

# A Comparative Expected Value Analysis Study to Determine If the Economic Benefits of Screening and Early Diagnosis Treatment of the Most Common Types of Cancer in the United States Provide Economic Value

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**ABSTRACT:** Breast, colorectal and skin cancer screening and early diagnosis with treatment provides economic value, while lung cancer screening and early diagnosis with treatment came close to providing economic value. Bladder, endometrial, kidney, leukemia, non-Hodgkin lymphoma, pancreatic, prostate and thyroid cancer screening and early diagnosis with treatment were not found to have provided economic value.

**KEYWORDS:** Cancer, cost to screen, positivity rate, expected cost to treat, early diagnosis treatment cost, late diagnosis treatment cost, and economic benefit.

## I. INTRODUCTION

Cancer is the second leading cause of death in the United States and in the year 2020 over 1.8 million cancer cases were projected to be diagnosed and over 600 thousand were projected to die from the disease (American Cancer Society, 2020). The cost to treat cancer was \$150.8 billion (excludes oral drugs) in 2018 (National Cancer Institute, 2020) and in 2015 there was \$94.4 billion in lost earnings by those diagnosed with cancer (Islami et al, 2019).

Earlier stage treatment costs can be up to four times less expensive than later stage diagnosis and earlier stage treatment is often less invasive resulting in shorter treatment times and lower patient costs (WHO, 2017). In the United States, stage IV cancer represents 18% of all diagnoses and 48% of cancer-related deaths (Clark et al, 2020). Clark et al (2020) estimated 15% fewer cancer-related deaths if stage IV patients had been diagnosed in stage III. The annual cost-savings in the United States from early stage cancer diagnosis was \$26 billion (Kakushadze et al, 2017)

The US Preventive Services Task Force (2020) currently recommends age and population-based screening for cervical, colorectal, breast, prostate as well as lung cancer screening for current and former heavy smokers. Population-based screening for breast cancer (Ahern et al, 2009), colon cancer (Ran et al, 2019) cervical cancer (Esselen, 2013) was found to be cost-effective. Prostate cancer screening every 4 years was also found to be cost-effective (de Carvalho et al, 2018). Screening for hepatitis B or C infection as well as cirrhosis is also recommended in targeting hepatocellular cancer (Marrero et al, 2018).

The cancer death rate fell 29% from 1991- 2017, which resulted in 2.9 million fewer deaths and the 5-year survival rate for all cancers rose from 49% in 1975 to 69% in 2015

(American Cancer Society, 2020). The decline in cancer deaths was mostly due to smoking-cessation programs, screening and an improvement in treatments (Siegel, 2020). Improvement in mortality was due to cancer screening for people with an average risk for breast, cervical, colorectal, prostate, and lung cancers (Brill, 2020).

The 5-year survival rate for patients diagnosed with metastatic lung cancer is 5% versus 57% for those patients who have been diagnosed in an early stage when the cancer is localized (Siegel, 2020). However, identifying cancer at an earlier stage when the cancer is potentially more treatable comes with risks such as internal bleeding complications from invasive procedures (Kim et al, 2019), false-negative as well as false-positive results (American Cancer Society, 2020) and the over diagnosis of early cancers or precancerous lesions that might have never advanced, leading to overtreatment (National Cancer Institute, 2018) and excess spending.

The most effective way to identify early-stage cancer is by screening asymptomatic individuals (Ahlquist, 2018). Intuitively, screening resulting in earlier stage diagnosis when the cancer is more likely to respond to treatment seems to make sense. However, there are no population-based screening recommendations for the majority of cancers in average-risk patients, most of which are not diagnosed until the later stages (Brill, 2020). Therefore, the purpose of this study is to determine if cancer screening and an earlier stage diagnosis reduces mortality rates and medical costs and if so what types of cancer screening provide economic value.

