

DP-GH Illustrative Solutions

Fall 2007

- 1. Learning Objectives:**
#9. Understand predictive modeling techniques

Solution:

- (a)**
Describe the advantages and disadvantages of using predictive models for underwriting.

Advantages:

- Helps identify members with regression to the mean
- Helps identify members expected to have high claims in the future
- Helps identify preferred and substandard risks
- Low-cost means of predicting claim costs
- Can be used to automate renewal process, saving underwriters' time
- Improve financial outcomes
- Identify members for disease management programs

Disadvantages:

- Data may not be available for members without prior coverage or covered by another insurer or capitated.
- Data from different sources, inconsistent coding, reporting bias.
- Understanding and application of the models may be limited due to training, tools, and underwriting capabilities.
- Sometimes the volume of data and timing of data collection are a concern.

- (b)**
Describe the technical and practical questions you would ask before agreeing to consider the model proposed by the CMO.

Technical questions:

- Is the R-squared presented at different group size levels?
- Is the R-squared result compared to other underwriting methods?
- Are large claims truncated and how is the impact handled?
- Are the groups in the analysis similar to real customers?
- Can you explain the impact on business metrics?
- How is credibility considered?

1. (b) continued

Practical questions:

- How does the model work at both extremes (high and low claims)?
- Is a risk score calculated that can be inexpensively implemented?
- Does the model save administrative costs?
- Does the model fit into the current underwriting process?
- Can the model be explained to others?
- How are regulatory requirements reflected in the model?

2. Learning Objectives:
#12. Applies principles of pricing, benefit design and funding to an underwriting situation.

Solution:

(a)

1. Draw from sources internal and external to company

External

- Plan holder – employers want to attract and retain employees
- Brokers, agents, consultants – value source of information on competition
- Direct market input – focus groups may be used
- Government regulation

Internal

- Group sales force – good incentive compensation arrangement is needed to encourage feedback
- Home office staff – products should have a good strategic fit

2. Evaluate the Product

- Does the product fit a market segment?
- What makes the product different from other products?

3. Determine the Strategic Fit

- Does the product fit into company's market segments
- Can the product achieve desired profit

4. Clarify the Product

- How will the product be marketed
- What administrative issues need to be addressed

(b) **Build, buy, or rent?**

- Building network has greater upfront costs
- Building requires longer lead time
- Market share effects ability to negotiate discounts

Considerations:

- Population to be served - Tailor mix of specialties to population
- Type of Product - POS vs. PPO
- Geographic Access
- Trade-off between size of network and discounts - Tiered networks are an alternative

2. (b) continued

- Trade-off between size of network and medical efficiency - Smaller network of providers with efficient practice patterns
- Entities to contract with - Hospitals, physicians, PCP networks, PHOs
- Target reimbursement levels - Balance competitive premiums and participation
- Current referral patterns - Build on existing practice patterns
- Specialty networks - Consider local supply and demand by provider type

(c)

- Discounted fee for service
- Fee schedules
- Per diems
- Global rates
- Capitation

(d) **Cost Performance**

- Price level measures – discount from billed charges
- Utilization measures – utilization rates per 1,000 members
- Claim cost measures – claim cost per episode, should adjust for demographic factors

Quality

- Look at structure, process, outcome
- JCAHO certification
- HEDIS measures

Member Satisfaction

- How they feel about the care
- Behavioral indicators
- Waiting times

(e) **Selection of providers**

- Credentialing
- Review of performance
- Careful selection, prune later, broad as feasible

Negotiated reimbursement

- Cost control strategies like capitation
- Negotiation strategies

Utilization management

3. Learning Objectives:

#10. Evaluate the process and be able to develop a medical manual rate for both ASO and insured business.

Solution:

(a)

	<u>Year 1</u>	<u>Year 2</u>
Hospital	130	145.6 assuming 12% trend from year 1
Medical	90	100.8 assuming 12% trend from year 1
Copayments	<u>25</u>	<u>25</u> assuming no plan design change in year 2
	195	221.4

The 3rd quarter of year 1 has a mid-point effective date of 8/1;
Therefore the rate will have 5 months of year 1 and 7 months of year 2.

$$3^{\text{rd}} \text{ quarter year 1 net charges} = \frac{5}{12} \times (195) + \frac{7}{12} \times (221.4) = \$210.40$$

Net charges \$212.40 PMPM divided by retention $(1 - 0.1 - 0.06) = 0.84$ (assuming 10% expenses and 6% profit)

$$\text{Capitation rate} = \$212.40 / 0.84 = \$250.48 \text{ PMPM}$$

(b) 4 tier premium:

First calculate average member per contract

$$= N1 \times 1 + N2 \times 2 + N3 \times 2.3 + N4 \times 4 = 0.5 \times 1 + 0.2 \times 2 + 0.2 \times 2.3 + 0.1 \times 4 = 1.76$$

Average premium per contract

$$= N1 \times S + N2 \times S \times R1 + N3 \times S \times R2 + N4 \times S \times R3 \text{ (where } S \text{ is the single rate and } R1 \text{ to } R3 \text{ are the ratio of costs from single to each of the tiers)}$$

Average premium per unit = average premium per member / S

$$= N1 + N2 \times R1 + N3 \times R2 + N4 \times R3 \\ = 0.5 + 0.2(2.2) + 0.2(1.8) + 0.1(3.8) = 1.68$$

Conversion factor = average member per contract/average premium per unit = 1.76/1.68

$$S \text{ the single rate} = \text{capitation rate} \times \text{conversion rate} \\ = 250.48 \times (1.76 / 1.68) = \$262.41$$

Single rate = \$262.41

$$\text{Couple rate} = 262.41 \times (2.2) = \$577.30$$

$$\text{Employee - Child rate} = 262.41 \times (1.8) = \$472.34$$

$$\text{Family rate} = 262.41 \times (3.8) = \$997.16$$

3. continued

(c)

Generally we must recalculate 2nd tier rates from first principle, but since this data assumes the exact same family distribution under 4 tier and 2 tier, we can take the weighted average of 4 tier weights, weighted by the 2 tier distribution.

$$\text{Family} = (0.2 \times 577.3 + 0.2 \times 472.34 + 0.1 \times 997.16) / (0.2 + 0.2 + 0.1) = \$619.29$$

For 2 tier this gives us rates of:

$$\text{Single} = \$262.41$$

$$\text{Family} = \$619.29$$

A very simple check is to make sure that both tiers generate the same revenue:

$$\text{4 tier} \quad 0.5 \times (262.41) + 0.2 \times (577.3) + 0.2 \times (472.34) + 0.1 \times (997.16)$$

$$\text{2 tier} \quad 0.5 \times (262.41) + 0.5 \times (619.29)$$

They both sum to 440.85; so they are OK.

