

**Original Article**

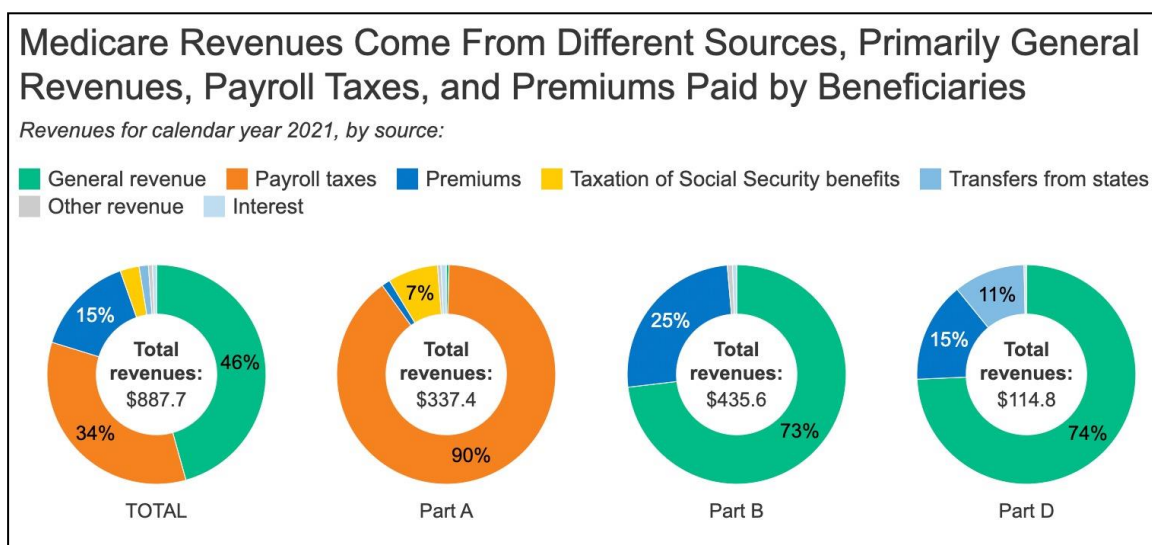


**How solvent is the Medicare Trust Fund?**  
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Medicare is a federal health insurance program that covers 65 million people ages 65 and over and younger people with permanent disabilities. It pays for hospitals, physician visits, prescription drugs, and other services. It accounts for 21% of the overall health care expenditure and is an important component of the total healthcare

system in the US.

Medicare has 3 parts: A, B and D. Chart 1 (source kff.org) shows how Medicare is financed. Each part is funded differently and the revenue sources dedicated to one part of the program, ex. Part A, cannot be used to pay for another part, Part B.



