CHEMICAL MANUFACTURERS ASSOCIATION

JUL 5

July 5, 1994

Dear Vinyl Chloride Research Coordinators:

The following items are enclosed:

1) the agenda for the August 2, 1994 VCRC meeting;

2) the June 13, 1994 Record of Conference Call;

3) the July 5, 1994 letter to EPA requesting a meeting with the Agency to discuss Richard Reitz's pharmacokinetic risk assessment model for vinyl chloride;

4) a list of ATSDR chemicals added to EPA's Master Testing List under TSCA Section 4. Please note that EPA has invited manufacturers of the listed chemicals to submit testing plans and enter into consent agreements for testing. For vinyl chloride, the proposed testing includes undertaking a two-generation reproductive effects study and a developmental effects study. Both studies are proposed to be conducted by the inhalation route. EPA intends to issue a final test rule for any listed chemicals which are not covered by a consent order or a voluntary testing agreement. Jonathan Ramlow has agreed to expedite his review of the available reproductive and developmental effects data on vinyl chloride to develop an industry position on the need for any additional data;

5) a draft letter to the American Cancer Society commenting on the TIME Magazine article. Please call me with your comments on the letter by July 19;

6) Cancer Facts and Figures, 1994. This report is the source of the TIME Magazine article;

7) draft Green Seal Standard on Anti-Corrosive Paints. A ban on vinyl chloride in the manufacture of final anti-corrosive paint products is proposed on page 6 of the draft under item 4.2.4;

8) draft EPA Recommended Inhalation Testing for Hazardous Air Pollutants to be Considered for TSCA Section 4 Test Rule Process (First Rule). The draft recommends the following tests for ethylene dichloride by the inhalation route:

- acute/subchronic systemic;
- acute/subchronic respiratory;
- acute/subchronic neurotoxicity;
- 1 species development toxicity; and,
- 2-generation reproductive test.

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EPA is seeking industry comments on its draft testing proposal. The proposed testing for EDC is very expensive, probably in excess of $500,000. Mr. Joe Ledvina of Vista Chemical has suggested to me that it would be cost-effective for the Vinyl Chloride Research Coordinators to initially work with EPA on the proposed testing for EDC as all vinyl chloride manufacturers will be impacted by the proposed testing. For many companies, the same representatives will be addressing both the vinyl chloride and ethylene dichloride testing issues. Therefore, a consolidation of efforts for both chemicals under the Vinyl Chloride Panel Research Coordinators would increase the efficient use of economic and man-power resources. Please complete the enclosed ballot to indicate your approval/disapproval of Mr. Ledvina's recommendation; and,

9) a commitment form for vinyl chloride research and advocacy activities. Please complete the form and send it to me as soon as possible. I have used the nameplate capacity data from Chemical Data Inc. to determine your company's pro-rata share of the estimated $300,000 budget for the 1994 and 1995 vinyl chloride related research and advocacy activities.

Lastly, I want to confirm that our next VCRC meeting is scheduled for August 2, 1994, starting at 10:00 a.m. The meeting will be held at the CMA offices in Washington, D.C. As many important issues are on the agenda for discussion, please make every effort to attend the meeting.

If you have any questions or need additional information, please call me at (202) 887-1192.

Sincerely,

Has Shah

Hasmukh C. Shah, Ph.D.
Manager, Vinyl Chloride Panel

Enclosures

BENEFITS OF UPDATING INTER-INDUSTRY STUDY OF VINYL CHLORIDE WORKERS

- Product Stewardship
  - Demonstrates to workers, community residents, customers, and other audiences our collective commitment to characterize cancer risks associated with employment in VCM/PVC processes.

- Scientific Knowledge
  - Refines the estimate of the number of cases of human angiosarcoma of the liver (ASL) associated with operating VCM/PVC plants in the pre-1972 era in North America.
  - Provides basis for refining human cancer risk assessments which are used by government agencies for permitting facilities, etc.
  - Contributes ASL cases to the international registry.
  - Helps to resolve unanswered questions about alleged links to cancers of the brain, lung, and hematopoeitic system as well as address non-cancer causes of death such as emphysema.

- Litigation Defense
  - VCM/PVC manufacturers continue to face toxic tort litigation alleging that numerous other types (non-ASL) of cancer are related to VCM/PVC employment. This type of research is useful in defending such litigation.

GGB 3/15/94

BENEFITS OF UPDATING INTER-INDUSTRY STUDY OF VINYL CHLORIDE WORKERS

(cont.)

- Chlorine Issue
  - VCM/PVC continue to be a part of the general debate on health and environmental impacts of chlorinated organics. This type of research serves a valuable role in helping to debate the issues on the basis of good science.

GGB 3/15/94

CHEMICAL MANUFACTURERS ASSOCIATION

Vinyl Chloride Panel

Vinyl Chloride Research Coordinators

Tentative Agenda

DATE: August 2, 1994
TIME: 10:00 a.m. - 3:00 p.m., EDT
PLACE: CMA Offices
2501 M Street, NW
Washington, D.C.

1.0 Approval of June 13, 1994 Record of Conference Call

2.0 Status of Company Commitments to Update the Vinyl Chloride Epidemiology Study

3.0 Discussion of Vinyl Chloride Epidemiology Study Update Proposals from Contractors

4.0 Approval of Line Item Budgets for the VCRC Activities

5.0 Discussion of Short-term Vinyl Chloride Exposure Effects Studies with James Swinberg of the University of North Carolina at Chapel Hill (Tentative)

6.0 Status of Meeting With EPA to Discuss Vinyl Chloride Risk Assessment

7.0 Status of Dow Chemical's Review of Vinyl Chloride Teratology and Reproductive Effects Studies

8.0 Discussion of VCRC Negotiating with EPA on Testing of Ethylene Dichloride Under TSCA Section 4

9.0 Discussion of Course of Action with EPA on VC and EDC Testing Program Under TSCA Section 4

10.0 Finalization of Response to TIME Magazine's Article on Vinyl Chloride Exposure and Development of Lymphoma

11.0 Set Date for Next Conference Call or Meeting

Has Shah

Hasmukh C. Shah, Ph.D.
Manager, Vinyl Chloride Panel

Subject to Approval

SL 107280

ANTITRUST CHECKLIST FOR CMA MEETINGS

This antitrust checklist is for use by CMA staff and member representatives in the conduct of CMA-sponsored meetings. *Prohibited discussion topics apply equally to social gatherings incidental to CMA-sponsored meetings.* The Checklist is not exhaustive and does not address antitrust issues relating to activities other than CMA meetings. Participants in CMA meetings also should be thoroughly familiar with: (1) "Antitrust Guide for CMA Committee Members;" and, (2) "General Principles Applicable to the Structure and Operations of Committees." Both of these documents may be found in the CMA Directory.

DO

Ensure strict performance in areas of:

OVERSIGHT/SUPERVISION:

- Have a CMA staff representative at each CMA-sponsored meeting (unless an exception has been authorized by the appropriate CMA vice-president);
- *consult with an attorney of the CMA Office of General Counsel on all antitrust questions relating to CMA-sponsored meetings;*
- limit meeting discussions to agenda topics (unless additional topics have been approved by the appropriate CMA staff representative), and
- provide each member company representative and CMA staff representative attending a CMA-sponsored meeting with a copy of this checklist, and have a copy available for reference at all CMA-sponsored meetings.

RECORDKEEPING:

- Have an agenda and minutes which accurately reflect the matters which occur;
- provide agendas and minutes to the CMA Office of General Counsel for review and approval in advance of distribution; and,
- fully describe the purposes and authorities of all task groups, work groups, ad hoc or other standing committee subgroups in the minutes of the appropriate parent committee.

VIGILANCE:

- Protest against any discussion or meeting activities which appear to violate this checklist, disassociate yourself from any such discussion or activities and leave any meeting in which they continue.

DON'T

Do not, in fact or appearance, discuss or exchange information on:

PRICES, INCLUDING:

- Individual company prices, price changes, price differentials, markups, discounts, allowances, credit terms, etc.;
- individual company data on costs, production, capacity, inventories, sales, etc.; and,
- industry pricing policies, price levels, price changes, differentials, etc.

PRODUCTION, INCLUDING:

- Plans of individual companies concerning the design, production, distribution or marketing of particular products, including proposed territories or customers; and,
- changes in industry production, capacity or inventories.

TRANSPORTATION RATES:

- Rates or rate policies for individual shipments, including basing point systems, zone prices, freight equalization, etc.

MARKET PROCEDURES, INCLUDING:

- Company bids on contracts for particular products; company procedures for responding to bid invitations, and,
- matters relating to actual or potential individual suppliers or customers that might have the effect of excluding them from any market or influencing the business conduct of firms toward them.

CONSENT DECREE SUBSTANCE:

- Any matter relating to trisodium phosphate (a restriction required by a 1962 consent decree to which CMA is a party).

Revised 3/80 (single page version)
Reformatted 1/89 MDB

CHEMICAL MANUFACTURERS ASSOCIATION
Vinyl Chloride Panel
Research Coordinators
Record of Conference Call

DATE: June 13, 1994
TIME: 10:00 a.m.

List of Participants:

Ed Beeler	GEON
Frank Borrelli	Georgia Gulf
Mark Gruenwald	Borden
Jim Knaak	Oxy
Dave Penney	Vista
Jonathan Ramlow	Dow Chemical
Bob Ondocsin	CMA
Has Shah	CMA

1.0 The May 19, 1994 Record of Meeting was approved with one change. On page 3, line 1, the proper name is changed from the American Chemical Society to the American Cancer Society.

2.0 There appears to be overall support from member companies to proceed with the update of the epidemiology study. Each company representative, however, will inform Has Shah of his company's final decision by June 24.

3.0 Jonathan Ramlow briefly reviewed the revised scope of work for the epidemiology study update. All comments on the draft scope of work should be sent to Dr. Ramlow with a copy to Dr. Shah by June 24, 1994.

4.0 Dr. Ramlow estimated Dow Chemical's cost to design the update, evaluate bids, monitor the study, provide technical guidance to the selected contractor, and evaluate the interim and draft reports at $30,000.

5.0 Dr. Shah will invite Jim Swinberg of the University of North Carolina at Chapel Hill to the next VCRC meeting to discuss the vinyl chloride short-term exposure effects evaluation program.

6.0 Dr. Shah reported that EPA's Carcinogen Review Assessment Verification Endeavor (CRAVE) currently is updating its IRIS risk assessment for vinyl chloride. Dr. Shah will contact Jim Cogliano, William Farland, and Hugh McKinnon of the Agency to request a meeting to discuss Richard Reitz's physiologically-based pharmacokinetic risk assessment model for vinyl chloride.

7.0 Dr. Ramlow informed the VCRC members that he did not find any new references in his literature search on reproductive and teratogenic effects of vinyl chloride other than Dow's own studies. Dr. Ramlow will review these studies and prepare a position paper on the adequacy of these studies or on the need for any additional studies.

8.0 David Penney will send a draft response to TIME Magazine's article on vinyl chloride exposure and development of lymphoma to Dr. Shah within the next two weeks.

9.0 The next VCRC meeting is scheduled for August 2, 1994 at 10:00 a.m.

10.0 The conference call ended at approximately 11:30 a.m.

Has Shah

Hasmukh C. Shah, Ph.D.
Manager, Vinyl Chloride Panel

Subject to Approval

CHEMICAL MANUFACTURERS ASSOCIATION

July 5, 1994

James Cogliano
Chairman, Carcinogen Review Assessment
Verification Endeavor
U.S. EPA (8602)
401 M Street, S.E.
Washington, D.C. 20460

Dear Mr. Cogliano:

It has come to my attention that EPA's Carcinogen Review Assessment Verification Endeavor currently is reassessing human health risk for vinyl chloride. The Chemical Manufacturers Association Vinyl Chloride Panel applauds EPA's efforts to review the latest health effects information to determine risks posed by specific chemicals.

Dr. Richard Reitz, formerly of Dow Chemical, has developed a physiologically-based pharmacokinetic model for vinyl chloride risk assessment. Dr. Reitz recently presented his model to the Vinyl Chloride Panel and has agreed to present his model to EPA prior to its publication, if the Agency provides an opportunity for the presentation. Therefore, the Vinyl Chloride Panel requests a meeting with appropriate EPA and/or contractor staff to discuss the new vinyl chloride risk assessment model. Dr. Reitz's abstract of the model is enclosed with this letter.

Also, the Panel conducted an epidemiologic study of vinyl chloride workers covering a period of time from 1942-1982. The final report on the study was submitted to the EPA Administrator in 1986. A copy of the report is enclosed with this letter just in case the report did not reach CRAVE or CAG personnel. The following articles related to the CMA-sponsored vinyl chloride epidemiology study also are enclosed:

1991 An Industry-Wide Epidemiologic Study of Vinyl Chloride Workers, 1942-1982;

1993 Letter to the Editor, Diagnostic Bias in Occupational Epidemiologic Studies (H. Shah); and,

1993 Response to Letter to the Editor, Diagnostic Bias in Occupational Epidemiologic Studies: An Example Based on the Vinyl Chloride Literature (O. Wong).

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I will call you in the next few weeks to discuss the possibility of meeting to examine scientific issues related to the vinyl chloride risk assessment. Meanwhile, if you have any questions or need additional information, please contact me at (202) 887-1192.

Sincerely,

Has Shah

Hasmukh C. Shah, Ph.D.
Manager, Vinyl Chloride Panel

Enclosures

cc: William Farland, Director, Office of Health and Environmental Assessment, EPA

Hugh McKinnon, M.D., Director, Human Health Assessment Group, EPA

Dr Shah
FYI
DeBarolla

ATSDR Chemicals Added to MTL

EPA is adding 12 chemicals to the Master Testing List in response to a request for testing by the Agency for Toxic Substances and Disease Registry (ATSDR). The chemicals are: benzene, beryllium, chloroethane, chromium, cyanide, di (2-ethylhexyl) phthalate, mercury, methylene chloride, tetrachloroethylene, toluene, trichloroethylene, and vinyl chloride.

ATSDR is required to identify the hazardous substances most commonly found at Superfund sites, prepare toxicological profiles, and identify priority data needs for those substances. ATSDR is also required to initiate a research program to meet the priority data needs it identifies.

In October 1992, ATSDR requested EPA to use its authorities under TSCA and FIFRA to fill some of the data needs it identified on 37 chemicals. In its response to ATSDR, EPA agreed to develop a test rule under section 4 of TSCA to obtain data on 12 of the chemicals, but noted that a TSCA test rule would not be an appropriate mechanism for obtaining data on the other 25 chemicals. Before initiating rulemaking, EPA is inviting manufacturers of the 12 chemicals listed in the following table to submit testing plans and enter into consent agreements for testing. EPA intends to issue a test rule in late 1994 for any of the 12 substances which are not covered by a consent order or a voluntary testing agreement.

Chemical	Testing to be Proposed
Mercury	Immunotoxicity oral Chronic oral Reproductive oral Acute oral
Vinyl chloride	Reproductive inhalation Developmental inhalation
Benzene	Subchronic oral Neurotoxicity oral
Tichloroethylene	Subchronic oral Neurotoxicity oral
Chromium	Acute oral Reproductive oral Immunotoxicity oral
Tetrachloroethylene	Reproductive inhalation Neurotoxicity inhalation Immunotoxicity inhalation Developmental inhalation
Cyanide	Acute inhalation Subchronic inhalation Developmental inhalation Fate in soil
Beryllium	Acute inhalation Subchronic inhalation with reproductive and pulmonary pathology Developmental inhalation Immuotoxicity inhalation Bioavailability Fate in air
Toluene	Comparative Pharmacokinetics Immunotoxicity oral
Methylene chloride	Subchronic oral Immunotoxicity oral Developmental oral Neurotoxicity oral
Chloroethane	Comparative Pharmacokinetics Immunotoxicity oral

CANCER FACTS & FIGU '994

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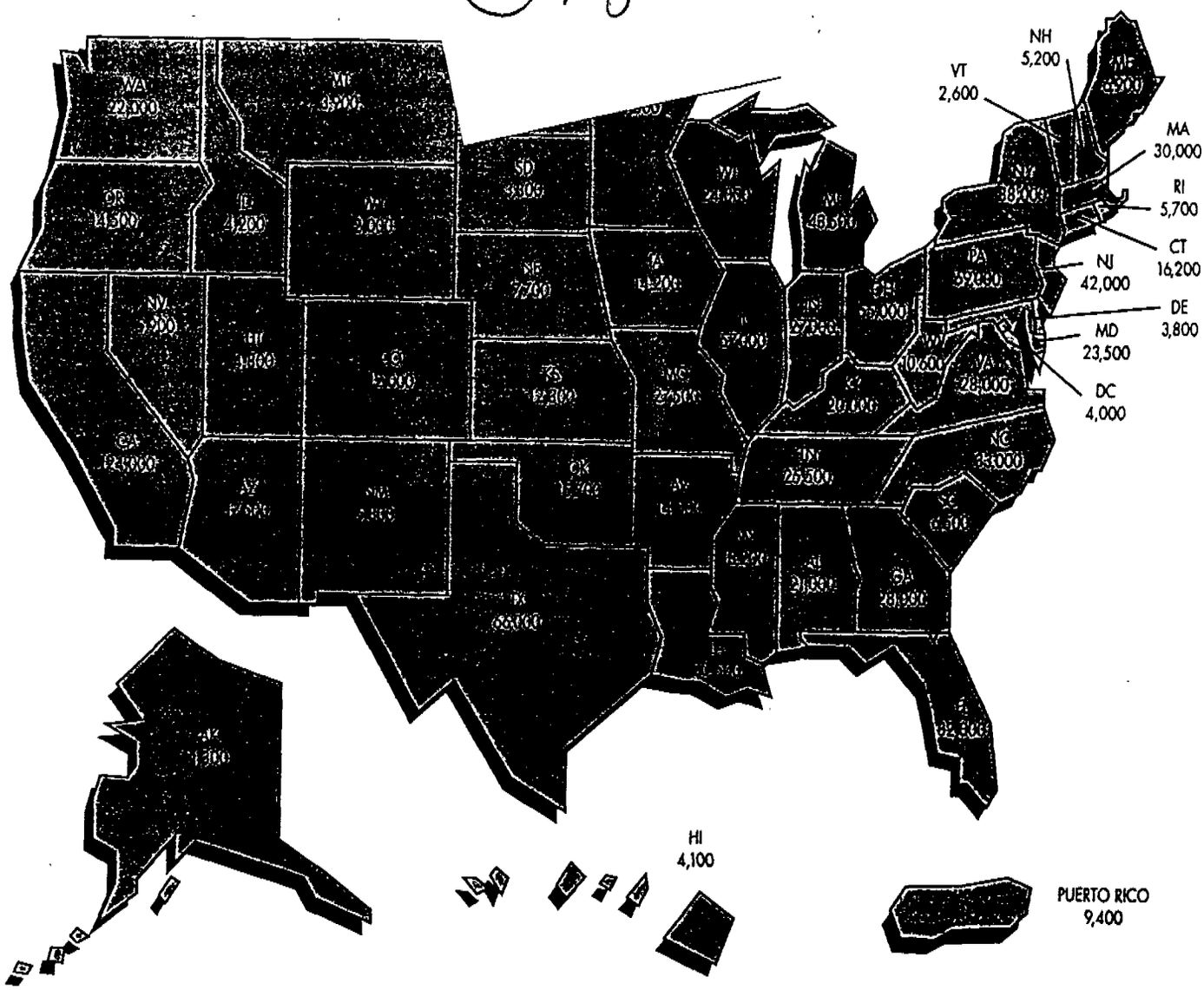


AMERICAN CANCER SOCIETY

Estimated number of new cancer cases in 1994 by state, total: 1,208,000 (excluding Puerto Rico).*

*Excluding basal and squamous cell skin cancer and carcinoma in situ.

SL 107287

Contents

Tables are indicated in bold print.

Sources of Statistics

Incidence. Since there is no nationwide cancer registry, there is no way of knowing exactly how many new cases of cancer are diagnosed each year. The American Cancer Society (ACS) estimates cancer incidence for the upcoming year using the best available data sources at the time.

Estimates of cancer incidence in *Facts and Figures* editions prior to 1974 were based on rates from two state cancer registries, the Connecticut Tumor Registry and the New York State Tumor Registry. The issues from 1974 to 1978 used information from the National Cancer Institute's Third National Cancer Survey (1969-1971) of nine major areas of the United States. In 1973, the NCI began the Surveillance, Epidemiology and End Results (SEER) program to collect ongoing data on cancer incidence and patient survival. The SEER program includes data from nine population-based cancer registries, covering about 10% of the US population. Beginning with the 1979 edition of *Facts and Figures,* estimates of cancer incidence have been based on incidence rates obtained through the SEER program, applied to the US Census estimates of the population for the current year. Estimates of new cancer cases include invasive cancers only, excluding in situ tumors except for cancers of the urinary bladder. Basal and squamous cell skin cancers are also excluded.

It is not appropriate or accurate to evaluate cancer incidence and mortality trends using only ACS estimates of cases and deaths, since these numbers are projected before the year begins, using data that are several years old. The numbers are presented to give the best available measure of the scope of the disease in the US at the time of publication. Comparable incidence rates are available for 1973 through 1990 from the National Cancer Institute's SEER program to evaluate cancer trends.

The estimates of total US cancer cases diagnosed in 1994 are based on age-specific incidence rates from the SEER program for 1988-1990 applied to the 1994 Census population projections. Some adjustment is made for sites with recently increasing or decreasing rates. Estimated new cases by state are calculated according to the distribution of estimated 1994 cancer deaths by state for each primary cancer site.

Mortality. Mortality statistics are derived from underlying cause of death data reported by the Division of Vital Statistics, National Center for Health Statistics, Department of Health and Human Services. The 1994 estimates of cancer deaths are based on cancer mortality data from 1984 through 1990.

Beginning with the 1981 edition of *Facts and Figures,* age-adjusted mortality rates per 100,000 are standardized to the 1970 census population distribution. Age-adjustment or age-standardization is a method used to make valid statistical comparisons among rates by assuming the same age distribution occurs among the different groups being compared.

Death rates by state: Since 1990, actual age-adjusted mortality rates, based on reported deaths in a recent 5-year period, have been presented. State mortality rate estimates from earlier *Facts and Figures* are not comparable.

Cancer Around the World: International mortality rates were calculated from data made available by the World Health Organization, and are adjusted to the old world population standard.

Probability of Developing Cancer. The probabilities of developing cancer are based on incidence rates for first primary cancers for that site, as reported to the NCI SEER program for 1988 through 1990. SEER area mortality rates for 1988-1990 were used to calculate survival into each age interval. Detailed methodology is available from the Applied Research Branch, National Cancer Institute.

Survival. Cancer survival statistics are usually reported as 5-year relative survival rates. In this edition, we present survival statistics for cases diagnosed in the period 1983-1989, as reported from the SEER program and followed through 1990. The relative survival rate is the ratio of the observed survival rate for the patient group to the expected survival rate for persons in the general population similar to the patient group with respect to age, sex, race and calendar year of observation. Because there is a certain lag time required in measuring survival, these rates may not reflect the most recent treatment advances.

SEER Report. The NCI SEER program is the source of specific data components for *Cancer Facts & Figures 1994,* including incidence rates and survival rates. These and other data are available in the SEER Cancer Statistics Review: 1973-1990, National Cancer Institute. NIH Pub. No. 93-2789, 1993.

Cancer: Basic Facts

What is cancer?

Cancer is a group of diseases characterized by uncontrolled growth and spread of abnormal cells. If the spread is not controlled, it can result in death.

What causes cancer?

Cancer is caused by both external (chemicals, radiation, and viruses) and internal (hormones, immune conditions, and inherited mutations) factors. Causal factors may act together or in sequence to initiate or promote carcinogenesis. Ten or more years often pass between exposures or mutations and detectable cancer.

Can cancer be prevented?

Yes, about 90% of the 700,000 skin cancers that will be diagnosed in 1994 could have been prevented by protection from the sun's rays. All cancers caused by cigarette smoking and heavy use of alcohol could be prevented completely. The ACS estimates that in 1994, about 165,000 lives will be lost to cancer because of tobacco use. About 17,000 cancer deaths will be related to excessive alcohol use, frequently in combination with cigarette smoking.

Regular screening and self-exams can detect cancers of the breast, tongue, mouth, colon, rectum, cervix, prostate, testis, and melanoma at an early stage, when treatment is more likely to be successful. These sites include nearly half of all new cases. Of these cases, about two-thirds of all patients currently survive five years. With early detection, about 90% would survive. This means that of those persons diagnosed with these cancers in 1994, about 100,000 more would survive if their cancers had been detected in a localized stage and treated promptly.

How is cancer treated?

By surgery, radiation, radioactive substances, chemicals, hormones, and immunotherapy.

Who gets cancer?

Anyone. Since incidence rises with age, most cases affect adults in mid-life or older. Among children ages 1-14, cancer causes more deaths in the US than any other disease. In the 1980s there were over 4.5 million cancer deaths, almost 9 million new cancer cases, and some 12 million people under medical care for cancer.

How many people alive today have ever had cancer?

Over 8 million Americans alive today have a history of cancer, 5 million diagnosed five or more years ago. Most of these 5 million can be considered cured, while others still have evidence of cancer. "Cured" means that a patient has no evidence of disease and has the same life expectancy as a person who never had cancer.

How many new cases will there be this year?

About 1,208,000 new cancer cases will be diagnosed. This estimate does not include carcinoma in situ and basal and squamous cell skin cancers. The incidence of these skin cancers is estimated to be over 700,000 cases annually.

How many people will die?

This year about 538,000 will die of cancer—over 1,400 people a day. One out of every five deaths in the US is from cancer.

What is the national cancer death rate?

There has been a steady rise in the cancer mortality rate in the US in the last half-century. The age-adjusted rate in 1930 was 143 per 100,000 population. It rose to 157 in 1950, to 163 in 1970, and was 174 in 1990. The major cause of this increase has been lung cancer. Death rates for many major cancer sites have leveled off or declined over the past 50 years (see page 5). If lung cancer deaths were excluded, cancer mortality would have declined 14% between 1950 and 1990.

How many people are surviving cancer?

In the early 1900s, few cancer patients had any hope of long-term survival. In the 1930s, less than one in five was alive five years after treatment. In the 1940s, it was one in four, and in the 1960s, it was one in three. About 483,000 Americans, or 4 of 10 patients who get cancer this year, will be alive 5 years after diagnosis. The gain from 1 in 3 in the 1960s to 4 in 10 now represents over 85,000 persons each year.

This 4 in 10, or about 40% is called the "observed" survival rate. When adjusted for normal life expectancy (factors such as dying of heart disease, accidents, and diseases of old age), a "relative" 5-year survival rate of 53% is seen for all cancers. The relative survival rate is commonly used to measure progress in the early detection and treatment of cancer.

SL 107289

Research, Prevention, Diagnosis, & Treatment

The vocabulary of cancer is ever increasing, as knowledge about the disease mounts. In the past decade, words such as oncogenes, retinoids, and growth factors have become standard. Indeed, our knowledge of the genetics of cancer has soared, and it is now possible to envision the day when the genetic basis of individual cancers will be known, along with mechanisms to correct the problem.

In addition to looking to the future, we can enjoy some successes now. Some cancers that only a few decades ago had a very poor outlook are often cured today: acute lymphocytic leukemia in children, Hodgkin's disease, Burkitt's lymphoma, Ewing's sarcoma (a form of bone cancer), Wilms' tumor (a kidney cancer in children), rhabdomyosarcoma (a cancer in certain muscle tissue), testicular cancer, and osteogenic (bone) sarcoma.

This section highlights some developments in cancer research, prevention, diagnosis, and therapy, and indicates the directions of current and future research.

- **Oncogenes,** which play a role in normal cell growth and differentiation, can mutate and cause the runaway cell growth associated with cancer. The ras oncogene is mutated in 50% of colon cancers and 90% of pancreatic cancers. The presence of certain oncogenes is being used to predict which tumors are likely to recur after surgery and/or to identify family members at risk.
- **Suppressor genes,** which exist in normal cells to control cell growth, also play a role in cancer. Some cancers are caused when mutations occur in these genes, allowing uncontrolled cell growth. For example, the p53 suppressor gene frequently is altered in many types of cancer, including breast and lung. In one familial syndrome, where family members have high rates of cancer, about 90% of those who inherit the abnormal p53 gene get cancer by the age of 50. Family members can now be screened for this genetic abnormality before cancer develops.
- Through **genetic engineering,** researchers may be able to correct or modify hereditary susceptibility by transplanting normal copies of genes into cells that have mutated copies of those genes.
- **Growth factors** can be used to stimulate normal bone marrow cells to withstand very high doses of chemotherapeutic drugs.
- A genetic fusing of cancer cells with normal cells can produce disease-fighting **monoclonal antibodies** (specific antibodies tailored to seek out chosen targets on cancer cells). Their potential in the diagnosis and treatment of cancer is under study, and they are showing promise for carrying cancer-killing radiation and drugs to a precise location.
- Researchers are understanding how cancer cells spread to healthy tissues, a process called **metastasis.** Cell mutations can cause increased production of destructive enzymes that allow them to invade surrounding tissues and penetrate blood vessels to travel to other parts of the body. A powerful enzyme inhibitor, **TIMP-2** is showing promise for abolishing the metastatic potential of tumor cells. A metastasis suppressor gene, **NM23,** has also been identified.
- New ways have been found to treat early breast and colon cancers postoperatively with drugs. This **"adjuvant" treatment** may eradicate cancer cells remaining after surgery and increase cure rates.
- **Neoadjuvant chemotherapy** (giving chemotherapy to shrink the cancer and then removing it surgically) has been tried against various types of cancers. This is a promising new treatment approach.
- Understanding the causes of pain in cancer patients has increased the **options for controlling pain.** Regular use of orally administered pain medicines, infusions or injections of analgesics, and procedures to interrupt pain pathways are among the effective approaches available for the majority of patients with pain from cancer.
- Researchers are examining **synthetic retinoids** (cousins of vitamin A) and other substances to see if recurrences of certain cancers can be prevented and if these agents can reduce cancer in high-risk groups. The cancer prevention capabilities of many other compounds are also being researched.
- In clinical trials, **taxol,** an agent obtained currently from the bark of Pacific yew trees, has been effective in treating ovarian cancer. Research efforts are underway to synthesize this scarce drug in the laboratory and the synthesized taxol will be tested for efficacy in all types of cancer.
- New approaches to drug therapy use **combinations of chemotherapeutic drugs, or chemotherapy plus surgery or radiation.** New classes of agents are being tested for their effectiveness in treating patients whose disease is resistant to drug therapies now in use. Understanding the basis of drug resistance and developing counterattacks are major areas of research today.
- Many patients with primary bone cancer now are treated successfully by **removing and replacing a section of bone** rather than by amputating the leg or arm. Drugs and radiation therapy are being used effectively after bone cancer surgery, resulting in dramatic improvement in survival.

• New **high-technology diagnostic imaging techniques** have replaced exploratory surgery for some cancer patients. Magnetic resonance imaging (MRI) is one example of such technology. In MRI, a huge electromagnet is used to detect hidden tumors by mapping the vibrations of the various atoms in the body on a computer screen. Computerized tomography (CT) scanning uses x-rays to examine parts of the body. In both of these painless, noninvasive procedures, cross-section pictures can show a tumor's shape and location more accurately than is possible with conventional x-ray techniques. For patients undergoing radiation therapy, CT scanning may enable the therapist to pinpoint the tumor more precisely, and thus provide more accurate radiation dosage while sparing normal tissue. Positron emission tomography (PET) is another imaging technique. One of the advances in the area of imaging combines two or three different types of images (e.g., MRI and PET) in a computer to create a three-dimensional picture that can be rotated on the screen. This technology is currently used in some medical centers to help plan for surgery and radiation therapy in areas such as the brain.

• **Immunotherapy** holds the hope of enhancing the body's own disease-fighting systems to help control cancer. **Interferon** (a naturally occurring body protein capable of killing cancer cells or stopping their growth), **interleukin-2** (a growth factor that stimulates cells of the immune system to fight cancer), and other **biologic response modifiers** are under study. Recently, interferon was made available to all doctors as the treatment for hairy cell leukemia, a rare blood cancer of older Americans. Interleukin-2 is under active research in the treatment of kidney cancer and melanoma. **Gene therapy** is the newest approach to stimulating immune cells to fight cancer. **Vaccines** against several types of cancer are also being developed.

• Many cancers develop in a two-stage process through exposure to substances known as **initiators and promoters.** Research scientists are exploring ways to interrupt this process.

• Ongoing research into new **drug development** will result in compounds that are less toxic to normal cells and more potent against tumor cells. New drugs will also allow physicians to circumvent the problem of drug resistance that many cancer cells develop. Along that same line of research, genes responsible for cancer cell resistance to chemotherapy have recently been discovered.

• New technologies have made it possible to use **bone marrow transplantation** as an important treatment option in select patients with leukemia and lymphoma. Bone marrow transplantation for breast cancers and other malignant tumors is under study. Because disruption of bone marrow function is a side effect of some cancer treatments, researchers are evaluating **autologous bone marrow transplants,** in which a portion of the patient's own marrow is removed before treatment, saved, and later restored. This procedure eliminates the problems of matching a donor with the recipient patient, and may make it possible for the patient to tolerate larger doses of anticancer drugs or radiation therapy.

• Improvements in cancer treatment have made possible more **conservative management** of some early cancers. In early cancer of the larynx, many patients are now able to retain the larynx and voice; in colorectal cancer, fewer permanent colostomies are needed; in many cases, the surgery for breast cancer is often more limited; and special nerve-sparing surgery now commonly used for prostate cancer could enable men to maintain normal penile function.

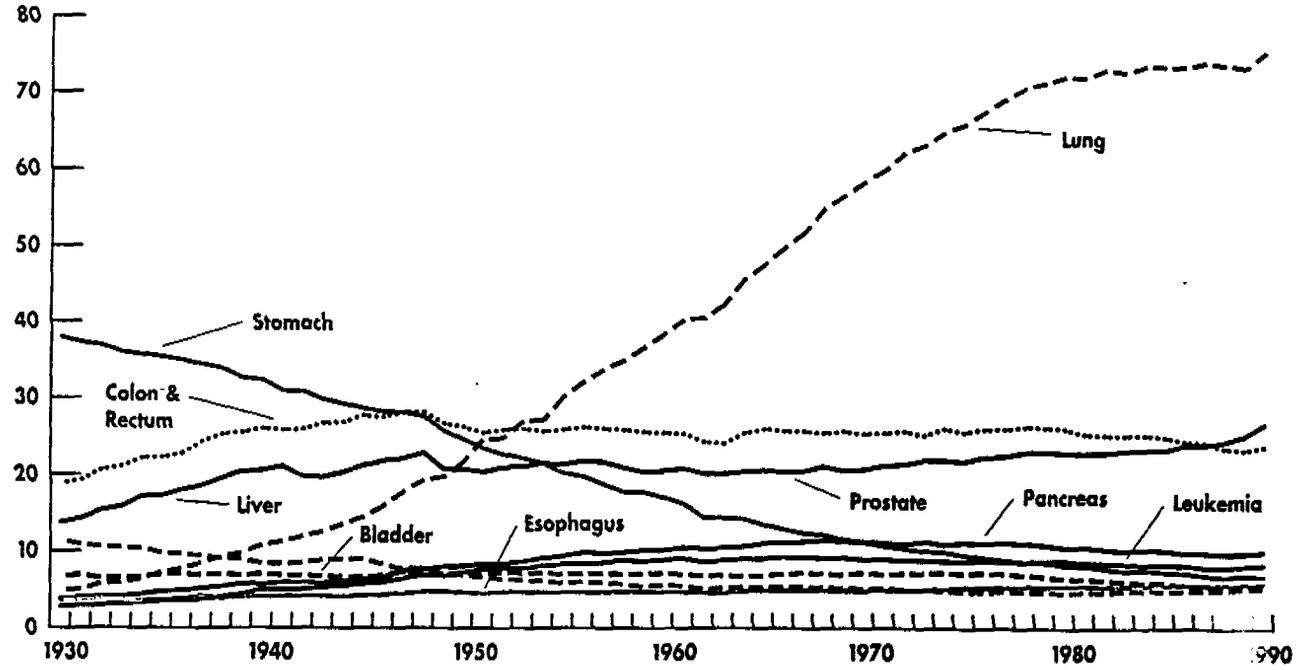
• **Prostatic ultrasound** (a rectal probe using ultrasonic waves to produce an image of the prostate) is currently being investigated as a potential means to increase the early detection of occult (not clinically suspected) prostate cancer. Recently, prostatic ultrasound has been combined with a blood test for **prostate-specific antigen** to aid in early detection of prostate cancer.

• A large clinical trial is underway to evaluate the usefulness of an estrogen-blocking drug called **tamoxifen.** Commonly used to treat women when they have breast cancer, this large study hopes to see if tamoxifen can also be used to prevent breast cancer in women who are at high risk.

• With medical progress producing longer survival periods for many cancer patients, clinical concerns are expanding to include not only patients' physical well-being, but also their **psychosocial needs.** The response of both patient and family to the disease, the patient's sexual concerns, employment and insurance needs, and ways to provide psychosocial support have emerged as important areas of research and clinical care.

• **Psychosocial and behavioral research** is showing much promise as evidence mounts that lifestyle (tobacco, diet) and environmental factors influence a person's general health and chances of developing cancer, as well as the mental ability to cope with cancer if it occurs. Research on behavioral modification is having a significant impact on symptoms of cancer and its treatment, such as pain, nausea, and vomiting. Other research deals with stress during treatment and during recovery after surgery or radiation treatment. A number of investigations concentrate on breast cancer, specifically on how women can be motivated to make use of mammography screening, and how to adjust to surgery, if such intervention becomes necessary.

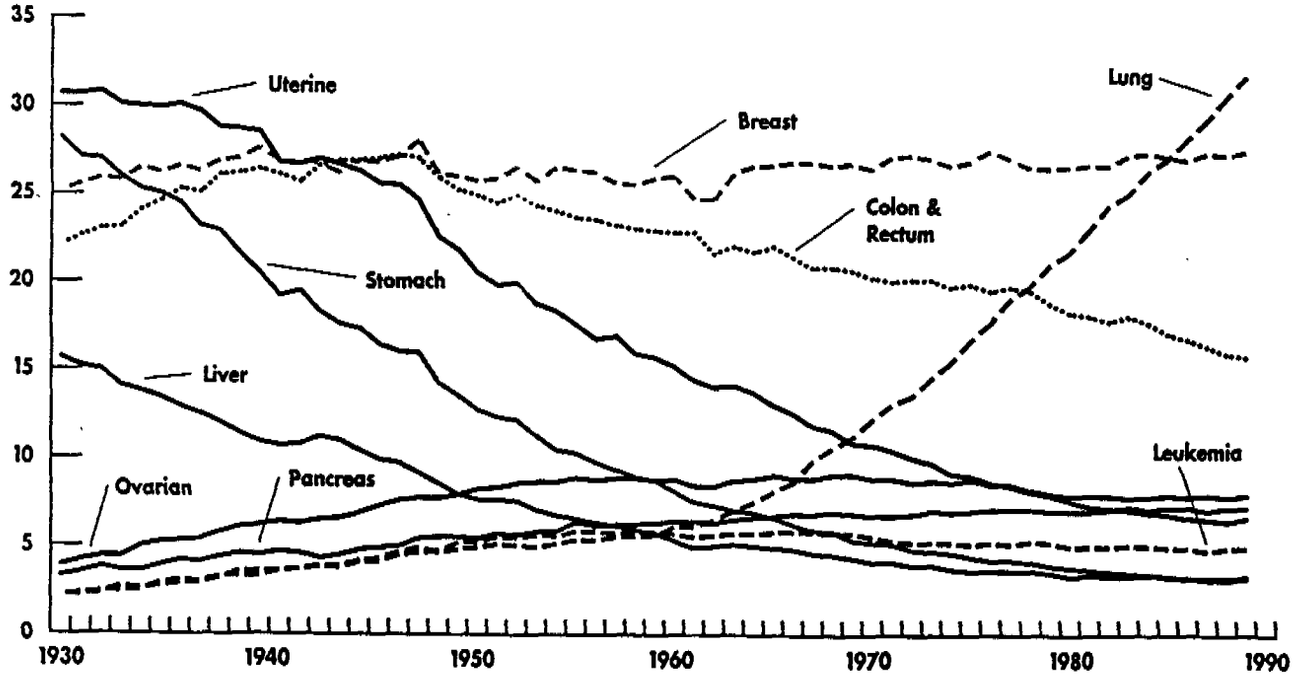
Cancer Death Rates by Site, Males, United States, 1930-90



Rates are per 100,000 and are age-adjusted to the 1970 US census population.

