.

In this example there are three predictor variables: cumulative paid claims, pended dollars and accounts payable pended dollars. All variables are stated on a per member per month basis. The predictor variables are not logarithmically transformed and I have broken the pended claims and cumulative paid claims variables into two pieces. The coefficients for the most recent time period are the ones used in predicting reserve levels.

The model statistics are indicated in the following tables and graphs.

Duration 1

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.854389376
R Square	0.729981205
Adjusted R Square	0.630930006
Standard Error	1.616321986
Observations	26

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	148.3176173	29.66352	11.35447	2.23E-05
Residual	21	54.862432	2.612497	-	-
Total	26	203.1800493	-	-	-

	Coefficients	*Standard Error*	*t Stat*	*P-Value*	*Lower 95%*	*Upper 95%*
Intercept	0	#NA	#nA	#NA	#NA	#NA
Pended Claims Pre 2001	12.73431218	1.913895284	6.65361	1.38E-06	8.754148	16.71448
Pended Claims Post 2000	12.84985547	2.194842844	5.854567	8.23E-06	8.285429	17.41428
Cum Paid Claims Pre Feb-01	0.055433252	0.101366983	0.546857	0.590241	-0.155371	0.266237
Cum Paid Claims Post Jan-02	0.013223526	0.083951033	0.157515	0.876344	-0.161362	0.187809
AP Pends	-0.478832562	0.683930742	-0.700118	0.491537	-1.901145	0.94348

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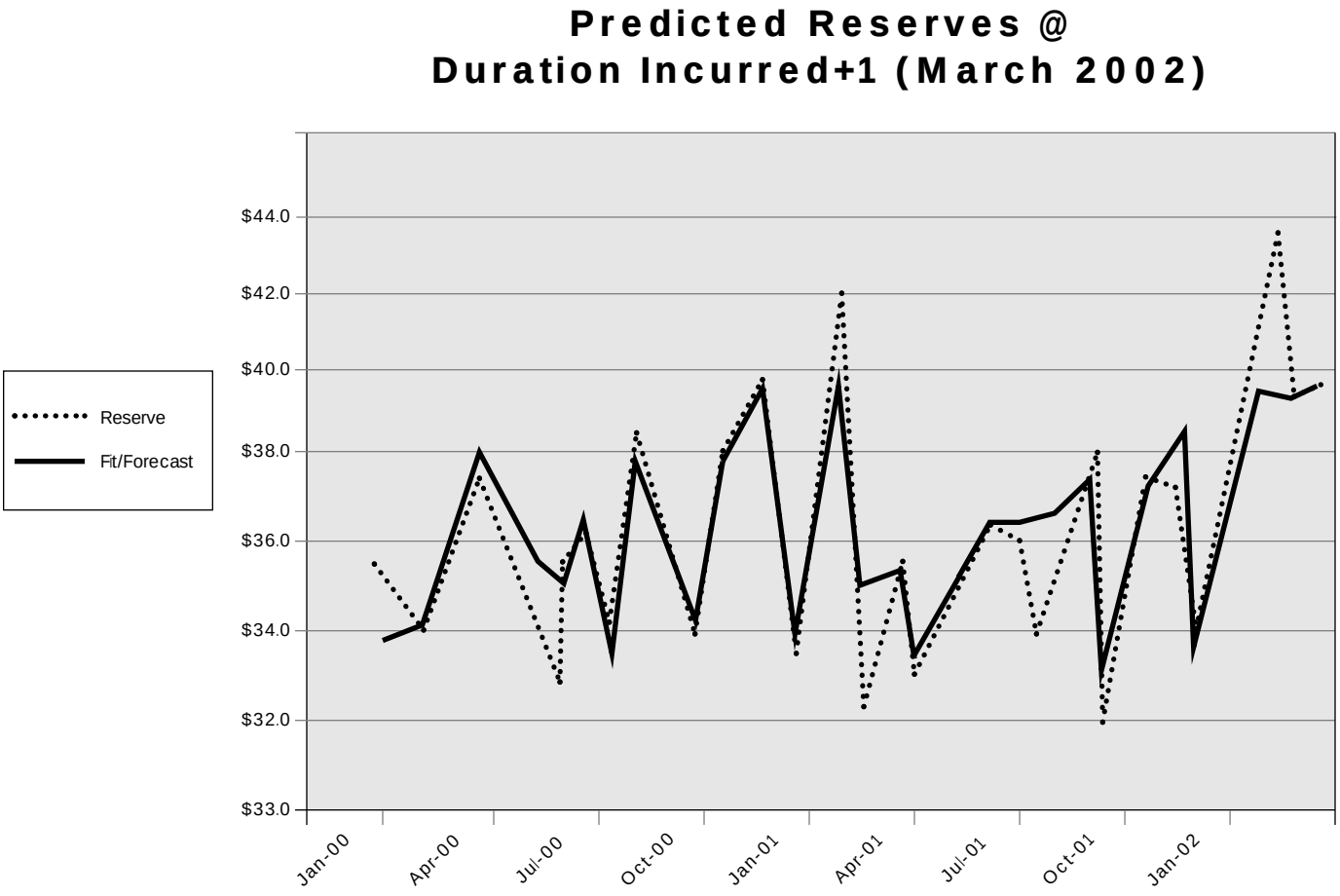