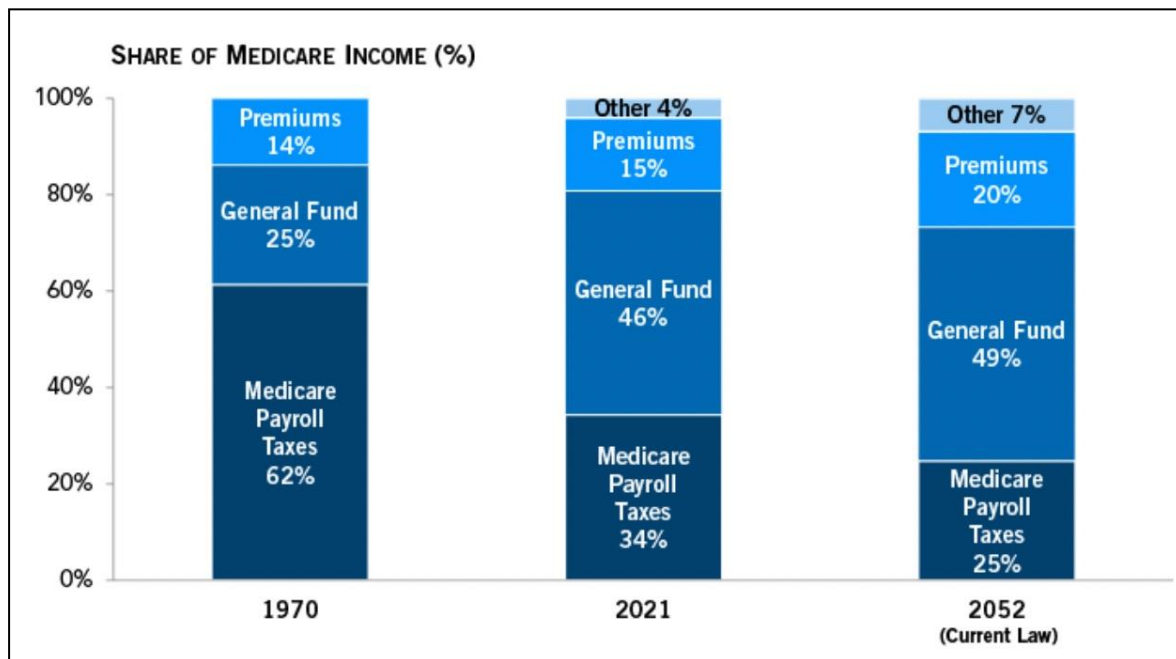
**Chart 1: Source kff.org**

Part A includes inpatient hospital stays, skilled nursing facility (SNF) stays, home health visits, and hospice care and is financed mainly from a payroll tax of 2.9% paid by all covered employers and their employees (shared 1.45% each). Higher income taxpayers pay a higher payroll tax on earnings (2.35%). In 2021, payroll taxes accounted for 90% of Part A revenue. Part B covers physician visits, outpatient services, preventive services, and home health visits, and is financed through general revenues (73%) and beneficiary premiums (25%). Part D covers

prescription drugs, financed primarily by general revenues (74%) and beneficiary premiums (15%). As a whole, the federal government now finances almost 46% of Medicare. In contrast, in 1970, almost three out of every four dollars (75%) spent in Medicare was financed within the system through payroll taxes and premiums. This trend is problematic because a system that was designed to be self-sustaining is increasingly becoming dependent on the government and the resulting politics that comes with that dependence. In addition, it is becoming a big drain on federal

spending and is the second largest program in the federal budget—currently it accounts for 13% of

federal spending compared to 3% in 1970.



**Chart 2: Medicare is increasingly becoming less self-financed and more dependent on the federal budget (Source: pggf.org and CMS Annual report 2022)**

Finally, there is a Part C (Medicare Advantage Plans) which combines Medicare Parts A (hospital), B (medical), and usually D (prescription drugs), as well as other benefits an enrollee selects. These plans are provided by private insurers and group health providers with Medicare paying these groups a lump sum per patient based on certain risk factors.

### The Medicare Budget:

The Medicare budget, like any other budget, has a revenue side and an expense side. In 2022, total revenues were \$988.6 billion, which consisted of \$980.7 billion in non-interest income and \$7.9 billion in interest earnings. Total expenses were \$905.1 billion leaving a surplus of \$83.5 billion which was added to the assets held in the Medicare funds. Medicare budgets are, however, not always in the green, and to ensure that there are enough funds to manage deficits, the Medicare program maintains two separate trust funds, the Medicare Hospital Insurance trust fund (HI), which covers deficits in Part A and the Supplementary Medical Insurance trust fund (SMI) covers Part B and Part D. Together these funds hold special issue U.S. Treasury Securities valued at \$409.1 billion at the end of 2022.

### Medicare's Solvency:

When annual expenses of Medicare exceed its revenues, the deficit is covered from money in the trust funds. If the assets in the funds were to run out and then if annual expenses were to exceed revenues, the funds will not have enough assets to meet those deficits. **At that point, Medicare will technically become insolvent.**