Available on reproduction sheet (5005.94)

Cancer Death Rates by Site, Females, United States, 1930-90



Rates are per 100,000 and are age-adjusted to the 1970 US census population.

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SL 107292

30-Year Trends in Cancer Death Rates* per 100,000 Population, 1958-60 to 1988-90

Sites	Sex	1958-1960	1988-1990	Percent Changes	Number of Deaths 1960	Number of Deaths 1990
All Sites	Male	180.9	218.0	21%	143,498	268,283
	Female	136.8	140.8	†	124,084	237,039
Oral	Male	6.0	4.6	-22%	4,668	5,636
	Female	1.6	1.7	9%	1,507	2,769
Esophagus	Male	4.8	5.9	23%	3,832	7,213
	Female	1.2	1.5	25%	1,083	2,506
Stomach	Male	17.5	6.9	-61%	13,085	8,336
	Female	9.0	3.1	-65%	7,774	5,737
Colon & rectum	Male	25.2	23.5	- 7%	19,127	28,635
	Female	22.8	16.1	-30%	20,265	28,895
Colon	Male	17.0	20.0	17%	13,010	24,385
	Female	17.4	14.1	-19%	15,527	25,325
Rectum	Male	8.2	3.5	-58%	6,117	4,250
	Female	5.4	2.0	-63%	4,738	3,570
Liver‡	Male	5.7	5.2	- 8%	4,566	6,557
	Female	5.9	3.2	-45%	5,828	5,811
Pancreas	Male	10.1	9.9	†	7,982	12,199
	Female	6.2	7.1	14%	5,693	12,883
Larynx	Male	2.7	2.5	- 6%	2,201	2,977
	Female	0.3	0.5	87%	225	733
Lung	Male	36.4	74.2	104%	31,257	91,091
	Female	5.5	30.6	452%	5,163	50,194
Melanoma of skin	Male	1.4	3.0	120%	1,194	3,844
	Female	1.0	1.5	48%	989	2,576
Other skin	Male	1.7	1.3	-25%	1,156	1,556
	Female	0.8	0.4	-56%	670	614
Breast	Male	0.3	0.2	-33%	215	272
	Female	25.7	27.4	7%	23,755	43,391
Cervix uteri	Female	9.4	3.0	-68%	8,487	4,627
Other uterus	Female	6.6	3.5	-47%	5,929	6,052
Ovary	Female	8.8	7.9	-10%	8,046	12,762
Prostate	Male	20.5	25.3	23%	14,452	32,378
Bladder	Male	7.2	5.6	-22%	5,440	6,910
	Female	2.7	1.7	-38%	2,425	3,431
Kidney	Male	3.8	5.1	35%	3,145	6,271
	Female	2.0	2.4	16%	1,794	4,042
Brain	Male	4.0	5.1	26%	3,700	6,339
	Female	2.7	3.4	27%	2,484	5,291
Non-Hodgkin's lymphoma	Male	4.8	7.7	62%	4,015	9,795
	Female	3.2	5.0	58%	2,839	8,806
Hodgkin's disease	Male	2.2	0.7	-67%	1,877	956
	Female	1.3	0.4	-68%	1,198	676
Multiple myeloma	Male	2.0	3.6	85%	1,687	4,561
	Female	1.4	2.5	76%	1,342	4,373
Leukemia	Male	8.9	8.2	- 7%	7,371	10,192
	Female	5.7	4.8	-16%	5,354	8,382

*Adjusted to the age distribution of the 1970 US Census population. †Percent changes not listed because they are not meaningful. ‡Primary and non-specified.

Note: Even though death rates declined or remained stable, the number of deaths increased because the population has become larger and older. The US population increased 38% from 1960 to 1990.

Estimated New Cancer Cases and Deaths, United States—1994*

	Estimated New Cases			Estimated Deaths		
	Both Sexes	Male	Female	Both Sexes	Male	Female
All sites	1,208,000	632,000	576,000	538,000	283,000	255,000
Buccal cavity & pharynx (**Oral**)	29,600	19,800	9,800	7,925	5,150	2,775
Lip	3,300	2,800	500	75	50	25
Tongue	6,000	3,800	2,200	1,750	1,100	650
Mouth	11,100	6,600	4,500	2,100	1,200	900
Pharynx	9,200	6,600	2,600	4,000	2,800	1,200
Digestive organs	233,300	123,100	110,200	121,450	64,550	56,900
Esophagus	11,000	8,000	3,000	10,400	7,800	2,600
Stomach	24,000	15,000	9,000	14,000	8,400	5,600
Small intestine	3,600	2,000	1,600	950	500	450
Large intestine } (**Colon-Rectum**)	107,000	52,000	55,000	49,000	24,000	25,000
Rectum }	42,000	23,000	19,000	7,000	3,800	3,200
Liver and biliary passages	16,100	8,800	7,300	13,200	7,200	6,000
Pancreas	27,000	13,000	14,000	25,900	12,400	13,500
Other and unspecified digestive	2,600	1,300	1,300	1,000	450	550
Respiratory system	189,000	112,800	76,200	158,200	97,900	60,300
Larynx	12,500	9,800	2,700	3,800	3,000	800
Lung	[illegible]	100,000	72,000	153,000	94,000	59,000
Other & unspecified respiratory	[illegible]	3,000	1,500	1,400	900	500
Bone	2,000	1,100	900	1,075	600	475
Connective tissue	6,000	3,300	2,700	3,300	1,600	1,700
Melanoma of skin	32,000	17,000	15,000	6,900	4,300	2,600
Breast	183,000	1,000	182,000	46,300	300	46,000
Genital organs	283,400	208,100	75,300	63,725	38,525	25,200
Cervix uteri } (**Uterus**)	15,000	—	15,000	4,600	—	4,600
Corpus & unspecified }	31,000	—	31,000	5,900	—	5,900
Ovary	24,000	—	24,000	13,600	—	13,600
Other & unspecified genital, female	5,300	—	5,300	1,100	—	1,100
Prostate	200,000	200,000	—	38,000	38,000	—
Testis	6,800	6,800	—	325	325	—
Other & unspecified genital, male	1,300	1,300	—	200	200	—
Urinary organs	78,800	55,000	23,800	21,900	13,800	8,100
Bladder	51,200	38,000	13,200	10,600	7,000	3,600
Kidney & other urinary	27,600	17,000	10,600	11,300	6,800	4,500
Eye	1,750	950	800	250	125	125
Brain & central nervous system	17,500	9,600	7,900	12,600	6,800	5,800
Endocrine glands	14,450	4,150	10,300	1,725	750	975
Thyroid	13,000	3,400	9,600	1,025	400	625
Other endocrine	1,450	750	700	700	350	350
Leukemia	28,600	16,200	12,400	19,100	10,500	8,600
Lymphocytic leukemia	12,500	7,300	5,200	5,700	3,300	2,400
Granulocytic leukemia	11,400	6,200	5,200	7,500	4,100	3,400
Other & unspecified leukemia	4,700	2,700	2,000	5,900	3,100	2,800
Other blood & lymph tissues	65,600	35,900	29,700	32,550	17,100	15,450
Hodgkin's disease	7,900	4,400	3,500	1,550	900	650
Non-Hodgkin's lymphoma	45,000	25,000	20,000	21,200	11,200	10,000
Multiple myeloma	12,700	6,500	6,200	9,800	5,000	4,800
All other & unspecified sites	43,000	24,000	19,000	41,000	21,000	20,000

*Excludes basal and squamous cell cancers and in situ carcinomas except bladder. Carcinoma in situ of the uterine cervix accounts for about 55,000 new cases annually, carcinoma in situ of the female breast accounts for about 25,000 new cases annually, and melanoma carcinoma in situ accounts for about 8,000 new cases annually. Overall, about 100,000 new cases of carcinoma in situ of all sites of cancer are diagnosed each year.

Basal cell and squamous cell skin cancers account for more than 700,000 new cases annually. About 2,300 nonmelanoma skin cancer deaths will occur in 1994.

Incidence estimates are based on rates from NCI SEER program 1988-90.

Estimated New Cancer Cases, by State—1994*

State	All Sites	Female Breast	Colon & Rectum	Lung	Oral	Uterus	Prostate	Skin Melanoma	Pancreas	Leukemia
Alabama	21,000	2,800	2,200	3,100	550	850	3,200	500	450	425
Alaska	1,300	150	150	250	50	60	150	40	25	30
Arizona	17,500	2,500	2,000	2,500	350	550	3,100	550	400	450
Arkansas	14,000	1,900	1,700	2,300	250	600	2,600	325	325	325
California	124,000	19,000	14,000	17,000	3,300	5,000	18,000	4,000	2,900	3,100
Colorado	12,000	1,900	1,500	1,500	275	450	2,600	475	300	275
Connecticut	16,200	2,500	2,300	2,100	400	500	2,500	400	375	400
Delaware	3,800	600	500	550	125	125	600	125	60	75
Dist. of Columbia	4,000	600	500	450	150	225	800	40	100	75
Florida	82,000	11,500	10,200	13,000	2,500	3,000	16,000	2,500	1,800	1,900
Georgia	28,000	4,200	3,000	4,200	900	900	4,700	750	600	650
Hawaii	4,100	475	550	500	100	125	650	60	100	80
Idaho	4,200	600	500	550	100	150	1,000	125	100	125
Illinois	57,000	8,800	7,600	7,600	1,400	2,200	9,400	1,300	1,200	1,400
Indiana	27,000	4,200	3,300	4,100	500	1,000	4,000	600	600	600
Iowa	14,200	2,200	2,100	1,900	300	450	2,600	450	300	375
Kansas	12,300	1,900	1,700	1,700	300	475	2,100	400	250	325
Kentucky	20,000	2,600	2,400	3,500	375	800	2,800	500	400	400
Louisiana	20,500	2,900	2,200	3,300	500	750	3,100	400	500	450
Maine	6,900	900	850	1,000	150	175	1,200	200	150	125
Maryland	23,500	3,300	2,900	3,400	600	800	3,800	550	500	475
Massachusetts	31,000	4,900	4,400	3,900	950	950	4,600	950	700	650
Michigan	43,500	6,800	5,400	6,000	950	1,700	7,100	850	950	1,100
Minnesota	19,300	3,100	2,600	2,300	350	650	4,000	500	450	550
Mississippi	13,200	1,700	1,400	2,100	350	500	2,500	275	300	275
Missouri	27,500	4,100	3,200	4,200	450	1,000	4,300	650	550	650
Montana	3,900	550	500	500	125	100	850	100	90	80
Nebraska	7,700	1,300	900	1,000	175	300	1,400	250	175	150
Nevada	5,900	800	600	1,000	100	225	800	150	125	125
New Hampshire	5,200	900	650	700	150	200	850	150	100	100
New Jersey	42,000	6,800	5,600	5,400	1,000	1,700	6,800	1,100	900	850
New Mexico	5,800	850	650	700	150	225	1,000	150	125	175
New York	88,000	15,000	12,500	11,500	2,300	3,600	13,000	2,200	2,100	2,000
North Carolina	33,000	4,800	4,000	5,000	900	1,400	6,300	1,000	750	800
North Dakota	3,300	425	425	350	70	100	950	70	60	100
Ohio	55,000	8,800	7,000	8,000	1,200	2,300	8,600	1,300	1,100	1,400
Oklahoma	15,700	2,100	1,700	2,500	350	650	2,600	425	300	400
Oregon	14,500	1,900	1,600	2,200	350	500	2,600	400	325	400
Pennsylvania	69,000	11,000	9,400	9,300	1,400	2,800	11,400	1,800	1,500	1,500
Rhode Island	5,700	900	800	750	125	200	850	150	125	100
South Carolina	16,500	2,300	1,800	2,500	600	700	3,000	400	400	350
South Dakota	3,300	475	450	425	60	100	650	90	75	80
Tennessee	25,500	3,500	3,200	4,200	500	950	4,000	700	600	600
Texas	66,000	9,200	7,500	10,000	1,700	2,500	10,000	1,600	1,600	1,800
Utah	4,800	750	500	375	60	275	1,200	175	100	125
Vermont	2,600	425	275	350	60	75	600	70	60	70
Virginia	28,000	4,400	3,100	4,200	650	1,100	4,800	750	650	600
Washington	22,000	3,300	2,300	3,200	500	650	3,800	550	500	550
West Virginia	10,600	1,400	1,200	1,800	275	375	1,500	325	225	250
Wisconsin	24,000	3,700	3,000	2,800	550	900	4,700	550	600	650
Wyoming	2,000	300	200	250	25	90	350	30	30	60
United States	1,208,000	182,000	149,000	172,000	29,600	46,000	200,000	32,000	27,000	28,600
Puerto Rico	9,400	1,300	1,100	650	425	425	1,800	75	225	225

*Does not include carcinoma in situ or basal and squamous cell skin cancers.

These estimates are offered as a rough guide and should not be regarded as definitive. They are calculated according to the distribution of estimated 1994 cancer deaths by state.

Cancer M rtality by State—1994

State	Reported Death Rate per 100,000*	Estimated Number of Deaths									
		All Sites	Female Breast	Colon & Rectum	Lung	Oral	Uterus	Prostate	Skin Melanoma	Pancreas	Leukemia
Alabama	179	9,400	700	850	2,800	150	200	600	100	425	300
Alaska	175	500	50	50	175	20	10	25	10	25	20
Arizona	157	7,800	600	750	2,200	100	125	600	125	375	300
Arkansas	176	6,200	475	650	2,100	70	150	500	70	300	225
California	166	52,000	4,600	5,100	14,500	900	1,100	3,600	900	2,800	2,000
Colorado	146	5,400	475	550	1,200	80	100	450	100	275	200
Connecticut	170	7,200	600	800	1,900	100	100	450	80	350	250
Delaware	195	1,600	150	200	500	40	30	100	30	60	50
Dist. of Columbia	230	1,700	150	200	400	40	50	150	10	100	50
Florida	166	37,700	3,000	3,800	11,500	650	700	3,000	500	1,800	1,300
Georgia	176	12,300	1,000	1,100	3,800	200	200	850	150	550	425
Hawaii	138	1,800	125	200	425	30	30	125	20	100	60
Idaho	150	1,900	175	175	475	30	30	175	30	100	90
Illinois	180	25,400	2,200	2,900	6,800	400	500	1,800	275	1,200	900
Indiana	178	12,100	1,100	1,200	3,700	125	225	750	125	550	400
Iowa	158	6,300	600	800	1,700	75	100	500	90	300	250
Kansas	157	5,500	500	600	1,500	75	100	375	80	250	225
Kentucky	188	9,100	650	900	3,100	100	175	500	100	375	300
Louisiana	190	9,100	750	850	2,900	150	150	600	80	500	300
Maine	184	3,100	225	325	900	40	40	225	40	150	90
Maryland	193	10,500	850	1,100	3,100	175	175	700	125	475	325
Massachusetts	179	13,800	1,200	1,700	3,600	225	200	850	225	650	425
Michigan	176	19,500	1,700	2,100	5,400	250	400	1,400	175	900	750
Minnesota	156	8,600	800	1,000	2,100	90	150	750	125	450	375
Mississippi	178	5,900	425	550	1,800	90	125	450	60	300	200
Missouri	174	12,300	1,000	1,300	3,800	125	250	800	150	500	450
Montana	160	1,700	150	175	450	25	30	175	25	90	50
Nebraska	159	3,400	325	325	900	40	80	275	50	175	125
Nevada	184	2,600	200	250	850	25	50	150	30	125	80
New Hampshire	179	2,300	225	225	600	40	50	175	30	100	60
New Jersey	185	18,700	1,700	2,100	4,900	275	400	1,300	225	850	550
New Mexico	146	2,600	225	250	600	40	50	175	40	125	125
New York	176	39,000	3,900	4,500	10,200	600	850	2,600	475	2,000	1,300
North Carolina	173	15,200	1,200	1,500	4,600	250	300	1,200	225	700	550
North Dakota	155	1,400	125	150	325	20	25	175	15	60	70
Ohio	181	24,700	2,200	2,600	7,200	325	500	1,600	275	1,100	900
Oklahoma	169	7,000	550	650	2,200	90	125	475	100	300	275
Oregon	167	6,500	500	600	2,000	90	100	475	80	325	275
Pennsylvania	180	31,000	2,800	3,500	8,300	375	650	2,200	375	1,400	1,000
Rhode Island	181	2,500	225	300	700	30	50	150	30	125	75
South Carolina	175	7,400	600	700	2,300	150	175	550	90	375	225
South Dakota	152	1,500	125	175	350	20	30	125	20	75	50
Tennessee	178	11,300	900	1,200	3,700	125	225	750	150	600	400
Texas	164	31,000	2,300	2,900	9,000	475	600	1,900	350	1,500	1,200
Utah	124	2,000	200	200	325	20	50	225	40	100	90
Vermont	175	1,100	125	100	300	20	20	125	20	60	50
Virginia	180	12,500	1,100	1,200	3,600	175	250	900	150	600	400
Washington	164	9,600	850	900	2,900	150	175	700	125	475	350
West Virginia	180	4,700	350	475	1,500	75	80	300	70	200	175
Wisconsin	165	10,800	950	1,200	2,600	150	200	900	125	550	425
Wyoming	154	800	75	75	225	10	20	75	10	30	40
United States	172	538,000	46,000	56,000	153,000	7,925	10,500	38,000	6,900	25,900	19,100
Puerto Rico	129	4,500	325	425	600	175	150	450	25	200	150

*Average annual mortality rate for 1986-1990, adjusted to the age distribution of the 1970 US Census Population.

Selected Cancers

Lung Cancer

Incidence: An estimated 172,000 new cases in 1994. The incidence rate, which had been increasing steadily in men and women for several decades, has declined in men, from a high of 87 per 100,000 in 1984 to 80 in 1990. The incidence rate in women continues to increase to 41 per 100,000 in 1990.

Mortality: An estimated 153,000 deaths in 1994. Since 1987, more women have died of lung cancer than breast cancer, which, for over 40 years, was the major cause of cancer death in women.

Signs and Symptoms: Persistent cough, sputum streaked with blood, chest pain, recurring pneumonia or bronchitis.

Risk Factors: Cigarette smoking; exposure to certain industrial substances, such as arsenic, certain organic chemicals and asbestos, particularly for persons who smoke; radiation exposure from occupational, medical, and environmental sources. Radon exposure may increase risk, especially in cigarette smokers. Exposure to sidestream cigarette smoke increases the risk for nonsmokers.

Early Detection: Because symptoms often don't appear until the disease is in advanced stages, early detection is very difficult. In smokers who stop smoking at the time of early precancerous cellular changes, damaged bronchial lining tissues often return to normal. Smokers who persist in smoking may form abnormal cell growth patterns that lead to cancer. Chest x-ray, analysis of the types of cells contained in sputum, and fiberoptic examination of the bronchial passages assist diagnosis.

Treatment: Determined by the type and stage of the cancer. Options include surgery, radiation therapy, and chemotherapy. For many localized cancers, surgery is usually the treatment of choice. Because the disease has usually spread by the time it is discovered, radiation therapy and chemotherapy are often needed in combination with surgery. In small cell cancer, chemotherapy alone or combined with radiation has replaced surgery as the treatment of choice; on this regimen, a large percentage of patients experience remission, which in some cases is long-lasting.

Survival: The 5-year relative survival rate is only 13% in all patients, regardless of stage at diagnosis. The rate is 46% for cases detected when the disease is still localized, but only 16% of lung cancers are discovered that early.

Colon and Rectum Cancer

Incidence: An estimated 149,000 new cases in 1994, including 107,000 of colon cancer and 42,000 of rectum cancer.

Mortality: An estimated 56,000 deaths (49,000 from colon cancer, 7,000 from rectum cancer) in 1994. Mortality from colorectal cancer has fallen 30% for women and 7% for men over the last 30 years.

Signs and Symptoms: Rectal bleeding, blood in the stool, change in bowel habits.

Risk Factors: Personal or family history of cancer or polyps of the colon or rectum; inflammatory bowel disease. High-fat and/or low-fiber diet may be associated with increased risk.

Early Detection: Digital rectal examination, stool blood test, and proctosigmoidoscopy are recommended by the American Cancer Society to detect colon or rectum cancer in asymptomatic patients.

Digital rectal examination is performed by a physician during an office visit. The American Cancer Society recommends that this examination be performed annually after age 40.

The stool blood test is a simple method to test feces for hidden blood. The specimen is obtained by the patient at home and returned to the physician's office, a hospital, or a clinic for analysis. The Society recommends annual testing after age 50.

In proctosigmoidoscopy, the physician uses a hollow lighted tube or a fiberoptic sigmoidoscope to inspect the rectum and lower colon. To detect cancers higher in the colon, longer, flexible instruments are being used. The American Cancer Society recommends sigmoidoscopy, preferably flexible, every 3 to 5 years after age 50.

If any of these tests reveal possible problems, more extensive studies, such as colonoscopy (examination of the entire colon) and barium enema (an x-ray procedure in which the intestines are viewed), may be needed.

Treatment: Surgery, at times combined with radiation, is the most effective method of treating colorectal cancer. The role of chemotherapy in treating advanced cases is under study. Combinations of chemotherapy and immunologic agents have recently been described as beneficial in postoperative patients with cancerous lymph nodes.

Colostomy (creation of an abdominal opening for elimination of body wastes) is seldom needed for colon cancer and is infrequently required for rectal cancer. The American Cancer Society has a patient assistance program for those who do have permanent colostomies (see p. 25).

Survival: When colorectal cancer is detected in an early, localized stage, the 5-year survival rates are 92% for colon cancer and 85% for rectal cancer. After the cancer has spread regionally, to involve adjacent organs or lymph nodes, the survival rates drop to 61% and 51%, respectively. Survival rates for persons with distant metastases are less than 7%.

Breast Cancer

Incidence: An estimated 182,000 new cases among women in the United States during 1994. About 1,000 new cases of breast cancer will be diagnosed in men in 1994. Breast cancer incidence rates for women increased about 2% a year since 1980, but recently have leveled off at about 108 per 100,000. Most of the recent rise in rates is believed to be due to marked increases in mammography utilization, allowing the detection of early stage breast cancers, frequently before they would become clinically apparent. Other reasons for a longer-term increase in breast cancer are not yet understood.

Mortality: An estimated 46,300 deaths (46,000 women, 300 men) in 1994; in women, the second major cause of cancer death. Although incidence rates are increasing, early detection and improved treatment have kept mortality rates fairly stable over the past 50 years.

Signs and Symptoms: Breast changes that persist, such as a lump, thickening, swelling, dimpling, skin irritation, distortion, retraction, scaliness, pain, tenderness of the nipple, or nipple discharge.

Risk Factors: Over age 40, increases with age; personal or family history of breast cancer; early age at menarche, late age at menopause, never had children or late age at first live birth, and higher education and socioeconomic status. International variability in cancer incidence rates correlate with variations in diet, especially fat intake, although a causal role for dietary factors has not been firmly established. Breast cancer risk factors appear to be more useful in providing clues to the development of cancer than in identifying prevention strategies. Since adult women may not be able to alter their personal risk factors in any practical sense, the best opportunity for reducing mortality is through early detection. Many women will have one or more risk factors for breast cancer. However, most risks are at such a low level that they only partly explain the high frequency of the disease in the population.

Early Detection: The Society recommends that women have a screening mammogram by age 40; women 40 to 49 should have a mammogram every 1-2 years; asymptomatic women age 50 and over should have a mammogram every year. In addition, a clinical physical examination of the breast is recommended every three years for women 20 to 40, and every year for those over 40. The Society also recommends monthly breast self-examination as a routine good health habit for women 20 years or older. Most breast lumps are not cancer, but only a physician can make a diagnosis.

Besides its effectiveness in screening asymptomatic women, mammography is recognized as a valuable diagnostic technique for women who have findings suggestive of breast cancer. Once a breast lump is found, mammography can help determine if there are other lesions too small to be felt in the same or opposite breast. Since a small percentage of breast cancers may not be seen on a mammogram, all suspicious lumps should be biopsied for a definitive diagnosis, even when current or recent mammography findings are described as normal.

Treatment: Taking into account the medical situation and the patient's preferences, treatment may require lumpectomy (local removal of the tumor), mastectomy (surgical removal of the breast), radiation therapy, chemotherapy, or hormone manipulation therapy. Often, two or more methods are used in combination.

Patients should discuss with their physicians possible options for the best management of their breast cancer.

New techniques in recent years have made breast reconstruction possible after mastectomy, and the cosmetic results usually are good. Reconstruction has become an important part of treatment and rehabilitation.

Survival: The 5-year survival rate (which includes all women living five years after diagnosis, whether the patient is in remission, disease-free, or under treatment) for localized breast cancer has risen from 78% in the 1940s to 93% today. If the cancer has spread regionally at the time of diagnosis, however, the 5-year survival rate is 72%, for persons with distant metastases at the time of diagnosis, the 5-year survival rate is 18%.

From current data, based on women diagnosed in the early 1970s, the long-term breast cancer survival rate is about 50%.

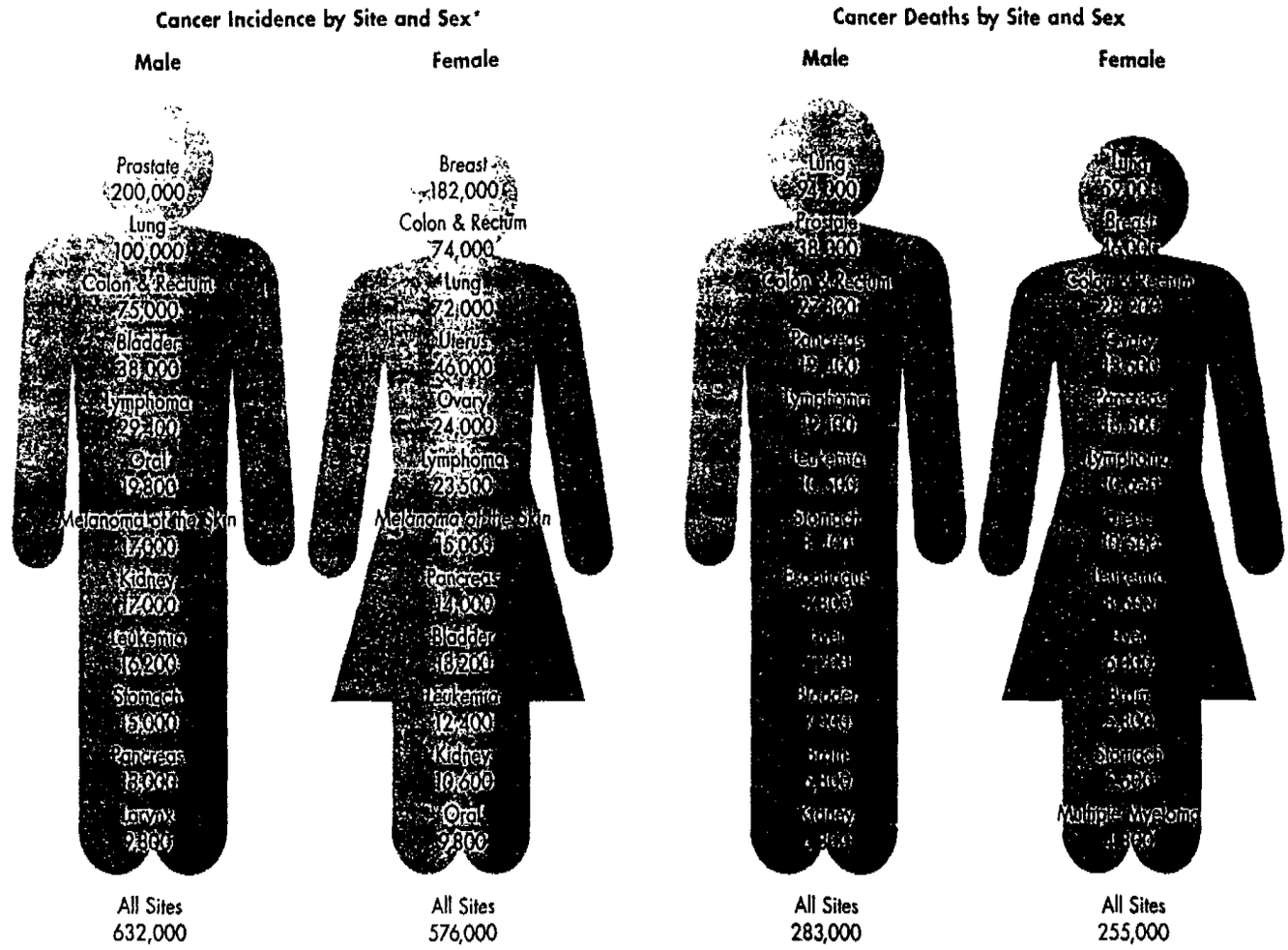
Prostate Cancer

Incidence: An estimated 200,000 new cases in the United States during 1994. Prostate cancer incidence rates are 30% higher for black men than white men. Between 1980 and 1990, prostate cancer incidence rates increased 50%, largely due to improved detection. Further increased incidence is expected with widespread use of serum screening tests.

Mortality: An estimated 38,000 deaths in 1994, the second leading cause of cancer death in men.

Signs and Symptoms: Weak or interrupted urine flow; inability to urinate, or difficulty starting or stopping the urine flow; the need to urinate frequently, especially at night; blood in the urine; pain or burning on urination; continuing pain in lower back, pelvis, or upper thighs.

Leading Sites of Cancer Incidence and Death—1994 Estimates



*Excluding basal and squamous cell skin cancer and carcinoma in situ.

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Most of these symptoms are nonspecific and may be similar to those caused by benign conditions such as infection or prostate enlargement.

Risk Factors: Incidence increases with age; over 80% of all prostate cancers are diagnosed in men over age 65. The disease is more common in northwestern Europe and North America. It is rare in the Near East, Africa, Central America, and South America. For reasons not currently known, black Americans have the highest incidence rate in the world. There is some familial association, but it is unclear whether this is due to genetic or environmental factors. International studies suggest that dietary fat may be a factor.

Early Detection: Every man 40 and over should have a digital rectal examination as part of his regular annual physical checkup. In addition the American Cancer Society recommends that men 50 and over have an annual prostate-specific antigen blood test. If either result is suspicious, further evaluation in the form of transrectal ultrasound should be performed.

Treatment: Surgery, radiation, and/or hormones and anticancer drugs, are treatment options. Hormone treatment and anticancer drugs may control prostate cancer for long periods by shrinking the size of the tumor, thus relieving pain.

Survival: Fifty-eight percent of all prostate cancers are discovered while still localized; the 5-year relative survival rate for patients whose tumors are diagnosed at this stage is 92%. Survival rates for all stages combined have steadily improved, and in the past 30 years have increased from 50% to 78%.

How t Estimate Cancer Statistics Locally

Estimated number of...	Number per 100,000	Multiply community population by	Special Notes
New cancer cases, 1994	400	0.004	Estimated cases and deaths will not reflect the age and ethnic characteristics of the population, access to detection and treatment, and varying risk factors. Actual data from a population-based tumor registry will allow more accurate estimates.
Cancer deaths, 1994	200	0.002	
Cancer survivors, 1994	2,000	0.020	Represents the number of people who were diagnosed over 5 years ago and are still living today.
Cancer cases under care, 1994	1,600	0.016	Represents the number of people diagnosed in 1994 and within the previous 5 years. All are assumed to be under treatment or follow-up care.
People who will eventually develop cancer	40,000	0.400	If current incidence and mortality rates remain the same, about 40% will develop cancer before they die.
People who will eventually die of cancer	20,000	0.200	If current mortality rates remain the same, about 1 in 5 people living today will die of cancer.
People who will be saved from cancer in 1994	200	0.002	Based on 5-year relative survival rate of 53%.

Note: The figures are only a rough approximation of actual data for a community and should be used with caution. Numbers may vary according to the age distribution of the local population.

Pancreas Cancer

Incidence: An estimated 27,000 new cases in the United States in 1994. The disease is more common in men, and occurs more frequently in black Americans than in white Americans.

Mortality: An estimated 25,900 deaths in 1994. Pancreatic cancer incidence and mortality rates have been fairly stable since the early 1970s, except among black women, whose rates have increased slightly.

Signs and Symptoms: Cancer of the pancreas is a "silent" disease, one that occurs without symptoms until it is in advanced stages.

Risk Factors: Very little is known about what causes the disease or how to prevent it. Risk increases after age 50, with the most cases occurring between ages 65 and 79. Smoking is a risk factor; incidence is more than twice as high for smokers as nonsmokers. Some studies have suggested associations with chronic pancreatitis, diabetes, or cirrhosis. In countries where the diet is high in fat, pancreatic cancer rates are higher.

Early Detection: At present, only a biopsy yields a certain diagnosis, and because of the "silent" course of the disease, the need for biopsy is likely to be obvious only after the disease has advanced. Researchers are focusing on ways to diagnose pancreatic cancer before symptoms occur. Ultrasound imaging and computerized tomography scans are being tried.

Treatment: Surgery, radiation therapy, and anticancer drugs are treatment options, but have had little influence on the outcome. Diagnosis is usually so late that none of these is used.

Survival: Only 3% of patients live more than 5 years after diagnosis.

Uterus (Cervix) Cancer

Incidence: An estimated 15,000 invasive and 55,000 carcinoma in situ cases will be diagnosed in 1994. The rate of invasive cervical cancer has decreased steadily over the last several decades, but has increased in recent years in women under 50. Cervical carcinoma in situ, a precancerous condition, is now more frequent than invasive cancer, especially in women under 50.

Mortality: An estimated 4,600 deaths from cervical cancer in 1994. The mortality rate is more than twice as high for black women as for white women.

Signs and Symptoms: Abnormal uterine bleeding or spotting; abnormal vaginal discharge. Pain and systemic symptoms are late manifestations of the disease.

Risk factors: Early age at first intercourse, multiple sex partners, cigarette smoking, and infection with certain types of human papillomavirus.

Early Detection: The Pap test is a simple procedure that can be performed at appropriate intervals by health care professionals as part of a pelvic examination. A small sample of cells is swabbed from the cervix, transferred to a slide, and examined under a microscope. This test should be performed annually with a pelvic examination in women who are, or have been, sexually active or who have reached age 18 years. After three or more consecutive annual examinations with normal findings, the Pap test

Percentage f P pulati n (Probability) Developing Invasive Cancers at Certain Ages

		Birth to 39	40 to 59	60 to 79	Ever (Birth to Death)
All sites	Male	1.68 (1 in 60)	7.51 (1 in 13)	32.27 (1 in 3)	42.52 (1 in 2)
	Female	1.91 (1 in 52)	9.29 (1 in 11)	23.06 (1 in 4)	38.88 (1 in 3)
Breast	Female	0.45 (1 in 222)	3.78 (1 in 26)	6.78 (1 in 15)	12.20 (1 in 8)
Colon	Male	0.06 (1 in 1,667)	0.91 (1 in 110)	4.45 (1 in 22)	6.12 (1 in 16)
& rectum	Female	0.05 (1 in 2,000)	0.73 (1 in 137)	3.34 (1 in 30)	5.96 (1 in 17)
Prostate	Male	Less than 1 in 10,000	0.78 (1 in 128)	10.71 (1 in 9)	13.05 (1 in 8)
Lung	Male	0.04 (1 in 2,500)	1.60 (1 in 63)	6.69 (1 in 15)	8.43 (1 in 12)
	Female	0.03 (1 in 3,333)	1.07 (1 in 93)	3.49 (1 in 29)	5.02 (1 in 20)

Note: This chart shows the risks of being diagnosed with the most common cancers over certain age intervals. These risks are calculated for persons free of the specified cancer at the beginning of the age interval. Risk estimates do not assume all persons live to the end of the age interval or to any fixed age. Risk estimates are presented to give an approximate measure of the burden of cancer to society. Measures are based on population level rates and do not take into account individual behaviors and risk factors. For example, lung cancer is rare among nonsmokers or persons not heavily exposed to environmental tobacco smoke, so the risk for a nonsmoking man getting lung cancer in his lifetime is much lower than 8.4%, and it is much higher for a smoker. It is clear that the risk of developing cancer increases with age. For prostate cancer, the risk before age 60 is very low, but between age 60 and 80, 1 in 9 men will be diagnosed with prostate cancer.

Source of data: Applied Research Branch, National Cancer Institute

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may be performed less frequently at the discretion of the physician.

Treatment: Cervix cancers generally are treated by surgery or radiation, or by a combination of the two. In precancerous (in situ) stages, changes in the cervix may be treated by cryotherapy (the destruction of cells by extreme cold), by electrocoagulation (the destruction of tissue through intense heat by electric current), or by local surgery.

Survival: The 5-year survival rate for cervical cancer patients is 67%. For women diagnosed with localized disease the survival rate is 90%.

Uterus (Endometrial) Cancer

Incidence: An estimated 31,000 cases of cancer of the corpus (body) of the uterus, usually of the endometrium (lining). Endometrial cancer is most frequently diagnosed in women over age 50.

Mortality: An estimated 5,900 deaths in 1994.

Signs and Symptoms: Abnormal uterine staining or bleeding, especially postmenopausal. Pain and weight loss occur late in the disease.

Risk Factors: Early menarche, late menopause, history of infertility, failure to ovulate, tamoxifen or unopposed estrogen therapy, obesity.

During menopause, the level of hormones (estrogens) normally produced by the ovaries declines. This causes symptoms such as "hot flashes" or painful sexual intercourse due to thinning of the vaginal lining. To control these symptoms, estrogen replacement therapy may be given to women during and after menopause. This therapy may increase the risk of endometrial cancer, therefore, the benefits and risks of such treatment should be discussed by the woman and her physician.

Early Detection: The Pap test, highly effective in detecting early cancer of the uterine cervix, is only partially effective in detecting endometrial cancer. Women 40 and over should have an annual pelvic exam by a health professional. Women at high risk of developing endometrial cancer should have an endometrial tissue sample evaluated at menopause.

Treatment: Uterine cancers are usually treated with surgery, radiation, hormones, and/or chemotherapy depending on the stage of disease.

Survival: The 5-year survival rate for endometrial cancer is 83% overall, 94% if discovered at an early stage, and 69% if diagnosed in a regional stage.

Cancer in Children

Incidence: An estimated 8,200 new cases in 1994; as a childhood disease, cancer is rare. Common sites include the blood and bone marrow, bone, lymph nodes, brain, nervous system, kidneys, and soft tissues.

Mortality: An estimated 1,600 deaths in 1994, about one-third of them from leukemia. Despite its rarity, cancer is the chief cause of death by disease in children between the ages of 1 and 14. Mortality rates have declined 60% since 1950.

Early Detection: Cancers in children often are difficult to recognize. Parents should see that their children have regular medical checkups and should be alert to any unusual symptoms that persist. These include: an unusual mass or swelling; unexplained paleness and loss of energy; sudden tendency to bruise; a persistent, localized pain or limping; prolonged, unexplained fever or illness; frequent headaches, often with vomiting; sudden eye or vision

changes; and excessive, rapid weight loss.

Some of the main childhood cancers are:

Leukemia, below.

Osteogenic sarcoma and Ewing's sarcoma are bone cancers. These may cause no pain at first, and swelling in the area of the tumor is often the first sign.

Neuroblastoma can appear anywhere but usually in the abdomen, where a swelling occurs.

Rhabdomyosarcoma, the most common soft tissue sarcoma, can occur in the head and neck area, genito-urinary area, trunk, and extremities.

Brain cancers in early stages may cause headaches, blurred or double vision, dizziness, difficulty in walking or handling objects, and nausea.

Lymphomas and Hodgkin's disease are cancers that involve the lymph nodes, but also may invade bone marrow and other organs. They may cause swelling of lymph nodes in the neck, armpit, or groin. Other symptoms may include general weakness and fever.

Retinoblastoma, an eye cancer, usually occurs in children under age four. When detected early, cure is possible with appropriate treatment.

Wilms' tumor, a kidney cancer, may be recognized by a swelling or lump in the abdomen.

Treatment: Childhood cancers can be treated by a combination of therapies. Treatment is coordinated by a team of experts including oncologic physicians, pediatric nurses, social workers, psychologists, and others who assist children and their families.

Survival: Five-year survival rates vary considerably, depending on the site: all sites, 68%; bone cancer, 58%; neuroblastoma, 57%; brain and central nervous system, 60%; Wilms' tumor (kidney), 88%; Hodgkin's disease, 88%; and acute lymphocytic leukemia, 72%.

Leukemia

Incidence: An estimated 28,600 new cases in 1994, approximately evenly divided into acute leukemia and chronic leukemia. Although often thought of as primarily a childhood disease, leukemia will strike many more adults (26,000 this year) than children (2,600 this year). Acute lymphocytic leukemia accounts for approximately 2,000 of the cases of leukemia among children. In adults, the most common types are acute granulocytic (approximately 7,000 cases) and chronic lymphocytic (approximately 8,500 cases).

