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THE ECONOMIC VALUE OF ELIMINATING CANCER

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ABSTRACT

This paper estimates the economic value to the United States of eliminating cancer mortality over a 35-year horizon beginning in 2030, which would eliminate 30.7 million cancer deaths with a total mortality burden of 380 million life-years. We quantify the economic value of this substantial reduction in cancer mortality by incorporating the monetized value of increased longevity. To value the longevity gains in monetary terms, we utilize the valuations used by the U.S. federal government in its cost-benefit evaluations of regulations. Eliminating cancer mortality generates \$197 trillion in economic benefits over 35 years, corresponding to approximately \$16,282 per American per year, or \$41,684 per American household per year. If cancer elimination is viewed as an R&D investment, it yields an enormous internal rate of return, ranging from 570% to 1,024%, based on benchmarked R&D costs. In addition, we perform a sensitivity analysis by varying the elimination durations and the degree of success, using the benchmark case scenario in which cancer mortality is reduced by 80 percent over a 20-year transition. This achieves about 70 percent of the total economic value of full elimination above, corresponding to aggregate benefits of about \$134 trillion, or approximately \$11,112 per person per year.

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Section 1: Introduction

By 1971, cancer had become the second leading cause of death in the United States, fueling a national effort to combat the disease. President Richard Nixon signed the National Cancer Act of 1971, which launched the “War on Cancer”. The legislation increased funding and authority for the National Cancer Institute (NCI). It established a coordinated National Cancer Program, giving the NCI director expanded powers (e.g., creating cancer centers, training programs, and a direct “bypass” budget to the President) to intensify research (National Cancer Institute). Despite these efforts, cancer incidence and mortality continued to rise throughout the 1980s, primarily due to smoking-related cancers. More specifically, in the early 1970s, when the War on Cancer began, the U.S. cancer death rate (age-adjusted) was roughly 190–200 per 100,000 people. Overall mortality peaked around 1990–1991 at about 215 per 100,000. Thereafter, a sustained decline set in. By 2019, the rate had fallen to 146.0 per 100,000, about 27% lower than in 1971 and 32% lower than the 1991 peak (NCHS, 2024). This downward trend has continued in recent years, reaching ~142 per 100,000 in 2023 (NCHS, 2024).

Yet despite this progress, cancer remains the second leading cause of death in the U.S. after heart disease. Over the past 50+ years, both cancer and heart disease mortality rates have declined, but heart disease treatments have improved significantly relative to cancer mortality. Thanks to advancements like better cardiac care and reductions in smoking, heart disease death rates fell by roughly 66% between 1970 and 2022 (Bai, 2025), far exceeding the roughly 27% decline in the overall cancer death rate since 1971. As a result of these underlying dynamics, the CDC estimates that cancer will overtake heart disease as the leading cause of premature mortality by 2030 (Best et al. 2018).

Given the large, enduring health and economic burden of cancer in the United States, this paper applies a forward-looking valuation framework to quantify the national gains from eliminating or drastically reducing cancer mortality during the period 2030 to 2064. A key premise underlying such an exercise is that sustained investment in medical research and treatment can yield meaningful improvements in cancer survival. Since the National Cancer Act of 1971, the United States has maintained substantial public funding for cancer research, with the National Cancer Institute alone allocating more than \$7 billion annually in recent years. U.S. cancer mortality rates have declined by approximately one-third since the early 1990s (AAMC, 2025). Beyond descriptive trends, more direct evidence links cancer-related spending and medical innovation to improvements in survival. Lakdawalla et al. (2010) provide an economic evaluation of the “War on Cancer,” estimating that improvements in cancer survival between 1988 and 2000 generated approximately 23 million additional life-years and nearly \$1.9 trillion in social value.