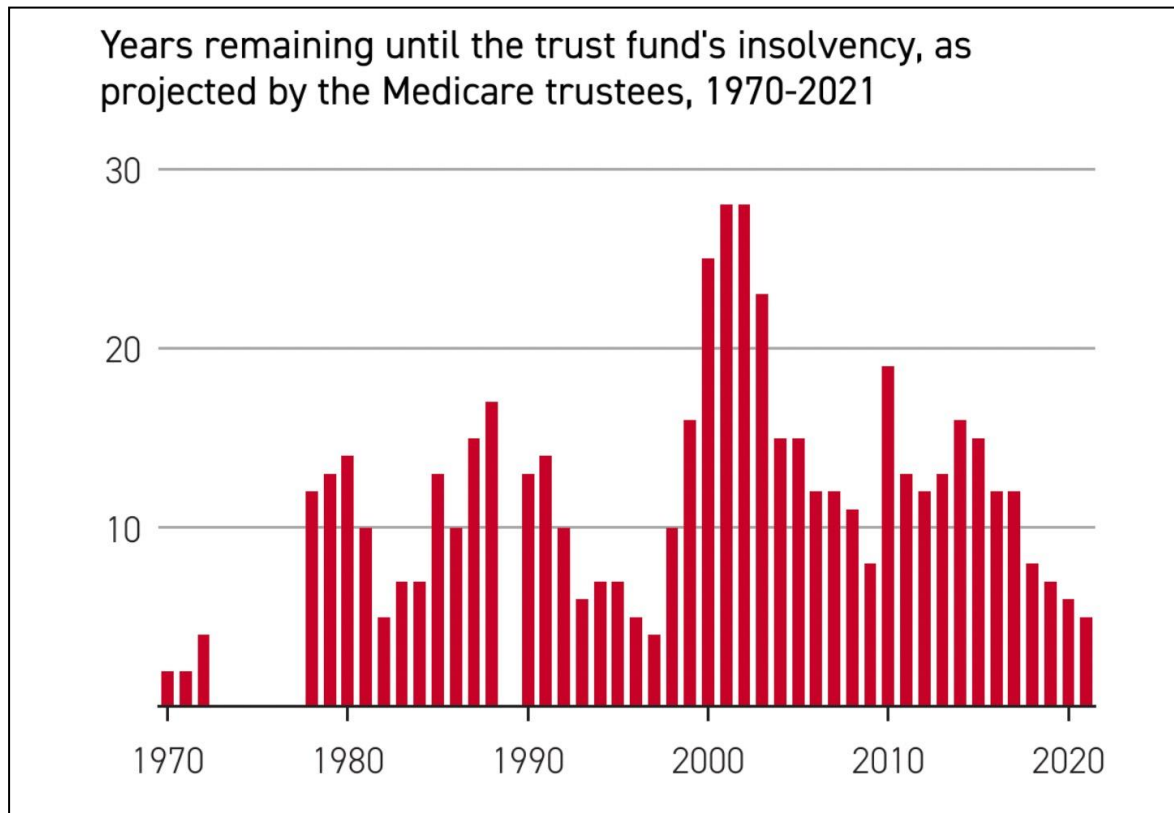
Currently, the HI Trust Fund is projected to become insolvent in 2028, meaning that it will only be able to pay out a portion of its obligations to beneficiaries. The SMI Trust Fund is projected to remain solvent for the foreseeable future, although its long-term financial sustainability is also a concern.

According to the report of the Trustees of the Medicare Funds, starting in 2023, Part A expenses will exceed revenues each year leading to a gradual depletion of assets in the HI trust fund. For example, in 2023, the HI trust fund started the year with \$196 billion in assets, but because spending is projected to exceed revenues by over \$3 billion, the trust fund is expected to end the year with \$170 billion in assets. By 2027, assets in the trust fund are projected to diminish to zero, and that assumes inflation below 3%. At 6%

inflation, the fund could be bankrupt by 2026. (Source: Congressional Budget Office 2022)

But these projections are based on assumptions that may not be realistic. Forecasting Medicare's insolvency has become a long-running tradition among economists and policy experts. In the

1970's the consensus was that Medicare would become insolvent in 4 to 5 years. That number changed to 30 years in the early 2000's. The chart below from Politico shows Medicare's forecasted "life-expectancy" at different times over the last fifty years.



**Chart 3: Years to insolvency for Medicare HI fund (Source: Politico)**

It is clear from the chart that the issue of Medicare's insolvency, which is based entirely on projections of variables that are hard to determine, is far from settled. And while it is an important political issue it is likely that politicians from both sides will exaggerate the probability of Medicare going insolvent. This could lead to sub optimal policy prescriptions.

In this paper we use a different technique to better analyze the solvency issue. We use Monte Carlo simulation, a well-established technique to deal with stochastic variables, to find the probability of Medicare becoming insolvent under different scenarios.

But let's first examine the different policy prescriptions currently being offered on both the expense and revenue sides to fix the Medicare budget.

