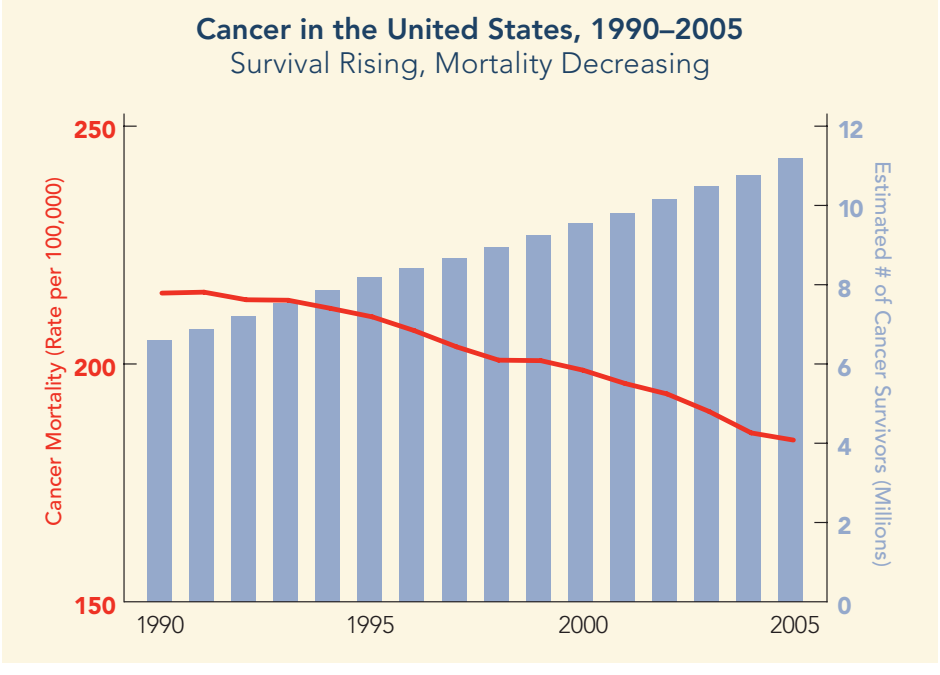
Progress Against **Cancer**

ASCO®
American Society of Clinical Oncology

As a result of the nation's investment in cancer research, more people are surviving cancer than ever before.

- **Two out of three people live at least five years after their diagnosis, up from roughly one out of two in the 1970s.**
- **The nation's cancer death rate has dropped 16 percent since the early 1990s, reversing decades of increases.**
- **Today, highly tailored, more effective treatments target the genetics of each cancer, and each patient.**
- **Better ways of managing nausea and other side effects are enabling patients to live better, more fulfilling lives.**
- **Revolutionary progress against some cancers shows what is possible. Five-year survival rates for breast cancer, testicular cancer and childhood leukemia are now over 90 percent.**



Federally-funded cancer research is behind virtually every major advance of the last 40 years. These clinical trials have served as the vital link between cutting-edge advances in the lab and new treatments that improve and extend the lives of people with cancer.

But much work remains to be done. Cancer is not one disease, but many highly complex diseases — each requiring unique treatment targeted to the specific biology of the tumor, and the patient. More than 1.5 million Americans are expected to be diagnosed with cancer this year, and the burden is projected to significantly increase over the coming decade.

Today, our scientific knowledge about cancer has never been greater, but shrinking federal investments threaten the pace of progress. To accelerate the search for new cures, we must re-invest in the nation's clinical cancer research system.

To show how past investments in clinical cancer research have improved the care of patients, ASCO has developed timelines highlighting clinical research progress against three of the most common cancers: breast, prostate and colorectal.

