



The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health
250 Washington Street, Boston, MA 02108-4619

CHARLES D. BAKER
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Commissioner

Tel: 617-624-6000
www.mass.gov/dph

TO: Boards of Health

FROM: Susan T. Gershman, MPH, PhD, CTR *STG*
Director
Massachusetts Cancer Registry

DATE: November 30, 2015

RE: Cancer Incidence in Massachusetts, 2007-2011, City and Town Supplement

I am writing to inform you that the Massachusetts Cancer Registry (MCR) of the Massachusetts Department of Public Health (MDPH) is releasing its report Cancer Incidence in Massachusetts, 2007-2011, City and Town Supplement. Please note that this report will be published in an electronic version only and will be posted on the Department of Public Health's web site at www.mass.gov/dph/mcr on December 7, 2015. If you are interested in further supplement data prior to the posting, please contact the registry directly at the telephone number listed below. Please note that there is no embargo on these data and they may be released prior to the web posting date.

The 2007-2011 City and Town Supplement updates the 2006-2010 City and Town Supplement. For each city and town, this report provides expected case counts, observed case counts, standardized incidence ratios, and confidence intervals for 23 types of cancer and for all cancers combined. The confidence intervals indicate if there is a statistically significant difference (excess or deficit) between the observed and expected counts.

We are providing you with the following pieces of information in advance of the report's Internet release.

1. The introduction to the report, including an explanation of standardized incidence ratios.
2. The cancer incidence data for your town (i.e. for 23 cancer types and all cancers combined).
3. Appendix II includes selected resources for information on cancer.
4. Appendix III includes MDPH Cancer Prevention and Control Initiatives.
5. For cancer risk factors, please check the following websites: American Cancer Society: www.cancer.org; National Cancer Institute: www.cancer.gov

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The complete Internet version will be available at: www.mass.gov/dph/mcr

The following reports have also been recently posted on the above website:

- *Cancer Incidence and Mortality in Massachusetts 2008-2012: Statewide Report*
- *Data Brief: Cancer Incidence in Massachusetts, 2009-2013 – Preliminary Data*
- *Data Brief: Trends in Cancer Incidence (2003-2013) and Mortality (2003-2014) for Four Major Cancers*

If you have any trouble accessing this web site, please contact the MCR at (617) 624-5662.

Lastly, enclosed is a brochure with information about the Massachusetts Environmental Public Health Tracking System.

For further information, please contact the following at MDPH:

Massachusetts Cancer Registry (617) 624-5662

Bureau of Environmental Health (617) 624-5757

Massachusetts Comprehensive Cancer Prevention and Control Program (617) 624-5484



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November 30, 2015

This is a notification to inform you that an error was very recently discovered in the web posting of last year's report *Cancer Incidence in Massachusetts 2006-2010: City and Town Supplement*. Inadvertently two sets of statistics were posted for some cities and towns, and each set had different statistics for females. The problem has been corrected and a new report has been posted at <http://www.mass.gov/dph/mcr> (at this page click on *Data & Statistics* and then *City & Town Series*). The corrected report will have 'run November 2015' in the title of each city and town's statistics page.

We apologize for any inconvenience that this may have caused.

Sincerely,

The Massachusetts Cancer Registry Staff

Wayland

Observed and Expected Case Counts, with Standardized Incidence Ratios, 2007-2011

	<u>Obs</u>	<u>Exp</u>	<u>SIR</u>	<u>95% CI</u>		<u>Obs</u>	<u>Exp</u>	<u>SIR</u>	<u>95% CI</u>
<u>Bladder, Urinary</u>					<u>Melanoma of Skin</u>				
Male	9	16.8	53.6	(24.5-101.8)	Male	16	10.7	149.3	(85.3-242.4)
Female	6	5.5	108.5	(39.6-236.2)	Female	14	7.9	178	(97.2-298.7)
<u>Brain and Other Nervous System</u>					<u>Multiple Myeloma</u>				
Male	3	3.1	nc	(nc-nc)	Male	4	3	nc	(nc-nc)
Female	7	2.4	286.2	(114.7-589.7)	Female	1	2.3	nc	(nc-nc)
<u>Breast</u>					<u>Non-Hodgkin Lymphoma</u>				
Male	0	0.5	nc	(nc-nc)	Male	12	9.4	127.3	(65.7-222.5)
Female	77	61.5	125.1	(98.7-156.4)	Female	11	7.3	151.1	(75.3-270.4)
<u>Cervix Uteri</u>					<u>Oral Cavity & Pharynx</u>				
Female	1	2.1	nc	(nc-nc)	Male	3	7.2	nc	(nc-nc)
<u>Colon / Rectum</u>					Female	0	3	nc	(nc-nc)
Male	11	18.9	58.1	(29-104)	<u>Ovary</u>				
Female	12	17.4	68.8	(35.5-120.2)	Female	3	5.5	nc	(nc-nc)
<u>Esophagus</u>					<u>Pancreas</u>				
Male	1	4.5	nc	(nc-nc)	Male	5	5.5	90.8	(29.3-211.9)
Female	0	1.1	nc	(nc-nc)	Female	6	5.3	113.2	(41.3-246.4)
<u>Hodgkin Lymphoma</u>					<u>Prostate</u>				
Male	3	1.1	nc	(nc-nc)	Male	64	63.3	101.1	(77.8-129.1)
Female	0	0.9	nc	(nc-nc)	<u>Stomach</u>				
<u>Kidney & Renal Pelvis</u>					Male	3	4	nc	(nc-nc)
Male	6	8.9	67.5	(24.7-146.9)	Female	0	2.1	nc	(nc-nc)
Female	4	4.8	nc	(nc-nc)	<u>Testis</u>				
<u>Larynx</u>					Male	1	1.5	nc	(nc-nc)
Male	2	2.5	nc	(nc-nc)	<u>Thyroid</u>				
Female	0	0.7	nc	(nc-nc)	Male	6	3.7	161.7	(59.1-352.1)
<u>Leukemia</u>					Female	16	10.8	148.1	(84.6-240.4)
Male	7	6.3	110.3	(44.2-227.3)	<u>Uteri Corpus and Uterus, NOS</u>				
Female	2	4.3	nc	(nc-nc)	Female	8	14.3	56	(24.1-110.3)
<u>Liver and Intrahepatic Bile Ducts</u>					<u>All Sites / Types</u>				
Male	3	5.3	nc	(nc-nc)	Male	186	224	83	(71.5-95.9)
Female	3	1.7	nc	(nc-nc)	Female	206	205.7	100.1	(86.9-114.8)
<u>Lung and Bronchus</u>									
Male	15	30.7	48.9	(27.3-80.6)					
Female	22	28.9	76.2	(47.7-115.4)					

- Obs = observed case count; Exp = expected case count;
- SIR = standardized incidence ratio ((Obs / Exp) X 100);
- 95% CI = 95% confidence intervals, a measure of the statistical significance of the SIR;
- Shading indicates the statistical significance of the SIR at 95% level of probability;
- nc = The SIR and 95% CI were not calculated when Obs < 5;

INTRODUCTION

Content

The purpose of this report is to provide an estimate of cancer incidence for each of the 351 cities and towns of Massachusetts for the five-year time period 2007 through 2011. For each city and town, Standardized Incidence Ratios (SIRs) are presented for twenty-three types of invasive cancer and for all invasive cancer types combined. These ratios compare the cancer incidence experience of each city or town with the cancer experience of the state as a whole. The method involves comparing the number of cases that were observed for a city or town to the number of cases that would be expected if the city or town had the same cancer rates as the state as whole. The report is organized into the following sections:

METHODS PROVIDES a detailed explanation of the data collection, data processing, and statistical techniques employed in this report.

TABLES present data for selected types of cancer by city/town and sex.

APPENDIX I provides a listing of *International Classification of Diseases for Oncology* codes used in the preparation of this report.

APPENDIX II provides selected resources for information on cancer.

APPENDIX III describes the Massachusetts Department of Public Health's current cancer control initiatives, and provides links to bureaus within the department that address some aspect of cancer. Links to resources for publications are also provided.

Comparison with Previous Reports

This report updates previous annual reports published by the Massachusetts Cancer Registry (MCR). It is available on line at <http://www.mass.gov/dph/mcr>. For questions about the report, contact the MCR at:

Massachusetts Cancer Registry
Office of Data Management and Outcomes Assessment
Massachusetts Department of Public Health
250 Washington Street, 6th floor
Boston, MA 02108-4619
telephone 617-624-5642; fax 617-624-5695

The preceding report, *Cancer Incidence in Massachusetts 2006-2010: City and Town Supplement*, included data for diagnosis years 2006 through 2010. This report contains data for the diagnosis years 2007 through 2011. There have been no changes in this report's format from the previous report.

METHODS

Data Sources

Cancer Incidence

The MCR collects reports of newly diagnosed cancer cases from health care facilities and practitioners throughout Massachusetts. Facilities that reported the 2007-2011 diagnoses that comprise this report include 69 Massachusetts acute care hospitals, 5 radiation/oncology centers, 2 endoscopy centers, 2 surgical centers, 10 independent laboratories, 3 medical practice associations, and approximately 500 private practice physicians. The MCR signed the modified National Data Exchange Agreement on March 28, 2013. This is a single agreement that allows participating states to exchange data on cases diagnosed or treated in other areas. Together with states participating in the agreement, and states with individual agreements, the MCR now has reciprocal reporting agreements with 36 states and with Puerto Rico to obtain data on Massachusetts residents diagnosed out of state. Currently the MCR collects information on *in situ* and invasive cancers and benign tumors of the brain and associated tissues. The MCR does not collect information on basal and squamous cell carcinomas of the skin.

The MCR also collects information from reporting hospitals on cases diagnosed and treated in staff physician offices when this information is available. Not all hospitals report this type of case, however, some hospitals report such cases as if the patients had been diagnosed and treated by the hospital directly. Collecting these types of data makes the MCR's overall case ascertainment more complete. Some cancer types that may be reported to the MCR in this manner are melanoma, prostate, colon/rectum, and oral cancers.

In addition, the MCR identifies previously unreported cancer cases through review of death certificate data to further improve case completeness. This process is referred to as death clearance and identifies cancers mentioned on death certificates that were not previously reported to the MCR. In some instances, the MCR obtains additional information on these cases through follow-up activities with hospitals, nursing homes, hospice residences, and physicians' offices. In other instances, a cancer-related cause of death recorded on a Massachusetts death certificate is the only source of information for a cancer case. Thus these "death certificate only" cancer diagnoses are poorly documented and have not been confirmed by review of clinical and pathological information. Such cases are included in this report, but they comprise less than 3% of all cancer cases.

All case reports that provided the basis for this report were coded following the *International Classification of Diseases for Oncology, Third Edition* (ICD-O-3), which was implemented in North America with cases diagnosed as of January 1, 2001. (1) Please see Appendix A for the classification of cancers by ICD-O3 codes.

Each year, the North American Association of Central Cancer Registries (NAACCR) reviews cancer registry data for quality, completeness, and timeliness. For 2007-2011, the MCR's annual case count was estimated by NAACCR to be more than 95% complete for each year. The MCR has achieved the gold standard for this certification element as well as for six other certification elements for each case year since 1997.

The Massachusetts cancer cases presented in this report are primary cases of cancer diagnosed among Massachusetts residents during 2007-2011 and reported to the MCR as of April 23, 2015. These data include some additional cases diagnosed in 2007-2010 that were not counted in the previous report, *Cancer Incidence in Massachusetts 2006-2010: City and Town Supplement*. The lag time between this report and the annual statewide report of 2008-2012 cancer cases is due to the fact that data for this city and town report needed to be cleaned for accuracy of residence within Massachusetts. The statewide report presented data at the state level and did not require such accuracy of city and town of

residence. The numbers presented in this report may change slightly in future reports, reflecting late reported cases or corrections based on subsequent details from the reporting facilities. Such changes might result in slight differences in numbers and rates in future reports of MCR data, reflecting the nature of population-based cancer registries that receive case reports on an ongoing basis.

Massachusetts cancer cases presented in this report are primary cases of cancer diagnosed among Massachusetts residents during 2007-2011. The Massachusetts data presented include invasive cancers only (except cancer of the urinary bladder, where *in situ* cancers are also included). Invasive cancers have spread beyond the layer of cells where they started and have the potential to spread to other parts of the body. *In situ* cancers are neoplasms diagnosed at the earliest stage, before they have spread, when they are limited to a small number of cells and have not invaded the organ itself. Typically, published incidence rates do not combine invasive and *in situ* cancers due to differences in the biologic significance, survival prognosis and types of treatment of the tumors. Cancer of the urinary bladder is the only exception, due to the specific nature of the diagnostic techniques and treatment patterns.

Presentation of Data

Each city and town in Massachusetts is listed alphabetically in the **TABLES** section. The observed number of cases, the expected number of cases, the standardized incidence ratios, and 95% confidence intervals are presented for twenty-three main types of cancer and for all cancer types combined. The “all cancers combined” category includes the twenty-three main types presented in this report and other malignant neoplasms. This category is meant to provide a summary of the total cancer experience in a community. As different cancers have different causes, this category does not reflect any specific risk factor that may be important for this community.

Observed and Expected Case Counts

The *observed* case count (**Obs**) for a particular type of cancer in a city/town is the actual number of newly diagnosed cases among residents of that city/town for a given time period.

A city/town’s *expected* case count (**Exp**) for a certain type of cancer for this time period is a calculated number based on that city/town’s population distribution² (by sex and among eighteen age groups) for the time period 2007-2011, and the corresponding statewide average annual age-specific incidence rates. The population data for the 2007 to 2011 period was calculated by adding 2005 city and town data with 2010 city and town data, dividing by two, and multiplying by five.

Standardized Incidence Ratios

A Standardized Incidence Ratio (SIR) is an indirect method of adjustment for age and sex that describes in numerical terms how a city/town’s cancer experience in a given time period compares with that of the state as a whole.

- An SIR of *exactly 100* indicates that a city/town’s incidence of a certain type of cancer is *equal to that expected* based on statewide average age-specific incidence rates.
- An SIR of *more than 100* indicates that a city/town’s incidence of a certain type of cancer is *higher than expected* for that type of cancer based on statewide average annual age-specific incidence rates. For example, an SIR of 105 indicates that a city/town’s cancer incidence is 5% higher than expected based on statewide average annual age-specific incidence rates.

- An SIR of *less than 100* indicates that a city/town's incidence of a certain type of cancer is *lower than expected* based on statewide average age-specific incidence rates. For example, an SIR of 85 indicates that a city/town's cancer incidence is 15% lower than expected based on statewide average annual age-specific incidence rates.

Statistical Significance and Interpretation of SIRs

The interpretation of the SIR depends on both how large it is and how stable it is. Stability in this context refers to how much the SIR changes when there are small increases or decreases in the observed or expected number of cases. Two SIRs may have the same size but not the same stability. For example, an SIR of 150 may represent 6 observed cases and 4 expected cases, or 600 observed cases and 400 expected cases. Both represent a 50 percent excess of observed cases. However, in the first instance, one or two fewer cases would change the SIR a great deal, whereas in the second instance, even if there were several fewer cases, the SIR would only change minimally. When the observed and expected numbers of cases are relatively small, their ratio is easily affected by one or two cases. Conversely, when the observed and expected numbers of cases are relatively large, the value of the SIR is stable.

A 95 percent confidence interval (CI) has been presented for each SIR in this report (when the observed number of cases is at least 5), to indicate if the observed number of cases is significantly different from the expected number, or if the difference is most likely due to chance. A confidence interval is a range of values around a measurement that indicates the precision of the measurement. In this report, the 95% confidence interval is the range of estimated SIR values that has a 95% probability of including the true SIR for a specific city or town. If the 95% confidence interval range *does not* include the value 100.0, then the number of observed cases is significantly different from the expected number of cases. "Significantly different" means there is at most a 5% chance that the difference between the number of observed and expected cancer cases is due solely to chance alone. If the confidence interval does contain the value 100, there is no significant difference between the observed and expected numbers. Statistically, the width of the interval reflects the size of the population and the number of events; smaller populations and smaller observed numbers of cases yield less precise estimates that have wider confidence intervals. Wide confidence intervals indicate instability, meaning that small changes in the observed or expected number of cases would change the SIR a great deal.

Examples:

- SIR = 137.0; 95% CI (101.6 - 180.6) – the confidence interval does not include 100.0 and the interval is above 100.0, indicating that the number of observed cases is *statistically significantly higher* than the expected number.
- SIR = 71.0; 95% CI (56.2 – 88.4) – the confidence interval does not include 100.0 and the interval is below 100.0, indicating that the number of observed cases is *statistically significantly lower* than the expected number.
- SIR = 108.8 95% CI (71.0-159.4) – the confidence interval DOES include 100.0 indicating that the number of observed cases is *NOT statistically significantly different* from what is expected, and the difference is likely due to chance. When the interval includes 100.0, then the true SIR may be 100.0.