#### Fixing the expense side:

1. One of the policy recommendations to reduce Medicare expenses is to shift from fee-based services to value-based care, a virtual restructuring of costs and payments that could take years to hammer out and then implement with industry groups.
2. While hospital expense is still the largest component of Medicare's spending, it's share in total Medicare spending has declined from 70% in 1970 to 39% in 2022. Spending for physician services has been fairly constant between 20 and 25 percent over the last fifty years ranging for most of the program's history, but the share of prescription drugs has increased from around 1.5% in 2006 to almost 15% currently. There has also been a rise in expenses used to administer the fund. These trends suggests that while managing hospital care expenses is vital, policy changes must

also focus on the other expenses which have mushroomed in recent years.

3. Another suggested fix on the expense side is to transfer inpatient services in Medicare Part A to Part B which is funded mostly by premiums and other taxes. But part B spending is growing significantly faster than Part A as it expands to cover a range of services along with provider-administered drugs. A more detailed analysis of this change is required, but on the surface, it doesn't appear that this is a viable fix for expenditure growth. All it does is transfer expense to a part of Medicare that currently appears to be more solvent.
4. The coronavirus pandemic created a huge opportunity to design policy and programs to advance technology-enabled home care to reduce the cost of inpatient services. In April 2020, telehealth accounted for 44 percent of all primary care visits, compared with just 0.1 percent before the pandemic. From advances in consumer wearables to remote monitoring, technology is now well-positioned to help lower costs and improve quality of care. We believe that this is the way to go. The government should spend resources on developing strategies to utilize technology, including AI, to improve home care and reduce inpatient expenses.
5. There is very little use of "big data" analysis yet in medicine. Predictive analytics can be deployed productively to enable service providers and insurers to intervene earlier and in a more targeted manner for at-risk patients. In March 2020, CMS launched a program, Hospitals Without Walls, that allows eligible hospitals to provide services to qualified patients in their homes. This will provide an important test case to develop cost-saving policies for providing remote services to older patients at home.
6. Increased use of Medicare Advantage (MA) plans has the potential to shift the risk from Medicare to private insurers and HMO's. In these plans the federal government pays the private groups a lump sum per patient based on certain risk factors instead of paying for each medical service as in traditional Medicare. The capitated payment structure

requires MA plans to shoulder the full financial risk for each enrollee. If an enrollee's care costs exceed the fixed payment amount, the plan must cover the difference. This dynamic incentivizes the private insurer to offer coordinated care and comparatively improved care management, and helps the government to better plan Medicare expenses.

MA plans have become popular. In 2022, 48% of eligible Medicare beneficiaries were enrolled in MA plans, up from 26% in 2011. Payments to MA Plans for Part A and Part B benefits nearly tripled between 2011 and 2021 going from \$124 billion to \$361 billion and are projected to increase to \$943 billion in 2031 with more than 50% of Medicare eligible beneficiaries enrolled in these plans.

In theory MA plans share financial risk with Medicare but in practice MA plans have contributed to a significant increase in Medicare spending largely because the government pays more per enrollee to private MA than their costs would be under traditional Medicare. According to a research report by kff.org, gross margins for Medicare Advantage plans in 2021 were substantially higher than those seen in the individual fully insured group plans. Newly released federal audits reveal widespread overcharges and other errors in payments to Medicare Advantage health plans.

So, while MA plans have the potential to be a great way to keep Medicare expenditures in check and ensure its long-term solvency, a more thorough and comprehensive analysis is required to achieve risk sharing and minimize overbilling by these private groups.

#### **Fixing the Revenue side:**

1. Some policy experts have recommended increasing the basic payroll tax rate. Payroll taxes provide a significant portion of the funds for Medicare part A, but the rate at which wages are taxed (2.9%) has remained unchanged since 1987 despite a doubling in both enrollment and per capita spending. Raising this to 3.5% would increase Medicare revenues by almost \$75 billion annually. But while raising taxes to cover deficits have always been an alluring proposition, there is no free lunch. Raising the payroll tax will

reduce disposable income and personal consumption by a commensurate amount, and since personal consumption is by far the largest component of GDP (68%), there will likely be significant collateral damage from a payroll tax increase on the GDP. A deeper analysis of this issue is warranted.

