

The Role of State Health Agencies in Cancer Prevention and Control: Lessons Learned from Massachusetts

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Introduction

Cancer remains one of humanity's most feared diseases.² Reducing the incidence and mortality associated with cancer must remain one of society's major health goals. America's "War on Cancer," launched in the 20th century, largely focused on research and new treatment modalities (1). As the century ended and a new one begins, the country has now seen the promise of a broader, population-based approach to cancer prevention and control (2). This public health approach employs a comprehensive community-based continuum of services, ranging from prevention and education to early detection and treatment. Such a comprehensive cancer control system must acknowledge, as did the Surgeon General in launching the Healthy People 2010 initiative, that "the health of the individual is almost inextricably linked to the health of the community" (3). Hence, a public health approach emphasizes changing health behaviors on many social levels through the communities in which people live (4). Such an approach must also be broad and flexible enough to meet the needs of increasingly diverse communities.

Traditionally, state health agencies, such as the MDPH,³ implemented programs that focused on organ-specific cancer initiatives (*e.g.*, breast cancer, cervical cancer) or specific risk factors (*e.g.*, smoking). To a large degree, the categorical nature of funding streams dictated this narrow structure. As a result, the collective sum of these programs usually represented only a minor part of the agency's overall public health activity.

In the late 1990s, federal money first became available for states to coordinate and integrate existing programs to promote broad population-based cancer control. Massachusetts, the 11th most populous state in the country with a population of 6 million, was one of the first to create and implement a comprehensive plan under the aegis of such funding. These broader funding guidelines from the Centers of Disease Control and Prevention have now facilitated the creation of a comprehen-

sive state cancer control plan. As a result, cancer prevention themes now resonate through most, if not almost all, of MDPH's programmatic activity.⁴

Using the three core functions of public health (assessment, policy development, and assurance), MDPH's comprehensive cancer control plan addresses the needs of our increasingly diverse state (5, 6). About 16% of Massachusetts and nearly half of the capital city of Boston (48%) is non-white (5–7); 13% of the population is over 65 years old. One of eight (12%) of the state's residents is foreign born. Massachusetts serves as home to the 7th largest refugee and immigrant population in the country. Nearly 10% of the state's population lacks health insurance (7). Our goal is to reach all people throughout the life span with cancer control opportunities.

In this article, we describe the role of MDPH in the development and implementation of an integrated cancer prevention and control system. We present: (a) the principles and model underlying the comprehensive statewide plan; (b) the public health strategies and programs used to achieve the goals of the plan, with special attention to disparities (2, 8, 9); (c) an overview of Massachusetts cancer outcomes; and (d) recommendations and lessons learned.

Principles and Model of the Massachusetts Cancer Control Plan

The public health vision of healthy people and healthy communities guides the Massachusetts comprehensive cancer prevention and control plan. This vision is based on three key principles: (a) the purpose of public health is to preserve and protect the health of entire populations and promote health status improvement for all; (b) prevention of illness, injury, and disability is paramount; and (c) prevention improves health status and can be cost-effective (3, 10).

The practice of public health is the systematic application of science-based knowledge, through political support and social strategies, to achieve better health outcomes for all people (10, 11). To be successful in changing the health status of the broad population of Massachusetts, policies and programs need integration within the context of existing health systems. Such integration must (a) link payers, providers, and consumers; (b) promote public/private partnerships; (c) link government health agencies to those that focus on education, disability, social welfare, employment, and justice; and (d) strengthen the relationships between communities, service providers, and residents (10, 11).

Building on the science of cancer prevention, screening, and treatment, the MDPH framework for comprehensive cancer

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³ The abbreviations used are: MDPH, Massachusetts Department of Public Health; MCR, Massachusetts Cancer Registry; BRFS, Behavioral Risk Factor Surveillance System; BEHA, Bureau of Environmental Health Assessment; MTCP, Massachusetts Tobacco Control Program; WHN, Women's Health Network; WIC, Women, Infants and Children Supplemental Nutrition Program; PSA, prostate-specific antigen; DRE, digital rectal exam; CBE, clinical breast exam; FOBT, fecal occult blood test.

⁴ www.state.ma.us/dph.



* Referring to the following cancer prevention programs: breast, cervical, prostate, colorectal, lung, liver, oral, ovarian, testicular, uterine, skin cancer/melanoma, and urinary/bladder
 ** Not consistently available for all cancers
 SES = Socioeconomic Status

Fig. 1. MDPH framework for comprehensive cancer control.

control (Fig. 1) outlines the short-term outcomes desired to reach the long-term goal of lowering cancer incidence and mortality. The short-term outcomes fall into three major areas: (a) health risks and behaviors; (b) screening and health system changes; and (c) environmental and occupational health changes. Fig. 2 summarizes the cancers affected by the modifiable risk factors (nutrition, physical activity, tobacco use, alcohol, UV radiation, health-seeking/promoting behavior, and environment/occupation).