Example of Calculation of an SIR and Its Significance

$$SIR = \frac{\text{OBSERVED CASES}}{\text{EXPECTED CASES}} \times 100$$

The following example illustrates the method of calculation for a hypothetical town for one type of cancer and one sex for the years 2007-2011:

Age Group	<u>Town X</u> Population (A)	<u>State</u> Age-Specific Incidence Rate (B)	<u>Town X</u> Expected Cases (C) = (A) x (B)	<u>Town X</u> Observed Cases (D)
00-04	74,657	0.0001	7.47	11
05-09	134,957	0.0002	26.99	25
10-14	54,463	0.0005	27.23	30
15-19	25,136	0.0015	37.70	40
20-24	17,012	0.0018	30.62	30
UP TO				
85+	6,337	0.0010	6.34	8
Total:			136.35	144

$$SIR = \frac{\text{Observed Cases}}{\text{Expected Cases}} \times 100 = \frac{(\text{column D total})}{(\text{column C total})} \times 100 = \frac{144}{136.35} \times 100 \approx 106$$

Thus the SIR for this type of cancer in Town X is 106, indicating that the incidence of this cancer in Town X is 6% higher than the corresponding statewide average incidence for this cancer. However, the range for the 95% confidence interval (89.1-124.3) (calculation not shown) indicates that the true value may be as low as 89.1 or as high as 124.3. Also, since the range includes the value 100, it means that the observed number of cases is *not statistically significantly higher or lower* than what is expected.

Whenever the number of observed cases is less than five, the corresponding SIR is neither calculated nor tested for statistical significance. This is indicated with an (nc) ("not calculated"). However, the number of observed and expected cases is shown in these circumstances.

Notes about Data Interpretation

The SIR is a useful indication of the disease categories that have relatively high or low rates for a given community. These statistics, however, should be used with care. Such statistics provide a starting point for further research and investigation into a possible health problem, but they do not by themselves confirm or deny the existence of a particular health problem. Many factors unrelated to disease causation may contribute to an elevated SIR, including demographic factors, changes in diagnostic techniques, and changes in data collection or recording methods over time, as well as the natural variation in disease occurrence.

When reviewing the data tables, it is important to keep in mind that an SIR compares the observed cancer incidence in a particular community with the expected incidence based on statewide average annual age-specific incidence rates. This means that *valid comparisons can only be made between a community and the state as a whole. SIRs for different cities and towns CANNOT and SHOULD NOT be compared to each other.* (Comparisons between two communities would be valid only if there were no differences in the age and sex distributions of the two communities' populations.)

Another point to keep in mind when reviewing these data is the large number of statistical tests being performed in this report. For each of the 351 cities and towns, we evaluate 18 types of cancer that can occur in both males and females, 3 types that occur only in females and 2 types that occur only in males, resulting in 41 gender/cancer categories. This results in 14,391 possible calculations (351 cities and towns x 41 gender cancer categories). Note that gender/cancer categories with less than 5 observed cases are not evaluated for statistical significance, so the actual numbers of tests is slightly lower than 14,391. This is important for the reader because when multiple significance tests are performed, some will result in a significant finding due to chance alone. Based on the number of calculations in this report, we expect 720 significant findings to be due to chance alone. Half of these would be significant excesses (360) and half would be significant deficits (360). There are statistical techniques that can be used to reduce this number, however use of these techniques leads to the opposite problem – true significant differences that may be missed. We choose to err on the side of caution and identify more significant results, knowing that some will be due to chance alone.

Data Limitations

It should be emphasized that apparent increases or decreases in cancer incidence over time might reflect changes in diagnostic methods or case reporting rather than true changes in cancer incidence. Four other limitations must be considered when interpreting cancer incidence data for Massachusetts cities and towns: under-reporting in areas close to neighboring states; under-reporting for cancers that may not be diagnosed in hospitals; cases being assigned to incorrect cities/towns; and standardized incidence ratios based on small numbers of cases.

Border Areas and Neighboring States

Some areas of Massachusetts appear to have low cancer incidence, but this may be due to loss of Massachusetts resident cases who are diagnosed in neighboring or other states and not reported to the MCR. The MCR has reciprocal reporting agreements with 29 states and with Puerto Rico.

Cases Diagnosed in Non-Hospital Settings

During the time period covered by this report, the MCR's primary information source for most newly diagnosed cases of cancer was hospitals. In addition the MCR collected information from reporting hospitals on cases diagnosed and treated in staff physician offices, when this information was available. Other reporting sources include dermatologists and dermatopathology laboratories, urologists' offices and a general laboratory. Some types of cancer in this report may be under-reported because they are diagnosed primarily by private physicians, private laboratories, health maintenance organizations, radiotherapy centers that escape identification systems used by hospitals. The most common types of cancer diagnosed or treated outside of the hospital include melanoma and prostate cancer. The exact extent of this under-reporting has not been determined, but cases included in this report represent the great majority of cases statewide and provide an essential basis for evaluating statewide cancer incidence patterns.

City/Town Misassignment

In accordance with standard central cancer registry procedures, each case reported to the MCR ideally should be assigned to the city/town in which the patient lived at the time of diagnosis, based on the address provided by the reporting hospital. In practice, however, a patient may provide the hospital with his/her mailing address (e.g., a post office box located outside the patient's city/town of residence); a business address; a temporary address (e.g., the patient is staying with a relative while receiving treatment and reports the relative's address as his/her own); or a locality or post office name (e.g., "Chestnut Hill" rather than "Boston," "Brookline," or "Newton"). In addition, if a patient has moved since being diagnosed, the hospital may report the patient's current address. Because of the large number of cases reported to the MCR, and because data are reported to the MCR via electronic media, most city/town case assignments are performed by an automated computer process. This simplified matching process may misassign some cases based on the reported locality name. When MCR staff become aware of such misassignments, they manually correct the errors. Furthermore, in order to minimize such errors, cases from fifty geographic localities prone to city/town misassignment are reviewed manually.

Small Numbers of Cases

Standardized incidence ratios based on small numbers of cases result in estimates that are very unstable. This situation is common when the population of a city or town is small or if the particular cancer type is rare. SIRs and statistical significance are not calculated when the number of observed cases for a specific category is less than five. In these instances, the observed and expected cases are presented in the tables for qualitative comparison only.

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APPENDIX II: SELECTED RESOURCES FOR INFORMATION ON CANCER

This Appendix contains a listing of selected resources for additional information on cancer. Cancers are complex diseases, many of which have multiple factors that may contribute to their development.

For information on cancer risk factors or prevention, you may wish to contact the following:

Cancer Information Service (National Cancer Institute): 1-800-4-CANCER (1-800-422-6237)

Cancer Response Line (American Cancer Society): 1-800-ACS-2345 (1-800-227-2345)

In addition, the following selected Internet websites provide information on cancer. Many of these also provide links to other sites (not listed) which may be of interest.

Massachusetts Department of Public Health: <http://www.mass.gov/dph>

American Cancer Society: <http://www.cancer.org>

Centers for Disease Control and Prevention

Home Page: <http://www.cdc.gov>

Cancer Prevention and Control Program: <http://www.cdc.gov/cancer>

Fruits and Veggies More Matters™ Campaign (nutrition – formerly 5-A-Day Program):
<http://www.FruitsandVeggiesMatter.gov>

National Cancer Institute

Information: <http://www.cancer.gov>

Cancer Literature in PubMed: http://www.cancer.gov/search/cancer_literature

Surveillance, Epidemiology, and End Results (SEER) Program data: <http://seer.cancer.gov>

Your Cancer Risk (Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine; formerly at Harvard Center for Cancer Prevention):
<http://www.yourdiseaserisk.wustl.edu>

OncoLink (Abramson Cancer Center of the University of Pennsylvania):
<http://www.oncolink.upenn.edu>

Cancerquest (Emory University – Winship Cancer Institute): www.cancerquest.org

Cancer News on the Net® (information on diagnosis and treatment for cancer patients and their families): <http://www.cancernews.com>

National Coalition for Cancer Survivorship: <http://www.canceradvocacy.org>

APPENDIX III: MDPH CANCER PREVENTION AND CONTROL INITIATIVES

The Massachusetts Department of Public Health is working to reduce the incidence and mortality of cancer in the Commonwealth. Partnerships between MDPH programs, researchers, healthcare providers and nonprofit organizations collect information about cancer, lead quality improvement projects, coordinate evidenced-based workshops for managing living with chronic disease (including cancer), provide education for health professionals and bring shared messages to the public. Our collaborated efforts focus on reducing cancer risk, incidence and mortality through healthy lifestyles, early diagnosis, and increased access to care. The Department's programs address the impact of tobacco, alcohol, nutrition, and physical activity on cancer prevention, along with environmental and occupational hazards for cancer. Throughout all of our efforts there is an emphasis on reducing disparate health outcomes and unequal access to cancer care.

MDPH Bureaus and Programs:

Bureau of Environmental Health, www.mass.gov/dph/environmental_health

Bureau of Substance Abuse Services, www.mass.gov/dph/bsas

Comprehensive Cancer Prevention and Control Program, www.mass.gov/compccancer

Men's Health/Women's Health/Care Coordination Program

Tobacco Cessation and Prevention Program, www.mass.gov/dph/mtcp

Occupational Health Surveillance Program, www.mass.gov/dph/ohsp

Office of Healthy Aging, www.mass.gov/dph/healthyaging

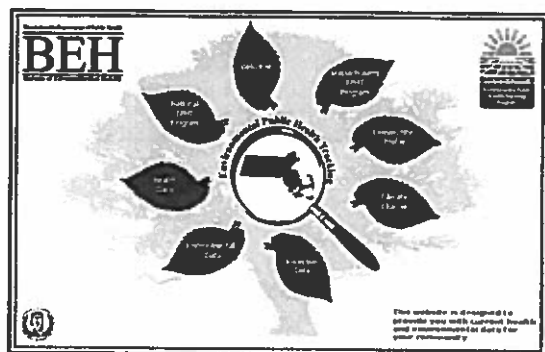
Oral Health Program, www.mass.gov/dph/oralhealth

Division of Prevention and Wellness www.mass.gov/dph/healthpromotion

MDPH publications on cancer prevention and screening are available at the Massachusetts Health Promotion Clearinghouse, www.maclearinghouse.com.

Massachusetts Cancer Registry Publications are available through the Massachusetts Cancer Registry, telephone: 617-624-5642 and on the web at www.mss.gov/dph/mcr.

Environmental Public Health Tracking



In 2000, the Pew Environmental Health Commission identified the lack of basic information needed to link environmental hazards and chronic diseases. Chronic diseases – such as heart disease, stroke, cancer and diabetes – are among the most prevalent, costly, and preventable of all health problems. Massachusetts has one of the highest rates of chronic illness in the United States, costing the state \$34 billion a year.

In response, the U.S. Centers for Disease Control and Prevention (CDC) developed the National Environmental Public Health Tracking (NEPHT) program to fund state and local health departments to build state-based environmental public health tracking networks. Environmental public health tracking is the ongoing collection, integration, analysis, and interpretation of data about environmental hazards, exposure to environmental hazards and the health effects potentially related to exposure.

Massachusetts has been part of the NEPHT Program since 2002 and launched the **Massachusetts Environmental Public Health Tracking** website (MA EPHT) in 2009.

The Massachusetts Department of Public Health/Bureau of Environmental Health

(MDPH/BEH) has been in the forefront of environmental public health tracking by analyzing information from statewide disease registries and surveillance programs to determine if exposure to environmental contaminants may be contributing to the high rates of these chronic diseases in Massachusetts.

Different types of data are used to learn how the environment affects people's health. The MA EPHT website currently provides information about the following data:

Health Data:

- Asthma Hospitalization
- Birth Defects
- Cancer
- Carbon Monoxide Poisoning
- Childhood Lead Poisoning
- Heart Attack Hospitalization
- Heat Stress
- Pediatric Asthma
- Pediatric Diabetes
- Reproductive Outcomes

Environmental Data:

- Air Quality
- Climate Change
- Drinking Water Quality
- Radon

Inspection Data:

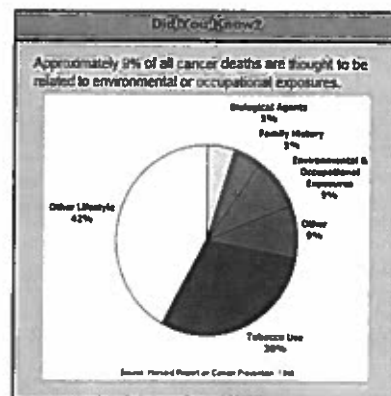
- Food Protection
- Mammography Inspection

On the MA EPHT website you can view maps, tables and charts to more closely examine the possible links between the environment and chronic diseases both statewide and locally.

You can visit the MA EPHT website at www.mass.gov/dph/matracking

MA Environmental Public Health Tracking: Cancer

Cancer is not one disease, but a group of diseases. According to the American Cancer Society, one in two men and one in three women will develop cancer during his or her lifetime. Research has shown that there are more than 100 different types of cancer, each with different causative (or risk) factors. A risk factor is anything that increases a person's chance of developing cancer and may include hereditary conditions, medical conditions or treatments, lifestyle factors, or environmental exposures. Cancer may be caused by several factors acting together over time. In general, most adult cancers have a long period of development that can range from 10 to 40 years.



Cancer data available on the MA EPHT website:

Cancer incidence rates available on the MA EPHT website are calculated using data from the Massachusetts Cancer Registry, a population-based surveillance program that has been monitoring cancer incidence in the state of MA since 1982. Cancer data are presented on the website using two different types of statistics:

Indirect Incidence Rates- referred to as *Standardized Incidence Ratios (SIRs)*: An SIR is the most appropriate statistic to examine cancer incidence in a small area, such as a community or a census tract within a community. It is used to evaluate whether a community's or a census tract's cancer incidence rate differs from that of the state as a whole.

Direct Incidence Rates- A direct incidence rate is the most appropriate statistic to use for larger, more stable study populations such as a state or county. Because of the way it is calculated, it may be used to compare cancer incidence in one relatively large area to another relatively large area (such as one county to another).

For more information, visit the MA EPHT cancer webpage at: <https://matracking.ehs.state.ma.us/Health-Data/Cancer/index.html>

Massachusetts Department of Public Health
Bureau of Environmental Health
250 Washington Street, 7th Floor
Boston, MA 02108
Phone: 617-624-5757 | Fax: 617-624-5183 | TTY: 617-624-5286
www.mass.gov/dph/environmental_health



Massachusetts Department of Public Health
Bureau of Environmental Health

November 2015



The Commonwealth of Massachusetts
Executive Office of Health and Human Services
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TOWN OF WAYLAND
BOARD OF HEALTH

TO: Boards of Health

FROM: Susan T. Gershman, MPH, PhD, CTR *ea*
Director
Massachusetts Cancer Registry

DATE: November 18, 2014

RE: Cancer Incidence in Massachusetts, 2006-2010, City and Town Supplement

I am writing to inform you that the Massachusetts Cancer Registry (MCR) of the Massachusetts Department of Public Health (MDPH) is releasing its report Cancer Incidence in Massachusetts, 2006-2010, City and Town Supplement. Please note that this report will be published in an electronic version only and will be posted on the Department of Public Health's web site at www.mass.gov/dph/mcr December 1, 2014. If you are interested in further supplement data prior to the posting, please contact the registry directly at the telephone number listed below. Please note that there is no embargo on these data and they may be released prior to the web posting date.

The 2006-2010 City and Town Supplement updates the 2005-2009 City and Town Supplement. For each city and town, this report provides expected case counts, observed case counts, standardized incidence ratios, and confidence intervals for 23 types of cancer and for all cancers combined. The confidence intervals indicate if there is a statistically significant difference (excess or deficit) between the observed and expected counts.

We are providing you with the following pieces of information in advance of the report's Internet release.

1. The introduction to the report, including an explanation of standardized incidence ratios.
2. The cancer incidence data for your town (i.e. for 23 cancer types and all cancers combined).
3. Appendix II includes selected resources for information on cancer.
4. Appendix III includes MDPH Cancer Prevention and Control Initiatives.
5. For cancer risk factors, please check the following websites: American Cancer Society: www.cancer.org; National Cancer Institute: www.cancer.gov

The complete Internet version will be available at: www.mass.gov/dph/mcr

The following report has also been recently posted on the above website:

Cancer Incidence and Mortality in Massachusetts 2006-2010: Statewide Report

If you have any trouble accessing this web site, please contact the MCR at (617) 624-5642.