2. Medicare Part A is funded almost entirely by taxes on wages, but wages and salaries today make up less of total incomes compared to returns from capital investment. In 1965, the year Medicare was enacted, wages and salaries comprised roughly 68% of personal incomes; today that number has dropped to about 50%. Subjecting all personal income (including capital gains) to Medicare taxes (keeping the rate unchanged at 2.9%) would increase Part A revenues by about \$100 billion a year. This may have less of a deleterious effect on GDP than raising payroll taxes.
3. There are also recommendations to redirect the collection of net investment taxes directly into the HI fund instead of sending those funds to the general fund. The 2010 Health Care and Education Reconciliation Act imposed a 3.8 percent tax on the net investment income tax (NIIT) on high-income taxpayers. It was termed the “unearned income Medicare contribution”, but the proceeds of this tax went instead to the general fund. Lawmakers can specify that future proceeds from the NIIT be deposited directly in the HI trust fund. This would amount to an addition of \$350 billion over the 2021–2030 period into the fund.
4. Covid has pushed an increasing number of people into contract work and into what is called the “gig-economy”. Since employers are not required to withhold payroll taxes from payments to independent contractors, this could potentially affect revenues collected under Medicare part A from payroll taxes.

### Simulating Medicare’s Solvency:

In order to better understand the issue of Medicare’s projected insolvency we conduct Monte Carlo simulation tests using the 3 key variables that ultimately determine what the projected revenues and expenses are likely to be.

- a) **The Level of Growth in the Economy.** The principal source (90% in 2021) of revenue for

Medicare part A is payroll taxes, the volume of which depends critically on the condition of the economy. An increase in economic growth leads to higher employment and increased payroll taxes and revenue into the trust fund, while an economic downfall has just the opposite effect. We model 3 different scenarios:

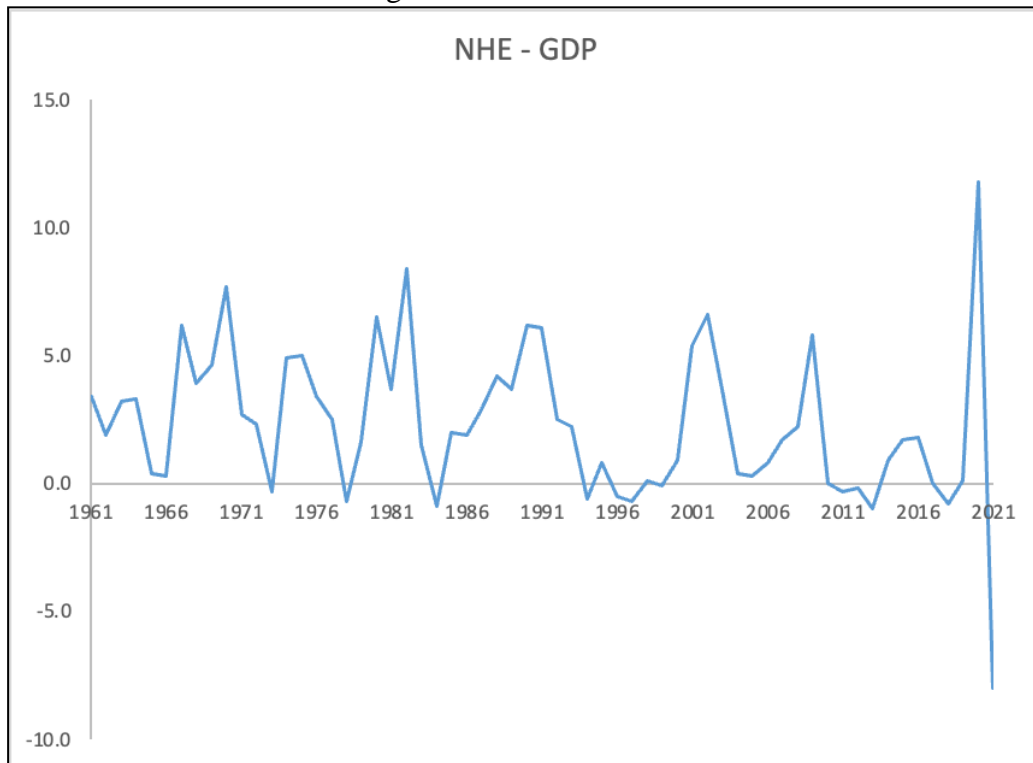
1. For our most-likely scenario we use the CBO’s and the BLS projection of annual GDP growth over the next ten years of 2.1%.
  2. For the best-case scenario we project the economy growing at an average rate of 4% over the next ten years. This was the average annual growth for the US economy between WWII and 1990.
  3. For the worst-case scenario we use a growth rate of 1.1%, which was the average for the worst ten years in US economic history
- b) **Health Care Spending:** Higher health care pricing cost grown leads to higher spending for services covered under Medicare which would speed up the bankruptcy date, while moderation in the growth of prices and costs could slow spending growth.

