

Technology Assignment-Calculate and Graph the Total Annual Cost

In an earlier technology assignment, you identified several details of a health plan and created a table of total cost. In this technology assignment, you'll create a worksheet which calculates the total cost of medical care as the amount of medical charges you incur increases. We want to create a table that calculates the total cost for several different amounts of medical charges. This table should duplicate the numbers you put into the table of charges and costs in the last technology assignment.

	A	B	C	D
1		Basic Plus Plan		Name
2	Plan Type	PPO		Date
3	Primary Care Physician Visits	40%		
4	Other Physician Office Visits	40%		
5	In Network Coinsurance	40%		
6	Prescription Drugs			
7	Generic	\$10	no deductible	
8	Preferred Brand	20%	max of \$100 per fill	
9	Non-Preferred Brand	50%	\$20 min to a max of \$150 per fill	
10	Out of Pocket Maximum			
11	Individual	\$6,000		
12	Family	\$12,000		
13	Annual Deductible			
14	Individual	\$600		
15	Family	\$1,200		
16	Lifetime Maximum	\$2,000,000		
17	Cost	\$46	per month	
18				

Recall the assumptions we make about this problem.

- 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.

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- Assume that the insured party make 2 visits to your 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 you have a single generic prescription that incurs a monthly charge of \$30.
- Find the total annual cost for a Individual Coverage.
- The insured party will only utilize in-network care.


For this demonstration, I'll work with data from a plan offered by the Yavapai Combined Trust, the Basic Plus Plan. The key details we'll need to compute the cost of the plan is summarized in the table below.

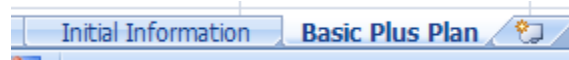
	Basic Plus Plan
Primary Care Physician Visit	40%
Other Physician Visits	40%
Prescription Drugs	30 day supply Generic: \$10, Preferred Brand: 20% to \$1000, Non-preferred Brand: 50% with \$20 minimum and \$150 maximum
Out of Pocket Maximum	Individual: \$6000 per year Family: \$12,000
Deductible	Individual: \$600 per year Family: \$1200
Monthly Premium	\$46

The percentages indicate the portion that the insured party is responsible for.

You should use the details you have already collected on your health plan in an earlier technology assignment to complete this technology assignment. The example shown in this handout is for illustrative purposes only. For instance, this handout uses family coverage. You will out your tables using individual coverage.

Calculate the Total Annual Cost for Total Charges Less Than the Deductible

1. In Excel, open the file you created to document the details of your health plan.
2. At the bottom of the Excel window, you'll see a tab labeled Sheet 2. If there are no other tabs other than the one labeled Initial Information, select the tab labeled  to create a new worksheet.
3. Double click the tab and rename the worksheet to reflect the name of your health plan.



4. In cell A1, put the name of your health plan. In the example below, the name of the plan is Basic Plus Plan. Your health plan will have a different name and associated costs. You may need to resize the columns or rows and wrap text to fit the name in cell A1.

	A	
1	Basic Plus Plan	
2		

5. To fill in the entries in the table, refer to the table you created in an earlier technology assignment. In this technology assignment, we do not want to just type in values. Instead, we want to take advantage of Excel to compute the values for us. Now let's put in the column labels in the worksheet for the different medical charges and costs. In row 3, put the following labels:

- In A3 put Total Medical Charges. This corresponds to the amount the primary care physician charges for the two office visits plus any other medical charges. For the Basic Plus Plan, the insured pays 40% of all charges after the deductible (family deductible is \$1200) has been met.
- In B3 put Total Medical Cost. This corresponds to the actual cost incurred by the insured for the medical charges.
- In C3 put Prescription Charges. This corresponds to the amount charged for prescriptions.
- In D3 put Prescription Costs. These labels correspond to what you actually pay for prescriptions.
- In E3 put Total Out of Pocket. This label corresponds to the total amount you will pay from your pocket for all medical charges.
- In F3 put Premium Cost. This is the annual amount you'll pay for the health plan's premiums.
- In G3 put Total Cost. This is the total annual cost of the plan to you including premiums.

	A	B	C	D	E	F	G
1	Basic Plus Plan						
2							
3	Total Medical Charges	Total Medical Cost	Prescription Charges	Prescription Cost	Total Out of Pocket	Premium Cost	Total Cost
4							

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6. Now let's calculate the total annual costs for the Basic Plus Plan for a particular amount of medical charges. Remember to use the details for your plan and not the details for the Basic Plus Plan. Suppose the only medical charges you incur are the ones assumed above: 2 primary care physician visits and 1 specialist visits. For this example only, I'll assume the primary care physician visits are \$100 per visit for a total of \$200 and specialist visits are \$150 per visit for a total of \$150. In cells A4 put the total medical charges by clicking in the cell and typing = 2*100+150. The formula will also be placed in the formula bar at the top of the worksheet. By using an = in front of the formula, you are indicating that this cell contains a calculation. Press Enter on the keyboard to carry out the calculation.

A		B
1	Basic Plus Plan	
2		
3	Total Medical Charges	Total Med
4	=2*100+150	
5		

A		
1	Basic Plus Plan	
2		
3	Total Medical Charges	Total Me
4		350
5		

7. For the Basic Plus Plan (not for all plans), there is no deductible for prescriptions and each generic prescription costs the insured \$10. Without the prescription charges, the total charges is \$200 + \$150 Or \$350. I am assuming family coverage with a \$1200 deductible so the deductible has not been met. In this situation, the insured is responsible for all non-prescription charges or \$350. This is exactly the amount in cell A4. Click in cell B4 and type = A4 to indicate that the Total Medical Cost is the same as the Total Medical Charges. The = sign indicates that a calculation is being done. Instead of typing A4, you could also click on the cell A4. Press Enter.