40 Years of Progress Against Cancer

Advances Since the National Cancer Act of 1971

	THEN	NOW
Chemotherapy	Limited understanding of how to target chemotherapy to each cancer type or how drugs can be combined most effectively. Side effects often require hospitalization.	Chemotherapy tailored to cancer type, stage, response to previous treatments, and often to specific subtype. Dozens of combinations proven to lengthen lives and shrink tumors. Treatment often given on an outpatient basis, with effective ways to manage side effects.
Radiation	Standard external beam radiation destroys both cancer cells and nearby healthy tissue. Potential for long-term health problems such as heart disease in some patients.	Highly targeted radiation is tailored to a patient's precise tumor type, size and location to minimize risk of damage to healthy tissue. Shorter courses of radiation also available for some cancer types. Side effects can be minimized.
Surgery	Radical surgery removes tumors as well as surrounding tissue and muscle. Long hospital stays and severe cosmetic effects are common.	Numerous conservative, less invasive surgical approaches available — including breast conservation surgery and nerve sparing prostatectomy to preserve sexual function and continence. Sophisticated reconstructive surgery options are also available.
Targeted Therapies	None	Rapid development of treatments targeted to the unique genetics of the patient and the tumor. Drugs are often more effective, with fewer side effects, than standard therapies.
Immunotherapy	None	Emerging field examining agents that boost the immune system to attack cancer cells. Proven or promising immunotherapies developed for prostate cancer, melanoma, bladder cancer, and lymphoma, among others.
Quality of Life	Severe side effects from cancer and its treatment — including pain, nausea, weakness — frequently require hospitalization. Few options available to relieve patient discomfort.	Effective supportive drugs ease pain and nausea and boost white cell counts to reduce fatigue, help many patients work and live otherwise normal lives. Growing use of integrative approaches (supplements, exercise) improve patients' sleep quality and energy, and minimize treatment side effects.
Survivorship	3 million cancer survivors. Limited understanding of and support for patients dealing with the long-term physical and psychological effects of cancer.	Nearly 12 million cancer survivors. Increased focus on discussions of fertility preservation, care coordination following treatment, monitoring for recurrence, and detection and management of long-term side effects.
Pediatric Cancer	Just over half of young patients survived five years after their diagnosis in the late 1970s.	Five-year survival rates have climbed to 80%; 10-year survival is nearly 75%. Robust pediatric patient participation in clinical trials has yielded highly successful treatments that can cure or induce long-term remission for the majority of children with cancer.

Progress Against **Breast Cancer**

1970

1971 A less radical procedure called total mastectomy (removing just the breast tissue) is found to be as effective for women with localized breast cancer as removing the breast, chest wall muscle and underarm lymph nodes — paving the way for future breast-conserving surgeries.

1975–76 Major studies demonstrate that chemotherapy after surgery (adjuvant chemotherapy) prolongs the lives of women with early-stage breast cancer.

1976 Lumpectomy (removal of the tumor only) followed by radiation therapy proves as effective as mastectomy for women with early-stage breast cancer, a finding that dramatically reduces the physical and cosmetic side effects of breast cancer treatment.

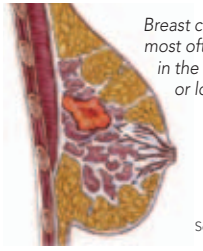
1977 FDA first approves tamoxifen for the treatment of advanced breast cancer. Subsequent studies over the following decades show long-term tamoxifen therapy following breast cancer surgery for earlier-stage disease substantially reduces the risk of breast cancer recurrence, and increases survival.

Late 1970s Regular breast cancer screening with mammography becomes increasingly common, and helps detect cancer at an earlier, more treatable stage.

1980

1981, 1983 Studies demonstrate the benefit of combining multiple treatment types, such as chemotherapy and radiation, for inflammatory breast cancer and locally advanced breast cancer.

1988 Early-stage breast cancer is increasingly treated with chemotherapy prior to surgery (neoadjuvant chemotherapy) to shrink the tumor, reduce the risk of cancer spread and allow more women to undergo breast-conserving lumpectomy, instead of mastectomy.



Breast cancer most often starts in the milk ducts or lobes.

Source: ASCO

1990

1992 Paclitaxel (Taxol), a chemotherapy drug derived from the bark of the yew tree, approved by FDA after it proves to be highly effective at treating breast cancer in women whose disease progresses after treatment with other drugs.

1997 Researchers discover BRCA1 and BRCA2 gene mutations are linked to a 50 to 85% increased risk of developing breast cancer — a finding that helps identify women at high risk who could benefit from more frequent screening or other prevention strategies.

1998 FDA approves tamoxifen to reduce the risk of developing breast cancer among women at high risk for the disease, such as those with BRCA1 or 2 mutations.

1998 Trastuzumab (Herceptin) — one of the first of a new generation of gene-targeted anticancer drugs — proven to increase survival among women with advanced breast cancer that over-expresses the HER-2 protein, along with chemotherapy. About 25% of breast cancer patients have HER-2-positive tumors. The drug is approved by the FDA later that year.

2000

2001–2005 Studies show the aromatase inhibitor letrozole (Femara) is effective at reducing the risk that cancer will progress in postmenopausal women with advanced breast cancer. Research also shows the drug reduces recurrence in women with early-stage disease.

2002–2004 Several gene tests are shown to be powerful predictors of breast cancer recurrence and the potential to benefit from chemotherapy.

