Solutions to Health Section Exercises

Chapter 30

Section 30.3.3:

30.1. Which gender/age/area cell would observe the largest absolute percentage of disruption as a result of rebalancing the age/gender and area factors as shown in Examples 30.5 and 30.6?

Solution. The disruption is the percentage difference between the term (the allowed PMPM times the new AGF and area factors for each combination of age/gender and area) and the term (the normalized allowed PMPM times the existing AGF and area factors for each combination of age/gender and area). In this example, the largest disruption would be for females age 35-39 residing in area Delta:

(401.18 * 1.0651 * 0.9225) / (254.48 * 1.2000 * 0.8000) - 1 = 61.3%.

Values for all combinations are calculated in the solution spreadsheet.

30.2. The state in which the given claim experience occurred recently passed new rating restrictions, requiring unisex rates (which means the insurer cannot use different age/gender factors for males and females) and a 3:1 age band (which means that the rate charged to members of any age cannot be more than three times that amount charged to members of any other age). Use the method illustrated in Example 30.5 to calculate new age/gender factors that meet both restrictions and are revenue-neutral in total to the existing ones.

Solution. The factors are contained in the "Compressed Curve Fit Factor" of this table:

Age	Members	Allowed Claims	Allowed PMPM	Relativity to Average	Compressed Curve Fit Factor
0-24	2,400	4,573,811	158.81	0.3959	0.5532
25-29	488	1,700,513	290.39	0.7238	0.7692
30-34	577	2,487,142	359.21	0.8954	0.8585
35-39	730	2,864,008	326.94	0.8149	0.9582
40-44	748	2,713,392	302.29	0.7535	1.0694
45-49	760	4,231,830	464.02	1.1566	1.1936
50-54	867	5,752,934	552.95	1.3783	1.3322
55-59	867	7,635,951	733.94	1.8294	1.4869
60-64	588	6,674,487	945.93	2.3578	1.6596
Total	**8,025**	**38,634,068**	**401.18**	**1.0000**	**1.0000**

First calculate the total member months, allowed claims and allowed PMPM by age band (irrespective of gender) and find the relativity to the average for each band. As in the example, the member-weighted relativity to average combines to 1.0; so should the member-weighted average of the Compressed Curve

Fit Factor. Since the age 60-64 band has the highest allowed PMPM and the age 0-24 band has the lowest allowed PMPM, the 3:1 restriction can be met by using a cell formula to ensure that the AGF for the 60-64 band is exactly three times the AGF for the 0-24 band. Then, use cell formulas in the rightmost column to fit the midpoints of the age bands to an exponential curve as before, with the endpoints as the 0-24 and 60-64 factors, and use the Goal Seek function to find the value of the 0-24 band that results in the total equal to 1.0.

The formulas are provided in the solution spreadsheet.

Section 30.5.1:

30.3. Using the CPD in Example 30.9 (Table 30.3) and the method shown in Example 30.10, calculate the paid-to-allowed ratio for a plan that features a 1,000 deductible and 30% member coinsurance up to a 4,000 out-of-pocket maximum.

Solution. Because the threshold of 11,000 is not a boundary in the table, an assumption needs to be made. The simplest assumption is that everyone in the band from 10,500-100,000 has the average claim of 24,799.74. In that case the calculation is the same as in the example. The solution is presented below with the formulas in the accompanying spreadsheet. The paid-to-allowed ratio is 0.7150.

Plan	**30.3**
Allowed Claimsper Member	4,814.21
Member Deductible	1,000.00
Member Coinsurance	30%
Coinsurance Maximum	4,000.00
Threshold	14,333.33
Upper Limit (entries are expected savings)	
0	-
500	57.89
2500	352.73
5500	240.49
10500	238.26
100000	459.19
infinity	23.68
Total Expected Savings	1,372.23
Expected Insurance Payment per Member	3,441.98
Paid to Allowed Ratio	71.50%

This will slightly overstate the savings as those with claims in the 10,500-11,000 range will not reach the threshold. The spreadsheet provides an alternative solution that allocates some probability to that range. Because the range is small, the Paid to Allowed Ratio only increases to 71.51%.

30.4. In what ways should the tables in Examples 30.9 and 30.11 be revised or expanded in order to calculate an expected paid-to-allowed ratio for a plan with the following features:

- Inpatient - services always subject to deductible and coinsurance
- Outpatient - surgeries and high-tech radiology subject to copays, but all other services subject to deductible and coinsurance
- Professional – physician office visits subject to copays that differ between primary care physicians and specialists, but all other services subject to deductible and coinsurance
- Prescriptions – all prescriptions subject to copays that differ between generic drugs and brand-name drugs

Solution. The deductible and coinsurance should be valued by using a CPD that includes the distribution of annual claims by member for only the services that will be subject to deductible and coinsurance. For the services subject to copays, the types of service in the cost model should be split out according to the different copays that could be applied. For example, the Prescriptions line should be divided into generic and brand-name, each with their own figures for utilization, allowed per service and allowed claims PMPM.

Chapter 31:

Section 31.2.3

31.1. Given the premium and claims figures in Table 31.3, recalculate the Estimated IBNR for CY 2011 incurred months using the loss ratio method, based on an 80% loss ratio assumption.

Solution. Since the assumed loss ratio is higher than the 75% used in the example, the ultimate incurred claims estimate will be higher given the same premium; thus the IBNR estimate will be higher.

Year	**2011**
Total Premium	12,009,492
Pricing Loss Ratio	80.0%
Incurred Claims Estimate	9,607,594
Incurred and Paid to Date	6,799,168
IBNR	2,808,425

The underlying calculations are in the solution spreadsheet.

Section 31.3.4:

31.2. A long-term product includes a cost-of-living adjustment that increases the monthly benefit at a compound rate of 0.25% per month. How would the adjustment be reflected in the calculation shown in Example 4.6?

Solution. The monthly benefits would be increased

$$_3V = \frac{1,000}{440}\left\lfloor 1(430)1.06^{-1/24} + 1.0025(410)1.06^{-3/24} + 1.0025^2(390)1.06^{-5/24} \right\rfloor = 2,782.32.$$