Medicare’s costs have grown from around 2.3% of GDP in 2000 to their current (2022) level of 3.7 percent of GDP. The CMS projects this will rise to 6.1% of GDP over the next 25 years. What this projection is based on is anyone’s guess. If anything, the difference between growth in health expenditures (as measured by NHE) and GDP has dropped in every decade since the 1970s.

Chart 3 below shows the difference in growth rates between NHE and GDP. Since 1960 the average annual growth rate in National Health Expenditure of 8.7% has far outpaced the 6.4% growth in nominal GDP, but the magnitude of the differences has been declining. Ideally, for a steady state equilibrium, we would like NHE to grow at the same rate as nominal GDP. But clearly, it has not. Health expenditures have grown at a faster rate annually than GDP. In the 1960s the average annual differential between growth in NHE and GDP was 7.3%. In other words, annual health expenditures grew (in percentage terms) 7.3% higher than GDP. In the 1970’s because of lower economic growth and higher inflation the average annual growth in NHE was 10% higher than GDP growth. In the 1980s this number dropped to 8%, in the 1990s

to 5.5%, in the 2000s (2000-2010) the difference dropped to 4.2% and in the most recent decade from 2010 to 2020 the difference between growth

rates in health expenditures and GDP has dropped to 3.5%.



**Chart 4: Annual differences in national Health Expenditures and GDP (Source: NHE statistics)**

Our simulation exercise postulates three scenarios:

1. The most-likely scenario, in which Medicare expenses stay at the current level of 3.7% of GDP.
  2. In the best-case scenario we have inflation falling to around 2% a year and as a result Medicare expenses averaging 2.3% of GDP.
  3. For the worst-case scenario we use the CMS projection that Medicare expenses will grow at around 5% of GDP over the next ten years.
- c) **Demographic Trends:** An important determinant of Medicare's long-term solvency are demographic trends which determines the number of potential payors into and beneficiaries from Medicare. This is especially true for Medicare Part 1 where 90% of the total revenue collected comes from payroll taxes (Chart 1). Medicare part A. It is, therefore, important to model demographic trends into our simulation.

