Summary

This analysis attempts to determine how much can be spent for children's education as well as a new house while also maintaining a *sustainable* standard of living. The majority of the inheritance will be used to pay off Mary's student loans, fund children's college and make a home down payment. Little will be left for retirement. Therefore, savings have to increase to attain that goal.

Assumptions

1. Economic
    a. Your investments are assumed to be in a portfolio of 80% stocks and 20% bonds with a return and standard deviation of 6% and 12% respectively. At retirement, the allocation is moved to a more conservative mix of 60% stocks and 40% bonds with a return and standard deviation of 5.3% and 9.8% respectively. These returns were forecast by Ibbottson Associates. Their forecasts are similar to other rational forecasts.
    b. Inflation is set to 3%. All expenses except the mortgage, college and health insurance rise with inflation. Health insurance premiums increase 5% annually and college inflation is described below.
2. Demographic: Mary and Bill desire to retire at 60 and 67 respectively. Both are assumed to have a life expectancy of 95.
3. Income
    a. Mary and Bill continue to earn $50,000 and $100,000 respectively. No bonuses are assumed for Bill.
    b. At retirement, Mary begins an ABC pension of $25,162 = 32 years x 1.7% x $46,225. Your ABC statement shows that you'll have 30 years of service by 7/2030 and your baseline plan retirement is 2035 (age 60).
    c. Social Security is claimed at 67.
4. Saving
    a. Bill currently makes a 4% contribution to his 401k and gets a 2% company match. It's recommended that he increase this to at least 6% in order to get the full company match which is 50% of his contribution up to 3% of his salary. This effectively gives him a $1000 per year raise. Further, the baseline plan has him increasing his contribution to 12% after Nate completes The Private kindergarten. More on this below.
    b. Your current $32,000 in savings/checking is kept as an emergency fund which is never spent but is shown as part of the ending plan balance.
5. Spending
    a. We determined that 2015 was representative of your standing of living expenditures which totaled $54,000. In order to be conservative we decided to increase this to $60,000 for planning purposes. It's assumed that spending does not decline when the children leave the house. $60,000 is very average for a couple without children. At the death of the first spouse, this amount declines to $40,000 based on the assumption that two people can live as cheaply as 1.6. Thus, $37,500 = $60,000/1.6 and I rounded up.
    b. Health insurance will decline from $13,000 to an assumed $6000 in 2017 or 2018.
    c. The baseline plan assumes that Bill will incur $1800/yr in 20 year term life insurance premiums for $1M in coverage.

d. Keep in mind that Medicare is not available before age 65. Therefore, Mary would need to buy private health insurance should she retire before then. The annual cost for a 60 year old today would be approximately $6000.
e. When you retire you'll each start to pay for Medicare and a Medicare supplement plan that fills the gaps in Medicare coverage. Annual costs today are $4400 per person.
f. Soccer expense ends when Bill Jr starts college in 2021.
g. The baseline plan assumes that Nate has the following costs. Additional costs will be investigated as a separate scenario.
    i. $1500/month child care until June
    ii. Kindergarten: $14,000
h. Home purchases assume a 20% down payment and a 30 year, fixed rate loan at 4%.

6. College funding
    a. Expected cost
        i. According to 2015 *College Board Trends In College Pricing*, in state tuition, room and board at a public college averaged $19,500. Private colleges averaged $44,000. We are assuming that college costs actually incurred will be the average of the two or $30,000. Additionally, the College Board reports that "*between 2005-06 and 2015-16, published in-state tuition and fees at public four-year institutions increased at an average annual rate of 3.4% per year beyond inflation, compared to average annual rates of increase of 4.2% between 1985-86 and 1995-96 and 4.3% between 1995-96 and 2005-06".* Annual inflation averaged 1.8% over the 2006-2016. This means that nominal college price growth was 5.2%=3.4% + 1.8%. I'll assume that this price growth continues. Assuming a $30,000 annual college cost today, you can expect first year college cost for Bill Jr and Nate to be $36,700 and $58,000 respectively.
        ii. It's assumed that you will prefund 50% of these costs and pay for the remainder out of your non 529 plan savings accounts. Recall that unless the funds are used for qualified education expenses, any growth of the funds is subject to income tax plus a 10% penalty. So, you don't want to overdo it. The penalty is waived if he were to get a scholarship.
        iii. The Maryland college savings plan have investments that get more conservative as the enrollment date approaches. The 2021 plan (Bill Jr) has a portfolio that is currently 50/50 stock/bond and will slowly morph into 30/70 by the time college starts. The expected return of this portfolio is approximately 4%. If you were to get precisely 4% annually (you won't) you'd have to set aside $63,000 into that 529 plan today to prefund 50% of the cost ($15,000/yr in today's cost). The 2030 plan has a portfolio that is currently 90% stocks which will also morph to 30% by the time college starts. The expected rate of return of that portfolio is approximately 5%. To prefund 50% of the expected cost you'd have to set aside $59,000 today.

Baseline Scenario

The baseline scenario simulates what you had originally planned on doing. That is:

- $500,000 house
- $30,000 college
- Retirement at ages 67 and 60 for Bill and Mary respectively
- Bill's retirement plan contributions are increased to 12%.

Under these assumptions, you ran out of funds during retirement (see scenario 1 on the last page)

Mary delays retirement to age 67

I then tried delaying Mary's retirement to age 67. This would not only delay the spenddown of savings by seven years but also increased her ABC pension to $30,667=46255 x 1.7% x 39 years. In this case, the probability of plan success under simulated market conditions was still an insufficient 54% (scenario 2). This level of success was determined by running your plan through simulated stock and bond market conditions 1000 times with rates of return and the sequence of those returns varying for each run. Generally, 85% is considered the minimal.