This framework of objectives and goals guides the activities of a wide array of MDPH programs and initiatives across the life span, with special attention to racial and ethnic disparities (12). Because a single strategy will rarely achieve a desired outcome, a broad ecological model of health guides our public health action. Only the collective impact of a variety of strategies can make the long-term goals of reduced cancer a reality.

Public Health Strategies and Programs Used to Achieve Plan Goals

To implement the comprehensive cancer control program and achieve the system changes needed, we used the three core functions of public health (assessment, policy development, and assurance) outlined in the Institute of Medicine (1988) report of the status of public health in America (10, 13). The MDPH integrated cancer control system reflects these core functions. We describe each of them, with examples of their use to reduce the cancer burden.

Assessment. A critical core function of public health is the use of data for assessment, *i.e.*, to monitor health status, ascertain needs, conduct health surveillance, investigate and diagnose disease, implement quality improvement, and evaluate programs (10). MDPH maintains a number of population-based data systems for assessment purposes.

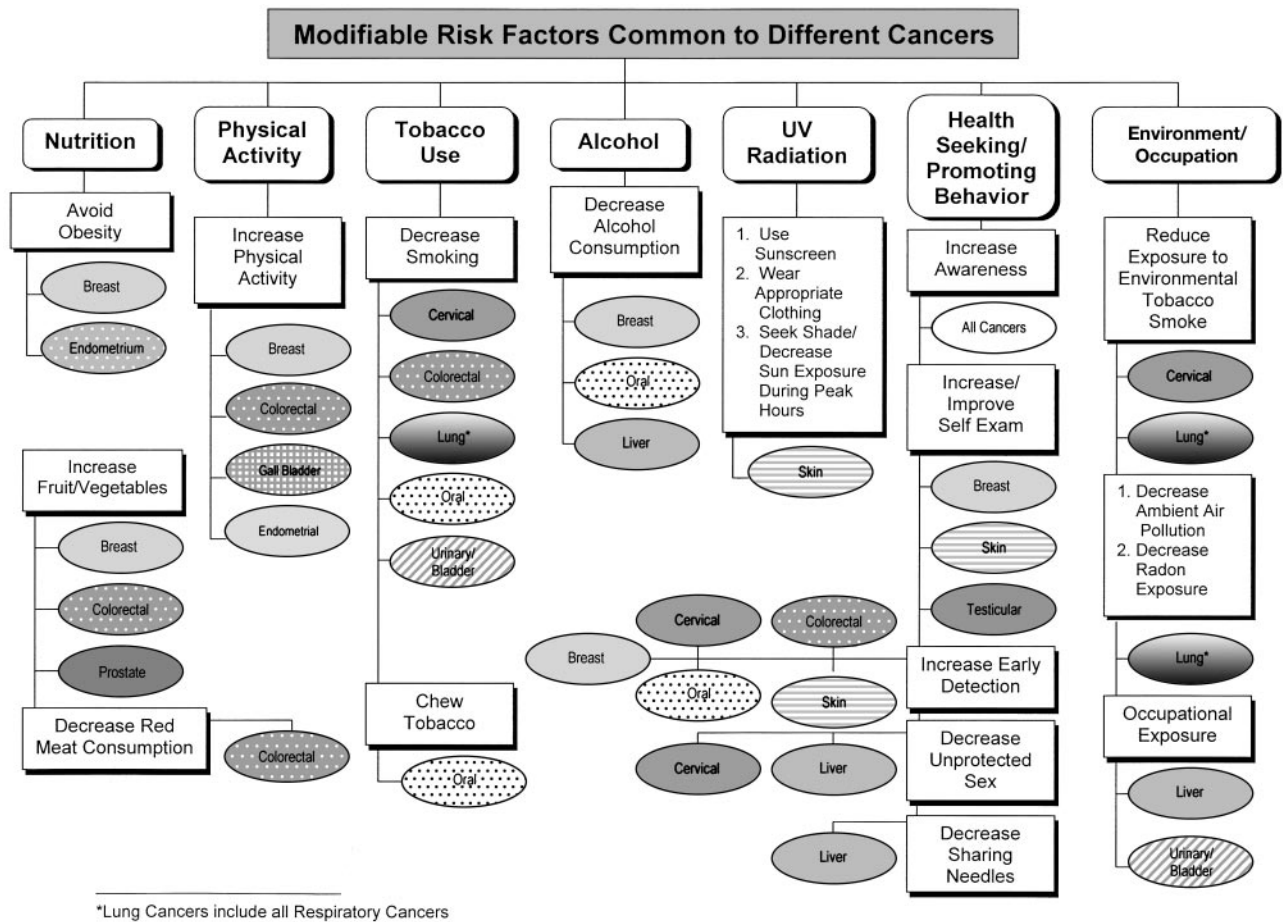


Fig. 2. Modifiable risk factors common to different forms of cancer.