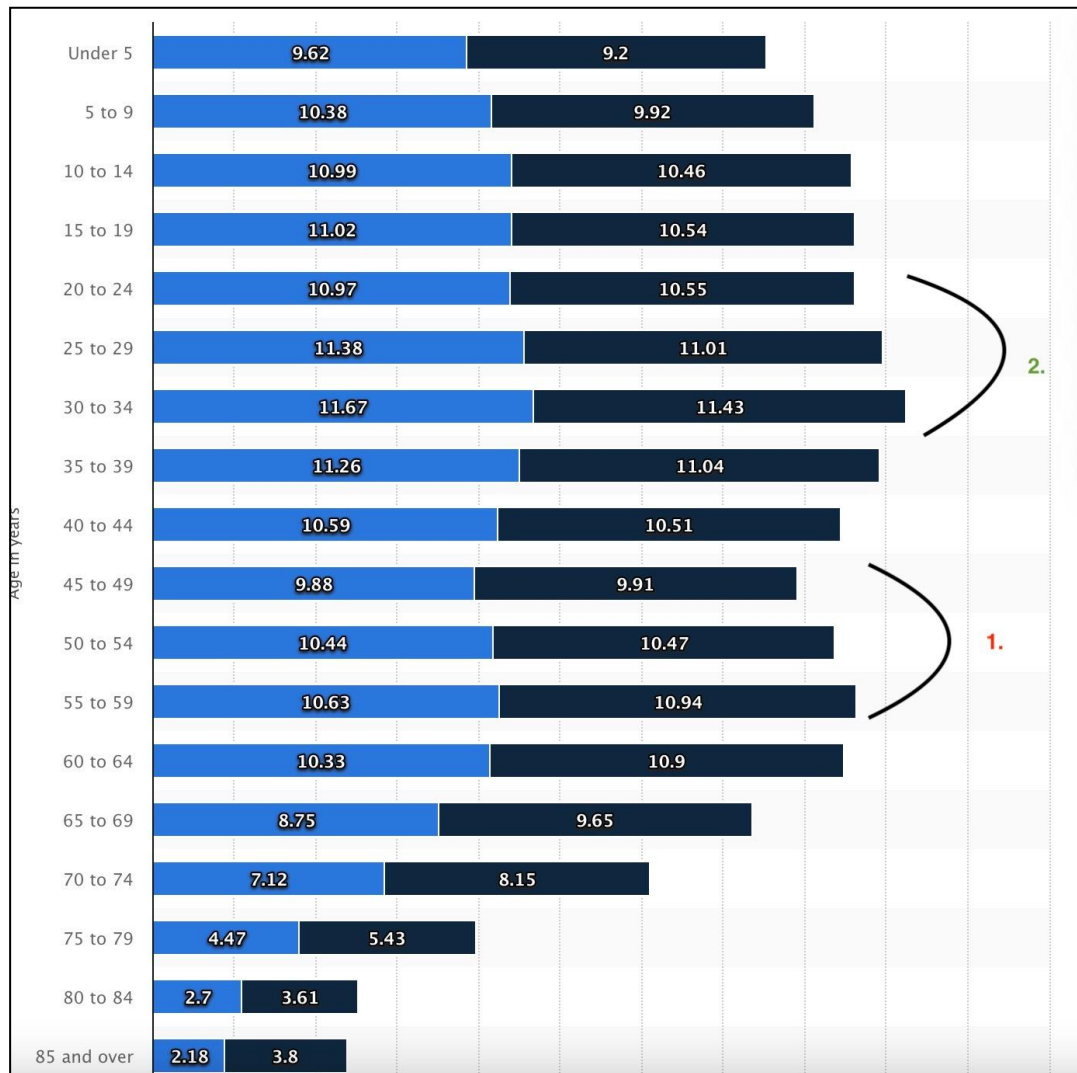
The rapid growth in Medicare expenses between 2010 and 2020 can be attributed to the baby

boomers getting past the age of 65. At the same time there has been a steady decline in the ratio of workers (payors) to beneficiaries.

But it appears that this trend is reversing. The number of payors is likely to outpace the number of beneficiaries very soon. The baby boomer generation has already been absorbed into the Medicare system and the number of people who will turn 65 (and enter the Medicare system) in the next ten to fifteen years is much lower. Note 1 in Chart 4 shows the progressively lower number of people in the age category 50-54 compared to 55-59 and subsequently an even lower number in the 45-49 age group.

Conversely, the number of people getting ready to enter the workforce (ages 25-35) and those that are at the peak of their wage earnings will increase in the next ten to fifteen years (Note 2 in the Chart4).

The demographics, therefore, are clearly in favor of a more solvent Medicare.



**Chart 5: US population by age groups (Blue is Males and Black is Females. Source: Statista)**

Demographics is a deterministic variable and can be predicted with a high degree of certainty. We can predict accurately how many new people will be enrolled in the program over the next ten years. We also have mortality tables that can predict, with a fair degree of accuracy, the number of people that will drop out because of death. We make the assumption, that the next ten years will not witness another Covid-like epidemic which accelerated death rates among older people. Pettingill and Tewes have documented Covid-related savings in Medicare expenses of around \$10 billion from the higher-than-normal deaths among people older than 65.

**d) Payroll tax rate:** Payroll taxes make up almost 90% of the revenue in Medicare part A. The rate at which wages are taxed for employees (and the corresponding contribution by the employer) are therefore an

important contributor to the solvency of Medicare. Since that is a hot political issue, we leave the payroll tax rate unchanged at 2.9%. The revenue from payroll taxes that funds the HI program has been around 1.3% of GDP for the last 25 years, and we apply the same number for the next 10 years.

