2018-19 Scenario Response

Topic 2: Pharmacy Benefit

A program of The Actuarial Foundation

Modeling The Future Challenge

Pharmacy Benefit Topic Overview

Company A issues medical insurance that covers members' medical needs including but not limited to stays in a hospital, doctor visits and procedures, lab and radiology tests, and prescription drugs. The company has 500,000 Medicare members age 65 and older and wants to analyze its pharmacy benefits. Pharmacy benefits are used more often than other benefits, so the company has ***credible*** data regarding the likelihood members will have a certain number of prescriptions filled during the year. A filled prescription is a thirty-day supply or less. (For example, most antibiotics may be prescribed for seven to ten days.)

By ***credible*** we mean that the data are "statistically reliable." In more technical language, ***credible*** means that the fluctuation or standard deviation about the expected values is small enough to be ignored when calculating the "required insurance premium." Another term for "required insurance premium" is ***pure premium***. If we ignore interest, ***pure premium*** of an insurable event equals the likelihood the event will happen (called the ***frequency***) multiplied by the insurer's expected cost when the event happens (called the ***severity***). The actual premium charged will take into account:

a) the company's administrative and marketing expenses and profit
b) investment income the company expects to earn on the premium
c) a margin to cover random fluctuation and unforeseen circumstances

The attached Excel file contains a continuance table (copied to the following page) that gives the probability (***frequency***) that a member will have a certain number of prescriptions during the year. The shorthand lingo for a prescription is a "script."

Data

# Scripts	Probability	Cumulative Probability
0	0.20000	0.20000
1	0.00299	0.20299
2	0.00336	0.20635
3	0.00373	0.21008
4	0.00411	0.21419
5	0.00448	0.21867
6	0.00485	0.22353
7	0.00523	0.22875
8	0.00560	0.23435
9	0.00597	0.24033
10	0.00635	0.24668
11	0.00672	0.25340
12	0.00709	0.26049
13	0.00747	0.26796
14	0.01120	0.27916
15	0.01494	0.29410
16	0.01623	0.31033
17	0.01752	0.32785
18	0.01881	0.34666
19	0.02010	0.36676
20	0.02139	0.38816
21	0.02269	0.41084
22	0.02398	0.43482
23	0.02527	0.46009
24	0.02656	0.48666
25	0.02785	0.51451
26	0.02656	0.54107
27	0.02527	0.56634
28	0.02398	0.59032
29	0.02269	0.61301
30	0.02139	0.63440
31	0.02010	0.65450
32	0.01881	0.67332
33	0.01752	0.69084
34	0.01623	0.70706
35	0.01494	0.72200
36	0.01440	0.73640
37	0.01400	0.75040
38	0.01360	0.76400
39	0.01320	0.77720
40	0.01280	0.79000
41	0.01240	0.80240
42	0.01200	0.81440
43	0.01160	0.82600
44	0.01120	0.83720
45	0.01080	0.84800
46	0.01040	0.85840
47	0.01000	0.86840
48	0.00960	0.87800
49	0.00920	0.88720

# scripts	Probability	Cumulative Probability
50	0.00880	0.89600
51	0.00840	0.90440
52	0.00800	0.91240
53	0.00760	0.92000
54	0.00720	0.92720
55	0.00680	0.93400
56	0.00640	0.94040
57	0.00600	0.94640
58	0.00560	0.95200
59	0.00520	0.95720
60	0.00480	0.96200
61	0.00440	0.96640
62	0.00400	0.97040
63	0.00360	0.97400
64	0.00320	0.97720
65	0.00280	0.98000
66	0.00240	0.98240
67	0.00200	0.98440
68	0.00160	0.98600
69	0.00120	0.98720
70	0.00080	0.98800
71	0.00040	0.98840
72	0.00040	0.98880
73	0.00040	0.98920
74	0.00040	0.98960
75	0.00040	0.99000
76	0.00040	0.99040
77	0.00040	0.99080
78	0.00040	0.99120
79	0.00040	0.99160
80	0.00040	0.99200
81	0.00040	0.99240
82	0.00040	0.99280
83	0.00040	0.99320
84	0.00040	0.99360
85	0.00040	0.99400
86	0.00040	0.99440
87	0.00040	0.99480
88	0.00040	0.99520
89	0.00040	0.99560
90	0.00040	0.99600
91	0.00040	0.99640
92	0.00040	0.99680
93	0.00040	0.99720
94	0.00040	0.99760
95	0.00040	0.99800
96	0.00040	0.99840
97	0.00040	0.99880
98	0.00040	0.99920
99	0.00040	0.99960
100	0.00040	1.00000

Questions

Part 1: the Basics

Question 1: Using the Excel file, what are the expected number of scripts per person per year? How many scripts will Company A likely insure during a year?