Mortality: An estimated 19,100 deaths in 1994.

Signs and Symptoms: Fatigue, paleness, weight loss, repeated infections, bruising easily, and nosebleeds or other hemorrhages. In children, these signs can appear suddenly. Chronic leukemia can progress slowly and with few symptoms.

Risk Factors: Leukemia strikes both sexes and all ages. Causes of most cases are unknown. Persons with Down syndrome and certain other genetic abnormalities have higher than normal incidence of leukemia. It has also been linked to excessive exposure to ionizing radiation and to certain chemicals such as benzene, a commercially used toxic liquid that is also present in lead-free gasoline. Certain forms of leukemia and lymphoma are caused by a retrovirus, HTLV-I (human T-cell leukemia/lymphoma virus-I).

Early Detection: Because symptoms often resemble those of other, less serious conditions, leukemia can be difficult to diagnose early. When a physician does suspect leukemia, diagnosis can be made using blood tests and biopsy of the bone marrow.

Treatment: Chemotherapy is the most effective method of treating leukemia. Various anticancer drugs are used, either in combinations or as single agents. Transfusions of blood components and antibiotics are used as supportive treatments. To illuminate hidden cells, therapy of the central nervous system has become standard treatment, especially in acute lymphocytic leukemia. Under appropriate conditions, bone marrow transplantation may be useful in the treatment of certain leukemias.

Survival: The 5-year survival rate for patients with leukemia is 38%, due partly to very poor survival of patients with some types of leukemia such as acute granulocytic. Over the last 30 years, however, there has been a dramatic improvement in survival of patients with acute lymphocytic leukemia; from a 5-year survival rate of 4% for people diagnosed in the early 1960s to 28% in the early 1970s to 52% in the mid-1980s. In children, the improvement has been from 4% to 72%.

Lymphoma

Incidence: An estimated 52,900 new cases in 1994, including 7,900 cases of Hodgkin's disease and 45,000 non-Hodgkin's lymphoma. Since the early 1970s, incidence rates for non-Hodgkin's lymphoma have increased over 65%. Incidence of Hodgkin's disease has declined over the same time period, especially among the elderly.

Mortality: An estimated 22,750 deaths in 1994 (non-Hodgkin's lymphoma, 21,200; Hodgkin's disease, 1,550).

Signs and Symptoms: Hodgkin's disease: enlarged lymph nodes, itching, fever, night sweats, and weight loss. Fever can come and go in periods of several days or weeks. Non-Hodgkin's lymphoma: enlarged lymph nodes, anemia, weight loss, and fever.

Risk Factors: Risk factors are largely unknown but in part involve reduced immune function and exposure to certain infectious agents. Persons with organ transplants are at higher risk due to altered immune function. Human immunodeficiency virus (HIV) and human T-cell leukemia/lymphoma virus-I (HTLV-I) are associated with increased risk of non-Hodgkin's lymphoma. Burkitt's lymphoma in

Africa is partly caused by the Epstein-Barr herpes virus. Other possible risk factors include exposures to herbicides, industrial solvents, and vinyl chloride.

Treatment: Hodgkin's disease: chemotherapy and radiotherapy are useful for most patients. Non-Hodgkin's lymphoma: early stage, localized lymph node disease can be treated with radiotherapy. Patients with later stage disease often benefit from the addition of chemotherapy. New programs using highly specific monoclonal antibodies directed at lymphoma cells, and improved techniques in bone marrow preservation, are under investigation in selected patients who relapse after standard treatment.

Survival: Survival rates vary widely by cell type and stage of disease. The overall 5-year survival rate for Hodgkin's disease is 78%. The overall 5-year survival for non-Hodgkin's lymphoma has steadily improved, and in the past 30 years has increased from 31% to 52%.

Skin Cancer

Incidence: Over 700,000 cases a year of highly curable basal cell or squamous cell cancers. They are more common among individuals with lightly pigmented skin. The most serious skin cancer is melanoma, which will be diagnosed in about 32,000 persons in 1994. Since 1973, the incidence rate of melanoma has increased about 4% per year. Incidence rates are over ten times higher among whites than blacks. An additional 10,000 invasive nonmelanoma skin cancers will occur in 1994, mostly sarcomas, including Kaposi's sarcoma.

Mortality: An estimated 9,200 deaths this year, 6,900 from malignant melanoma and 2,300 due to other skin cancers.

Signs and Symptoms: Any unusual skin condition, especially a change in the size or color of a mole or other darkly pigmented growth or spot. Scaliness, oozing, bleeding, or change in the appearance of a bump or nodule, the spread of pigmentation beyond its border, a change in sensation, itchiness, tenderness, or pain.

Risk Factors: Excessive exposure to ultraviolet radiation; fair complexion; occupational exposure to coal tar, pitch, creosote, arsenic compounds, or radium.

Prevention: The sun's ultraviolet rays are strongest between 10 a.m. and 3 p.m. Exposure at these times should be avoided, and protective clothing should be worn. Sunscreens should be used. These come in various strengths, ranging from those facilitating gradual tanning to those that allow practically no tanning. Because of the possible link between severe sunburns in childhood and greatly increased risk of melanoma in later life, children, in particular, should be protected from the sun.

Early Detection: Early detection is critical. Recognition of changes in skin growths or the appearance of new growths is the best way to find early skin cancer. Adults should practice skin self-examination once a month, and suspicious lesions should be evaluated promptly by a physician. Basal and squamous cell skin cancers often take the form of a pale, waxlike, pearly nodule, or a red, scaly, sharply outlined patch. A sudden or progressive change in a mole's appearance should be checked by a physician. Melanomas often start as small, mole-like growths that increase in size, change color, become ulcerated, and bleed easily from a slight injury. A simple **ABCD** rule outlines the warning signals of melanoma: **A** is for asymmetry. One half of the mole does not match the other half. **B** is for border irregularity. The edges are ragged, notched, or blurred. **C** is for color. The pigmentation is not uniform. **D** is for diameter greater than 6 millimeters. Any sudden or progressive increase in size should be of special concern.

Treatment: There are four methods of treatment: surgery (used in 90% of cases), radiation therapy, electrodessication (tissue destruction by heat), or cryosurgery (tissue destruction by freezing) for early skin cancer. For malignant melanoma, the primary growth must be adequately excised, and it may be necessary to remove nearby lymph nodes. Removal and microscopic examination of all suspicious moles is essential. Advanced cases of melanoma are treated according to the characteristics of the case.

Survival: For basal cell or squamous cell cancers, cure is highly likely if detected and treated early. Malignant melanoma can spread to other parts of the body quickly; however, when detected in its earliest stages, and with proper treatment, it is highly curable.

The overall 5-year survival rate for patients with malignant melanoma is 84%. The 5-year survival rate for localized malignant melanoma is 92%; survival rates for regional and distant disease are 55% and 14%, respectively. About 82% of melanomas are diagnosed in a local stage.

Ovary Cancer

Incidence: An estimated 24,000 new cases in the United States in 1994. It accounts for 4% of all cancers among women.

Mortality: An estimated 13,600 deaths in 1994. Although ovarian cancer ranks second in incidence among gynecological cancers, it causes more deaths than any other cancer of the female reproductive system.

Signs and Symptoms: Ovarian cancer is often "silent," showing no obvious signs or symptoms until late in its development. The most common sign is enlargement of the abdomen, which is caused by the accumulation of fluid. Rarely will there be abnormal vaginal bleeding. In women over 40, vague digestive disturbances (stomach discomfort, gas, distention) that persist and cannot be explained by any other cause may indicate the need for a thorough evaluation for ovarian cancer.

Five-Year Relative Survival Rates by Stage at Diagnosis*

Site	All Stages %	Local %	Regional %	Distant %
Oral	53	78	42	19
Colon-rectum	58	89	58	6
Pancreas	3	8	4	2
Lung	13	46	13	1
Melanoma	84	92	55	14
Female breast	79	93	72	18
Cervix uteri	67	90	52	13
Corpus uteri	83	94	69	27
Ovary	39	88	36	17
Prostate	77	92	82	28
Bladder	79	91	46	9
Kidney	55	86	57	10

*Adjusted for normal life expectancy. This chart based on cases diagnosed in 1983–87, followed through 1990.

Source: Cancer Statistics Branch, National Cancer Institute

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Risk Factors: Risk for ovarian cancer increases with age. Women who have never had children are more likely to develop ovarian cancer than those who have. Increased number of pregnancies and the use of oral contraceptives, appear to be protective against ovarian cancer. Women who have had breast cancer or have a family history of ovarian cancer are at increased risk. Certain rare genetic disorders are associated with increased risk. With the exception of Japan, the highest incidence rates are reported from the more industrialized countries.

Early Detection: Periodic, thorough pelvic examinations are important. The Pap test, useful in detecting cervical cancer, does not reveal ovarian cancer. Women over the age of 40 should have a cancer-related checkup every year.

Treatment: Surgery, radiation therapy, and drug therapy are treatment options. Surgery usually includes the removal of one or both ovaries (oophorectomy), the uterus (hysterectomy), and the fallopian tubes (salpingectomy). In some very early tumors, only the involved ovary will be removed, especially in young women. In advanced disease, an attempt is made to remove all intraabdominal disease, to enhance the effect of chemotherapy.

Survival: Overall, the 5-year survival rate for ovarian cancer is 41%. If diagnosed and treated early, the relative survival rate is 88%; however, only about 23% of all cases are detected at the localized stage. Survival rates for women with regional and distant disease are 36% and 17%, respectively.

Bladder Cancer

Incidence: An estimated 51,200 new cases in 1994; 38,000 in men, 13,200 in women. Overall, the incidence rate of bladder cancer is four times greater among men than among women, and is higher in whites than in blacks.

Mortality: An estimated 10,600 deaths in 1994.

Signs and Symptoms: Blood in the urine. Usually associated with increased frequency of urination.

Risk Factors: Smoking is the greatest risk factor in bladder cancer, with smokers experiencing twice the risk of nonsmokers. Smoking is estimated to be responsible for approximately 47% of the bladder cancer deaths among men and 37% among women. People living in urban areas and workers exposed to dye, rubber, or leather also are at higher risk.

Early Detection: Bladder cancer is diagnosed by examination of the bladder wall with a cystoscope, a slender tube fitted with a lens and light that can be inserted into the tract through the urethra.

Treatment: Surgery, alone or in combination with other treatments is used in over 90% of cases. Preoperative chemotherapy alone or with radiation before cystectomy (bladder removal) has improved some treatment results.

Survival: When detected at an early stage, the 5-year survival rate for bladder cancer is 91%. For regional and distant disease, the survival rates are 46% and 9%, respectively.

Oral Cancer

Incidence: An estimated 29,600 new cases in 1994. Incidence is more than twice as high in men as in women, and is most frequent in men over age 40.

Mortality: An estimated 7,925 deaths in 1994.

Signs and Symptoms: A sore that bleeds easily and doesn't heal; a lump or thickening; a red or white patch that persists. Difficulty in chewing, swallowing, or moving tongue or jaws are often late changes.

Trends in Cancer Survival, by Race

Cases Diagnosed in 1960-63, 1970-73, 1974-76, 1977-79, 1983-89

	White					Black				
	Relative 5-Year Survival %					Relative 5-Year Survival %				
Site	1960-63[1]	1970-73[1]	1974-76[2]	1977-79[2]	1983-89[2]	1960-63[1]	1970-73[1]	1974-76[2]	1977-79[2]	1983-89[2]
All sites	39	43	50	51	55*	27	31	39	39	39
Oral cavity & pharynx	45	43	55	54	54	—	—	36	36	33
Esophagus	4	4	5	6	10*	1	4	4	3	7*
Stomach	11	13	14	16	17*	8	13	16	15	18
Colon	43	49	50	53	60*	34	37	46	48	49*
Rectum	38	45	49	50	58*	27	30	42	38	45
Liver	2	3	4	3	6*	—	—	1	6	5
Pancreas	1	2	3	2	3*	1	2	2	4	5*
Larynx	53	62	66	68	68	—	—	59	55	54
Lung & bronchus	8	10	12	14	13*	5	7	11	11	11
Melanoma of skin	60	68	80	82	84*	—	—	69†	52‡	72†
Female breast	63	68	75	75	81*	46	51	63	63	64
Cervix uteri	58	64	69	69	69	47	61	63	62	57*
Corpus uteri	73	81	89	86	85*	31	44	60	58	56
Ovary	32	36	36	38	40*	32	32	41	40	40
Prostate	50	63	68	72	79*	35	55	58	62	64*
Testis	63	72	79	88	93*	—	—	76†	—	84†
Urinary bladder	53	61	74	76	80*	24	36	48	55	61*
Kidney & renal pelvis	37	46	52	51	56*	38	44	49	52	51
Brain & nervous system	18	20	22	24	26*	19	19	27	28	31
Thyroid gland	83	86	92	92	94*	—	—	87	92	92
Hodgkin's disease	40	67	72	73	79*	—	—	69	73	74
Non-Hodgkin's lymphoma	31	41	48	48	52*	—	—	48	50	44
Multiple myeloma	12	19	24	25	27*	—	—	27	34	29
Leukemia	14	22	35	37	39*	—	—	31	30	30

Source: Cancer Statistics Branch, National Cancer Institute

[1]Rates are based on End Results Group data from a series of hospital registries and one population-based registry.

[2]Rates are from the SEER Program. They are based on data from population-based registries in Connecticut, New Mexico, Utah, Iowa, Hawaii, Atlanta, Detroit, Seattle-Puget Sound, and San Francisco-Oakland. Rates are based on follow-up of patients through 1990.

*The difference in rates between 1974-76 and 1983-89 is statistically significant ($p < 0.05$). †The standard error of the survival rate is between 5 and 10 percentage points. ‡The standard error of the survival rate is greater than 10 percentage points. —Valid survival rate could not be calculated.

Risk Factors: Cigarette, cigar, or pipe smoking; use of smokeless tobacco; excess use of alcohol.

Early Detection: Cancer can affect any part of the oral cavity, including the lip, tongue, mouth, and throat. Dentists and primary care physicians have the opportunity, during regular checkups, to see abnormal tissue changes and to detect cancer at an early, curable stage.

Treatment: Principal methods are radiation therapy and surgery. Chemotherapy is being studied as an adjunct to surgery in advanced disease.

Survival: Five-year survival rates vary substantially, depending on the site. Rates range from 25% for cancer of the hypopharynx to 90% for lip cancer. Overall, 5-year survival for oral cancer patients is about 52%.

SL 107305

Cancer in Minorities

In 1994, about 1,208,000 cancers will be diagnosed in the United States. About 120,000 of these cancers will be among black Americans and 35,000 among other minority Americans.

Cancer incidence and mortality rates are generally higher for black Americans than for whites. In 1990, the incidence rates were 423 per 100,000 for blacks and 393 for whites, about a 6% difference. In 1990, the mortality rates were 230 for blacks and 170 for whites.

Cancer sites for which blacks have significantly higher incidence and mortality rates include esophagus, uterine cervix, stomach, liver, prostate, larynx, and multiple myeloma. Rates for esophageal cancer are over three times higher among blacks than whites.

The 5-year survival rate for cancer in blacks diagnosed from 1983 through 1989 was about 39% compared with 55% for whites. A considerable part of this difference in survival can be attributed to late diagnosis. Many cancers are more frequently diagnosed in a localized stage among whites than among blacks. Most of these sites represent cancers for which screening tests are available or which present symptoms early in the disease process. Early detection and timely treatment can increase survival.

Incidence and mortality rates for other minority groups such as Hispanics are often lower than those for white or black Americans. Because cancer risk is strongly associated with lifestyle and behavior, differences in ethnic and cultural groups can provide clues to factors involved in the development of cancer such as dietary patterns, alcohol use, and sexual and reproductive behaviors involved in the development of cancer. Cultural values and belief systems can affect attitudes about seeking medical care or following screening guidelines (see p. 21). Socioeconomic factors such as lack of health insurance or transportation can impede access to care, and lead to late diagnosis and poor survival.

Number of Cancer Deaths for Black, American Indian, Chinese, Japanese, and Hispanic Persons, United States, 1990

Cancer Site	Black Males	Black Females	American Indian	Chinese	Japanese	Hispanic*
All sites	31,995	25,082	1,275	1,527	1,122	14,003
Oral cavity	1,000	311	23	60	23	232
Esophagus	1,433	541	19	45	32	233
Stomach	1,341	917	67	117	132	811
Colon & rectum	2,898	3,169	117	166	168	1,414
Liver & other biliary	757	615	68	168	66	769
Pancreas	1,442	1,581	52	65	77	795
Lung (male)	10,632	—	205	238	148	1,824
Lung (female)	—	4,512	117	145	75	787
Melanoma of skin	51	55	9	2	3	89
Breast (female)	—	4,659	89	88	79	1,246
Cervix uteri	—	972	47	22	12	296
Other uterus	—	899	12	15	14	168
Ovary	—	975	34	29	22	385
Prostate	5,181	—	59	42	56	728
Bladder	466	381	9	21	12	210
Kidney	563	382	39	12	14	355
Brain & CNS†	372	319	21	35	14	376
Lymphoma	747	573	50	47	42	688
Leukemia	854	737	52	47	27	735
Multiple myeloma	745	708	39	15	6	273

*Persons classified as of Hispanic origin on death certificates may be of any race. Hispanic origin reporting, however, may be incomplete on death certificates in some states. These numbers are believed to include over 90% of cancer deaths in Hispanics in 1990.

†CNS = Central nervous system.

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Prevention

Smoking

Cigarette smoking is responsible for 90% of lung cancer among men and 79% among women—about 87% overall. Smoking accounts for about 30% of all cancer deaths. Those who smoke two or more packs of cigarettes a day have lung cancer mortality rates 12 to 25 times greater than nonsmokers. (See Tobacco Use.)

Nutrition and Diet

Research is showing the important role nutrition plays in preventing cancer. Evidence indicates that people may reduce their cancer risk by observing these nutrition guidelines:

1. Maintain a desirable weight. Individuals 40% or more overweight increase their risk of colon, breast, prostate, gallbladder, ovary, and uterus cancers. Physicians can recommend a suitable diet and exercise regimen to help maintain appropriate weight and body fitness.

2. Eat a varied diet. A varied diet eaten in moderation offers the best hope for lowering the risk of cancer.

3. Include a variety of vegetables and fruits in the daily diet. Studies have shown that daily consumption of vegetables and fresh fruits is associated with a decreased risk of lung, prostate, bladder, esophagus, colorectal, and stomach cancers.

4. Eat more high-fiber foods such as whole grain cereals, breads, and pasta; and vegetables and fruits. High-fiber diets are a healthy substitute for fatty foods and may reduce the risk of colon cancer.

5. Cut down on total fat intake. A diet high in fat may be a factor in the development of certain cancers, particularly breast, colon, and prostate.

6. Limit consumption of alcohol, if you drink at all. Heavy drinking, especially when accompanied by cigarette smoking or smokeless tobacco use, increases risk of cancers of the mouth, larynx, throat, esophagus, and liver.

7. Limit consumption of salt-cured, smoked, and nitrite-cured foods. In areas of the world where salt-cured and smoked foods are eaten frequently, there is higher incidence of cancer of the esophagus and stomach. Modern methods of food processing and preserving appear to avoid the cancer-causing byproducts associated with older methods of food treatment.

Sunlight

Almost all of the more than 700,000 cases of basal and squamous cell skin cancer diagnosed each year in the US are sun-related (ultraviolet radiation). Epidemiologic evidence shows that sun exposure is a major factor in the development of melanoma and that incidence increases for those living near the equator. (See Selected Cancers: Skin Cancer.)

Alcohol

Oral cancer and cancers of the larynx, throat, esophagus, and liver occur more frequently among heavy drinkers of alcohol especially when accompanied by smoking cigarettes or chewing tobacco. (See Selected Cancers: Oral Cancer.)

Smokeless Tobacco

Use of chewing tobacco or snuff increases risk of cancer of the mouth, larynx, throat, and esophagus and is a highly addictive habit. (See Selected Cancers: Oral Cancer.)

Estrogen

Estrogen treatment to control menopausal symptoms can increase risk of endometrial cancer. However, including progesterone in estrogen replacement therapy helps to minimize this risk. Consultation with a physician will help each woman to assess personal risks and benefits. Continued research is needed in the area of estrogen use and breast cancer. (See Selected Cancers: Uterus and Cervix Cancer).

Occupational Hazards

Exposure to several different industrial agents (nickel, chromate, asbestos, vinyl chloride, etc.) increases risk of various cancers. Risk of lung cancer from asbestos is greatly increased when combined with cigarette smoking. (See Environmental Cancer Risks.)

Ionizing Radiation

Excessive exposure to ionizing radiation can increase cancer risk. Most medical and dental x-rays are adjusted to deliver the lowest dose possible without sacrificing image quality. Excessive radon exposure in homes may increase risk of lung cancer, especially in cigarette smokers. If levels are found to be too high, remedial actions should be taken.

Environmental Cancer Risks

The environmental causes of cancer include exposures in the community or workplace settings, as well as exposures determined by individual lifestyle choices (smoking, diet, medications, etc.).

The degree of cancer hazard posed by such risks depends on the concentration or intensity of the carcinogen in the environment and the exposure dose a person receives. These factors in combination create a range of risk. For example, in situations where high levels of carcinogen are present and where exposures are extensive, significant hazards may exist, but where concentrations are low and exposures limited, hazards are often negligible.

Risk Assessment

To protect people against unsafe exposures, risks should be assessed so that appropriate environmental standards can be set. **Risk assessment** is a two-step process: identifying the toxic properties of potential oncogenic hazards and measuring the extent of human exposure.

The first step, **hazard identification,** evaluates the chemical or physical nature of hazards and their oncogenicity in observed clinical and epidemiologic studies and in laboratory tests using animals or cell systems. Special attention is given to any evidence suggesting that cancer risk may increase with dose (dose-response relationships).

The second step, **exposure measurement,** determines the levels of hazards in the environment (air, water, food, etc.) and the extent to which people are actually exposed (how much they eat of a particular food, use a particular water source, etc.). Knowledge of how the body absorbs, metabolizes, and excretes chemicals or is exposed to radiation sources is essential to determine accurately the actual carcinogenic dose delivered to humans.

Unfortunately, evidence of risk for most potential carcinogens usually rests on the results of high-dose animal experiments or on human observations where high-dose exposures have occurred. To use such information in setting human safety standards, scientists must extrapolate from animals to humans and from high-dose to low-dose conditions. Both extrapolations involve much uncertainty; therefore conservative assumptions are used so that risk assessment will err on the side of safety. For cancer safety standards, only increased risks of one case or less per million persons over a lifetime are usually accepted.

Safety standards developed in this way for chemical or radiation exposures are the basis for federal regulatory activities at the Food and Drug Administration, the Environmental Protection Agency, and the Occupational Safety and Health Administration. The application of laws and procedures by which standards are implemented and risks are controlled is called **risk management.**

Chemicals and Radiation

Not all chemicals or all forms of radiation cause cancer. Only a limited number of chemicals (for example, benzene, asbestos, vinyl chloride, arsenic, aflatoxins) show definite evidence of human carcinogenicity or are probable human carcinogens based on animal experiments (for example, chloroform, dichlorodiphenyltrichloroethane [DDT], formaldehyde, polychlorinated biphenyls [PCBs], polycyclic aromatic hydrocarbons). The only forms of radiation proven to cause human cancer are ionizing radiation (for example, x-rays, radon, cosmic rays) and ultraviolet radiation (principally UV-B radiation).

Unproven Risks

Public concern about environmental cancer risks often focuses on risks for which no carcinogenicity has been proven or on situations where known carcinogen exposures are at such low levels that risks are negligible. For example:

1. Non-ionizing radiation. Electromagnetic radiation at frequencies below ionizing and ultraviolet levels has not been shown to cause cancer. While some epidemiologic studies suggest associations with cancer, others do not, and experimental studies have not yielded reproducible evidence of carcinogenic mechanisms. Low frequency radiation includes radiowaves, microwaves, and radar, as well as power frequency radiation arising from the electric and magnetic fields associated with electric currents (often called ELF or extremely low frequency radiation).

2. Pesticides. Many kinds of pesticides (insecticides, herbicides, etc.) are widely used in producing and marketing our food supply. While some of these chemicals cause cancer at high doses in experimental animals, the very low concentrations found in some foods are generally within established safety levels. Environmental pollution by slowly degraded pesticides such as DDT, a result of past agricultural practices, can lead to food chain bioaccumulation and to persistent residues in body fat. Such residues have been suggested as a possible risk factor for breast cancer; concentrations in tissue are low, however, and the evidence is not conclusive.

Continued research regarding pesticide use is essential for maximum food safety, improved food production through alternative pest control methods, and reduced pollution of the environment. At the same time, banning any man-made chemicals with carcinogenic potential (as required for processed foods under the 1958 Delaney Amendment of the Food and Drug Act) is unrealistic, given the very low concentrations involved and the value of pesticides in sustaining our food supply. Scientists and consumer groups stress the important health benefits of a diet which includes many fruits and vegetables in contrast to the minimal risks associated with pesticide residues.

3. Toxic wastes. Toxic wastes in dump sites can threaten

human health through air, water, and soil pollution. Although many toxic chemicals contained in such wastes can be carcinogenic at high doses, most community exposures appear to involve very low or negligible dose levels. Clean-up of existing dump sites and close control of toxic materials in the future is essential to ensure healthy living conditions in our industrialized society.

4. Nuclear power plants. Ionizing radiation emissions from nuclear facilities are closely controlled and involve negligible levels of exposure for communities near such plants. Although reports about cancer case clusters in such communities have raised public concern, studies show that clusters do not occur more often near nuclear plants than they do by chance elsewhere in the population.

Early Detection

Each person should be aware of the cancer early detection guidelines that pertain to them. To understand the role of the cancer-related checkup, the ACS adopted the following definitions. **Screening** is the search for disease in persons without symptoms. Once a person has had a positive screening test, or once signs or symptoms have been identified, further tests are considered diagnostic. **Detection** is the discovery of an abnormality in a person with or without symptoms. **Diagnostic evaluation** is the evaluation of a patient who has signs or symptoms suggestive of disease to determine the actual existence and nature of the disease.

The following recommendations are for the early detection of cancer in asymptomatic persons on an individual basis. The recommendations are intended to help individual providers and their patients determine the most appropriate early cancer detection tests to meet their individual needs.

Guidelines for the early detection of cancer in people without symptoms are recommended by the American Cancer Society as follows: A cancer-related checkup by a physician every three years for persons aged 20-39 and annually for those aged 40 and over. Some persons at particular risk for certain cancers may need tests more often and should discuss this with their doctor. The checkup should always include health counseling (how to quit smoking, etc.) and exams for cancer of the breast, uterus, cervix, colon, rectum, prostate, mouth, skin, testes, thyroid, and lymph nodes.

In 1989 and 1990, Congress passed legislation mandating Medicare coverage for cervical and breast cancer screening, respectively. For women over age 65, Medicare currently covers a Pap smear once every three years and a mammogram every two years. Although this policy does not strictly conform to ACS screening recommendations, it does begin to address the benefits of early detection.

Breast

The American Cancer Society recommends that screening mammography begin by age 40. Women aged 40-49 should have a mammogram every 1-2 years, depending on physical and mammographic findings. Women aged 50 and older should have mammograms yearly. The ACS recommends the monthly practice of breast self-exam (BSE) by women 20 years and older as a routine good health habit. Examination of the breast by a health care professional should be done every three years from ages 20-40 and then every year.

Colon and Rectum

The American Cancer Society recommends three tests for the early detection of colon and rectum cancer in people without symptoms. A digital rectal examination by a physician during an office visit should be performed every year after the age of 40; the stool blood test is recommended every year after age 50; and sigmoidoscopy, preferably flexible, should be performed every 3 to 5 years.

Uterus

For cervical cancer, women who are or have been sexually active, or have reached age 18, should have an annual Pap test and pelvic examination. After a woman has had three or more consecutive satisfactory normal annual examinations, the Pap test may be performed less frequently at the discretion of her physician.

Women at high-risk for endometrial cancer (those who have a history of infertility, obesity, failure to ovulate, abnormal uterine bleeding, or unopposed estrogen or tamoxifen therapy) should have an endometrial tissue sample taken at menopause and thereafter at the discretion of the physician.

Prostate

Men who have reached 50 years of age and older should have a digital rectal examination (DRE) annually. Annual prostate-specific antigen blood testing should be performed on men age 50 and older.

SL 107309

Tobacco Use

Smoking is the most preventable cause of death in our society. Tobacco use is responsible for nearly one in five deaths in the United States. Based upon data from the American Cancer Society's Cancer Prevention Study II, it is estimated that smoking is related to about 419,000 US deaths each year. Although the number of cardiovascular deaths are declining, smoking-related cancer deaths continue to rise. According to the World Health Organization approximately 3 million people die worldwide each year as a result of smoking. Smokers lose an average of 15 years of life.

The risks of dying of lung cancer are 22 times higher for male smokers and 12 times higher for female smokers than for people who have never smoked. In addition to being responsible for 87% of lung cancers, smoking is also associated with cancers of the mouth, pharynx, larynx, esophagus, pancreas, uterine cervix, kidney, and bladder. Smoking accounts for 30% of all cancer deaths, is a major cause of heart disease, and is associated with conditions ranging from colds and gastric ulcers to chronic bronchitis, emphysema, and cerebrovascular disease.

Trends in Smoking

The National Health Interview Survey (NHIS) reports that cigarette smoking among adults aged 18 and over declined from 42% in 1965 to 25% in 1991. The NHIS data from 1974 to 1991 show:

- Smoking among women decreased from 33% to 24%.
- Smoking among men dropped from 43% to 28%.
- Rates for college graduates declined from 28% to 14%.
- Rates for persons without a high school education decreased slightly from 44% to 37%.

Data from the 1991 NHIS indicate that the decline in cigarette smoking among adults has begun to level off. Between 1990 and 1991, smoking rates rose for the first time in nearly 20 years due to increased smoking among blacks and women. Contributing to this rise may be the growth in discount cigarette products and the recent surge in the tobacco industry's domestic advertising and promotion expenditures.

According to the 1989 Surgeon General's Report, decisions to quit or not to start through 1985 will postpone or prevent an additional 2 million smoking-related deaths between 1986 and the year 2000.

Per capita cigarette consumption dropped 37% from 1973 to 1992 (4,148 to 2,640). This is the lowest per capita cigarette consumption since 1942.

Profile of Smokers

In 1991, the number of current smokers in the US: 46 million.

The prevalence of smoking is highest among people who live below poverty level: men 39%; women 29%. Smoking rates are highest in the age group 25-44.

Approximately 50% of smokers start smoking regularly before age 18.

More than 3,000 teenagers become regular smokers each day in the United States.

According to the Centers for Disease Control and Prevention's 1991 Youth Risk Behavior Survey:

- 70% of all students in grades 9-12 reported ever trying cigarettes.
- About 13% of high school students reported frequent cigarette use.

Cost of Tobacco

The 1992 Surgeon General's Report estimates that the total lifetime excess medical care costs for smokers exceed those for nonsmokers by $501 billion.

The US Congress Office of Technology Assessment estimates that cigarettes cost Americans $68 billion annually in tobacco-related health care costs and lost productivity. The cost of treating smoking-related diseases and lost productivity amounts to $2.59 for each pack of cigarettes sold in the US. For every 10% increase in the price of tobacco products, it is estimated that tobacco consumption would decline 4%.

Cigarette Exports

US cigarette exports have increased due to aggressive marketing by tobacco companies and expanding foreign markets. A September 1993 tobacco report of the US Department of Agriculture estimates:

- US cigarette exports have increased about 275% since 1985.
- US cigarette exports to Japan have increased almost 800%, from 6.5 billion in 1985 to 56 billion in 1993.
- Exports to South Korea have grown from 1.3 billion in 1987 to 4 billion in 1993.
- Exports to the countries that formerly comprised the Soviet Union have increased from 4.6 billion in 1991 to 13.6 billion in 1993.
- US cigarette output from July 1992 to June 1993 was 702 billion. Even though domestic consumption has dropped, this recent increase in output is the result of

foreign demand of US tobacco leaf and US manufacturers offering discounted cigarettes and lower prices on premium brands.

Nicotine Addiction

Tobacco smoke contains over 4,000 chemical compounds including at least 43 different carcinogenic substances.

The 1988 Surgeon General's Report on Nicotine Addiction concluded:

- Cigarettes and other forms of tobacco are addicting.
- Nicotine is the drug in tobacco that causes addiction.
- The pharmacologic and behavioral processes that determine tobacco addiction are similar to those that determine addiction to drugs such as heroin and cocaine.

Nicotine is found in substantial amounts in tobacco. It is absorbed readily from tobacco smoke in the lungs and from smokeless tobacco in the mouth or nose and is rapidly distributed throughout the body.

Smoking Cessation

By 1991, almost 44 million Americans had quit smoking cigarettes, nearly half of all living adults who ever smoked.

In September 1990, the Surgeon General outlined the benefits of smoking cessation:

- People who quit smoking, regardless of age, live longer than people who continue to smoke.
- Smokers who quit before age 50 have half the risk of dying in the next 15 years compared with those who continue to smoke.
- Quitting smoking substantially decreases the risk of lung, laryngeal, esophageal, oral, pancreatic, bladder, and cervical cancers.
- Benefits of cessation include risk reduction for other major diseases including coronary heart disease and cardiovascular disease.

A 1989 Gallup Survey reported that the following people want to quit smoking:

- 57% of smokers 50 and older
- 67% of smokers aged 30-49
- 68% of smokers aged 18-29.

Environmental Tobacco Smoke

In December 1992, the Environmental Protection Agency concluded that widespread exposure to environmental tobacco smoke (ETS) presents "a serious and substantial" public health problem in the United States. Each year about 3,000 nonsmoking adults die of lung cancer as a result of breathing the smoke of other's cigarettes.

- The risk of dying of lung cancer is 30% higher for a nonsmoker living with a smoker compared with a nonsmoker living with a nonsmoker.
- It is estimated that ETS causes 35,000 to 40,000 excess heart disease deaths among people who are not current smokers.
- ETS contains essentially all of the same carcinogens and toxic agents that are inhaled by the smoker.
- ETS can result in aggravated asthmatic conditions, impaired blood circulation, bronchitis, and pneumonia.
- ETS poses additional health hazards for unborn and young children. According to the 1988 NHIS, about 10 million children under the age of six are exposed to ETS by a household member.

Children exposed to secondhand smoke have increased risks of respiratory illnesses and infections, impaired development of lung function, and middle ear infections. Infants born to women who smoked during pregnancy are more likely to die of Sudden Infant Death syndrome.

Smokeless Tobacco

There has been a resurgence in the use of all forms of smokeless tobacco—plug, leaf, and snuff—but the greatest cause for concern centers on the increased use of "dipping snuff." In this practice, tobacco that has been processed into a coarse, moist powder is placed between the cheek and gum, and nicotine, along with a number of carcinogens, is absorbed through the oral tissue. Dipping snuff is highly addictive, and exposes the body to levels of nicotine equal to those of cigarettes.

- In 1986, the US Surgeon General concluded that the use of smokeless tobacco "is not a safe substitute for smoking cigarettes. It can cause cancer and a number of noncancerous oral conditions and can lead to nicotine addiction and dependence."
- Oral cancer occurs several times more frequently among snuff dippers compared with non-tobacco users.
- The excess risk of cancer of the cheek and gum may reach nearly fiftyfold among long-term snuff users.
- The use of smokeless tobacco is increasing among male adolescents and young male adults.
- According to the US Department of Agriculture, US output of moist snuff has risen 83% from about 30 million pounds in 1981 to an estimated 55 million pounds in 1993.
- About 5 million US adults use smokeless tobacco.
- The Centers for Disease Control and Prevention's 1991 Youth Risk Behavior Survey reported that 19% of male high school students used smokeless tobacco.

Industrial Hazards

Industrial workers are especially susceptible to lung diseases due to the combined effects of cigarette smoke and exposure to certain toxic industrial substances, such as fumes from rubber and chlorine, and dust from cotton and coal. Exposure to asbestos in combination with cigarette smoking increases an individual's lung cancer risk nearly 60 times. Smoking also enhances lung cancer risk in underground miners exposed to radon.

The American Cancer Society

In 1913, 10 physicians and five laymen founded the American Society for the Control of Cancer. Its stated purpose was to "disseminate knowledge concerning the symptoms, treatment, and prevention of cancer; to investigate conditions under which cancer is found; and to compile statistics in regard thereto." Later renamed the American Cancer Society, Inc., the organization now consists of over 2 million Americans working to conquer cancer.

Organization: The American Cancer Society, Inc., consists of a National Society, 57 Divisions, and over 3,400 Units.

The National Society: A 285-member Board of Directors provides representation from the 57 Divisions.

The National Society is responsible for overall planning and coordination, providing technical help and materials to Divisions and Units, administering programs of research, medical grants and clinical fellowships, and performing public and professional education at the national level.

The 57 Divisions: Located in all states plus five metropolitan areas, the District of Columbia, and Puerto Rico, the Divisions are governed by members of Divisional boards of directors.

The Units: These are organized to cover the counties in the United States. There are thousands of community leaders who direct the Society's programs at this level.

Descriptions of some of the Society's major programs follow.

Research

The American Cancer Society is the largest private source of cancer research funds in the United States, second only to the federal government's National Cancer Institute in total dollars spent.

In fiscal year 1993, the Society invested approximately $100 million in research—slightly over 26% of its budget. To date, the Society has invested more than $1.5 billion in cancer research.

The research program consists of two components: extramural grants and awards, and intramural epidemiology research. The extramural program supports investigator-initiated projects taking place in leading centers across the country. Applications for grants are subjected to a rigorous external peer review which ensures that only the highest quality applications receive funding. The success of the Society's research program is exemplified by the fact that 26 Nobel Prize winners received grant support from the Society early in their careers.

Epidemiology

The Society supports an active program of epidemiologic research at its National office. This program analyzes trends in cancer occurrence and has conducted three large prospective studies of cancer risk in Americans over the past 40 years.

- The Hammond-Horn study demonstrated the effects of smoking on mortality and cancer risk in 188,000 men observed from 1952-1955.
- Cancer Prevention Study I, conducted from 1959 through 1972, encompassed 1 million men and women in 25 states and examined potential cancer risk factors related to the environment and to individual lifestyles.
- Cancer Prevention Study II (CPS II), was launched in 1982 and is still in progress, examining the habits and exposures of more than 1 million Americans. Causes of death among these people over subsequent years are being studied to learn how lifestyles and environmental factors affect the development of cancer.

Over 77,000 volunteers enrolled the men and women in CPS II. These volunteer researchers distributed questionnaires to participants who were asked about their lifestyles.

Another questionnaire was sent in October 1992, to 160,000 households participating in CPS II. This questionnaire seeks additional dietary information to gain more specific knowledge about how diet impacts disease.

Public Education

The Society's Public Education programs focus on tobacco control, the relationship between diet and cancer, comprehensive school health education and early detection.

The programs are divided into two audiences: adult and youth. Adults are reached through the worksites, healthsites, and the community. Volunteers are recruited and trained both to promote and to deliver programs.

Examples of adult education include **Taking Control,** which identifies 10 steps to a healthier lifestyle; **Smart Move,** a single-session stop-smoking program; **Self-Defense,** which explains how a person can work with a health care provider to become familiar with cancer tests and examinations; and **Special Touch,** which explains breast cancer and early detection techniques.

The Society has joined with other health, education, and social service agencies to promote comprehensive school health education. The best way to ensure good cancer education in the schools, comprehensive school health

education is the means of delivering a planned health education curricula from pre-school to grade 12.

The Society's education programs emphasize the importance of developing good health habits. Beginning in preschool, students learn about the dangers of tobacco use with **Starting Free: Good Air for Me.** Other tobacco prevention programs include: **An Early Start to Good Health** (grades K-3), and **Health Myself** (grades 7-9). **Changing the Course** curricula help elementary and secondary students make good dietary choices that will reduce their risk of developing a number of diseases, including cancer. High school students can also learn in-depth about cancer through **Right Choices.**

Professional Education

The Society's Professional Education Department provides health care professionals with the latest information on developments in cancer prevention, early detection, and treatment through:

- National conferences and workshops (The Society is accredited by the Accreditation Council for Continuing Medical Education)
- Materials (videotapes, slide programs, audiotapes, textbooks, proceedings of conferences and workshops, and booklets on key issues are examples, in addition to two national journals for health care professionals)
- Clinical awards, professorships, and scholarships (Clinical Oncology Fellowships, Clinical Oncology Career Development Awards, Oncology Social Work Awards, Cancer Control Career Development Awards). Over the past 40 years, Clinical Fellowships and Junior Faculty Clinical Fellowships have supported the education of more than 9,600 individuals.
- Nursing programs (a newsletter, scholarships, and professorships)
- Information on questionable methods of cancer management.