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### II. RESULTS

**Bladder Cancer** - The United States Preventive Services Task Force (2021) concludes that there is no evidence to support that the screening benefits exceed the costs in identifying bladder cancer in asymptomatic adults. A total of 1.3% of those screened received a diagnosis of bladder cancer, including 0.06% with a muscle-invasive cancer (Chou, 2010). The use of renal ultrasound with cystoscopy had an incremental cost per cancer detected of \$50,000, while the incremental cost per cancer detected was \$6.5 million with a CT scan and cystoscopy (Halpern et al, 2017). The replacement of the renal ultrasound with a CT scan detected just one more malignancy per 10,000 screened patients (Halpern et al, 2017). The cost to treat patients in the highest intensity quartile (\$7,131) is nearly three times more than the cost to treat bladder cancer patients in the lowest quartile (\$2,830) even after adjusting for differences in disease severity (Hollenbeck, 2009). Therefore, the expected cost to screen and treat early diagnosed bladder cancer is \$52,830 (\$50,000 + \$2,830) and the cost to treat late diagnosed bladder cancer is \$7,131 resulting in a \$45,699 economic cost for bladder cancer screening.

**Breast Cancer** - The United States Preventive Services Task Force (2021) recommends biennial screening mammography for women starting at age 50 years and continuing until age 74. About 10% of women who receive a mammogram will get called back for further testing and eventually after further analysis only about 0.5% (1 in 200) tested positive for cancer (O'Connell, 2015). The American Cancer Society (2019) also reported that about 10% are called back for additional tests following their initial mammogram and of that percentage only 10% are biopsied and 20% of biopsies come back positive. MDSave (2020) reported that the national average cost for a mammogram is \$214 so the expected cost to screen would be \$42,800 ( $\$214 / .005$ ). There is also the issue of false negatives and positives. Mammography correctly identifies 87% of women who have breast cancer or misses about 13% who have it (BCSC, 2017). The average costs of breast cancer treatment within the first year after receiving a diagnosis were as follows: Stage 0: \$60,637, Stage I: \$82,121, Stage II: \$129,387 and Stage III: \$134,682 (Elder, 2017 & Blumen et al, 2016). Therefore, the expected cost to screen and treat early diagnosed breast cancer is \$103,437 ( $\$42,800 + \$60,637$ ) and the cost to treat later diagnosed cancer is \$115,396 ( $\$82,121 + \$129,387 + \$134,682 / 3$ ) so there would be an \$11,959 economic benefit for breast cancer screening.

**Colorectal Cancer** - The United States Preventive Services Task Force (2021) recommends screening for colorectal cancer starting at age 50 years and continuing until age 75 years. On average individuals should get a colonoscopy at 50, 60, and 70 years of age or roughly 3 times in their lifetime. The average clinical cost for screening and diagnostic

services per person served was \$1,150 for colonoscopy-based programs, compared to \$304 for fecal occult blood tests or immune-chemical tests (Subramanian et al, 2016). Therefore, the total recommended lifetime costs per individual for colonoscopy's is \$3,450 ( $\$1,150 * 3$ ). According to the American Cancer Society (2021) the overall lifetime risk of developing colorectal cancer is: about 1 in 23 (4.3%) for men and 1 in 25 (4.0%) for women. Colon cancer is found in four-tenths of one percent of all screening colonoscopies and about 40% of the time a precancerous polyp is found and removed during a screening colonoscopy (Sand, 2020). The median estimated lifetime costs per capita was \$25,369 for patients with early-stage (stages I and II) tumors, while the median costs were \$97,503 for patients with late-stage (stages III and IV) tumor (Eaglehouse et al, 2019). The cost for patients who had surgical treatment was \$19,944 and the cost for patients who had surgery and radiation or chemotherapy was \$100,404 (Eaglehouse et al, 2019). Polyps less than 1 centimeter in size have less than a 1% chance of becoming cancerous, but those with two centimeters or greater have a 40% chance of becoming cancerous (WebMD, 2021). Therefore, the expected cost to remove the polyps before they become cancerous is \$95,156,830 ( $\$80,232 + \$14,924$ ) and the cost to treat late stage diagnosed colorectal cancer is \$100,404 so there would be a \$5,248 economic benefit for colorectal cancer screening.