The MDPH MCR collects data about new cases of cancer diagnosed in state residents. Cancer information in the MCR comes from several sources: all acute care hospitals in Massachusetts, physicians who diagnose and treat cases of cancer, pathology laboratories, and radiation therapy facilities. Agreements with 17 other cancer registries allow collection of information on Massachusetts residents who are diagnosed with or receive treatment for cancer in other states. The MCR collects both information about the patient (such as age, sex, race, town of residence, and occupation) and the cancer (such as the type, date of diagnosis, stage, and first course of treatment).

The BRFSS, part of the MDPH Chronic Disease Surveillance Program, collects prevalence data on cancer-related risk factors as well as screening services for breast, cervical, and colorectal cancers. In sampling more than 7000 state respondents by random digit-dial telephone interviews, BRFSS gathers information on prostate, cervical, and colorectal cancer screening; mammography; cancer risk factors (including nutritional deficiencies); physical activity; and alcohol and tobacco use. The MDPH Occupational Health Surveillance Program monitors selected work-related illnesses, including suspected links to cancer.

In another major example of assessment capability, the MDPH BEHA responds to environmental health concerns by providing communities with epidemiological and toxicological health assessments. Such information guides the provision of

appropriate health education to communities and health professionals. In the 1980s, MDPH attracted national attention in investigating the Woburn Childhood Leukemia study (14, 15), which ultimately prompted the book and movie, *A Civil Action*. In this time of heightened public awareness of possible adverse health effects from environmental exposures, MDPH BEHA also tracks concerns (from citizen groups, state legislators, local boards of health, the media, and other state agencies) about the 32 National Priority List (Superfund) sites as well as nearly 2500 additional state sites under investigation by the United States Environmental Protection Agency and the Massachusetts Department of Environmental Protection. Budget permitting, MDPH BEHA also supports research projects specifically focused on breast cancer and the environment.

MDPH has joined with four major state health plans (Harvard Pilgrim Health Care, Tufts Health Plan, Blue Cross/Blue Shield Health Maintenance Organization, and Fallon Community Health Plan) in a major quality improvement initiative known as the Massachusetts Health Assessment Partnership. This public/private partnership (which also involves the state Medicaid program) integrates public health and health plan data systems to measure health status and improve outcomes in managed care. A specific project aims to identify barriers to colorectal screening among enrollees and a population-based comparison group. Massachusetts Health Assessment Partnership is determining methods for linking the health plan data

with the MDPH MCR to establish baseline colorectal cancer incidence and stage-at-diagnosis information and to monitor future trends. Such information should prompt further health plan interventions to increase colorectal cancer screening rates.

In many assessment areas, MDPH collaborates with faculty and student researchers from the state's medical and public health schools (Harvard, Boston University, Tufts, and the University of Massachusetts). Budget permitting, MDPH also funds investigators to pursue research in breast cancer, prostate cancer, and tobacco control.

Policy Development. The core function of policy development requires leadership and advocacy, collaborative health partnerships, attention to financing, and public participation in policy development (10). Partners must allocate time to build relationships and develop coalitions to develop and process new policies. Partnerships are key to optimal coordination, both internally within a health department across all program components and externally with outside stakeholders. To demonstrate our commitment to partnership in policy development, the MDPH Commissioner chairs the external community advisory committee, and the Associate Commissioner chairs the internal working group, with the common goal of smooth coordination of all statewide cancer control efforts.

Two such partnerships involve The Massachusetts Colorectal Cancer Working Group and the Massachusetts Skin Cancer Collaborative. The Massachusetts Colorectal Cancer Working Group includes MDPH, the American Cancer Society, and the state's leading academic institutions, health maintenance organizations, cancer centers, medical societies, community health centers, and local public health commissions. The Massachusetts Colorectal Cancer Working Group's mission is to improve public awareness about risk factors of colorectal cancer, eliminate barriers to screening (1, 14, 16) and treatment services, and promote self advocacy. The Massachusetts Colorectal Cancer Working Group has developed public and professional education materials, co-sponsored symposia, and presented the results of a knowledge, attitude, and practice survey of statewide healthcare providers to national medical meetings.

The Massachusetts Skin Cancer Collaborative complements work by nongovernment organizations by focusing on broad policy initiatives to prevent overexposure to UV light (1, 17). For example, a key collaborative effort with another Massachusetts agency, The Office of Child Care Services, mandates sun protection policies in the state's 17,000 licensed day care centers. Also, MDPH MaxCare (Maximizing the Health and Safety of Children in Out-of-Home Care) works as part of the Massachusetts Skin Cancer Collaborative to train child care providers in sun protection and education. The Massachusetts Skin Cancer Collaborative has developed a community-based sun protection education guide to help cities and towns implement sun protection programs, especially focusing on young children. Also, local Boards of Health have received state minigrants to implement these programs at a local level. More targeted MDPH efforts have reached new mothers in hospital maternity units with skin cancer prevention messages for their newborns (14).