Question 2: What is the expected number of scripts considering only members who have at least one script?

Question 3: What is the variance and standard deviation in the number of scripts per person per year?

Part 2: Severity

We now need to consider the cost of the drugs or the ***severity***.

There are two main classifications of drugs: brand and generic. A brand drug is made by one manufacturer who has a patent on the drug. A generic drug is a drug that has the exact same chemical composition of a brand drug, but since the patent on the brand drug has expired, a generic (copy) can be made by one or more manufacturers and offered to the public at a much lower cost than the original brand drug. Generic drug manufactures can charge less because they do not have to recover the cost for the original research and development.

Today there is a third class of drugs called specialty drugs. Many of these are administered in a doctor's office or outpatient facility. These tend to be very expensive. For the purposes of this scenario, we will assume they are included with brand drugs, which is why you will see a large value for the standard deviation of the cost of brand drugs.

We will assume that 88% of all prescriptions are filled with generic drugs and 12% with brand drugs. The average cost and standard deviation of the cost of a script is given by:

	Average Cost	Standard Deviation
Generic	$30.00	$10.00
Brand	$120.00	$200.00

Question 4: If Company A covered 100% of the costs of the drugs, what is the pure premium for a given member?

Question 5: Assume that the standard deviation of the cost of a script is $75.00. Using the formula for variance below, calculate the minimum premium that allows a margin equal to 1.5 standard deviations.

Let S=N*X where N=frequency, and X=severity. Let E[ ] represent the expected value of what is in the brackets, Var( ) represent the variance of what is in the brackets, and S = Pure Premium. Then one can show that if pure premium = E[S] = E[N]*E[X], then Var(S) = Var(X)*E[N] + Var(N)*(E[X])^2

Part 3: Insurance Benefits

From the previous question's calculations, the premium for a **prescription-drug-only coverage** would be very expensive, and only those that are likely to use a lot of prescription drugs, particularly brand-name drugs, would sign up. In the following questions, we want to examine more specifically how an insurance company could setup their insurance benefits.

Question 6: Suppose the only people who enroll in prescription-drug-only coverage were those who expect to have at least 25 prescriptions a year. Revise the continuance table and calculate the required pure premium.

In actual practice, Company A will not cover 100% of the cost of drugs. Indeed, if all costs were covered, it is likely that insureds might demand more prescriptions from their physicians. Therefore, insurers ask their insureds to share in the cost of the drugs, and a typical benefit would include what is called "member copayments" such as:

1. the member must pay $5.00 for every generic script
2. the member must pay $50.00 for every brand script

Question 7: Using the frequencies in the original continuance table, what is the new pure premium given the above benefit structure?

Company A is concerned that with the above copayments, a member could have very large out-of-pocket costs. Therefore, Company A added a third benefit called an "out-of-pocket maximum." With the out of pocket maximum the company will cover all costs after a member pays $500 in copayments.

Question 8: What is the new pure premium given the out-of-pocket maximum? Explain the assumptions you made in order to do this calculation. Why might another actuary calculate a different number that could also be reasonably defended?

Question 9: The Chief Actuary of the Company is concerned about the accuracy of the 12% brand usage assumption (noted previously in question 4). Instead, the Chief Actuary proposes using the following distribution governing the brand percentage assumption:

% of Scripts that are Brand	Likelihood
10%	5%
12%	50%
15%	30%
18%	10%
20%	5%

By recalculating the pure premium in Question 8 for each brand percentage assumption, calculate the pure premium that takes into account the Chief Actuary's uncertainty about this key assumption.

Question 10: Given the above distribution for the % brand and your answer to #9, calculate the minimum premium that allows for a margin of 1.5 standard deviations in % brand assumption.

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