Patient Services

In 1993, approximately 745,141 cancer patients were reached through the service and rehabilitation programs of the American Cancer Society.

Service Programs

Community Connection: Resources, Information, and Guidance: provides information about Society services and other resources in the community to meet the practical, social, psychological, and other support needs of cancer patients and their families.

Transportation: Trained volunteer drivers provide transportation that enables patients to get to and from treatment.

Home Care Items: offers supplies and equipment to care for the patient at home.

Rehabilitation Programs

Reach to Recovery: This one-on-one visitation program provides information and support to women with experience with breast cancer; additional information for husbands, children, and friends of breast cancer patients is available.

Laryngectomy Rehabilitation: Spearheaded by the International Association of Laryngectomees, this program provides pre- and/or postoperative support for patients by laryngectomee visitors.

Look Good...Feel Better: In partnership with the Cosmetic, Toiletry and Fragrance Association and National Cosmetology Association, this program is an opportunity for people undergoing cancer treatment to develop skills to cope with appearance changes.

CanSurmount: A short-term program for cancer patients and their families. Trained volunteers who have experienced the same type of cancer offer support through one-to-one visits.

Ostomy Rehabilitation: In cooperation with the United Ostomy Association and enterostomal therapists, trained volunteers who have experienced the same type of surgery as the patient offer help on a one-to-one basis.

Children's Camps: Many Divisions offer camps for children who have or have had cancer. These camps can cope with the special needs of children undergoing treatment.

Patient and Family Education Programs

Group and individual programs designed to help patients of all ages and their families understand the complexities of cancer.

I Can Cope: offers information on cancer treatments, nutrition, resources, and other issues to patients and families.

Group Support Programs

Offered to patients, families and friends, these programs vary according to each Division's needs and resources.

Public Issues

Cancer has become a political, as well as a medical, social, psychological, and economic issue. Policy makers at all levels of government make decisions which impact the lives of more than 8 million Americans with a history of cancer, their families, and millions of potential cancer patients. Therefore, the Society's Public Issues program educates policy makers about cancer and how it affects the individuals and families they represent. The Society is organized to advocate for public policy initiatives which relate to and affect:

- the welfare of the cancer patient and his/her family
- risks to and protection of the potential cancer patient
- cancer research

The Society supports increased federal funding and provides direction for the federal government's cancer research program run by the National Cancer Institute. The Public Issues program also supports the work of the Society's cancer education and service programs by influencing public policy on tobacco control, access to health care, employment discrimination against cancer patients, environmental cancer issues, and other issues affecting cancer survivors and their families. Among the major public policy changes that the Society has advocated are:

- smoking ban on airlines.
- restricted tobacco advertising.
- expanded access to screening mammography and Pap tests.

Costs of Cancer

The financial costs of cancer are great both for the individual and for society as a whole. Cancer accounts for about 10% of the total cost of disease in the US and its share of the total cost of premature deaths was about 18% of all causes of death in 1985. The National Cancer Institute estimates overall costs for cancer at $104 billion; $35 billion for direct medical costs, $12 billion for morbidity costs (cost of lost productivity), and $57 billion for mortality costs. Over half of the direct medical costs are due to treatment of breast ($6 billion), lung ($5 billion), and prostate ($5 billion) cancers. The cost of cancer screenings, including mammograms, Pap smears, and colorectal exams adds another $3 to $4 billion to overall cancer costs, but reduces suffering and saves lives if cancer is detected at an earlier, treatable stage.

The current debate on health care reform highlights these figures in a new way. An estimated $900 billion will be spent on health care this year in the United States, yet 34 million Americans do not have any health insurance. The number of uninsured, moreover, does not take into account the tens of millions of Americans now living with disease or disability who daily encounter problems with our health care system, including 8 million Americans who have had cancer.

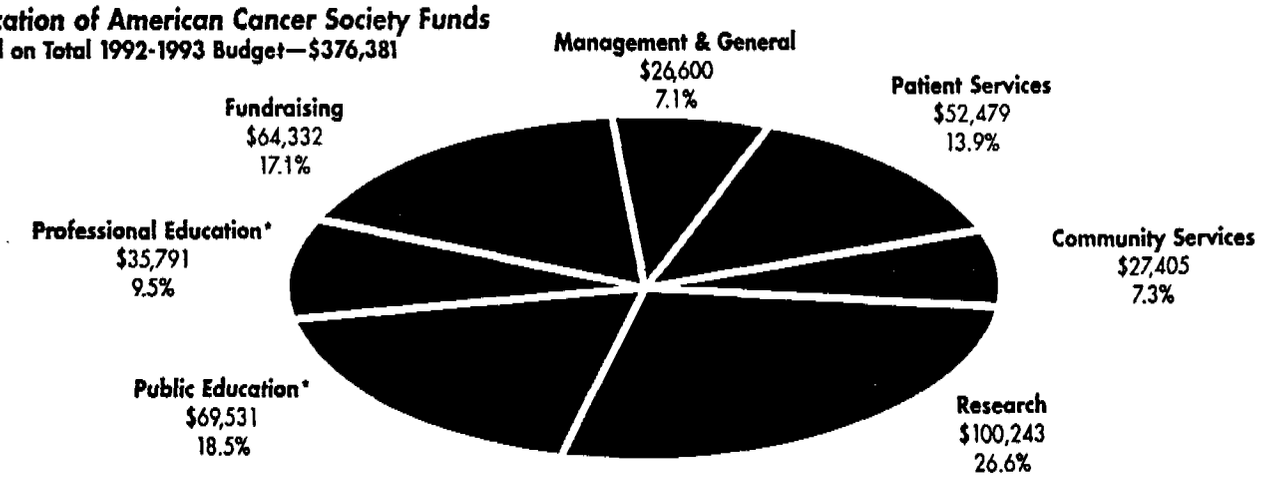
The American Cancer Society's Statement of Principles on Health Care System Reform calls for:

- high quality cancer care for all Americans;
- expanded support for basic and clinical cancer research;
- comprehensive school health education as a key cost-saving primary prevention strategy; and,
- an increase of at least $2.00 in the federal cigarette excise tax and a comparable increase for other tobacco products to prevent death and disease from smoking.

The Disadvantaged

Since 1988, the Society has funded over 100 community demonstration projects to provide cancer education messages and programs (cancer screening and education, transportation, and patient service support) to the poor and underserved of our country. Overall, approximately 10 to 12 million adults in socioeconomically disadvantaged populations are reached annually with public education programs. In addition, the Society currently has over $2 million in research grants in effect in this area.

Allocation of American Cancer Society Funds
Based on Total 1992-1993 Budget—$376,381



*The Society's cancer prevention, detection, and treatment programs are carried out through these areas.
Figures taken from 1992 Annual Report (in thousands).

Summary of Research Grants & Fellowships Awarded by the American Cancer Society (National and Division) During the Fiscal Year Ending August 31, 1993 (Subject to Audit)

Albany Medical College, Albany, NY	(3)	$ 333,000	Medical College of Virginia, Richmond	(2)	$ 113,000	Univ. of Colorado Hlth. Sci. Center, Denver	(11)	1,488,500
Albert Einstein College of Medicine, Bronx, NY	(8)	797,000	Medical College of Wisconsin, Milwaukee	(1)	63,000	Univ. of Colorado, Boulder	(8)	898,900
American Assn. for Cancer Research, Philadelphia, PA	(1)	140,000	Medical Foundation of Buffalo, Buffalo, NY	(1)	180,000	Univ. of Connecticut, Farmington	(2)	121,000
American Health Foundation, New York, NY	(2)	241,000	Medical Univ. of South Carolina, Charleston	(3)	79,000	Univ. of Delaware, Newark	(2)	272,000
Baylor College of Medicine, Houston, TX	(9)	1,000,000	Memorial Sloan-Kettering Cancer Ctr., New York, NY	(19)	$2,250,500	Univ. of Florida, Gainesville	(1)	200,000
Beth Israel Hospital, Boston, MA	(3)	271,580	Michigan State Univ., East Lansing	(1)	120,000	Univ. of Georgia, Athens	(1)	88,000
Boston City Hospital, Boston, MA	(1)	90,500	Montana State Univ., Bozeman	(2)	128,000	Univ. of Hawaii, Honolulu	(1)	200,000
Boston College, Chestnut Hill, MA	(1)	90,500	Montefiore Medical Center, Bronx, NY	(1)	52,000	Univ. of Houston, TX	(1)	206,000
Boston Univ., Boston, MA	(3)	458,000	MRC Lab. of Mol. Biology, Cambridge, England	(1)	80,000	Univ. of Iowa, Iowa City	(4)	395,000
Bowman Gray Sch. of Medicine, Winston-Salem, NC	(4)	410,000	Mt. Sinai Medical Center, New York, NY	(4)	369,300	Univ. of Kansas, Lawrence	(1)	141,000
Brandeis Univ., Waltham, MA	(3)	272,000	Natl. Jewish Hospital & Research Ctr., Denver, CO	(1)	100,000	Univ. of Kentucky, Lexington	(1)	90,000
Brigham & Women's Hospital, Boston, MA	(5)	701,000	New England Medical Center Hospitals, Boston, MA	(2)	306,000	Univ. of Illinois, Chicago	(4)	324,000
Brigham Young Univ., Provo, UT	(1)	125,000	New Jersey Medical School, Newark	(1)	100,000	Univ. of Illinois, Urbana	(2)	246,500
Brown Univ., Providence, RI	(3)	316,000	New York Medical College, Valhalla	(2)	261,000	Univ. of Maryland, Baltimore	(4)	336,000
California Inst. of Biological Res., La Jolla	(1)	186,000	New York Univ., NYC	(9)	1,109,000	Univ. of Maryland, College Park	(1)	85,500
California Inst. of Technology, Pasadena	(7)	626,400	National Institutes of Health, Bethesda, MD	(2)	128,000	Univ. of Massachusetts Med. Center, Worcester	(7)	836,472
Carle Foundation Hospital, Urbana, IL	(1)	15,000	North Carolina State Univ., Raleigh	(1)	32,000	Univ. of Miami, FL	(5)	681,000
Carnegie Institution of Washington, Baltimore, MD	(4)	254,190	North Dakota State Univ., Fargo	(1)	225,500	Univ. of Michigan, Ann Arbor	(16)	2,000,500
Case Western Reserve Univ., Cleveland, OH	(4)	406,000	Northwestern Univ., Chicago, IL	(7)	960,500	Univ. of Minnesota, Minneapolis	(10)	1,047,000
Chicago Medical School, North Chicago, IL	(2)	282,000	Oak Ridge Assoc., Univ. of Tennessee, Oak Ridge	(1)	118,000	Univ. of Nebraska Med. Center, Omaha	(4)	441,000
Children's Hospital, Boston, MA	(3)	273,500	Oberlin University, Oberlin, OH	(1)	76,000	Univ. of Nebraska, Lincoln	(1)	89,000
Children's Hospital of Los Angeles, Los Angeles, CA	(2)	290,000	Ohio State Univ., Columbus	(6)	1,001,000	Univ. of New Mexico, Albuquerque	(2)	89,125
City of Hope National Medical Ctr., Duarte, CA	(2)	364,000	Oklahoma Medical Res. Fdn., Oklahoma City	(1)	48,000	Univ. of New Orleans, LA	(1)	73,000
Cold Spring Harbor Lab., Cold Spring Harbor, NY	(5)	430,075	Oregon Health Science Univ., Portland	(2)	188,000	Univ. of North Carolina, Chapel Hill	(15)	1,592,000
Colorado State Univ., Fort Collins	(1)	50,190	Oregon State Univ., Corvallis	(2)	95,000	Univ. of Oklahoma, Oklahoma City	(2)	413,000
Columbia Univ., New York, NY	(13)	1,915,600	Pennsylvania State Univ., Hershey	(2)	410,000	Univ. of Oregon, Eugene	(9)	1,011,000
Cornell Univ., New York, NY	(3)	315,000	Pennsylvania State Univ., University Park	(3)	247,300	Univ. of Oxford, Oxford, England	(1)	78,000
Dana-Farber Cancer Institute, Boston, MA	(9)	835,000	Philadelphia Coll. Pharm. & Science, Philadelphia, PA	(1)	71,000	Univ. of Pennsylvania, Philadelphia	(11)	1,098,850
Dartmouth College, Hanover, NH	(1)	75,000	Picower Institute Med. Research, Manhasset, NY	(1)	140,000	Univ. of Pittsburgh, PA	(8)	892,000
Dartmouth-Hitchcock Medical Center, Lebanon, NH	(2)	310,000	Pittsburgh Cancer Research Institute, PA	(3)	563,000	Univ. of Rochester, NY	(8)	703,383
Drexel Univ., Philadelphia, PA	(1)	180,000	Princeton Univ., Princeton, NJ	(9)	1,079,000	Univ. of South Carolina, Columbia	(1)	191,000
Duke Univ., Durham, NC	(18)	1,927,000	Public Health Res. Inst. of New York, NYC	(3)	354,000	Univ. of South Florida, Tampa	(1)	135,000
Eleanor Roosevelt Inst. for Cancer Res., Denver, CO	(1)	105,000	Purdue Univ., West Lafayette, IN	(2)	122,000	Univ. of Southern California, Los Angeles	(3)	1,190,000
Eastern Virginia Medical School, Norfolk	(2)	294,000	Reed College, Portland, OR	(1)	93,000	Univ. of Tennessee, Knoxville	(2)	62,000
Emory Univ., Atlanta, GA	(5)	474,000	Rockefeller Univ., New York, NY	(1)	180,000	Univ. of Tennessee, Memphis	(3)	345,000
European Mol. Biol. Laboratory, Heidelberg, Germany	(1)	79,500	Roger Williams General Hospital, Providence, RI	(1)	125,000	Univ. of Texas MD Anderson Ca. Ctr., Houston	(11)	1,516,000
Foundation for Biomedical Research, Washington, DC	(1)	10,000	Roswell Park Memorial Institute, Buffalo, NY	(4)	444,000	Univ. of Texas, Austin	(1)	50,000
Fox Chase Cancer Center, Philadelphia, PA	(8)	921,000	Rush Presbyterian-St Luke's Med. Ctr., Chicago, IL	(2)	125,000	Univ. of Texas Med. Br., Galveston	(1)	50,000
Fred Hutchinson Cancer Res. Center, Seattle, WA	(8)	747,970	Rutgers, State Univ. of New Jersey, Piscataway	(5)	603,000	Univ. of Texas Southwestern Med. Ctr. at Dallas	(14)	1,649,000
Georgetown Univ., Washington, DC	(4)	638,000	State Univ. of New York (SUNY) at Stony Brook	(11)	1,238,000	Univ. of Texas Hlth. Sci. Ctr. at Houston	(1)	90,500
Georgia Inst. of Technology, Atlanta, GA	(1)	180,000	State Univ. of New York (SUNY) at Syracuse	(1)	90,000	Univ. of Texas Hlth. Sci. Ctr. at San Antonio	(2)	193,000
Hahnemann University, Philadelphia, PA	(1)	8,313	Salk Institute, La Jolla, CA	(5)	525,500	Univ. of Texas Health Ctr., Tyler	(1)	180,000
Harrington Cancer Center, Amarillo, TX	(1)	100,000	Scripps Clinic & Research Foundation, La Jolla, CA	(3)	206,810	Univ. of Utah, Salt Lake City	(5)	486,000
Harvard Univ. Medical School, Boston, MA	(13)	1,320,150	Southwest Foundation Biomed. Res., San Antonio, TX	(1)	88,000	Univ. of Vermont, Burlington	(5)	749,000
Harvard Univ., Cambridge, MA	(5)	491,500	St. Jude's Children's Research Hospital, Memphis, TN	(3)	354,000	Univ. of Virginia, Charlottesville	(10)	1,423,000
Henry Ford Hospital, Detroit, MI	(1)	60,000	St. John's Univ., Jamaica, NY	(2)	194,000	Univ. of Washington, Seattle	(11)	1,117,670
Hunter College CUNY, New York, NY	(1)	125,000	St. Louis Univ., St. Louis, MO	(3)	364,000	Univ. of Wisconsin, Madison	(13)	2,357,000
Imperial Cancer Research Fund, London, England	(1)	79,000	Stanford Univ., Stanford, CA	(27)	2,358,451	Univ. of Wisconsin, Milwaukee	(1)	99,000
Indiana Univ., Indianapolis	(4)	506,500	Texas A & M Univ., College Station, TX	(2)	181,000	Univ. of Wyoming, Laramie	(1)	166,000
Indiana Univ., Bloomington	(3)	372,300	Thomas Jefferson Univ., Philadelphia, PA	(7)	932,500	Utah State Univ., Logan	(1)	90,000
Intl. Union Against Cancer, Geneva, Switzerland	(2)	705,000	Tufts Univ., Boston, MA	(5)	468,000	Vanderbilt Univ., Nashville, TN	(7)	991,000
Iowa State Univ., Ames	(1)	105,000	University Hospitals of Cleveland, Cleveland, OH	(2)	290,000	Virginia Polytechnic Inst., Blacksburg	(1)	127,000
Jackson Laboratory, Bar Harbor, ME	(41)	698,000	UMDNJ-Robert Wood Johnson Medical School, NJ	(2)	290,000	W. Alton Jones Cell Sci. Ctr., Lake Placid, NY	(2)	400,000
Johns Hopkins Univ., Baltimore, MD	(28)	3,538,000	Univ. of Alabama, Birmingham	(5)	688,500	Washington State Univ., Pullman	(2)	195,000
Kaiser Permanente Health Research, Portland, OR	(1)	90,000	Univ. of Arizona, Tucson	(6)	836,000	Washington Univ., St Louis, MO	(5)	495,670
Kansas State Univ., Manhattan	(2)	184,000	Univ. of Arkansas for Med. Science, Little Rock	(4)	420,000	Wayne State Univ., Detroit, MI	(5)	443,000
La Jolla Cancer Research Foundation, La Jolla, CA	(4)	522,000	Univ. of California at Berkeley	(9)	800,000	Wesleyan Univ., Middletown, CT	(3)	279,500
La Jolla Inst. Allergy and Immunology, La Jolla, CA	(1)	210,000	Univ. of California at Davis	(5)	381,500	West Virginia Univ., Morgantown	(2)	206,000
Louisiana State Univ. Med. Ctr., Shreveport, LA	(2)	270,000	Univ. of California at Irvine	(11)	963,100	Whitehead Institute, Cambridge, MA	(4)	242,500
Lankenau Medical Research Center, Wynnewood, PA	(2)	300,500	Univ. of California at Los Angeles	(15)	1,525,500	Wichita State University, Wichita, KS	(1)	59,000
Loyola Univ. of Chicago, Maywood, IL	(1)	98,000	Univ. of California at Riverside	(1)	$ 210,000	William Patterson College, Wayne, NJ	(1)	105,000
Massachusetts General Hospital, Charlestown	(8)	721,000	Univ. of California at Santa Barbara	(4)	274,000	Wistar Institute, Philadelphia, PA	(4)	407,500
Massachusetts Inst. of Technology, Cambridge	(9)	871,020	Univ. of California at San Francisco	(23)	2,564,000	Yale Univ., New Haven, CT	(27)	2,915,274
Mayo Clinic Foundation, Rochester, MN	(1)	78,000	Univ. of California at San Diego	(14)	1,324,600	Subtotal	(847)	$95,838,887
McLaughlin Research Inst., Great Falls, MT	(1)	105,000	Univ. of California at Santa Cruz	(1)	213,000	**Division Research Grants**		$ 3,918,015
Medical Biology Institute, La Jolla, CA	(2)	134,194	Univ. of Chicago, IL	(7)	730,500	Grand Total		$99,756,902
Medical College of Ohio, Toledo	(1)	80,000	Univ. of Cincinnati, OH	(1)	$ 48,000			

Note: Numbers in parentheses indicate numbers of grants per institution.

Cancer Around the World, 1988-1991, Death Rates per 100,000 Population for 46 Countries

COUNTRY	ALL SITES		ORAL		COLON & RECTUM		PROSTATE	LUNG		BREAST	UTERUS		STOMACH		LEUKEMIA	
	Male	Female	Male	Female	Male	Female	Male	Male	Female	Female	Cervix	Other	Male	Female	Male	Female
United States	164.4 (24)	110.6 (11)	3.7 (29)	1.3 (12)	16.7 (20)	11.4 (19)	16.8 (17)	57.1 (10)	24.7 (2)	22.4 (16)	2.6 (33)	2.6 (33)	5.2 (46)	2.3 (46)	6.3 (8)	3.8 (9)
Argentina‡	151.8 (29)	97.6 (26)	4.0 (26)	0.9 (35)	13.7 (31)	9.3 (33)	13.1 (29)	39.2 (30)	5.8 (38)	20.9 (19)	4.6 (16)	6.5 (5)	12.8 (26)	5.6 (29)	4.6 (33)	3.3 (28)
Australia§	164.0 (25)	102.2 (22)	4.7 (20)	1.3 (13)	21.5 (9)	14.7 (9)	17.2 (15)	45.1 (25)	12.8 (15)	20.7 (21)	3.1 (29)	1.7 (44)	8.4 (41)	3.6 (44)	6.1 (11)	3.8 (10)
Austria	172.3 (18)	106.9 (19)	5.9 (16)	0.9 (33)	22.4 (6)	14.2 (11)	16.7 (18)	45.1 (24)	9.0 (20)	22.0 (17)	2.9 (30)	5.1 (9)	16.7 (19)	8.2 (15)	5.4 (21)	3.5 (24)
Bulgaria	139.0 (37)	84.2 (38)	3.8 (28)	0.6 (45)	15.1 (25)	10.7 (26)	7.8 (39)	40.3 (29)	6.3 (36)	15.6 (31)	4.1 (22)	6.0 (7)	19.8 (11)	10.7 (9)	4.5 (36)	2.9 (43)
Canada†	170.8 (21)	110.6 (12)	4.4 (22)	1.3 (14)	17.8 (17)	12.0 (17)	16.9 (16)	57.3 (9)	20.6 (6)	23.9 (12)	2.3 (37)	2.5 (35)	8.0 (42)	3.4 (45)	6.2 (10)	3.9 (8)
Chile‡	140.8 (36)	109.4 (14)	2.3 (39)	0.6 (44)	7.0 (40)	6.0 (41)	13.1 (28)	21.1 (40)	5.8 (39)	12.5 (39)	12.5 (2)	2.4 (38)	35.2 (3)	13.6 (6)	3.9 (42)	3.3 (32)
China*‡	154.1 (27)	87.3 (35)	2.5 (36)	1.2 (17)	7.9 (39)	6.5 (40)	—	34.0 (33)	14.5 (13)	4.6 (46)	4.2 (21)	—	32.6 (5)	15.7 (4)	4.1 (40)	3.3 (27)
Costa Rica‡	166.6 (22)	108.6 (16)	3.2 (31)	1.0 (25)	6.8 (42)	6.7 (39)	19.6 (5)	17.5 (43)	6.4 (34)	12.9 (38)	10.4 (3)	3.5 (22)	54.7 (1)	22.8 (1)	6.2 (9)	4.9 (1)
Cuba†	129.8 (39)	95.6 (28)	5.6 (19)	2.0 (3)	10.2 (36)	11.4 (20)	18.7 (7)	39.0 (32)	14.3 (14)	14.8 (33)	6.2 (9)	7.3 (4)	7.3 (45)	3.8 (42)	4.6 (32)	3.6 (16)
Czechoslovakia†	232.8 (2)	121.0 (8)	9.0 (6)	1.0 (26)	30.7 (1)	17.0 (4)	13.6 (26)	74.4 (2)	8.3 (22)	19.8 (22)	5.6 (11)	5.7 (8)	19.7 (12)	8.9 (12)	6.7 (4)	4.3 (4)
Denmark	179.5 (11)	139.8 (1)	4.0 (27)	1.4 (9)	22.8 (5)	17.5 (3)	18.1 (10)	51.9 (15)	23.9 (3)	27.7 (4)	5.3 (12)	3.5 (23)	7.8 (43)	4.2 (41)	6.8 (3)	4.1 (5)
Ecuador§	83.6 (45)	85.2 (37)	0.7 (46)	0.7 (40)	2.7 (46)	4.1 (45)	11.1 (32)	6.9 (46)	2.8 (46)	5.6 (45)	5.8 (10)	13.7 (1)	26.9 (6)	19.2 (2)	3.7 (45)	3.2 (33)
England & Wales	179.2 (12)	125.7 (6)	2.9 (33)	1.2 (18)	20.2 (12)	13.7 (14)	16.6 (20)	57.0 (11)	20.5 (7)	28.7 (1)	4.4 (18)	2.5 (34)	12.5 (29)	5.1 (31)	5.3 (24)	3.3 (31)
Finland	154.1 (28)	90.6 (32)	2.3 (40)	0.8 (39)	12.2 (35)	8.6 (36)	17.5 (12)	47.8 (21)	6.6 (33)	17.0 (28)	1.7 (43)	2.6 (31)	13.0 (25)	7.0 (23)	5.2 (25)	3.0 (38)
France†	200.7 (5)	88.1 (34)	13.6 (3)	1.3 (15)	17.3 (19)	10.3 (27)	17.3 (13)	46.8 (22)	5.0 (41)	19.7 (23)	1.8 (40)	4.0 (17)	9.1 (38)	3.6 (43)	6.1 (13)	3.7 (15)
Germany, Fed.#	177.9 (13)	108.3 (17)	6.3 (13)	1.0 (22)	21.1 (10)	15.2 (6)	15.9 (21)	48.7 (19)	7.8 (26)	21.9 (18)	3.6 (25)	3.2 (25)	14.9 (21)	7.7 (17)	5.9 (14)	3.7 (13)
Greece†	144.3 (34)	77.5 (43)	1.6 (44)	0.6 (46)	6.8 (41)	5.5 (42)	8.1 (38)	49.8 (17)	6.9 (32)	15.2 (32)	1.3 (45)	3.0 (26)	9.6 (36)	4.9 (34)	5.7 (16)	3.4 (25)
Hong Kong‡	175.1 (16)	91.0 (31)	14.5 (2)	4.4 (2)	14.8 (29)	10.7 (25)	2.6 (45)	54.2 (14)	23.3 (5)	8.6 (41)	3.9 (23)	1.4 (45)	31.5 (31)	5.3 (30)	3.8 (43)	2.7 (45)
Hungary	246.5 (1)	131.5 (3)	14.7 (1)	1.7 (5)	29.0 (2)	18.1 (2)	15.7 (22)	76.4 (1)	14.9 (12)	22.6 (15)	6.8 (7)	5.0 (11)	24.0 (8)	10.2 (10)	7.2 (1)	4.6 (2)
Iceland	147.6 (32)	114.6 (10)	2.1 (42)	1.0 (27)	14.9 (27)	10.8 (24)	19.4 (6)	30.8 (34)	23.8 (4)	23.7 (13)	2.6 (34)	1.8 (42)	18.1 (15)	7.7 (18)	4.9 (29)	3.1 (37)
Ireland†	174.9 (17)	127.5 (4)	4.4 (24)	1.0 (28)	23.2 (4)	15.1 (7)	17.6 (11)	47.9 (20)	19.2 (8)	27.8 (3)	3.2 (27)	2.9 (27)	12.0 (30)	5.9 (27)	6.1 (12)	3.7 (12)
Israel‡	115.5 (42)	98.7 (24)	1.0 (45)	0.7 (42)	14.4 (30)	11.9 (18)	8.6 (37)	24.5 (38)	7.9 (24)	23.0 (14)	1.4 (44)	2.2 (39)	7.7 (44)	4.2 (40)	6.4 (7)	4.5 (3)
Italy‡	192.3 (10)	99.2 (23)	6.3 (11)	1.0 (23)	15.6 (21)	10.3 (28)	11.5 (31)	58.9 (8)	7.3 (28)	20.8 (20)	0.9 (46)	5.1 (10)	18.2 (14)	8.6 (13)	6.7 (5)	4.0 (7)
Japan	150.2 (30)	76.7 (44)	2.3 (41)	0.6 (43)	15.1 (24)	9.7 (32)	3.8 (44)	30.1 (36)	8.0 (23)	6.3 (44)	1.8 (41)	2.4 (37)	34.9 (4)	15.5 (5)	4.3 (38)	2.8 (44)
Luxembourg	197.6 (8)	109.4 (15)	10.1 (5)	1.4 (10)	21.8 (7)	12.4 (16)	16.6 (19)	62.9 (7)	8.8 (21)	25.4 (10)	3.2 (28)	4.5 (14)	11.3 (32)	4.3 (38)	6.7 (6)	3.6 (21)
Malta	144.0 (35)	92.5 (30)	3.6 (30)	1.6 (6)	13.5 (32)	10.0 (31)	9.1 (35)	42.2 (28)	3.7 (44)	28.1 (2)	1.9 (39)	3.8 (20)	14.9 (22)	6.1 (26)	5.4 (22)	3.6 (17)
Mauritius	85.0 (44)	62.3 (46)	4.6 (21)	1.8 (4)	5.0 (44)	4.1 (44)	5.3 (42)	18.9 (42)	5.1 (40)	6.7 (43)	3.6 (24)	7.4 (3)	12.7 (27)	7.2 (21)	3.5 (46)	2.3 (46)
Mexico†	83.5 (46)	79.7 (42)	2.0 (43)	0.7 (41)	3.3 (45)	3.1 (46)	10.6 (33)	16.5 (45)	5.9 (37)	8.1 (42)	15.9 (1)	2.6 (32)	10.5 (35)	7.6 (19)	3.8 (44)	3.0 (40)
Netherlands†	195.3 (9)	109.8 (13)	2.8 (35)	1.0 (32)	17.9 (16)	13.3 (15)	18.3 (9)	71.2 (4)	10.2 (17)	26.8 (7)	2.5 (35)	2.5 (36)	13.1 (23)	5.0 (33)	5.6 (18)	3.5 (23)
New Zealand‡	171.9 (19)	126.8 (5)	4.3 (25)	1.4 (8)	25.7 (3)	20.5 (1)	18.7 (8)	44.4 (27)	17.3 (11)	27.0 (6)	4.5 (17)	2.8 (28)	8.8 (40)	4.7 (35)	7.2 (2)	4.1 (6)
North Ireland	176.6 (14)	122.3 (7)	2.8 (34)	1.0 (31)	21.5 (8)	14.8 (8)	15.4 (23)	55.4 (12)	17.8 (9)	26.5 (8)	3.5 (26)	2.0 (41)	12.6 (28)	6.7 (25)	4.5 (34)	3.2 (34)
Norway†	148.2 (31)	102.2 (21)	3.1 (32)	1.1 (20)	20.0 (13)	14.2 (10)	21.7 (2)	30.3 (35)	10.3 (16)	19.2 (24)	4.3 (19)	2.8 (29)	11.0 (34)	5.0 (32)	4.9 (28)	3.3 (30)
Poland	203.5 (4)	107.8 (18)	6.2 (14)	1.0 (24)	14.9 (26)	10.2 (29)	9.8 (34)	70.4 (5)	9.7 (19)	15.7 (30)	7.9 (6)	4.0 (16)	23.1 (9)	8.2 (14)	5.8 (15)	3.6 (18)
Portugal	145.9 (33)	86.6 (36)	5.7 (18)	0.8 (37)	15.3 (22)	10.1 (30)	14.5 (25)	26.0 (37)	4.4 (43)	17.8 (26)	2.3 (36)	4.9 (12)	24.9 (7)	12.0 (7)	5.0 (27)	3.7 (14)
Puerto Rico†	125.5 (41)	75.1 (45)	7.9 (7)	1.4 (7)	9.6 (38)	7.4 (37)	17.3 (14)	19.5 (41)	7.0 (31)	14.2 (35)	2.6 (32)	3.5 (21)	11.0 (33)	4.5 (36)	4.8 (30)	3.5 (22)
Romania	135.3 (38)	83.8 (39)	5.7 (17)	1.0 (29)	9.7 (37)	7.2 (38)	7.1 (40)	39.1 (31)	6.4 (35)	14.8 (34)	10.3 (4)	3.9 (18)	18.2 (13)	7.1 (22)	4.5 (35)	3.0 (39)
Scotland	198.5 (6)	137.1 (2)	4.4 (23)	1.3 (11)	20.6 (11)	15.2 (5)	14.9 (24)	71.3 (3)	28.3 (1)	27.1 (5)	4.6 (15)	2.1 (40)	13.1 (24)	5.9 (28)	4.4 (37)	3.1 (35)
Singapore†	175.3 (15)	103.9 (20)	12.9 (4)	4.4 (1)	19.1 (14)	14.0 (13)	4.2 (43)	50.6 (16)	17.5 (10)	12.9 (37)	6.4 (8)	1.8 (43)	20.3 (10)	10.8 (8)	4.2 (39)	3.0 (41)
Spain‡	166.3 (23)	80.8 (41)	6.3 (12)	0.8 (38)	(21.4)	9.2 (35)	12.9 (30)	45.2 (23)	3.4 (45)	17.1 (27)	1.7 (42)	3.8 (19)	15.0 (20)	6.9 (24)	5.3 (23)	3.4 (26)
Sweden‡	129.4 (40)	98.1 (25)	2.4 (38)	0.8 (36)	14.9 (28)	11.1 (21)	20.4 (3)	23.4 (39)	9.9 (18)	18.2 (25)	2.2 (38)	2.7 (30)	8.9 (39)	4.5 (37)	5.1 (26)	3.3 (29)
Switzerland	171.1 (20)	97.2 (27)	6.6 (10)	1.2 (16)	18.2 (15)	10.9 (23)	22.5 (1)	44.9 (26)	7.2 (29)	24.3 (11)	2.6 (33)	3.3 (24)	9.6 (37)	4.2 (39)	5.6 (17)	3.6 (20)
Uruguay†	204.7 (3)	116.6 (9)	6.0 (15)	0.9 (34)	17.7 (18)	14.1 (12)	19.9 (4)	55.0 (13)	4.6 (42)	26.4 (9)	4.7 (14)	6.4 (6)	17.0 (18)	7.3 (20)	5.5 (20)	3.8 (11)
USSR†	198.3 (7)	94.5 (29)	7.4 (8)	1.0 (30)	15.2 (23)	10.9 (22)	6.3 (41)	63.6 (6)	7.1 (30)	13.6 (36)	5.2 (13)	4.4 (15)	36.9 (2)	16.0 (3)	5.5 (19)	3.6 (19)
Venezuela‡	92.7 (43)	83.7 (40)	2.4 (37)	1.1 (19)	7.1 (43)	5.2 (43)	13.3 (27)	16.5 (44)	7.9 (25)	9.6 (40)	9.7 (5)	7.9 (2)	17.1 (17)	9.5 (11)	4.0 (41)	3.1 (36)
Yugoslavia†	158.4 (26)	90.2 (33)	6.9 (9)	1.0 (21)	13.4 (33)	9.3 (34)	8.9 (36)	48.9 (18)	7.3 (27)	15.9 (29)	4.2 (20)	4.6 (13)	18.0 (16)	7.8 (16)	4.7 (31)	3.0 (42)

NOTE: Figures in parentheses are order of rank within site and sex group. Rates are age-adjusted to the WHO world standard population.
*Oral cancer rates include nasopharynx only. †1988–1990 only. ‡1988–1989 only. §1988 only. #1989–1990 only.

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The institutions listed have been recognized as Cancer Centers by the National Cancer Institute. These centers have been rigorously reviewed by the National Cancer Advisory Board. They receive financial support from the National Cancer Institute, the American Cancer Society and many other sources.

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The American Cancer Society is the nationwide, community-based, voluntary health organization dedicated to eliminating cancer as a major health problem by preventing cancer, saving lives from cancer, and diminishing suffering from cancer through research, education, and service.

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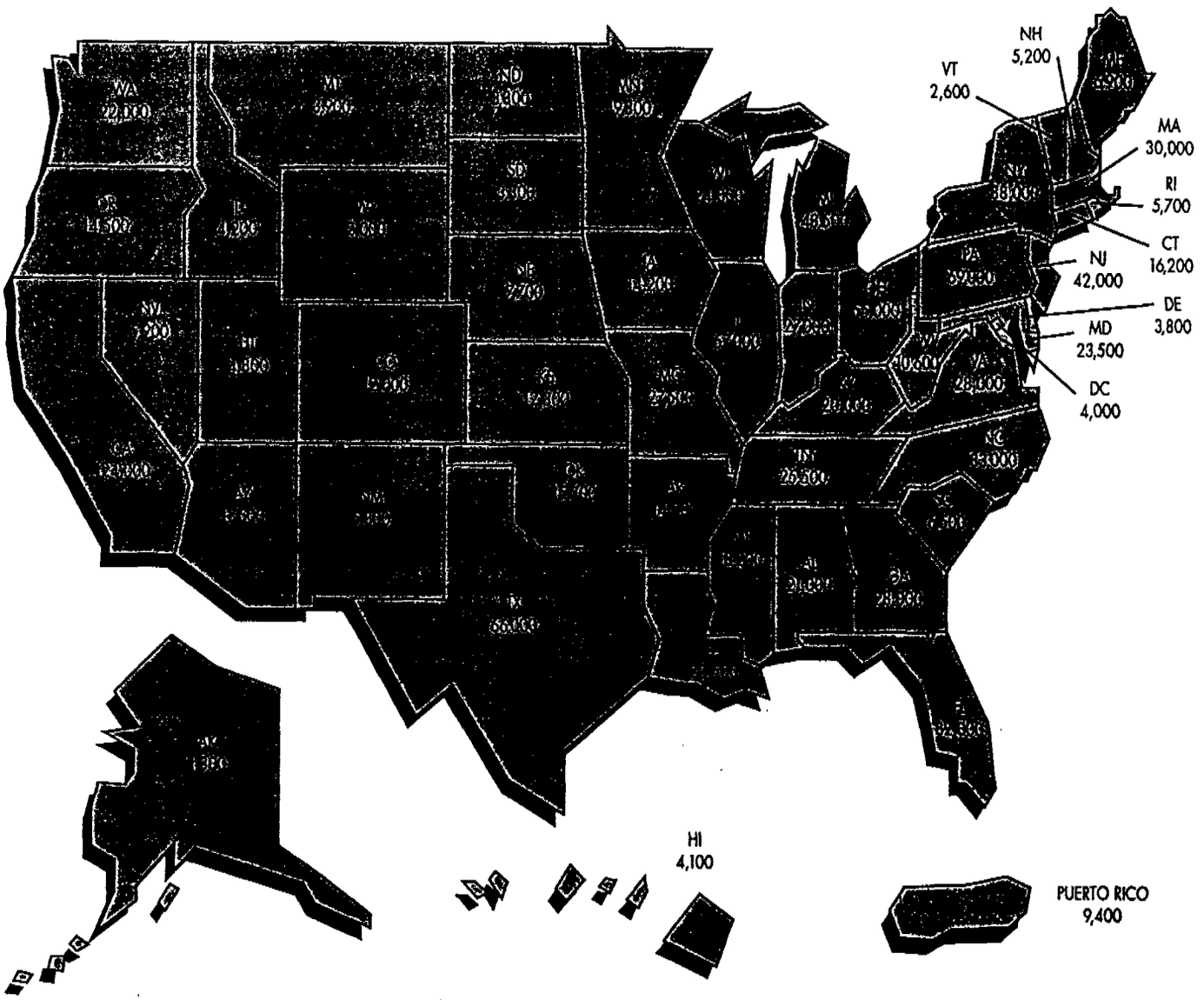
CANCER FACTS & FIGURES–1994



AMERICAN CANCER SOCIETY®

Estimated number of new cancer cases in 1994 by state, total: 1,208,000 (excluding Puerto Rico).*

*Excluding basal and squamous cell skin cancer and carcinoma in situ.

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Contents

Tables are indicated in bold print.

Sources of Statistics

Incidence. Since there is no nationwide cancer registry, there is no way of knowing exactly how many new cases of cancer are diagnosed each year. The American Cancer Society (ACS) estimates cancer incidence for the upcoming year using the best available data sources at the time.

Estimates of cancer incidence in *Facts and Figures* editions prior to 1974 were based on rates from two state cancer registries, the Connecticut Tumor Registry and the New York State Tumor Registry. The issues from 1974 to 1978 used information from the National Cancer Institute's Third National Cancer Survey (1969-1971) of nine major areas of the United States. In 1973, the NCI began the Surveillance, Epidemiology and End Results (SEER) program to collect ongoing data on cancer incidence and patient survival. The SEER program includes data from nine population-based cancer registries, covering about 10% of the US population. Beginning with the 1979 edition of *Facts and Figures*, estimates of cancer incidence have been based on incidence rates obtained through the SEER program, applied to the US Census estimates of the population for the current year. Estimates of new cancer cases include invasive cancers only, excluding in situ tumors except for cancers of the urinary bladder. Basal and squamous cell skin cancers are also excluded.