In our analysis, we consider the value of cancer elimination in terms of the direct value of health generated. Under the status quo of no cancer elimination, we find that the U.S. would have 30.7 million cancer deaths during our study period, with a total mortality burden of approximately 380

million life-years, equivalent to roughly 4.9 million full lives lost under current U.S. life expectancy. Because our analysis focuses on valuing life-years lost for cancer patients, this framework implicitly values saving a child more than saving an older person, reflecting differences in remaining life expectancy at the time of death. To monetize the value of such reductions in mortality, we use the U.S. federal government's \$580,000 valuation of a life-year in its cost-benefit analysis of regulations, as reviewed by Philipson et al. (2023). To illustrate, for a breast cancer patient who dies at age 45 rather than living to age 75, this implies a loss of 30 life years. Using U.S. federal government valuations, this implies a loss in value of $30 \times \$580,000$, totaling \$17.4 million. This calculation for a single cancer death illustrates why aggregate losses from cancer mortality of 30.7 million cancer deaths amount to trillions in value, that is, millions of millions.

Given that health is the most valuable asset for most people, eliminating cancer brings substantial value through improved health. This is important as many cancers are diagnosed during productive years and some cancers, such as colorectal cancers, are declining in age of diagnosis. We find that the economic health gain is \$196.65 trillion during the 2030-2064 period. This amounts to about \$16,282 per American per year or \$41,684 per American household per year.

If the elimination of cancer were viewed as an investment, its returns would be extremely large. Assuming a cost range of \$500 to \$900 billion to eliminate cancer, we find an extremely high internal rate of return of 569.8% to 1,024.4%, underscoring the exceptionally large social returns to investments that accelerate progress towards cancer elimination. Importantly, a sensitivity analysis scenario in which cancer mortality is reduced by 80 percent over a 20-year transition captures roughly 70 percent of the total economic value of full elimination, corresponding to aggregate benefits on the order of \$134 trillion, or approximately \$11,112 per person per year. Altogether, these findings highlight the excellent and robust returns from reducing and eliminating cancer mortality and the value of policies that stimulate medical innovation in cancer.

Section 2: The Future Mortality Burden of Cancer

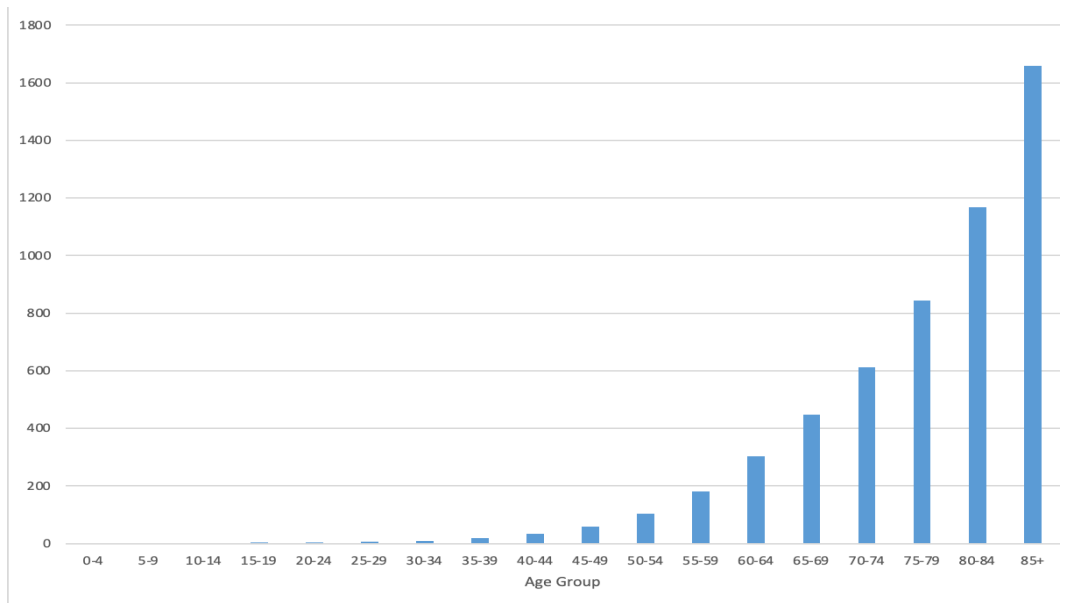
In this section, we quantify the future cancer mortality burden in the United States over a 35-year period. We begin by documenting the current age distribution of cancer mortality to establish a baseline risk pattern. We then project age-specific cancer deaths from 2030 to 2064 using population forecasts and observed mortality rates. Finally, we convert these projected deaths into life-years lost and full lives lost, offering a comprehensive measure of the potential longevity improvements that could result from eliminating cancer mortality.