B	
	Total Medical Cost
	=A4

B	
	Total Medical Cost
	350

8. The monthly charge of the single generic prescription is \$30 so the total annual charge for prescriptions is 12 x \$30 or \$360. Click your mouse in cell C4 to select it. Now type = 12*30. Notice that this formula appears in the function bar at the top of the page. Using an = indicates to Excel that you want it to work out this arithmetic. Press Enter to carry out the calculation.

C	
	Prescription Charges
	=12*30

C	
	Prescription Charges
	360

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9. Even though the prescription charge is \$360 annually, the Basic Plus Plan pays for part of this prescription charge resulting in a monthly cost of \$10 for the generic prescription. To calculate the annual cost for this prescription, click in cell D4 and type = 12*10. Press Enter to calculate this amount.

D
Prescription Cost
=12*10
D
Prescription Cost
120

10. In cell E4, we want to add the entries in cells B4 and D4 to get the total amount you'll pay out of pocket. Click the cursor in cell E4 to select it and type = B4 + D4.

	A	B	C	D	E
1	Basic Plus Plan				
2					
3	Total Medical Charges	Total Medical Cost	Prescription Charges	Prescription Cost	Total Out of Pocket
4	350	350	360	120	=B4+D4
5					

As a shortcut, you can click on the cells in the sheet instead of typing the location of the cell.

11. Press Enter to see this sum.

Total Out of Pocket
470

12. For the Basic Plus Plan, family coverage costs \$46 per month. In cell F4 type = 12*46 to calculate the annual cost of premiums.

13. Press Enter to calculate the total cost of premiums.

Premium Cost
=12*46
Premium Cost
552

14. To complete the first row of charges and costs, click on the cell G4 and type = E4 + F4 and then press Enter.

Total Out of Pocket	Premium Cost	Total Cost
470	552	=E4+F4

This gives total annual costs of \$1022.

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15. Now we need to increase the total medical charges by some amounts up to the deductible. In this worksheet, the deductible will be assumed to be \$1200. Put that amount in cell A7. You'll need two different amounts in the cells between A5 and A6. Your deductible and numbers will be different.

	A	
1	Basic Plus Plan	
2		
3	Total Medical Charges	Tc
4		350
5		850
6		1000
7		1200

16. The process for calculating the entries in rows 5 through 7 is exactly the same as the process we used for row 4. To duplicate this process in row 5 through 7, we can utilize a Fill. Fills are used to apply a calculation to adjacent cells using the entries in the adjacent cells. To start the fill, click on cell B4 to select it. While holding the left mouse button down, drag the cursor to cell G4. The cells will be selected as shown below.

	A	B	C	D	E	F	G
1	Basic Plus Plan						
2							
3	Total Medical Charges	Total Medical Cost	Prescription Charges	Prescription Cost	Total Out of Pocket	Premium Cost	Total Cost
4	350	350	360	120	470	552	1022
5	850						
6	1000						
7	1200						

Fill Handle

Move the cursor to the small box in the lower right hand corner of the selection. This box is called the fill handle.

17. When the cursor is hovering over the fill handle, it changes from a cross to a +. Click on the left mouse button. While holding the mouse button, drag the cursor to cell G7.

5	Total Medical Cost	Prescription Charges	Prescription Cost	Total Out of Pocket	Premium Cost	Total Cost
6	350	360	120	470	552	1022
7						
8						

You'll see the selection size increase meaning the formulas in E4 through G4 will be used in the corresponding cells in rows 5 through 7.

18. Release the mouse button to complete the fill.

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Total Medical Cost	Prescription Charges	Prescription Cost	Total Out of Pocket	Premium Cost	Total Cost
350	360	120	470	552	1022
850	360	120	970	552	1522
1000	360	120	1120	552	1672
1200	360	120	1320	552	1872

The numbers in your Excel table should match the numbers you calculated in the earlier technology assignment. This section of the table reflects charges and costs up to the point where the deductible is met.

Calculate the Total Annual Cost After the Deductible Is Met

- In row 7, the Total Medical Charges were equal to the plan's deductible. Now we'll continue to increase the Total Medical Charges by large increments. We'll need to modify how the costs are calculated since the plan pays for 60% of the charges in the Basic Plus Plan once the deductible has been met. A Basic Plan Plus member is responsible for the other 40% of the charges. For your plan, the amount of coinsurance might be different. Increase the other medical charges by a large increment like \$3000. When we enter 4200 in A8, Excel assumes that we want the same entry in B8. However, now the plan pays for some of the charges so we'll need to modify the number in cell B8.

	Total Medical Charges	Total Medical Cost	P
3			
4	350	350	
5	850	850	
6	1000	1000	
7	1200	1200	
8	4200	4200	
9			

- Now we need to calculate the Total Medical Cost in B8. For the Basic Plus Plan, you must pay the deductible plus 40% of any amount greater than the deductible. This is done by clicking in B8 and typing $=1200 + 0.4*(A8-1200)$.

7	1200	1200
8	4200	$=1200+0.4*(A8-1200)$
9		

The quantity in parentheses, $A8 - 1200$, gives the amount of Total Medical Charges over \$1200. Multiplying by 0.4 gives us 40% of that amount. Adding 1200 to this amount adds the deductible that needs to be paid.

- Press Enter to carry out the calculation.

7	1200	1200
8	4200	2400
9		

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12. Once you have reached over \$30,000, release the mouse button to see the cells in the table filled.