(d)

Historical Averages/Graphs:

- Based on recent experience, judgment, and competitive pressure
- Contributes to underwriting cycle

Actuarial Models:

- Project prices and utilizations separate, and by categories of services
- Still based on historical averages

Regression Analysis:

- Projects historical trend forward
- Corrects for random fluctuations

ARIMA:

- Not good with cyclical patterns
- Should be used for short term only

3. continued

(e)

Challenges in trend measurement/analysis:

- Lack of resources (staff/data)
- Change in data system (inconsistent data)
- Change in claim payment system
- Change in technology
- Change in demographic mix
- Abrupt level shift
- High credibility being given to groups with high fluctuation in cost
- Catastrophic Claims
- Seasonality
- Random fluctuations (Pulse Outliers)
- Change in government programs
- Change in product mix

4. Learning Objectives:
#11. Understand and apply the concept of credibility theory

Solution:

(a)

$$(i) \quad \text{Credibility Factor} = \frac{\sum \frac{|D_a^i|}{D_a} \times D_B^i}{\sum |D_a^i|}$$

$$a = 2005$$

$$b = 2006$$

	$2005D^i$	$2006D^i$	$\frac{ D_a^i }{D_a} \times D_B$	
A	-	-		
B	5%	6%	6%	} positive if same sign negative if different sign
C	-2%	-1%	1%	
D	1%	-1%	-1%	
E	<u>5%</u>	<u>5%</u>	<u>5%</u>	
Total of Absolute Value	13%		11%	

$$\text{Credibility Factor} = \frac{11\%}{13\%} = 84.62\%$$

$$(ii) \quad \begin{aligned} &\text{Actual 2006 Total Loss Ratio Weighted By Members} \\ &= \frac{500(0.82) + 700(0.93) + 800(0.65) + 300(0.70)}{2300} \\ &= \frac{1791}{2300} = 0.779 \end{aligned}$$

$$\begin{aligned} &\text{Expected 2006 Loss Ratio Weighted By Members} \\ &= \frac{500(0.76) + 700(0.94) + 800(0.66) + 300(0.65)}{2300} \\ &= \frac{1761}{2300} = 0.766 \end{aligned}$$

$$\text{Projected Loss Ratio} = 0.779(0.8462) + 0.766(1 - 0.8462) = 0.778$$

4. (a) continued

- (iii) Must use projected loss ratio of 80% for area A and projected loss ratio of 77.8% for all else.

$$\text{Total Loss Ratio} = \frac{10,000(0.80) + 2,300(0.778)}{12,300} = 0.796$$

(b)

Sources of error:

- Using membership instead of claims to weight
- Lack of credibility of loss ratio projection for Area A
- Area A membership may not be correct since it is a projection.

5. Learning Objectives:
#10. Evaluate the process and be able to develop a medical manual rate for both ASO and insured business.

Solution:

(a)

Based on the data given, we can calculate the following:

<u>Duration</u>	<u>Pre-tax Profit</u>	<u>Tax</u>	<u>After Tax Profit</u>	<u>PV factor</u>	<u>PV of Earned Premium</u>	<u>PV of After Tax Profit</u>
1	(210.00)	(73.50)	(136.50)	1.00000	3,000.00	(136.50)
2	455.00	159.25	295.75	0.90909	1,800.00	268.86
3	275.00	96.25	178.75	0.82645	1,260.33	147.73
4	186.00	65.10	120.90	0.75131	1,071.37	90.83
Sum					7,131.71	370.92

The details are:

$$\text{Duration 1 after-tax profit} = (3000 - 1350 - 900 - 1050 + 90) \times (1 - 0.35) = -136.5$$

$$\text{Duration 2 after-tax profit} = (1980 - 1188 - 297 - 99 + 59) \times (1 - 0.35) = 295.75$$

$$\text{Duration 3 after-tax profit} = (1525 - 991 - 229 - 76 + 46) \times (1 - 0.35) = 178.75$$

$$\text{Duration 4 after-tax profit} = (1426 - 998 - 214 - 71 + 43) \times (1 - 0.35) = 120.90$$

$$\text{PV factor Duration 1} = 1$$

$$\text{PV factor Duration 2} = 1/(1.1) = 0.90909$$

$$\text{PV factor Duration 3} = 1/(1.1)^2 = 0.82645$$

$$\text{PV factor Duration 4} = 1/(1.1)^3 = 0.75131$$

PV of lifetime Earned Premium

$$= 3000 + 1980 \times 0.90909 + 1525 \times 0.82645 + 1426 \times 0.75131 = 7131.71$$

PV of lifetime After-tax Profit

$$= -136.5 + 295.75 \times 0.90909 + 178.75 \times 0.82645 + 120.90 \times 0.75131 = 370.92$$

5. (a) continued

(After-tax Profit as % of Premium = PV of lifetime after-tax profit / PV lifetime earned premium = $370.92 / 7131.71 = 5.2\%$)

So if the company's after-tax profit target is 6%, the 5.2% is short. Therefore may need to use a higher starting premium than \$3,000 if other assumptions remain the same (if the company cannot improve lapse, reduce expenses, etc.)