Duration 2

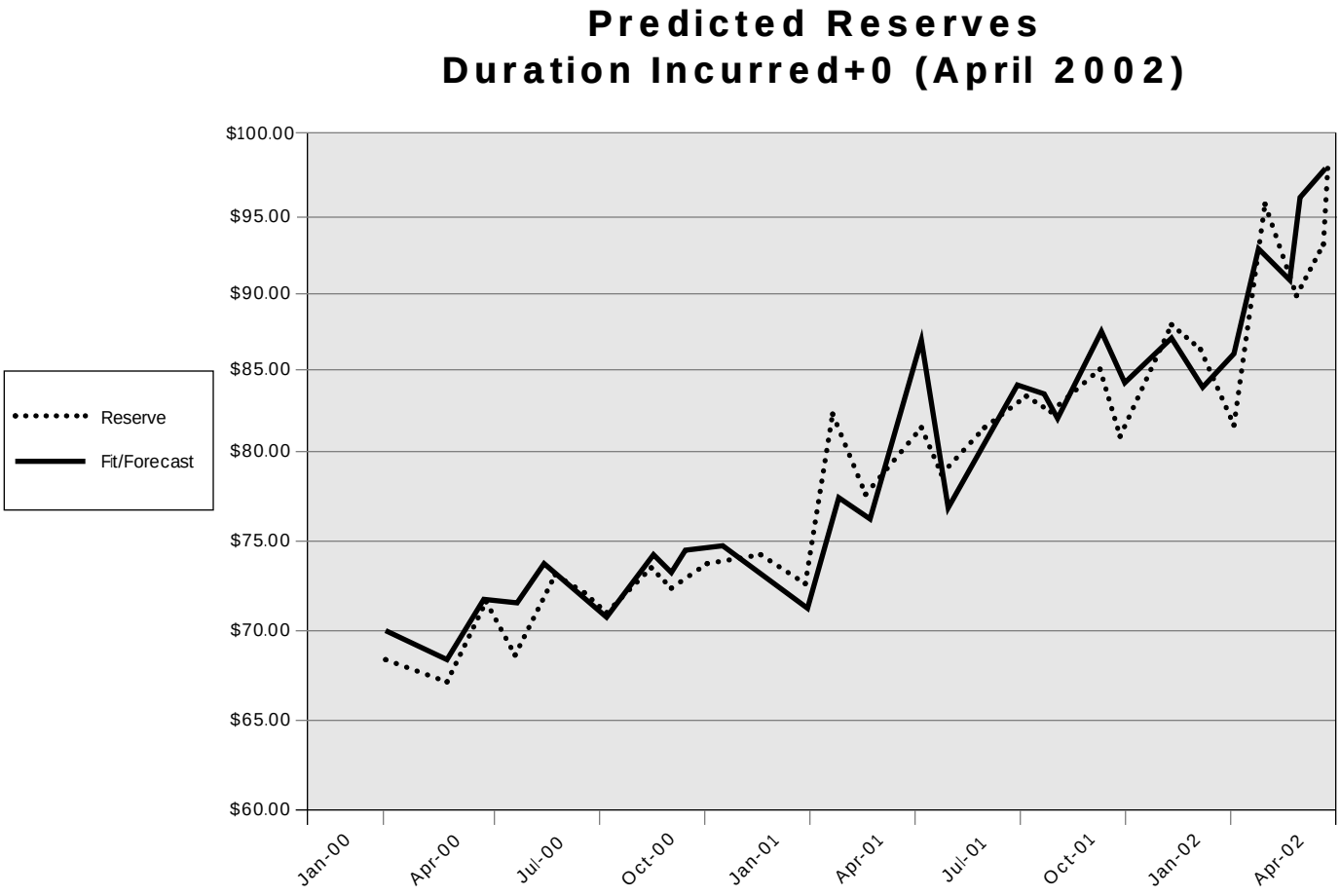
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.956480244
R Square	0.914854457
Adjusted R Square	0.853918904
Standard Error	2.411341347
Observations	27

