National Health Improvement Association
1090 Nightengale Ave
Phoenix, AZ 85004

Independent Mathematical Contractors
1100 E Sheldon Street
Prescott, AZ 86301

Dear IMC:

During the past several years, a national debate over health care has taken place. The outcome of this debate is unknown. However, it seems clear that in the future people will be faced with more choices to make regarding their health care. We often get letters from consumers like the one below that express frustration over the complexity of a typical health insurance plan:

> Recently I was faced with a decision about which health insurance plan my family should participate in. On possibility was a plan, called the Premier Plan, that costs over $6000 per year and offers a low deductible of $600 for my family. This means that my family would need to incur $600 in health care charges before the insurance plan would share the payment of my health charges. Once this deductible was satisfied, I would pay 20% of the charges and the insurance plan would pay 80% of the charges. The plan also offers a maximum out of pocket of $6000. This seems like great coverage, but at a considerable price.

> The second plan is called the Basic Plus Plan and costs a little over $500 per year. Because of the lower price, it has a higher deductible of $1200 for my family. Additionally, once the deductible is achieved the plan will pay 60% of the medical charges my family incurs and I am responsible for the other 40%. The maximum out of pocket for the Basic Plus Plan is $12,000.

> Both plans utilize the same network of doctors although the Premier Plan allows me to go out of network if I split the costs 60/40. With the Basic Plus Plan, I must stay in network except for emergency care.

> I am tempted to go with the lower priced Basic Plus Plan, but I am concerned that I could potentially open myself to some high costs if one of my family members falls seriously ill. Can you provide some guidance for me as to how I should choose one of these plans?

I would like you to develop a process for analyzing health insurance plans like the two described by the author of the letter above. Instead of using the exact information above, we would like you to use the Basic Plus Plan and another plan of your choosing. These two plans should have different deductibles, coinsurance requirements, out of pocket maximums, and premiums.

With the help of your instructor, I think I have a strategy that you can follow to develop a mathematical model of the insurance plans.

1. Find a health insurance plan on the website http://www.ehealthinsurance.com. Organize the information in an Excel worksheet along with the information for the Basic Plus Plan (Tech Assignment – Collect and Organize Data).

2. Make a table of health insurance charges and corresponding health insurance costs for each of your plans in a PDF form (Tech Assignment – Find and Understand Costs).

3. Use the PDF form to make a table in Excel. Make a graph of health costs as a function of total medical charges for each health insurance plan (Tech Assignment – Calculate and Graph Total Annual Costs).

4. Locate the point of intersection of the two health insurance plans on your graph and verify its location using algebra (Tech Assignment – Find Piecewise Linear Model).

I would like you to carry out this strategy and compare two health insurance plans. Assume that the best plan is the one that will cost you the least and explain the mathematical process you followed to find the best plan. Illustrate your process using the details from the two plans. This calculation is complicated by the fact that there are very many variables that can affect your total annual cost. To simplify this calculation, you should make several other assumptions.

- The total annual cost is the sum of several other costs: primary care physician costs, specialist physician costs, prescription costs and premiums. Since we are assuming a typical year, ignore other major costs such as emergency care, maternity care, ect. since these are not normally incurred.

- There is a distinction between charges and costs. A medical charge is the actual charge of the care as incurred at the point of service. A medical cost is the amount paid after figuring in any coinsurance or copays.
- Assume that the insured party makes 2 visits to their primary care physician at a charge of $100 + 5F per visit, where F is the first number in your social security number. Assume a single specialist visit at a charge of $150 + 10L per visit, where L is the last number in your social security number. In addition, assume they have a single generic prescription that incurs a monthly charge of $30.
- Find the total annual cost for an Individual.
- The insured party will only utilize in-network care.

I would like your work communicated to me in the form of a technical memo. Your instructor has provided resources to you about this format. An excellent technical memo will communicate your mathematical process for choosing one plan over the other and illustrate the process with the two plans you have chosen. It should also be applicable to other similar plans and allow a typical college algebra student to repeat the process with similar plans.

My experience has shown that the decision is largely dependent on the amount of medical charges you might incur. This is the case for the letter above. If this is not the case for your plans, contact your instructor as soon as possible so that he can check your work for errors.

Thanks in advance for your work on this important issue.

Sincerely,
Dr Zhee Vago
Executive Director, NHIA