For further information, please contact the following at MDPH:

Massachusetts Cancer Registry (617) 624-5642

Bureau of Environmental Health (617) 624-5757

Massachusetts Comprehensive Cancer Prevention and Control Program (617) 624-5484

Wayland

Observed and Expected Case Counts, with Standardized Incidence Ratios, 2006-2010

	Obs	Exp	SIR	95% CI		Obs	Exp	SIR	95% CI
<u>Bladder, Urinary</u>					<u>Melanoma of Skin</u>				
Male	11	15.9	69.2	(34.5-123.8)	Male	12	10.6	113.6	(58.6-198.4)
Female	4	5.5	nc	(nc-nc)	Female	15	7.9	<u>189.4</u>	<u>(105.9-312.5)</u>
<u>Brain and Other Nervous System</u>					<u>Multiple Myeloma</u>				
Male	3	3.1	nc	(nc-nc)	Male	2	2.8	nc	(nc-nc)
Female	7	2.5	<u>281.2</u>	<u>(112.7-579.4)</u>	Female	1	2.1	nc	(nc-nc)
<u>Breast</u>					<u>Non-Hodgkin Lymphoma</u>				
Male	0	0.5	nc	(nc-nc)	Male	13	9.3	140.3	(74.6-239.9)
Female	84	60.4	<u>139.1</u>	<u>(110.9-172.2)</u>	Female	10	7.3	136.4	(65.3-250.9)
<u>Cervix Uteri</u>					<u>Oral Cavity & Pharynx</u>				
Female	0	2.2	nc	(nc-nc)	Male	6	7.0	85.7	(31.3-186.5)
<u>Colon / Rectum</u>					Female	0	3.0	nc	(nc-nc)
Male	15	18.9	79.5	(44.5-131.1)	<u>Ovary</u>				
Female	14	18.0	77.8	(42.5-130.5)	Female	6	5.5	109.5	(40.0-238.4)
<u>Esophagus</u>					<u>Pancreas</u>				
Male	2	4.4	nc	(nc-nc)	Male	6	5.3	114.1	(41.7-248.4)
Female	0	1.2	nc	(nc-nc)	Female	5	5.4	92.4	(29.8-215.7)
<u>Hodgkin Lymphoma</u>					<u>Prostate</u>				
Male	3	1.1	nc	(nc-nc)	Male	61	64.7	94.2	(72.1-121.0)
Female	0	0.9	nc	(nc-nc)	<u>Stomach</u>				
<u>Kidney & Renal Pelvis</u>					Male	3	3.8	nc	(nc-nc)
Male	5	8.9	56.1	(18.1-130.9)	Female	0	2.1	nc	(nc-nc)
Female	6	4.9	123.1	(45.0-268.0)	<u>Testis</u>				
<u>Larynx</u>					Male	1	1.5	nc	(nc-nc)
Male	2	2.6	nc	(nc-nc)	<u>Thyroid</u>				
Female	0	0.7	nc	(nc-nc)	Male	5	3.6	139.8	(45.1-326.3)
<u>Leukemia</u>					Female	17	10.4	163.8	(95.3-262.2)
Male	5	5.9	85.1	(27.4-198.5)	<u>Uteri Corpus and Uterus, NOS</u>				
Female	3	4.3	nc	(nc-nc)	Female	9	14.0	64.2	(29.3-121.9)
<u>Liver and Intrahepatic Bile Ducts</u>					<u>All Sites / Types</u>				
Male	3	5.2	nc	(nc-nc)	Male	191	220.8	<u>86.5</u>	<u>(74.7-99.7)</u>
Female	3	1.6	nc	(nc-nc)	Female	222	204.7	108.4	(94.6-123.7)
<u>Lung and Bronchus</u>									
Male	22	29.7	74.1	(46.4-112.2)					
Female	25	29.0	86.3	(55.8-127.4)					

- Obs = observed case count; Exp = expected case count;
- SIR = standardized incidence ratio (Obs / Exp) X 100;
- 95% CI = 95% confidence intervals, a measure of the statistical significance of the SIR;
- Shading indicates the statistical significance of the SIR at 95% level of probability;
- nc = The SIR and 95% CI were not calculated when Obs < 5;

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TOWN OF WAYLAND
BOARD OF HEALTH

INTRODUCTION

Content

The purpose of this report is to provide an estimate of cancer incidence for each of the 351 cities and towns of Massachusetts for the five-year time period 2006 through 2010. For each city and town, Standardized Incidence Ratios (SIRs) are presented for twenty-three types of invasive cancer and for all invasive cancer types combined. These ratios compare the cancer incidence experience of each city or town with the cancer experience of the state as a whole. The method involves comparing the number of cases that were observed for a city or town to the number of cases that would be expected if the city or town had the same cancer rates as the state as whole. The report is organized into the following sections:

METHODS provides a detailed explanation of the data collection, data processing, and statistical techniques employed in this report.

TABLES present data for selected types of cancer by city/town and sex.

APPENDIX I provides a listing of *International Classification of Diseases for Oncology* codes used in the preparation of this report.

APPENDIX II provides a listing of risk factors for selected cancer types and a listing of the individuals who reviewed the risk factor list.

APPENDIX III describes the Massachusetts Department of Public Health's current cancer control initiatives, and provides links to bureaus within the department that address some aspect of cancer. Links to resources for publications are also provided.

Comparison with Previous Reports

This report updates previous annual reports published by the Massachusetts Cancer Registry (MCR). It is available on line at <http://www.mass.gov/dph/mcr>. For questions about the report, contact the MCR at:

Massachusetts Cancer Registry
Office of Data Management and Outcomes Assessment
Massachusetts Department of Public Health
250 Washington Street, 6th floor
Boston, MA 02108-4619
telephone 617-624-5642; fax 617-624-5695

The preceding report, *Cancer Incidence in Massachusetts 2005-2009: City and Town Supplement*, included data for diagnosis years 2005 through 2009. This report contains data for the diagnosis years 2006 through 2010. There have been no changes in this report's format from the previous report.

METHODS

Data Sources

Cancer Incidence

The MCR collects reports of newly diagnosed cancer cases from health care facilities and practitioners throughout Massachusetts. Facilities that reported the 2006-2010 diagnoses that comprise this report include 69 Massachusetts acute care hospitals, 5 radiation/oncology centers, 2 endoscopy centers, 2 surgical centers, 10 independent laboratories, 3 medical practice associations, and approximately 500 private practice physicians. The MCR signed the modified National Data Exchange Agreement on March 28, 2013. This is a single agreement that allows participating states to exchange data on cases diagnosed or treated in other areas. Together with states participating in the agreement, and states with individual agreements, the MCR now has reciprocal reporting agreements with 29 states and with Puerto Rico to obtain data on Massachusetts residents diagnosed out of state. Currently the MCR collects information on *in situ* and invasive cancers and benign tumors of the brain and associated tissues. The MCR does not collect information on basal and squamous cell carcinomas of the skin.

The MCR also collects information from reporting hospitals on cases diagnosed and treated in staff physician offices when this information is available. Not all hospitals report this type of case, however, some hospitals report such cases as if the patients had been diagnosed and treated by the hospital directly. Collecting these types of data makes the MCR's overall case ascertainment more complete. Some cancer types that may be reported to the MCR in this manner are melanoma, prostate, colon/rectum, and oral cancers.

In addition, the MCR identifies previously unreported cancer cases through review of death certificate data to further improve case completeness. This process is referred to as death clearance and identifies cancers mentioned on death certificates that were not previously reported to the MCR. In some instances, the MCR obtains additional information on these cases through follow-up activities with hospitals, nursing homes, hospice residences, and physicians' offices. In other instances, a cancer-related cause of death recorded on a Massachusetts death certificate is the only source of information for a cancer case. Thus these "death certificate only" cancer diagnoses are poorly documented and have not been confirmed by review of clinical and pathological information. Such cases are included in this report, but they comprise less than 3% of all cancer cases.

All case reports that provided the basis for this report were coded following the *International Classification of Diseases for Oncology, Third Edition* (ICD-O-3), which was implemented in North America with cases diagnosed as of January 1, 2001. (1) Please see Appendix A for the classification of cancers by ICD-O3 codes.

Each year, the North American Association of Central Cancer Registries (NAACCR) reviews cancer registry data for quality, completeness, and timeliness. The NAACCR certification results for the MCR for diagnosis years 2006-2010 are presented in Table A. For 2006-2010, the MCR's annual case count was estimated by NAACCR to be more than 95% complete for each year. The MCR has achieved the gold standard for this certification element as well as for six other certification elements for each case year since 1997. (See Table A.)

The Massachusetts cancer cases presented in this report are primary cases of cancer diagnosed among Massachusetts residents during 2006-2010 and reported to the MCR as of August 1, 2014. These data include some additional cases diagnosed in 2006-2009 that were not counted in the previous report, *Cancer Incidence in Massachusetts 2005-2009: City and Town Supplement*. The lag time between this report and the annual statewide report of 2006-2010 cancer cases is due to the fact that data for this city and town report needed to be cleaned for accuracy of residence within Massachusetts. The statewide report presented data at the state level and did not require such accuracy of city and town of

residence. The numbers presented in this report may change slightly in future reports, reflecting late reported cases or corrections based on subsequent details from the reporting facilities. Such changes might result in slight differences in numbers and rates in future reports of MCR data, reflecting the nature of population-based cancer registries that receive case reports on an ongoing basis.

Massachusetts cancer cases presented in this report are primary cases of cancer diagnosed among Massachusetts residents during 2006-2010. The Massachusetts data presented include invasive cancers only (except cancer of the urinary bladder, where *in situ* cancers are also included). Invasive cancers have spread beyond the layer of cells where they started and have the potential to spread to other parts of the body. *In situ* cancers are neoplasms diagnosed at the earliest stage, before they have spread, when they are limited to a small number of cells and have not invaded the organ itself. Typically, published incidence rates do not combine invasive and *in situ* cancers due to differences in the biologic significance, survival prognosis and types of treatment of the tumors. Cancer of the urinary bladder is the only exception, due to the specific nature of the diagnostic techniques and treatment patterns.

Presentation of Data

Each city and town in Massachusetts is listed alphabetically in the **TABLES** section. The observed number of cases, the expected number of cases, the standardized incidence ratios, and 95% confidence intervals are presented for twenty-three main types of cancer and for all cancer types combined. The "all cancers combined" category includes the twenty-three main types presented in this report and other malignant neoplasms. This category is meant to provide a summary of the total cancer experience in a community. As different cancers have different causes, this category does not reflect any specific risk factor that may be important for this community.

Observed and Expected Case Counts

The *observed* case count (Obs) for a particular type of cancer in a city/town is the actual number of newly diagnosed cases among residents of that city/town for a given time period.

A city/town's *expected* case count (Exp) for a certain type of cancer for this time period is a calculated number based on that city/town's population distribution² (by sex and among eighteen age groups) for the time period 2006-2010, and the corresponding statewide average annual age-specific incidence rates. The population data for the 2006 to 2010 period was calculated by adding 2005 city and town data with 2010 city and town data, dividing by two, and multiplying by five.

Standardized Incidence Ratios

A Standardized Incidence Ratio (SIR) is an indirect method of adjustment for age and sex that describes in numerical terms how a city/town's cancer experience in a given time period compares with that of the state as a whole.

- An SIR of *exactly 100* indicates that a city/town's incidence of a certain type of cancer is *equal to that expected* based on statewide average age-specific incidence rates.
- An SIR of *more than 100* indicates that a city/town's incidence of a certain type of cancer is *higher than expected* for that type of cancer based on statewide average annual age-specific incidence rates. For example, an SIR of 105 indicates that a city/town's cancer incidence is 5% higher than expected based on statewide average annual age-specific incidence rates.

- An SIR of *less than 100* indicates that a city/town's incidence of a certain type of cancer is *lower than expected* based on statewide average age-specific incidence rates. For example, an SIR of 85 indicates that a city/town's cancer incidence is 15% lower than expected based on statewide average annual age-specific incidence rates.

Statistical Significance and Interpretation of SIRs

The interpretation of the SIR depends on both how large it is and how stable it is. Stability in this context refers to how much the SIR changes when there are small increases or decreases in the observed or expected number of cases. Two SIRs may have the same size but not the same stability. For example, an SIR of 150 may represent 6 observed cases and 4 expected cases, or 600 observed cases and 400 expected cases. Both represent a 50 percent excess of observed cases. However, in the first instance, one or two fewer cases would change the SIR a great deal, whereas in the second instance, even if there were several fewer cases, the SIR would only change minimally. When the observed and expected numbers of cases are relatively small, their ratio is easily affected by one or two cases. Conversely, when the observed and expected numbers of cases are relatively large, the value of the SIR is stable.

A 95 percent confidence interval (CI) has been presented for each SIR in this report (when the observed number of cases is at least 5), to indicate if the observed number of cases is significantly different from the expected number, or if the difference is most likely due to chance. A confidence interval is a range of values around a measurement that indicates the precision of the measurement. In this report, the 95% confidence interval is the range of estimated SIR values that has a 95% probability of including the true SIR for a specific city or town. If the 95% confidence interval range *does not* include the value 100.0, then the number of observed cases is significantly different from the expected number of cases. "Significantly different" means there is at most a 5% chance that the difference between the number of observed and expected cancer cases is due solely to chance alone. If the confidence interval does contain the value 100, there is no significant difference between the observed and expected numbers. Statistically, the width of the interval reflects the size of the population and the number of events; smaller populations and smaller observed numbers of cases yield less precise estimates that have wider confidence intervals. Wide confidence intervals indicate instability, meaning that small changes in the observed or expected number of cases would change the SIR a great deal.

Examples:

- SIR = 137.0; 95% CI (101.6 - 180.6) – the confidence interval does not include 100.0 and the interval is above 100.0, indicating that the number of observed cases is *statistically significantly higher* than the expected number.
- SIR = 71.0; 95% CI (56.2 – 88.4) – the confidence interval does not include 100.0 and the interval is below 100.0, indicating that the number of observed cases is *statistically significantly lower* than the expected number.
- SIR = 108.8 95% CI (71.0-159.4) – the confidence interval DOES include 100.0 indicating that the number of observed cases is *NOT statistically significantly different* from what is expected, and the difference is likely due to chance. When the interval includes 100.0, then the true SIR may be 100.0.

Example of Calculation of an SIR and Its Significance

$$SIR = \frac{\text{OBSERVED CASES}}{\text{EXPECTED CASES}} \times 100$$

The following example illustrates the method of calculation for a hypothetical town for one type of cancer and one sex for the years 2004-2008:

Age Group	<u>Town X</u> Population (A)	<u>State</u> Age-Specific Incidence Rate (B)	<u>Town X</u> Expected Cases (C) = (A) x (B)	<u>Town X</u> Observed Cases (D)
00-04	74,657	0.0001	7.47	11
05-09	134,957	0.0002	26.99	25
10-14	54,463	0.0005	27.23	30
15-19	25,136	0.0015	37.70	40
20-24	17,012	0.0018	30.62	30
UP TO 85+	6,337	0.0010	6.34	8
Total:			136.35	144

$$SIR = \frac{\text{Observed Cases}}{\text{Expected Cases}} \times 100 = \frac{(\text{column D total})}{(\text{column C total})} \times 100 = \frac{144}{136.35} \times 100 \approx 106$$

Thus the SIR for this type of cancer in Town X is 106, indicating that the incidence of this cancer in Town X is 6% higher than the corresponding statewide average incidence for this cancer. However, the range for the 95% confidence interval (89.1-124.3) (calculation not shown) indicates that the true value may be as low as 89.1 or as high as 124.3. Also, since the range includes the value 100, it means that the observed number of cases is *not statistically significantly higher or lower* than what is expected.

Whenever the number of observed cases is less than five, the corresponding SIR is neither calculated nor tested for statistical significance. This is indicated with an (nc) ("not calculated"). However, the number of observed and expected cases is shown in these circumstances.

Notes about Data Interpretation

The SIR is a useful indication of the disease categories that have relatively high or low rates for a given community. These statistics, however, should be used with care. Such statistics provide a starting point for further research and investigation into a possible health problem, but they do not by themselves confirm or deny the existence of a particular health problem. Many factors unrelated to disease causation may contribute to an elevated SIR, including demographic factors, changes in diagnostic techniques, and changes in data collection or recording methods over time, as well as the natural variation in disease occurrence.

When reviewing the data tables, it is important to keep in mind that an SIR compares the observed cancer incidence in a particular community with the expected incidence based on statewide average annual age-specific incidence rates. This means that *valid comparisons can only be made between a community and the state as a whole. SIRs for different cities and towns CANNOT and SHOULD NOT be compared to each other.* (Comparisons between two communities would be valid only if there were no differences in the age and sex distributions of the two communities' populations.)

Another point to keep in mind when reviewing these data is the large number of statistical tests being performed in this report. For each of the 351 cities and towns, we evaluate 18 types of cancer that can occur in both males and females, 3 types that occur only in females and 2 types that occur only in males, resulting in 41 gender/cancer categories. This results in 14,391 possible calculations (351 cities and towns x 41 gender cancer categories). Note that gender/cancer categories with less than 5 observed cases are not evaluated for statistical significance, so the actual numbers of tests is slightly lower than 14,391. This is important for the reader because when multiple significance tests are performed, some will result in a significant finding due to chance alone. Based on the number of calculations in this report, we expect 720 significant findings to be due to chance alone. Half of these would be significant excesses (360) and half would be significant deficits (360). There are statistical techniques that can be used to reduce this number, however use of these techniques leads to the opposite problem – true significant differences that may be missed. We choose to err on the side of caution and identify more significant results, knowing that some will be due to chance alone.