**Endometrial Cancer** - The United States Preventive Services Task Force (2021) does not recommend annual screening for endometrial cancer. The American Cancer Society (2019) estimated the number of new cases of endometrial cancer was 61,880 and the number of deaths was 12,160 in the United States, which is not a high number considering that there are more than 30 million women over the age of 60. This means there is only a 1 in 200 chance ( $61,880 / 30,000,000$ ) of getting endometrial cancer. An ultrasound, a blood test and an endometrial biopsy to monitor the uterus and ovaries costs around \$1,500 on MDSave. There is no standard or routine screening test for endometrial cancer, but this type of cancer causes symptoms such as vaginal bleeding so it is often found at an early stage. Since endometrial cancer is usually diagnosed and treated at an early stage there is a good chance of recovery (American Cancer Society, 2019). Cardiovascular disease is the most common cause of death in patients with endometrial cancer because of the related metabolic risk factors (Ward et al, 2012). An abdominal hysterectomy is a common treatment procedure and reduces the risk of endometrial cancer. According to MDSave, the cost of an abdominal hysterectomy ranges \$7,316 to \$15,727 and averages \$13,421. Therefore, the expected cost to screen and treat early diagnosed endometrial cancer is \$763,421 ( $\$750,000 + \$13,421$ ) and the cost to treat late diagnosed endometrial cancer is \$13,421 so there would be a \$750,000 economic cost for endometrial cancer screening.

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**Kidney Cancer** – The United States Preventive Services Task Force (2021) concludes that the current evidence is insufficient to assess the balance and harms of a clinician screening for kidney cancer in asymptomatic adults. A renal function panel costs about \$72 in the United States (Farivar-Mohseni, 2006). However, there is no test that has been shown to lower the overall risk of dying from kidney cancer (Cancer.org, 2020). There are tests that can find some kidney cancers early, but none are recommended to screen for kidney cancer in people with average risk (Cancer.org, 2020). CT screening identified one malignant mass for every 371 people screened and \$123 million was spent screening to identify 1,396 tumors at a cost of \$88,000 per tumor identified (Ekwueme et al, 2008). Surgical treatment of small renal tumors has a 5-year cancer specific mortality-free rate of 97.5% (Crépel, 2010). If a renal mass is identified early, treatment is usually curative. The 5-year survival rate with localized renal cancer is 91% but with distant spread the survival rate is 11% (Howlader, 2009) reflecting the slow natural progress of the disease and effectiveness of surgical treatment. Given the slow average growth rate of renal masses, 5-yearly screening would be likely to pick up most cancers at a treatable stage. The harm of overtreatment might outweigh the benefits of screening, particularly in populations with a reduced life-expectancy (Patel et al, 2012). The treatment of renal masses would not be of net benefit in older populations (Parkinson, 2006). MDSave reported that Kidney cancer treatment typically costs \$15,000-\$75,000 or more for a nephrectomy, a kidney removal surgery, which depends on the extent of the surgery and whether there are complications. Another cost comparison site Vimo.com reported that the average list price for kidney removal was more than \$25,000 while the average negotiated price, through an insurance company, was about \$8,000. Therefore, the expected cost to screen and treat early diagnosed kidney cancer is \$113,000 (\$88,000 + \$25,000) and the cost to treat late diagnosed kidney cancer is \$25,000 so there would be an \$88,000 economic cost for kidney cancer screening. The M.D. Anderson Cancer Center (2020) reported that a kidney transplant can cost \$260,000 or more once the pre-transplant screening, donor matching, surgery, post-surgical care and first six months of drugs are summed.