2005 Docetaxel (Taxotere) — a taxane drug that blocks cell division — is shown to decrease the risk of cancer recurrence and increase survival among women with operable breast cancer that has spread to the lymph nodes, compared to the previous standard therapy, fluorouracil.

2006 Trastuzumab approved for early-stage, HER-2 positive breast cancer after the drug is found to substantially increase survival and decrease recurrence risk when used after surgery as adjuvant treatment.

2007 The targeted therapy lapatinib (Tykerb) approved by the FDA in combination with capecitabine for patients with advanced HER-2-positive breast cancer. The drug is a new, effective treatment option for patients whose cancer stops responding to trastuzumab.

2007 American Cancer Society releases guidelines recommending routine MRI screening for women at increased risk of developing breast cancer, in combination with standard mammography screening.

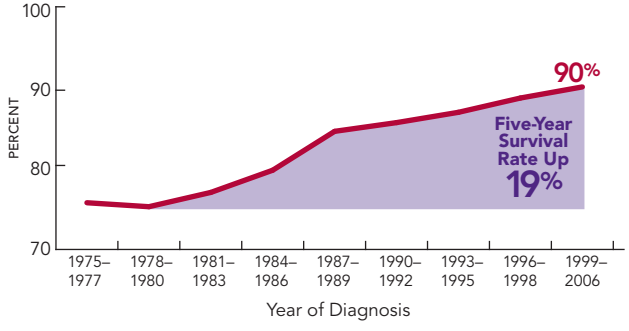
2007 Studies link declines in breast cancer incidence in women 50 and older to decreased use of hormone replacement therapy.

2008 Major trial finds that taking aromatase inhibitors (like letrozole) after five years of tamoxifen treatment reduce risk of breast cancer recurrence and spread. Benefit is greatest for postmenopausal women with early-stage disease, reducing recurrence risk by as much as 63% over tamoxifen alone.

"Thanks to research advances, nine in ten women who get breast cancer today will survive it. Treatment options are multiplying at a rapid pace, more and more women are diagnosed early, and we have a growing number of ways to prevent the disease from ever developing."

—Dr. Nancy Davidson,
Past ASCO President, breast cancer expert
at Johns Hopkins University

Five-Year Breast Cancer Survival



Progress Against **Colorectal Cancer**

1970

1970s–1980s: Flexible sigmoidoscopy and colonoscopy introduced. Led to earlier detection of precancerous polyps and surgically curable cancer.

1980

1985 Chemotherapy with radiation after surgery becomes a new treatment standard after the combination is shown to improve survival in rectal cancer patients.

1990

1990s First tests become available to detect genetic abnormalities associated with colon cancer, such as familial adenomatous polyposis and hereditary nonpolyposis colon cancer. These tests allow people at higher risk to be identified and more closely followed.

1991 5-fluorouracil chemotherapy given after surgery proven to increase survival in colon cancer.

1996 Irinotecan (Camptosar) becomes the first new agent approved for treating advanced colorectal cancer in 40 years.

2000

2002 Oxaliplatin (Eloxatin) combined with 5-fluorouracil and leucovorin (together called FOLFOX) approved to treat advanced colon cancer that has spread despite other treatments.

2003 Two large studies show that taking daily aspirin reduces development of pre-cancerous colorectal polyps.

2004 FOLFOX approved as initial therapy for advanced colorectal cancer. Later approved for earlier-stage treatment following surgery, after a pivotal trial finds it increased the time a patient lives without the disease returning.

2004 Bevacizumab (Avastin), when combined with chemotherapy, approved to treat advanced colorectal cancer, becoming the first FDA-approved anti-angiogenesis drug. These drugs block the blood vessels that fuel tumor growth.

2004 Results from a large rectal cancer clinical study show that administering chemotherapy before, rather than after, surgery improves outcomes.

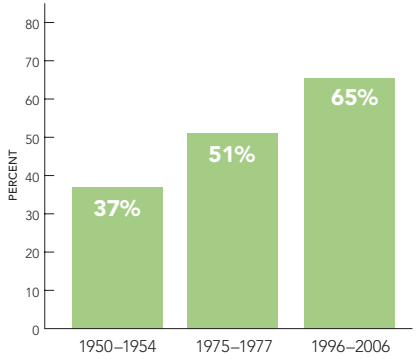
2004, 2006 The targeted drugs cetuximab (Erbitux) and panitumumab (Vectibix) are approved to treat metastatic colon cancer.