2.1 Mortality Rate and Projection

Figure 1 displays the age distribution of cancer mortality in the United States, as reported by the CDC in 2023. Mortality rates are extremely low in childhood and early adulthood, remain modest through middle age, and then rise sharply beginning around age 55. The steep acceleration after age 65 reflects both increased cancer incidence and higher fatality among older adults. The oldest

age group (85+) exhibits mortality rates exceeding 1,600 per 100,000, underscoring the concentration of cancer mortality among the elderly population.

Figure 1: Age-Specific Cancer Mortality Rates in the United States (per 100,000 Population), 2023



To project future cancer mortality by age, we combined the 2023 U.S. cancer mortality rates with population forecasts from the U.S. Census Bureau. Since age-disaggregated population projections were only available for selected benchmark years (2030, 2035, and 2040), we interpolated each age group’s proportional population share across these benchmark years and applied these shares to annual total population projections to create consistent age-by-year population estimates. Cancer incidence peaks during the productive years of life, typically in one’s 50s, and remains elevated through working years into the 70s. Additionally, some major cancers, such as colorectal cancer, have experienced a decreasing age at diagnosis, increasingly affecting individuals during high-productivity years.

Projected cancer deaths were first calculated for each CDC age group as the product of the age-specific mortality rate and the projected population in that age group, yielding an initial age-group-by-year matrix of predicted deaths. To convert these grouped estimates into single-year ages ($N_{t,a}$) for subsequent analysis, we then assumed a uniform distribution of mortality within each age group.

2.2 Estimated Life Expectancy for Cancer Patients

We estimate life expectancy for cancer patients by combining baseline conditional life expectancy with long-term relative survival rates for major cancer types. Baseline life expectancy is measured as projected remaining life expectancy conditional on age and year, obtained from the *United*

Nations World Population Prospects (2024 Revision). For an individual dying at age a in year t , the conditional life expectancy is denoted by $L_{t,a}$, representing the expected number of additional life years in the absence of cancer-related excess mortality.

Since the UN dataset only provides projected conditional life expectancy at ages 0, 15, 65, and 80, we interpolate conditional life expectancy across all ages. As life expectancy is expected to continue rising over the next several decades due to improvements in overall population health, allowing $L_{t,a}$ to vary by year ensures that our calculations accurately reflect the longevity lost of a group at a given age and year.

To adjust baseline life expectancy for cancer patients, we use long-horizon relative survival rates. We collect 5-year, 10-year, and 15-year relative survival rates for four major cancer types: breast cancer, colorectal cancer, prostate cancer, and lung cancer. We then compute the arithmetic mean across these cancers to construct a representative survival profile. Relative survival rates are reported cumulatively, reflecting survival from treatment to a given horizon. We therefore convert cumulative relative survival into interval-specific survival using conditional survival. For example, relative survival between years 5 and 10 is given by

$$RS_{5-10} = \frac{RS(10)}{RS(5)},$$

and similarly for subsequent intervals.