Data Limitations

It should be emphasized that apparent increases or decreases in cancer incidence over time might reflect changes in diagnostic methods or case reporting rather than true changes in cancer incidence. Four other limitations must be considered when interpreting cancer incidence data for Massachusetts cities and towns: under-reporting in areas close to neighboring states; under-reporting for cancers that may not be diagnosed in hospitals; cases being assigned to incorrect cities/towns; and standardized incidence ratios based on small numbers of cases.

Border Areas and Neighboring States

Some areas of Massachusetts appear to have low cancer incidence, but this may be due to loss of Massachusetts resident cases who are diagnosed in neighboring or other states and not reported to the MCR. The MCR has reciprocal reporting agreements with 29 states and with Puerto Rico.

Cases Diagnosed in Non-Hospital Settings

During the time period covered by this report, the MCR's primary information source for most newly diagnosed cases of cancer was hospitals. In addition the MCR collected information from reporting hospitals on cases diagnosed and treated in staff physician offices, when this information was available. Other reporting sources include dermatologists and dermatopathology laboratories, urologists' offices and a general laboratory. Some types of cancer in this report may be under-reported because they are diagnosed primarily by private physicians, private laboratories, health maintenance organizations, radiotherapy centers that escape identification systems used by hospitals. The most common types of cancer diagnosed or treated outside of the hospital include melanoma and prostate cancer. The exact extent of this under-reporting has not been determined, but cases included in this report represent the great majority of cases statewide and provide an essential basis for evaluating statewide cancer incidence patterns.

City/Town Misassignment

In accordance with standard central cancer registry procedures, each case reported to the MCR ideally should be assigned to the city/town in which the patient lived at the time of diagnosis, based on the address provided by the reporting hospital. In practice, however, a patient may provide the hospital with his/her mailing address (e.g., a post office box located outside the patient's city/town of residence); a business address; a temporary address (e.g., the patient is staying with a relative while receiving treatment and reports the relative's address as his/her own); or a locality or post office name (e.g., "Chestnut Hill" rather than "Boston," "Brookline," or "Newton"). In addition, if a patient has moved since being diagnosed, the hospital may report the patient's current address. Because of the large number of cases reported to the MCR, and because data are reported to the MCR via electronic media, most city/town case assignments are performed by an automated computer process. This simplified matching process may misassign some cases based on the reported locality name. When MCR staff become aware of such misassignments, they manually correct the errors. Furthermore, in order to minimize such errors, cases from fifty geographic localities prone to city/town misassignment are reviewed manually.

Small Numbers of Cases

Standardized incidence ratios based on small numbers of cases result in estimates that are very unstable. This situation is common when the population of a city or town is small or if the particular cancer type is rare. SIRs and statistical significance are not calculated when the number of observed cases for a specific category is less than five. In these instances, the observed and expected cases are presented in the tables for qualitative comparison only.

APPENDIX II: SELECTED RESOURCES FOR INFORMATION ON CANCER

This Appendix contains a listing of selected resources for additional information on cancer. Cancers are complex diseases, many of which have multiple factors that may contribute to their development.

For information on cancer risk factors or prevention, you may wish to contact the following:

Cancer Information Service (National Cancer Institute): 1-800-4-CANCER (1-800-422-6237)

Cancer Response Line (American Cancer Society): 1-800-ACS-2345 (1-800-227-2345)

In addition, the following selected Internet websites provide information on cancer. Many of these also provide links to other sites (not listed) which may be of interest.

Massachusetts Department of Public Health: <http://www.mass.gov/dph>

American Cancer Society: <http://www.cancer.org>

Centers for Disease Control and Prevention

Home Page: <http://www.cdc.gov>

Cancer Prevention and Control Program: <http://www.cdc.gov/cancer>

Fruits and Veggies More Matters™ Campaign (nutrition – formerly 5-A-Day Program):

<http://www.FruitsandVeggiesMatter.gov>

National Cancer Institute

Information: <http://www.cancer.gov>

Cancer Literature in PubMed: http://www.cancer.gov/search/cancer_literature

Surveillance, Epidemiology, and End Results (SEER) Program data: <http://seer.cancer.gov>

Your Cancer Risk (Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine; formerly at Harvard Center for Cancer Prevention):
<http://www.yourdiseaserisk.wustl.edu>

OncoLink (Abramson Cancer Center of the University of Pennsylvania):
<http://www.oncolink.upenn.edu>

Cancerquest (Emory University – Winship Cancer Institute): www.cancerquest.org

Cancer News on the Net® (information on diagnosis and treatment for cancer patients and their families): <http://www.cancernews.com>

National Coalition for Cancer Survivorship: <http://www.canceradvocacy.org>

APPENDIX III: MDPH CANCER PREVENTION AND CONTROL INITIATIVES

The Massachusetts Department of Public Health is working to reduce the incidence and mortality of cancer in the Commonwealth. Partnerships between MDPH programs, researchers, healthcare providers and nonprofit organizations collect information about cancer, lead quality improvement projects, coordinate evidenced-based workshops for managing living with chronic disease (including cancer), provide education for health professionals and bring shared messages to the public. Our collaborated efforts focus on reducing cancer risk, incidence and mortality through healthy lifestyles, early diagnosis, and increased access to care. The Department's programs address the impact of tobacco, alcohol, nutrition, and physical activity on cancer prevention, along with environmental and occupational hazards for cancer. Throughout all of our efforts there is an emphasis on reducing disparate health outcomes and unequal access to cancer care.

MDPH Bureaus and Programs:

Bureau of Environmental Health, www.mass.gov/dph/environmental_health

Bureau of Substance Abuse Services, www.mass.gov/dph/bsas

Comprehensive Cancer Prevention and Control Program, www.mass.gov/compccancer

Men's Health/Women's Health/Care Coordination Program

Tobacco Cessation and Prevention Program, www.mass.gov/dph/mtcp

Occupational Health Surveillance Program, www.mass.gov/dph/ohsp

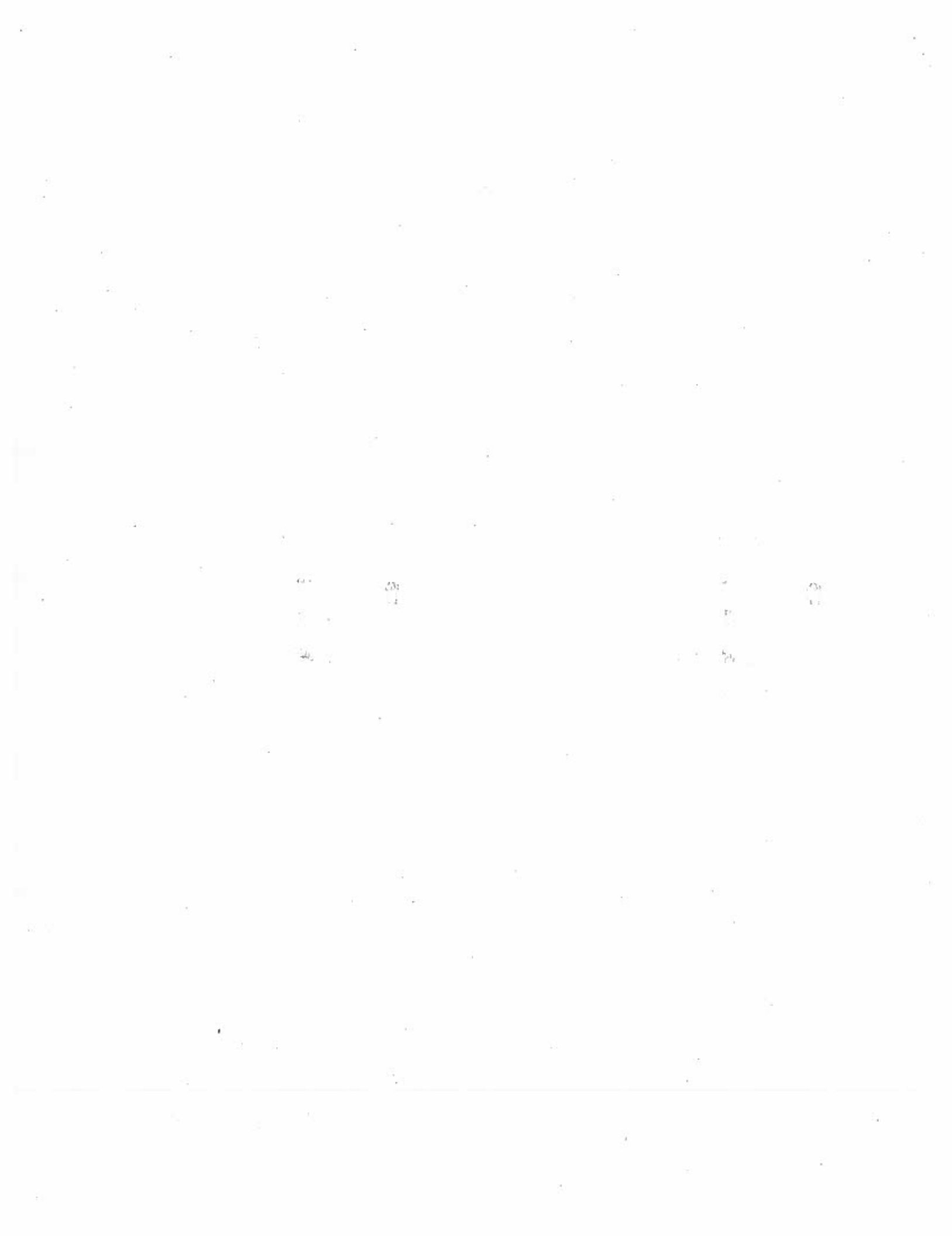
Office of Healthy Aging, www.mass.gov/dph/healthyaging

Oral Health Program, www.mass.gov/dph/oralhealth

Division of Prevention and Wellness www.mass.gov/dph/healthpromotion

MDPH publications on cancer prevention and screening are available at the Massachusetts Health Promotion Clearinghouse, www.mhclearinghouse.com.

Massachusetts Cancer Registry Publications are available through the Massachusetts Cancer Registry, telephone: 617-624-5642 and on the web at www.mass.gov/dph/mcr.





The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health
250 Washington Street, Boston, MA 02108-4619

DEVAL L. PATRICK
GOVERNOR

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SECRETARY

CHERYL BARTLETT
COMMISSIONER

Tel: 617-624-5000
Fax: 617-624-5206
www.mass.gov/dph

TO: Boards of Health

FROM: Susan T. Gershman, MPH, PhD, CTR *SG*
Director
Massachusetts Cancer Registry

DATE: November 19, 2014

RE: Cancer Incidence in Massachusetts, 2006-2010, City and Town Supplement

On Tuesday, November 18th, the Massachusetts Cancer Registry (MCR) of the Massachusetts Department of Public Health (MDPH) sent you a memo to inform you of the release of its report Cancer Incidence in Massachusetts, 2006-2010, City and Town Supplement. Unfortunately, the page with the statistics for your city or town was inadvertently omitted from the packet, so it is included here. Please accept my sincere apologies for this oversight.

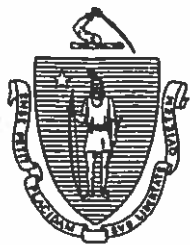
Just a reminder that this report will be published in an electronic version only and will be posted on the Department of Public Health's web site at www.mass.gov/dph/mcr December 1, 2014.

If you have any questions, please don't hesitate to call me at (617)624-5646.

RECEIVED

NOV 24 2014

TOWN OF WAYLAND
BOARD OF HEALTH



The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health
250 Washington Street, Boston, MA 02108-4619

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COMMISSIONER

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OCT 24 2013
TOWN OF WAYLAND
BOARD OF HEALTH

TO: Boards of Health

FROM: Susan T. Gershman, MPH, PhD, CTR
Director
Massachusetts Cancer Registry

DATE: October 24, 2013

RE: *Cancer Incidence in Massachusetts, 2005-2009, City and Town Supplement*

I am writing to inform you that the Massachusetts Cancer Registry (MCR) of the Massachusetts Department of Public Health (MDPH) is releasing its report *Cancer Incidence in Massachusetts, 2005-2009, City and Town Supplement*. Please note that this report will be published in an electronic version only and will be posted on the Department of Public Health's web site at www.mass.gov/dph/mcr November 4, 2013. If you are interested in further supplement data prior to the posting, please contact the registry directly at the telephone number listed below. Please note that there is no embargo on these data and they may be released prior to the web posting date.

The 2005-2009 City and Town Supplement updates the *2004-2008 City and Town Supplement*. For each city and town, this report provides expected case counts, observed case counts, standardized incidence ratios, and confidence intervals for 23 types of cancer and for all cancers combined. The confidence intervals indicate if there is a statistically significant difference (excess or deficit) between the observed and expected counts. In addition, the report provides risk factor information for the major types of cancer, or types for which screening/early detection is available, and information on the Cancer Control Programs at the MDPH.

We are providing you with the following pieces of information in advance of the report's Internet release.

1. The introduction to the report, including an explanation of standardized incidence ratios.
2. The cancer incidence data for your town (i.e. for 23 cancer types and all cancers combined).
3. Appendix II of the report, which has risk factor information for selected cancers.
4. Appendix III of the report, which describes current MDPH efforts to investigate and reduce the risk of cancer and includes links to bureaus and programs involved in these efforts.

The complete Internet version will be available at: www.mass.gov/dph/mcr

The following report has also been recently posted on the above website:

Cancer Incidence and Mortality in Massachusetts 2005-2009: Statewide Report

If you have any trouble accessing this web site, please contact the MCR at (617) 624-5642.

For further information, please contact the following at MDPH:

Massachusetts Cancer Registry	(617) 624-5642
Bureau of Environmental Health	(617) 624-5757
Massachusetts Comprehensive Cancer Prevention and Control Program	(617) 624-5484

INTRODUCTION

Content

The purpose of this report is to provide an estimate of cancer incidence for each of the 351 cities and towns of Massachusetts for the five-year time period 2005 through 2009. For each city and town, Standardized Incidence Ratios (SIRs) are presented for twenty-three types of cancer and for all cancer types combined. These ratios compare the cancer incidence experience of each city or town with the cancer experience of the state as a whole. The method involves comparing the number of cases that were observed for a city or town to the number of cases that would be expected if the city or town had the same cancer rates as the state as whole. The report is organized into the following sections:

METHODS provides a detailed explanation of the data collection, data processing, and statistical techniques employed in this report.

TABLES present data for selected types of cancer by city/town and sex.

APPENDIX I provides a listing of *International Classification of Diseases for Oncology* codes used in the preparation of this report.

APPENDIX II provides a listing of risk factors for selected cancer types and a listing of the individuals who reviewed the risk factor list.

APPENDIX III describes the Massachusetts Department of Public Health's current cancer control initiatives, and provides links to bureaus within the department that address some aspect of cancer. Links to resources for publications are also provided.

Comparison with Previous Reports

This report updates previous annual reports published by the Massachusetts Cancer Registry (MCR). It is available on line at <http://www.mass.gov/dph/mcr>. For questions about the report, contact the MCR at:

Massachusetts Cancer Registry
Bureau of Health Information, Statistics, Research, and Evaluation
Massachusetts Department of Public Health
250 Washington Street, 6th floor
Boston, MA 02108-4619
telephone 617-624-5642; fax 617-624-5695

The preceding report, *Cancer Incidence in Massachusetts 2004-2008: City and Town Supplement*, included data for diagnosis years 2004 through 2008. This report contains data for the diagnosis years 2005 through 2009. There have been no changes in this report's format from the previous report.

METHODS

Data Collection

Massachusetts cancer incidence data are collected by the Massachusetts Cancer Registry (MCR). The MCR is a population-based cancer registry that was established by state law in 1980 and began collecting data in January 1982. Currently, the MCR collects information on *in situ* and invasive cancers and benign tumors of the brain and associated tissues. The MCR does not collect information on basal and squamous cell carcinomas of the skin.

The MCR collects reports of newly diagnosed cancer cases from health care facilities and practitioners throughout Massachusetts. Facilities reporting to the MCR in 2012 included 65 Massachusetts acute care hospitals, 6 radiation centers, 3 endoscopy centers, 4 surgical centers, 19 independent laboratories, 2 medical practice associations, 4 radiation/oncology centers and approximately 500 private practice physicians. Additionally, the MCR has reciprocal reporting agreements with 18 states to obtain data on Massachusetts residents diagnosed out of state (see section "Border Areas and Neighboring States" on page 15 for a listing of states currently participating in this data exchange). Currently the MCR collects information on *in situ* and invasive cancers and benign tumors of the brain and associated tissues. The MCR does not collect information on basal and squamous cell carcinomas of the skin.

The MCR also collects information from reporting hospitals on cases diagnosed and treated in staff physician offices when this information is available. Not all hospitals report this type of case, however, and some hospitals report such cases as if the patients had been diagnosed and treated by the hospital directly. Collecting this type of data makes the MCR's overall case ascertainment more complete. The cancer types most often reported to the MCR in this manner are prostate cancer and melanoma.