(b)

Factors used in setting lapse assumptions for pricing individual medical and disability insurance

The magnitude of lapsation for individual health insurance varies by the following:

Age

Younger policyholders tend to have a higher lapse rate than older policyholders, except at ages just prior to retirement

Duration

Most blocks of policies will have lapse rates that decrease by duration. Lapse rates will usually become level after a period of time. They will often be expressed as a constant level after a specific duration. Depending on the type of benefits, an increase in lapse rate may occur as policyholders reach the age bracket for early retirement. Change in lapse rate by duration also can occur within a calendar year when premiums are not paid annually. These changes tend to occur most heavily in the first few years a policy is in force.

Product Type

Lapse rates will differ by product type. For example, a buyer of non-cancellable disability insurance is paying a higher premium for the premium guarantee, therefore should have a lower lapse. Medical expense products will have significantly different persistency than disability income products. Even within a particular product, blocks of policies representing different benefit packages may have different lapse rates.

Premium Levels

Premium levels can have a significant impact on lapsation. If policyholders can find equivalent coverage elsewhere for less money, they are much more likely to lapse a current policy than otherwise. Premium increases can have a drastic effect on lapsation. Some insurers have experienced situations in which the entire expected aggregate increase in premium was offset by increased lapsation.

5. (b) continued

Premium Payment Mode and Premium Payment Method

A policyholder with monthly premium payments has twelve times as many opportunities for lapsation as one paying annually. On the other hand, when premiums are collected automatically through a checking account and cancellation requires a positive action by the insured, persistency usually significant increases.

Occupation

The occupation of the policyholder can have a significant impact on persistency. While this is usually considered in analysis of disability income covered, it is usually not considered for medical coverage.

(c)

Steps and considerations when using the loss ratio method to calculate renewal rates

The loss ratio method is the most common method of determining renewal rates. In this method, the actual loss ratio is compared to the expected loss ratio over the experience period and then projected in the future.

The premium rates are then recalculated at a level where the target loss ratio (which may or may not equal the original expected loss ratio) will be met. The target loss ratio may be the overall lifetime loss ratio, or more likely, the future loss ratio at the time of the analysis.

For individual health insurance, regulators have a substantial amount of input into the choice of target loss ratios. This sometimes includes requiring a higher loss ratio on renewals than on new policies.

6. Learning Objectives:
#8. Understand techniques for utilization and claims management

Solution:

(a)

Control

Randomized – equivalent populations pulled post intervention of reference & intervention population randomly

- (i) best method
- (ii) legal concerns about withholding treatment

Geographic – compare equivalent populations in 2 locations post intervention

- (i) need to adjust for area differences
- (ii) our plan only has members in one state – can we do rural vs. urban?

Temporal – equivalent samples drawn from same population at different pt in time, i.e. before and after intervention

- (i) most common
- (ii) adjust after measurement for medical trend

Product Control – compare samples from same population at same time with different products

- (i) adjust for benefit differences
- (ii) don't know how many products are offered

Patients as their own control – intervention and reference population are resampled each period, i.e. “with replacement”

- (i) regression to mean potentially present in post intervention measurement
- (ii) don't know how many members with disease were not placed in program

Participant vs. Nonparticipant – those who chose to participate are compared to those that did not choose to do so

- (i) how to measure the selection effect
- (ii) don't know if there are enough non-participants

Noncontrol

Services Avoided – Savings = cost of service × decreased utilization in intervention population

- (i) high degree of subjectivity – validity questionable
Clinical Improvement

6. (a) continued

Statistical

Time series

- (i) difficulty demonstrating high correlation between actual and fitted data

Regression discontinuity

- (i) break in regression curve at time of intervention represents savings

Benchmark Methods – key statistics compared in both populations

- (i) difficult to demonstrate adequate equivalence of populations, is data available?

(b)

- ROI
- Gross savings
- Cost
- Number of members to be targeted
- Risk intensity of members to be targeted
- Types of interventions
- Number of nurses/staff required to deliver program
- Method for contacting/engaging member
- Rules for integrating the program with res of care management system
- Timing
- Predicted behavior of target population/projected savings

7. Learning Objectives:
#12. Applies principles of pricing, benefit design and funding to an underwriting situation.

Solution:

(a)

$$\text{Credibility} = 200 \times 12 / 6000 = 0.4$$

$$\text{Midpoint of experience period} = 1/1/06$$

$$\text{Midpoint of effective period} = 7/1/08$$

→ 18 months of trend

Incurred non-pooled claims = Paid claims + Δ Reserves - Large claims above pooling threshold

$$\text{Paid claims} = 1,200,000$$

$$\Delta \text{ Reserves} = 230,000 - 200,000 = 30,000$$

$$\text{Large claims above pooling} = (125,000 - 50,000) + (75,000 - 50,000) = 100,000$$

$$\text{Incurred non-pooled claims} = 1,200,000 + 30,000 - 100,000 = 1,130,000$$

$$\text{Expected incurred claims} = 1,000,000$$

$$\text{Credibility weighted claims} = 0.4 \times 1,130,000 + 0.6 \times 1,000,000 = 1,052,000$$

-add 60,000 claim increase due to government program

$$\text{Projected claims} = (1.1^{1.5}) \times (1,052,000 + 60,000) = 1,282,903$$

$$\begin{aligned} \text{Gross premium} &= (1,282,903 + 70 \times 12 \times 200 + 40 \times 12 \times 200) / (1 - (0.04 - 0.03 - 0.02)) \\ &= 1,498,900 / 0.91 = 1,699,893 \end{aligned}$$

$$\text{Premium PEPM} = 1,699,893 / 200 / 12 = 708.29 \text{ PEPM}$$

(b)

For retrospective experience rating:

Current Balance =

	Prior Period Balance
+	Premium
+	Investment Income
-	Claims Charged
-	Expenses Charged
-	Risk Charge
-	Addition to Rate Stabilization Reserve
-	Profit Charge

7. (b) continued

where $\text{Claims Charged} = \text{Paid Claims} + \Delta \text{Reserves} - \text{Pooled Claims} + \text{Pooling Charge} + \text{Conversion Charges} + \text{Margin}$

Premium

- need premium paid for contract year

Investment Income

- including interest credited on reserves or other balances
- can use portfolio or investment year method

Claims Charged

- also include other modifications to claims
- remove stop-loss claims
- pooling charges
- conversion charges

Risk Charge

- covers risk of account terminating in a deficit position

Addition to Rate Stabilization Reserve

- can accumulate portion of surplus to offset experience fluctuations
- can be paid out to policyholder if they terminate with a positive balance

Profit Charge

- may or may not be shown explicitly

8. Learning Objectives:
#8. Understand techniques for utilization and claims management

Solution:

(a)

Calculate the expected return on investment (ROI) for this program.