Cancer-adjusted remaining life expectancy is then calculated as a piecewise weighted sum of baseline conditional life expectancy across future time intervals, where each interval is weighted by the respective interval-specific relative survival rate. Specifically, cumulative relative survival at 5, 10, and 15 years is used to determine survival probabilities for the periods 0–5, 5–10, and 10–15 years. Survival beyond 15 years is assumed to follow the 15-year relative survival rate, indicating convergence toward long-term survival. Baseline conditional life expectancy is broken down across these future intervals and weighted by the corresponding interval-specific relative survival probabilities. For an individual aged a in year t , cancer-adjusted life expectancy is given by:

$$L_{t,a}^{cancer} = l_{0-5} \times RS(5) + l_{5-10} \times \frac{RS(10)}{RS(5)} + l_{10-15} \times \frac{RS(15)}{RS(10)} + l_{15+} \times RS(15)$$

where:

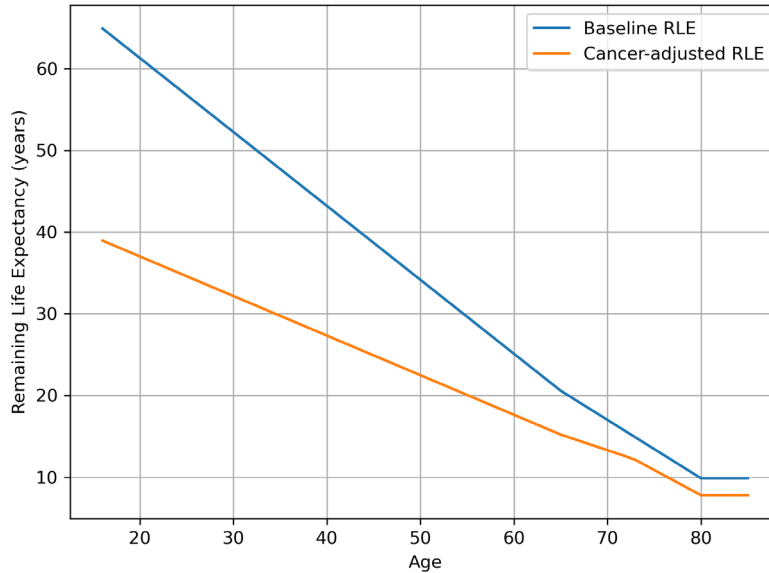
- l_{0-5} , l_{5-10} , l_{10-15} , l_{15+} denote the contributions of each future interval to baseline remaining life expectancy $L_{t,a}$;
- $RS(5)$, $RS(10)$, and $RS(15)$ are cumulative relative survival rates to 5, 10, and 15 years, respectively;

- Survival beyond 15 years is assumed to remain constant at the 15-year relative survival rate.

This estimation preserves the age profile and calendar-year variation of baseline life expectancy while accounting for excess long-term mortality among cancer survivors. The resulting cancer-adjusted life expectancy is used in subsequent mortality and valuation calculations.

Figure 2 plots baseline and cancer-adjusted remaining life expectancy by age for the year 2030. The difference between the two curves is larger at younger ages and declines steadily with age. This pattern arises because younger individuals have a longer remaining life horizon, so excess mortality translates into a larger absolute reduction in remaining life expectancy. As age increases and remaining life expectancy shortens, the absolute decrease in life expectancy associated with cancer correspondingly diminishes. As a result, this pattern implicitly values saving a child more than saving an older person.

Figure 2: Baseline and Cancer-Adjusted Remaining Life Expectancy by Age (2030)



2.3 Cancer Mortality Burden

Under the status quo scenario, total projected cancer deaths over the 35-year period from 2030 to 2064 sum to 30.7 million. In the following, we calculate the aggregate mortality burden by summing years of life lost across all ages up to 85 and calendar years from 2030 to 2064. The formula is as follows:

$$Mortality\ Burden = \sum_{t=2030}^{2064} \sum_{a=0}^{85} N_{t,a} \times L_{t,a}^{cancer},$$

where t indexes the year, a denotes the age, and $N_{t,a}$ is the number of deaths due to cancer at the age a in year t . In terms of equivalent loss in full lives, we convert the life-year burden by the U.S. life expectancy of 78.4 in 2025 as follows:

$$\text{Equivalent Full Lives Lost} = \frac{\text{Mortality Burden}}{\text{U.S. Life Expectancy}} = \frac{\text{Mortality Burden}}{78.4}.$$