	A	B	C	D	E	F	G
1	Basic Plus Plan						
2							
3	Total Medical Charges	Total Medical Cost	Prescription Charges	Prescription Cost	Total Out of Pocket	Premium Cost	Total Cost
4	350	350	360	120	470	552	1022
5	850	850	360	120	970	552	1522
6	1000	1000	360	120	1120	552	1672
7	1200	1200	360	120	1320	552	1872
8	4200	2400	360	120	2520	552	3072
9	7200	3600	360	120	3720	552	4272
10	10200	4800	360	120	4920	552	5472
11	13200	6000	360	120	6120	553	6673
12	16200	7200	360	120	7320	552	7872
13	19200	8400	360	120	8520	554	9074
14	22200	9600	360	120	9720	552	10272
15	25200	10800	360	120	10920	555	11475
16	28200	12000	360	120	12120	552	12672
17	31200	13200	360	120	13320	556	13876

13. Examine the table closely. In this table, in row 16 the Total Out of Pocket exceeds \$12,000. For the Basic Plus Plan, the plan covers the entire medical charge once the Total Out of Pocket reaches \$12,000. Your plan will have a different amount.

	A	B	C	D	E	F	G
1	Basic Plus Plan						
2							
3	Total Medical Charges	Total Medical Cost	Prescription Charges	Prescription Cost	Total Out of Pocket	Premium Cost	Total Cost
4	350	350	360	120	470	552	1022
5	850	850	360	120	970	552	1522
6	1000	1000	360	120	1120	552	1672
7	1200	1200	360	120	1320	552	1872
8	4200	2400	360	120	2520	552	3072
9	7200	3600	360	120	3720	552	4272
10	10200	4800	360	120	4920	552	5472
11	13200	6000	360	120	6120	553	6673
12	16200	7200	360	120	7320	552	7872
13	19200	8400	360	120	8520	554	9074
14	22200	9600	360	120	9720	552	10272
15	25200	10800	360	120	10920	555	11475
16	28200	12000	360	120	12120	552	12672
17	31200	13200	360	120	13320	556	13876

We need to determine the amount of Total Medical Charges that results in a Total Out of Pocket of \$12,000 exactly. We could vary the amount in A16 until the E16 is 12,000, but it is more efficient to calculate that amount directly. The amount on E16 is the sum of the Total Medical Cost, $1200 + 0.4 \cdot (A16 - 1200)$ and the Prescription Cost, 120. Replacing the cell name with x , we can write the Total Out of Pocket as $1200 + 0.4(x - 1200) + 120$. Set this amount equal to 12,000 to find when the Total Out of Pocket is equal to \$12,000:

$$1200 + 0.4(x - 1200) + 120 = 12,000$$

To solve this equation, remove the parentheses and combine like terms to yield

$$0.4x + 840 = 12,000$$

Subtract 840 from both sides of the equation and divide by 0.4 to give $x = 27,900$.

This means that Total Medical Charges of \$27,900 leads to Total Out of Pocket of \$12,000.

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14. Change the entry in A16 to this new value for Total Medical Charges (your amount will be different). If you have done the calculation correctly, the Total Out of Pocket in E16 will be equal the Maximum Out of Pocket (in this case \$12,000).

15	25200	10800	360	120	10920	555	11475
16	27900	11880	360	120	12000	552	12552
17	31200	13200	360	120	13320	556	13876

15. For any greater amount of Total Medical Charge, such as those in row 17, the Total Out of Pocket will be equal to the Maximum Out of Pocket. This is easily accomplished by changing every entry in column E after row 16 to 12,000. In this case, simply click in E17 and type 12,000. If you have any more rows, change the entries to the maximum out of pocket in column E.

15	25200	10800	360	120	10920	555	11475
16	27900	11880	360	120	12000	552	12552
17	31200	13200	360	120	12000	552	12552

The table you have just created shows how the Total Cost of the plan changes as the amount of annual Total Medical Charges increases. There are three different areas we have focused on, how the cost changes until the deductible has been met (rows 4 through 7), how the cost changes after the deductible has been met until the Maximum Out of Pocket has been achieved (rows 8 through 16), and how the cost changes after the Maximum Out of Pocket has been achieved (row 17).

16. Save your worksheet. This is the worksheet that you will submit for this technology assignment.

Make a Graph for the Health Plan

Now that we have a table with total medical charges and the corresponding total cost, we'll graph these columns in Excel.

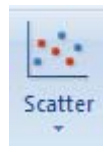
1. Open the worksheet you have been using for earlier technology assignments.
2. Click on the worksheet containing the table for the health plan. In the example we have been working on in the handouts, this would be the worksheet for the Basic Plus Plan. You'll want to work with your health plan.
3. Locate the column corresponding to the Total Medical Charges. For the worksheet pictured below, this column is in column A. Click the mouse button in the cell containing the first numerical entry in this column, A4. To indicate that you have selected this cell, you'll see a black outline around the cell.
4. While holding the left mouse button down, drag the cursor to the last numeric entry under the Total Medical Charges. The black selection outline will encompass all of the Total Medical Charge values in the column.

	A
1	Basic Plus Plan
2	
3	Total Medical Charges
4	350
5	850
6	1000
7	1200
8	4200
9	7200
10	10200
11	13200
12	16200
13	19200
14	22200
15	25200
16	27900
17	31200
18	

5. Press and hold the CTRL key on your keyboard.
6. Click on the first numerical entry under Total Cost (in this example G4). While holding the left mouse button down, drag the mouse to the last numerical entry in this column (in this example G17). As you do this you'll notice that the numbers in column A and in column G are being highlighted letting you know that you have selected entries in both columns.