**Leukemia** - The United States Preventive Services Task Force (2021) concludes that the current evidence is insufficient to assess the balance and harms of a clinician screening for leukemia in asymptomatic adults. There is not a screening test that has been proven to be reliable enough to detect leukemia in its earliest stages prior to the symptoms (WebMD, 2020). While there are no tests specifically designed for leukemia screening, the condition may be detected through a chest X-ray or CAT scan, spinal tap or a bone marrow aspiration and biopsy (WebMD, 2020). If the patient tests positive for leukemia, then the doctor will perform a bone marrow biopsy

to determine the patient's leukemia type (WebMD, 2020). Once diagnosed the doctor may recommend delaying treatment if the patient is healthy, has no bothersome B-cell lymphoma symptoms, small lymph nodes, doesn't have lymphoma in any of the major organs (heart, lungs, kidneys, etc.) or is over the age of 70 (WebMD, 2020). Delaying treatment delays the side effects of chemotherapy drugs, which cause hair loss, nausea, mouth sores, fatigue and skin blisters (WebMD, 2020). Further, sometimes lymphoma cells no longer respond to the chemotherapy drugs or other therapy, but when treatment is delayed the cancer cells can't become as resistant (WebMD, 2020). For those diagnosed with slow-growing types of B-cell lymphoma, there may be no difference in the way the disease develops between immediate treatment and delaying treatment as long as the patient gets regular check-ups (WebMD, 2020). Even though research shows that delaying treatment can be just as helpful as active treatment, there are risks of delaying since it could allow the cancer to grow and affect one's odds of surviving (WebMD, 2020). Most people with B-cell lymphoma will eventually need to be treated, but if the patient has a slow-growing lymphoma that isn't causing symptoms, the delaying treatment may be best (WebMD, 2020).

**Lung Cancer** - The United States Preventive Services Task Force (2021) recommends annual screening for lung cancer with low-dose computed tomography (LDCT) in adults aged 55 – 80 who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years. A spiral CT scan costs \$300 and is covered by insurance for patients in the high risk for developing lung cancer category. However, only around 2% of eligible smokers have sought the free scans (Black et al, 2014). As a result, by the time lung cancer causes symptoms, such as chronic cough or difficulty breathing, it is usually in an advanced stage when it is more difficult to treat. As a result, the 4% of patients with a diagnosis of lung cancer, only have an incremental life expectancy was 1.6 years (Black et al, 2014) since nearly half of all those diagnosed with lung cancer were in the advanced stages (Zappa and Mousa, 2016). According to Gilda et al (2017), the total health care costs and utilization after lung cancer diagnosis were significantly higher among patients diagnosed at Stage IV (\$21,441) than they were for patients diagnosed at Stage I (\$7,239). Earlier diagnosis treatment costs were estimated to be \$14,340 (\$21,441 + \$7,239 / 2) since the spiral CT scan would only provide economic benefit to 50% of those screened since half of the patients screened were in the advanced stages of lung cancer so the expected cost to screen would be \$7,500 (\$300 / .02 / 2). Black et al (2017) reported that 217 high-risk smokers would have to undergo a CT lung scan for one to be spared death from lung cancer. Therefore, the expected cost to screen and treat early diagnosed lung cancer is \$21,840 (\$7,500 + \$14,340) and the cost to treat late diagnosed lung cancer is \$21,441 so there would be a \$399 economic cost for kidney cancer screening.

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**Non-Hodgkin lymphoma** - The United States Preventive Services Task Force (2021) has not assessed the costs and benefits for clinical screening for non-Hodgkin lymphoma in asymptomatic adults. Even though there is no routine lymphoma screening test, early detection is possible for both Hodgkin and non-Hodgkin lymphoma (Cancer.org, 2021). The typical diagnostic process involves a physical exam and medical history, along with a biopsy and cell/blood tests. There are no widely recommended screening tests for non-Hodgkin lymphoma, because no screening test has been shown to lower the risk of dying from this cancer (Cancer.Org, 2021). More often symptoms are caused by something other than lymphoma, but it's important for the patients to have them checked by a doctor if they aren't going away or are getting worse. Careful, regular medical check-ups are important for people with known risk factors for non-Hodgkin lymphoma, such as HIV infections, organ transplants, autoimmune disease, or prior cancer treatment (Cancer.Org, 2021).