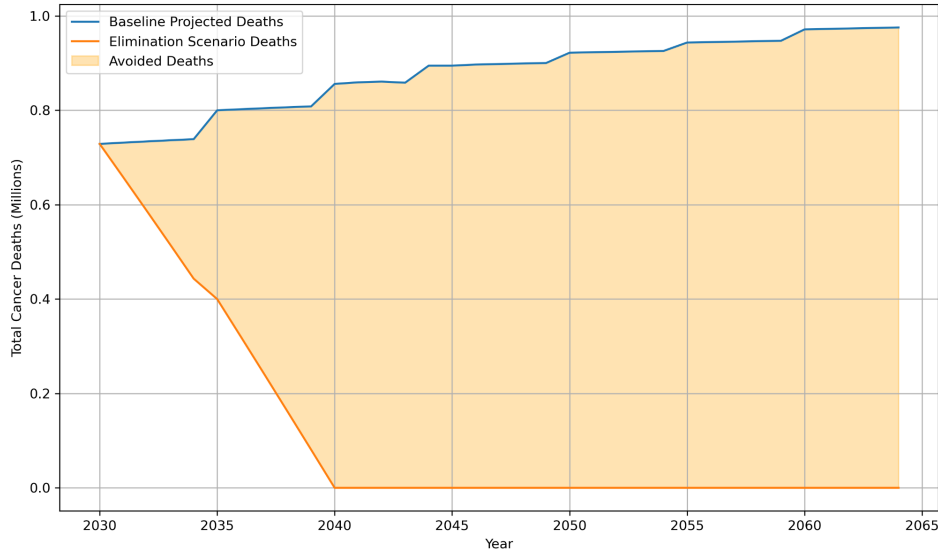
Aggregating the age-specific life-years lost across 2030–2064 yields a total mortality burden of 379.96 million life-years under the status quo, reflecting the longevity that would be forfeited in the absence of further progress against cancer. When expressed as equivalent full lives lost—dividing total life-years lost by the 78-year life expectancy benchmark—this corresponds to approximately 4.9 million full lives lost, providing an intuitive measure of the population-level impact. These estimates underscore the magnitude of health gains that could be realized from eliminating cancer mortality.

Section 3: The Monetary Value of Eliminating Cancer Mortality

3.1 Counterfactual Elimination Scenario

To estimate the economic value of health gain to the United States associated with a modeled reduction in cancer mortality over the period 2030–2064, we consider a counterfactual elimination scenario. In this scenario, cancer mortality declines linearly during a transition period and remains at the reduced level thereafter. Specifically, we assume that cancer deaths fall linearly over the transition period between 2030 and 2039, reaching the elimination target by 2040, and that this reduced mortality level persists through the remainder of the sample period. The baseline mortality series used for comparison corresponds to the status quo mortality burden estimated in Section 2. Figure 3 presents the baseline mortality path and the implied mortality trajectory under this linear transition framework. In our elimination scenario, the avoided deaths result in a total of 339.1 million life-years gained. We then quantify the economic value of these prevented deaths, with reductions in mortality generating monetized health benefits through additional life years, valued using the standard Value of a Life Year (VLY).

Figure 3: Cancer Deaths under Baseline and Elimination Scenarios



3.2 Health Gains

To quantify the health benefit from averted cancer deaths in the United States, we converted the avoided mortality burden measured as projected life-years lost into monetary terms using estimates of the value of a life-year (VLY). Our valuation is grounded in how the U.S. federal government has assessed the value of a life-year. Based on the systematic review by Philipson et al. (2023), we used a baseline VLY of \$580,000. The monetary value of eliminating cancer was calculated as:

$$\text{Health Gain} = \text{VLY} \times \sum_{t=2030}^{2064} \sum_{a=16}^{85} D_{\text{averted},t,a} \times L_{t,a}^{\text{cancer}},$$

where $D_{\text{averted},t,a}$ denotes the number of averted cancer deaths of age group a at year t . Using the baseline VLY of \$580,000 and age-conditional life expectancy, we estimate that eliminating cancer between 2030 and 2064 would generate a total economic value of \$196.65 trillion. These gains reflect the substantial increase in longevity that would accrue across all ages and capture the long-run welfare improvements associated with reduced cancer mortality. This result underscores the significant economic benefits of accelerating progress toward eliminating cancer mortality.