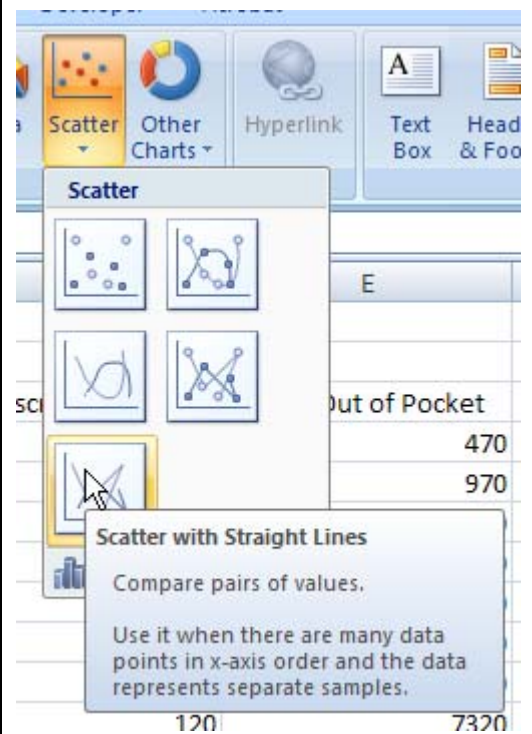
	G
	Total Cost
52	1022
52	1522
52	1672
52	1872
52	3072
52	4272
52	5472
53	6673
52	7872
54	9074
52	10272
55	11475
52	12552
52	12552

7. Click on the Insert tab along the top of the Excel window. Locate the Charts panel.

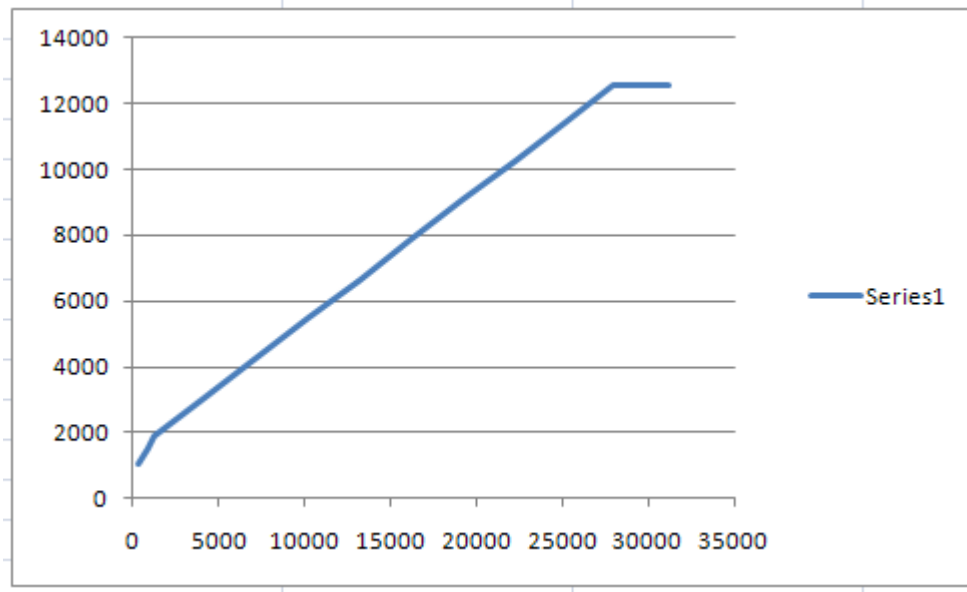


8. Within the Charts panel is a button for creating Scatter Plots. Click on the Scatter button to reveal several different types of scatter plots that Excel is able to make with the two columns of data we have selected.

9. Select the scatter plot at the bottom, Scatter with Straight Lines. This button will graph the selected data as ordered pairs and then connect the points with straight lines. The points will not appear as dots on the graph.



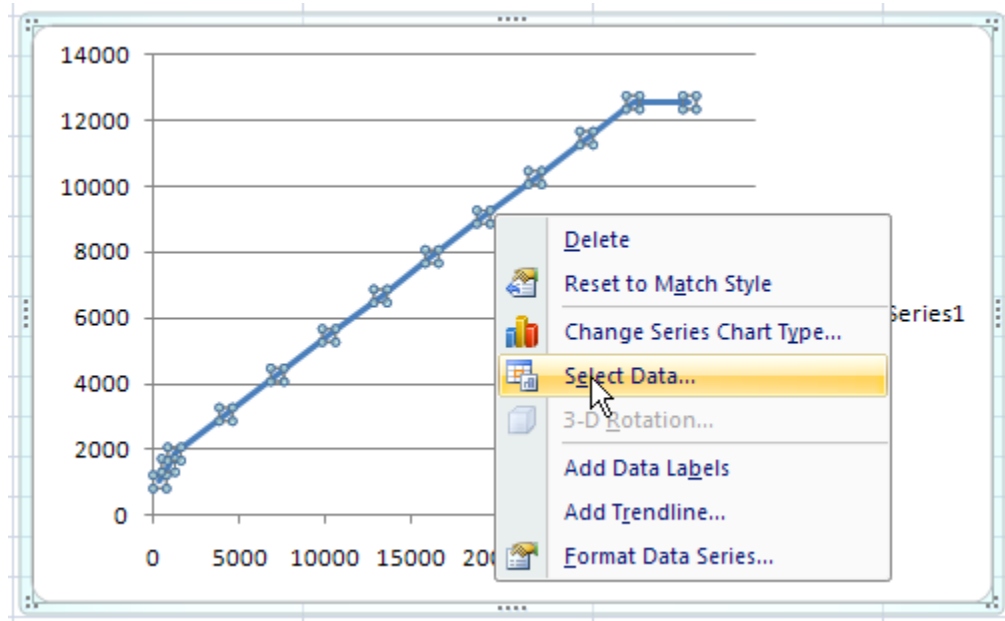
10. Your graph will appear below the table. If it is not in a convenient location, click on the edge of the graph. While holding the left mouse button, you may drag the graph to a better location.