It is not appropriate or accurate to evaluate cancer incidence and mortality trends using only ACS estimates of cases and deaths, since these numbers are projected before the year begins, using data that are several years old. The numbers are presented to give the best available measure of the scope of the disease in the US at the time of publication. Comparable incidence rates are available for 1973 through 1990 from the National Cancer Institute's SEER program to evaluate cancer trends.

The estimates of total US cancer cases diagnosed in 1994 are based on age-specific incidence rates from the SEER program for 1988-1990 applied to the 1994 Census population projections. Some adjustment is made for sites with recently increasing or decreasing rates. Estimated new cases by state are calculated according to the distribution of estimated 1994 cancer deaths by state for each primary cancer site.

Mortality. Mortality statistics are derived from underlying cause of death data reported by the Division of Vital Statistics, National Center for Health Statistics, Department of Health and Human Services. The 1994 estimates of cancer deaths are based on cancer mortality data from 1984 through 1990.

Beginning with the 1981 edition of *Facts and Figures*, age-adjusted mortality rates per 100,000 are standardized to the 1970 census population distribution. Age-adjustment or age-standardization is a method used to make valid statistical comparisons among rates by assuming the same age distribution occurs among the different groups being compared.

Death rates by state: Since 1990, actual age-adjusted mortality rates, based on reported deaths in a recent 5-year period, have been presented. State mortality rate estimates from earlier *Facts and Figures* are not comparable.

Cancer Around the World: International mortality rates were calculated from data made available by the World Health Organization, and are adjusted to the old world population standard.

Probability of Developing Cancer. The probabilities of developing cancer are based on incidence rates for first primary cancers for that site, as reported to the NCI SEER program for 1988 through 1990. SEER area mortality rates for 1988-1990 were used to calculate survival into each age interval. Detailed methodology is available from the Applied Research Branch, National Cancer Institute.

Survival. Cancer survival statistics are usually reported as 5-year relative survival rates. In this edition, we present survival statistics for cases diagnosed in the period 1983-1989, as reported from the SEER program and followed through 1990. The relative survival rate is the ratio of the observed survival rate for the patient group to the expected survival rate for persons in the general population similar to the patient group with respect to age, sex, race and calendar year of observation. Because there is a certain lag time required in measuring survival, these rates may not reflect the most recent treatment advances.

SEER Report. The NCI SEER program is the source of specific data components for *Cancer Facts & Figures 1994*, including incidence rates and survival rates. These and other data are available in the SEER Cancer Statistics Review: 1973-1990, National Cancer Institute. NIH Pub. No. 93-2789, 1993.

Cancer: Basic Facts

What is cancer?

Cancer is a group of diseases characterized by uncontrolled growth and spread of abnormal cells. If the spread is not controlled, it can result in death.

What causes cancer?

Cancer is caused by both external (chemicals, radiation, and viruses) and internal (hormones, immune conditions, and inherited mutations) factors. Causal factors may act together or in sequence to initiate or promote carcinogenesis. Ten or more years often pass between exposures or mutations and detectable cancer.

Can cancer be prevented?

Yes, about 90% of the 700,000 skin cancers that will be diagnosed in 1994 could have been prevented by protection from the sun's rays. All cancers caused by cigarette smoking and heavy use of alcohol could be prevented completely. The ACS estimates that in 1994, about 165,000 lives will be lost to cancer because of tobacco use. About 17,000 cancer deaths will be related to excessive alcohol use, frequently in combination with cigarette smoking.

Regular screening and self-exams can detect cancers of the breast, tongue, mouth, colon, rectum, cervix, prostate, testis, and melanoma at an early stage, when treatment is more likely to be successful. These sites include nearly half of all new cases. Of these cases, about two-thirds of all patients currently survive five years. With early detection, about 90% would survive. This means that of those persons diagnosed with these cancers in 1994, about 100,000 more would survive if their cancers had been detected in a localized stage and treated promptly.

How is cancer treated?

By surgery, radiation, radioactive substances, chemicals, hormones, and immunotherapy.

Who gets cancer?

Anyone. Since incidence rises with age, most cases affect adults in mid-life or older. Among children ages 1-14, cancer causes more deaths in the US than any other disease. In the 1980s there were over 4.5 million cancer deaths, almost 9 million new cancer cases, and some 12 million people under medical care for cancer.

How many people alive today have ever had cancer?

Over 8 million Americans alive today have a history of cancer, 5 million diagnosed five or more years ago. Most of these 5 million can be considered cured, while others still have evidence of cancer. "Cured" means that a patient has no evidence of disease and has the same life expectancy as a person who never had cancer.

How many new cases will there be this year?

About 1,208,000 new cancer cases will be diagnosed. This estimate does not include carcinoma in situ and basal and squamous cell skin cancers. The incidence of these skin cancers is estimated to be over 700,000 cases annually.

How many people will die?

This year about 538,000 will die of cancer—over 1,400 people a day. One out of every five deaths in the US is from cancer.

What is the national cancer death rate?

There has been a steady rise in the cancer mortality rate in the US in the last half-century. The age-adjusted rate in 1930 was 143 per 100,000 population. It rose to 157 in 1950, to 163 in 1970, and was 174 in 1990. The major cause of this increase has been lung cancer. Death rates for many major cancer sites have leveled off or declined over the past 50 years (see page 5). If lung cancer deaths were excluded, cancer mortality would have declined 14% between 1950 and 1990.

How many people are surviving cancer?

In the early 1900s, few cancer patients had any hope of long-term survival. In the 1930s, less than one in five was alive five years after treatment. In the 1940s, it was one in four, and in the 1960s, it was one in three. About 483,000 Americans, or 4 of 10 patients who get cancer this year, will be alive 5 years after diagnosis. The gain from 1 in 3 in the 1960s to 4 in 10 now represents over 85,000 persons each year.

This 4 in 10, or about 40% is called the "observed" survival rate. When adjusted for normal life expectancy (factors such as dying of heart disease, accidents, and diseases of old age), a "relative" 5-year survival rate of 53% is seen for all cancers. The relative survival rate is commonly used to measure progress in the early detection and treatment of cancer.

Research, Prevention, Diagnosis, & Treatment

The vocabulary of cancer is ever increasing, as knowledge about the disease mounts. In the past decade, words such as oncogenes, retinoids, and growth factors have become standard. Indeed, our knowledge of the genetics of cancer has soared, and it is now possible to envision the day when the genetic basis of individual cancers will be known, along with mechanisms to correct the problem.

In addition to looking to the future, we can enjoy some successes now. Some cancers that only a few decades ago had a very poor outlook are often cured today: acute lymphocytic leukemia in children, Hodgkin's disease, Burkitt's lymphoma, Ewing's sarcoma (a form of bone cancer), Wilms' tumor (a kidney cancer in children), rhabdomyosarcoma (a cancer in certain muscle tissue), testicular cancer, and osteogenic (bone) sarcoma.

This section highlights some developments in cancer research, prevention, diagnosis, and therapy, and indicates the directions of current and future research.

- **Oncogenes,** which play a role in normal cell growth and differentiation, can mutate and cause the runaway cell growth associated with cancer. The ras oncogene is mutated in 50% of colon cancers and 90% of pancreatic cancers. The presence of certain oncogenes is being used to predict which tumors are likely to recur after surgery and/or to identify family members at risk.
- **Suppressor genes,** which exist in normal cells to control cell growth, also play a role in cancer. Some cancers are caused when mutations occur in these genes, allowing uncontrolled cell growth. For example, the p53 suppressor gene frequently is altered in many types of cancer, including breast and lung. In one familial syndrome, where family members have high rates of cancer, about 90% of those who inherit the abnormal p53 gene get cancer by the age of 50. Family members can now be screened for this genetic abnormality before cancer develops.
- Through **genetic engineering,** researchers may be able to correct or modify hereditary susceptibility by transplanting normal copies of genes into cells that have mutated copies of those genes.
- **Growth factors** can be used to stimulate normal bone marrow cells to withstand very high doses of chemotherapeutic drugs.
- A genetic fusing of cancer cells with normal cells can produce disease-fighting **monoclonal antibodies** (specific antibodies tailored to seek out chosen targets on cancer cells). Their potential in the diagnosis and treatment of cancer is under study, and they are showing promise for carrying cancer-killing radiation and drugs to a precise location.
- Researchers are understanding how cancer cells spread to healthy tissues, a process called **metastasis.** Cell mutations can cause increased production of destructive enzymes that allow them to invade surrounding tissues and penetrate blood vessels to travel to other parts of the body. A powerful enzyme inhibitor, **TIMP-2** is showing promise for abolishing the metastatic potential of tumor cells. A metastasis suppressor gene, **NM23,** has also been identified.
- New ways have been found to treat early breast and colon cancers postoperatively with drugs. This **"adjuvant" treatment** may eradicate cancer cells remaining after surgery and increase cure rates.
- **Neoadjuvant chemotherapy** (giving chemotherapy to shrink the cancer and then removing it surgically) has been tried against various types of cancers. This is a promising new treatment approach.
- Understanding the causes of pain in cancer patients has increased the **options for controlling pain.** Regular use of orally administered pain medicines, infusions or injections of analgesics, and procedures to interrupt pain pathways are among the effective approaches available for the majority of patients with pain from cancer.
- Researchers are examining **synthetic retinoids** (cousins of vitamin A) and other substances to see if recurrences of certain cancers can be prevented and if these agents can reduce cancer in high-risk groups. The cancer prevention capabilities of many other compounds are also being researched.
- In clinical trials, **taxol,** an agent obtained currently from the bark of Pacific yew trees, has been effective in treating ovarian cancer. Research efforts are underway to synthesize this scarce drug in the laboratory and the synthesized taxol will be tested for efficacy in all types of cancer.
- New approaches to drug therapy use **combinations of chemotherapeutic drugs, or chemotherapy plus surgery or radiation.** New classes of agents are being tested for their effectiveness in treating patients whose disease is resistant to drug therapies now in use. Understanding the basis of drug resistance and developing counterattacks are major areas of research today.
- Many patients with primary bone cancer now are treated successfully by **removing and replacing a section of bone** rather than by amputating the leg or arm. Drugs and radiation therapy are being used effectively after bone cancer surgery, resulting in dramatic improvement in survival.

• **New high-technology diagnostic imaging techniques** have replaced exploratory surgery for some cancer patients. Magnetic resonance imaging (MRI) is one example of such technology. In MRI, a huge electromagnet is used to detect hidden tumors by mapping the vibrations of the various atoms in the body on a computer screen. Computerized tomography (CT) scanning uses x-rays to examine parts of the body. In both of these painless, noninvasive procedures, cross-section pictures can show a tumor's shape and location more accurately than is possible with conventional x-ray techniques. For patients undergoing radiation therapy, CT scanning may enable the therapist to pinpoint the tumor more precisely, and thus provide more accurate radiation dosage while sparing normal tissue. Positron emission tomography (PET) is another imaging technique. One of the advances in the area of imaging combines two or three different types of images (e.g., MRI and PET) in a computer to create a three-dimensional picture that can be rotated on the screen. This technology is currently used in some medical centers to help plan for surgery and radiation therapy in areas such as the brain.

• **Immunotherapy** holds the hope of enhancing the body's own disease-fighting systems to help control cancer. **Interferon** (a naturally occurring body protein capable of killing cancer cells or stopping their growth), **interleukin-2** (a growth factor that stimulates cells of the immune system to fight cancer), and other **biologic response modifiers** are under study. Recently, interferon was made available to all doctors as the treatment for hairy cell leukemia, a rare blood cancer of older Americans. Interleukin-2 is under active research in the treatment of kidney cancer and melanoma. **Gene therapy** is the newest approach to stimulating immune cells to fight cancer. **Vaccines** against several types of cancer are also being developed.

• Many cancers develop in a two-stage process through exposure to substances known as **initiators and promoters.** Research scientists are exploring ways to interrupt this process.

• Ongoing research into new **drug development** will result in compounds that are less toxic to normal cells and more potent against tumor cells. New drugs will also allow physicians to circumvent the problem of drug resistance that many cancer cells develop. Along that same line of research, genes responsible for cancer cell resistance to chemotherapy have recently been discovered.

• New technologies have made it possible to use **bone marrow transplantation** as an important treatment option in select patients with leukemia and lymphoma. Bone marrow transplantation for breast cancers and other malignant tumors is under study. Because disruption of bone marrow function is a side effect of some cancer treatments, researchers are evaluating **autologous bone marrow transplants,** in which a portion of the patient's own marrow is removed before treatment, saved, and later restored. This procedure eliminates the problems of matching a donor with the recipient patient, and may make it possible for the patient to tolerate larger doses of anticancer drugs or radiation therapy.

• Improvements in cancer treatment have made possible more **conservative management** of some early cancers. In early cancer of the larynx, many patients are now able to retain the larynx and voice; in colorectal cancer, fewer permanent colostomies are needed; in many cases, the surgery for breast cancer is often more limited; and special nerve-sparing surgery now commonly used for prostate cancer could enable men to maintain normal penile function.

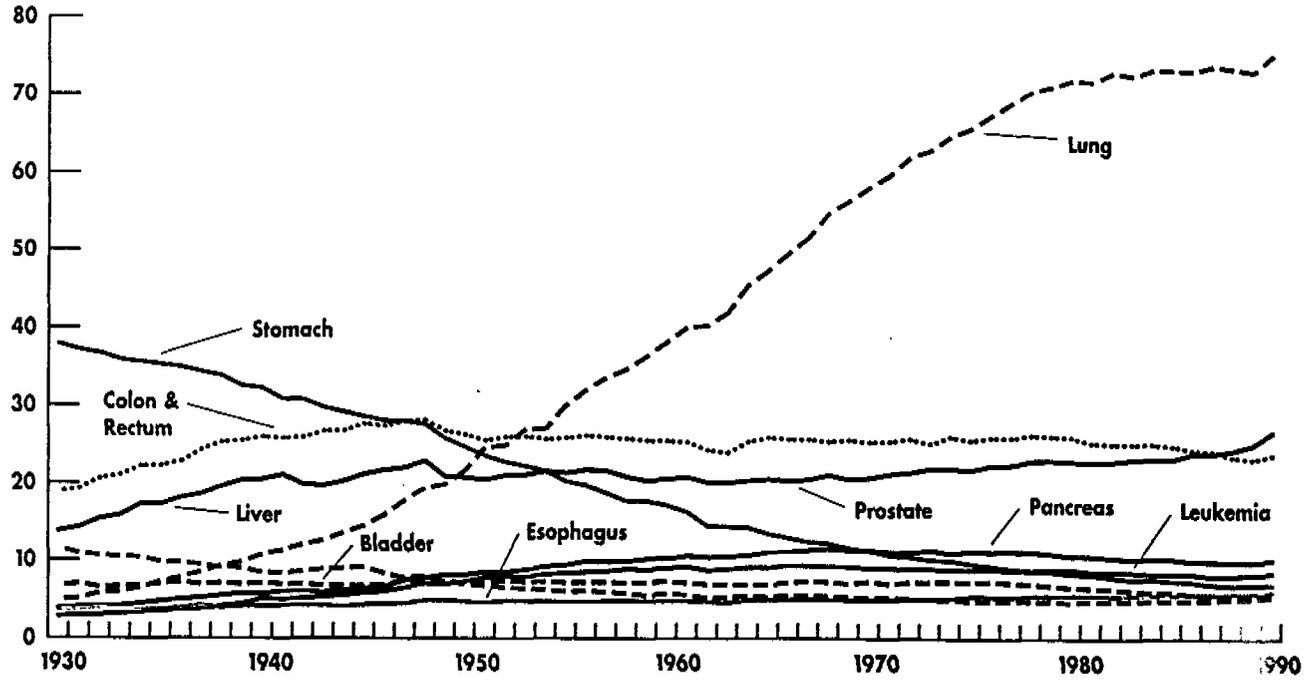
• **Prostatic ultrasound** (a rectal probe using ultrasonic waves to produce an image of the prostate) is currently being investigated as a potential means to increase the early detection of occult (not clinically suspected) prostate cancer. Recently, prostatic ultrasound has been combined with a blood test for **prostate-specific antigen** to aid in early detection of prostate cancer.

• A large clinical trial is underway to evaluate the usefulness of an estrogen-blocking drug called **tamoxifen.** Commonly used to treat women when they have breast cancer, this large study hopes to see if tamoxifen can also be used to prevent breast cancer in women who are at high risk.

• With medical progress producing longer survival periods for many cancer patients, clinical concerns are expanding to include not only patients' physical well-being, but also their **psychosocial needs.** The response of both patient and family to the disease, the patient's sexual concerns, employment and insurance needs, and ways to provide psychosocial support have emerged as important areas of research and clinical care.

• **Psychosocial and behavioral research** is showing much promise as evidence mounts that lifestyle (tobacco, diet) and environmental factors influence a person's general health and chances of developing cancer, as well as the mental ability to cope with cancer if it occurs. Research on behavioral modification is having a significant impact on symptoms of cancer and its treatment, such as pain, nausea, and vomiting. Other research deals with stress during treatment and during recovery after surgery or radiation treatment. A number of investigations concentrate on breast cancer, specifically on how women can be motivated to make use of mammography screening, and how to adjust to surgery, if such intervention becomes necessary.

Cancer Death Rates by Site, Males, United States, 1930-90



Rates are per 100,000 and are age-adjusted to the 1970 US census population.

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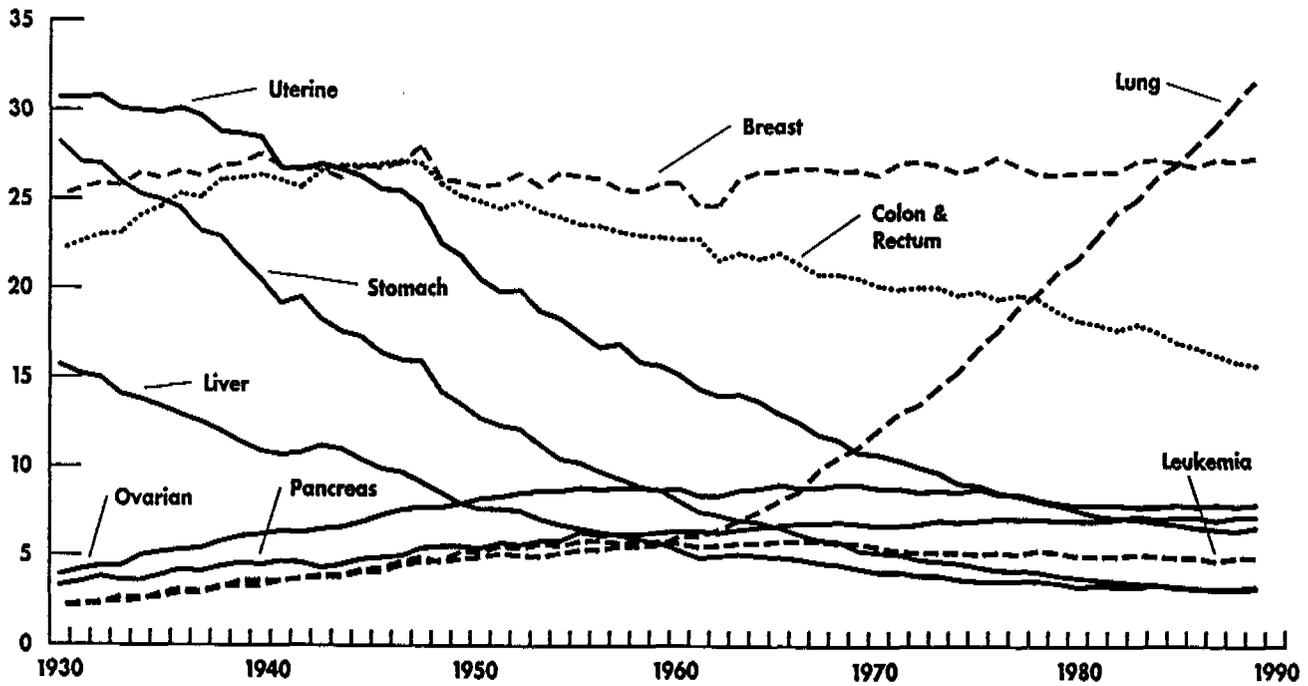
Cancer Death Rates by Site, Females, United States, 1930-90



Rates are per 100,000 and are age-adjusted to the 1970 US census population.

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30-Year Trends in Cancer Death Rates* per 100,000 P pulation, 1958-60 t 1988-90

Sites	Sex	1958-1960	1988-1990	Percent Changes	Number of Deaths 1960	Number of Deaths 1990
All Sites	Male	180.9	218.0	21%	143,498	268,283
	Female	136.8	140.8	†	124,084	237,039
Oral	Male	6.0	4.6	–22%	4,668	5,636
	Female	1.6	1.7	9%	1,507	2,769
Esophagus	Male	4.8	5.9	23%	3,832	7,213
	Female	1.2	1.5	25%	1,083	2,506
Stomach	Male	17.5	6.9	–61%	13,085	8,336
	Female	9.0	3.1	–65%	7,774	5,737
Colon & rectum	Male	25.2	23.5	– 7%	19,127	28,635
	Female	22.8	16.1	–30%	20,265	28,895
Colon	Male	17.0	20.0	17%	13,010	24,385
	Female	17.4	14.1	–19%	15,527	25,325
Rectum	Male	8.2	3.5	–58%	6,117	4,250
	Female	5.4	2.0	–63%	4,738	3,570
Liver‡	Male	5.7	5.2	– 8%	4,566	6,557
	Female	5.9	3.2	–45%	5,828	5,811
Pancreas	Male	10.1	9.9	†	7,982	12,199
	Female	6.2	7.1	14%	5,693	12,883
Larynx	Male	2.7	2.5	– 6%	2,201	2,977
	Female	0.3	0.5	87%	225	733
Lung	Male	36.4	74.2	104%	31,257	91,091
	Female	5.5	30.6	452%	5,163	50,194
Melanoma f skin	Male	1.4	3.0	120%	1,194	3,844
	Female	1.0	1.5	48%	989	2,576
Other skin	Male	1.7	1.3	–25%	1,156	1,556
	Female	0.8	0.4	–56%	670	614
Breast	Male	0.3	0.2	–33%	215	272
	Female	25.7	27.4	7%	23,755	43,391
Cervix uteri	Female	9.4	3.0	–68%	8,487	4,627
Other uterus	Female	6.6	3.5	–47%	5,929	6,052
Ovary	Female	8.8	7.9	–10%	8,046	12,762
Prostate	Male	20.5	25.3	23%	14,452	32,378
Bladder	Male	7.2	5.6	–22%	5,440	6,910
	Female	2.7	1.7	–38%	2,425	3,431
Kidney	Male	3.8	5.1	35%	3,145	6,271
	Female	2.0	2.4	16%	1,794	4,042
Brain	Male	4.0	5.1	26%	3,700	6,339
	Female	2.7	3.4	27%	2,484	5,291
Non-Hodgkin's lymphoma	Male	4.8	7.7	62%	4,015	9,795
	Female	3.2	5.0	58%	2,839	8,806
Hodgkin's disease	Male	2.2	0.7	–67%	1,877	956
	Female	1.3	0.4	–68%	1,198	676
Multiple myeloma	Male	2.0	3.6	85%	1,687	4,561
	Female	1.4	2.5	76%	1,342	4,373
Leukemia	Male	8.9	8.2	– 7%	7,371	10,192
	Female	5.7	4.8	–16%	5,354	8,382

*Adjusted to the age distribution of the 1970 US Census population. †Percent changes not listed because they are not meaningful. ‡Primary and non-specified.

Note: Even though death rates declined or remained stable, the number of deaths increased because the population has become larger and older. The US population increased 38% from 1960 to 1990.

Estimated New Cancer Cases and Deaths, United States—1994*

	Estimated New Cases			Estimated Deaths		
	Both Sexes	Male	Female	Both Sexes	Male	Female
All sites	1,208,000	632,000	576,000	538,000	283,000	255,000
Buccal cavity & pharynx (**Oral**)	29,600	19,800	9,800	7,925	5,150	2,775
Lip	3,300	2,800	500	75	50	25
Tongue	6,000	3,800	2,200	1,750	1,100	650
Mouth	11,100	6,600	4,500	2,100	1,200	900
Pharynx	9,200	6,600	2,600	4,000	2,800	1,200
Digestive organs	233,300	123,100	110,200	121,450	64,550	56,900
Esophagus	11,000	8,000	3,000	10,400	7,800	2,600
Stomach	24,000	15,000	9,000	14,000	8,400	5,600
Small intestine	3,600	2,000	1,600	950	500	450
Large intestine } (**Colon-Rectum**)	107,000	52,000	55,000	49,000	24,000	25,000
Rectum }	42,000	23,000	19,000	7,000	3,800	3,200
Liver and biliary passages	16,100	8,800	7,300	13,200	7,200	6,000
Pancreas	27,000	13,000	14,000	25,900	12,400	13,500
Other and unspecified digestive	2,600	1,300	1,300	1,000	450	550
Respiratory system	189,000	112,800	76,200	158,200	97,900	60,300
Larynx	12,500	9,800	2,700	3,800	3,000	800
Lung	[illegible]00	100,000	72,000	153,000	94,000	59,000
Other & unspecified respiratory	[illegible]00	3,000	1,500	1,400	900	500
Bone	2,000	1,100	900	1,075	600	475
Connective tissue	6,000	3,300	2,700	3,300	1,600	1,700
Melanoma of skin	32,000	17,000	15,000	6,900	4,300	2,600
Breast	183,000	1,000	182,000	46,300	300	46,000
Genital organs	283,400	208,100	75,300	63,725	38,525	25,200
Cervix uteri } (**Uterus**)	15,000	—	15,000	4,600	—	4,600
Corpus & unspecified }	31,000	—	31,000	5,900	—	5,900
Ovary	24,000	—	24,000	13,600	—	13,600
Other & unspecified genital, female	5,300	—	5,300	1,100	—	1,100
Prostate	200,000	200,000	—	38,000	38,000	—
Testis	6,800	6,800	—	325	325	—
Other & unspecified genital, male	1,300	1,300	—	200	200	—
Urinary organs	78,800	55,000	23,800	21,900	13,800	8,100
Bladder	51,200	38,000	13,200	10,600	7,000	3,600
Kidney & other urinary	27,600	17,000	10,600	11,300	6,800	4,500
Eye	1,750	950	800	250	125	125
Brain & central nervous system	17,500	9,600	7,900	12,600	6,800	5,800
Endocrine glands	14,450	4,150	10,300	1,725	750	975
Thyroid	13,000	3,400	9,600	1,025	400	625
Other endocrine	1,450	750	700	700	350	350
Leukemia	28,600	16,200	12,400	19,100	10,500	8,600
Lymphocytic leukemia	12,500	7,300	5,200	5,700	3,300	2,400
Granulocytic leukemia	11,400	6,200	5,200	7,500	4,100	3,400
Other & unspecified leukemia	4,700	2,700	2,000	5,900	3,100	2,800
Other blood & lymph tissues	65,600	35,900	29,700	32,550	17,100	15,450
Hodgkin's disease	7,900	4,400	3,500	1,550	900	650
Non-Hodgkin's lymphoma	45,000	25,000	20,000	21,200	11,200	10,000
Multiple myeloma	12,700	6,500	6,200	9,800	5,000	4,800
All other & unspecified sites	43,000	24,000	19,000	41,000	21,000	20,000

*Excludes basal and squamous cell cancers and in situ carcinomas except bladder. Carcinoma in situ of the uterine cervix accounts for about 55,000 new cases annually, carcinoma in situ of the female breast accounts for about 25,000 new cases annually, and melanoma carcinoma in situ accounts for about 8,000 new cases annually. Overall, about 100,000 new cases of carcinoma in situ of all sites of cancer are diagnosed each year.

Basal cell and squamous cell skin cancers account for more than 700,000 new cases annually. About 2,300 nonmelanoma skin cancer deaths will occur in 1994.

Incidence estimates are based on rates from NCI SEER program 1988-90.

Estimated New Cancer Cases, by State—1994*

State	All Sites	Female Breast	Colon & Rectum	Lung	Oral	Uterus	Prostate	Skin Melanoma	Pancreas	Leukemia
Alabama	21,000	2,800	2,200	3,100	550	850	3,200	500	450	425
Alaska	1,300	150	150	250	50	60	150	40	25	30
Arizona	17,500	2,500	2,000	2,500	350	550	3,100	550	400	450
Arkansas	14,000	1,900	1,700	2,300	250	600	2,600	325	325	325
California	124,000	19,000	14,000	17,000	3,300	5,000	18,000	4,000	2,900	3,100
Colorado	12,000	1,900	1,500	1,500	275	450	2,600	475	300	275
Connecticut	16,200	2,500	2,300	2,100	400	500	2,500	400	375	400
Delaware	3,800	600	500	550	125	125	600	125	60	75
Dist. of Columbia	4,000	600	500	450	150	225	800	40	100	75
Florida	82,000	11,500	10,200	13,000	2,500	3,000	16,000	2,500	1,800	1,900
Georgia	28,000	4,200	3,000	4,200	900	900	4,700	750	600	650
Hawaii	4,100	475	550	500	100	125	650	60	100	80
Idaho	4,200	600	500	550	100	150	1,000	125	100	125
Illinois	57,000	8,800	7,600	7,600	1,400	2,200	9,400	1,300	1,200	1,400
Indiana	27,000	4,200	3,300	4,100	500	1,000	4,000	600	600	600
Iowa	14,200	2,200	2,100	1,900	300	450	2,600	450	300	375
Kansas	12,300	1,900	1,700	1,700	300	475	2,100	400	250	325
Kentucky	20,000	2,600	2,400	3,500	375	800	2,800	500	400	400
Louisiana	20,500	2,900	2,200	3,300	500	750	3,100	400	500	450
Maine	6,900	900	850	1,000	150	175	1,200	200	150	125
Maryland	23,500	3,300	2,900	3,400	600	800	3,800	550	500	475
Massachusetts	31,000	4,900	4,400	3,900	950	950	4,600	950	700	650
Michigan	43,500	6,800	5,400	6,000	950	1,700	7,100	850	950	1,100
Minnesota	19,300	3,100	2,600	2,300	350	650	4,000	500	450	550
Mississippi	13,200	1,700	1,400	2,100	350	500	2,500	275	300	275
Missouri	27,500	4,100	3,200	4,200	450	1,000	4,300	650	550	650
Montana	3,900	550	500	500	125	100	850	100	90	80
Nebraska	7,700	1,300	900	1,000	175	300	1,400	250	175	150
Nevada	5,900	800	600	1,000	100	225	800	150	125	125
New Hampshire	5,200	900	650	700	150	200	850	150	100	100
New Jersey	42,000	6,800	5,600	5,400	1,000	1,700	6,800	1,100	900	850
New Mexico	5,800	850	650	700	150	225	1,000	150	125	175
New York	88,000	15,000	12,500	11,500	2,300	3,600	13,000	2,200	2,100	2,000
North Carolina	33,000	4,800	4,000	5,000	900	1,400	6,300	1,000	750	800
North Dakota	3,300	425	425	350	70	100	950	70	60	100
Ohio	55,000	8,800	7,000	8,000	1,200	2,300	8,600	1,300	1,100	1,400
Oklahoma	15,700	2,100	1,700	2,500	350	650	2,600	425	300	400
Oregon	14,500	1,900	1,600	2,200	350	500	2,600	400	325	400
Pennsylvania	69,000	11,000	9,400	9,300	1,400	2,800	11,400	1,800	1,500	1,500
Rhode Island	5,700	900	800	750	125	200	850	150	125	100
South Carolina	16,500	2,300	1,800	2,500	600	700	3,000	400	400	350
South Dakota	3,300	475	450	425	60	100	650	90	75	80
Tennessee	25,500	3,500	3,200	4,200	500	950	4,000	700	600	600
Texas	66,000	9,200	7,500	10,000	1,700	2,500	10,000	1,600	1,600	1,800
Utah	4,800	750	500	375	60	275	1,200	175	100	125
Vermont	2,600	425	275	350	60	75	600	70	60	70
Virginia	28,000	4,400	3,100	4,200	650	1,100	4,800	750	650	600
Washington	22,000	3,300	2,300	3,200	500	650	3,800	550	500	550
West Virginia	10,600	1,400	1,200	1,800	275	375	1,500	325	225	250
Wisconsin	24,000	3,700	3,000	2,800	550	900	4,700	550	600	650
Wyoming	2,000	300	200	250	25	90	350	30	30	60
United States	1,208,000	182,000	149,000	172,000	29,600	46,000	200,000	32,000	27,000	28,600
Puerto Rico	9,400	1,300	1,100	650	425	425	1,800	75	225	225

*Does not include carcinoma in situ or basal and squamous cell skin cancers.

These estimates are offered as a rough guide and should not be regarded as definitive. They are calculated according to the distribution of estimated 1994 cancer deaths by state.

Cancer M rtality by State—1994

State	Reported Death Rate per 100,000*	Estimated Number of Deaths									
		All Sites	Female Breast	Colon & Rectum	Lung	Oral	Uterus	Prostate	Skin Melanoma	Pancreas	Leukemia
Alabama	179	9,400	700	850	2,800	150	200	600	100	425	300
Alaska	175	500	50	50	175	20	10	25	10	25	20
Arizona	157	7,800	600	750	2,200	100	125	600	125	375	300
Arkansas	176	6,200	475	650	2,100	70	150	500	70	300	225
California	166	52,000	4,600	5,100	14,500	900	1,100	3,600	900	2,800	2,000
Colorado	146	5,400	475	550	1,200	80	100	450	100	275	200
Connecticut	170	7,200	600	800	1,900	100	100	450	80	350	250
Delaware	195	1,600	150	200	500	40	30	100	30	60	50
Dist. of Columbia	230	1,700	150	200	400	40	50	150	10	100	50
Florida	166	37,700	3,000	3,800	11,500	650	700	3,000	500	1,800	1,300
Georgia	176	12,300	1,000	1,100	3,800	200	200	850	150	550	425
Hawaii	138	1,800	125	200	425	30	30	125	20	100	60
Idaho	150	1,900	175	175	475	30	30	175	30	100	90
Illinois	180	25,400	2,200	2,900	6,800	400	500	1,800	275	1,200	900
Indiana	178	12,100	1,100	1,200	3,700	125	225	750	125	550	400
Iowa	158	6,300	600	800	1,700	75	100	500	90	300	250
Kansas	157	5,500	500	600	1,500	75	100	375	80	250	225
Kentucky	188	9,100	650	900	3,100	100	175	500	100	375	300
Louisiana	190	9,100	750	850	2,900	150	150	600	80	500	300
Maine	184	3,100	225	325	900	40	40	225	40	150	90
Maryland	193	10,500	850	1,100	3,100	175	175	700	125	475	325
Massachusetts	179	13,800	1,200	1,700	3,600	225	200	850	225	650	425
Michigan	176	19,500	1,700	2,100	5,400	250	400	1,400	175	900	750
Minnesota	156	8,600	800	1,000	2,100	90	150	750	125	450	375
Mississippi	178	5,900	425	550	1,800	90	125	450	60	300	200
Missouri	174	12,300	1,000	1,300	3,800	125	250	800	150	500	450
Montana	160	1,700	150	175	450	25	30	175	25	90	50
Nebraska	159	3,400	325	325	900	40	80	275	50	175	125
Nevada	184	2,600	200	250	850	25	50	150	30	125	80
New Hampshire	179	2,300	225	225	600	40	50	175	30	100	60
New Jersey	185	18,700	1,700	2,100	4,900	275	400	1,300	225	850	550
New Mexico	146	2,600	225	250	600	40	50	175	40	125	125
New York	176	39,000	3,900	4,500	10,200	600	850	2,600	475	2,000	1,300
North Carolina	173	15,200	1,200	1,500	4,600	250	300	1,200	225	700	550
North Dakota	155	1,400	125	150	325	20	25	175	15	60	70
Ohio	181	24,700	2,200	2,600	7,200	325	500	1,600	275	1,100	900
Oklahoma	169	7,000	550	650	2,200	90	125	475	100	300	275
Oregon	167	6,500	500	600	2,000	90	100	475	80	325	275
Pennsylvania	180	31,000	2,800	3,500	8,300	375	650	2,200	375	1,400	1,000
Rhode Island	181	2,500	225	300	700	30	50	150	30	125	75
South Carolina	175	7,400	600	700	2,300	150	175	550	90	375	225
South Dakota	152	1,500	125	175	350	20	30	125	20	75	50
Tennessee	178	11,300	900	1,200	3,700	125	225	750	150	600	400
Texas	164	31,000	2,300	2,900	9,000	475	600	1,900	350	1,500	1,200
Utah	124	2,000	200	200	325	20	50	225	40	100	90
Vermont	175	1,100	125	100	300	20	20	125	20	60	50
Virginia	180	12,500	1,100	1,200	3,600	175	250	900	150	600	400
Washington	164	9,600	850	900	2,900	150	175	700	125	475	350
West Virginia	180	4,700	350	475	1,500	75	80	300	70	200	175
Wisconsin	165	10,800	950	1,200	2,600	150	200	900	125	550	425
Wyoming	154	800	75	75	225	10	20	75	10	30	40
United States	172	538,000	46,000	56,000	153,000	7,925	10,500	38,000	6,900	25,900	19,100
Puerto Rico	129	4,500	325	425	600	175	150	450	25	200	150

*Average annual mortality rate for 1986-1990, adjusted to the age distribution of the 1970 US Census Population.

Selected Cancers

Lung Cancer

Incidence: An estimated 172,000 new cases in 1994. The incidence rate, which had been increasing steadily in men and women for several decades, has declined in men, from a high of 87 per 100,000 in 1984 to 80 in 1990. The incidence rate in women continues to increase to 41 per 100,000 in 1990.

Mortality: An estimated 153,000 deaths in 1994. Since 1987, more women have died of lung cancer than breast cancer, which, for over 40 years, was the major cause of cancer death in women.

Signs and Symptoms: Persistent cough, sputum streaked with blood, chest pain, recurring pneumonia or bronchitis.

Risk Factors: Cigarette smoking; exposure to certain industrial substances, such as arsenic, certain organic chemicals and asbestos, particularly for persons who smoke; radiation exposure from occupational, medical, and environmental sources. Radon exposure may increase risk, especially in cigarette smokers. Exposure to sidestream cigarette smoke increases the risk for nonsmokers.

Early Detection: Because symptoms often don't appear until the disease is in advanced stages, early detection is very difficult. In smokers who stop smoking at the time of early precancerous cellular changes, damaged bronchial lining tissues often return to normal. Smokers who persist in smoking may form abnormal cell growth patterns that lead to cancer. Chest x-ray, analysis of the types of cells contained in sputum, and fiberoptic examination of the bronchial passages assist diagnosis.

Treatment: Determined by the type and stage of the cancer. Options include surgery, radiation therapy, and chemotherapy. For many localized cancers, surgery is usually the treatment of choice. Because the disease has usually spread by the time it is discovered, radiation therapy and chemotherapy are often needed in combination with surgery. In small cell cancer, chemotherapy alone or combined with radiation has replaced surgery as the treatment of choice; on this regimen, a large percentage of patients experience remission, which in some cases is long-lasting.

Survival: The 5-year relative survival rate is only 13% in all patients, regardless of stage at diagnosis. The rate is 46% for cases detected when the disease is still localized, but only 16% of lung cancers are discovered that early.

Colon and Rectum Cancer

Incidence: An estimated 149,000 new cases in 1994, including 107,000 of colon cancer and 42,000 of rectum cancer.

Mortality: An estimated 56,000 deaths (49,000 from colon cancer, 7,000 from rectum cancer) in 1994. Mortality from colorectal cancer has fallen 30% for women and 7% for men over the last 30 years.

Signs and Symptoms: Rectal bleeding, blood in the stool, change in bowel habits.

Risk Factors: Personal or family history of cancer or polyps of the colon or rectum; inflammatory bowel disease. High-fat and/or low-fiber diet may be associated with increased risk.

Early Detection: Digital rectal examination, stool blood test, and proctosigmoidoscopy are recommended by the American Cancer Society to detect colon or rectum cancer in asymptomatic patients.

Digital rectal examination is performed by a physician during an office visit. The American Cancer Society recommends that this examination be performed annually after age 40.

The stool blood test is a simple method to test feces for hidden blood. The specimen is obtained by the patient at home and returned to the physician's office, a hospital, or a clinic for analysis. The Society recommends annual testing after age 50.