**Pancreatic Cancer** - The United States Preventive Services Task Force (2021) recommends against screening for pancreatic cancer in asymptomatic adults. There is no single test that diagnosis for pancreatic cancer. Definitive diagnosis requires a series of imaging scans, blood tests and biopsy, which are typically if the patient has symptoms. Since early pancreatic cancer does not usually show symptoms, the cancer has likely grown and even spread to other organs. According to the American Cancer Society (2020), none of the available tests have proven to actually lower the risk of dying from the disease since only 20% of patients are alive a year after diagnosis and after five years only 7% are still living (Yu et al, 2015). Once pancreatic cancer becomes detectable clinically progression from low-stage to advanced-stage disease is rapid. Patients with a stage I cancer diagnosis were on average 1.3 years removed from a stage IV cancer diagnosis (Yu et al, 2015).

**Prostate Cancer** - The United States Preventive Services Task Force (2021) recommends PSA-screening for prostate cancer in men aged 55 to 69. Screening offers a small potential benefit of reducing the chance of death from prostate cancer in men over the age of 70 (Mayo Clinic, 2019). False-positives often result in additional testing and possible prostate biopsy, overtreatment and treatment complications, such as incontinence and erectile dysfunction (Mayo Clinic, 2019). The low-risk, slow-growing prostate cancer is often unlikely to harm a man before he dies of other causes (Mayo Clinic, 2019). The cost for a PSA test is about \$40. If the test yields an abnormal result, then the costs start adding up as the doctor will usually refer to a urologist for a biopsy resulting a consultation fee (up to \$350), an ultrasound fee (about \$150), additional professional fees (up to \$200) and biopsy fees (about \$500). If 100 men over age 50 take the PSA test: 85 will have a normal PSA and 15 will have a higher than normal

PSA and require further tests (Mayo Clinic, 2019). After further testing, results will show that 12 do not have prostate cancer, but 3 will have it (Mayo Clinic, 2019). However, studies have shown that between 23 to 42% of men with prostate cancer detected by PSA tests will not have symptoms during their lifetimes (Mayo Clinic, 2019). For an American male, the lifetime risk of developing prostate cancer is 1 in 6, but the risk of dying of prostate cancer is only 2.9% (1 in 34). Men in their 50s who died from other causes have shown a 30-45% prevalence of prostate cancer while men in their 70s have shown an 80% prevalence rate of prostate cancer (Mayo Clinic, 2019). The median treatment cost per patient within 3 years following prostate cancer diagnosis was \$14,452, with treatment costs accounting for the \$10,558 (Rosenberg, 2018). The treatment cost ranged from \$19,901 for low-risk disease robot-assisted prostatectomies to \$50,276 for high-risk disease treatment that includes radiation therapy (Bardi, 2013). Therefore, the expected cost to screen and treat early diagnosed prostate cancer is \$81,901 (\$62,000 + \$19,901) and the cost to treat late diagnosed prostate cancer is \$50,276 so there would be a \$31,625 economic cost for prostate cancer screening.

**Skin Cancer** - The United States Preventive Services Task Force (2021) concludes that the current evidence is insufficient to assess the balance and harms of visual skin examination by a clinician to screen for skin cancer in asymptomatic adults. MDSave.com reported that the national average for a skin biopsy is \$536 and 4.1% of biopsy test positive for invasive melanoma (Piepkorn et al, 2021). Losina et al (2007) found that that the average treatment costs for skin cancers to range from \$1,732 for stage I disease to \$56,059 for stage IV disease. Therefore, the expected cost to screen \$13,073 (\$536 / .041) and treat (\$1,732) early diagnosed skin cancer is \$14,805 and the cost to treat late stage diagnosed skin cancer is \$56,059 so there would be a \$41,254 economic benefit for skin cancer screening.