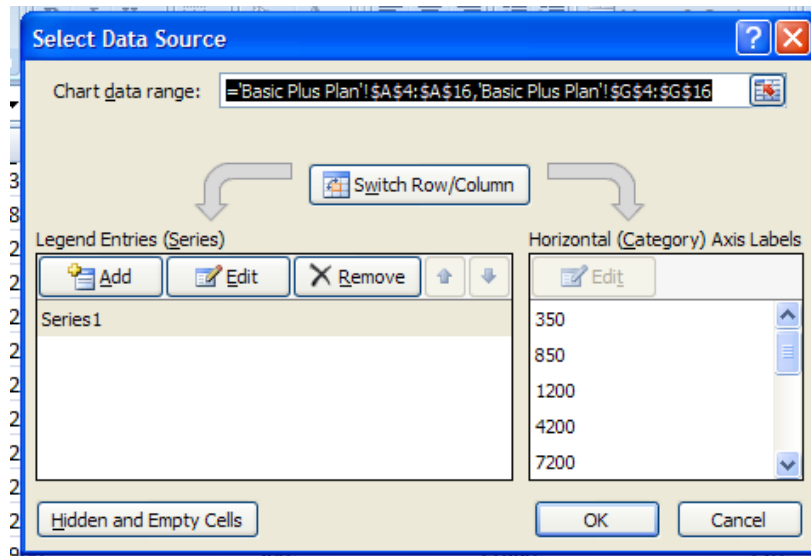
This is a good initial graph, but we should modify it with axes labels, a more accurate legend, gridlines, and a better window.

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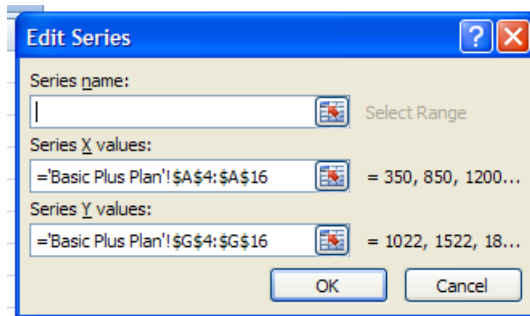
- Let's start by modifying the legend on the right side of the graph. The name "Series 1" is not very useful. We would like to have the legend reflect the nature of the graph. Move the cursor over the blue curve on the graph and right mouse click. You should see a menu like the one shown below. If you do not see Select Data in this menu, move your cursor to a slightly different location on the graph and try right clicking again.
- Choose Select Data from the menu with your mouse.



13. The Select Data Source box will appear. Using this box we can edit where the data for the graph comes from, add another set of data to the graph, or delete a set of data from the graph. Since we want to edit the existing data, click on the data labeled Series 1 on the left and select the Edit button.

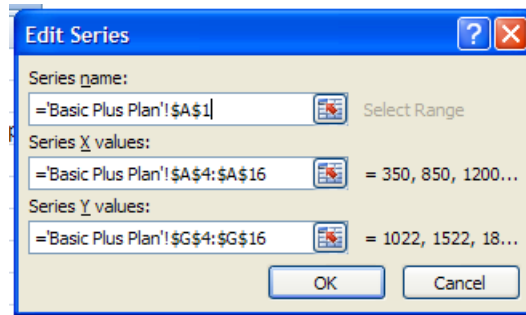


14. From this box we could change the location of the data if we wanted. However, in this case we simply want to give the graph a name.

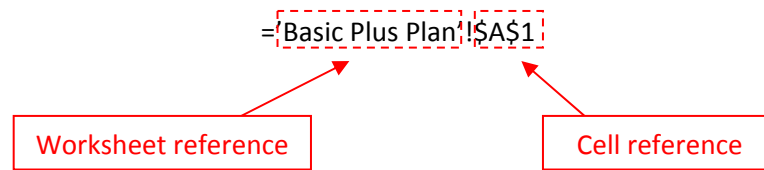


Notice that the insertion point is under Series name. To put the name of the health plan on the graph, click on the cell containing the name of the health plan, A1.

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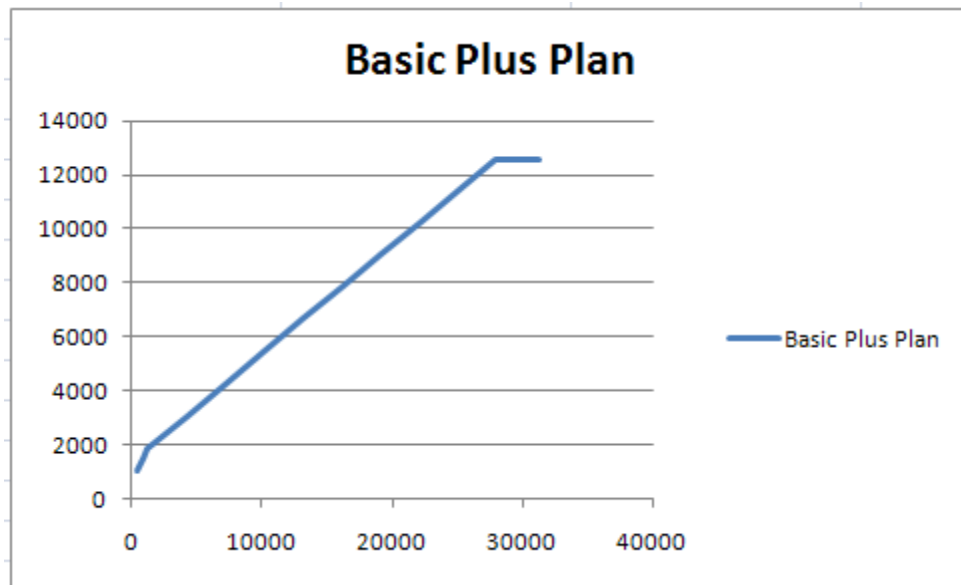
Examine closely what was pasted into the space below Series name. The text after the = sign is called a reference.