Chronic admits/1000 members:

2005: $22500 / (7500 / 1000) = 3,000$

2006: $27000 / (9750 / 1000) = 2,769.23$

Expected admits/1000 in 2006 = $3,000 \times 1.041 = 3,123$

Expected total admits in 2006 = $3,123 \times 9,750 / 1000 = 30,449.25$

Number of admits saved = $30,449.25 - 27,000 = 3,449.25$

Savings due to decrease in admissions = $\$3,449.25 \times 8,500$
per admit = $\$29,318,625$

Program costs for 2006: $(150,000 \text{ members}) \times \$2.25 \text{ PMPM} = \$337,500$

Return on investment = $(\text{Expected savings}) / (\text{Expected costs})$
= $(\$29,318,625) / (\$337,500) = 86.87$

(b)

Describe issues you should consider when presenting these results.

1. Regression to the mean: patients with high costs one year due to a non-recurring event may improve in the following year regardless of participation in the program.
2. Identifying members: due to regression to the mean, threshold-based methods of identifying targeted members may not be appropriate
3. Persistency: want to understand why people drop out of the program
4. Patient selection bias: if people are volunteering for the program, need to be aware of this bias.
5. Trend: the chronic vs. non-chronic trend may be different.
6. Population growth: the chronic population grew between 2005 and 2006, so we may not be comparing apples to apples

(c)

Discuss legal implications associated with medical management programs.

Legal implications: Can be placed at risk for litigation

8. (c) continued

Steps to avoid getting hit with liability:

1. Stay current on new court cases
2. Make sure marketing brochure information matches the contract
3. Comply with ERISA notification rules
4. Stay up to date with new, experimental treatments
5. Physician bonuses should not be based solely on utilization.
6. Do not contract med management activities to a 3rd party.
7. Investigate before making decisions adverse to beneficiaries.
8. Purchase professional malpractice insurance.
9. Require providers at substantial financial risk to have stop-loss protection.
10. Implement quality assurance programs.
11. Adopt credentialing criteria.
12. Investigate any questions concerning a provider's conduct and competence.
13. Establish a provider appeal procedure.

9. Learning Objectives:
#6. Apply U.S. and Canadian nation-specific regulation to product design and pricing

Solution:

(a)

Account Based Plans

Health Savings Account (HSA)

- Must be tied to a high deductible plan design
- Rollover year to year, no use it or lose it
- Portable
- Tax-free benefits, growth not taxed, and not included in taxable salary
- Funded by employer or employee
- Employee owns

Medical Savings Account (MSA)

- Must be tied to a high deductible plan design
- Rollover year to year, no use it or lose it
- Portable
- Tax-free benefits, growth not taxed, and not included in taxable salary
- Funded by employer or employee, but not in same year
- Employee owns

Flexible Savings Account (FSA)

- Can be tied to any plan design, no HDHP required
- No rollover year to year, use it or lose it
- Tax-free benefits on IRS-allowed medical expenses, not included in taxable salary
- Annual election available immediately even if not in account yet

Health Reimbursement Account (HRA)

- Usually tied to a high deductible plan design, but not required
- Rollover year to year, no use it or lose it
- Not portable, typically
- Tax-free benefits
- Funded by employer only
- Notional account

9. Continued

Issues to Consider

- Stacking of deductibles' impact on single versus family contracts
- Retirement savings, hard to save enough under HSA limitations
- Adverse selection of benefit options
- No impact on high utilizers
- Money to low utilizers, may induce utilization
- Unclear impact on costs
- Astute shopping for health care, behavior changes (consumerism benefits)

(b)

Option 1: Traditional PPO

Deductible + coinsurance + vision + dental + member premiums for coverage = total member OOP
 $500 + 0.2(2000-500) + 200 + 100 + 12(100) = 2300$

Option 2: HRA

Medical claims – account + vision + dental + premiums
 $2000-1000 + 200+100 +600 = 1900$

Option 3: HSA

Medical claims – account + vision + dental + premiums
 $2000-500 + 200+100 +300 = 2100$

Option 3 is the only one where the member can contribute more towards HAS
The member could only contribute an additional \$2100, because the aggregate limit is \$2600 and the employer already contributed \$500 toward that limit

Tax savings = $\$2100 * 0.3 = \630

After-Tax dollars = $\$2100 - \$630 = \$1470$

10. Learning Objectives:

#10. Evaluate the process and be able to develop a medical manual rate for both ASO and insured business

Solution:

Goals of IDS:

- Efficient delivery of services
- Improve quality of services provided and of health outcomes
- Customer satisfaction
- Make its providers attractive to customers
- Accept risk to provide all health care services

Services an Actuary can Provide:

- Actuarial Cost Modeling
 - Establish Budgets
 - Allocate Revenue Among Providers
 - Develop Capitation arrangements
- Fee Structure Analysis
 - Determine equitable payment Structure
 - Negotiate provider fee schedules
- Clinical Efficiency Benchmark Analysis
- Claim Probability Distributions
 - Analyze to determine effect of stop loss arrangements.
- Risk Pool Disbursement Analysis
- Incentive Structure Design
- Develop Reporting of Medical Claim Costs on Actual Costs

11. Learning Objectives:

#1: Understand and evaluate the effectiveness of the various types of Single Employer group coverage typically offered under: Group health plan, including Consumer driven plans, etc., Prescription Drug, Group dental plan, STD or LTD plan (including mention of coverage without other plans), Group life plan, Post retirement coverages.