Finally, MDPH is nationally recognized for its policy initiatives of the MTCP (18, 19). The passage of a 1992 voter-approved initiative petition raised the state tobacco tax, with the purpose of dedicating the generated funds to launching MTCP. The program has promoted three goals: (a) persuading and supporting adult smokers to stop smoking; (b) preventing young people from starting to use tobacco (7, 18–20); and (c) protecting the public by reducing exposure to environmental

tobacco smoke. Policy development has led local governments to pass local ordinances for smoke-free public places (notably restaurants and worksites) and to reduce youth access to tobacco. Other new policy initiatives include regulations requiring tobacco firms to report ingredients and additives in their products by descending order of weight, a proposal now being heard in the United States Federal Court of Appeals (20).

Local health officials, as represented by the Massachusetts Health Officers Association and the Massachusetts Association of Health Boards, promote cancer control in a number of ways. Special efforts focus on compliance checks to prevent youth access to tobacco. Current efforts to enhance state-local interactions in bioterrorism and emergency preparedness should strengthen public health infrastructure. A Local Health Coordinating Committee, co-chaired by the Commissioners of Public Health and Environmental Protection, maximizes statewide integration.

Assurance

The third public health core function of assurance creates a system of care for all in the population, regardless of geography or insurance status. Major ways of providing assurance are to educate the public, enforce laws and regulations, develop and implement standards of care, train workers, and, finally, provide direct clinical services to those who have no other options (10, 11).

Many MDPH programs exemplify the core function of assurance. For example, a highly prominent public health effort to change behaviors is the MTCP's media campaign (19–21). More recent media communications in Spanish, Portuguese, and other languages have reached diverse populations. As another example of assurance, MDPH upholds standards of care by promoting established cancer screening guidelines of major professional groups and national advisory bodies, such as those of the Center for Disease Control and Prevention and the American Cancer Society (14). Yet another example is MTCP's Quitworks, a newly unveiled major partnership between MDPH, major health care plans and physicians, which provides all smokers in the state (regardless of insurance status) with access to free tobacco treatment and cessation services. Counseling is available to smokers by telephone, on the Internet,⁵ or in community sites at over 80 locations in the state.

MDPH Programs Demonstrating Assurance. MDPH's integrated cancer control efforts now reach all populations throughout the life span. In addition to establishing a centralized MDPH Cancer Prevention and Control Office, we have woven the theme of cancer control into existing programs. Such initiatives focus on a specific age group (*e.g.*, adolescent health, school health, women's health, and elder health), a specific cancer (*e.g.*, breast, colorectal, skin, and prostate), or a specific risk factor (*e.g.*, tobacco, nutrition, physical activity, alcohol, and environment). Each program uses evidence-based information to guide programmatic activity; a major priority in all program areas is the reduction and elimination of racial and ethnic disparities. Fig. 2 presents an overview of each cancer and the modifiable risk factor(s) associated with them. The internal work group within MDPH coordinates activities within the department to assure that all appropriate risk factors are being addressed for the entire population.

Adolescents and Children. The MDPH Adolescent Health program utilizes a comprehensive wellness approach to provide

⁵ www.trystop.org.

adolescents with the knowledge and skills to reduce cancer risk as they develop into adulthood. This effort reaches approximately 20,000 adolescents annually through a statewide system of community health centers (14), licensed clinics, school health services and school-based health centers. Additionally, approximately another 15,000 adolescents receive health education through an extensive network of community-based providers. Such programs educate youth at risk for HIV/AIDS and sexually transmitted disease, pregnancy, alcohol abuse, substance and tobacco abuse, violence, nutritional deficiencies, and physical inactivity. Youth help plan all levels of program development, serve as peer leaders, and ensure quality services and appropriate access.

MDPH School Health supports school-based comprehensive health education programs and services. These programs emphasize prevention and detection of chronic diseases, including cancer. Key strategies involve educating students concerning personal health habits and early detection practices (including breast and testicular self-examination). Other initiatives train school staff on environmental hazards, including asbestos, radon, and toxic laboratory or art supplies. In addition, the MDPH Massachusetts Immunization Program now mandates hepatitis B immunization for all newborns in a step toward the prevention of primary liver cancer.