In proctosigmoidoscopy, the physician uses a hollow lighted tube or a fiberoptic sigmoidoscope to inspect the rectum and lower colon. To detect cancers higher in the colon, longer, flexible instruments are being used. The American Cancer Society recommends sigmoidoscopy, preferably flexible, every 3 to 5 years after age 50.

If any of these tests reveal possible problems, more extensive studies, such as colonoscopy (examination of the entire colon) and barium enema (an x-ray procedure in which the intestines are viewed), may be needed.

Treatment: Surgery, at times combined with radiation, is the most effective method of treating colorectal cancer. The role of chemotherapy in treating advanced cases is under study. Combinations of chemotherapy and immunologic agents have recently been described as beneficial in postoperative patients with cancerous lymph nodes.

Colostomy (creation of an abdominal opening for elimination of body wastes) is seldom needed for colon cancer and is infrequently required for rectal cancer. The American Cancer Society has a patient assistance program for those who do have permanent colostomies (see p. 25).

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Survival: When colorectal cancer is detected in an early, localized stage, the 5-year survival rates are 92% for colon cancer and 85% for rectal cancer. After the cancer has spread regionally, to involve adjacent organs or lymph nodes, the survival rates drop to 61% and 51%, respectively. Survival rates for persons with distant metastases are less than 7%.

Breast Cancer

Incidence: An estimated 182,000 new cases among women in the United States during 1994. About 1,000 new cases of breast cancer will be diagnosed in men in 1994. Breast cancer incidence rates for women increased about 2% a year since 1980, but recently have leveled off at about 108 per 100,000. Most of the recent rise in rates is believed to be due to marked increases in mammography utilization, allowing the detection of early stage breast cancers, frequently before they would become clinically apparent. Other reasons for a longer-term increase in breast cancer are not yet understood.

Mortality: An estimated 46,300 deaths (46,000 women, 300 men) in 1994; in women, the second major cause of cancer death. Although incidence rates are increasing, early detection and improved treatment have kept mortality rates fairly stable over the past 50 years.

Signs and Symptoms: Breast changes that persist, such as a lump, thickening, swelling, dimpling, skin irritation, distortion, retraction, scaliness, pain, tenderness of the nipple, or nipple discharge.

Risk Factors: Over age 40, increases with age; personal or family history of breast cancer; early age at menarche, late age at menopause, never had children or late age at first live birth, and higher education and socioeconomic status. International variability in cancer incidence rates correlate with variations in diet, especially fat intake, although a causal role for dietary factors has not been firmly established. Breast cancer risk factors appear to be more useful in providing clues to the development of cancer than in identifying prevention strategies. Since adult women may not be able to alter their personal risk factors in any practical sense, the best opportunity for reducing mortality is through early detection. Many women will have one or more risk factors for breast cancer. However, most risks are at such a low level that they only partly explain the high frequency of the disease in the population.

Early Detection: The Society recommends that women have a screening mammogram by age 40; women 40 to 49 should have a mammogram every 1-2 years; asymptomatic women age 50 and over should have a mammogram every year. In addition, a clinical physical examination of the breast is recommended every three years for women 20 to 40, and every year for those over 40. The Society also recommends monthly breast self-examination as a routine good health habit for women 20 years or older. Most breast lumps are not cancer, but only a physician can make a diagnosis.

Besides its effectiveness in screening asymptom women, mammography is recognized as a valuable diagnostic technique for women who have findings suggestive of breast cancer. Once a breast lump is found, mammography can help determine if there are other lesions too small to be felt in the same or opposite breast. Since a small percentage of breast cancers may not be seen on a mammogram, all suspicious lumps should be biopsied for a definitive diagnosis, even when current or recent mammography findings are described as normal.

Treatment: Taking into account the medical situation and the patient's preferences, treatment may require lumpectomy (local removal of the tumor), mastectomy (surgical removal of the breast), radiation therapy, chemotherapy, or hormone manipulation therapy. Often, two or more methods are used in combination.

Patients should discuss with their physicians possible options for the best management of their breast cancer.

New techniques in recent years have made breast reconstruction possible after mastectomy, and the cosmetic results usually are good. Reconstruction has become an important part of treatment and rehabilitation.

Survival: The 5-year survival rate (which includes all women living five years after diagnosis, whether the patient is in remission, disease-free, or under treatment) for localized breast cancer has risen from 78% in the 1940s to 93% today. If the cancer has spread regionally at the time of diagnosis, however, the 5-year survival rate is 72%, for persons with distant metastases at the time of diagnosis, the 5-year survival rate is 18%.

From current data, based on women diagnosed in the early 1970s, the long-term breast cancer survival rate is about 50%.

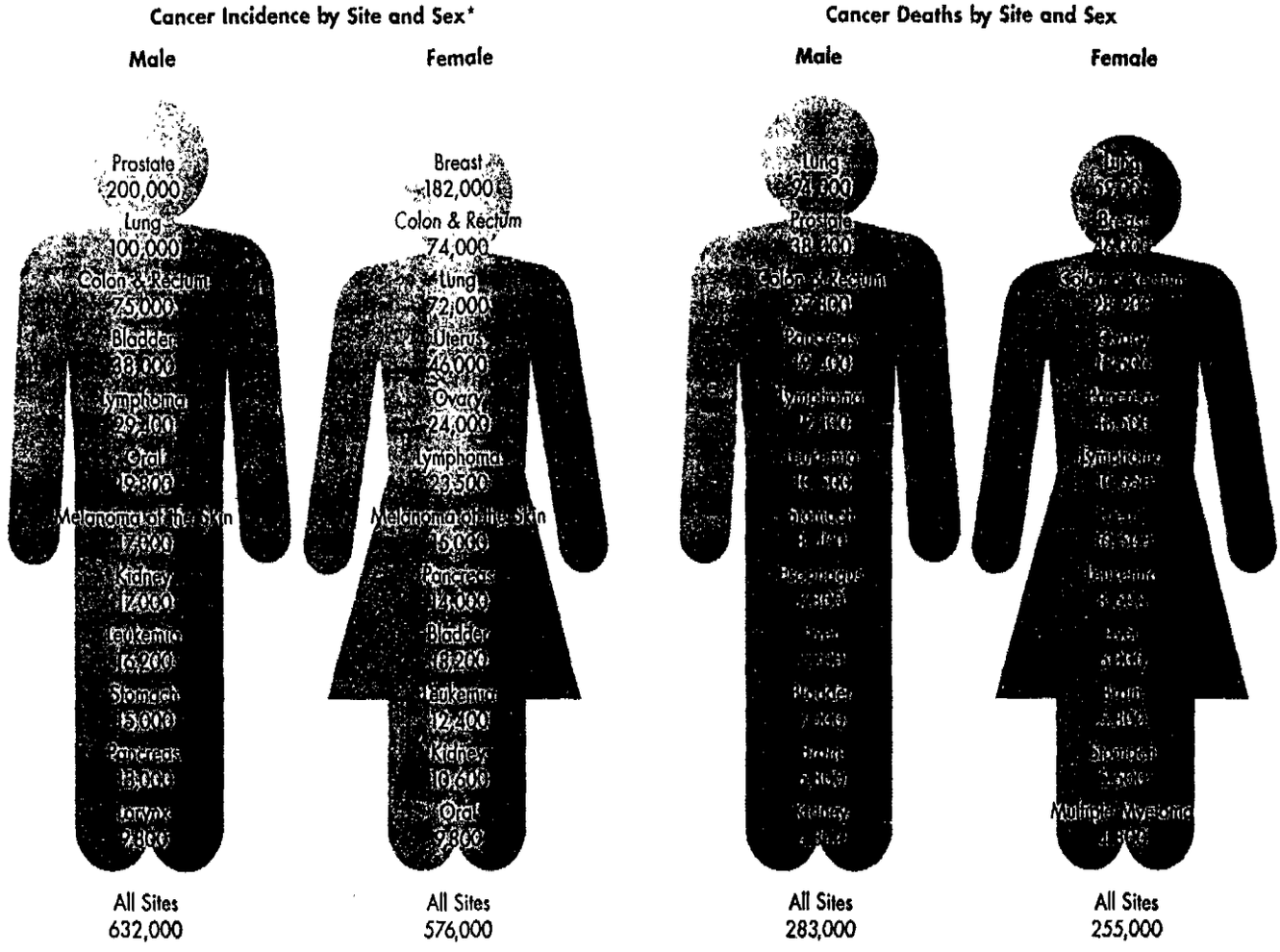
Prostate Cancer

Incidence: An estimated 200,000 new cases in the United States during 1994. Prostate cancer incidence rates are 30% higher for black men than white men. Between 1980 and 1990, prostate cancer incidence rates increased 50%, largely due to improved detection. Further increased incidence is expected with widespread use of serum screening tests.

Mortality: An estimated 38,000 deaths in 1994, the second leading cause of cancer death in men.

Signs and Symptoms: Weak or interrupted urine flow; inability to urinate, or difficulty starting or stopping the urine flow; the need to urinate frequently, especially at night; blood in the urine; pain or burning on urination; continuing pain in lower back, pelvis, or upper thighs.

Leading Sites of Cancer Incidence and Death—1994 Estimates



*Excluding basal and squamous cell skin cancer and carcinoma in situ.

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Most of these symptoms are nonspecific and may be similar to those caused by benign conditions such as infection or prostate enlargement.

Risk Factors: Incidence increases with age; over 80% of all prostate cancers are diagnosed in men over age 65. The disease is more common in northwestern Europe and North America. It is rare in the Near East, Africa, Central America, and South America. For reasons not currently known, black Americans have the highest incidence rate in the world. There is some familial association, but it is unclear whether this is due to genetic or environmental factors. International studies suggest that dietary fat may be a factor.

Early Detection: Every man 40 and over should have a digital rectal examination as part of his regular annual physical checkup. In addition the American Cancer Society recommends that men 50 and over have an annual prostate-specific antigen blood test. If either result is suspicious, further evaluation in the form of transrectal ultrasound should be performed.

Treatment: Surgery, radiation, and/or hormones and anticancer drugs, are treatment options. Hormone treatment and anticancer drugs may control prostate cancer for long periods by shrinking the size of the tumor, thus relieving pain.

Survival: Fifty-eight percent of all prostate cancers are discovered while still localized; the 5-year relative survival rate for patients whose tumors are diagnosed at this stage is 92%. Survival rates for all stages combined have steadily improved, and in the past 30 years have increased from 50% to 78%.

How t Estimate Cancer Statistics Locally

Estimated number of...	Number per 100,000	Multiply community population by	Special Notes
New cancer cases, 1994	400	0.004	Estimated cases and deaths will not reflect the age and ethnic characteristics of the population, access to detection and treatment, and varying risk factors. Actual data from a population-based tumor registry will allow more accurate estimates.
Cancer deaths, 1994	200	0.002	
Cancer survivors, 1994	2,000	0.020	Represents the number of people who were diagnosed over 5 years ago and are still living today.
Cancer cases under care, 1994	1,600	0.016	Represents the number of people diagnosed in 1994 and within the previous 5 years. All are assumed to be under treatment or follow-up care.
People who will eventually develop cancer	40,000	0.400	If current incidence and mortality rates remain the same, about 40% will develop cancer before they die.
People who will eventually die of cancer	20,000	0.200	If current mortality rates remain the same, about 1 in 5 people living today will die of cancer.
People who will be saved from cancer in 1994	200	0.002	Based on 5-year relative survival rate of 53%.

Note: The figures are only a rough approximation of actual data for a community and should be used with caution. Numbers may vary according to the age distribution of the local population.

Pancreas Cancer

Incidence: An estimated 27,000 new cases in the United States in 1994. The disease is more common in men, and occurs more frequently in black Americans than in white Americans.

Mortality: An estimated 25,900 deaths in 1994. Pancreatic cancer incidence and mortality rates have been fairly stable since the early 1970s, except among black women, whose rates have increased slightly.

Signs and Symptoms: Cancer of the pancreas is a "silent" disease, one that occurs without symptoms until it is in advanced stages.

Risk Factors: Very little is known about what causes the disease or how to prevent it. Risk increases after age 50, with the most cases occurring between ages 65 and 79. Smoking is a risk factor; incidence is more than twice as high for smokers as nonsmokers. Some studies have suggested associations with chronic pancreatitis, diabetes, or cirrhosis. In countries where the diet is high in fat, pancreatic cancer rates are higher.

Early Detection: At present, only a biopsy yields a certain diagnosis, and because of the "silent" course of the disease, the need for biopsy is likely to be obvious only after the disease has advanced. Researchers are focusing on ways to diagnose pancreatic cancer before symptoms occur. Ultrasound imaging and computerized tomography scans are being tried.

Treatment: Surgery, radiation therapy, and anticancer drugs are treatment options, but have had little influence on the outcome. Diagnosis is usually so late that none of these is used.

Survival: Only 3% of patients live more than 5 years after diagnosis.

Uterus (Cervix) Cancer

Incidence: An estimated 15,000 invasive and 55,000 carcinoma in situ cases will be diagnosed in 1994. The rate of invasive cervical cancer has decreased steadily over the last several decades, but has increased in recent years in women under 50. Cervical carcinoma in situ, a precancerous condition, is now more frequent than invasive cancer, especially in women under 50.

Mortality: An estimated 4,600 deaths from cervical cancer in 1994. The mortality rate is more than twice as high for black women as for white women.

Signs and Symptoms: Abnormal uterine bleeding or spotting; abnormal vaginal discharge. Pain and systemic symptoms are late manifestations of the disease.

Risk factors: Early age at first intercourse, multiple sex partners, cigarette smoking, and infection with certain types of human papillomavirus.

Early Detection: The Pap test is a simple procedure that can be performed at appropriate intervals by health care professionals as part of a pelvic examination. A small sample of cells is swabbed from the cervix, transferred to a slide, and examined under a microscope. This test should be performed annually with a pelvic examination in women who are, or have been, sexually active or who have reached age 18 years. After three or more consecutive annual examinations with normal findings, the Pap test

Percentage of Population (Probability) Developing Invasive Cancers at Certain Ages

		Birth to 39	40 to 59	60 to 79	Ever (Birth to Death)
All sites	Male	1.68 (1 in 60)	7.51 (1 in 13)	32.27 (1 in 3)	42.52 (1 in 2)
	Female	1.91 (1 in 52)	9.29 (1 in 11)	23.06 (1 in 4)	38.88 (1 in 3)
Breast	Female	0.45 (1 in 222)	3.78 (1 in 26)	6.78 (1 in 15)	12.20 (1 in 8)
Colon	Male	0.06 (1 in 1,667)	0.91 (1 in 110)	4.45 (1 in 22)	6.12 (1 in 16)
& rectum	Female	0.05 (1 in 2,000)	0.73 (1 in 137)	3.34 (1 in 30)	5.96 (1 in 17)
Prostate	Male	Less than 1 in 10,000	0.78 (1 in 128)	10.71 (1 in 9)	13.05 (1 in 8)
Lung	Male	0.04 (1 in 2,500)	1.60 (1 in 63)	6.69 (1 in 15)	8.43 (1 in 12)
	Female	0.03 (1 in 3,333)	1.07 (1 in 93)	3.49 (1 in 29)	5.02 (1 in 20)

Note: This chart shows the risks of being diagnosed with the most common cancers over certain age intervals. These risks are calculated for persons free of the specified cancer at the beginning of the age interval. Risk estimates do not assume all persons live to the end of the age interval or to any fixed age. Risk estimates are presented to give an approximate measure of the burden of cancer to society. Measures are based on population level rates and do not take into account individual behaviors and risk factors. For example, lung cancer is rare among nonsmokers or persons not heavily exposed to environmental tobacco smoke, so the risk for a nonsmoking man getting lung cancer in his lifetime is much lower than 8.4%, and it is much higher for a smoker. It is clear that the risk of developing cancer increases with age. For prostate cancer, the risk before age 60 is very low, but between age 60 and 80, 1 in 9 men will be diagnosed with prostate cancer.

Source of data: Applied Research Branch, National Cancer Institute

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may be performed less frequently at the discretion of the physician.

Treatment: Cervix cancers generally are treated by surgery or radiation, or by a combination of the two. In precancerous (in situ) stages, changes in the cervix may be treated by cryotherapy (the destruction of cells by extreme cold), by electrocoagulation (the destruction of tissue through intense heat by electric current), or by local surgery.

Survival: The 5-year survival rate for cervical cancer patients is 67%. For women diagnosed with localized disease the survival rate is 90%.

Uterus (Endometrial) Cancer

Incidence: An estimated 31,000 cases of cancer of the corpus (body) of the uterus, usually of the endometrium (lining). Endometrial cancer is most frequently diagnosed in women over age 50.

Mortality: An estimated 5,900 deaths in 1994.

Signs and Symptoms: Abnormal uterine staining or bleeding, especially postmenopausal. Pain and weight loss occur late in the disease.

Risk Factors: Early menarche, late menopause, history of infertility, failure to ovulate, tamoxifen or unopposed estrogen therapy, obesity.

During menopause, the level of hormones (estrogens) normally produced by the ovaries declines. This causes symptoms such as "hot flashes" or painful sexual intercourse due to thinning of the vaginal lining. To control these symptoms, estrogen replacement therapy may be given to women during and after menopause. This therapy may increase the risk of endometrial cancer, therefore, the benefits and risks of such treatment should be discussed by the woman and her physician.

Early Detection: The Pap test, highly effective in detecting early cancer of the uterine cervix, is only partially effective in detecting endometrial cancer. Women 40 and over should have an annual pelvic exam by a health professional. Women at high risk of developing endometrial cancer should have an endometrial tissue sample evaluated at menopause.

Treatment: Uterine cancers are usually treated with surgery, radiation, hormones, and/or chemotherapy depending on the stage of disease.

Survival: The 5-year survival rate for endometrial cancer is 83% overall, 94% if discovered at an early stage, and 69% if diagnosed in a regional stage.

Cancer in Children

Incidence: An estimated 8,200 new cases in 1994; as a childhood disease, cancer is rare. Common sites include the blood and bone marrow, bone, lymph nodes, brain, nervous system, kidneys, and soft tissues.

Mortality: An estimated 1,600 deaths in 1994, about one-third of them from leukemia. Despite its rarity, cancer is the chief cause of death by disease in children between the ages of 1 and 14. Mortality rates have declined 60% since 1950.

Early Detection: Cancers in children often are difficult to recognize. Parents should see that their children have regular medical checkups and should be alert to any unusual symptoms that persist. These include: an unusual mass or swelling; unexplained paleness and loss of energy; sudden tendency to bruise; a persistent, localized pain or limping; prolonged, unexplained fever or illness; frequent headaches, often with vomiting; sudden eye or vision

changes; and excessive, rapid weight loss.

Some of the main childhood cancers are:

Leukemia, below.

Osteogenic sarcoma and Ewing's sarcoma are bone cancers. These may cause no pain at first, and swelling in the area of the tumor is often the first sign.

Neuroblastoma can appear anywhere but usually in the abdomen, where a swelling occurs.

Rhabdomyosarcoma, the most common soft tissue sarcoma, can occur in the head and neck area, genito-urinary area, trunk, and extremities.

Brain cancers in early stages may cause headaches, blurred or double vision, dizziness, difficulty in walking or handling objects, and nausea.

Lymphomas and Hodgkin's disease are cancers that involve the lymph nodes, but also may invade bone marrow and other organs. They may cause swelling of lymph nodes in the neck, armpit, or groin. Other symptoms may include general weakness and fever.

Retinoblastoma, an eye cancer, usually occurs in children under age four. When detected early, cure is possible with appropriate treatment.

Wilms' tumor, a kidney cancer, may be recognized by a swelling or lump in the abdomen.

Treatment: Childhood cancers can be treated by a combination of therapies. Treatment is coordinated by a team of experts including oncologic physicians, pediatric nurses, social workers, psychologists, and others who assist children and their families.

Survival: Five-year survival rates vary considerably, depending on the site: all sites, 68%; bone cancer, 58%; neuroblastoma, 57%; brain and central nervous system, 60%; Wilms' tumor (kidney), 88%; Hodgkin's disease, 88%; and acute lymphocytic leukemia, 72%.

Leukemia

Incidence: An estimated 28,600 new cases in 1994, approximately evenly divided into acute leukemia and chronic leukemia. Although often thought of as primarily a childhood disease, leukemia will strike many more adults (26,000 this year) than children (2,600 this year). Acute lymphocytic leukemia accounts for approximately 2,000 of the cases of leukemia among children. In adults, the most common types are acute granulocytic (approximately 7,000 cases) and chronic lymphocytic (approximately 8,500 cases).

Mortality: An estimated 19,100 deaths in 1994.

Signs and Symptoms: Fatigue, paleness, weight loss, repeated infections, bruising easily, and nosebleeds or other hemorrhages. In children, these signs can appear suddenly. Chronic leukemia can progress slowly and with few symptoms.

Risk Factors: Leukemia strikes both sexes and all ages. Causes of most cases are unknown. Persons with Down syndrome and certain other genetic abnormalities have higher than normal incidence of leukemia. It has also been linked to excessive exposure to ionizing radiation and to certain chemicals such as benzene, a commercially used toxic liquid that is also present in lead-free gasoline. Certain forms of leukemia and lymphoma are caused by a retrovirus, HTLV-I (human T-cell leukemia/lymphoma virus-I).

Early Detection: Because symptoms often resemble those of other, less serious conditions, leukemia can be difficult to diagnose early. When a physician does suspect leukemia, diagnosis can be made using blood tests and biopsy of the bone marrow.

Treatment: Chemotherapy is the most effective method of treating leukemia. Various anticancer drugs are used, either in combinations or as single agents. Transfusions of blood components and antibiotics are used as supportive treatments. To illuminate hidden cells, therapy of the central nervous system has become standard treatment, especially in acute lymphocytic leukemia. Under appropriate conditions, bone marrow transplantation may be useful in the treatment of certain leukemias.

Survival: The 5-year survival rate for patients with leukemia is 38%, due partly to very poor survival of patients with some types of leukemia such as acute granulocytic. Over the last 30 years, however, there has been a dramatic improvement in survival of patients with acute lymphocytic leukemia; from a 5-year survival rate of 4% for people diagnosed in the early 1960s to 28% in the early 1970s to 52% in the mid-1980s. In children, the improvement has been from 4% to 72%.

Lymphoma

Incidence: An estimated 52,900 new cases in 1994, including 7,900 cases of Hodgkin's disease and 45,000 non-Hodgkin's lymphoma. Since the early 1970s, incidence rates for non-Hodgkin's lymphoma have increased over 65%. Incidence of Hodgkin's disease has declined over the same time period, especially among the elderly.

Mortality: An estimated 22,750 deaths in 1994 (non-Hodgkin's lymphoma, 21,200; Hodgkin's disease, 1,550).

Signs and Symptoms: Hodgkin's disease: enlarged lymph nodes, itching, fever, night sweats, and weight loss. Fever can come and go in periods of several days or weeks. Non-Hodgkin's lymphoma: enlarged lymph nodes, anemia, weight loss, and fever.

Risk Factors: Risk factors are largely unknown but in part involve reduced immune function and exposure to certain infectious agents. Persons with organ transplants are at higher risk due to altered immune function. Human immunodeficiency virus (HIV) and human T-cell leukemia/lymphoma virus-I (HTLV-I) are associated with increased risk of non-Hodgkin's lymphoma. Burkitt's lymphoma in

Africa is partly caused by the Epstein-Barr herpes virus. Other possible risk factors include exposures to herbicides, industrial solvents, and vinyl chloride.

Treatment: Hodgkin's disease: chemotherapy and radiotherapy are useful for most patients. Non-Hodgkin's lymphoma: early stage, localized lymph node disease can be treated with radiotherapy. Patients with later stage disease often benefit from the addition of chemotherapy. New programs using highly specific monoclonal antibodies directed at lymphoma cells, and improved techniques in bone marrow preservation, are under investigation in selected patients who relapse after standard treatment.

Survival: Survival rates vary widely by cell type and stage of disease. The overall 5-year survival rate for Hodgkin's disease is 78%. The overall 5-year survival for non-Hodgkin's lymphoma has steadily improved, and in the past 30 years has increased from 31% to 52%.

Skin Cancer

Incidence: Over 700,000 cases a year of highly curable basal cell or squamous cell cancers. They are more common among individuals with lightly pigmented skin. The most serious skin cancer is melanoma, which will be diagnosed in about 32,000 persons in 1994. Since 1973, the incidence rate of melanoma has increased about 4% per year. Incidence rates are over ten times higher among whites than blacks. An additional 10,000 invasive nonmelanoma skin cancers will occur in 1994, mostly sarcomas, including Kaposi's sarcoma.

Mortality: An estimated 9,200 deaths this year, 6,900 from malignant melanoma and 2,300 due to other skin cancers.

Signs and Symptoms: Any unusual skin condition, especially a change in the size or color of a mole or other darkly pigmented growth or spot. Scaliness, oozing, bleeding, or change in the appearance of a bump or nodule, the spread of pigmentation beyond its border, a change in sensation, itchiness, tenderness, or pain.

Risk Factors: Excessive exposure to ultraviolet radiation; fair complexion; occupational exposure to coal tar, pitch, creosote, arsenic compounds, or radium.

Prevention: The sun's ultraviolet rays are strongest between 10 a.m. and 3 p.m. Exposure at these times should be avoided, and protective clothing should be worn. Sunscreens should be used. These come in various strengths, ranging from those facilitating gradual tanning to those that allow practically no tanning. Because of the possible link between severe sunburns in childhood and greatly increased risk of melanoma in later life, children, in particular, should be protected from the sun.

Early Detection: Early detection is critical. Recognition of changes in skin growths or the appearance of new growths is the best way to find early skin cancer. Adults should practice skin self-examination once a month, and suspicious lesions should be evaluated promptly by a physician. Basal and squamous cell skin cancers often take the form of a pale, waxlike, pearly nodule, or a red, scaly, sharply outlined patch. A sudden or progressive change in a mole's appearance should be checked by a physician. Melanomas often start as small, mole-like growths that increase in size, change color, become ulcerated, and bleed easily from a slight injury. A simple **ABCD** rule outlines the warning signals of melanoma: **A** is for asymmetry. One half of the mole does not match the other half. **B** is for border irregularity. The edges are ragged, notched, or blurred. **C** is for color. The pigmentation is not uniform. **D** is for diameter greater than 6 millimeters. Any sudden or progressive increase in size should be of special concern.

Treatment: There are four methods of treatment: surgery (used in 90% of cases), radiation therapy, electrodessication (tissue destruction by heat), or cryosurgery (tissue destruction by freezing) for early skin cancer. For malignant melanoma, the primary growth must be adequately excised, and it may be necessary to remove nearby lymph nodes. Removal and microscopic examination of all suspicious moles is essential. Advanced cases of melanoma are treated according to the characteristics of the case.

Survival: For basal cell or squamous cell cancers, cure is highly likely if detected and treated early. Malignant melanoma can spread to other parts of the body quickly; however, when detected in its earliest stages, and with proper treatment, it is highly curable.

The overall 5-year survival rate for patients with malignant melanoma is 84%. The 5-year survival rate for localized malignant melanoma is 92%; survival rates for regional and distant disease are 55% and 14%, respectively. About 82% of melanomas are diagnosed in a local stage.

Ovary Cancer

Incidence: An estimated 24,000 new cases in the United States in 1994. It accounts for 4% of all cancers among women.

Mortality: An estimated 13,600 deaths in 1994. Although ovarian cancer ranks second in incidence among gynecological cancers, it causes more deaths than any other cancer of the female reproductive system.

Signs and Symptoms: Ovarian cancer is often "silent," showing no obvious signs or symptoms until late in its development. The most common sign is enlargement of the abdomen, which is caused by the accumulation of fluid. Rarely will there be abnormal vaginal bleeding. In women over 40, vague digestive disturbances (stomach discomfort, gas, distention) that persist and cannot be explained by any other cause may indicate the need for a thorough evaluation for ovarian cancer.

Five-Year Relative Survival Rates by Stage at Diagnosis*

Site	All Stages %	Local %	Regional %	Distant %
Oral	53	78	42	19
Colon-rectum	58	89	58	6
Pancreas	3	8	4	2
Lung	13	46	13	1
Melanoma	84	92	55	14
Female breast	79	93	72	18
Cervix uteri	67	90	52	13
Corpus uteri	83	94	69	27
Ovary	39	88	36	17
Prostate	77	92	82	28
Bladder	79	91	46	9
Kidney	55	86	57	10

*Adjusted for normal life expectancy. This chart based on cases diagnosed in 1983-87, followed through 1990.

Source: Cancer Statistics Branch, National Cancer Institute

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Risk Factors: Risk for ovarian cancer increases with age. Women who have never had children are more likely to develop ovarian cancer than those who have. Increased number of pregnancies and the use of oral contraceptives, appear to be protective against ovarian cancer. Women who have had breast cancer or have a family history of ovarian cancer are at increased risk. Certain rare genetic disorders are associated with increased risk. With the exception of Japan, the highest incidence rates are reported from the more industrialized countries.

Early Detection: Periodic, thorough pelvic examinations are important. The Pap test, useful in detecting cervical cancer, does not reveal ovarian cancer. Women over the age of 40 should have a cancer-related checkup every year.

Treatment: Surgery, radiation therapy, and drug therapy are treatment options. Surgery usually includes the removal of one or both ovaries (oophorectomy), the uterus (hysterectomy), and the fallopian tubes (salpingectomy). In some very early tumors, only the involved ovary will be removed, especially in young women. In advanced disease, an attempt is made to remove all intraabdominal disease, to enhance the effect of chemotherapy.

Survival: Overall, the 5-year survival rate for ovarian cancer is 41%. If diagnosed and treated early, the relative survival rate is 88%; however, only about 23% of all cases are detected at the localized stage. Survival rates for women with regional and distant disease are 36% and 17%, respectively.

Bladder Cancer

Incidence: An estimated 51,200 new cases in 1994; 38,000 in men, 13,200 in women. Overall, the incidence rate of bladder cancer is four times greater among men than among women, and is higher in whites than in blacks.

Mortality: An estimated 10,600 deaths in 1994.

Signs and Symptoms: Blood in the urine. Usually associated with increased frequency of urination.

Risk Factors: Smoking is the greatest risk factor in bladder cancer, with smokers experiencing twice the risk of nonsmokers. Smoking is estimated to be responsible for approximately 47% of the bladder cancer deaths among men and 37% among women. People living in urban areas and workers exposed to dye, rubber, or leather also are at higher risk.

Early Detection: Bladder cancer is diagnosed by examination of the bladder wall with a cystoscope, a slender tube fitted with a lens and light that can be inserted into the tract through the urethra.

Treatment: Surgery, alone or in combination with other treatments is used in over 90% of cases. Preoperative chemotherapy alone or with radiation before cystectomy (bladder removal) has improved some treatment results.

Survival: When detected at an early stage, the 5-year survival rate for bladder cancer is 91%. For regional and distant disease, the survival rates are 46% and 9%, respectively.

Oral Cancer

Incidence: An estimated 29,600 new cases in 1994. Incidence is more than twice as high in men as in women, and is most frequent in men over age 40.

Mortality: An estimated 7,925 deaths in 1994.

Signs and Symptoms: A sore that bleeds easily and doesn't heal; a lump or thickening; a red or white patch that persists. Difficulty in chewing, swallowing, or moving tongue or jaws are often late changes.

Trends in Cancer Survival, by Race

Cases Diagnosed in 1960-63, 1970-73, 1974-76, 1977-79, 1983-89

	White					Black				
	Relative 5-Year Survival %					Relative 5-Year Survival %				
Site	1960-63[1]	1970-73[1]	1974-76[2]	1977-79[2]	1983-89[2]	1960-63[1]	1970-73[1]	1974-76[2]	1977-79[2]	1983-89[2]
All sites	39	43	50	51	55*	27	31	39	39	39
Oral cavity & pharynx	45	43	55	54	54	—	—	36	36	33
Esophagus	4	4	5	6	10*	1	4	4	3	7*
Stomach	11	13	14	16	17*	8	13	16	15	18
Colon	43	49	50	53	60*	34	37	46	48	49*
Rectum	38	45	49	50	58*	27	30	42	38	45
Liver	2	3	4	3	6*	—	—	1	6	5
Pancreas	1	2	3	2	3*	1	2	2	4	5*
Larynx	53	62	66	68	68	—	—	59	55	54
Lung & bronchus	8	10	12	14	13*	5	7	11	11	11
Melanoma of skin	60	68	80	82	84*	—	—	69†	52‡	72†
Female breast	63	68	75	75	81*	46	51	63	63	64
Cervix uteri	58	64	69	69	69	47	61	63	62	57*
Corpus uteri	73	81	89	86	85*	31	44	60	58	56
Ovary	32	36	36	38	40*	32	32	41	40	40
Prostate	50	63	68	72	79*	35	55	58	62	64*
Testis	63	72	79	88	93*	—	—	76†	—	84†
Urinary bladder	53	61	74	76	80*	24	36	48	55	61*
Kidney & renal pelvis	37	46	52	51	56*	38	44	49	52	51
Brain & nervous system	18	20	22	24	26*	19	19	27	28	31
Thyroid gland	83	86	92	92	94*	—	—	87	92	92
Hodgkin's disease	40	67	72	73	79*	—	—	69	73	74
Non-Hodgkin's lymphoma	31	41	48	48	52*	—	—	48	50	44
Multiple myeloma	12	19	24	25	27*	—	—	27	34	29
Leukemia	14	22	35	37	39*	—	—	31	30	30

Source: Cancer Statistics Branch, National Cancer Institute

[1]Rates are based on End Results Group data from a series of hospital registries and one population-based registry.

[2]Rates are from the SEER Program. They are based on data from population-based registries in Connecticut, New Mexico, Utah, Iowa, Hawaii, Atlanta, Detroit, Seattle-Puget Sound, and San Francisco-Oakland. Rates are based on follow-up of patients through 1990.

*The difference in rates between 1974-76 and 1983-89 is statistically significant ($p < 0.05$). †The standard error of the survival rate is between 5 and 10 percentage points. ‡The standard error of the survival rate is greater than 10 percentage points. —Valid survival rate could not be calculated.

Risk Factors: Cigarette, cigar, or pipe smoking; use of smokeless tobacco; excess use of alcohol.

Early Detection: Cancer can affect any part of the oral cavity, including the lip, tongue, mouth, and throat. Dentists and primary care physicians have the opportunity, during regular checkups, to see abnormal tissue changes and to detect cancer at an early, curable stage.

Treatment: Principal methods are radiation therapy and surgery. Chemotherapy is being studied as an adjunct to surgery in advanced disease.

Survival: Five-year survival rates vary substantially, depending on the site. Rates range from 25% for cancer of the hypopharynx to 90% for lip cancer. Overall, 5-year survival for oral cancer patients is about 52%.

Cancer in Minorities

In 1994, about 1,208,000 cancers will be diagnosed in the United States. About 120,000 of these cancers will be among black Americans and 35,000 among other minority Americans.

Cancer incidence and mortality rates are generally higher for black Americans than for whites. In 1990, the incidence rates were 423 per 100,000 for blacks and 393 for whites, about a 6% difference. In 1990, the mortality rates were 230 for blacks and 170 for whites.

Cancer sites for which blacks have significantly higher incidence and mortality rates include esophagus, uterine cervix, stomach, liver, prostate, larynx, and multiple myeloma. Rates for esophageal cancer are over three times higher among blacks than whites.

The 5-year survival rate for cancer in blacks diagnosed from 1983 through 1989 was about 39% compared with 55% for whites. A considerable part of this difference in survival can be attributed to late diagnosis. Many cancers are more frequently diagnosed in a localized stage among whites than among blacks. Most of these sites represent cancers for which screening tests are available or which present symptoms early in the disease process. Early detection and timely treatment can increase survival.

Incidence and mortality rates for other minority groups such as Hispanics are often lower than those for white or black Americans. Because cancer risk is strongly associated with lifestyle and behavior, differences in ethnic and cultural groups can provide clues to factors involved in the development of cancer such as dietary patterns, alcohol use, and sexual and reproductive behaviors involved in the development of cancer. Cultural values and belief systems can affect attitudes about seeking medical care or following screening guidelines (see p. 21). Socioeconomic factors such as lack of health insurance or transportation can impede access to care, and lead to late diagnosis and poor survival.

Number of Cancer Deaths for Black, American Indian, Chinese, Japanese, and Hispanic Persons, United States, 1990

Cancer Site	Black Males	Black Females	American Indian	Chinese	Japanese	Hispanic*
All sites	31,995	25,082	1,275	1,527	1,122	14,003
Oral cavity	1,000	311	23	60	23	232
Esophagus	1,433	541	19	45	32	233
Stomach	1,341	917	67	117	132	811
Colon & rectum	2,898	3,169	117	166	168	1,414
Liver & other biliary	757	615	68	168	66	769
Pancreas	1,442	1,581	52	65	77	795
Lung (male)	10,632	—	205	238	148	1,824
Lung (female)	—	4,512	117	145	75	787
Melanoma of skin	51	55	9	2	3	89
Breast (female)	—	4,659	89	88	79	1,246
Cervix uteri	—	972	47	22	12	296
Other uterus	—	899	12	15	14	168
Ovary	—	975	34	29	22	385
Prostate	5,181	—	59	42	56	728
Bladder	466	381	9	21	12	210
Kidney	563	382	39	12	14	355
Brain & CNS†	372	319	21	35	14	376
Lymphoma	747	573	50	47	42	688
Leukemia	854	737	52	47	27	735
Multiple myeloma	745	708	39	15	6	273

*Persons classified as of Hispanic origin on death certificates may be of any race. Hispanic origin reporting, however, may be incomplete on death certificates in some states. These numbers are believed to include over 90% of cancer deaths in Hispanics in 1990.

†CNS = Central nervous system.

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Prevention

Smoking

Cigarette smoking is responsible for 90% of lung cancer among men and 79% among women—about 87% overall. Smoking accounts for about 30% of all cancer deaths. Those who smoke two or more packs of cigarettes a day have lung cancer mortality rates 12 to 25 times greater than nonsmokers. (See Tobacco Use.)

Nutrition and Diet

Research is showing the important role nutrition plays in preventing cancer. Evidence indicates that people may reduce their cancer risk by observing these nutrition guidelines:

1. **Maintain a desirable weight.** Individuals 40% or more overweight increase their risk of colon, breast, prostate, gallbladder, ovary, and uterus cancers. Physicians can recommend a suitable diet and exercise regimen to help maintain appropriate weight and body fitness.
2. **Eat a varied diet.** A varied diet eaten in moderation offers the best hope for lowering the risk of cancer.
3. **Include a variety of vegetables and fruits in the daily diet.** Studies have shown that daily consumption of vegetables and fresh fruits is associated with a decreased risk of lung, prostate, bladder, esophagus, colorectal, and stomach cancers.
4. **Eat more high-fiber foods such as whole grain cereals, breads, and pasta; and vegetables and fruits.** High-fiber diets are a healthy substitute for fatty foods and may reduce the risk of colon cancer.
5. **Cut down on total fat intake.** A diet high in fat may be a factor in the development of certain cancers, particularly breast, colon, and prostate.
6. **Limit consumption of alcohol, if you drink at all.** Heavy drinking, especially when accompanied by cigarette smoking or smokeless tobacco use, increases risk of cancers of the mouth, larynx, throat, esophagus, and liver.
7. **Limit consumption of salt-cured, smoked, and nitrite-cured foods.** In areas of the world where salt-cured and smoked foods are eaten frequently, there is higher incidence of cancer of the esophagus and stomach. Modern methods of food processing and preserving appear to avoid the cancer-causing byproducts associated with older methods of food treatment.

Sunlight

Almost all of the more than 700,000 cases of basal and squamous cell skin cancer diagnosed each year in the US are sun-related (ultraviolet radiation). Epidemiologic evidence shows that sun exposure is a major factor in the development of melanoma and that incidence increases for those living near the equator. (See Selected Cancers: Skin Cancer.)

Alcohol

Oral cancer and cancers of the larynx, throat, esophagus, and liver occur more frequently among heavy drinkers of alcohol especially when accompanied by smoking cigarettes or chewing tobacco. (See Selected Cancers: Oral Cancer.)

Smokeless Tobacco

Use of chewing tobacco or snuff increases risk of cancer of the mouth, larynx, throat, and esophagus and is a highly addictive habit. (See Selected Cancers: Oral Cancer.)

Estrogen

Estrogen treatment to control menopausal symptoms can increase risk of endometrial cancer. However, including progesterone in estrogen replacement therapy helps to minimize this risk. Consultation with a physician will help each woman to assess personal risks and benefits. Continued research is needed in the area of estrogen use and breast cancer. (See Selected Cancers: Uterus and Cervix Cancer).