Solution:

Reverse Copay

- Employer pays a fixed amount and the member is responsible for the rest
- Protects employer from sharp increases in costs
- May be financial barrier for low income members

Formulary

- A specific list of drugs covered by the plan with certain non-effective drugs excluded

PreAuthorization

- Patient must receive a pre approval before drug is dispensed

Generics

- Steer members towards generic equivalents
- Must take into account any rebates from brand name drugs

Reference Based Pricing

- Plan pays fixed amount per therapeutic class, member pays the rest
- Member aware of true cost of drug
- Creates price competition among drug companies
- Creates barrier for low income employees

12. Learning Objectives:

#1: Understand and evaluate the effectiveness of the various types of Single Employer group coverage typically offered under: Group health plan, including Consumer driven plans, etc., Prescription Drug, Group dental plan, STD or LTD plan (including mention of coverage within other plans), Group life plan, Post retirement coverages

Solution:

(a)

Critical illness benefit:

- Lump sum payable upon a carefully defined list of diseases
- May be based on hospital confinement benefit
- Individual or group basis

Supplemental disability benefit:

- Usually short benefit period and low monthly max
- Benefit can be fixed dollar amount or % of salary
- Variety of elimination periods and benefit period options available
- Definition of own occupation and any occupation

(b)

Critical illness benefit:

- Level premium rating based on participant's issue age
- Mortality and morbidity data are not readily available – use government publications and population data, with appropriate adjustments for anti selection based on underwriting, marketing approach and policy provisions
- Pricing projection of assumptions goes far into future and can produce substantial reserves
 - Investment income important
 - Persistency important (high is bad)
- Premium rates generally vary by tobacco use but not always by sex.

Supplemental disability benefit:

- Industry/occupation, SIC used
- Certain industries and hazardous activities are usually excluded
- Morbidity assumptions: 1985 Disability Term study or 1987 GLTD with adjustments for anti-selection for longer benefit period, shorter elimination period, high amount

12. continued

(c)

Critical illness benefit:

- Appropriate underwriting to address selection concerns – short form for group; more thorough for individual
- Strong pre existing condition limitation clause
- Benefit limits or graded benefit provisions
- Rating or exclusions can be used and more common for higher benefits

Supplemental disability benefit:

- More detailed questions on underwriting forms for higher amounts or longer benefit period
- Actively at work requirements
- Assign industry/occupation to appropriate rate structure
- May review case individually by U/W to determine the appropriate premium rate category
- Income replacement % range from 50-70%: take into consideration replacement ratio
- Participation level/guaranteed issue for group policy

13. Learning Objectives:

#1: Understand and evaluate the effectiveness of the various types of Single Employer group coverage typically offered under: Group health plan, including Consumer driven plans, etc., Prescription Drug, Group dental plan, STD or LTD plan (including mention of coverage within other plans), Group life plan, Post retirement coverages

#4 Evaluates employer strategies for designing and funding benefit plans for Active employees, Dependents, Pre-65 retirees, Post-65 retirees, Disabled (short and long term)

Solution:

(a)

	Indemnity	managed indemnity	PPO	POS	HMO
steerage	none	none	[-coins differentials-]		maximum
provider choice	unlimited	unlimited	[- in network -]		network only
utilization review	none	minimal	yes	yes	maximum
referral management	none	none	none	[- PCP/gatekeeper -]	
balance billing	yes	yes	[- no for in-network -]		none
provider payment	FFS	FFS	[- discounts in-net -]		capitation
rating methods	[- experience rating -]				mostly community
claims handling	member	member	[- provider in-net -]		provider

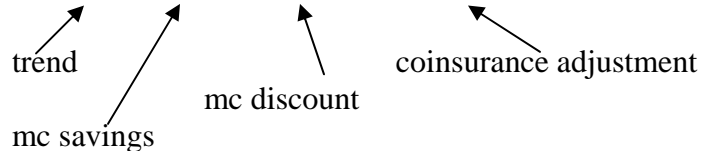
13. continued

- (b) future cost of indemnity plan
 $6,000,000 / (1.25) \times 1.16 = 9,280,000$

Future cost of POS plan

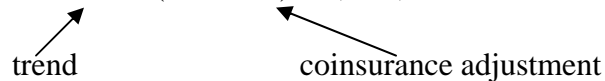
In-network costs

$$8,000,000 \times 1.12 \times 0.98 \times 0.90 \times (0.9 / 0.85) = 8,367,586$$



out-of-network costs

$$8,000,000 \times 1.18 \times (0.7 / 0.85) = 7,774,118$$



Need to solve for % of in-network use...call it U . Since consultant claims 1,000,000 in savings...

$$9,280,000 - 1,000,000 = (U) \times (8,367,586) + (1 - U) \times (7,774,118)$$

$$U = 85.2\% \text{ in-network utilization to achieve } 1,000,000 \text{ in savings}$$

The consultant is assuming a little over 85% of claims will come from in-network providers. This seems like a reasonable assumption for in-network use, although often times it is even higher.