3.3 Return of Elimination

The economic returns from eliminating cancer mortality between 2030 and 2064 are substantial in terms of health gains. Summing over the study period, the total economic benefit is estimated at \$196.65 trillion. On a per-capita basis, this amounts to an estimated \$569,881 for the 2030 projected U.S. population. For context, this figure is more than seven times the U.S. personal annual income per capita in 2025. Spread evenly over the 35-year study period, the per-capita-based figure implies a benefit of \$16,282 per person per year or \$41,684 per American household per year. When expressed in present value terms, assuming a 2 percent annual inflation rate and a

4 percent discount rate applied to today’s dollars (2026), the total economic benefit corresponds to an aggregate present value of approximately \$125.4 trillion.

To further evaluate the estimated economic benefits, we calculate the internal rate of return (IRR) associated with eliminating cancer mortality. The IRR is defined as the constant discount rate that equates the total program cost incurred during the transition period to the entire stream of economic benefits. Formally, the IRR satisfies

$$\sum_{t=2030}^{2039} \frac{C_t}{(1+R)^{t-2030}} = \sum_{t=2030}^{2064} \frac{B_t}{(1+R)^{t-2030}}$$

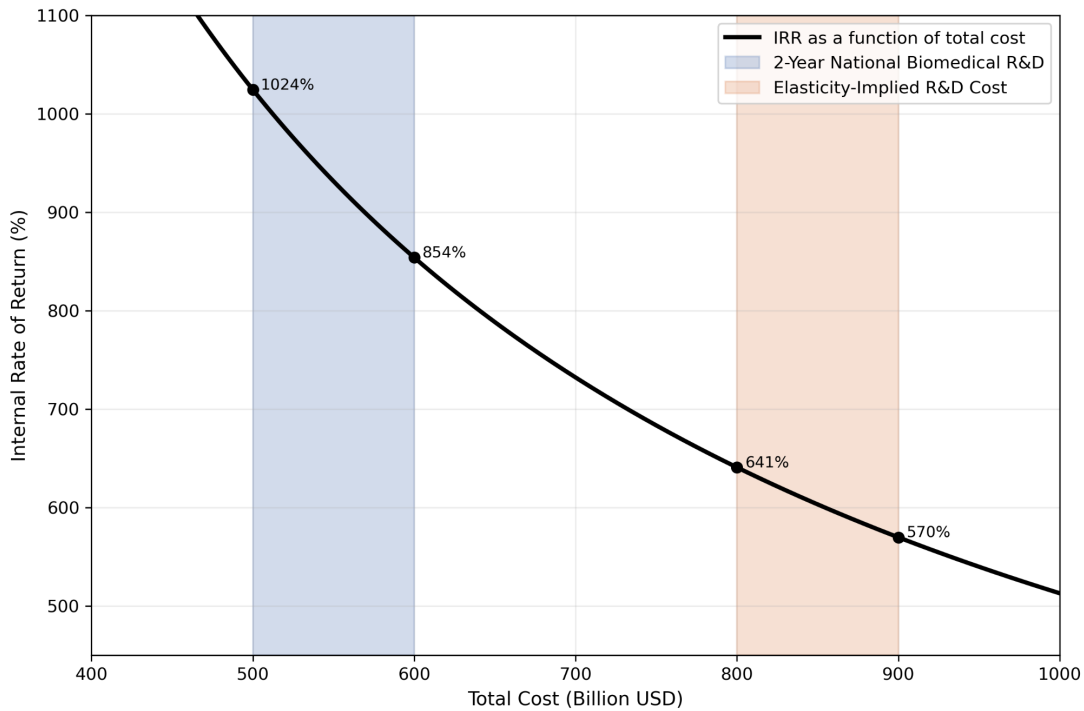
where C_t denotes program cost in year t , B_t denotes the economic benefit in year t , and R represents the internal rate of return. We benchmark the cost of curing cancer using empirically grounded estimates of research and development (R&D) expenditure. We assume that total program costs are evenly distributed over the 10-year elimination phase, such that $C_t = \frac{\text{Assumed Total Cost}}{10}$ for $t = 0, 1, \dots, 9$.