**Thyroid Cancer** - The United States Preventive Services Task Force (2021) doesn't recommend thyroid cancer screening in asymptomatic adults. The total cost for the surveillance tests and procedures per patient in the low, intermediate and high risk groups were \$1,225, \$1,760 and \$2,774 respectively and the cost was \$149,619 to detect in the low risk group, \$22,434 in the intermediate risk group and \$20,680 in the high risk group (American Thyroid Association, 2016). The cost for low-risk thyroid cancer undergoing thyroidectomy or neck dissection, which included initial surgery, follow-up, and treatment of recurrence were between \$13,896 and \$14,241 for total thyroidectomy and between \$15,037 and \$15,063 for hemi-thyroidectomy (Shrime et al, 2007). Therefore, the expected cost to screen and treat early diagnosed thyroid cancer is \$164,178 (\$149,619 + \$14,559) and the cost to treat late diagnosed thyroid cancer is \$115,680 (\$95,000 +

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\$20,680) so there would be a \$48,498 economic cost for thyroid cancer screening.

**RESULTS**

The expected cost to screen and treat early stage diagnosed bladder cancer is \$52,830 (\$50,000 + \$2,830) and the cost to treat late stage diagnosed bladder cancer is \$7,131 so there would be a \$45,699 economic cost screening for bladder cancer. The expected cost to screen and treat early stage diagnosed breast cancer is \$103,437 (\$42,800 + \$60,637) and the cost to treat late stage diagnosed bladder cancer is \$115,396 so there would be an \$11,959 economic benefit screening for breast cancer. The expected cost to screen and treat early stage diagnosed colorectal cancer is \$95,156,830 (\$80,232 + \$14,924) and the cost to treat late stage diagnosed colorectal cancer is \$100,404 so there would be a \$5,248 economic benefit for colorectal cancer screening. The expected cost to screen and treat early stage diagnosed endometrial cancer is \$763,421 (\$750,000 + \$13,421) and the cost to treat late stage diagnosed endometrial cancer is \$13,421 so there would be a \$750,000 economic cost for endometrial cancer screening.

| Types of Cancer | Cost to Screen | Positivity Rate | Expected Cost Screen | Early Stage Treatment Cost |
|-----------------|----------------|-----------------|----------------------|----------------------------|
| Bladder         | -              | 1.300           | \$50,000             | \$2,830                    |
| Breast          | \$214          | 0.005           | \$42,800             | \$60,637                   |
| Colon           | \$3,450        | 0.043           | \$80,232             | \$14,924                   |
| Endom           | \$1,500        | 0.002           | \$750,000            | \$13,421                   |
| Kidney          | -              | -               | \$88,000             | \$25,000                   |
| Leukem          | -              | -               | -                    | -                          |
| Lung            | \$300          | 4.000           | \$7,500              | \$14,340                   |
| NH lym          | -              | -               | -                    | -                          |
| Pancrea         | -              | -               | -                    | -                          |
| Prostate        | \$1,240        | 2.000           | \$62,000             | \$19,901                   |
| Skin            | \$536          | 4.100           | \$13,073             | \$1,732                    |
| Thyroid         | -              | -               | \$149,619            | \$14,559                   |

The expected cost to screen and treat early stage diagnosed kidney cancer is \$113,000 (\$88,000 + \$25,000) and the cost to treat late stage diagnosed kidney cancer is \$25,000 so there would be an \$88,000 economic cost for kidney cancer screening. The expected cost to screen and treat early stage diagnosed lung cancer is \$21,840 (\$7,500 + \$14,340) and the cost to treat late stage diagnosed lung cancer is \$21,441 so there would be a \$399 economic cost for kidney cancer screening. The expected cost to screen and treat early stage diagnosed prostate cancer is \$81,901 (\$62,000 + \$19,901) and the cost to treat late stage diagnosed prostate cancer is \$50,276 so there would be a \$31,625 economic cost for prostate cancer screening. The expected cost to screen and treat early stage diagnosed skin cancer is \$14,805 (\$13,073 + \$19,901) and the cost to treat late stage diagnosed skin cancer is \$56,059 so there would be a \$41,254 economic benefit for

skin cancer screening. The expected cost to screen and treat early stage diagnosed thyroid cancer is \$164,178 (\$149,619 + \$14,559) and the cost to treat late stage diagnosed thyroid cancer is \$115,680 so there would be a \$48,498 economic cost for thyroid cancer screening.