2005 Capecitabine (Xeloda), an oral form of 5-fluorouracil, approved to treat advanced colorectal cancer after it is shown to increase time before disease relapse.

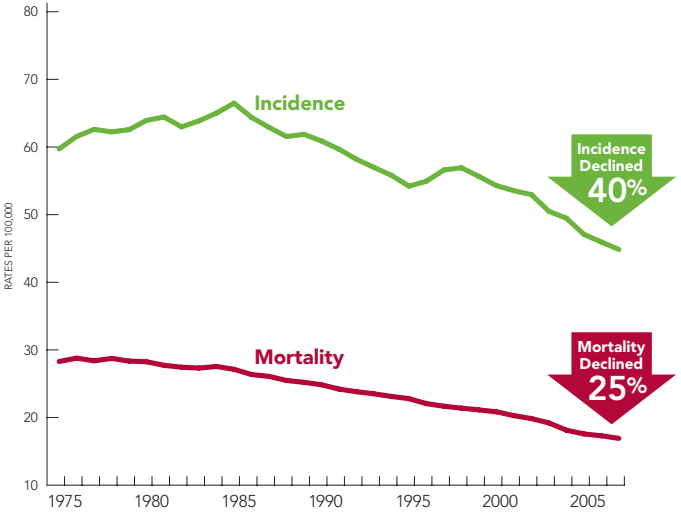
2007 Studies show that patients who adhere to a low-fat diet and regular exercise have a lower risk of cancer recurrence after surgery for early-stage disease, demonstrating that lifestyle factors can have a significant effect on cancer recurrence risk.

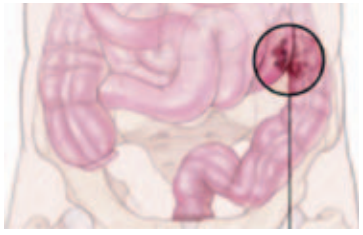
2008 Researchers find that the targeted drugs cetuximab (Erbitux) and panitumumab (Vectibix) are only effective in patients with the normal form of the *KRAS* gene — helping personalize these treatments to those who will benefit most, while avoiding unnecessary treatment and cost for those who won't.

Five-Year Colorectal Cancer Survival Rates



Colorectal Cancer — Incidence and Mortality, 1975–2007





Tumor has spread through colon wall and to nearby tissue.

Source: ASCO

Progress Against **Prostate Cancer**

1940–1960

Early 1940s Dr. Charles Huggins makes key discoveries on the role of hormones in prostate cancer growth. Shows that surgery to remove the testicles and estrogen therapy (an early version of hormone therapy) can lower testosterone levels and shrink tumors. Research later earned him a Nobel Prize.

1970

1971 Dr. Andrew Schally discovers leutinizing hormone receptor hormone antagonists help shut off testicular testosterone production and in turn slow prostate cancer growth.

1971 Screening with annual rectal exams, followed by surgery to remove the prostate in men found to have cancer, is found to help men live as long as their peers who did not have the disease.

Early 1970s Brachytherapy — a less invasive form of radiation where tiny radioactive "seeds" are implanted in the prostate gland — first proven to extend the lives of prostate cancer patients.

1980

1982 A new, nerve-sparing form of prostate removal surgery (prostatectomy) is introduced — for the first time helping some men to maintain their sexual potency and urinary continence following surgery.

1982, 1985 The effectiveness of leutinizing hormone receptor hormone antagonists (LHRHa therapy) is demonstrated in 9 of the first 10 prostate cancer patients given the drug. FDA later approves first LHRHa drug after larger trials demonstrate its effectiveness.

1986 FDA approves the first PSA (prostate-specific antigen) test to detect prostate cancer in men age 50 and older. Widespread use leads to a significant jump in early-stage prostate cancer diagnoses, sparking debate about whether PSA testing improves survival for prostate cancer patients. PSA testing also approved later to monitor for prostate cancer recurrence.

1990

1990s The first forms of laparoscopic prostatectomy techniques are introduced. This new minimally-invasive surgical approach shortens recovery time and dramatically reduces the side effects of surgery, compared to traditional "open" surgery.

1990s "Watchful waiting" — in which treatment is delayed or replaced by frequent exams and PSA testing — is introduced for men with early-stage prostate cancer. This approach helps identify and treat the patients most likely to benefit, and spare men whose disease is not progressing from unnecessary treatment and related side effects.

2000

1983 – 2010 Early research suggests that adding the non-steroidal anti-androgen drug flutamide to LHRHa therapy is superior to LHRHa therapy alone. Later trials ultimately show this combination approach modestly improves overall survival, but this benefit is felt to be outweighed by the cost and toxicity of the non-steroidal antiandrogens.