#### Monte Carlo Simulations:

Monte Carlo simulation is a technique used to model complex systems or processes that involve uncertainty and randomness. In the context of Medicare solvency, Monte Carlo simulation can be used to estimate the likelihood of the program's bankruptcy under different scenarios and assumptions.

To conduct a Monte Carlo simulation of Medicare bankruptcy, one would need to define a set of input variables and assumptions that capture the

Current Opinion

key drivers of the program's financial sustainability, such as demographic trends, healthcare costs, revenue sources, and policy changes. These variables and assumptions would then be used to generate multiple simulations of the program's financial trajectory over time, accounting for the inherent variability and uncertainty in each variable.

By aggregating the results of these simulations, one can estimate the probability of the program's insolvency under different scenarios and assumptions. For example, one could simulate the effects of different policy changes, such as increasing the payroll tax rate, reducing provider payments, or increasing beneficiary premiums, and evaluate their impact on the likelihood of bankruptcy.

Our basic equation is that the year-ending balance in the fund can be calculated from the following:

$$A_i = \Sigma(A_{i-1} + (.013 (GDP)_i - S * (GDP)_i))$$

We calculate the probability of insolvency over a ten-year period, so *i* goes from 1 to 10. Insolvency occurs whenever the balance in the fund in any year  $A_i$  falls below 0. The starting amount in the H1 fund in 2023 is \$196.6 billion (source: Medicare Trustees report 2023).

$$GDP_i = GDP \text{ for year } i$$

*S* = Medicare expenses as a % of GDP under 3 different scenarios

We run 500 simulations for each year under each scenario. We assume a normal distribution for GDP and Medicare spending. The average fund balance at the end of each year becomes the starting fund balance for the next year and the subsequent set of simulations. This process is repeated for a ten-year period. For each simulation run we calculate the probability of the year-end ending balance falling below zero. This is *P(S)*, the probability of insolvency. The table below shows the results for the nine scenarios:

PROBABILITY OF MEDICARE INSOLVENCY					
		Economic growth			
		Worst-case scenario	Most-likely scenario	Best-case scenario	
		GDP grows 1.1%	GDP grows 2.1%	GDP grows 4%	
	Worst-case scenario	5% of GDP	98%	61%	32%
Medicare spending	Most-likely scenario	3.7% of GDP	61%	47%	19%
	Best-case scenario	2.3% of GDP	37%	22%	9%

**Results:**

There is close to a 50% chance of the HI fund becoming insolvent within the next ten years if Medicare spending and GDP growth remain at their long-term averages (the most-likely scenario). The probabilities of insolvency rise to near certainty in the worst-case scenarios where the economy slows to a growth rate around 1.1% and Medicare spending increases to around 5% of GDP.

There are, however, some positives from these results. GDP growth has an enormous effect on the probability of insolvency. If the economy grows at around 4% a year the probability of insolvency falls to less than one in three even if

Medicare spending exceeds its expected growth rate. In the best case-scenario with GDP growth at around 4% and Medicare spending at around 2.3% of GDP there is a near certainty that the HI fund will remain solvent for the next 10 years.

**Conclusions:**

The insolvency of the Medicare Trust Fund Hi has been a topic for debate among economists since its inception. At times the fund's insolvency has been predicted to be three years away, and at other times thirty years. A wide range of policy prescriptions from raising Medicare taxes, to shifting expenses from Part A to Part B have been suggested. But there is little consensus, and very little research on what variables affect the



probability of insolvency. We believe, our study is the first to use Monte Carlo Simulation to find the probability of the fund's insolvency under different spending and GDP regimes. We find that the probability of insolvency can vary from near certainty when GDP growth is between 1% and 1.5%, to virtually no chance of insolvency if GDP growth is in the 4% range.

Economic growth solves a lot of problems and the solvency of the Medicare Fund is no exception. Policy makers will be well advised to focus more on creating conditions for economic growth, than tinkering with tax rates or cutting services. Instead, the focus should be on using technology to create efficiencies in the system and using large-data analysis to develop reimbursement rates for Medicare Advantage plans that allow private companies to generate attractive returns on investment yet at the same time sharing the risk of overspending with the state.

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