| Types of Cancer | Screen & Early Stage Treatment Cost | Late stage Diagnosis Treatment Cost | Economic Benefit | US PT F |
|-----------------|-------------------------------------|-------------------------------------|------------------|---------|
| Bladder         | \$52,830                            | \$7,131                             | (\$45,699)       | I       |
| Breast          | \$103,437                           | \$115,396                           | \$11,959         | BCI     |
| Colon           | \$95,156                            | \$100,404                           | \$5,248          | AC      |
| Endom           | \$763,421                           | \$13,421                            | (\$750,000 )     | I       |
| Kidney          | \$113,000                           | \$25,000                            | (\$88,000)       | I       |
| Leuk            | -                                   | -                                   | -                | I       |
| Lung            | \$21,840                            | \$21,441                            | (\$399)          | B       |
| NH lym          | -                                   | -                                   | -                | I       |
| Pancrea         | -                                   | -                                   | -                | D       |
| Prostate        | \$81,901                            | \$50,276                            | (\$31,625)       | CD      |
| Skin            | \$14,805                            | \$56,059                            | \$41,254         | I       |
| Thyroid         | \$164,178                           | \$115,680                           | (\$48,498)       | D       |

**CONCLUSION**

From a purely cost-saving analysis, by comparing screening and early stage treatment costs versus late stage treatment costs, it is found that there is economic benefit in promoting regular screening for early detection and treatment in breast, colorectal, and skin cancers, while there are currently no cost savings in early detection in the other cancers. Nevertheless, depending on fatality rates and chances of recovery in early detection, the value of lives saved from recovery due to early detection of the other cancers continues to drive the desire for early screening and detection. It is therefore beneficial to continue research and development into more efficient and less costly methods of screening and treatments to increase the economic benefit for all cancers.

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**APPENDIX**

| Types of Cancer | Cost to Screen | Positivity Rate | Expected Cost to Screen | Early Stage Treatment Cost | Screen & Early Stage Treat Cost | Late Stage Treatment Cost | Economic Benefit | USPTF |
|-----------------|----------------|-----------------|-------------------------|----------------------------|---------------------------------|---------------------------|------------------|-------|
| Bladder         | -              | 1.300           | \$50,000                | \$2,830                    | \$52,830                        | \$7,131                   | (\$45,699)       | I     |
| Breast          | \$214          | 0.005           | \$42,800                | \$60,637                   | \$103,437                       | \$115,396                 | \$11,959         | BCI   |
| Colorectal      | \$3,450        | 0.043           | \$80,232                | \$14,924                   | \$95,156                        | \$100,404                 | \$5,248          | AC    |
| Endometrial     | \$1,500        | 0.002           | \$750,000               | \$13,421                   | \$763,421                       | \$13,421                  | (\$750,000)      | I     |
| Kidney          | -              | -               | \$88,000                | \$25,000                   | \$113,000                       | \$25,000                  | (\$88,000)       | I     |
| Leukemia        | -              | -               | -                       | -                          | -                               | -                         | -                | I     |
| Lung            | \$300          | 4.000           | \$7,500                 | \$14,340                   | \$21,840                        | \$21,441                  | (\$399)          | B     |
| NH lymphoma     | -              | -               | -                       | -                          | -                               | -                         | -                | I     |
| Pancreatic      | -              | -               | -                       | -                          | -                               | -                         | -                | D     |
| Prostate        | \$1,240        | 2.000           | \$62,000                | \$19,901                   | \$81,901                        | \$50,276                  | (\$31,625)       | CD    |
| Skin            | \$536          | 4.100           | \$13,073                | \$1,732                    | \$14,805                        | \$56,059                  | \$41,254         | I     |
| Thyroid         | -              | -               | \$149,619               | \$14,559                   | \$164,178                       | \$115,680                 | (\$48,498)       | D     |