To improve case completeness, this MCR report includes previously unreported cancer cases that have been discovered through death certificate clearance. This process identifies cancers mentioned on death certificates that were not previously reported to the MCR. In some instances, the MCR was able to obtain additional information on these cases through follow-up activities with hospitals, nursing homes and physicians' offices. In other instances, a cancer-related cause of death recorded on a Massachusetts death certificate is the only source of information for a cancer case. These "death certificate only" cancer diagnoses are, therefore, poorly documented, and have not been confirmed by review of complete clinical information. Such cases are included in this report, but they comprise less than 3% of all cancer cases for the years covered by this report.

Each year, the North American Association of Central Cancer Registries (NAACCR) reviews cancer registry data for quality, completeness, and timeliness. For diagnosis years 2005-2009, the MCR annual case count was estimated by NAACCR to be more than 95% complete each year. The MCR achieved the gold standard for this certification element, in addition to six other quality and timeliness elements for each year during 2005-2009.

Case reports were coded following the International Classification of Diseases for Oncology, Third Edition (ICD-O-3), which was implemented in North America with cases diagnosed as of January 1, 2001¹. The codes used in this report are listed in Appendix I.

The Massachusetts cancer cases presented in this report are primary cases of cancer diagnosed among Massachusetts residents during 2005-2009 and reported to the MCR as of July 23, 2012. These data

include some additional cases diagnosed in 2005-2008 that were not counted in the previous report, *Cancer Incidence in Massachusetts 2004-2008: City and Town Supplement*. The lag time between this report and the annual statewide report of 2005-2009 cancer cases is due to the fact that data for this city and town report needed to be cleaned for accuracy of residence within Massachusetts. The statewide report presented data at the state level and did not require such accuracy of city and town of residence. The numbers presented in this report may change slightly in future reports, reflecting late reported cases or corrections based on subsequent details from the reporting facilities. Such changes might result in slight differences in numbers and rates in future reports of MCR data, reflecting the nature of population-based cancer registries that receive case reports on an ongoing basis.

Massachusetts cancer cases presented in this report are primary cases of cancer diagnosed among Massachusetts residents during 2005-2009. The Massachusetts data presented include invasive cancers only (except cancer of the urinary bladder, where *in situ* cancers are also included). Invasive cancers have spread beyond the layer of cells where they started and have the potential to spread to other parts of the body. *In situ* cancers are neoplasms diagnosed at the earliest stage, before they have spread, when they are limited to a small number of cells and have not invaded the organ itself. Typically, published incidence rates do not combine invasive and *in situ* cancers due to differences in the biologic significance, survival prognosis and types of treatment of the tumors. Cancer of the urinary bladder is the only exception, due to the specific nature of the diagnostic techniques and treatment patterns.

Presentation of Data

Each city and town in Massachusetts is listed alphabetically in the **TABLES** section. The observed number of cases, the expected number of cases, the standardized incidence ratios, and 95% confidence intervals are presented for twenty-three main types of cancer and for all cancer types combined. The "all cancers combined" category includes the twenty-three main types presented in this report and other malignant neoplasms. This category is meant to provide a summary of the total cancer experience in a community. As different cancers have different causes, this category does not reflect any specific risk factor that may be important for this community.

Observed and Expected Case Counts

The *observed* case count (Obs) for a particular type of cancer in a city/town is the actual number of newly diagnosed cases among residents of that city/town for a given time period.

A city/town's *expected* case count (Exp) for a certain type of cancer for this time period is a calculated number based on that city/town's population distribution² (by sex and among eighteen age groups) for the time period 2005-2009, and the corresponding statewide average annual age-specific incidence rates.

Standardized Incidence Ratios

A Standardized Incidence Ratio (SIR) is an indirect method of adjustment for age and sex that describes in numerical terms how a city/town's cancer experience in a given time period compares with that of the state as a whole.

- An SIR of *exactly 100* indicates that a city/town's incidence of a certain type of cancer is *equal to that expected* based on statewide average age-specific incidence rates.
- An SIR of *more than 100* indicates that a city/town's incidence of a certain type of cancer is *higher than expected* for that type of cancer based on statewide average annual age-specific

incidence rates. For example, an SIR of 105 indicates that a city/town's cancer incidence is 5% higher than expected based on statewide average annual age-specific incidence rates.

- An SIR of *less than 100* indicates that a city/town's incidence of a certain type of cancer is *lower than expected* based on statewide average age-specific incidence rates. For example, an SIR of 85 indicates that a city/town's cancer incidence is 15% lower than expected based on statewide average annual age-specific incidence rates.

Statistical Significance and Interpretation of SIRs

The interpretation of the SIR depends on both how large it is and how stable it is. Stability in this context refers to how much the SIR changes when there are small increases or decreases in the observed or expected number of cases. Two SIRs may have the same size but not the same stability. For example, an SIR of 150 may represent 6 observed cases and 4 expected cases, or 600 observed cases and 400 expected cases. Both represent a 50 percent excess of observed cases. However, in the first instance, one or two fewer cases would change the SIR a great deal, whereas in the second instance, even if there were several fewer cases, the SIR would only change minimally. When the observed and expected numbers of cases are relatively small, their ratio is easily affected by one or two cases. Conversely, when the observed and expected numbers of cases are relatively large, the value of the SIR is stable.

A 95 percent confidence interval (CI) has been presented for each SIR in this report (when the observed number of cases is at least 5), to indicate if the observed number of cases is significantly different from the expected number, or if the difference is most likely due to chance. A confidence interval is a range of values around a measurement that indicates the precision of the measurement. In this report, the 95% confidence interval is the range of estimated SIR values that has a 95% probability of including the true SIR for a specific city or town. If the 95% confidence interval range *does not* include the value 100.0, then the number of observed cases is significantly different from the expected number of cases. "Significantly different" means there is at most a 5% chance that the difference between the number of observed and expected cancer cases is due solely to chance alone. If the confidence interval does contain the value 100, there is no significant difference between the observed and expected numbers. Statistically, the width of the interval reflects the size of the population and the number of events; smaller populations and smaller observed numbers of cases yield less precise estimates that have wider confidence intervals. Wide confidence intervals indicate instability, meaning that small changes in the observed or expected number of cases would change the SIR a great deal.

Examples:

- SIR = 137.0; 95% CI (101.6 - 180.6) – the confidence interval does not include 100.0 and the interval is above 100.0, indicating that the number of observed cases is *statistically significantly higher* than the expected number.
- SIR = 71.0; 95% CI (56.2 – 88.4) – the confidence interval does not include 100.0 and the interval is below 100.0, indicating that the number of observed cases is *statistically significantly lower* than the expected number.
- SIR = 108.8 95% CI (71.0-159.4) – the confidence interval DOES include 100.0 indicating that the number of observed cases is *NOT statistically significantly different* from what is expected, and the difference is likely due to chance. When the interval includes 100.0, then the true SIR may be 100.0.

Example of Calculation of an SIR and Its Significance

$$SIR = \frac{\text{OBSERVED CASES}}{\text{EXPECTED CASES}} \times 100$$

The following example illustrates the method of calculation for a hypothetical town for one type of cancer and one sex for the years 2004-2008:

Age Group	<u>Town X</u> Population (A)	<u>State</u> Age-Specific Incidence Rate (B)	<u>Town X</u> Expected Cases (C) = (A) x (B)	<u>Town X</u> Observed Cases (D)
00-04	74,657	0.0001	7.47	11
05-09	134,957	0.0002	26.99	25
10-14	54,463	0.0005	27.23	30
15-19	25,136	0.0015	37.70	40
20-24	17,012	0.0018	30.62	30
UP TO 85+	6,337	0.0010	6.34	8
Total:			136.35	144

$$SIR = \frac{\text{Observed Cases}}{\text{Expected Cases}} \times 100 = \frac{(\text{column D total})}{(\text{column C total})} \times 100 = \frac{144}{136.35} \times 100 \approx 106$$

Thus the SIR for this type of cancer in Town X is 106, indicating that the incidence of this cancer in Town X is 6% higher than the corresponding statewide average incidence for this cancer. However, the range for the 95% confidence interval (89.1-124.3) (calculation not shown) indicates that the true value may be as low as 89.1 or as high as 124.3. Also, since the range includes the value 100, it means that the observed number of cases is *not statistically significantly higher or lower* than what is expected.

Whenever the number of observed cases is less than five, the corresponding SIR is neither calculated nor tested for statistical significance. This is indicated with an (nc) ("not calculated"). However, the number of observed and expected cases is shown in these circumstances.

Notes about Data Interpretation

The SIR is a useful indication of the disease categories that have relatively high or low rates for a given community. These statistics, however, should be used with care. Such statistics provide a starting point for further research and investigation into a possible health problem, but they do not by themselves confirm or deny the existence of a particular health problem. Many factors unrelated to disease causation may contribute to an elevated SIR, including demographic factors, changes in diagnostic techniques, and changes in data collection or recording methods over time, as well as the natural variation in disease occurrence.

When reviewing the data tables, it is important to keep in mind that an SIR compares the observed cancer incidence in a particular community with the expected incidence based on statewide average annual age-specific incidence rates. This means that *valid comparisons can only be made between a community and the state as a whole. SIRs for different cities and towns CANNOT and SHOULD NOT be compared to each other.* (Comparisons between two communities would be valid only if there were no differences in the age and sex distributions of the two communities' populations.)

Another point to keep in mind when reviewing these data is the large number of statistical tests being performed in this report. For each of the 351 cities and towns, we evaluate 18 types of cancer that can occur in both males and females, 3 types that occur only in females and 2 types that occur only in males, resulting in 41 gender/cancer categories. This results in 14,391 possible calculations (351 cities and towns x 41 gender cancer categories). Note that gender/cancer categories with less than 5 observed cases are not evaluated for statistical significance, so the actual numbers of tests is slightly lower than 14,391. This is important for the reader because when multiple significance tests are performed, some will result in a significant finding due to chance alone. Based on the number of calculations in this report, we expect 720 significant findings to be due to chance alone. Half of these would be significant excesses (360) and half would be significant deficits (360). There are statistical techniques that can be used to reduce this number, however use of these techniques leads to the opposite problem – true significant differences that may be missed. We choose to err on the side of caution and identify more significant results, knowing that some will be due to chance alone.

Data Limitations

It should be emphasized that apparent increases or decreases in cancer incidence over time might reflect changes in diagnostic methods or case reporting rather than true changes in cancer incidence. Four other limitations must be considered when interpreting cancer incidence data for Massachusetts cities and towns: under-reporting in areas close to neighboring states; under-reporting for cancers that may not be diagnosed in hospitals; cases being assigned to incorrect cities/towns; and standardized incidence ratios based on small numbers of cases.

Border Areas and Neighboring States

Some areas of Massachusetts appear to have low cancer incidence, but this may be due to loss of Massachusetts resident cases who are diagnosed in neighboring or other states and not reported to the MCR. The MCR has reciprocal reporting agreements with the following fifteen states: Alaska, Arkansas, Connecticut, Florida, Maine, Mississippi, New Hampshire, New York, North Carolina, Rhode Island, South Carolina, Texas, Vermont, Wisconsin, and Wyoming. On March 24, 2011 the MCR signed the NAACCR Agreement for Administering the Central Cancer Registry Inter-Registry Data Exchange which expanded data exchange to ten additional states: Alabama, Idaho, Kentucky, Michigan, Mississippi, Montana, North Dakota, Oklahoma, Utah, and Virginia.

Cases Diagnosed in Non-Hospital Settings

During the time period covered by this report, the MCR's primary information source for most newly diagnosed cases of cancer was hospitals. In addition the MCR collected information from reporting hospitals on cases diagnosed and treated in staff physician offices, when this information was available. In 2001, dermatologists and dermatopathology laboratories were added as reporting sources. The addition of these new reporting sources may elevate the incidence of melanoma diagnosed in the years 2001 and later. In 2002, urologists' offices and a general laboratory were added as reporting sources. Some types of cancer in this report, such as prostate cancer, may be under-reported because they are diagnosed primarily by private physicians, private laboratories, health maintenance

organizations, or under-reporting has not been determined exactly, but cases included in this report represent the great majority of cases statewide and provide an essential basis for evaluating statewide cancer incidence patterns.

City/Town Misassignment

In accordance with standard central cancer registry procedures, each case reported to the MCR ideally should be assigned to the city/town in which the patient lived at the time of diagnosis, based on the address provided by the reporting hospital. In practice, however, a patient may provide the hospital with his/her mailing address (e.g., a post office box located outside the patient's city/town of residence); a business address; a temporary address (e.g., the patient is staying with a relative while receiving treatment and reports the relative's address as his/her own); or a locality or post office name (e.g., "Chestnut Hill" rather than "Boston," "Brookline," or "Newton"). In addition, if a patient has moved since being diagnosed, the hospital may report the patient's current address. Because of the large number of cases reported to the MCR, and because data are reported to the MCR via electronic media, most city/town case assignments are performed by an automated computer process. This simplified matching process may misassign some cases based on the reported locality name. When MCR staff become aware of such misassignments, they manually correct the errors. Furthermore, in order to minimize such errors, cases from fifty geographic localities prone to city/town misassignment are reviewed manually.

Small Numbers of Cases

Standardized incidence ratios based on small numbers of cases result in estimates that are very unstable. This situation is common when the population of a city or town is small or if the particular cancer type is rare. SIRs and statistical significance are not calculated when the number of observed cases for a specific category is less than five. In these instances, the observed and expected cases are presented in the tables for qualitative comparison only.

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APPENDIX II: RISK FACTORS FOR SELECTED CANCER TYPES AND REVIEWERS OF RISK FACTORS

This Appendix contains a list of risk factors for thirteen types of cancer. The list briefly summarizes available information from the scientific literature. The list was last revised in 2000. Cancers are complex diseases, many of which have multiple factors that may contribute to their development. It should be noted that there is no single agreed-upon list of risk factors – even the experts may disagree. This list should be viewed only as a starting point for the interested reader, and should not be viewed as constituting a definitive or comprehensive summary of cancer risk factors. Future risk factor lists may change as new research findings emerge.

The list separates those characteristics for which research clearly indicates a strong association in the development of the cancer (“Risk Factors”) from those characteristics for which weaker associations exist (“Possible Risk Factors”) or which are now coming under investigation (“Under Investigation”).

For additional information on cancer risk factors or prevention, you may wish to contact the following:

Cancer Information Service (National Cancer Institute): 1-800-4-CANCER (1-800-422-6237)

Cancer Response Line (American Cancer Society): 1-800-ACS-2345 (1-800-227-2345)

In addition, the following selected Internet websites provide information on cancer. Many of these also provide links to other sites (not listed) which may be of interest.

Massachusetts Department of Public Health: <http://www.mass.gov/dph>

American Cancer Society: <http://www.cancer.org>

Centers for Disease Control and Prevention

Home Page: <http://www.cdc.gov>

Cancer Prevention and Control Program: <http://www.cdc.gov/cancer>

Fruits and Veggies More Matters™ Campaign (nutrition – formerly 5-A-Day Program):
<http://www.FruitsandVeggiesMatter.gov>

National Cancer Institute

Information: <http://www.cancer.gov>

Cancer Literature in PubMed: http://www.cancer.gov/search/cancer_literature

Surveillance, Epidemiology, and End Results (SEER) Program data: <http://seer.cancer.gov>

Your Cancer Risk (Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine; formerly at Harvard Center for Cancer Prevention):
<http://www.yourdiseaserisk.wustl.edu>

OncoLink (Abramson Cancer Center of the University of Pennsylvania):
<http://www.oncolink.upenn.edu>

Cancerquest (Emory University – Winship Cancer Institute): www.cancerquest.org

Cancer News on the Net® (information on diagnosis and treatment for cancer patients and their families): <http://www.cancernews.com>

National Coalition for Cancer Survivorship: <http://www.canceradvocacy.org>

BLADDER, URINARY

Risk Factors:

- Age (In Massachusetts, incidence rates increase markedly in the 65 to 74 year age group, and are highest in the 75 years and older age groups.)
- Cigarette smoking
- Excessive use of certain pain medications such as those containing phenacetin
- Treatment with alkylating agent chemotherapy drugs such as Cytosan (cyclophosphamide)
- Having had radiation therapy to the bladder

Possible Risk Factors:

- Occupations in which workers are suspected of having an elevated bladder cancer risk due to certain chemical exposures include working in the rubber and/or leather industries, dye manufacturing, painters, professional drivers of trucks and other motor vehicles, aluminum workers, machinists, chemical workers, printers, metal workers, hairdressers, and textile workers
- Urologic conditions such as urinary tract infections and urinary stasis
- Dietary factors

BREAST

Risk Factors:

- Age (In Massachusetts, incidence rates increase markedly in the 45 to 64 year age group, and are highest in the 75 years and older age groups.)
- Family (mother, sister, or daughter) history of breast cancer, especially if it was detected pre-menopausally (before the change of life)
- High-dose radiation therapy to the chest, especially from age 11 until age 30
- Never giving birth
- First childbirth after age 30
- Menstruating since age 12 or younger
- Late age (older than 55) at menopause (change of life)
- Having inherited a mutation in breast cancer susceptibility genes such as BRCA1 or BRCA2
- Increasing body fat in post-menopausal women
- Estrogen taken post-menopausally (after the change of life)
- More than three alcoholic drinks per day

Possible Risk Factors:

- Diet low in fruits and vegetables

Under Investigation:

- Pesticide exposure
- Other environmental exposures

CERVIX UTERI (cervical cancer)

Risk Factors:

- Age (In Massachusetts, incidence rates are highest in the 45 years and older age groups.)
- Certain types of human papilloma virus (HPV, the virus that causes genital warts)
- Sexual intercourse before age 19
- Multiple sexual partners
- Unprotected intercourse (having sex without a condom)
- Smoking
- Infection with HIV (human immunodeficiency virus, the virus that causes AIDS)

Possible Risk Factors:

- Too little vitamin A, vitamin C, and/or folic acid in the diet
- Exposure to secondhand smoke (other people's smoke)

Use of the medication *diethylstilbestrol (DES)* during pregnancy is associated with later vaginal clear cell adenocarcinoma (a form of cervical and vaginal cancer) in the female children of those pregnancies.