Women. The WHN, funded with state and federal dollars, targets minority and rural women who are traditionally hard to reach due to linguistic, cultural, or economic barriers. Services are available at more than 90 sites, in concert with community health centers, hospitals, visiting nurse associations, and home care agencies. WHN provides free screening and diagnostic services, case management, and linkage to free or low cost treatment for uninsured (and underinsured) women (age 40 years and older). Whereas in the past such outreach was confined to breast and cervical cancer screening only (hence the prior name of the Breast and Cervical Cancer Initiative), WHN now also offers comprehensive health promotion, including free cardiovascular disease screening. Also, counseling interventions, based on individual risk factors, include attention to increasing physical activity, eliminating tobacco use, and eating a well-balanced diet. Linguistically appropriate public education materials are distributed through collaboration with MDPH programs, community health centers, and ethnic organizations.

WHN also collaborates with the MDPH Radiation Control Program that licenses all mammography facilities in Massachusetts. Massachusetts was one of the first states to develop strict licensure, inspection, and training requirements for both mammography and radiological technicians. Under a contract with the United States Food and Drug Administration, the MDPH Radiation Control Program implements the inspection component of the federal Mammography Quality Standards Act (14). Annual mammography facility inspections are conducted for both state and federal compliance. In addition, the MDPH Radiation Control Program protects the public and workers from adverse health effects from all sources of radiation (such as ionizing radiation from X-ray machines) and α -, β -, and γ -rays from radioactive materials.

We have integrated cancer control into two other major public health initiatives that reach low-income women, MDPH Family Planning and the MDPH WIC. MDPH Family Planning, which provides comprehensive services (including medical care, contraceptives, pregnancy testing, individual health counseling, outreach, and education) to high-risk populations, now also promotes breast and cervix cancer screening and information. MDPH WIC provides supplemental nutrition, in

collaboration with the United States Department of Food and Agriculture, to low-income postpartum women and young children with the goal of reducing infant mortality and morbidity and improving health outcomes of mothers. Participants gain access to low-cost healthy food through a statewide network including 130 sites and 800 retail stores. Adding a cancer control theme to MDPH WIC efforts that promote nutritional guidance (22) and breastfeeding sends a holistic message of the importance of the health of women and families.

Men. MDPH has recently created a Men's Health program which brings communities together in collaboration to provide a full range of services to men. Partnerships bring together neighborhood health centers, hospitals, churches, cultural groups, and YMCAs to increase the number of men who receive outreach and education regarding health care (especially prostate cancer, cardiovascular disease, diabetes, cholesterol, and high blood pressure). Budget permitting, MDPH also funds prostate cancer research activities.

The MDPH Men of Color Program contracts with health centers and ethnic organizations throughout the state to enhance the health of specific underserved male populations. Contracted vendors conduct outreach and health promotion, provide referrals to screening for prostate cancer (when appropriate), and also link men to local tobacco cessation programs in collaboration with the MTCP.

The MDPH Prostate Health Awareness Program uses a multifaceted approach. Community outreach provides men and their families with education on prostate cancer, referrals to screenings (when appropriate), and medical care. Targeted programs use a multiple risk factor approach to reach minority groups, provide health care providers with information, and fund support groups and symposia for prostate cancer survivors. The media program (using billboards; advertisements posters on buses, trains, and subways; and pamphlets in several languages) targets men of color, who are at higher risk.

Elders. The MDPH Office of Elder Health fosters healthy aging through programs and policies that assure access to care and enhances opportunities for older persons to take responsibility for their own health. Efforts that focus on health promotion center on physical activity; prostate, breast, and colorectal cancer; and substance abuse. The MDPH Office of Elder Health also provides consultation and technical assistance on cancer, including end-of-life issues.⁶

The MDPH Chronic Disease Prevention Program for Underserved Populations uses outreach workers to educate racial and ethnic minorities about cancer risk factors. Outreach workers (trained in health aspects of breast, cervical, colorectal, and prostate cancer, as well as issues of nutrition, physical inactivity, and tobacco) can refer participants to other cancer-specific MDPH programs.

All Populations. The MDPH Nutrition Program advances broad-based community commitment to healthy eating, thereby reducing risk for cancer (22). In endorsing the National Cancer Institute's (1) 5-A-Day Program, MDPH promotes the daily consumption of fruits and vegetables to at least five servings. We have woven a nutritional cancer prevention theme into other MDPH programs, including Worksite Wellness, WIC, the MDPH Division of Children with Special Health Care Needs, and School Health (which includes school nutrition programs).

MDPH MassMoves promotes awareness of regular physical activity to improve overall health and cancer prevention.

⁶ www.endoflifecommission.org.

Table 1 Leading cancers in Massachusetts by race/ethnicity: Males, 1995–1999^a

White, NH	Black, NH	Asian, NH	Hispanic
Prostate 172.6	Prostate 293.6	Prostate 95.3	Prostate 141.7
Lung 92.4	Lung 109.6	Lung 73.1	Lung 58.0
C/R 74.5	C/R 76.9	C/R 43.0	C/R 40.8
Bladder 31.0	Stomach 24.1	Liver 24.0	Oral 19.6

^a Incidence rates per 100,000; age-adjusted to the 2000 standard million. C/R, colorectal; NH, Non Hispanic.