Occupational Hazards

Exposure to several different industrial agents (nickel, chromate, asbestos, vinyl chloride, etc.) increases risk of various cancers. Risk of lung cancer from asbestos is greatly increased when combined with cigarette smoking. (See Environmental Cancer Risks.)

Ionizing Radiation

Excessive exposure to ionizing radiation can increase cancer risk. Most medical and dental x-rays are adjusted to deliver the lowest dose possible without sacrificing image quality. Excessive radon exposure in homes may increase risk of lung cancer, especially in cigarette smokers. If levels are found to be too high, remedial actions should be taken.

Environmental Cancer Risks

The environmental causes of cancer include exposures in the community or workplace settings, as well as exposures determined by individual lifestyle choices (smoking, diet, medications, etc.).

The degree of cancer hazard posed by such risks depends on the concentration or intensity of the carcinogen in the environment and the exposure dose a person receives. These factors in combination create a range of risk. For example, in situations where high levels of carcinogen are present and where exposures are extensive, significant hazards may exist, but where concentrations are low and exposures limited, hazards are often negligible.

Risk Assessment

To protect people against unsafe exposures, risks should be assessed so that appropriate environmental standards can be set. **Risk assessment** is a two-step process: identifying the toxic properties of potential oncogenic hazards and measuring the extent of human exposure.

The first step, **hazard identification,** evaluates the chemical or physical nature of hazards and their oncogenicity in observed clinical and epidemiologic studies and in laboratory tests using animals or cell systems. Special attention is given to any evidence suggesting that cancer risk may increase with dose (dose-response relationships).

The second step, **exposure measurement,** determines the levels of hazards in the environment (air, water, food, etc.) and the extent to which people are actually exposed (how much they eat of a particular food, use a particular water source, etc.). Knowledge of how the body absorbs, metabolizes, and excretes chemicals or is exposed to radiation sources is essential to determine accurately the actual carcinogenic dose delivered to humans.

Unfortunately, evidence of risk for most potential carcinogens usually rests on the results of high-dose animal experiments or on human observations where high-dose exposures have occurred. To use such information in setting human safety standards, scientists must extrapolate from animals to humans and from high-dose to low-dose conditions. Both extrapolations involve much uncertainty; therefore conservative assumptions are used so that risk assessment will err on the side of safety. For cancer safety standards, only increased risks of one case or less per million persons over a lifetime are usually accepted.

Safety standards developed in this way for chemical or radiation exposures are the basis for federal regulatory activities at the Food and Drug Administration, the Environmental Protection Agency, and the Occupational Safety and Health Administration. The application of laws and procedures by which standards are implemented and risks are controlled is called **risk management.**

Chemicals and Radiation

Not all chemicals or all forms of radiation cause cancer. Only a limited number of chemicals (for example, benzene, asbestos, vinyl chloride, arsenic, aflatoxins) show definite evidence of human carcinogenicity or are probable human carcinogens based on animal experiments (for example, chloroform, dichlorodiphenyltrichloroethane [DDT], formaldehyde, polychlorinated biphenyls [PCBs], polycyclic aromatic hydrocarbons). The only forms of radiation proven to cause human cancer are ionizing radiation (for example, x-rays, radon, cosmic rays) and ultraviolet radiation (principally UV-B radiation).

Unproven Risks

Public concern about environmental cancer risks often focuses on risks for which no carcinogenicity has been proven or on situations where known carcinogen exposures are at such low levels that risks are negligible. For example:

1. Non-ionizing radiation. Electromagnetic radiation at frequencies below ionizing and ultraviolet levels has not been shown to cause cancer. While some epidemiologic studies suggest associations with cancer, others do not, and experimental studies have not yielded reproducible evidence of carcinogenic mechanisms. Low frequency radiation includes radiowaves, microwaves, and radar, as well as power frequency radiation arising from the electric and magnetic fields associated with electric currents (often called ELF or extremely low frequency radiation).

2. Pesticides. Many kinds of pesticides (insecticides, herbicides, etc.) are widely used in producing and marketing our food supply. While some of these chemicals cause cancer at high doses in experimental animals, the very low concentrations found in some foods are generally within established safety levels. Environmental pollution by slowly degraded pesticides such as DDT, a result of past agricultural practices, can lead to food chain bioaccumulation and to persistent residues in body fat. Such residues have been suggested as a possible risk factor for breast cancer; concentrations in tissue are low, however, and the evidence is not conclusive.

Continued research regarding pesticide use is essential for maximum food safety, improved food production through alternative pest control methods, and reduced pollution of the environment. At the same time, banning any man-made chemicals with carcinogenic potential (as required for processed foods under the 1958 Delaney Amendment of the Food and Drug Act) is unrealistic, given the very low concentrations involved and the value of pesticides in sustaining our food supply. Scientists and consumer groups stress the important health benefits of a diet which includes many fruits and vegetables in contrast to the minimal risks associated with pesticide residues.

3. Toxic wastes. Toxic wastes in dump sites can threaten

human health through air, water, and soil pollution. Although many toxic chemicals contained in such wastes can be carcinogenic at high doses, most community exposures appear to involve very low or negligible dose levels. Clean-up of existing dump sites and close control of toxic materials in the future is essential to ensure healthy living conditions in our industrialized society.

4. Nuclear power plants. Ionizing radiation emissions from nuclear facilities are closely controlled and involve negligible levels of exposure for communities near such plants. Although reports about cancer case clusters in such communities have raised public concern, studies show that clusters do not occur more often near nuclear plants than they do by chance elsewhere in the population.

Early Detection

Each person should be aware of the cancer early detection guidelines that pertain to them. To understand the role of the cancer-related checkup, the ACS adopted the following definitions. **Screening** is the search for disease in persons without symptoms. Once a person has had a positive screening test, or once signs or symptoms have been identified, further tests are considered diagnostic. **Detection** is the discovery of an abnormality in a person with or without symptoms. **Diagnostic evaluation** is the evaluation of a patient who has signs or symptoms suggestive of disease to determine the actual existence and nature of the disease.

The following recommendations are for the early detection of cancer in asymptomatic persons on an individual basis. The recommendations are intended to help individual providers and their patients determine the most appropriate early cancer detection tests to meet their individual needs.

Guidelines for the early detection of cancer in people without symptoms are recommended by the American Cancer Society as follows: A cancer-related checkup by a physician every three years for persons aged 20-39 and annually for those aged 40 and over. Some persons at particular risk for certain cancers may need tests more often and should discuss this with their doctor. The checkup should always include health counseling (how to quit smoking, etc.) and exams for cancer of the breast, uterus, cervix, colon, rectum, prostate, mouth, skin, testes, thyroid, and lymph nodes.

In 1989 and 1990, Congress passed legislation mandating Medicare coverage for cervical and breast cancer screening, respectively. For women over age 65, Medicare currently covers a Pap smear once every three years and a mammogram every two years. Although this policy does not strictly conform to ACS screening recommendations, it does begin to address the benefits of early detection.

Breast

The American Cancer Society recommends that screening mammography begin by age 40. Women aged 40-49 should have a mammogram every 1-2 years, depending on physical and mammographic findings. Women aged 50 and older should have mammograms yearly. The ACS recommends the monthly practice of breast self-exam (BSE) by women 20 years and older as a routine good health habit. Examination of the breast by a health care professional should be done every three years from ages 20-40 and then every year.

Colon and Rectum

The American Cancer Society recommends three tests for the early detection of colon and rectum cancer in people without symptoms. A digital rectal examination by a physician during an office visit should be performed every year after the age of 40; the stool blood test is recommended every year after age 50; and sigmoidoscopy, preferably flexible, should be performed every 3 to 5 years.

Uterus

For cervical cancer, women who are or have been sexually active, or have reached age 18, should have an annual Pap test and pelvic examination. After a woman has had three or more consecutive satisfactory normal annual examinations, the Pap test may be performed less frequently at the discretion of her physician.

Women at high-risk for endometrial cancer (those who have a history of infertility, obesity, failure to ovulate, abnormal uterine bleeding, or unopposed estrogen or tamoxifen therapy) should have an endometrial tissue sample taken at menopause and thereafter at the discretion of the physician.

Prostate

Men who have reached 50 years of age and older should have a digital rectal examination (DRE) annually. Annual prostate-specific antigen blood testing should be performed on men age 50 and older.

Tobacco Use

Smoking is the most preventable cause of death in our society. Tobacco use is responsible for nearly one in five deaths in the United States. Based upon data from the American Cancer Society's Cancer Prevention Study II, it is estimated that smoking is related to about 419,000 US deaths each year. Although the number of cardiovascular deaths are declining, smoking-related cancer deaths continue to rise. According to the World Health Organization approximately 3 million people die worldwide each year as a result of smoking. Smokers lose an average of 15 years of life.

The risks of dying of lung cancer are 22 times higher for male smokers and 12 times higher for female smokers than for people who have never smoked. In addition to being responsible for 87% of lung cancers, smoking is also associated with cancers of the mouth, pharynx, larynx, esophagus, pancreas, uterine cervix, kidney, and bladder. Smoking accounts for 30% of all cancer deaths, is a major cause of heart disease, and is associated with conditions ranging from colds and gastric ulcers to chronic bronchitis, emphysema, and cerebrovascular disease.

Trends in Smoking

The National Health Interview Survey (NHIS) reports that cigarette smoking among adults aged 18 and over declined from 42% in 1965 to 25% in 1991. The NHIS data from 1974 to 1991 show:

- Smoking among women decreased from 33% to 24%.
- Smoking among men dropped from 43% to 28%.
- Rates for college graduates declined from 28% to 14%.
- Rates for persons without a high school education decreased slightly from 44% to 37%.

Data from the 1991 NHIS indicate that the decline in cigarette smoking among adults has begun to level off. Between 1990 and 1991, smoking rates rose for the first time in nearly 20 years due to increased smoking among blacks and women. Contributing to this rise may be the growth in discount cigarette products and the recent surge in the tobacco industry's domestic advertising and promotion expenditures.

According to the 1989 Surgeon General's Report, decisions to quit or not to start through 1985 will postpone or prevent an additional 2 million smoking-related deaths between 1986 and the year 2000.

Per capita cigarette consumption dropped 37% from 1973 to 1992 (4,148 to 2,640). This is the lowest per capita cigarette consumption since 1942.

Profile of Smokers

In 1991, the number of current smokers in the US: 46 million.

The prevalence of smoking is highest among people who live below poverty level: men 39%; women 29%. Smoking rates are highest in the age group 25-44.

Approximately 50% of smokers start smoking regularly before age 18.

More than 3,000 teenagers become regular smokers each day in the United States.

According to the Centers for Disease Control and Prevention's 1991 Youth Risk Behavior Survey:

- 70% of all students in grades 9-12 reported ever trying cigarettes.
- About 13% of high school students reported frequent cigarette use.

Cost of Tobacco

The 1992 Surgeon General's Report estimates that the total lifetime excess medical care costs for smokers exceed those for nonsmokers by $501 billion.

The US Congress Office of Technology Assessment estimates that cigarettes cost Americans $68 billion annually in tobacco-related health care costs and lost productivity. The cost of treating smoking-related diseases and lost productivity amounts to $2.59 for each pack of cigarettes sold in the US. For every 10% increase in the price of tobacco products, it is estimated that tobacco consumption would decline 4%.

Cigarette Exports

US cigarette exports have increased due to aggressive marketing by tobacco companies and expanding foreign markets. A September 1993 tobacco report of the US Department of Agriculture estimates:

- US cigarette exports have increased about 275% since 1985.
- US cigarette exports to Japan have increased almost 800%, from 6.5 billion in 1985 to 56 billion in 1993.
- Exports to South Korea have grown from 1.3 billion in 1987 to 4 billion in 1993.
- Exports to the countries that formerly comprised the Soviet Union have increased from 4.6 billion in 1991 to 13.6 billion in 1993.
- US cigarette output from July 1992 to June 1993 was 702 billion. Even though domestic consumption has dropped, this recent increase in output is the result

foreign demand of US tobacco leaf and US manufacturers offering discounted cigarettes and lower prices on premium brands.

Nicotine Addiction

Tobacco smoke contains over 4,000 chemical compounds including at least 43 different carcinogenic substances.

The 1988 Surgeon General's Report on Nicotine Addiction concluded:

- Cigarettes and other forms of tobacco are addicting.
- Nicotine is the drug in tobacco that causes addiction.
- The pharmacologic and behavioral processes that determine tobacco addiction are similar to those that determine addiction to drugs such as heroin and cocaine.

Nicotine is found in substantial amounts in tobacco. It is absorbed readily from tobacco smoke in the lungs and from smokeless tobacco in the mouth or nose and is rapidly distributed throughout the body.

Smoking Cessation

By 1991, almost 44 million Americans had quit smoking cigarettes, nearly half of all living adults who ever smoked.

In September 1990, the Surgeon General outlined the benefits of smoking cessation:

- People who quit smoking, regardless of age, live longer than people who continue to smoke.
- Smokers who quit before age 50 have half the risk of dying in the next 15 years compared with those who continue to smoke.
- Quitting smoking substantially decreases the risk of lung, laryngeal, esophageal, oral, pancreatic, bladder, and cervical cancers.
- Benefits of cessation include risk reduction for other major diseases including coronary heart disease and cardiovascular disease.

A 1989 Gallup Survey reported that the following people want to quit smoking:

- 57% of smokers 50 and older
- 67% of smokers aged 30-49
- 68% of smokers aged 18-29.

Environmental Tobacco Smoke

In December 1992, the Environmental Protection Agency concluded that widespread exposure to environmental tobacco smoke (ETS) presents "a serious and substantial" public health problem in the United States. Each year about 3,000 nonsmoking adults die of lung cancer as a result of breathing the smoke of other's cigarettes.

- The risk of dying of lung cancer is 30% higher for a nonsmoker living with a smoker compared with a nonsmoker living with a nonsmoker.
- It is estimated that ETS causes 35,000 to 40,000 excess heart disease deaths among people who are not current smokers.
- ETS contains essentially all of the same carcinogens and toxic agents that are inhaled by the smoker.
- ETS can result in aggravated asthmatic conditions, impaired blood circulation, bronchitis, and pneumonia.
- ETS poses additional health hazards for unborn and young children. According to the 1988 NHIS, about 10 million children under the age of six are exposed to ETS by a household member.

Children exposed to secondhand smoke have increased risks of respiratory illnesses and infections, impaired development of lung function, and middle ear infections. Infants born to women who smoked during pregnancy are more likely to die of Sudden Infant Death syndrome.

Smokeless Tobacco

There has been a resurgence in the use of all forms of smokeless tobacco—plug, leaf, and snuff—but the greatest cause for concern centers on the increased use of "dipping snuff." In this practice, tobacco that has been processed into a coarse, moist powder is placed between the cheek and gum, and nicotine, along with a number of carcinogens, is absorbed through the oral tissue. Dipping snuff is highly addictive, and exposes the body to levels of nicotine equal to those of cigarettes.

- In 1986, the US Surgeon General concluded that the use of smokeless tobacco "is not a safe substitute for smoking cigarettes. It can cause cancer and a number of noncancerous oral conditions and can lead to nicotine addiction and dependence."
- Oral cancer occurs several times more frequently among snuff dippers compared with non-tobacco users.
- The excess risk of cancer of the cheek and gum may reach nearly fiftyfold among long-term snuff users.
- The use of smokeless tobacco is increasing among male adolescents and young male adults.
- According to the US Department of Agriculture, US output of moist snuff has risen 83% from about 30 million pounds in 1981 to an estimated 55 million pounds in 1993.
- About 5 million US adults use smokeless tobacco.
- The Centers for Disease Control and Prevention's 1991 Youth Risk Behavior Survey reported that 19% of male high school students used smokeless tobacco.

Industrial Hazards

Industrial workers are especially susceptible to lung diseases due to the combined effects of cigarette smoke and exposure to certain toxic industrial substances, such as fumes from rubber and chlorine, and dust from cotton and coal. Exposure to asbestos in combination with cigarette smoking increases an individual's lung cancer risk nearly 60 times. Smoking also enhances lung cancer risk in underground miners exposed to radon.

The American Cancer Society

In 1913, 10 physicians and five laymen founded the American Society for the Control of Cancer. Its stated purpose was to "disseminate knowledge concerning the symptoms, treatment, and prevention of cancer; to investigate conditions under which cancer is found; and to compile statistics in regard thereto." Later renamed the American Cancer Society, Inc., the organization now consists of over 2 million Americans working to conquer cancer.

Organization: The American Cancer Society, Inc., consists of a National Society, 57 Divisions, and over 3,400 Units.

The National Society: A 285-member Board of Directors provides representation from the 57 Divisions.

The National Society is responsible for overall planning and coordination, providing technical help and materials to Divisions and Units, administering programs of research, medical grants and clinical fellowships, and performing public and professional education at the national level.

The 57 Divisions: Located in all states plus five metropolitan areas, the District of Columbia, and Puerto Rico, the Divisions are governed by members of Divisional boards of directors.

The Units: These are organized to cover the counties in the United States. There are thousands of community leaders who direct the Society's programs at this level.

Descriptions of some of the Society's major programs follow.

Research

The American Cancer Society is the largest private source of cancer research funds in the United States, second only to the federal government's National Cancer Institute in total dollars spent.

In fiscal year 1993, the Society invested approximately $100 million in research—slightly over 26% of its budget. To date, the Society has invested more than $1.5 billion in cancer research.

The research program consists of two components: extramural grants and awards, and intramural epidemiology research. The extramural program supports investigator-initiated projects taking place in leading centers across the country. Applications for grants are subjected to a rigorous external peer review which ensures that only the highest quality applications receive funding. The success of the Society's research program is exemplified by the fact that 26 Nobel Prize winners received grant support from the Society early in their careers.

Epidemiology

The Society supports an active program of epidemiologic research at its National office. This program analyzes trends in cancer occurrence and has conducted three large prospective studies of cancer risk in Americans over the past 40 years.

- The Hammond-Horn study demonstrated the effects of smoking on mortality and cancer risk in 188,000 men observed from 1952-1955.
- Cancer Prevention Study I, conducted from 1959 through 1972, encompassed 1 million men and women in 25 states and examined potential cancer risk factors related to the environment and to individual lifestyles.
- Cancer Prevention Study II (CPS II), was launched in 1982 and is still in progress, examining the habits and exposures of more than 1 million Americans. Causes of death among these people over subsequent years are being studied to learn how lifestyles and environmental factors affect the development of cancer.

Over 77,000 volunteers enrolled the men and women in CPS II. These volunteer researchers distributed questionnaires to participants who were asked about their lifestyles.

Another questionnaire was sent in October 1992, 160,000 households participating in CPS II. This questionnaire seeks additional dietary information to gain more specific knowledge about how diet impacts disease.

Public Education

The Society's Public Education programs focus on tobacco control, the relationship between diet and cancer, comprehensive school health education and early detection.

The programs are divided into two audiences: adult and youth. Adults are reached through the worksites, healthsites, and the community. Volunteers are recruited and trained both to promote and to deliver programs.

Examples of adult education include **Taking Control,** which identifies 10 steps to a healthier lifestyle; **Smart Move,** a single-session stop-smoking program; **Self-Defense,** which explains how a person can work with a health care provider to become familiar with cancer tests and examinations; and **Special Touch,** which explains breast cancer and early detection techniques.

The Society has joined with other health, education, and social service agencies to promote comprehensive school health education. The best way to ensure good cancer education in the schools, comprehensive school healt

education is the means of delivering a planned health education curricula from pre-school to grade 12.

The Society's education programs emphasize the importance of developing good health habits. Beginning in preschool, students learn about the dangers of tobacco use with **Starting Free: Good Air for Me.** Other tobacco prevention programs include: **An Early Start to Good Health** (grades K-3), and **Health Myself** (grades 7-9). **Changing the Course** curricula help elementary and secondary students make good dietary choices that will reduce their risk of developing a number of diseases, including cancer. High school students can also learn in-depth about cancer through **Right Choices.**

Professional Education

The Society's Professional Education Department provides health care professionals with the latest information on developments in cancer prevention, early detection, and treatment through:

- National conferences and workshops (The Society is accredited by the Accreditation Council for Continuing Medical Education)
- Materials (videotapes, slide programs, audiotapes, textbooks, proceedings of conferences and workshops, and booklets on key issues are examples, in addition to two national journals for health care professionals)
- Clinical awards, professorships, and scholarships (Clinical Oncology Fellowships, Clinical Oncology Career Development Awards, Oncology Social Work Awards, Cancer Control Career Development Awards). Over the past 40 years, Clinical Fellowships and Junior Faculty Clinical Fellowships have supported the education of more than 9,600 individuals.
- Nursing programs (a newsletter, scholarships, and professorships)
- Information on questionable methods of cancer management.

Patient Services

In 1993, approximately 745,141 cancer patients were reached through the service and rehabilitation programs of the American Cancer Society.

Service Programs

Community Connection: Resources, Information, and Guidance: provides information about Society services and other resources in the community to meet the practical, social, psychological, and other support needs of cancer patients and their families.

Transportation: Trained volunteer drivers provide transportation that enables patients to get to and from treatment.

Home Care Items: offers supplies and equipment to care for the patient at home.

Rehabilitation Programs

Reach to Recovery: This one-on-one visitation program provides information and support to women with experience with breast cancer; additional information for husbands, children, and friends of breast cancer patients is available.

Laryngectomy Rehabilitation: Spearheaded by the International Association of Laryngectomees, this program provides pre- and/or postoperative support for patients by laryngectomee visitors.

Look Good...Feel Better: In partnership with the Cosmetic, Toiletry and Fragrance Association and National Cosmetology Association, this program is an opportunity for people undergoing cancer treatment to develop skills to cope with appearance changes.

CanSurmount: A short-term program for cancer patients and their families. Trained volunteers who have experienced the same type of cancer offer support through one-to-one visits.

Ostomy Rehabilitation: In cooperation with the United Ostomy Association and enterostomal therapists, trained volunteers who have experienced the same type of surgery as the patient offer help on a one-to-one basis.

Children's Camps: Many Divisions offer camps for children who have or have had cancer. These camps can cope with the special needs of children undergoing treatment.

Patient and Family Education Programs

Group and individual programs designed to help patients of all ages and their families understand the complexities of cancer.

I Can Cope: offers information on cancer treatments, nutrition, resources, and other issues to patients and families.

Group Support Programs

Offered to patients, families and friends, these programs vary according to each Division's needs and resources.

Public Issues

Cancer has become a political, as well as a medical, social, psychological, and economic issue. Policy makers at all levels of government make decisions which impact the lives of more than 8 million Americans with a history of cancer, their families, and millions of potential cancer patients. Therefore, the Society's Public Issues program educates policy makers about cancer and how it affects the individuals and families they represent. The Society is organized to advocate for public policy initiatives which relate to and affect:

- the welfare of the cancer patient and his/her family
- risks to and protection of the potential cancer patient
- cancer research

The Society supports increased federal funding and provides direction for the federal government's cancer research program run by the National Cancer Institute. The Public Issues program also supports the work of the Society's cancer education and service programs by influencing public policy on tobacco control, access to health care, employment discrimination against cancer patients, environmental cancer issues, and other issues affecting cancer survivors and their families. Among the major public policy changes that the Society has advocated are:

- smoking ban on airlines.
- restricted tobacco advertising.
- expanded access to screening mammography and Pap tests.

Costs of Cancer

The financial costs of cancer are great both for the individual and for society as a whole. Cancer accounts for about 10% of the total cost of disease in the US and its share of the total cost of premature deaths was about 18% of all causes of death in 1985. The National Cancer Institute estimates overall costs for cancer at $104 billion; $35 billion for direct medical costs, $12 billion for morbidity costs (cost of lost productivity), and $57 billion for mortality costs. Over half of the direct medical costs are due to treatment of breast ($6 billion), lung ($5 billion), and prostate ($5 billion) cancers. The cost of cancer screenings, including mammograms, Pap smears, and colorectal exams adds another $3 to $4 billion to overall cancer costs, but reduces suffering and saves lives if cancer is detected at an earlier, treatable stage.

The current debate on health care reform highlights these figures in a new way. An estimated $900 billion will be spent on health care this year in the United States, yet 34 million Americans do not have any health insurance. The number of uninsured, moreover, does not take into account the tens of millions of Americans now living with disease or disability who daily encounter problems with our health care system, including 8 million Americans who have had cancer.

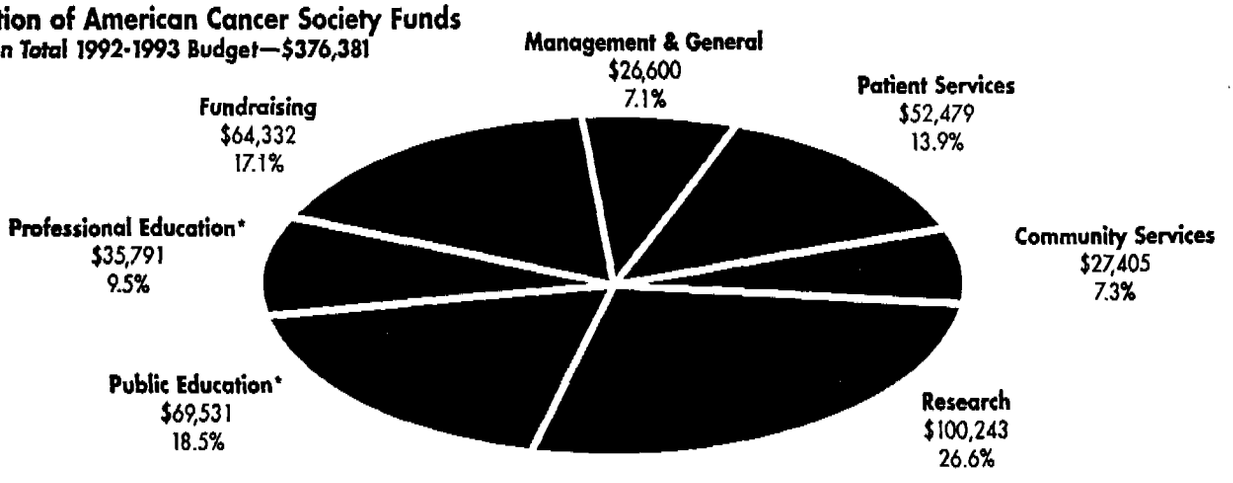
The American Cancer Society's Statement of Principles on Health Care System Reform calls for:

- high quality cancer care for all Americans;
- expanded support for basic and clinical cancer research;
- comprehensive school health education as a key cost-saving primary prevention strategy; and,
- an increase of at least $2.00 in the federal cigarette excise tax and a comparable increase for other tobacco products to prevent death and disease from smoking.

The Disadvantaged

Since 1988, the Society has funded over 100 community demonstration projects to provide cancer education messages and programs (cancer screening and education, transportation, and patient service support) to the poor and underserved of our country. Overall, approximately 10 to 12 million adults in socioeconomically disadvantaged populations are reached annually with public education programs. In addition, the Society currently has over $2 million in research grants in effect in this area.

Allocation of American Cancer Society Funds
***Based on Total* 1992-1993 Budget—$376,381**



*The Society's cancer prevention, detection, and treatment programs are carried out through these areas.
Figures taken from 1992 Annual Report (in thousands).

Summary of Research Grants & Fellowships Awarded by the American Cancer Society (National and Division) During the Fiscal Year Ending August 31, 1993 (Subject to Audit)

Albany Medical College, Albany, NY	(3)	$ 333,000	Medical College of Virginia, Richmond	(2)	$ 113,000	Univ. of Colorado Hlth. Sci. Center, Denver	(11)	1,488,500
Albert Einstein College of Medicine, Bronx, NY	(8)	797,000	Medical College of Wisconsin, Milwaukee	(1)	63,000	Univ. of Colorado, Boulder	(8)	898,900
American Assn. for Cancer Research, Philadelphia, PA	(1)	140,000	Medical Foundation of Buffalo, Buffalo, NY	(1)	180,000	Univ. of Connecticut, Farmington	(2)	121,000
American Health Foundation, New York, NY	(2)	241,000	Medical Univ. of South Carolina, Charleston	(1)	79,000	Univ. of Delaware, Newark	(2)	272,000
Baylor College of Medicine, Houston, TX	(9)	1,000,000	Memorial Sloan-Kettering Cancer Ctr., New York, NY	(19)	$2,250,500	Univ. of Florida, Gainesville	(1)	200,000
Beth Israel Hospital, Boston, MA	(3)	271,580	Michigan State Univ., East Lansing	(1)	120,000	Univ. of Georgia, Athens	(1)	88,000
Boston City Hospital, Boston, MA	(1)	90,500	Montana State Univ., Bozeman	(2)	128,000	Univ. of Hawaii, Honolulu	(1)	200,000
Boston College, Chestnut Hill, MA	(1)	90,500	Montefiore Medical Center, Bronx, NY	(1)	52,000	Univ. of Houston, TX	(1)	206,000
Boston Univ., Boston, MA	(3)	458,000	MRC Lab. of Mol. Biology, Cambridge, England	(1)	80,000	Univ. of Iowa, Iowa City	(4)	395,000
Bowman Gray Sch. of Medicine, Winston-Salem, NC	(4)	410,000	Mt. Sinai Medical Center, New York, NY	(4)	369,300	Univ. of Kansas, Lawrence	(1)	141,000
Brandeis Univ., Waltham, MA	(3)	272,000	Natl. Jewish Hospital & Research Ctr., Denver, CO	(1)	100,000	Univ. of Kentucky, Lexington	(1)	90,000
Brigham & Women's Hospital, Boston, MA	(5)	701,000	New England Medical Center Hospitals, Boston, MA	(2)	306,000	Univ. of Illinois, Chicago	(4)	324,000
Brigham Young Univ., Provo, UT	(1)	125,000	New Jersey Medical School, Newark	(1)	100,000	Univ. of Illinois, Urbana	(2)	246,500
Brown Univ., Providence, RI	(3)	316,000	New York Medical College, Valhalla	(2)	261,000	Univ. of Maryland, Baltimore	(4)	336,000
California Inst. of Biological Res., La Jolla	(1)	186,000	New York Univ., NYC	(9)	1,109,000	Univ. of Maryland, College Park	(1)	85,500
California Inst. of Technology, Pasadena	(7)	626,400	National Institutes of Health, Bethesda, MD	(2)	128,000	Univ. of Massachusetts Med. Center, Worcester	(7)	836,472
Carle Foundation Hospital, Urbana, IL	(1)	15,000	North Carolina State Univ., Raleigh	(1)	32,000	Univ. of Miami, FL	(5)	681,000
Carnegie Institution of Washington, Baltimore, MD	(4)	254,190	North Dakota State Univ., Fargo	(1)	225,500	Univ. of Michigan, Ann Arbor	(16)	2,000,500
Case Western Reserve Univ., Cleveland, OH	(4)	406,000	Northwestern Univ., Chicago, IL	(7)	960,500	Univ. of Minnesota, Minneapolis	(10)	1,047,000
Chicago Medical School, North Chicago, IL	(2)	282,000	Oak Ridge Assoc., Univ. of Tennessee, Oak Ridge	(1)	118,000	Univ. of Nebraska Med. Center, Omaha	(4)	441,000
Children's Hospital, Boston, MA	(3)	273,500	Oberlin University, Oberlin, OH	(1)	76,000	Univ. of Nebraska, Lincoln	(1)	89,000
Children's Hospital of Los Angeles, Los Angeles, CA	(2)	290,000	Ohio State Univ., Columbus	(6)	1,001,000	Univ. of New Mexico, Albuquerque	(2)	89,125
City of Hope National Medical Ctr., Duarte, CA	(2)	364,000	Oklahoma Medical Res. Fdn., Oklahoma City	(1)	48,000	Univ. of New Orleans, LA	(1)	73,000
Cold Spring Harbor Lab., Cold Spring Harbor, NY	(5)	430,075	Oregon Health Science Univ., Portland	(2)	188,000	Univ. of North Carolina, Chapel Hill	(15)	1,592,000
Colorado State Univ., Fort Collins	(1)	50,190	Oregon State Univ., Corvallis	(2)	95,000	Univ. of Oklahoma, Oklahoma City	(2)	413,000
Columbia Univ., New York, NY	(13)	1,915,600	Pennsylvania State Univ., Hershey	(2)	410,000	Univ. of Oregon, Eugene	(9)	1,011,000
Cornell Univ., New York, NY	(3)	315,000	Pennsylvania State Univ., University Park	(3)	247,300	Univ. of Oxford, Oxford, England	(1)	78,000
Dana-Farber Cancer Institute, Boston, MA	(9)	835,000	Philadelphia Coll. Pharm. & Science, Philadelphia, PA	(1)	71,000	Univ. of Pennsylvania, Philadelphia	(11)	1,098,850
Dartmouth College, Hanover, NH	(1)	75,000	Picower Institute Med. Research, Manhasset, NY	(1)	140,000	Univ. of Pittsburgh, PA	(8)	892,000
Dartmouth-Hitchcock Medical Center, Lebanon, NH	(2)	310,000	Pittsburgh Cancer Research Institute, PA	(3)	563,000	Univ. of Rochester, NY	(8)	703,383
Drexel Univ., Philadelphia, PA	(1)	180,000	Princeton Univ., Princeton, NJ	(9)	1,079,000	Univ. of South Carolina, Columbia	(1)	191,000
Duke Univ., Durham, NC	(18)	1,927,000	Public Health Res. Inst. of New York, NYC	(3)	354,000	Univ. of South Florida, Tampa	(1)	135,000
Eleanor Roosevelt Inst. for Cancer Res., Denver, CO	(1)	105,000	Purdue Univ., West Lafayette, IN	(2)	122,000	Univ. of Southern California, Los Angeles	(3)	1,190,000
Eastern Virginia Medical School, Norfolk	(2)	294,000	Reed College, Portland, OR	(1)	93,000	Univ. of Tennessee, Knoxville	(2)	62,000
Emory Univ., Atlanta, GA	(5)	474,000	Rockefeller Univ., New York, NY	(1)	180,000	Univ. of Tennessee, Memphis	(3)	345,000
European Mol. Biol. Laboratory, Heidelberg, Germany	(1)	79,500	Roger Williams General Hospital, Providence, RI	(1)	125,000	Univ. of Texas MD Anderson Co. Ctr., Houston	(11)	1,516,000
Foundation for Biomedical Research, Washington, DC	(1)	10,000	Roswell Park Memorial Institute, Buffalo, NY	(4)	444,000	Univ. of Texas, Austin	(1)	50,000
Fox Chase Cancer Center, Philadelphia, PA	(8)	921,000	Rush Presbyterian-St Luke's Med. Ctr., Chicago, IL	(2)	125,000	Univ. of Texas Med. Br., Galveston	(1)	50,000
Fred Hutchinson Cancer Res. Center, Seattle, WA	(8)	747,970	Rutgers, State Univ. of New Jersey, Piscataway	(5)	605,000	Univ. of Texas Southwestern Med. Ctr. at Dallas	(14)	1,649,000
Georgetown Univ., Washington, DC	(4)	638,000	State Univ. of New York (SUNY) at Stony Brook	(11)	1,238,000	Univ. of Texas Hlth. Sci. Ctr. at Houston	(1)	90,500
Georgia Inst. of Technology, Atlanta, GA	(1)	180,000	State Univ. of New York (SUNY) at Syracuse	(1)	90,000	Univ. of Texas Hlth. Sci. Ctr. at San Antonio	(2)	193,000
Hahnemann University, Philadelphia, PA	(1)	8,313	Salk Institute, La Jolla, CA	(5)	525,500	Univ. of Texas Health Ctr., Tyler	(1)	180,000
Harrington Cancer Center, Amarillo, TX	(1)	100,000	Scripps Clinic & Research Foundation, La Jolla, CA	(3)	206,810	Univ. of Utah, Salt Lake City	(5)	486,000
Harvard Univ. Medical School, Boston, MA	(13)	1,320,150	Southwest Foundation Biomed. Res., San Antonio, TX	(1)	88,000	Univ. of Vermont, Burlington	(5)	749,000
Harvard Univ., Cambridge, MA	(5)	491,500	St. Jude's Children's Research Hospital, Memphis, TN	(3)	354,000	Univ. of Virginia, Charlottesville	(10)	1,423,000
Henry Ford Hospital, Detroit, MI	(1)	60,000	St. John's Univ., Jamaica, NY	(2)	194,000	Univ. of Washington, Seattle	(11)	1,117,670
Hunter College CUNY, New York, NY	(1)	125,000	St. Louis Univ., St. Louis, MO	(3)	364,000	Univ. of Wisconsin, Madison	(13)	2,357,000
Imperial Cancer Research Fund, London, England	(1)	79,000	Stanford Univ., Stanford, CA	(27)	2,358,451	Univ. of Wisconsin, Milwaukee	(1)	99,000
Indiana Univ., Indianapolis	(4)	506,500	Texas A & M Univ., College Station, TX	(2)	181,000	Univ. of Wyoming, Laramie	(1)	166,000
Indiana Univ., Bloomington	(3)	372,300	Thomas Jefferson Univ., Philadelphia, PA	(7)	932,500	Utah State Univ., Logan	(1)	90,000
Intl. Union Against Cancer, Geneva, Switzerland	(2)	705,000	Tufts Univ., Boston, MA	(5)	468,000	Vanderbilt Univ., Nashville, TN	(7)	991,000
Iowa State Univ., Ames	(1)	105,000	University Hospitals of Cleveland, Cleveland, OH	(2)	290,000	Virginia Polytechnic Inst., Blacksburg	(1)	127,000
Jackson Laboratory, Bar Harbor, ME	(41)	698,000	UMDNJ-Robert Wood Johnson Medical School, NJ	(2)	290,000	W. Alton Jones Cell Sci. Ctr., Lake Placid, NY	(2)	400,000
Johns Hopkins Univ., Baltimore, MD	(28)	3,538,000	Univ. of Alabama, Birmingham	(5)	688,500	Washington State Univ., Pullman	(2)	195,000
Kaiser Permanente Health Research, Portland, OR	(1)	90,000	Univ. of Arizona, Tucson	(6)	836,000	Washington Univ., St Louis, MO	(5)	495,670
Kansas State Univ., Manhattan	(2)	184,000	Univ. of Arkansas for Med. Science, Little Rock	(4)	420,000	Wayne State Univ., Detroit, MI	(5)	443,000
La Jolla Cancer Research Foundation, La Jolla, CA	(4)	522,000	Univ. of California at Berkeley	(9)	800,000	Wesleyan Univ., Middletown, CT	(3)	279,500
La Jolla Inst. Allergy and Immunology, La Jolla, CA	(1)	210,000	Univ. of California at Davis	(5)	381,500	West Virginia Univ., Morgantown	(2)	206,000
Louisiana State Univ. Med. Ctr., Shreveport, LA	(2)	270,000	Univ. of California at Irvine	(11)	963,100	Whitehead Institute, Cambridge, MA	(4)	242,500
Lankenau Medical Research Center, Wynnewood, PA	(2)	300,500	Univ. of California at Los Angeles	(15)	1,525,500	Wichita State University, Wichita, KS	(1)	59,000
Loyola Univ. of Chicago, Maywood, IL	(1)	98,000	Univ. of California at Riverside	(1)	$ 210,000	William Patterson College, Wayne, NJ	(1)	105,000
Massachusetts General Hospital, Charlestown	(8)	721,000	Univ. of California at Santa Barbara	(4)	274,000	Wistar Institute, Philadelphia, PA	(4)	407,500
Massachusetts Inst. of Technology, Cambridge	(9)	871,020	Univ. of California at San Francisco	(23)	2,564,000	Yale Univ., New Haven, CT	(27)	2,915,274
Mayo Clinic Foundation, Rochester, MN	(1)	78,000	Univ. of California at San Diego	(14)	1,324,600	**Subtotal**	(847)	$95,838,887
McLaughlin Research Inst., Great Falls, MT	(1)	105,000	Univ. of California at Santa Cruz	(1)	213,000	**Division Research Grants**		$ 3,918,015
Medical Biology Institute, La Jolla, CA	(2)	134,194	Univ. of Chicago, IL	(7)	730,500	**Grand Total**		$99,756,902
Medical College of Ohio, Toledo	(1)	80,000	Univ. of Cincinnati, OH	(1)	$ 48,000			

Note: Numbers in parentheses indicate numbers of grants per institution.