- (c) Year 2 indemnity claims = 9,280,000
 Employer cost is 75%, so $9,280,000 \times 0.75 = 6,960,000$

Year 2 POS claims = $9,280,000 - 1,000,000 = 8,280,000$

Employer cost is 75%, so $8,280,000 \times 0.75 = 6,210,000$

13. continued

(d)

- Pre-certification
- Discharge planning – additional service needed?
- Center of excellence – used for certain high cost procedures
- Prenatal advisory services – identify high cost pregnancies
- Concurrent review
- Large case management
- Referral management – access through PCP
- Onsite concurrent review – nurse at hospital reviews
- Outpatient pre-certification
- Managed 2nd surgical opinion

14. Learning Objectives:

#7: Apply U.S. & Canadian taxation rules to employer and individual health plan

#10: Evaluate the process and be able to develop a medical manual rate for both ASO and insured business

Solution:

(a)

US:

- Employer-paid group term life is tax free up to \$50K in US
- Colin has \$80,000 - \$50,000 = \$30,000 in taxable benefit
- Monthly imputed income = (Benefit - \$50,000)/\$1,000 × Table I rate
- Imputed income = \$30,000 × 0.08/1000 = \$2.40 per month
= \$28.80 per year

Canada

- In Canada, term life insurance premium paid by employer is completely taxable to employee
- Tax is based on group's average actual premiums paid
- Average premium rate =
$$\frac{\sum \text{EE's coverage amount} \times \text{rate}}{\sum \text{EE's coverage amount}}$$
$$= \frac{10 \times 60 \times 0.09 + 15 \times 75 \times 0.15 + 5 \times 90 \times 0.4}{10 \times 60 + 15 \times 75 + 5 \times 90}$$
$$= 0.185 / \$1000 \text{ of coverage}$$
- Taxable for Colin = 0.185 × \$80,000 / 1000 = \$14.80 per month
= \$177.60 per year

(b)

- Group Universal Life
 - Premium includes mortality charges, expenses and amount towards cash build-up
- Accidental Death & Dismemberment
 - Inexpensive
- Dependent Life Insurance
 - Small amounts for spouse/children
 - Significant anti-selection
 - Usually employee-pay-all
- Living Benefits
 - 3 basic types: LTC, catastrophic illness, terminal illness
 - Death benefit is reduced by the living benefit amount

14. (b) continued

- Survivor Income
 - Income paid to spouse/dependents of deceased employee
 - Often a % of salary

15. Learning Objectives:

#5: Evaluate the various types of coverages typically offered under a government health plan (e.g. Medicare, Medicaid, Canadian health plan, Social Security Disability Income, states' Temporary Disability Income programs, Workers Compensation, etc.)

Solution:

(a)

Comprehensiveness

- All medically necessary services should be covered by plan

Universality

- All residents of the province must be covered under the same terms and conditions

Access

- Access to medically necessary services should not be inhibited by high use charges

Portability

- Waiting period of no more than 3 months when moving between provinces

Public Administration

- Plan must be administered by a public entity on a non-profit basis

(b)

- Waiting for months to see a specialist
- Long waiting times for elective and non-emergency surgery due to lack of operating room time
- Long waiting times in hospitals for the elderly due to lack of enough LTC facilities
- Overcrowding of ER due to lack of after hour clinics
- Some residents don't have access to medically necessary treatments (eg prescription drugs for chronically ill)
- Lack of technology intensive services in some areas
- Long waiting time for diagnostic tests due to lack of sufficient equipment, technicians and specialists
- Demand exceeds supply leading to rationing

(c)

- Hospital charges
 - Inpatient room and board to upgrade from ward to private room
- Prescription drugs
 - About 2/3 cost
- Other practitioners
 - Subject to inside limits on visits

15. (c) continued

- Miscellaneous
 - Nearly any expense that is medically necessary but not covered by provincial plan (ambulance, x-ray, etc)
- Out of Canada coverage
 - For short trips outside of Canada
 - Typically covers ER visits

16. Learning Objectives:

#4: Evaluates employer strategies for designing and funding benefit plans for Active employees, Dependents, Pre-65 retirees, Post-65 retirees, Disabled (short and long-term)

#5: Evaluate the various types of coverages typically offered under a government health plan (e.g. Medicare, Medicaid, Canadian health plan, Social Security Disability Income, states' Temporary Disability Income programs, Workers Compensation, etc.)

Solution:

(a)

- Part A
 - Eligibility: when a person attains age 65, with 40 credits, or being disabled
 - Coverage: inpatient hospital care, skilled nursing facilities, home care
- Part B
 - Eligibility: same as part A, but also pay a premium
 - Coverage: physician services, outpatient hospital services, home health care not covered by Part A
- Part C (or Medicare Advantage)
 - Must be eligible for Part A and enrolled in Part B
 - Offers benefits similar to non-Medicare plan but more services
 - Plans can be offered under: HMO, PPO, PFFS, MSA.
- Part D (prescription drugs)
 - Must be eligible for Part A and enrolled in Part B
 - Voluntary benefit

(b)

Advantages

- Tax-effective means of providing retirement financial security
- Valuable benefit for those currently receiving coverage
- Support workforce planning and growth opportunities for employees
- Viewed as a social responsibility of the employer
- Help provide a competitive package of total compensation
- Costs are nominal relative to the total spending on benefits
- Often at the top of the list of union demands

16. (b) continued

Disadvantages

- Tax-effective but employers don't receive full credit (DEFRA)
- Benefits are valuable for a minority of active employees – near retirement
- Long term careers are diminishing
- Social responsibility is diminishing due to workers switching jobs more often
- Competition is global and more are dropping benefits
- Cash cost is increasing faster
 - Accounting measure, e.g.: FAS 106
- Union demands, but traded for something more valuable to current workers

(c)

- Strict eligibility rules
 - Tied with years of service and age
- Fixed contribution by the employer (versus %)
- Adjust retiree contributions based on the age
 - Early retirement reduction
- Introduce service-related benefits
- Integration with Medicare
- Dynamic plan provisions: coinsurance and cost sharing increase with trend
- Consumer awareness
- Cost containment measures

(d)

(i) Carve out: C% - M

Medicare reimbursement:

- Hospital: $12,000 - 952 = 11,048$
- Medical: $(5,000 - 124) \times 80\% = 3,901$

	Hospital	Medical
Covered expenses	12,000	5,000
Deductible	200	0
Coinsurance	<u>1,770</u>	<u>750</u>
Total	10,030	4,250
Medicare	<u>11,048</u>	<u>3,901</u>
YoungCo's plan cost	Max (0, 10, 030-11,048)	349
	= \$0	
YoungCo's total plan cost	\$349	

16. (d) continued

(ii) Exclusion: (C – M)%

	Hospital	Medical
Covered expenses	12,000	5,000
Medicare	<u>11,048</u>	<u>3,901</u>
Net expenses	952	1,099
Deductible	<u>200</u>	<u>0</u>
	752	1,099
Coinsurance	<u>113</u>	<u>165</u>
Total	639	934
YoungCo's total plan cost	\$1,574	

17. Learning Objectives:

#10: Evaluate the process and be able to develop a medical manual rate for both ASO and insured business

Solution:

(a)

Analysis of claims incidence

- Review AE incidence

Analysis of claim termination

- Understand benefit limit such as Mental and Nervous limitation
- Understand change in definition of disability after a set period

Combine the experience in terms of total cost or A/E LR

Review benefit offset experience

- A/E offset study is most effective

(b)

Ensure eligibility for coverage

- Is employee in class which is eligible for coverage?
- Plan in force at date of disability?
- Actively at work requirement met?
- Does disability fall under pre-existing condition exclusion?