This may seem counterintuitive with a half million-dollar inheritance. However, keep in mind that most of these funds are going to paying off student loans and to pay for children's college. This is shown below using 1/3 of your father's account balances. You'll also need some of these funds for a house down payment.

Total	423,548
Student loans	(42,823)
College Bill Jr	(120,000)
College Nate	(120,000)
Remaining	140,725

At this point in the analysis, it was realized that the goal of sending Nate to The Private School would be difficult at best. If we assume that the funds for his school could be invested at a 5% annual rate of return, we'd have to set aside $216,000 today; assuming he attends from K through 12. It also doesn't matter whether the funds for The Private School are taken from cash flow while allowing the inheritance to grow for retirement or whether the funds from the inheritance are used to pay for The Private School while cash flow is saved for retirement. The results are the same. The remaining scenarios assume that he goes to The Private School for kindergarten only.

Increased saving, decreasing spending during retirement and assuming a shorter live expectancy

The baseline plan assumed that your discretionary spending remained constant throughout retirement. However, recent research has shown that retiree spending lags inflation as they spend less as their world gets smaller. I simulated this by cutting discretionary spending by 10% in 2048 when Bill turns 80. In reality, the decline would occur gradually over time but this approach is

sufficient for a very long range plan like yours. Unfortunately, this only increased the probability of plan success from 54% to 63% (scenario 3).

At this point, a common question would be whether a life expectancy of 95 years is overly optimistic and whether results would improve if life expectancy were dialed back to 90. In testing this, the probability improved to 67% (scenario 4). Shorter life expectancies often have little impact. This is because you are not spending from a static balance. Rather, your savings are growing over time. And, for a plan to be successful, your rate of withdrawal from savings has to be lower than the rate at which those savings are expected to grow. This protects you from sequence of returns risk. That is the risk that the portfolio suffers declines early in retirement due to both withdrawals and poor market returns. Later, when the good market returns arrive, the portfolio has declined so much in value that it's impossible to grow it back to the size it needs to be to fund the remainder of retirement.

Impact of reduced home purchase price and college tuition

Scenario 5 reduced the home price from $500,000 to $450,000 and college from $30,000 to $20,000. That's the current tuition, room and board for University of MD, College Park. Since the annual mortgage was approximately $2000 less, I increased Bill's 401k contribution from 12% to 14%. This resulted in an 81% probability of plan success; very close to the 85% minimal target.

It's only when the home price is reduced to $400,000 that the probability of plan success increases to an acceptable 87% (scenario 6).

Long term plans are very sensitive to rates of spending and/or saving. Note in scenarios 7 and 8 that both college and home price could increase if Mary were to increase her earnings by $5000 annually and save ALL of it. This also would increase her pension by about $3000 per year.

A note about the probability of success: the market simulation is random and based on a normal distribution with a mean and standard deviation described in the assumptions section. Since the simulation is random, it's possible to run the same simulation several times and get slightly different results each time. Say, 95%, 93% and 97% for the same scenario. I would consider scenarios that differ by only a few percent (like scenarios 6,7 and 8) to have essentially the same probability of success.

Bill life insurance needs analysis (Mary as survivor)

The following is assumed:

- To be conservative, discretionary spending declines from $60,000 to $45,000 beginning when Nate starts college.
- Both Nate and Bill Jr will receive an annual Social Security survivor benefit of $22,344 until they turn 18.
- Insurance proceeds are held in a conservative 50% stock 50% bond portfolio
- Private school and college costs remain unchanged.
- Mary continues to earn her current salary and retires at age 67.

- She claims a Social Security survivor benefit at age 67. The monthly benefit will be equal to Bill's current primary insurance amount of $2482. I calculated this amount based on the children's survivor benefit which is equal to 75% of his current primary insurance amount.

Under these assumptions a $1.3M, 20 year term policy would be sufficient to give the survivor plan a 90% probability of success.

Avoid employer life insurance unless you can take it with you when you leave. It would be an unfortunate situation if you had to quit do to failing health and lost coverage in the process.

									Ending plan values	
Scenario	Life exp	Retire S/A	House	Mary income	College	401k	Ret spend cut?	Probability of retirement success	50th percentile	10th percentile
1	95	60/67	$500k	Same	$30,000			0%		
2	95	**67**/67	$500k	Same	$30,000	12%	No	54%	$ 91,459	$ 32,000
3	95	67/67	$500k	Same	$30,000	12%	10% in 2048	63%	$ 209,118	$ 32,000
4	**90**	67/67	$500k	Same	$30,000	12%	10% in 2048	67%	$ 200,400	$ 32,000
5	95	67/67	**$450k**	Same	**$20,000**	**14%**	10% in 2048	81%	$ 585,941	$ 32,000
6	95	67/67	**$400k**	Same	$20,000	**15%**	10% in 2048	87%	$ 654,015	$ 32,000
7	95	67/67	$500k	$5000 more	**$25,000**	14%	10% in 2048	89%	$ 699,313	$ 32,000
8	95	67/67	$450k	$5000 more	**$27,000**	14%	10% in 2048	91%	$ 666,122	$ 58,450

Ending plan values are one measure of plan success. The table shows the ending plan values for the 50th and 10th percentile of simulated market runs. The 50th percentile shows the ending plan value for the run in which 50% of the runs had larger values and 50% had less. The values are shown in today spending power. All but scenario 8 ended with only the $32,000 checking/saving emergency fund remaining.