First, drawing on Lichtenberg (2002), which estimates that pharmaceutical R&D expenditure required to gain one life-year is approximately \$1,345 in 2002 dollars, we update this figure to 2026 dollars (\approx \$2,475 per life-year). Applying this estimate to the 339 million life-years gained under our elimination scenario implies a total R&D investment of approximately \$839.1 billion. We then benchmark on a range of costs from \$800 to \$900 billion, and the implied IRR ranges from approximately 569.8% to 640.8%.

Second, we benchmark cure costs against the scale of total U.S. biomedical research and development spending. According to a report of Research!America, U.S. medical and health R&D expenditures were approximately \$245.1 billion in 2020. Using a conservative two-year benchmark (roughly \$500–600 billion) as a plausible upper bound for a concentrated national cancer cure effort, the implied IRR ranges from approximately 853.9% to 1024.4%.

Figure 4 plots the implied IRRs as a function of the assumed total program cost. Across these empirically grounded cost benchmarks, the estimated returns to eliminating cancer mortality remain extraordinarily high, with IRRs ranging from roughly 500% to nearly 1,000%, even under conservative assumptions regarding total program costs.

Figure 4: Implied Internal Rates of Return from Averted Cancer Death



3.4 Sensitivity to Elimination Speed and Final Reduction Levels

Having established the economic health value associated with eliminating cancer mortality, this section examines how these estimates vary with key assumptions about the speed of elimination and the ultimate reduction level in cancer mortality. Because complete elimination is unlikely to occur instantaneously, the economic value of cancer control depends critically on both how rapidly mortality declines and how far those reductions extend in the long run. In all scenarios, mortality reductions are assumed to increase linearly during the transition period and to remain at the final reduction level in all subsequent years.

Table 1 reports the total economic value aggregated over the 2030–2064 study period under alternative mortality-reduction paths. Rows vary the number of years required to reach the final reduction level, while columns vary the long-run percentage reduction in cancer mortality. Across all specifications, total economic value increases monotonically with both faster transitions and larger final reductions.

Table 1: Total Economic Benefits under Different Scenarios (in Trillion USD)

Years	Final Reduction Level					
	50%	60%	70%	80%	90%	100%
15	91.27	109.52	127.78	146.03	164.28	182.54
20	83.88	100.66	117.44	134.21	150.99	167.77
25	76.22	91.46	106.70	121.95	137.19	152.44

Note: Years indicate the number of years required to reach the Final Reduction Level of Cancer Mortality

At the same time, the sensitivity analysis reveals that a substantial portion of the economic value is realized before complete elimination. For example, under a 20-year transition horizon, an 80 percent reduction in cancer mortality generates approximately \$134 trillion in total economic value over the study period. Expressed on a per capita basis, this scenario corresponds to an average annual economic value of approximately \$11,112 per person per year over 2030–2064.

This per capita framing provides an intuitive interpretation of the magnitude of the gains. An annual benefit exceeding \$10,000 per person reflects large health gains from avoided mortality. Importantly, these gains are achieved without requiring the complete elimination of cancer mortality. Relative to the baseline full elimination, which yields approximately \$197 trillion in aggregate value, or about \$16,282 per person per year, an 80 percent reduction in 20 years captures about 70% of the attainable economic value, despite being achieved over a longer transition horizon.