Determination of disability

- Physician records or APS
- Occupation

Calculate payment amount

- Pre-disability income \times Benefit% - Offsets

Assist claimant with offset application process, if not receiving offset,

Ongoing proof of disability

- Enforce benefit limits such as Mental and Nervous
- Disability re-evaluated a minimum of once a year
- Re-evaluated if definition of disability changes

Tools in the (or on-going) claims process

- Medical and functional capacity exams
- Rehabilitation – voc rehab and physical rehab
- Financials, verify pre-disability and current earnings
- Fraud review, surveillance

18. Learning Objectives:

#10: Evaluate the process and be able to develop a medical manual rate for both ASO and insured business

Solution:

(a)

Combined trend:	2005	2006
Claims	\$172,740,905	\$246,539,183
Members	60,034	81,289
cost/member	\$2,877.38	\$3,032.87

$$\text{Trend} = 3032.87 / 2877.38 - 1 = 5.39\%$$

HMO trend:	2005	2006
Claims	\$24,144,578	\$77,283,449
Members	10,156	30,156
cost/member	\$2,377.37	\$2,562.79

$$\text{Trend} = 7.8\%$$

PPO trend:	2005	2006
Claims	\$148,596,327	\$169,255,734
Members	49,878	51,133
cost/member	\$2,979.20	\$3,310.11

$$\text{Trend} = 11.11\%$$

The combined trend is lower than the HMO and PPO trends. The reason is because HMO has a lower trend but in the second year, its average covered members increased which pulled down the trend.

(b)

Advantage of combined trend:

- Simpler

Disadvantage

- Misleading as in this case
- Not all population and products the same
- Should not analyze them together
- Data is large and credible to be analyzed individually
- Not very accurate
- Not true and not representative of true trend

18. continued

(c)

External sources:

- CPI indices: current basket
- GDP: there is lag, not most up-to-date
- Reinsurance: make sure data is applicable; may have different benefits
- Medicare data: only post-65 data, may be affected by legislation, need to sort out data for relevance
- Consultants: make sure data is applicable; check benefits and check time period; check area

19. Learning Objectives:

#10: Evaluate the process and be able to develop a medical manual rate for both ASO and insured business

Solution:

(a)

Factors and assumptions to analyze pricing factors

Use company experience when available

Factors include

- Morbidity
 - Industry studies
 - Rate filings
- Mortality
 - Not significant
 - Included for persistency
- Persistency (lapsation)
 - Based on Company experience
- Investment Earnings
 - For claim reserves to adjust loss ratio in community rating (very small impact)
- Selection Factors in Underwriting
 - UW usually yes/no questions
 - No underwriting if <65 and may show adv selection
- Age/Sex Distribution
 - Assumption for issue age/sex distribution
 - Smoker/Non-smoker consideration
 - Smoker higher claims than non-smoker
- Area Factors
 - Typically by 3-digit zip or county
- Expenses & Taxes – consider following
 - Issue & UW
 - Maintenance (premium billing, claims, customer service)
 - Premium tax
 - Other Expenses (commissions)
- Other Considerations
 - Premium mode (e.g., annual premium)
 - Policy fee separately charged?
 - Reasonable assumptions selected
 - Actuarial certification of rates
 - Trend (utilization & unit cost)
 - Profit
 - Benefit Design – Issue Age/Attained Age

19. continued

(b)

Describe Loss Ratio Tests applicable to Med Supp Pols

Model Regs describe 3 loss ratio standards met for filing

1. Accumulated value of past + PV of future claims/Accumulated value of past Premium +
2. PV of future claims/PV of future Prem \geq LR Standard
 - o Prevents company from increasing premiums to recover past losses
3. Expected 3rd year LR \geq applicable standard
 - o Applicable standard = greater of filed LR or Stat min
 - o Project future LR from 2nd std
 - o Individual LR Standard = 65%
 - o Group LR Standard = 75%

(c)

Calculate loss ratios & determine if meets requirements

Paid	Discount Paid	PV Mid year Claims	PV Mid-Year Premium	Loss Ratio
1	0.5	1,531,948	2,439,750	62.8%
2	1.5	1,263,544	1,886,525	67.0%
3	2.5	1,084,385	1,523,796	71.2%
4	3.5	916,428	1,216,238	75.3%
5	4.5	761,838	957,859	79.5%
Total		5,558,144	8,024,170	69.3%

Note, can give credit if Premium at BOY or Mid-Yr estimate

Paid	Discount Paid	PV Mid year Claims	PV BOY Premium	Loss Ratio
1	0.5	1,531,948	2,500,000	61.3%
2	1.5	1,263,544	1,933,114	65.4%
3	2.5	1,084,385	1,561,427	69.4%
4	3.5	916,428	1,246,273	73.5%
5	4.5	761,838	981,514	77.6%
Total		5,558,144	8,222,328	67.6%

20. Learning Objectives:

#4: Evaluates employer strategies for designing and funding benefit plans for Active employees, Dependents, Pre-65 retirees, Post-65 retirees, Disabled (short and long-term)

#7: Apply U.S. & Canadian taxation rules to employer and individual health plan

Solution:

(a)

Canada

- Each of provincial/territorial jurisdictions (and the federal government) have different prohibited grounds of discrimination
 - Almost all include non-discrimination on the basis of age, gender, marital status, race, religion and disability
- At the same time,
 - For employee-pay-all group life and disability plans, rates may vary by age and gender, if actuarially justifiable
 - For employee-pay-all supplemental medical and dental plans, rates may differ by gender and marital status
 - Employer contributions may differ based on age and/or gender to provide for the same benefit levels

US

- Non-discrimination general tests applicable to cafeteria plans as a whole must be met:
 - Eligibility test
 - Contributions and benefits test
 - Key employee concentration test
- Tests applicable to underlying benefits of the cafeteria plans must also be met, such as:
 - Health care spending account test
 - Dependent care assistance plan tests
 - Group term life insurance tests

(b)

Compare the health spending account requirements of Canada and the U.S.