2003, 2010 Two large trials report that finasteride (Proscar) and dutasteride (Avodart) reduce the risk of developing prostate cancer by up to 25 percent, compared to placebo.

2004 FDA approves docetaxel after two clinical trials show these drugs increase survival in men with prostate cancer that continues to grow despite hormone therapy (called "androgen-independent disease").

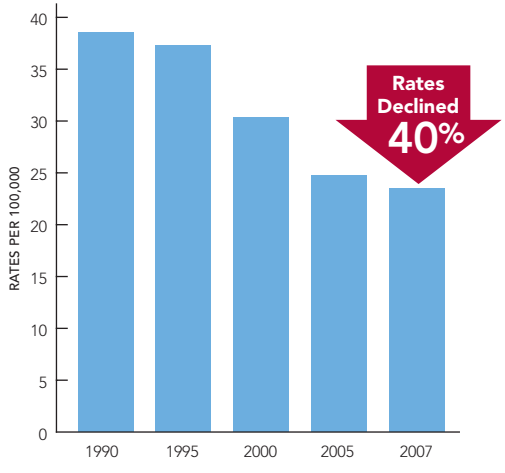
2009, 2010 Findings from a long-term clinical trial show that radiation therapy after surgery (adjuvant radiation) reduces the risk of prostate cancer spread and increases survival time by nearly 30% in men with early-stage disease; another study finds that adding external beam radiation to hormone therapy in prostate cancer that has spread to the surrounding areas reduces the risk of death by more than 40%.

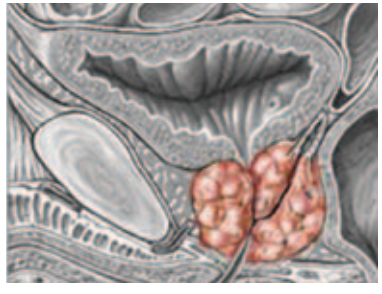
2009, 2010 Three large, randomized, long-term trials find conflicting results on the effect of PSA testing for reducing the risk of dying from prostate cancer. Initial results from two trials with up to 10 years of follow-up find that routine PSA testing has a minimal effect on reducing the risk of dying from prostate cancer and leads to diagnosis and treatment of slow-growing cancers that are unlikely to be life-threatening. A third study, with a median of 14 years of follow-up, finds that PSA testing every two years among men age 60 and older reduces the risk of prostate cancer death by 40%. Men are urged to discuss the risks and benefits of screening with their doctors prior to PSA testing.

2010 FDA approves Provenge, the first therapeutic prostate cancer vaccine, for advanced disease. This novel approach boosts a patient's own immune system to fight the cancer and was shown to extend survival.

2010 FDA approves cabazitaxel (Jevtana), with prednisone, for men with metastatic prostate cancer whose disease has progressed despite prior treatment. The approval, the first for this group of patients, was based on data showing cabazitaxel increases survival over standard therapy.

Prostate Cancer Mortality, 1990–2007





Treatment for prostate cancer varies depending on the stage of the cancer and may include surgery, radiation, chemotherapy and/or hormone therapy.

Source: ASCO

Additional Resources

Cancer.Net™

Oncologist-approved cancer information from the American Society of Clinical Oncology

Basic Cancer Information

www.cancer.net/cancertypes

Comprehensive information on more than 120 cancer types and cancer-related syndromes

- Risk factors
- Staging
- Diagnosis
- Questions to ask the doctor
- Treatment
- Spanish language section
- Symptoms
- Medical illustrations

Coping Resources

www.cancer.net/coping

Resources to help people with cancer and those who care for them

- Caregiving
- Sexuality
- End-of-life care
- Relationships
- Emotional health

Cancer Clinical Trials

www.cancer.net/clinicaltrials

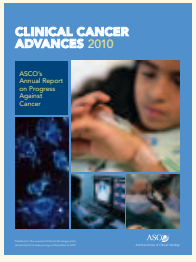
How to participate in studies of promising new treatments

- Finding a clinical trial
- Deciding to participate
- Questions to ask the research team
- Patient safety
- Phases of clinical trials

ASCO Progress Reports

www.cancer.net/cca

Clinical Cancer Advances: ASCO's Annual Report on Progress Against Cancer (2006 – present)



This timeline, sources and citations are available at **www.cancer.net/progresstimeline**

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All data come from the National Cancer Institute and the U.S. Food and Drug Administration with the following exceptions:

Breast

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