Overall, this sensitivity analysis demonstrates that the estimated economic value of reducing cancer mortality is robust across a wide range of plausible transition paths. While faster implementation increases total gains, the results indicate that large and sustained reductions in cancer mortality—even if short of full elimination—are sufficient to deliver most of the economic value associated with eliminating cancer.

Section 4: Conclusion

This paper quantifies the mortality burden of cancer over the period 2030 to 2064 and thereby the economic value of reducing cancer deaths in the United States. By aggregating the longevity lost due to 30.7 million cancer deaths across the sample period, our analysis yields a total mortality burden of 379.96 million life-years under the status quo, equivalent to roughly 4.9 million full lives lost at the U.S. average life expectancy.

We then estimated the health gains that would result if cancer mortality declined to zero between 2030 and 2039 and remained at zero thereafter. The resulting benefits are estimated at \$196.65 trillion. Under the assumptions of a 2 percent annual inflation rate and a 4 percent discount rate, this corresponds to a present value of \$125.4 trillion in 2026 dollars. On an annual per capita basis, the total value amounts to \$16,282 per person per year or \$41,684 per American household per year over 2030-2064. If cancer elimination were regarded as an investment, its internal rate of return would be between 569.8% and 1024.4%, with estimated program costs ranging from \$500 to \$900 billion, reflecting the significant economic value created by preventing premature cancer deaths. Importantly, our sensitivity analysis shows that a scenario in which cancer mortality is reduced by 80 percent over a 20-year transition captures roughly 70 percent of the total economic value of full elimination, corresponding to aggregate benefits on the order of \$134.2 trillion, or approximately \$11,112 per person per year.

The progress of medical innovation is a central driver of increased cancer longevity. Philipson et al. (2012) find that U.S. patients experienced greater improvements in survival than in Europe due to higher therapeutic spending, and that the incremental value generated for U.S. cancer patients was substantial. Although medical investment plays an important role in reducing cancer mortality, it is important to recognize that declines in cancer burden can arise through multiple complementary channels. A substantial body of epidemiological evidence links modifiable behaviors—including smoking, obesity, physical inactivity, excessive alcohol consumption, and poor diet—to increased cancer risk across multiple major cancer types (Khan, Afaq, & Mukhtar, 2010). Comprehensive global reviews similarly conclude that maintaining a healthy body weight, engaging in regular physical activity, limiting processed meats and alcohol consumption, and adopting plant-forward dietary patterns can significantly reduce cancer incidence (World Cancer Research Fund & American Institute for Cancer Research, 2007). These prevention pathways complement therapeutic innovation and highlight that reductions in cancer mortality may be achieved through both medical advances and public health interventions. But it is important to stress that our valuation framework applies to mortality reductions regardless of the channel through which they are realized.

Moreover, our analysis evaluates a broad range of plausible total-cost assumptions for a cancer elimination program, ensuring that the estimated returns are not driven by any single implementation pathway. The large returns to cancer elimination suggest that U.S. policy should aim to stimulate, rather than hinder, cancer innovation. Notably, the Biden administration's Inflation Reduction Act has had dramatic negative implications for cancer R&D (Philipson et al., 2022). In addition, the Inflation Reduction Act (IRA)'s compressed exclusivity periods discourage precisely the follow-on research that enables drugs to reach earlier disease stages, where treatment is most effective, and cures are most possible (Philipson et al., 2025). The "pill penalty" discriminates against the precision oral medications that represent the future of targeted oncology

(Grabowski et al., 2024). And recent policies of most-favored-nation pricing compound these harms by importing foreign price controls that undervalue medical innovation.

Given the significant economic value of reducing cancer mortality, the long-run returns to pharmaceutical innovation dwarf any short-term savings from attempts to hold down prices through price controls or other means. The trillions in potential benefits from eliminating cancer mortality mean that investing in cancer innovation is among the highest-return investments society could make.

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