Partnerships with professional organizations and community agencies have led to dissemination of physical activity messages (through conference co-sponsorship, event co-sponsorship, and literature distribution).

The MDPH Office of Oral Health works closely with MTCP and the MDPH Bureau of Substance Abuse Services to facilitate the prevention and detection of oral cancer among high-risk populations. In addition, the MDPH Office of Oral Health works with the Massachusetts Dental Society and other outreach community agencies to provide education materials and trainings to dentists and oral health professionals.

Massachusetts is the only state in the country to include genetics in its Cancer Control Plan. The MDPH Massachusetts Genetics Program tracks and disseminates updated information in multiple languages about developments in genetic medicine. The MDPH Massachusetts Genetics Program also links people to statewide family-centered genetic counseling, testing, treatment, and support services. Special initiatives focus on public and professional education related to genetic aspects of colorectal, breast, and ovarian cancers.

The MDPH Bureau of Substance Abuse Services furthers cancer-related risk education by promoting prevention of alcohol abuse. Public and professional education has included a statewide radio campaign concerning underage drinking and statewide conferences with college presidents to raise awareness of binge drinking on campuses. Furthermore, the MDPH Bureau of Substance Abuse Services supports a broad continuum of treatment services for nearly 80,000 people suffering from substance abuse in the state.

Overview of Massachusetts Cancer Outcomes: Incidence and Mortality of Leading Cancers

As has been documented nationwide (1), overall cancer mortality in Massachusetts is declining, with decreases occurring for the top four areas of cancer mortality. The MDPH MCR recently released updated cancer figures for 1995–1999 (23). This report, for the first time, included data by race/ethnicity. In that time, there were 156,735 newly diagnosed cases of cancer and 69,665 deaths from cancer among Massachusetts residents. Overall cancer incidence increased 2.4% (0.9% in males and 3.4% in females), a change entirely attributable to the addition of case identification through mortality records (“death clearance only” method) as a way of maximizing completeness of incidence reporting (23).

Overall age-adjusted (year 2000 United States population standard) cancer mortality rates decreased 7.8% (Ref. 23; 6.7% in males and 8.9% in females). Specific decreases in mortality

Table 2 Leading cancers in Massachusetts by race/ethnicity: Females, 1995–1999^a

White, NH	Black, NH	Asian, NH	Hispanic
Breast 145.4	Breast 113.7	Breast 81.6	Breast 82.3
Lung 58.1	Lung 48.9	C/R 46.4	C/R 27.4
C/R 50.9	C/R 47.8	Lung 35.6	Lung 21.9
Endo 28.2	Endo 20.4	Endo 15.2	Endo 17.9

^a Incidence rates per 100,000; age-adjusted to the 2000 standard million. C/R, colorectal; Endo, endometrium; NH, Non Hispanic.

occurred for the leading causes of cancer death among Massachusetts residents: prostate cancer; breast cancer; colon/rectum cancer; and lung cancer. Mortality decreases ranged from 4.3% for prostate cancer to 19.9% for breast cancer (23).

Data on leading cancers by race/ethnicity (Tables 1–4) showed that the rank orders were generally the same across groups, although the magnitude of rates differed by population.

Prostate Cancer and Early Detection Trends. Prostate cancer, the leading cause of cancer incidence in Massachusetts men, is also the second leading cause of cancer death (23). With 1999 age-adjusted rates of 179.1 cases per 100,000 males, prostate cancer accounted for 30% of all cancers diagnosed in Massachusetts males. The incidence rate of prostate cancer reached its peak of 217 cases per 100,000 males in 1992 and has declined since then, despite year-to-year fluctuations. The age-adjusted mortality rate of prostate cancer decreased 4.3% from 1995 to 1999 in Massachusetts (from 35.1 deaths per 100,000 males to 33.6 deaths per 100,000 males).

Black Massachusetts men, a major focus of the MDPH Prostate Health Awareness Program, had prostate cancer rates that far exceeded those seen in other groups (Table 1). The magnitude in black men (293.6 cases per 100,000 males) exceeded that seen in other racial subgroups (172.6, 141.7, and 95.3 per 100,000 males for white, Hispanic, and Asian men, respectively). Such data are consistent with international data showing that African-American men have the highest rates of prostate cancer in the world (1).