COLON / RECTUM

Risk Factors:

- Age (In Massachusetts, incidence rates increase markedly in the 45 to 64 year age group, and continue to increase markedly in the 65 to 74 year and 75 to 84 year age groups.)
- A personal history of colorectal polyps or colorectal cancer
- Family history of colorectal cancer or polyps, including the various polyposis syndromes such as familial adenomatous polyposis, Gardner's Syndrome, or Peutz-Jeghers Syndrome
- Personal history of inflammatory bowel disease such as ulcerative colitis or Crohn's Disease
- Personal history of ovarian, breast, or endometrial cancer
- Diet high in red meat, and low in fruits, vegetables, and folic acid
- Physical inactivity

Possible Risk Factors:

- Alcohol, especially beer
- Smoking
- Increasing body fat

LEUKEMIA

Risk Factors:

- Exposure to ionizing radiation
- Exposure to benzene
- Treatment with chemotherapy drugs (especially alkylating agents)
- Certain genetic conditions such as Down's syndrome
- Exposure to ethylene oxide

Possible Risk Factors:

- Exposure to low level solvent and metal mixtures
- Smoking

Under Investigation:

- Exposure to electromagnetic fields (e.g., from power lines)

LUNG AND BRONCHUS

Risk Factors:

- Smoking

Note: 85% of all lung cancers are caused by smoking. The risk of lung cancer is *10 times greater* for persons who smoke up to one pack of cigarettes a day and *20 times greater* for persons who smoke more than one pack of cigarettes a day than for persons who do not smoke.

- Occupational, and in some cases environmental, exposures (e.g., asbestos, metals)
- Exposure to secondhand smoke (other people's smoke)

MELANOMA OF SKIN

Note: *changing or changed moles, or new moles which appear after age 30 that itch and are tender* are early, potentially malignant lesions, and should be examined by a health care professional.

Risk Factors:

- Age (In Massachusetts, incidence rates begin to increase markedly in the 45 to 65 year age group, and are highest in the 75 to 84 year age group.)
- One or more large or unevenly colored lesions such as:
 - Dysplastic (abnormal) mole(s), with or without a family history of melanoma
 - Lentigo maligna (a type of malignant melanoma that is slow growing)
- Familial atypical mole and melanoma syndrome
- Giant congenital melanocytic nevi (pigmented patches of skin)
- Nevus (birthmark) since birth
- Caucasian
- Previous melanoma
- Family history of melanoma
- Immunosuppression (when the body's defenses are weakened, such as after transplant surgery)
- Sun sensitivity
- Repeated sunburns, especially as a child
- Easily sunburned
- Freckling
- Unable to tan easily

NON-HODGKIN'S LYMPHOMA (now known as non-Hodgkin lymphoma)

Risk Factors:

- Age (In Massachusetts, incidence rates begin to increase in the 45 to 65 year age group, and are highest in the 75 to 84 year age group.)
- Abnormalities of the immune system, either congenital or resulting from suppression due to organ transplantation or disease
- Infection with HIV (human immunodeficiency virus, the virus that causes AIDS)
- Exposure to radiation or chemotherapy
- Exposure to certain herbicides

Possible Risk Factors:

- Smoking
- Other chemical exposures

ORAL CAVITY AND PHARYNX

Risk Factors:

- Tobacco use (including cigarettes, pipes, cigars, chewing tobacco, and snuff)
- Heavy alcohol use
- Age (In Massachusetts, incidence rates begin to increase in the 45 to 64 year age group, and are highest in the 75 to 84 year age group.)
- Poor nutrition, especially chronic iron deficiency

Possible Risk Factors:

- Chronic irritation of the mouth due to ill-fitting dentures or broken teeth
- Poor oral hygiene

OVARY

Risk Factors:

- Age (In Massachusetts, incidence rates increase markedly in the 45 to 64 year age group, and are highest in the 65 to 74 year age group.)
- Never giving birth
- Personal history of endometrial (lining of the uterus), colon, or breast cancer
- Family history of ovarian cancer (mother, sister, or daughter)
- Having one of three inherited ovarian cancer conditions:
 - breast-ovarian cancer syndrome
 - site-specific ovarian cancer syndrome
 - hereditary nonpolyposis colorectal cancer or Lynch II syndrome (includes early-onset colorectal cancer, endometrial cancer, breast cancer, and ovarian cancer)
- Never having used oral contraceptives, or having used oral contraceptives for fewer than five years
- Caucasian

Possible Risk Factors:

- Fertility drugs
- Use of talc powder containing asbestos fibers in the perineal or external genitalia area
- High fat diet

PROSTATE

Risk Factors:

- Age (In Massachusetts, incidence rates begin to increase markedly in the 45 to 64 year age group, and are highest in the 65 to 74 year age group.)
- Family history of prostate cancer
- Hormonal factors
- African-American

Possible Risk Factors:

- Alcohol consumption
- Having a history of benign prostate disease
- Smoking
- Physical inactivity
- Diet high in fat

TESTIS

Risk Factors:

- Age (In Massachusetts, incidence rates are highest in the 20 to 44 year age group.)
- Undescended testicle

Possible Risk Factors:

- Inguinal hernia
- Testicular trauma
- Familial factors
- Occupations related to leather processing

UTERI, CORPUS AND UTERUS, NOS (uterine cancer)

Risk Factors:

- Age (In Massachusetts, incidence rates are highest in the 45 years and older age groups.)
- Personal history of colon and/or breast cancer
- Family history of uterine cancer
- Being more than 20 pounds overweight
- Never giving birth
- Presence of estrogen-producing ovarian tumors
- Postmenopausal (change of life) use of estrogen without progesterone
- Tamoxifen (a drug given to women who have had breast cancer to lower the risk of recurrence)
- Late age (older than 55) at menopause (change of life)

Possible Risk Factors:

- Diet high in fatty foods
- Hypertension (high blood pressure)
- Diabetes (high blood sugar)
- Chronic anovulation (ovaries do not produce eggs)
- Menstrual problems
- Radiation therapy to the pelvis
- Malignant tumors on the ovaries
- Never having used oral contraceptives, or having used oral contraceptives for fewer than five years

Reviewers of Risk Factors

This Appendix was assembled under the auspices of the American Cancer Society (New England Division) through seeking the advice of leading cancer experts. The following clinicians, researchers, and public health professionals reviewed the risk factors for the type(s) of cancers indicated:

Ross Berkowitz, MD (ovarian, uterine)	Frederick Li, MD (all types)
Cynthia Boddie-Willis, MD, MPH (prostate)	John Lisco, MPH (colorectal)
Risa Burns, MD (breast, cervical)	Robert Mayer, MD (colorectal)
Richard Clapp, ScD (all types)	Kenneth Miller, MD (leukemia)
Graham Colditz, DrPH (colorectal)	Michael Monopoli, DMD (oral)
Suzanne Condon, MS (all types)	Nancy Mueller, ScD (non-Hodgkin lymphoma)
Greg Connolly, DMD (lung)	J. David Naparstek, ScM, CHO (all types)
Daniel Cramer, MD (ovarian)	Robert Osteen, MD (breast)
Letitia Davis, ScD (all types)	James Petros, MD (colorectal)
Catherine DuBeau, MD (prostate)	Marianne Prout, MD, MPH (all types)
Kathleen Egan, PhD (breast)	Lowell Schnipper, MD (non-Hodgkin lymphoma)
Richard Fabian, MD (oral)	Paul Schroy, MD, MPH (colorectal)
Marc Garnick, MD (prostate, testicular)	Ellen Sheets, MD (cervical)
Alan Geller, RN, MPH (melanoma)	William Shipley, MD (bladder)
Annekathryn Goodman, MD (uterine)	Art Skarin, MD (lung)
Lauren Holm, RN, MSN (all types)	Arthur Sober, MD (melanoma)
David Hunter, MD, BS, ScD (all types)	Bonnie Tavares, MEd (breast, cervical)
Joe Jacobson, MD (prostate)	Howard Weinstein, MD (leukemia)
Phil Kantoff, MD (bladder, prostate)	Martha Crosier Wood, MBA (all types)
Howard Koh, MD, MPH (melanoma)	
Robert Krane, MD (testicular)	

Risk factors were also reviewed by staff members of the Massachusetts Department of Public Health's Bureau of Environmental Health (all types), Colorectal Cancer Working Group (colorectal), Skin Cancer Prevention Program (melanoma), and Massachusetts Women's Health Network (breast, cervical).

We would also particularly like to thank Lauren Holm, former Vice President for Planning and Evaluation, American Cancer Society (New England Division), and Martha Crosier Wood, former Director, Comprehensive Cancer Prevention and Control, Massachusetts Department of Public Health, for their assistance in the development of this Appendix.

APPENDIX III: MDPH CANCER PREVENTION AND CONTROL INITIATIVES

The Massachusetts Department of Public Health is working to reduce the incidence and mortality of cancer in the Commonwealth. Partnerships between MDPH programs, researchers, healthcare providers and nonprofit organizations collect information about cancer, lead quality improvement projects, coordinate evidenced-based workshops for managing living with chronic disease (including cancer), provide education for health professionals and bring shared messages to the public. Our collaborated efforts focus on reducing cancer risk, incidence and mortality through healthy lifestyles, early diagnosis, and increased access to care. The Department's programs address the impact of tobacco, alcohol, nutrition, and physical activity on cancer prevention, along with environmental and occupational hazards for cancer. Throughout all of our efforts there is an emphasis on reducing disparate health outcomes and unequal access to cancer care.

MDPH Bureaus and Programs:

Bureau of Environmental Health, www.mass.gov/dph/environmental_health

Bureau of Substance Abuse Services, www.mass.gov/dph/bsas

Comprehensive Cancer Prevention and Control Program, www.mass.gov/dph/cancer

Men's Health/Women's Health/Care Coordination Program

Tobacco Cessation and Prevention Program, www.mass.gov/dph/mtcp

Occupational Health Surveillance Program, www.mass.gov/dph/ohsp

Office of Healthy Aging, www.mass.gov/dph/healthyaging

Oral Health Program, www.mass.gov/dph/oralhealth

Wellness Unit,

http://www.mass.gov/?pageID=eohhs2terminal&L=5&L0=Home&L1=Government&L2=Departments+and+Divisions&L3=Department+of+Public+Health&L4=Programs+and+Services+T+-+Z&sid=Eeohhs2&b=terminalcontent&f=dph_com_health_g_div_wellness&csid=Eeohhs2

MDPH publications on cancer prevention and screening are available at the Massachusetts Health Promotion Clearinghouse, www.maclclearinghouse.com.

Massachusetts Cancer Registry Publications are available through the Massachusetts Cancer Registry, telephone: 617-624-5642 and on the web at www.mss.gov/dph/mcr.

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Observed and Expected Case Counts, with Standardized Incidence Ratios, 2005-2009

	Obs	Exp	SIR	95% CI		Obs	Exp	SIR	95% CI
Bladder, Urinary					Melanoma of Skin				
Male	13	16.1	80.7	(42.9-137.9)	Male	11	10.7	103.0	(51.3-184.3)
Female	5	5.3	94.3	(30.4-220.0)	Female	15	7.8	192.2	(107.5-317.1)
Brain and Other Nervous System					Multiple Myeloma				
Male	3	3.1	nc	(nc-nc)	Male	4	2.7	nc	(nc-nc)
Female	7	2.4	288.9	(115.7-595.2)	Female	0	1.9	nc	(nc-nc)
Breast					Non-Hodgkin Lymphoma				
Male	0	0.5	nc	(nc-nc)	Male	16	9.2	173.2	(98.9-281.3)
Female	86	60.4	142.3	(113.8-175.8)	Female	10	7.0	143.4	(68.6-263.7)
Cervix Uteri					Oral Cavity & Pharynx				
Female	0	2.2	nc	(nc-nc)	Male	6	6.8	88.2	(32.2-192.0)
Colon / Rectum					Female	0	2.9	nc	(nc-nc)
Male	22	19.7	111.9	(70.1-169.5)	Ovary				
Female	18	17.1	105.4	(62.4-166.6)	Female	6	5.6	107.0	(39.1-232.8)
Esophagus					Pancreas				
Male	2	4.4	nc	(nc-nc)	Male	7	5.3	132.3	(53.0-272.7)
Female	0	1.1	nc	(nc-nc)	Female	4	4.9	nc	(nc-nc)
Hodgkin Lymphoma					Prostate				
Male	3	1.1	nc	(nc-nc)	Male	63	64.9	97.1	(74.6-124.2)
Female	0	0.9	nc	(nc-nc)	Stomach				
Kidney & Renal Pelvis					Male	3	3.8	nc	(nc-nc)
Male	5	9.0	55.3	(17.8-129.1)	Female	0	1.9	nc	(nc-nc)
Female	4	4.9	nc	(nc-nc)	Testis				
Larynx					Male	2	1.6	nc	(nc-nc)
Male	3	2.6	nc	(nc-nc)	Thyroid				
Female	0	0.7	nc	(nc-nc)	Male	5	3.4	147.0	(47.4-343.0)
Leukemia					Female	16	10.2	157.5	(90.0-255.8)
Male	4	5.8	nc	(nc-nc)	Uteri Corpus and Uterus, NOS				
Female	6	3.9	153.9	(56.2-334.9)	Female	10	13.9	71.8	(34.4-132.1)
Liver and Intrahepatic Bile Ducts					All Sites / Types				
Male	3	4.9	nc	(nc-nc)	Male	208	222.1	93.6	(81.3-107.3)
Female	3	1.5	nc	(nc-nc)	Female	230	200.5	114.7	(100.3-130.5)
Lung and Bronchus									
Male	23	30.3	75.9	(48.1-113.8)					
Female	26	29.2	89.2	(58.2-130.6)					

- Obs = observed case count; Exp = expected case count;
- SIR = standardized incidence ratio ((Obs / Exp) X 100);
- 95% CI = 95% confidence intervals, a measure of the statistical significance of the SIR;
- **Shading** indicates the statistical significance of the SIR at 95% level of probability;
- nc = The SIR and 95% CI were not calculated when Obs < 5;



The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health
250 Washington Street, Boston, MA 02108-4619

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TIMOTHY P. MURRAY
LIEUTENANT GOVERNOR

JUDYANN BIGBY, MD
SECRETARY

JOHN AUERBACH
COMMISSIONER

TO: Boards of Health

FROM: Susan T. Gershman, MPH, PhD, CTR *STG*
Director
Massachusetts Cancer Registry

DATE: December 28, 2011

RE: *Cancer Incidence in Massachusetts, 2004-2008, City and Town Supplement*

This is a follow-up to the memo that you received on November 14, 2011 regarding the Massachusetts Cancer Registry (MCR) report *Cancer Incidence in Massachusetts, 2004-2008, City and Town Supplement*. This report is now posted at www.mass.gov/dph/mcr.

If you have any trouble accessing this web site, please contact the MCR at (617) 624-5642.

For further information, please contact the following at MDPH:

Massachusetts Cancer Registry.....(617) 624-5642
Bureau of Environmental Health(617) 624-5757
Cancer Prevention and Control Program ..(617) 624-5484

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Department of Public Health
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TO: Boards of Health

FROM: Susan T. Gershman, MPH, PhD, CTR *STG*
Director
Massachusetts Cancer Registry

DATE: November 14, 2011

RE: *Cancer Incidence in Massachusetts, 2004-2008, City and Town Supplement*

I am writing to inform you that the Massachusetts Cancer Registry (MCR) of the Massachusetts Department of Public Health (MDPH) is releasing its report *Cancer Incidence in Massachusetts, 2004-2008, City and Town Supplement*. Please note that this report will be published in an electronic version only and will be posted on the Department of Public Health's web site at www.mass.gov/dph/mcr in mid December. An earlier posting is not possible because the Executive Office of Health and Human Services, which the Department and the Cancer Registry fall under, is currently undergoing a web page redesign. Once we have a definite posting date, we will communicate with you to let you know when that will be. If you are interested in further supplement data prior to the posting, please contact the registry directly at the telephone number listed below. Please note that there is no embargo on these data and they may be released prior to the web posting date.