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	1374.45381	274.8908	47.27622	1.01E-10
Residual	22	127.920476	5.814567	-	-
Total	27	1502.374307	-	-	-

	Coefficients	*Standard Error*	*t Stat*	*P-Value*	*Lower 95%*	*Upper 95%*
Intercept	0	#NA	#nA	#NA	#NA	#NA
Pended Claims Pre 2001	20.30555462	0.926769978	21.910003	1.96E-14	18.38355	22.22756
Pended Claims Post 2000	20.67095749	1.147051825	18.02094	1.16E-14	18.29212	23.0498
Cum Paid Claims Pre Feb-01	0.536370206	0.205172893	2.614235	0.0153838	0.110867	0.961873
Cum Paid Claims Post Jan-02	0.511675694	0.15794425	3.239597	0.003764	0.184119	0.839232
AP Pends	0.705568172	0.358653302	1.967271	0.061888	-0.038234	1.44937



The summary statistics indicate fairly high R2's, indicating that a large portion of the historical variance is explained in the model. There is little evidence that the relationship between reserves and pended claims has changed over time. Interestingly, in the duration incurred+1 model cumulative paid claims is not statistically significant. The bulk of the reserve prediction is coming from pended dollars PMPM. AP pends are not statistically significant at duration incurred+1 but are significant at duration incurred+0.

Conclusions

The incorporation of additional information not traditionally incorporated formally in the reserve process has the potential to reduce errors in setting IBNR reserve. Additionally, a statistical approach can facilitate setting confidence limits around reserve estimates and the assessment of the probability of adequate recorded reserves.

The downside to this approach is the requirements of familiarity and skill with certain statistical techniques, potential difficulty in communicating the process to non-technical audiences, potential distrust of the process until its efficacy can be demonstrated and the difficulty in identifying and dealing with time varying parameters.

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Press Release:

SOA Names New Insurance Administrator—Marsh Affinity Group Services

We are pleased to announce that the Society of Actuaries (SOA) has appointed Marsh Affinity Group Services to administer insurance programs for society members.

Marsh is a full-service insurance broker and administrator for affinity groups. A pioneer in the concept of association-sponsored insurance plans since 1949, Marsh Affinity Group Services has earned a reputation for the innovative design and administration of a wide range of insurance and financial a, and has become a leading provider of insurance program management and underwriting services in North America. Marsh Affinity Group Services is a part of Marsh & McLennan Companies, a multinational corporation and one of the world's foremost leaders in insurance administration.

By purchasing insurance programs through SOA, members can take advantage of a wide variety of benefits. These programs have been researched by the SOA and have been proven to be an excellent source of protection for members. Also, with the mass-purchasing power of the SOA, members can benefit from the group rates offered.

Insurance Plans currently being made available to SOA members include:

- Professional Liability Insurance
- Disability Income Insurance
- Term Life Insurance
- 10-Year Term Life Insurance
- Catastrophe Major Medical Insurance
- Major Medical Market Basket

Members who have any questions, or who would like more information, may contact the insurance administrator:
Marsh Affinity Group Services
a service of Seabury & Smith
1-800-503-9230
www.seaburychicago.com

Health Section Meets in Boston

BELOW: Taking a break from the planning session—

Left to right—John Cookson (2002-2003 Section Chairperson), Dan Skwire (retiring council member and 2003 Spring Meeting Program representative—DI), Bryan Miller (new council member) and Dan Wolak (2001-2002 Section Chairperson)

Other council members include: Cynthia Miller, Karl Volkmar, Rowen Bell, Chuck Fuhrer, John Lloyd and Jim O'Connor

ABOVE: While other council members participate by phone, Health Section Council members meet in Boston to discuss future activities and goals of the section.

Left to right—Dan Skwire, John Cookson, Dan Wolak, Darrell Knapp (Annual Mtg. Program representative), Bryan Miller and Kara Clark (SOA Staff Fellow, Health)