The reference shown here consists of two parts, a worksheet reference and a cell reference. The worksheet reference is separated from the cell reference by an exclamation point. If you are working exclusively in a single worksheet, the worksheet reference may be left off leaving the cell reference alone. A reference helps you to point to a particular cell or set of cells in a worksheet.

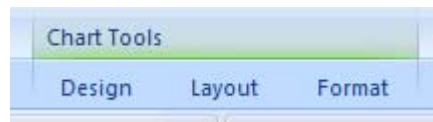
The dollar signs in front of the cell location make this cell reference into an absolute cell reference. For an absolute cell reference, the location referred to is fixed and will not change. When a reference does not contain a \$ sign it is a relative cell reference. When a cell with a relative reference is pasted to another place in the worksheet, the cell location that is pasted is relative to the location it was copied from. . Absolute references are used throughout the Edit Series boxes since we want the name of the graph and the data in the graph to be fixed.

15. Click OK to update the graph.

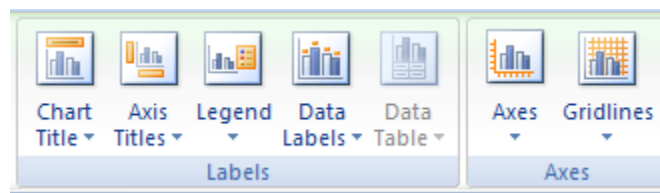


There is now a title on the graph and a legend reflecting the plan name in cell A1.

16. Now let's change the layout of this graph. Most of these layout options are accessed by first clicking on the outside of the graph to select it. Notice that the tabs along the top of the Excel window changes slightly. Now there is an option for Chart tools. Select the Layout tab.

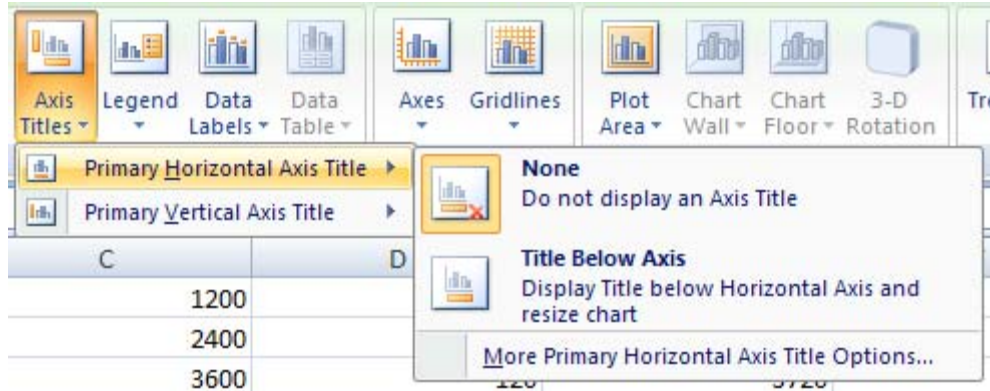


17. The panels for Labels and Axes are useful for making changes to the data and axes labels as well as adding gridlines.



Click on the Axis Titles button.

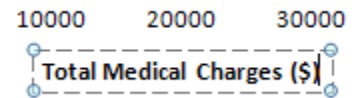
18. This reveals a series of options for adding labels (called titles in Excel) to the graph. Select Primary Horizontal Axis Title and then Title Below Axis to add a label to the horizontal axis.



19. A small box should appear below the horizontal axis. Click in this box to edit the title.

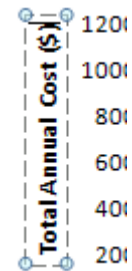


20. For this particular graph, the horizontal axis represents the total amount of medical charges in dollars. Type a label for your graph. A good label will have a descriptive title, like Total Medical Charges, and the units corresponding to this quantity in parentheses.

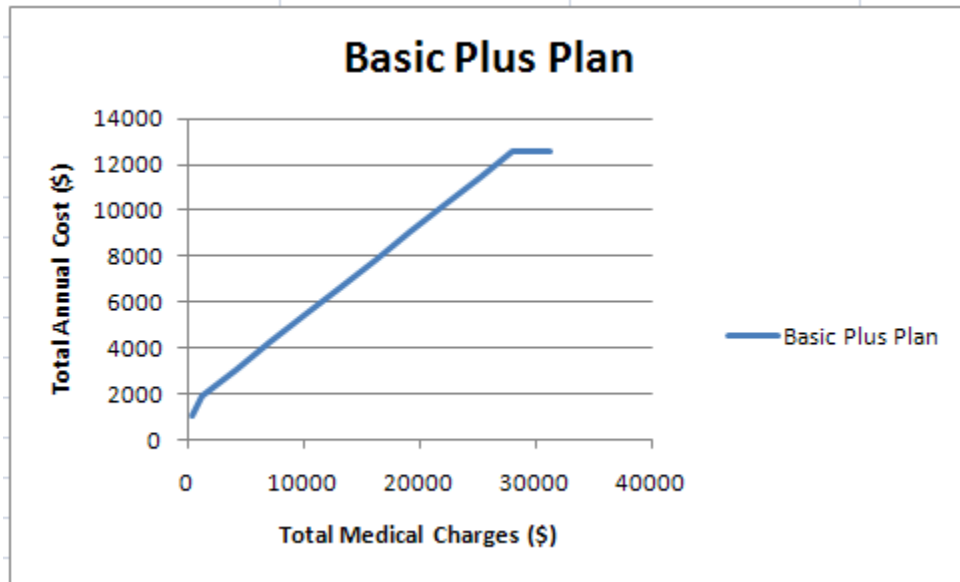


21. Select the graph again by clicking on it (it may already be selected) and go back to the Labels panel as in step 20. Let's put a label on the vertical axis by selecting Axes Titles. This time pick Primary Vertical Axis Title and then Rotated Title.