In 1999–2000, 59% of Massachusetts men age 50 and older had a PSA test within the past year (24). PSA testing was higher for men age 60–79 years (68%) compared with older (46%) and younger men (50%). PSA testing was lower for Hispanics (43%) compared with whites (61%) and blacks (56%). In 1999–2000, 63% of men age 50 years and older had a DRE within the past year. DRE increased with age until age 80 years and then decreased for men 80 years and older (24). DRE was lower for Hispanics (43%) compared with whites (64%) and blacks (66%) (numbers were too low to report rate for Asians). Rates for both tests were lowest for men whose incomes were \$25,000 or less and who had less than a high school education (24).

Breast Cancer and Early Detection Trends. For Massachusetts females, breast cancer was the most commonly diagnosed cancer (overall and for individual races; Table 2) and the second leading cause of cancer death (from 1995 to 1999). Breast cancer accounted for 32% of all cancers diagnosed among women (23). The age-adjusted incidence rate of breast cancer increased slightly in Massachusetts from 1995 to 1999 (from 143.6 to 146.1 cases). On the other hand, the age-adjusted

Table 3 Leading cancer deaths in Massachusetts by race/ethnicity: Males, 1995–1999^a

White, NH	Black, NH	Asian, NH	Hispanic
Lung 78.5	Lung 98.8	Lung 50.2	Lung 29.1
Prostate 33.9	Prostate 69.6	Liver 18.9	Prostate 20.2
C/R 30.5	C/R 43.3	Prostate 18.4	C/R 13.6
Pancreas 12.9	Pancreas 19.1	Stomach 15.6	Esophagus 7.7

^a Mortality rates per 100,000; age-adjusted to the 2000 standard million. C/R, colorectal; NH, Non Hispanic.

mortality rate for breast cancer decreased 19.9% during this time period (from 34.6 deaths per 100,000 females in 1995 to 27.7 deaths per 100,000 females in 1999).

To some degree, both increasing incidence and decreasing mortality can be attributed to relatively high rates of breast cancer screening practices in Massachusetts compared with the country at large. In 2000, 84% of all women age 40 years and older had had a mammogram within the past 2 years (up from 68% in 1992; Ref. 24). Women age 50–69 years (89%) were more likely than younger (80%) and older women (80%) to have had a recent mammogram. Mammogram rates were consistent across race/ethnicity groups, reflecting in part the efforts of the WHN to reach women of color [white, 81%; black, 87%; Hispanic, 84%; and Asian, 79% (1998–2000 data)]. College graduates (87%) were more likely than women with less education (82%) to have had a recent mammogram. Mammogram rates rose with increasing income. In 2000, 86% of all women had a CBE within the past 2 years (up from 79% in 1992; Ref. 24). Women age 80 years and older were less likely than younger women to have a CBE. Overall, Asian women were less likely to have a CBE compared with white, black, and Hispanic women. Whereas there are no differences by race/ethnicity for women 40 years and older, among younger women, Hispanic (70%) and Asian (58%) women were less likely than white (86%) and black women (85%) to have a CBE (1997–2000 data).

Lung Cancer and Smoking. Cancers of the lung, the second most commonly diagnosed cancer, was the leading cause of cancer death among both Massachusetts males and females (overall and in all races; Table 3). Between 1995 and 1999, lung cancer accounted for 29% of male cancer deaths (age-adjusted mortality rate of 77.6 per 100,000) and 23% of female cancer deaths (age-adjusted mortality rate of 43.7 per 100,000; Ref. 24). The age-adjusted incidence rate of lung cancer decreased 0.5% among Massachusetts males from 1995 to 1999 but increased 7.7% among Massachusetts females, perhaps reflecting a lag in the historical pattern of cigarette smoking for females. The age-adjusted mortality rate of lung cancer decreased for both Massachusetts males and females from 1995 to 1999, 8.1% in males and 5.0% in females.

The MTCP, in the first decade of its existence, has dropped overall *per capita* adult cigarette consumption at a rate far exceeding the rest of the country (19, 20). Striking declines have occurred in both adult and youth smoking prevalence. Specifically, adult *per capita* consumption has showed a consistent annual decline of more than 4%, compared with less than 1% a year in comparison states (the other states in the United States, excluding California; Refs. 19 and 20). Adult

Table 4 Leading cancer deaths in Massachusetts by race/ethnicity: Females, 1995–1999^a

White, NH	Black, NH	Asian, NH	Hispanic
Lung 44.8	Lung 45.6	Lung 25.5	Breast 12.6
Breast 31.1	Breast 38.2	Breast 16.8	C/R 10.9
C/R 20.6	C/R 28.3	C/R 16.7	Lung 9.2
Pancreas 10.1	Pancreas 15.3	Stomach 10.3	NHL 5.2

^a Mortality rates per 100,000; age-adjusted to the 2000 standard million. C/R, colorectal; NH, Non Hispanic; NHL, Non Hodgkins Lymphoma.

smoking prevalence (1999) is 19.4% (down from 23.5% in 1990). Studies of Massachusetts youth smoking in grades 7–12 (ages 12–18 years) document declines in current cigarette use (from 30.7% to 23.7%). The decreases for youth in grades 8 and 10 exceed national trends. A longitudinal survey has demonstrated that younger Massachusetts adolescents (ages 12 and 13 years) who report baseline exposure to television antismoking advertisements were half as likely to progress to smoking compared with nonexposed peers (21).