The 2004-2008 City and Town Supplement updates the *2003-2007 City and Town Supplement*. For each city and town, this report provides expected case counts, observed case counts, standardized incidence ratios, and confidence intervals for 23 types of cancer and for all cancers combined. The confidence intervals indicate if there is a statistically significant difference (excess or deficit) between the observed and expected counts. In addition, the report provides risk factor information for the major types of cancer, or types for which screening/early detection is available, and information on the Cancer Control Programs at the MDPH.

We are providing you with the following pieces of information in advance of the report's Internet release.

1. The introduction to the report, including an explanation of standardized incidence ratios.
2. The cancer incidence data for your town (i.e. for 23 cancer types and all cancers combined).
3. Appendix II of the report, which has risk factor information.
4. Appendix III of the report, which describes current MDPH efforts to investigate and reduce the risk of specific cancers and includes a list of related educational materials.

The complete Internet version will be available at: www.mass.gov/dph/mcr

The following report has also been recently posted on the above website:

Cancer Incidence and Mortality in Massachusetts 2004-2008: Statewide Report

If you have any trouble accessing this web site, please contact the MCR at (617) 624-5642.

For further information, please contact the following at MDPH:

Massachusetts Cancer Registry.....	(617) 624-5642
Bureau of Environmental Health(617) 624-5757
Cancer Prevention and Control Program(617) 624-5484

INTRODUCTION

Content

The purpose of this report is to provide an estimate of cancer incidence for each of the 351 cities and towns of Massachusetts for the five-year time period 2004 through 2008. For each city and town, Standardized Incidence Ratios (SIRs) are presented for twenty-three types of cancer and for all cancer types combined. These ratios compare the cancer incidence experience of each city or town with the cancer experience of the state as a whole. The method involves comparing the number of cases that were observed for a city or town to the number of cases that would be expected if the city or town had the same cancer rates as the state as whole. The report is organized into the following sections:

METHODS provides a detailed explanation of the data collection, data processing, and statistical techniques employed in this report.

TABLES present data for selected types of cancer by city/town and sex.

APPENDIX I provides a listing of *International Classification of Diseases for Oncology* codes used in the preparation of this report.

APPENDIX II provides a listing of risk factors for selected cancer types and a listing of the individuals who reviewed the risk factor list.

APPENDIX III describes the Massachusetts Department of Public Health's current cancer control initiatives, and provides links to bureaus within the department that address some aspect of cancer. Links to resources for publications are also provided.

Comparison with Previous Reports

This report updates previous annual reports published by the Massachusetts Cancer Registry (MCR). It is available on line at <http://www.mass.gov/dph/mcr>. For questions about the report, contact the MCR at:

Massachusetts Cancer Registry
Bureau of Health Information, Statistics, Research, and Evaluation
Massachusetts Department of Public Health
250 Washington Street, 6th floor
Boston, MA 02108-4619
telephone 617-624-5642; fax 617-624-5695

The preceding report, *Cancer Incidence in Massachusetts 2003-2007: City and Town Supplement*, included data for diagnosis years 2003 through 2007. This report contains data for the diagnosis years 2004 through 2008. There have been no changes in this report's format from the previous report.

METHODS

Data Collection

Massachusetts cancer incidence data are collected by the Massachusetts Cancer Registry (MCR). The MCR is a population-based cancer registry that was established by state law in 1980 and began collecting data in January 1982. Currently, the MCR collects information on *in situ* and invasive cancers and benign tumors of the brain and associated tissues. The MCR does not collect information on basal and squamous cell carcinomas of the skin.

Facilities reporting to the MCR in 2008 included 68 Massachusetts acute care hospitals, 7 radiation centers, 3 endoscopy centers, 4 surgical centers, 14 independent laboratories, 1 medical practice association, 1 radiation/oncology center, and approximately 500 private practice physicians. Reports from dermatologists' offices and dermatopathology laboratories have only been collected by the MCR since 2001. Reports from urologists' offices have only been collected by the MCR since 2002.

The MCR also collects information from reporting hospitals on cases diagnosed and treated in staff physician offices when this information is available. Not all hospitals report this type of case, however, and some hospitals report such cases as if the patients had been diagnosed and treated by the hospital directly. Collecting this type of data makes the MCR's overall case ascertainment more complete. The cancer types most often reported to the MCR in this manner are prostate cancer and melanoma.

To improve case completeness, this MCR report includes previously unreported cancer cases that have been discovered through death certificate clearance. This process identifies cancers mentioned on death certificates that were not previously reported to the MCR. In some instances, the MCR was able to obtain additional information on these cases through follow-up activities with hospitals, nursing homes and physicians' offices. In other instances, a cancer-related cause of death recorded on a Massachusetts death certificate is the only source of information for a cancer case. These "death certificate only" cancer diagnoses are, therefore, poorly documented, and have not been confirmed by review of complete clinical information. Such cases are included in this report, but they comprise less than 3% of all cancer cases for the years covered by this report.

Each year, the North American Association of Central Cancer Registries (NAACCR) reviews cancer registry data for quality, completeness, and timeliness. For diagnosis years 2004-2008, the MCR's annual case count was estimated by NAACCR to be more than 95% complete each year. The MCR achieved the gold standard for this certification element, in addition to six other quality and timeliness elements for each year during 2004-2008.

Case reports were coded following the International Classification of Diseases for Oncology, Third Edition (ICD-O-3), which was implemented in North America with cases diagnosed as of January 1, 2001 (1). The codes used in this report are listed in Appendix I.

The Massachusetts data summarized in this report were drawn from cancer cases entered on MCR computer files before July 1, 2011 and from death certificate clearance activities completed in November 2010. The numbers presented in this report may change slightly in future reports, reflecting late reported cases or corrections based on subsequent details from the reporting facilities. Such changes might result in slight differences in numbers and rates in future reports of MCR data,

reflecting the nature of population-based cancer registries that receive case reports on an ongoing basis.

Massachusetts cancer cases presented in this report are primary cases of cancer diagnosed among Massachusetts residents during 2004-2008. The Massachusetts data presented include invasive cancers only (except cancer of the urinary bladder, where *in situ* cancers are also included). Invasive cancers have spread beyond the layer of cells where they started and have the potential to spread to other parts of the body. *In situ* cancers are neoplasms diagnosed at the earliest stage, before they have spread, when they are limited to a small number of cells and have not invaded the organ itself. Typically, published incidence rates do not combine invasive and *in situ* cancers due to differences in the biologic significance, survival prognosis and types of treatment of the tumors. Cancer of the urinary bladder is the only exception, due to the specific nature of the diagnostic techniques and treatment patterns.

Presentation of Data

Each city and town in Massachusetts is listed alphabetically in the **TABLES** section. The observed number of cases, the expected number of cases, the standardized incidence ratios, and 95% confidence intervals are presented for twenty-three main types of cancer and for all cancer types combined. The “all cancers combined” category includes the twenty-three main types presented in this report and other malignant neoplasms. This category is meant to provide a summary of the total cancer experience in a community. As different cancers have different causes, this category does not reflect any specific risk factor that may be important for this community.

Observed and Expected Case Counts

The *observed* case count (**Obs**) for a particular type of cancer in a city/town is the actual number of newly diagnosed cases among residents of that city/town for a given time period.

A city/town’s *expected* case count (**Exp**) for a certain type of cancer for this time period is a calculated number based on that city/town’s population distribution² (by sex and among eighteen age groups) for the time period 2004-2008, and the corresponding statewide average annual age-specific incidence rates.

Standardized Incidence Ratios

A Standardized Incidence Ratio (SIR) is an indirect method of adjustment for age and sex that describes in numerical terms how a city/town’s cancer experience in a given time period compares with that of the state as a whole.

- An SIR of *exactly 100* indicates that a city/town’s incidence of a certain type of cancer is *equal to that expected* based on statewide average age-specific incidence rates.
- An SIR of *more than 100* indicates that a city/town’s incidence of a certain type of cancer is *higher than expected* for that type of cancer based on statewide average annual age-specific incidence rates. For example, an SIR of 105 indicates that a city/town’s cancer incidence is 5% higher than expected based on statewide average annual age-specific incidence rates.
- An SIR of *less than 100* indicates that a city/town’s incidence of a certain type of cancer is *lower than expected* based on statewide average age-specific incidence rates. For example, an SIR of 85 indicates that a city/town’s cancer incidence is 15% lower than expected based on statewide average annual age-specific incidence rates.

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Statistical Significance and Interpretation of SIRs

The interpretation of the SIR depends on both how large it is and how stable it is. Stability in this context refers to how much the SIR changes when there are small increases or decreases in the observed or expected number of cases. Two SIRs may have the same size but not the same stability. For example, an SIR of 150 may represent 6 observed cases and 4 expected cases, or 600 observed cases and 400 expected cases. Both represent a 50 percent excess of observed cases. However, in the first instance, one or two fewer cases would change the SIR a great deal, whereas in the second instance, even if there were several fewer cases, the SIR would only change minimally. When the observed and expected numbers of cases are relatively small, their ratio is easily affected by one or two cases. Conversely, when the observed and expected numbers of cases are relatively large, the value of the SIR is stable.

A 95 percent confidence interval (CI) has been presented for each SIR in this report (when the observed number of cases is at least 5), to indicate if the observed number of cases is significantly different from the expected number, or if the difference is most likely due to chance. A confidence interval is a range of values around a measurement that indicates the precision of the measurement. In this report, the 95% confidence interval is the range of estimated SIR values that has a 95% probability of including the true SIR for a specific city or town. If the 95% confidence interval range *does not* include the value 100.0, then the number of observed cases is significantly different from the expected number of cases. "Significantly different" means there is at most a 5% chance that the difference between the number of observed and expected cancer cases is due solely to chance alone. If the confidence interval does contain the value 100, there is no significant difference between the observed and expected numbers. Statistically, the width of the interval reflects the size of the population and the number of events; smaller populations and smaller observed numbers of cases yield less precise estimates that have wider confidence intervals. Wide confidence intervals indicate instability, meaning that small changes in the observed or expected number of cases would change the SIR a great deal.

Examples:

- SIR = 137.0; 95% CI (101.6 - 180.6) – the confidence interval does not include 100.0 and the interval is above 100.0, indicating that the number of observed cases is *statistically significantly higher* than the expected number.
- SIR = 71.0; 95% CI (56.2 – 88.4) – the confidence interval does not include 100.0 and the interval is below 100.0, indicating that the number of observed cases is *statistically significantly lower* than the expected number.
- SIR = 108.8 95% CI (71.0-159.4) – the confidence interval DOES include 100.0 indicating that the number of observed cases is *NOT statistically significantly different* from what is expected, and the difference is likely due to chance. When the interval includes 100.0, then the true SIR may be 100.0.

Example of Calculation of an SIR and Its Significance

$$\text{SIR} = \frac{\text{OBSERVED CASES}}{\text{EXPECTED CASES}} \times 100$$

The following example illustrates the method of calculation for a hypothetical town for one type of cancer and one sex for the years 2004-2008:

Age Group	<u>Town X</u> Population (A)	<u>State</u> Age-Specific Incidence Rate (B)	<u>Town X</u> Expected Cases (C) = (A) x (B)	<u>Town X</u> Observed Cases (D)
00-04	74,657	0.0001	7.47	11
05-09	134,957	0.0002	26.99	25
10-14	54,463	0.0005	27.23	30
15-19	25,136	0.0015	37.70	40
20-24	17,012	0.0018	30.62	30
UP TO 85+	6,337	0.0010	6.34	8
Total:			136.35	144

$$\text{SIR} = \frac{\text{Observed Cases}}{\text{Expected Cases}} \times 100 = \frac{(\text{column D total})}{(\text{column C total})} \times 100 = \frac{144}{136.35} \times 100 \approx 106$$

Thus the SIR for this type of cancer in Town X is 106, indicating that the incidence of this cancer in Town X is 6% higher than the corresponding statewide average incidence for this cancer. However, the range for the 95% confidence interval (89.1-124.3) (calculation not shown) indicates that the true value may be as low as 89.1 or as high as 124.3. Also, since the range includes the value 100, it means that the observed number of cases is *not statistically significantly higher or lower* than what is expected.

Whenever the number of observed cases is less than five, the corresponding SIR is neither calculated nor tested for statistical significance. This is indicated with an (nc) ("not calculated"). However, the number of observed and expected cases is shown in these circumstances.

Notes about Data Interpretation

The SIR is a useful indication of the disease categories that have relatively high or low rates for a given community. These statistics, however, should be used with care. Such statistics provide a starting point for further research and investigation into a possible health problem, but they do not by themselves confirm or deny the existence of a particular health problem. Many factors unrelated to disease causation may contribute to an elevated SIR, including demographic factors, changes in diagnostic techniques, and changes in data collection or recording methods over time, as well as the natural variation in disease occurrence.

When reviewing the data tables, it is important to keep in mind that an SIR compares the observed cancer incidence in a particular community with the expected incidence based on statewide average annual age-specific incidence rates. This means that *valid comparisons can only be made between a community and the state as a whole. SIRs for different cities and towns CANNOT and SHOULD NOT be compared to each other.* (Comparisons between two communities would be valid only if there were no differences in the age and sex distributions of the two communities' populations.)

Data Limitations

It should be emphasized that apparent increases or decreases in cancer incidence over time might reflect changes in diagnostic methods or case reporting rather than true changes in cancer incidence. Four other limitations must be considered when interpreting cancer incidence data for Massachusetts cities and towns: under-reporting in areas close to neighboring states; under-reporting for cancers that may not be diagnosed in hospitals; cases being assigned to incorrect cities/towns; and standardized incidence ratios based on small numbers of cases.

Border Areas and Neighboring States

Some areas of Massachusetts appear to have low cancer incidence, but this may be the result of under-reporting – that is, a loss of cases diagnosed or treated in neighboring states that are not reported to the MCR. Presently the MCR has reciprocal reporting agreements with fifteen states – Alaska, Arkansas, Connecticut, Florida, Maine, Mississippi, New Hampshire, New York, North Carolina, Rhode Island, South Carolina, Texas, Vermont, Wisconsin, and Wyoming. Approximately one percent of cases are reported by out-of-state hospitals.

Cases Diagnosed in Non-Hospital Settings

During the time period covered by this report (2004-2008), hospitals provided most of the information about cancer cases to the MCR. Dermatologists' offices began reporting in 2001, and urologists' offices in 2002. Some types of cancer in this report are undoubtedly under-reported because they may be diagnosed by private physicians, private laboratories, health maintenance organizations, or radiotherapy centers that escape hospital case identification systems. Examples may include melanoma of the skin, prostate cancer, and certain hematologic malignancies such as leukemia and multiple myeloma. The extent of this under-reporting has not been determined exactly, but the MCR is actively working to increase reporting of cases that are diagnosed by non-hospital sources. The North American Association of Central Cancer Registries has estimated that the MCR's records are more than 95% complete for the period 2004-2008.

City/Town Misassignment

In accordance with standard central cancer registry procedures, each case reported to the MCR ideally should be assigned to the city/town in which the patient lived at the time of diagnosis, based on the address provided by the reporting hospital. In practice, however, a patient may provide the hospital with his/her mailing address (e.g., a post office box located outside the patient's city/town of residence); a business address; a temporary address (e.g., the patient is staying with a relative while receiving treatment and reports the relative's address as his/her own); or a locality or post office name (e.g., "Chestnut Hill" rather than "Boston," "Brookline," or "Newton"). In addition, if a patient has moved since being diagnosed, the hospital may report the patient's current address. Because of the large number of cases reported to the MCR, and because data are reported to the MCR via electronic media, most city/town case assignments are performed by an automated computer process. This simplified matching process may misassign some cases based on the reported locality name. When

MCR staff become aware of such misassignments, they manually correct the errors. Furthermore, in order to minimize such errors, cases from fifty geographic localities prone to city/town misassignment are reviewed manually.

Small Numbers of Cases

Standardized incidence ratios based on small numbers of cases result in estimates that are very unstable. This situation is common when the population of a city or town is small or if the particular cancer type is rare. SIRs and statistical significance are not calculated when the number of observed cases for a specific category is less than five. In these instances, the observed and expected cases are presented in the tables for qualitative comparison only.