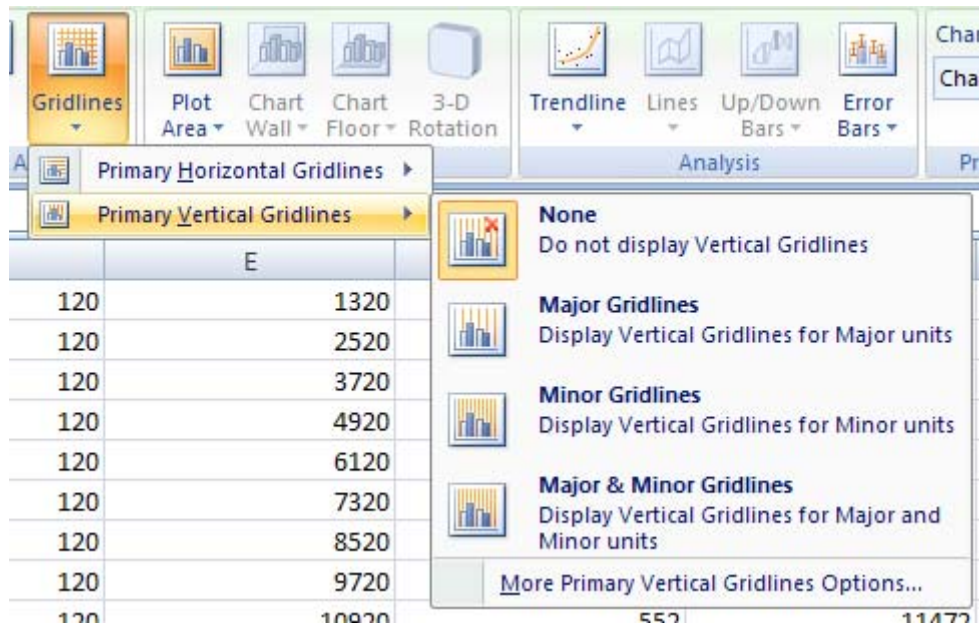
22. This will add an axes label along the vertical axis. Click on this title and edit it to reflect the quantity corresponding to the vertical axis.



23. After this change in the layout, you should have a graph like the one shown below. Your graph might have a different curve, but the title on the graph, legend, and axes titles should be similar to the one below, but with wording to match your first health insurance plan.

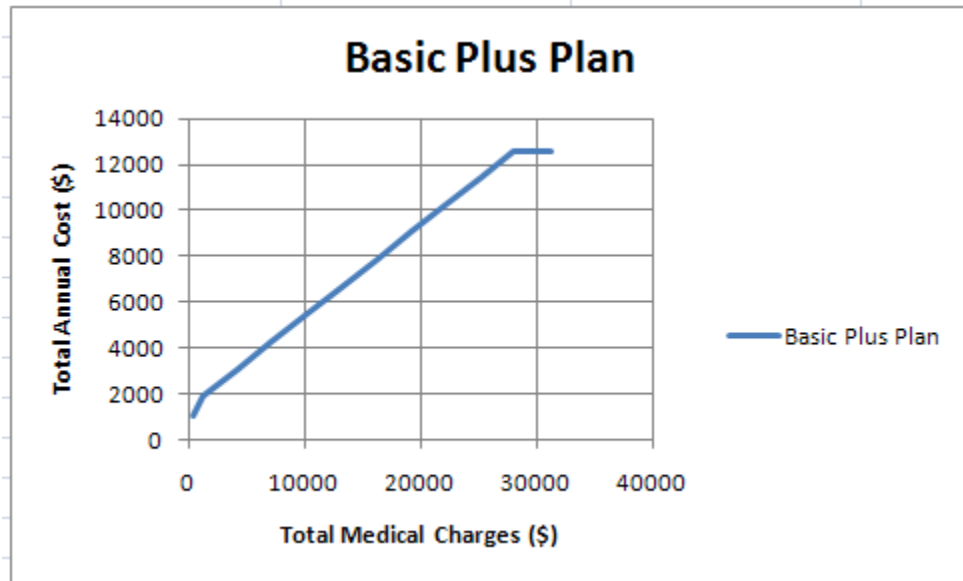


24. To add vertical gridlines to the graph, make sure the graph is selected. On the Chart Tools Layout tab locate the Gridlines button in the Axes panel. Click on the Gridlines button and select Primary Vertical Gridlines. Now select Major Gridlines.



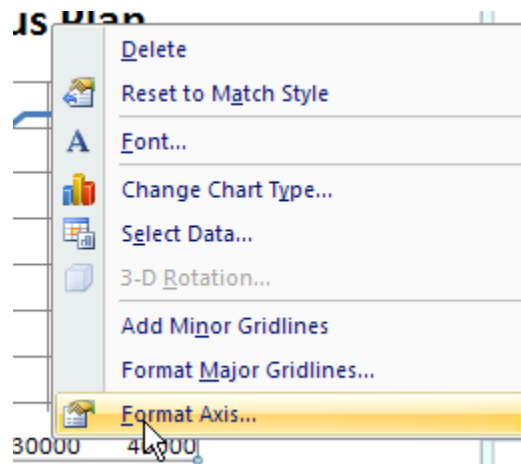
This will add gridlines to your graph wherever there is a number along the horizontal axes.