Colorectal Cancer and Screening. Colorectal cancer was the third most commonly diagnosed type of cancer and the third leading cause of cancer death in Massachusetts. Between 1995 and 1999, age-adjusted incidence of colorectal cancer per 100,000 was essentially stable in men (from 72.9 cases to 71.9 cases per 100,000) and women (51 cases per 100,000; Ref. 23). Females have almost 30% lower incidence of colorectal cancer than males. Of note, colorectal cancer mortality declined approximately 16% in both Massachusetts males and females between 1995 and 1999 (23).

As is seen in the rest of the country (16), colorectal cancer screening rates in Massachusetts are suboptimal. In 2000, only 36% of adults age 50 and older had a FOBT in the past year. Women were slightly more likely than men to have had a recent FOBT. Adults age 80 years and older were less likely to have had a recent FOBT compared with younger adults. There were no differences in recent FOBT by education or income.

Similar trends are seen for sigmoidoscopy and colonoscopy (24). In 2000, 38% of adults age 50 years and older had a sigmoidoscopy or colonoscopy in the past 5 years, a figure that had increased from 27% in 1993 (24). Men were more likely to have the test compared with women. Adults age 60–79 years were more likely to have the test compared with younger and older adults. The rate of sigmoidoscopy or colonoscopy increased with increasing education and income.

Other Cancers, with Attention to Disparities. Cervical cancer death rates have dropped 23.3% in Massachusetts from 1995–1999 (from 9.0 to 6.9 deaths per 100,000; Ref. 23). This decline is attributable to Massachusetts screening rates that rank among the highest in the country (24). In 2000, 89% of women (age 18 years and older without a hysterectomy) had had a Pap test within the past 3 years (up from 84% in 1992). Women age 65 years and older were less likely than younger women to have had a Pap test. Screening rates increased slightly with increasing education and income.

National reports have noted significantly fewer Asian women receiving cervical cancer screening compared with others. This trend is most striking in Massachusetts in younger women (under age 40 years), where Asian women (68%) were

less likely than white (91%), black (93%), and Hispanic women (75%) to have had a Pap test (1997–2000 data; Ref. 24). There are no differences by race/ethnicity for women 40 years and older.

Cutaneous melanoma incidence rates continue to rise faster than any other cancer in Massachusetts (23). Striking increases were seen in both women [31.4% (from 10.5 in 1995 to 13.8 in 1999)] and men [17.4% (from 17.2 in 1995 to 20.2 in 1999)]. However, melanoma mortality rates have remained stable over that time (17), perhaps due to increasing awareness of early warning signs.

Asian-American men in Massachusetts had disproportionately high rates of liver cancer (incidence of 24.0 and mortality of 18.9 per 100,000; see Tables 1 and 2), probably due to high hepatitis B prevalence. Stomach cancer, a relatively uncommon cancer in other populations, ranked as a leading cause of cancer death in Massachusetts Asian-American men (third; Table 3) and women (fourth; Table 4).

Recommendations and Lessons Learned

Reducing cancer incidence and mortality in the 21st century will require attention to prevention for populations (4, 25) as well as treatment for individuals. State health departments can serve as catalysts by integrating health promotion efforts to reach all populations. Development and implementation of a statewide cancer prevention and control strategy must use a population-based social determinants model to be comprehensive. At MDPH, we have adopted such a model to link public health activity to short- and long-term goals in a broad approach across all cancers. The model has helped us deliver cancer prevention and control to populations while maintaining organ-specific initiatives.

We have adopted a life span approach to cancer control that reaches all populations and seeks to eliminate disparities. A set of strategies and messages for each decade of a person's life is also important because it is never too late to change risky behaviors or promote early detection and treatment. The public health systems (local, state, and national) are the only entities with the mandate to convene partners to create the most comprehensive strategies for a population-based approach. State public health departments can and must maximize leadership opportunities to initiate and update plans.

Everyone in the process needs to acknowledge that the implementation of all of the strategies will take much perseverance and time. Cancer prevention and control is a long-term process; there are no single solutions or "quick fixes." However, with a comprehensive plan, MDPH has begun to see some progress in addressing short-term outcomes (*e.g.*, reduction of smoking and increase in mammography and Pap smear rates). Continually modifying the plan, with appropriate changes based on new science and population-based data, will help us reach the long-term goals of reduced cancer incidence and mortality in the 21st century.

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