Cancer Around the World, 1988-1991, Death Rates per 100,000 Population for 46 Countries

COUNTRY	ALL SITES		ORAL		COLON & RECTUM		PROSTATE	LUNG		BREAST	UTERUS		STOMACH		LEUKEMIA	
	Male	Female	Male	Female	Male	Female	Male	Male	Female	Female	Cervix	Other	Male	Female	Male	Female
United States	164.4(24)	110.6(11)	3.7(29)	1.3(12)	16.7(20)	11.4(19)	16.8(17)	57.1(10)	24.7(2)	22.4(16)	2.6(33)	2.6(33)	5.2(46)	2.3(46)	6.3(8)	3.8(9)
Argentina‡	151.8(29)	97.6(26)	4.0(26)	0.9(35)	13.7(31)	9.3(33)	13.1(29)	39.2(30)	5.8(38)	20.9(19)	4.6(16)	6.5(5)	12.8(26)	5.6(29)	4.6(33)	3.3(28)
Australia§	164.0(25)	102.2(22)	4.7(20)	1.3(13)	21.5(9)	14.7(9)	17.2(15)	45.1(25)	12.8(15)	20.7(21)	3.1(29)	1.7(44)	8.4(41)	3.6(44)	6.1(11)	3.8(10)
Austria	172.3(18)	106.9(19)	5.9(16)	0.9(33)	22.4(6)	14.2(11)	16.7(18)	45.1(24)	9.0(20)	22.0(17)	2.9(30)	5.1(9)	16.7(19)	8.2(15)	5.4(21)	3.5(24)
Bulgaria	139.0(37)	84.2(38)	3.8(28)	0.6(45)	15.1(25)	10.7(26)	7.8(39)	40.3(29)	6.3(36)	15.6(31)	4.1(22)	6.0(7)	19.8(11)	10.7(9)	4.5(36)	2.9(43)
Canada†	170.8(21)	110.6(12)	4.4(22)	1.3(14)	17.8(17)	12.0(17)	16.9(16)	57.3(9)	20.6(6)	23.9(12)	2.3(37)	2.5(35)	8.0(42)	3.4(45)	6.2(10)	3.9(8)
Chile‡	140.8(36)	109.4(14)	2.3(39)	0.6(44)	7.0(40)	6.0(41)	13.1(28)	21.1(40)	5.8(39)	12.5(39)	12.5(2)	2.4(38)	35.2(3)	13.6(6)	3.9(42)	3.3(32)
China*‡	154.1(27)	87.3(35)	2.5(36)	1.2(17)	7.9(39)	6.5(40)	—	34.0(33)	14.5(13)	4.6(46)	4.2(21)	—	32.6(5)	15.7(4)	4.1(40)	3.3(27)
Costa Rica‡	166.6(22)	108.6(16)	3.2(31)	1.0(25)	6.8(42)	6.7(39)	19.6(5)	17.5(43)	6.4(34)	12.9(38)	10.4(3)	3.5(22)	54.7(1)	22.8(1)	6.2(9)	4.9(1)
Cuba†	129.8(39)	95.6(28)	5.6(19)	2.0(3)	10.2(36)	11.4(20)	18.7(7)	39.0(32)	14.3(14)	14.8(33)	6.2(9)	7.3(4)	7.3(45)	3.8(42)	4.6(32)	3.6(16)
Czechoslovakia†	232.8(2)	121.0(8)	9.0(6)	1.0(26)	30.7(1)	17.0(4)	13.6(26)	74.4(2)	8.3(22)	19.8(22)	5.6(11)	5.7(8)	19.7(12)	8.9(12)	6.7(4)	4.3(4)
Denmark	179.5(11)	139.8(1)	4.0(27)	1.4(9)	22.8(5)	17.5(3)	18.1(10)	51.9(15)	23.9(3)	27.7(4)	5.3(12)	3.5(23)	7.8(43)	4.2(41)	6.8(3)	4.1(5)
Ecuador§	83.6(45)	85.2(37)	0.7(46)	0.7(40)	2.7(46)	4.1(45)	11.1(32)	6.9(46)	2.8(46)	5.6(45)	5.8(10)	13.7(1)	26.9(6)	19.2(2)	3.7(45)	3.2(33)
England & Wales	179.2(12)	125.7(6)	2.9(33)	1.2(18)	20.2(12)	13.7(14)	16.6(20)	57.0(11)	20.5(7)	28.7(1)	4.4(18)	2.5(34)	12.5(29)	5.1(31)	5.3(24)	3.3(31)
Finland	154.1(28)	90.6(32)	2.3(40)	0.8(39)	12.2(35)	8.6(36)	17.5(12)	47.8(21)	6.6(33)	17.0(28)	1.7(43)	2.6(31)	13.0(25)	7.0(23)	5.2(25)	3.0(38)
France†	200.7(5)	88.1(34)	13.6(3)	1.3(15)	17.3(19)	10.3(27)	17.3(13)	46.8(22)	5.0(41)	19.7(23)	1.8(40)	4.0(17)	9.1(38)	3.6(43)	6.1(13)	3.7(15)
Germany, Fed.#	177.9(13)	108.3(17)	6.3(13)	1.0(22)	21.1(10)	15.2(6)	15.9(21)	48.7(19)	7.8(26)	21.9(18)	3.6(25)	3.2(25)	14.9(21)	7.7(17)	5.9(14)	3.7(13)
Greece†	144.3(34)	77.5(43)	1.6(44)	0.6(46)	6.8(41)	5.5(42)	8.1(38)	49.8(17)	6.9(32)	15.2(32)	1.3(45)	3.0(26)	9.6(36)	4.9(34)	5.7(16)	3.4(25)
Hong Kong‡	175.1(16)	91.0(31)	14.5(2)	4.4(2)	14.8(29)	10.7(25)	2.6(45)	54.2(14)	23.3(5)	8.6(41)	3.9(23)	1.4(45)	11.5(31)	5.3(30)	3.8(43)	2.7(45)
Hungary	246.5(1)	131.5(3)	14.7(1)	1.7(5)	29.0(2)	18.1(2)	15.7(22)	76.4(1)	14.9(12)	22.6(15)	6.8(7)	5.0(11)	24.0(8)	10.2(10)	7.2(1)	4.6(2)
Iceland	147.6(32)	114.6(10)	2.1(42)	1.0(27)	14.9(27)	10.8(24)	19.4(6)	30.8(34)	23.8(4)	23.7(13)	2.6(34)	1.8(42)	18.1(15)	7.7(18)	4.9(29)	3.1(37)
Ireland†	174.9(17)	127.5(4)	4.4(24)	1.0(28)	23.2(4)	15.1(7)	17.6(11)	47.9(20)	19.2(8)	27.8(3)	3.2(27)	2.9(27)	12.0(30)	5.9(27)	6.1(12)	3.7(12)
Israel‡	115.5(42)	98.7(24)	1.0(45)	0.7(42)	14.4(30)	11.9(18)	8.6(37)	24.5(38)	7.9(24)	23.0(14)	1.4(44)	2.2(39)	7.7(44)	4.2(40)	6.4(7)	4.5(3)
Italy‡	192.3(10)	99.2(23)	6.3(11)	1.0(23)	15.6(21)	10.3(28)	11.5(31)	58.9(8)	7.3(28)	20.8(20)	0.9(46)	5.1(10)	18.2(14)	8.6(13)	6.7(5)	4.0(7)
Japan	150.2(30)	76.7(44)	2.3(41)	0.6(43)	15.1(24)	9.7(32)	3.8(44)	30.1(36)	8.0(23)	6.3(44)	1.8(41)	2.4(37)	34.9(4)	15.5(5)	4.3(38)	2.8(44)
Luxembourg	197.6(8)	109.4(15)	10.1(5)	1.4(10)	21.8(7)	12.4(16)	16.6(19)	62.9(7)	8.8(21)	25.4(10)	3.2(28)	4.5(14)	11.3(32)	4.3(38)	6.7(6)	3.6(21)
Malta	144.0(35)	92.5(30)	3.6(30)	1.6(6)	13.5(32)	10.0(31)	9.1(35)	42.2(28)	3.7(44)	28.1(2)	1.9(39)	3.8(20)	14.9(22)	6.1(26)	5.4(22)	3.6(17)
Mauritius	85.0(44)	62.3(46)	4.6(21)	1.8(4)	5.0(44)	4.1(44)	5.3(42)	18.9(42)	5.1(40)	6.7(43)	3.6(24)	7.4(3)	12.7(27)	7.2(21)	3.5(46)	2.3(46)
Mexico†	83.5(46)	79.7(42)	2.0(43)	0.7(41)	3.3(45)	3.1(46)	10.6(33)	16.5(45)	5.9(37)	8.1(42)	15.9(1)	2.6(32)	10.5(35)	7.6(19)	3.8(44)	3.0(40)
Netherlands†	195.3(9)	109.8(13)	2.8(35)	1.0(32)	17.9(16)	13.3(15)	18.3(9)	71.2(4)	10.2(17)	26.8(7)	2.5(35)	2.5(36)	13.1(23)	5.0(33)	5.6(18)	3.5(23)
New Zealand‡	171.9(19)	126.8(5)	4.3(25)	1.4(8)	25.7(3)	20.5(1)	18.7(8)	44.4(27)	17.3(11)	27.0(6)	4.5(17)	2.8(28)	8.8(40)	4.7(35)	7.2(2)	4.1(6)
North Ireland	176.6(14)	122.3(7)	2.8(34)	1.0(31)	21.5(8)	14.8(8)	15.4(23)	55.4(12)	17.8(9)	26.5(8)	3.5(26)	2.0(41)	12.6(28)	6.7(25)	4.5(34)	3.2(34)
Norway†	148.2(31)	102.2(21)	3.1(32)	1.1(20)	20.0(13)	14.2(10)	21.7(2)	30.3(35)	10.3(16)	19.2(24)	4.3(19)	2.8(29)	11.0(34)	5.0(32)	4.9(28)	3.3(30)
Poland	203.5(4)	107.8(18)	6.2(14)	1.0(24)	14.9(26)	10.2(29)	9.8(34)	70.4(5)	9.7(19)	15.7(30)	7.9(6)	4.0(16)	23.1(9)	8.2(14)	5.8(15)	3.6(18)
Portugal	145.9(33)	86.6(36)	5.7(18)	0.8(37)	15.3(22)	10.1(30)	14.5(25)	26.0(37)	4.4(43)	17.8(26)	2.3(36)	4.9(12)	24.9(7)	12.0(7)	5.0(27)	3.7(14)
Puerto Rico†	125.5(41)	75.1(45)	7.9(7)	1.4(7)	9.6(38)	7.4(37)	17.3(14)	19.5(41)	7.0(31)	14.2(35)	2.6(32)	3.5(21)	11.0(33)	4.5(36)	4.8(30)	3.5(22)
Romania	135.3(38)	83.8(39)	5.7(17)	1.0(29)	9.7(37)	7.2(38)	7.1(40)	39.1(31)	6.4(35)	14.8(34)	10.3(4)	3.9(18)	18.2(13)	7.1(22)	4.5(35)	3.0(39)
Scotland	198.5(6)	137.1(2)	4.4(23)	1.3(11)	20.6(11)	15.2(5)	14.9(24)	71.3(3)	28.3(1)	27.1(5)	4.6(15)	2.1(40)	13.1(24)	5.9(28)	4.4(37)	3.1(35)
Singapore†	175.3(15)	103.9(20)	12.9(4)	4.4(1)	19.1(14)	14.0(13)	4.2(43)	50.6(16)	17.5(10)	12.9(37)	6.4(8)	1.8(43)	20.3(10)	10.8(8)	4.2(39)	3.0(41)
Spain‡	166.3(23)	80.8(41)	6.3(12)	0.8(38)	13.4(34)	9.2(35)	12.9(30)	45.2(23)	3.4(45)	17.1(27)	1.7(42)	3.8(19)	15.0(20)	6.9(24)	5.3(23)	3.4(26)
Sweden‡	129.4(40)	98.1(25)	2.4(38)	0.8(36)	14.9(28)	11.1(21)	20.4(3)	23.4(39)	9.9(18)	18.2(25)	2.2(38)	2.7(30)	8.9(39)	4.5(37)	5.1(26)	3.3(29)
Switzerland	171.1(20)	97.2(27)	6.6(10)	1.2(16)	18.2(15)	10.9(23)	22.5(1)	44.9(26)	7.2(29)	24.3(11)	2.6(33)	3.3(24)	9.6(37)	4.2(39)	5.6(17)	3.6(20)
Uruguay†	204.7(3)	116.6(9)	6.0(15)	0.9(34)	17.7(18)	14.1(12)	19.9(4)	55.0(13)	4.6(42)	26.4(9)	4.7(14)	6.4(6)	17.0(18)	7.3(20)	5.5(20)	3.8(11)
USSR†	198.3(7)	94.5(29)	7.4(8)	1.0(30)	15.2(23)	10.9(22)	6.3(41)	63.6(6)	7.1(30)	13.6(36)	5.2(13)	4.4(15)	36.3(2)	16.0(3)	5.5(19)	3.6(19)
Venezuela‡	92.7(43)	83.7(40)	2.4(37)	1.1(19)	5.1(43)	5.2(43)	13.3(27)	16.5(44)	7.9(25)	9.6(40)	9.7(5)	7.9(2)	17.3(17)	9.5(11)	4.0(41)	3.1(36)
Yugoslavia†	158.4(26)	90.2(33)	6.9(9)	1.0(21)	13.4(33)	9.3(34)	8.9(36)	48.9(18)	7.3(27)	15.9(29)	4.2(20)	4.6(13)	18.0(16)	7.8(16)	4.7(31)	3.0(42)

NOTE: Figures in parentheses are order of rank within site and sex group. Rates are age-adjusted to the WHO world standard population.
*Oral cancer rates include nasopharynx only. †1988-1990 only. ‡1988-1989 only. §1988 only. #1989-1990 only.

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The institutions listed have been recognized as Cancer Centers by the National Cancer Institute. These centers have been rigorously reviewed by the National Cancer Advisory Board. They receive financial support from the National Cancer Institute, the American Cancer Society and many other sources.

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National Headquarters: American Cancer Society, Inc., 1599 Clifton Road N.E., Atlanta, GA 30329-4251

94-375M-No. 5008.94

National Paint & Coatings Association

May 24, 1994

TO: Air Quality Committee
Architectural Coatings Committee
Industrial Coatings Committee
Labeling and Product Safety Committee
Manufacturing Management Committee
Water Quality/Waste Management Committee

FROM: Soonie McDavid, Assistant Director
Environmental Affairs

RE: DRAFT Green Seal Standard on Anti-Corrosive Paints

Enclosed is a DRAFT Green Seal Environmental Criteria for Anti-Corrosive Paints dated May 20, 1994. Green Seal is seeking comments to this proposed standard which will be used in a product certification program. Please review and return your comments to me by June 10, 1994.

Green Seal was founded in 1990 by Earth Day founder Dennis Hayes to help identify environmentally preferable products in an effort t encourage consumers to purchase products with reduced environmental impacts/burdens. Green Seal hopes to encourage manufacturers to develop products which are significantly less damaging to the environment than their predecessors.

NPCA commented on Green Seal's Environmental Standard for Paints (primarily focused on architectural coatings), which was focused on a life-cycle analysis approach, in 1992.

1500 Rhode Island Avenue, NW • Washington, DC 20005-5597 • 202/462-6272 • FAX 202/462-8549

May 20, 1994

Ms. Soony McDavid
Director Environmental Affairs
NPCA
1500 Rhode Island Avenue, NW
Washington, DC 20005

Dear Ms. McDavid:

Green Seal is now accepting comments on proposed environmental criteria we are developing for anti-corrosive paints. Green Seal's existing standard for paint, GS-11, covers primarily architectural coatings.

A separate standard for anti-corrosive paints allows Green Seal to establish environmental requirements more appropriate for this category and to develop performance criteria to evaluate the rust inhibiting properties of products.

While the proposed standard is still in draft form, Green Seal is soliciting comment on the appropriateness of the criteria we have chosen for evaluating environmentally preferable anti-corrosive paints. We also would appreciate suggestions regarding other performance or environmental requirements you believe Green Seal should include in this standard.

Enclosed is an outline of proposed criteria for evaluating anti-corrosive paints. In lieu of, or in addition to written comments, I hope to discuss with you directly any comments you have about the proposed standards. Thank you in advance for your time. I will call you next week to discuss the proposed environmental criteria with you. Or feel free to contact me at Green Seal at 202-331-7337.

Sincerely,

Amy L. Hitchcock

Amy L. Hitchcock
Project Manager

Green Seal • 1250 23rd Street NW, Suite 275 • Washington DC 20037-1401 • Telephone (202) 331 7337 • Fax (202) 331 7313

SL 107319

GREEN SEAL
ENVIRONMENTAL CRITERIA
FOR ANTI-CORROSIVE PAINTS

May 20, 1994

GREEN SEAL

Green Seal is a n n-profit organization devoted to environmental standard setting, product certification, and public education. Green Seal helps identify environmentally preferable products in order to encourage and enable consumers to purchase such products with reduced impacts on the earth. Through its standard setting, certification and education programs, Green Seal:

- identifies products that are designed and manufactured in an environmentally preferable manner;
- offers scientific analysis to help consumers make educated purchasing decisions regarding environmental impacts;
- ensures consumers that any product bearing the Green Seal Certification Mark has earned the right to use it; and
- encourages manufacturers to develop new products that are significantly less damaging to the environment than their predecessors.

THE ENVIRONMENTAL STANDARDS

The intent of Green Seal's standards is to reduce, to the extent technologically and economically feasible, the environmental impacts associated with the manufacture, use, and disposal of products. Set on a category-by-category basis, Environmental Standards focus on opportunities to significantly reduce a product's environmental impact. Each Green Seal Environmental Standard is first issued in proposed form. Industry, trade associations, government agencies, environmental and other public interest organizations, users, and other interested parties are encouraged to comment on the proposal. Standards are then established after careful review and consideration of the comments.

Green Seal offers the opportunity to achieve certification to all products covered by its standards. Manufacturers may submit their products for evaluation by Green Seal. Those which comply with Green Seal's requirements may be authorized to use the Green Seal Certification Mark on products and in product advertising. Manufacturers authorized to use the Green Seal Certification Mark on their product are subject to an ongoing program of testing, inspection, and enforcement. Underwriters Laboratories Inc., the nation's premier product testing and inspection organization, serves as Green Seal's primary testing and factory inspection contractor.

For additional information on Green Seal or any of its programs, contact:

Green Seal
1250 23rd Street, NW, Suite 275
Washington, DC 20037-1101
(202) 331-7337

TABLE OF CONTENTS

SUMMARY OF COMMENTS REQUESTED

When reviewing the standard please pay particular attention to the following areas:

Performance Requirements

- Has Green Seal chosen appropriate testing protocols for adhesion and hiding power?
- When developing the standard, it came to our attention that a test protocol for corrosion/weathering is currently under development by ASTM subcommittee 27. This test reportedly imitates real world corrosion characteristics better than the traditional salt fog test for measuring a paint's rust inhibiting properties. The corrosion/weathering test also reportedly produces more consistent results on a product by product basis.

  What would be the advantages and disadvantages of Green Seal using the corrosion/weathering test currently under development instead of the salt fog test?
- What would constitute acceptable performance by a product when using the test protocols of the salt fog test?
- Should other performance requirements be specified?

Environmental Requirements

- Has Green Seal chosen appropriate VOC limits to recognize environmentally preferable anti-corrosive paints? If not, what levels should be specified?
- How widespread is the use of heavy metals in anti-corrosive paints? Are there any differences in the use and concentrations of heavy metals in industrial anti-corrosive paints versus consumer anti-corrosive paints?
- Are the chemical component restrictions appropriate? Should additional compounds be added or should any listed components be deleted?

ENVIRONMENTAL STANDARD

1 Scope.

This Standard establishes environmental requirements for anti-corrosive paints.

2 Definitions.

For the purpose of this Standard, the following definitions apply.

2.1 Paints: Liquid, liquefiable or mastic composition that is converted to a solid protective, or functional adherent film after application as a thin layer. These coatings are intended for application to metal surfaces to provide protection from rusting.

2.2 Volatile Organic Compounds (VOCs): Compounds as defined by U. S. Environmental Protection Agency (EPA) in 40 CFR § 51.100 (s), (s) (1).

2.3 Aromatic Compounds: Hydrocarbon compounds containing one or more 6-carbon benzene rings in the molecular structure.

3 Product-Specific Performance Requirements.

3.1 Adhesion. The product shall demonstrate a minimum of Classification 4B according to ASTM D3359-90 Method B, *Standard Test Methods for Measuring Adhesion by Tape Test.*

3.2 Corrosion/Weathering (Prohesion QUV) Test. (protocols to be determined.)

OR

Salt Spray (fog) Testing according to ASTM designation B117-90. (parameters to be determined)

3.3 Hiding Power (Opacity). The product shall demonstrate a minimum 0.95 contrast ratio at 400 square feet per gallon as determined by ASTM D2805-88, *Standard Test Method for Hiding Power of Paints by Reflectometry.*

4 Product-Specific Environmental Requirements.

4.1 Chemical Component Limitations.

4.1.1 VOCs. The VOC concentrations of the product shall not exceed those listed below as determined by U. S. Environmental Protection Agency (EPA) Reference Test Method 24 (Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coatings), Code of Federal Regulations Title 40, Part 60, Appendix A.

The calculation of VOCs shall exclude water and tinting color added at the point of sale.

Coating Type	VOC weight in grams/liter of product minus water
Gloss	250
Semi-Gloss	225
Satin and Flat	200

4.1.2 **Aromatic Compounds.** The product must contain no more than 1.0% by weight of the sum total of aromatic compounds. Testing for the concentration of these compounds will be performed if they are determined to be present in the product during a materials audit.

4.2 **Chemical Component Restrictions.** The manufacturer shall demonstrate that the following chemical compounds are not used as ingredients in the manufacture of the final product.

4.2.1 Halomethanes

methylene chloride

4.2.2 Chlorinated ethanes

1,1,1-trichloroethane

4.2.3 Aromatic solvents

benzene
toluene (methylbenzene)
ethylbenzene

4.2.4 Chlorinated ethylenes

vinyl chloride

4.2.5 Polynuclear aromatics

naphthalene

4.2.6 Chlorobenzenes

1,2-dichlorobenzene

4.2.7 Phthalate esters

di (2-ethylhexyl) phthalate
butyl benzyl phthalate
di-n-butyl phthalate
di-n-octyl phthalate

diethyl phthalate
dimethyl phthalate

4.2.8 Miscellaneous semi-volatile organics

isophorone

4.2.9 Metals and their compounds

antimony
cadmium
hexavalent chromium
lead
mercury

4.2.10 Preservatives (antifouling agents)

formaldehyde

4.2.11 Ketones

methyl ethyl ketone
methyl isobutyl ketone

4.2.12 Miscellaneous volatile organics

acrolein
acrylonitrile

5 Packaging Requirements.

5.1 Toxics in Packaging.

5.1.1 The manufacturer shall demonstrate that paint cans and their components are not fabricated with lead.

Appendix: Labeling Requirements for Certification by Green Seal

Unless otherwise approved in writing by Green Seal, the following labeling requirements shall apply:

1 The Green Seal Certification Mark must appear on the packaging.

2 Whenever the certification mark appears on a package or product, the product or package must contain a description of the basis for the certification. The description shall be in a location, style, and typeface that are easily readable by the consumer. The description shall read as follows:

> This product has reduced volatile organic compound (VOC) levels: does not contain specified toxic chemicals.

3 Paints which have been formulated without VOCs shall be designated Class A and may contain a special designation to that effect on the label.

June 22, 1994

DRAFT

RECOMMENDED INHALATION TESTING

HAZARDOUS AIR POLLUTANTS TO BE CONSIDERED FOR TSCA SECTION 4 TEST RULE PROCESS (1ST RULE)

Biphenyl

- Acute/Subchronic Systemic
- Acute/Subchronic Respiratory
- Acute/Subchronic Neurotoxicity
- 1 species Developmental Toxicity
- 2-Generation Reproductive Test

Carbonyl Sulfide

- Acute/Subchronic Systemic
- Acute/Subchronic Respiratory
- Acute/Subchronic Neurotoxicity
- 2 species Developmental Toxicity
- 2-Generation Reproductive Test
- Cancer test (2 species in both sexes)
- Ames, *in vitro* gene mutation mammalian test, bone marrow cytogenetics

Chlorine

- Acute Systemic (in both sexes)
- Acute Respiratory (in both sexes)

Chlorobenzene

- Acute/Subchronic Systemic
- Acute/Subchronic Respiratory
- Acute/Subchronic Neurotoxicity

Chloroprene

- Acute Systemic
- Acute Respiratory
- Acute/Subchronic Neurotoxicity
- 1 species Developmental Toxicity
- 2-Generation Reproductive Test

Cresols(mixture or isomers)

- Acute/Subchronic Systemic
  Acute/Subchronic Respiratory
  Acute Neurotoxicity

SL 107328

Cumene

- Acute Systemic
- Acute Respiratory
- Acute Neurotoxicity
- 2-Generation Reproductive Test

Dibutyl Phthalate

- Acute/Subchronic Systemic
- Acute/Subchronic Respiratory
- Acute/Subchronic Neurotoxicity
- 2 species Developmental Toxicity

Diethanolamine

- Acute/Subchronic Systemic
- Acute/Subchronic Respiratory
- Acute/Subchronic Neurotoxicity
- 2 species Developmental Toxicity
- 2-Generation Reproductive Test

Ethylbenzene

- Acute Systemic
- Acute Respiratory
- Acute/Subchronic Neurotoxicity
- 1 species Developmental Toxicity
- 2-Generation Reproductive Test

Ethyl Chloride

- Acute/Subchronic Neurotoxicity
- 1 species Developmental Toxicity
- 2-Generation Reproductive Test

Ethylene Dichloride

- Acute/Subchronic Systemic
- Acute/Subchronic Respiratory
- Acute/Subchronic Neurotoxicity
- 1 species Developmental Toxicity
- 2-Generation Reproductive Test

Ethylene Glycol

- Acute/Subchronic Systemic
- Acute/Subchronic Respiratory
- Acute/Subchronic Neurotoxicity

Hydrochloric Acid

- Acute Respiratory

Hydrogen Fluoride

- Acute/Subchronic Systemic
- Acute/Subchronic Respiratory
- Acute/Subchronic Neurotoxicity
- 2 species Developmental Toxicity
- 2-Generation Reproductive Test

Maleic Anhydride

- Acute Systemic
- Acute Respiratory
- Acute/Subchronic Neurotoxicity
- 1 species Developmental Toxicity
- Cancer Test (2 species in both sexes)

Methyl Isobutyl Ketone

- Acute Systemic
- Acute Respiratory
- 2-Generation Reproductive Test

Methyl Methacrylate

- Acute Systemic
- Acute Respiratory
- Acute/Subchronic Neurotoxicity
- 2-Generation Reproductive Test

Naphthalene

- Acute Systemic
- Acute Respiratory
- Acute/Subchronic Neurotoxicity
- 2-Generation Reproductive Test

Phenol

- Acute Systemic
- Acute Respiratory

Phthalic Anhydride

- Acute/Subchronic Systemic
- Acute/Subchronic Respiratory
- Acute/Subchronic Neurotoxicity
- 2 species Developmental Toxicity
- 2-Generation Reproductive Test
- Cancer Test(2 species in both sexes)

1,2,4 Trichlorobenzene

- Acute Systemic
- Acute Respiratory
- Acute/Subchronic Neurotoxicity
- 2 species Developmental Toxicity

1,1,2 Trichloroethane

- Acute/Subchronic Systemic
- Acute/Subchronic Respiratory
- Acute/Subchronic Neurotoxicity
- 2 species Developmental Toxicity
- 2-Generation Reproductive Test
- Cancer Test(modified, i.e. Huff Approach)
- Bone marrow cytogenetics

Vinyl Acetate

- Acute Respiratory
- 1 species Developmental Toxicity

Vinylidene Chloride

- Acute Systemic
- Acute Respiratory
- Acute/Subchronic Neurotoxicity

TOXICITY TESTING OF HAZARDOUS AIR POLLUTANTS

On June 22, 1994, EPA held a briefing to provide industry with background information on the Hazardous Air Pollutant (HAP) Test Rule that will be proposed this Fall. EPA also distributed a list of the HAPs and the testing that will be proposed for each of the chemicals. Briefings have already been held with the environmental groups and other interested parties.

In order to make multi-chemical risk assessment/risk management decisions, the Office of Air Quality Planning and Standards has requested that 3 TSCA section 4 Test Rules be promulgated for HAPs that are missing inhalation data. The data generated by the test rules would provide EPA with a consistent/even data base and allow them to do residual risk analyses on mixtures. EPA's intent is that this test rule respond to the CAA concern for both cancer and non-cancer health effects and that a dose-response via the inhalation route be established.

EPA stated that if the database for a chemical was rich in oral data, they might agree that focused pharmacokinetic will provide enough data for route-to-route extrapolation. In that case, EPA would also require subchronic inhalation studies to evaluate entry portal sensitivity and damage. Only drinking water or feeding studies will be considered when oral data is evaluated.

EPA is seeking industry comment in several areas:

- There will be a problem testing low vapor pressure chemicals, EPA feels that conducting aerosol testing may mimic human exposure and is seeking comment.

- Even though EPA wants all testing by the inhalation route, it is seeking industry input on the most appropriate routes of exposure. EPA is also soliciting feedback on what testing will give the best information to make risk assessments.

- EPA realized that there may not be an adequate number of inhalation chambers available and is looking for ways to "piggy-back" tests.

- Test standards will be proposed with the test rule and EPA will be seeking comment on the appropriateness of the methods.

- EPA is trying to generate good histopathological data on the respiratory system.

The proposed rule will require all testing via the inhalation route. The rat will be the species of choice unless otherwise noted.

EPA expects the proposed test rule to be published in the early or late Fall of 1994.

(over)

SELECTION OF CANDIDATE HAPs FOR TEST RULES

EPA has identified 189 chemicals as hazardous air pollutants. When deciding on the HAP test rule, this group was divided into those with TRI emissions of 50 tons/year or greater and those with TRI emissions of less than 50 tons/year or no TRI data.

EPA determined that there are 66 HAPs in the 1st category. When the existing data was assessed, 16 HAPs had adequate data or were currently undergoing testing. Of the 50 remaining chemicals, 25 were proposed for the 1st test rule.

For the 2nd test rule, EPA is evaluating the remaining 25 chemicals and 10 chemicals that have potential concern under the Great Waters and Urban Toxics provisions of the Clean Air Act. Industry has not been apprised which HAPs are being evaluated for this rule.

The remaining 113 chemicals with TRI emissions of less than 50 tons/year will be evaluated for the 3rd test rule. EPA has stated that some HAPs will immediately be dropped from consideration, i.e. dioxin and asbestos.

TENTATIVE HAPs TEST RULE SCHEDULE

- o 1994 1st test rule proposed (25 HAPs)
- o 1995 1st test rule promulgated
  2nd test rule proposed (approx. 25 HAPs)
- o 1996 2nd test rule promulgated
  3rd test rule proposed (approx. 25 HAPs)
- o 1997 3rd test rule promulgated

CMA VC

July 5, call for within interest

$300,000 at 2

$ 21,145 1/2 '94
1/2 '95

CHEMICAL MANUFACTURERS ASSOCIATION

FILING INSTRUCTIONS:
ASSOCIATIONS
CMA
VINYL CHLORIDE PANEL
KEYWORDS:

Vinyl Chloride Panel
Research Coordinators
Fax
July 13, 1994

TO:	James Barter	PPG	412/434-2137
	Ed Beeler	GEON	216/447-6459
	Frank Borrelli	Georgia Gulf	302/323-8105
	Ron Gilbert	Westlake	713/963-1540
	Mark Gruenwald	Borden	614/431-6611
	James Knaak	OxyChem	716/286-3141
	Dave Penney	Vista	512/331-2387
	David Pun	Formosa	201/716-7283
	Jonathan Ramlow	Dow	517/636-1875

FROM: Has Shah

RE: Vinyl Chloride Panel Research Coordinators Meeting

PAGES: 2 (including cover)

SENDER: Kim Reed

PHONE: (202) 887-1191

SL 107337

2501 M Street, NW, Washington, DC 20037 Telephone 202-887-1100 Fax 202-887-1237

Responsible Care® A Public Commitment

CHEMICAL MANUFACTURERS ASSOCIATION

July 13, 1994

Dear Vinyl Chloride Research Coordinators:

I am forced to cancel the next Research Coordinators meeting scheduled for August 2. Instead, we will have a conference call at 10:00 a.m., EDT. We will follow the agenda that was sent to you on July 5. I would like to include Westlake Polymers on the call, if possible. Mr. Ron Gilbert should call me if he is available to participate on the call.

The main purpose of the meeting was to review the bids for the epidemiology stud update from contractors. However, because commitments are still outstanding from Formosa and PPG, I have not sent our requests for proposals for the update. I hope to hear from Formosa and PPG within the next few days. Contractors will need at least a month to prepare their proposals. Therefore, the next Research Coordinators meeting will be scheduled for early September. We will set the date for the next meeting on the conference call.

Meanwhile, please send me your comments on the draft letter to the American Cancer Society on the TIME Magazine article, your ballot for undertaking EDC activities, and the completed commitment form for the 1994-1995 budget. All of the above items were included in my July 5 package to you.

I am looking forward to talking with you on August 2 at 10:00 a.m.

Sincerely,

Hasmukh Shah

Hasmukh C. Shah, Ph.D.
Manager, Vinyl Chloride Panel

SL 107338

2501 M Street, NW, Washington, DC 20037 Telephone 202-887-1100 Fax 202-887-1237

Responsible Care® A Public Commitment

July 5, 1994

Explanation of Vinyl Chloride Research Coordinator Budget

An initial budget of $300,000 is proposed for the following activities:

- Contractor cost for the update of vinyl chloride epidemiology study
- Dow Chemical's expenses for designing, monitoring, consulting with the selected contractor, and reviewing interim, draft and final reports for the epidemiological update
- Consultant expenses for vinyl chloride risk assessment and short-term exposure effects studies
- Administrative expenses for update of the epidemiology study; follow-ups with EPA on VC risk assessment; follow-ups with EPA on VC and/or EDC testing under TSCA Section 4; follow-ups with consultants on VC risk assessment and short-term exposure effects studies; meeting planning, attendance, and other routine services; follow-up of action items resulting from meetings and conference calls; and, monitoring of regulatory activities impacting vinyl chloride manufacturing companies

The VCRC has proposed to share the estimated $300,000 budget based upon the 1993 VC nameplate capacity. CMA has used the nameplate capacities for VC published in the attached chart from Chemical Data Inc., September 1993, to determine each company's pro-rata share as follows:

Total 1993 VC Nameplate Capacity	12,918 M lbs.
Westlake 1993 VC Nameplate Capacity	1,000 M lbs.
Total 1993 VC Nameplate Capacity Used in Determining VCRC Member Companies Pro-Rata Share	11,918 M lbs.

COMPANY	NAMEPLATE CAPACITY (Million Lbs.)	PRO-RATA SHARE
Borden Chemical	935	23,536
Dow Chemical	2,210	55,630
Formosa Plastics	1,793	45,133
GEON	1,400	35,241
Georgia Gulf	1,260	31,717
Occidental (w/OxyMar)	2,600	65,447
PPG Industries	840	21,145
Vista Chemical	880	22,151
TOTAL	11,918	300,000

If the above budget is committed by all companies, one-half of the commitment will be due in August, 1994 and the remainder in January, 1995. If Westlake joins the VCRC at a later date, your 1995 amount due will be adjusted accordingly.

U.S.
VINYL CHLORIDE MONOMER
AVERAGE DESIGN CAPACITY
(Millions of Pounds Per Year)

PRODUCER	LOCATION	FEEDSTOCKS	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Borden Chemical	Geismar, LA	Ethylene	525	525	525	568	610	610	610	610	610	610	610	610
	Geismar, LA	Acetylene	325	325	325	325	325	325	325	325	325	325	325	325
Dow Chemical	Oyster Creek, TX	Ethylene	750	810	810	833	900	900	900	910	910	910	910	910
	Oyster Creek, TX	Ethylene	--	--	--	--	--	--	--	--	563	750	750	750
	Plaquemine, LA	Ethylene	850	900	1,040	1,200	1,200	1,275	1,300	1,300	1,300	1,300	1,300	1,300
Formosa Plastics	Point Comfort, TX	Ethylene	580	580	580	690	838	900	900	900	900	900	900	900
	Baton Rouge, LA	Ethylene	420	420	420	420	420	420	315	53	420	420	420	420
	Baton Rouge, LA	EDC	--	--	--	--	--	--	537	840	840	840	840	840
Geon (formally Goodrich)	Calvert City, KY	Ethylene	1,000	1,000	1,000	1,000	See Westlake Monomers							
	La Porte, TX	Ethylene	1,100	1,100	1,250	1,300	1,300	1,400	1,400	1,400	1,400	1,400	1,400	1,400
Georgia Gulf	Plaquemine, LA	Ethylene	1,025	1,100	1,220	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260
Occidental Chem	Deer Park, TX	Ethylene	--	450	925	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100
OxyMar	Corpus Christi, TX	Ethylene	--	--	--	--	--	1,467	1,500	1,500	1,500	1,500	1,500	1,500
PPG Ind.	Lake Charles, LA	Ethylene	600	750	800	800	840	840	840	840	840	840	840	840
Shell	Deer Park, TX	Ethylene	900	450	See Occidental Chemical									
Vista Chemical	Lake Charles, LA	Ethylene	700	738	750	825	825	825	835	880	910	970	990	990
Westlake Monomers	Calvert City, KY	Ethylene	--	--	--	--	1,000	1,000	1,000	1,000	1,000	1,000	1,050	1,050
Total			8,775	9,148	9,645	10,320	10,618	12,322	12,822	12,918	13,878	14,125	14,195	14,195

SEPTEMBER 1993

CHEMICAL MANUFACTURERS ASSOCIATION
Vinyl Chloride Panel
Vinyl Chloride Research Coordinators
Commitment Form

[X] My company commits its pro-rata share of $300,000 research and advocacy budget as described in the attached July 5, 1994 Explanation of VCRC Budget. The Vinyl Chloride Panel is conducted under the policies and procedures outlined in the CHEMSTAR Panel Guidelines and briefly noted on the reverse of this form.

[ ] While appreciating the opportunity, my company declines to participate.

CMA has estimated that 16% of the total CMA 1994/95 fiscal year "dues and similar income", which includes CHEMSTAR contributions, is allocable to lobbying and political expenditures to which Section 162 (e)(1) of the Internal Revenue Code of 1986, as amended, applies. Consequently, this portion of your commitment is not deductible as an ordinary and necessary business expense for federal income tax purposes. Further, contributions to CMA are not tax deductible as charitable contributions.

Panel Representative	Management Contact
James A Barter	Same
Name (Signed)	Name (Signed)
James A. Barter	
Name (Typed)	Name (Typed)
Manager, Industrial Hygiene, ~~Health & Toxicology~~	
Title	Title
PPG Industries, Inc.	
Company	Company
1 PPG Place, 36 West	
Address Pgh., PA 15272	Address
412-434-2801	
Telephone	Telephone
412-434-2137	
Telecopier	Telecopier

Please return signed form to:

Hasmukh C. Shah, Manager
Chemical Manufacturers Association
2501 M Street, NW
Washington, D.C. 20037

SL 107339

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272 USA

James A. Barter, Ph.D.
Manager, Industrial Hygiene, Health,
and Toxicology
Chemicals
(412) 434-2801
FAX: (412) 434-2137

July 27, 1994

Dr. Has Shah
CMA
2501 M Street, NW
Washington, DC 20037

Dear Dr. Shah,

Executed copies of the Vinyl Chloride Panel Commitment Form to conduct research and advocacy activities on vinyl chloride and the vote on the CMA Vinyl Chloride Research Coordinators addressing the ethylene dichloride hazardous air pollutant testing issues with EPA are enclosed. Copies of these documents have been retained for our files.

Please contact me if you need any additional information.

Sincerely,

James A. Barter, Ph.D., D.A.B.T.

SL 107341

CHEMICAL MANUFACTURERS ASSOCIATION

Vinyl Chloride Research Coordinators

July 5, 1994

☑ I agree with Mr. Joe Ledvina's (Vista Chemical) suggestion that the VCRC initially address the ethylene dichloride hazardous air pollutant testing issues with EPA along with vinyl chloride testing issues under TSCA Section 4. This arrangement would consolidate the technical and economic resources of EDC and VC manufacturers.

☐ I do not agree with Mr. Ledvina's suggestion but offer the following alternative suggestion to deal with EPA on the EDC testing issues: _____

_____

_____

NAME: JAMES A. BARTER

COMPANY: PPG INDUSTRIES, INC

PHONE: 412 434 2801

Please return by fax to:

Hasmukh C. Shah, Ph.D.
Chemical Manufacturers Association
Fax (202) 887-5427

SL 107342