25. Your graph should now have vertical and horizontal gridlines like the one below.

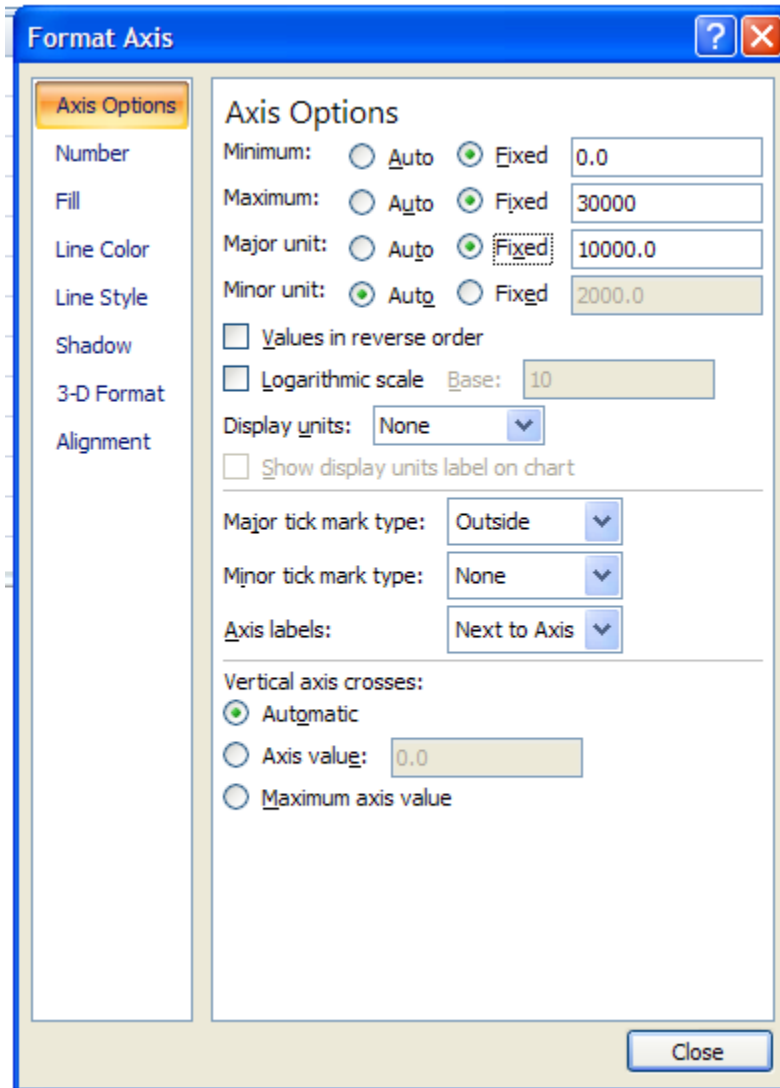


Our last task is to modify the window of the graph so that it better fits the curve. This graph fits the vertical window perfectly, but could fit the horizontal window better if it ran from 0 to 30,000. Look at your graph determine how you could modify your graph's window.

26. You can modify the window horizontally by right clicking on the numbers along the horizontal axis. You can modify the vertical window by right clicking the numbers along the vertical axis. When you do this, you'll see a menu of choices. Select Format Axis.

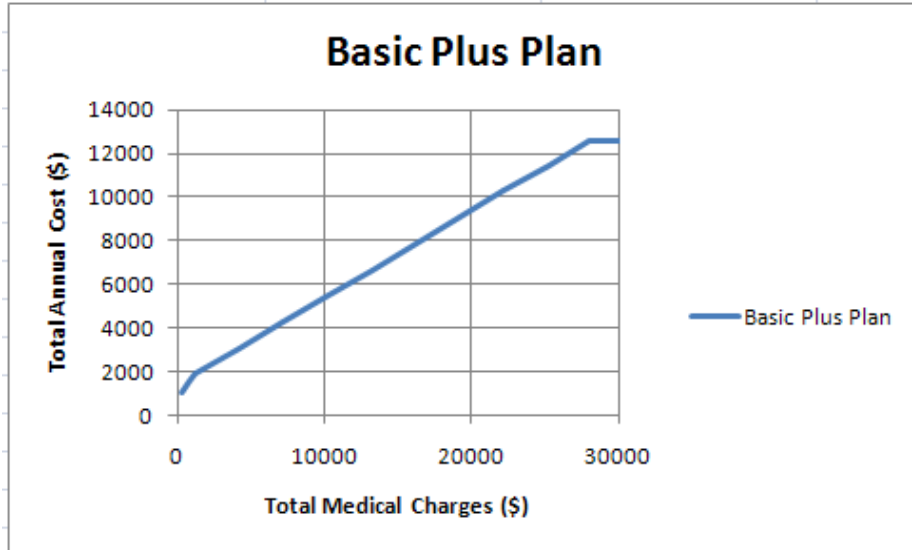


27. The Format Axis box will appear. To modify the window, we'll need to select Fixed for the Maximum, Minimum, and Major Unit. In the box next to each of those options, we'll put the extremes of the window. Since we want the window to run from 0 to 30,000 horizontally, set the Minimum to 0 and the Maximum to 30,000. The Major Unit defines the increments between the numbers along the axis. If we set the Major Unit equal to 10,000, the axis will be labeled at 0, 10000, 20000, and 30000.



The Minor unit defines the increments between the tic marks between the numbers. This amount can be changed, if desired, by selecting Fixed and modifying the number in the box. This number must be smaller than the Major unit.

28. Click Close at the bottom of the Format Axis box to update the graph. Notice how the graph fills the horizontal window of the graph better than it did before.



29. Make sure you save you Excel file. Submit this Excel file. This file should include the initial information for the plan you chose and the corresponding table for the plan.