Canada – health spending account requirements:

- Election to allocate funds must be made prior to the beginning of the plan year
- Election is irrevocable (exception in the event of a change in family status)
- Funds can only be used to reimburse eligible health expenses

20. (b) continued

- Either unpaid claims or unused funds can be rolled over at the end of the plan year for 12 months (not both)
- Unused funds are forfeited upon termination of employment (at either the actual termination date or the end of the calendar year)

US – health care flexible spending account requirements:

- Account must qualify for health and accident sections of Internal Revenue Code
- Election to allocate funds must be made prior to the beginning of the plan year
- Full elected amount must be available throughout the year (even if not fully contributed yet)
- Funds can only be used to pay qualified medical expenses incurred during the coverage period
- Claims must be reviewed by a third party
- At the end of the year, unused funds are forfeited (use-it-or-lose-it)
- Forfeited funds belong to the employer

(c)

Calculate the expense reimbursement for the above claims in Years 1 and 2:

- (i) Under the proposed health spending account in Canada using the various carryforward methods.

Method 1: Balance rollover

	Amount Reimbursed	Credit Balance
Year 1 – beginning of the year		\$500
Glasses	(\$375)	\$125
Massage	(\$125)	\$0
Prescription drugs	\$0	\$0

Prescription drugs expense of \$92 is not reimbursed by the account (the employee pays it out-of-pocket).

	Amount Reimbursed	Credit Balance
Year 2 – beginning of the year		\$500
Hospital Charge	(\$250)	\$250
Dental check up	(\$150)	\$100

The \$100 balance is rolled over to Year 3.

20. (c) continued

Method 2: Expenses rollover

	Amount Reimbursed	Credit Balance
Year 1 – beginning of the year		\$500
Glasses	(\$375)	\$125
Massage	(\$125)	\$0
Prescription drugs	\$0	\$0

Prescription drugs expense of \$92 is not reimbursed by the account in Year 1 but is rolled over to Year 2.

	Amount Reimbursed	Credit Balance
Year 2 – beginning of the year		\$500
Prescription drugs	(\$92)	\$408
Hospital Charge	(\$250)	\$158
Dental check up	(\$150)	\$8

The \$8 balance is forfeited at the end of Year 2.

(ii) Under the flexible spending account in the U.S.

	Amount Reimbursed	Credit Balance
Year 1 – beginning of the year		\$500
Glasses	(\$375)	\$125
Massage	(\$125)	\$0
Prescription drugs	\$0	\$0

Prescription drugs expense of \$92 is not reimbursed by the account (the employee pays it out-of-pocket).

	Amount Reimbursed	Credit Balance
Year 2 – beginning of the year		\$500
Hospital Charge	(\$250)	\$250
Dental check up	(\$150)	\$100

The \$100 balance is forfeited at the end of Year 2.

21. Learning Objectives:

#1: Understand and evaluate the effectiveness of the various types of Single Employer group coverage typically offered under: Group health plan, including Consumer driven plans, etc., Prescription Drug, Group dental plan, STD or LTD plan (including mention of coverage within other plans), Group life plan, Post retirement coverages

#10: Evaluate the process and be able to develop a medical manual rate for both ASO and insured business

Solution:

(a)

Nursing home benefits:

- Skilled nursing facility, with skilled medical professional performs procedures, under doctor's orders, 24 hour care
- Intermediate care, which does not need to be medical professional performing procedure; less services than Skilled Nursing Facility
- Custodial care, which provides care for Activities of Daily Living (ADL's)

Assisted Living Facility (ALF):

- Provide qualified care, which may be some nursing care
- Qualifies as ALF if licensed by a state agency, have skilled staff at all times, and provides necessary care for ADL's and cognitive impairments (CI's)

Home Health Care

- Provides skilled service and/or homemaker services

Adult Day Care

- Have nurse that provides care

Other:

- Durable medical equipment
- Home modification
- Respite care
- Caregiver training
- Hospice benefits
- Ambulance
- Prescription drugs

21. continued

(b)

Benefit maximum

Benefit period:

- Nursing home is one year or lifetime
- Home health is number of visits or continuous with Nursing Home

Elimination period:

- 0, 20 or 90 days for Nursing home

Daily Benefit:

- \$50 - \$350 per day

Issue Age:

- Usually to age 79
- Reduce benefits if past age 80
- Average age for individual coverage is below 60
- For group policies, average age is 45

Inflation:

- Most index benefits
- May only occur for a limited period

Exclusions:

- Pre-existing condition

Benefit triggers:

- 2 types: 2 ADL's or CI's

Premium Structures:

- Guaranteed renewable
- Issue age rated
- Unisex rate
- Spousal discounts

Riders"

- Non-forfeiture required

Combination products:

- Disability/LTC or Term Life

21. continued

- (c)**
 - (i) Because of long term nature of LTC, this product is dependent on investment earnings to cover future liabilities. Investment earnings are not significant for most other health products.
 - (ii) The profit on LTC may take 7 – 10 years to emerge because of surplus strain. Government has forced companies to recognize high persistency and LTC is a lapse supported product. For health products, the focus is on annual profit goals.