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Wayland

Observed and Expected Case Counts, with Standardized Incidence Ratios, 2004-2008

	<u>Obs</u>	<u>Exp</u>	<u>SIR</u>	<u>95% CI</u>		<u>Obs</u>	<u>Exp</u>	<u>SIR</u>	<u>95% CI</u>
<u>Bladder, Urinary</u>					<u>Melanoma of Skin</u>				
Male	16	16.1	99.6	(56.9-161.7)	Male	11	10.1	108.8	(54.2-194.6)
Female	5	5.5	91.6	(29.5-213.8)	Female	11	7.5	147.3	(73.4-263.6)
<u>Brain and Other Nervous System</u>					<u>Multiple Myeloma</u>				
Male	3	3.1	nc	(nc-nc)	Male	4	2.6	nc	(nc-nc)
Female	5	2.4	210.3	(67.8-490.7)	Female	0	1.8	nc	(nc-nc)
<u>Breast</u>					<u>Non-Hodgkin Lymphoma</u>				
Male	0	0.5	nc	(nc-nc)	Male	15	8.8	170.4	(95.3-281.1)
Female	84	58.2	144.3	(115.1-178.6)	Female	11	7.0	157.0	(78.3-280.9)
<u>Cervix Uteri</u>					<u>Oral Cavity & Pharynx</u>				
Female	0	2.3	nc	(nc-nc)	Male	7	6.4	110.0	(44.1-226.6)
<u>Colon / Rectum</u>					Female	0	2.7	nc	(nc-nc)
Male	21	20.5	102.5	(63.4-156.7)	<u>Ovary</u>				
Female	18	18.3	98.3	(58.2-155.3)	Female	7	5.5	126.4	(50.6-260.5)
<u>Esophagus</u>					<u>Pancreas</u>				
Male	1	4.3	nc	(nc-nc)	Male	7	5.1	137.4	(55.0-283.0)
Female	0	1.1	nc	(nc-nc)	Female	4	4.8	nc	(nc-nc)
<u>Hodgkin Lymphoma</u>					<u>Prostate</u>				
Male	3	1.1	nc	(nc-nc)	Male	61	61.9	98.5	(75.4-126.6)
Female	0	0.9	nc	(nc-nc)	<u>Stomach</u>				
<u>Kidney & Renal Pelvis</u>					Male	2	3.8	nc	(nc-nc)
Male	6	8.4	71.1	(26.0-154.7)	Female	0	2.0	nc	(nc-nc)
Female	4	4.7	nc	(nc-nc)	<u>Testis</u>				
<u>Larynx</u>					Male	1	1.6	nc	(nc-nc)
Male	3	2.5	nc	(nc-nc)	<u>Thyroid</u>				
Female	0	0.7	nc	(nc-nc)	Male	3	3.0	nc	(nc-nc)
<u>Leukemia</u>					Female	16	9.2	173.5	(99.1-281.8)
Male	3	5.6	nc	(nc-nc)	<u>Uteri Corpus and Uterus, NOS</u>				
Female	6	3.9	154.0	(56.2-335.2)	Female	12	13.3	90.5	(46.7-158.1)
<u>Liver and Intrahepatic Bile Ducts</u>					<u>All Sites / Types</u>				
Male	2	4.4	nc	(nc-nc)	Male	204	215.7	94.6	(82.0-108.5)
Female	2	1.4	nc	(nc-nc)	Female	224	195.6	114.5	(100.0-130.5)
<u>Lung and Bronchus</u>									
Male	23	29.9	77.0	(48.8-115.5)					
Female	25	27.4	91.2	(59.0-134.7)					

- Obs = observed case count; Exp = expected case count;
- SIR = standardized incidence ratio ((Obs / Exp) X 100);
- 95% CI = 95% confidence intervals, a measure of the statistical significance of the SIR;
- Shading indicates the statistical significance of the SIR at 95% level of probability;
- nc = The SIR and 95% CI were not calculated when Obs < 5;

APPENDIX II: RISK FACTORS FOR SELECTED CANCER TYPES AND REVIEWERS OF RISK FACTORS

This Appendix contains a list of risk factors for thirteen types of cancer. The list briefly summarizes available information from the scientific literature. The list was last revised in 2000. Cancers are complex diseases, many of which have multiple factors that may contribute to their development. It should be noted that there is no single agreed-upon list of risk factors – even the experts may disagree. This list should be viewed only as a starting point for the interested reader, and should not be viewed as constituting a definitive or comprehensive summary of cancer risk factors. Future risk factor lists may change as new research findings emerge.

The list separates those characteristics for which research clearly indicates a strong association in the development of the cancer (“Risk Factors”) from those characteristics for which weaker associations exist (“Possible Risk Factors”) or which are now coming under investigation (“Under Investigation”).

For additional information on cancer risk factors or prevention, you may wish to contact the following:

Cancer Information Service (National Cancer Institute): 1-800-4-CANCER (1-800-422-6237)

Cancer Response Line (American Cancer Society): 1-800-ACS-2345 (1-800-227-2345)

In addition, the following selected Internet websites provide information on cancer. Many of these also provide links to other sites (not listed) which may be of interest.

Massachusetts Department of Public Health: <http://www.mass.gov/dph>

American Cancer Society: <http://www.cancer.org>

Centers for Disease Control and Prevention

Home Page: <http://www.cdc.gov>

Cancer Prevention and Control Program: <http://www.cdc.gov/cancer>

Fruits and Veggies More Matters™ Campaign (nutrition – formerly 5-A-Day Program):

<http://www.FruitsandVeggiesMatter.org>

National Cancer Institute

Information: <http://www.cancer.gov>

Cancer Literature in PubMed: http://www.cancer.gov/search/cancer_literature

Surveillance, Epidemiology, and End Results (SEER) Program data: <http://seer.cancer.gov>

Your Cancer Risk (Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine; formerly at Harvard Center for Cancer Prevention):

<http://www.yourdiseaserisk.wustl.edu>

OncoLink (Abramson Cancer Center of the University of Pennsylvania):

<http://www.oncolink.upenn.edu>

Cancerquest (Emory University – Winship Cancer Institute): www.cancerquest.org

Cancer News on the Net® (information on diagnosis and treatment for cancer patients and their families): <http://www.cancernews.com>

National Coalition for Cancer Survivorship: <http://www.canceradvocacy.org>

BLADDER, URINARY

Risk Factors:

- Age (In Massachusetts, incidence rates increase markedly in the 65 to 74 year age group, and are highest in the 75 years and older age groups.)
- Cigarette smoking
- Excessive use of certain pain medications such as those containing phenacetin
- Treatment with alkylating agent chemotherapy drugs such as Cytosan (cyclophosphamide)
- Having had radiation therapy to the bladder

Possible Risk Factors:

- Occupations in which workers are suspected of having an elevated bladder cancer risk due to certain chemical exposures include working in the rubber and/or leather industries, dye manufacturing, painters, professional drivers of trucks and other motor vehicles, aluminum workers, machinists, chemical workers, printers, metal workers, hairdressers, and textile workers
- Urologic conditions such as urinary tract infections and urinary stasis
- Dietary factors

BREAST

Risk Factors:

- Age (In Massachusetts, incidence rates increase markedly in the 45 to 64 year age group, and are highest in the 75 years and older age groups.)
- Family (mother, sister, or daughter) history of breast cancer, especially if it was detected pre-menopausally (before the change of life)
- High-dose radiation therapy to the chest, especially from age 11 until age 30
- Never giving birth
- First childbirth after age 30
- Menstruating since age 12 or younger
- Late age (older than 55) at menopause (change of life)
- Having inherited a mutation in breast cancer susceptibility genes such as BRCA1 or BRCA2
- Increasing body fat in post-menopausal women
- Estrogen taken post-menopausally (after the change of life)
- More than three alcoholic drinks per day

Possible Risk Factors:

- Diet low in fruits and vegetables

Under Investigation:

- Pesticide exposure
- Other environmental exposures

CERVIX UTERI (cervical cancer)

Risk Factors:

- Age (In Massachusetts, incidence rates are highest in the 45 years and older age groups.)
- Certain types of human papilloma virus (HPV, the virus that causes genital warts)
- Sexual intercourse before age 19
- Multiple sexual partners
- Unprotected intercourse (having sex without a condom)
- Smoking
- Infection with HIV (human immunodeficiency virus, the virus that causes AIDS)

Possible Risk Factors:

- Too little vitamin A, vitamin C, and/or folic acid in the diet
- Exposure to secondhand smoke (other people's smoke)

Use of the medication *diethylstilbestrol (DES)* during pregnancy is associated with later vaginal clear cell adenocarcinoma (a form of cervical and vaginal cancer) in the female children of those pregnancies.

COLON / RECTUM

Risk Factors:

- Age (In Massachusetts, incidence rates increase markedly in the 45 to 64 year age group, and continue to increase markedly in the 65 to 74 year and 75 to 84 year age groups.)
- A personal history of colorectal polyps or colorectal cancer
- Family history of colorectal cancer or polyps, including the various polyposis syndromes such as familial adenomatous polyposis, Gardner's Syndrome, or Peutz-Jeghers Syndrome
- Personal history of inflammatory bowel disease such as ulcerative colitis or Crohn's Disease
- Personal history of ovarian, breast, or endometrial cancer
- Diet high in red meat, and low in fruits, vegetables, and folic acid
- Physical inactivity

Possible Risk Factors:

- Alcohol, especially beer
- Smoking
- Increasing body fat

LEUKEMIA

Risk Factors:

- Exposure to ionizing radiation
- Exposure to benzene
- Treatment with chemotherapy drugs (especially alkylating agents)
- Certain genetic conditions such as Down's syndrome
- Exposure to ethylene oxide

Possible Risk Factors:

- Exposure to low level solvent and metal mixtures
- Smoking

Under Investigation:

- Exposure to electromagnetic fields (e.g., from power lines)

LUNG AND BRONCHUS

Risk Factors:

- Smoking
Note: 85% of all lung cancers are caused by smoking. The risk of lung cancer is *10 times greater* for persons who smoke up to one pack of cigarettes a day and *20 times greater* for persons who smoke more than one pack of cigarettes a day than for persons who do not smoke.
- Occupational, and in some cases environmental, exposures (e.g., asbestos, metals)
- Exposure to secondhand smoke (other people's smoke)

MELANOMA OF SKIN

Note: *changing or changed moles, or new moles which appear after age 30 that itch and are tender* are early, potentially malignant lesions, and should be examined by a health care professional.

Risk Factors:

- Age (In Massachusetts, incidence rates begin to increase markedly in the 45 to 65 year age group, and are highest in the 75 to 84 year age group.)
- One or more large or unevenly colored lesions such as:
 - Dysplastic (abnormal) mole(s), with or without a family history of melanoma
 - Lentigo maligna (a type of malignant melanoma that is slow growing)
- Familial atypical mole and melanoma syndrome
- Giant congenital melanocytic nevi (pigmented patches of skin)
- Nevus (birthmark) since birth
- Caucasian
- Previous melanoma
- Family history of melanoma
- Immunosuppression (when the body's defenses are weakened, such as after transplant surgery)
- Sun sensitivity
- Repeated sunburns, especially as a child
- Easily sunburned
- Freckling
- Unable to tan easily

NON-HODGKIN'S LYMPHOMA (now known as non-Hodgkin lymphoma)

Risk Factors:

- Age (In Massachusetts, incidence rates begin to increase in the 45 to 65 year age group, and are highest in the 75 to 84 year age group.)
- Abnormalities of the immune system, either congenital or resulting from suppression due to organ transplantation or disease
- Infection with HIV (human immunodeficiency virus, the virus that causes AIDS)
- Exposure to radiation or chemotherapy
- Exposure to certain herbicides

Possible Risk Factors:

- Smoking
- Other chemical exposures

ORAL CAVITY AND PHARYNX

Risk Factors:

- Tobacco use (including cigarettes, pipes, cigars, chewing tobacco, and snuff)
- Heavy alcohol use
- Age (In Massachusetts, incidence rates begin to increase in the 45 to 64 year age group, and are highest in the 75 to 84 year age group.)
- Poor nutrition, especially chronic iron deficiency

Possible Risk Factors:

- Chronic irritation of the mouth due to ill-fitting dentures or broken teeth
- Poor oral hygiene

OVARY

Risk Factors:

- Age (In Massachusetts, incidence rates increase markedly in the 45 to 64 year age group, and are highest in the 65 to 74 year age group.)
- Never giving birth
- Personal history of endometrial (lining of the uterus), colon, or breast cancer
- Family history of ovarian cancer (mother, sister, or daughter)
- Having one of three inherited ovarian cancer conditions:
 - breast-ovarian cancer syndrome
 - site-specific ovarian cancer syndrome
 - hereditary nonpolyposis colorectal cancer or Lynch II syndrome (includes early-onset colorectal cancer, endometrial cancer, breast cancer, and ovarian cancer)
- Never having used oral contraceptives, or having used oral contraceptives for fewer than five years
- Caucasian

Possible Risk Factors:

- Fertility drugs
- Use of talc powder containing asbestos fibers in the perineal or external genitalia area
- High fat diet

PROSTATE

Risk Factors:

- Age (In Massachusetts, incidence rates begin to increase markedly in the 45 to 64 year age group, and are highest in the 65 to 74 year age group.)
- Family history of prostate cancer
- Hormonal factors
- African-American

Possible Risk Factors:

- Alcohol consumption
- Having a history of benign prostate disease
- Smoking
- Physical inactivity
- Diet high in fat

TESTIS

Risk Factors:

- Age (In Massachusetts, incidence rates are highest in the 20 to 44 year age group.)
- Undescended testicle

Possible Risk Factors:

- Inguinal hernia
- Testicular trauma
- Familial factors
- Occupations related to leather processing

UTERI, CORPUS AND UTERUS, NOS (uterine cancer)

Risk Factors:

- Age (In Massachusetts, incidence rates are highest in the 45 years and older age groups.)
- Personal history of colon and/or breast cancer
- Family history of uterine cancer
- Being more than 20 pounds overweight
- Never giving birth
- Presence of estrogen-producing ovarian tumors
- Postmenopausal (change of life) use of estrogen without progesterone
- Tamoxifen (a drug given to women who have had breast cancer to lower the risk of recurrence)
- Late age (older than 55) at menopause (change of life)

Possible Risk Factors:

- Diet high in fatty foods
- Hypertension (high blood pressure)
- Diabetes (high blood sugar)
- Chronic anovulation (ovaries do not produce eggs)
- Menstrual problems
- Radiation therapy to the pelvis
- Malignant tumors on the ovaries
- Never having used oral contraceptives, or having used oral contraceptives for fewer than five years

Reviewers of Risk Factors

This Appendix was assembled under the auspices of the American Cancer Society (New England Division) through seeking the advice of leading cancer experts. The following clinicians, researchers, and public health professionals reviewed the risk factors for the type(s) of cancers indicated:

Ross Berkowitz, MD (ovarian, uterine)	Frederick Li, MD (all types)
Cynthia Boddie-Willis, MD, MPH (prostate)	John Lisco, MPH (colorectal)
Risa Burns, MD (breast, cervical)	Robert Mayer, MD (colorectal)
Richard Clapp, ScD (all types)	Kenneth Miller, MD (leukemia)
Graham Colditz, DrPH (colorectal)	Michael Monopoli, DMD (oral)
Suzanne Condon, MS (all types)	Nancy Mueller, ScD (non-Hodgkin lymphoma)
Greg Connolly, DMD (lung)	J. David Naparstek, ScM, CHO (all types)
Daniel Cramer, MD (ovarian)	Robert Osteen, MD (breast)
Letitia Davis, ScD (all types)	James Petros, MD (colorectal)
Catherine DuBeau, MD (prostate)	Marianne Prout, MD, MPH (all types)
Kathleen Egan, PhD (breast)	Lowell Schnipper, MD (non-Hodgkin lymphoma)
Richard Fabian, MD (oral)	Paul Schroy, MD, MPH (colorectal)
Marc Garnick, MD (prostate, testicular)	Ellen Sheets, MD (cervical)
Alan Geller, RN, MPH (melanoma)	William Shipley, MD (bladder)
Annekathryn Goodman, MD (uterine)	Art Skarin, MD (lung)
Lauren Holm, RN, MSN (all types)	Arthur Sober, MD (melanoma)
David Hunter, MD, BS, ScD (all types)	Bonnie Tavares, MEd (breast, cervical)
Joe Jacobson, MD (prostate)	Howard Weinstein, MD (leukemia)
Phil Kantoff, MD (bladder, prostate)	Martha Crosier Wood, MBA (all types)
Howard Koh, MD, MPH (melanoma)	
Robert Krane, MD (testicular)	

Risk factors were also reviewed by staff members of the Massachusetts Department of Public Health's Bureau of Environmental Health (all types), Colorectal Cancer Working Group (colorectal), Skin Cancer Prevention Program (melanoma), and Massachusetts Women's Health Network (breast, cervical).

We would also particularly like to thank Lauren Holm, former Vice President for Planning and Evaluation, American Cancer Society (New England Division), and Martha Crosier Wood, former Director, Comprehensive Cancer Prevention and Control, Massachusetts Department of Public Health, for their assistance in the development of this Appendix.

APPENDIX III: MDPH CANCER PREVENTION AND CONTROL INITIATIVES

The Massachusetts Department of Public Health is working to reduce the incidence and mortality of cancer in the Commonwealth. Partnerships between MDPH programs, researchers, healthcare providers and nonprofit organizations collect information about cancer, lead quality improvement projects, coordinate evidenced-based workshops for managing living with chronic disease (including cancer), provide education for health professionals and bring shared messages to the public. Our collaborated efforts focus on reducing cancer risk, incidence and mortality through healthy lifestyles, early diagnosis, and increased access to care. The Department's programs address the impact of tobacco, alcohol, nutrition, and physical activity on cancer prevention, along with environmental and occupational hazards for cancer. Throughout all of our efforts there is an emphasis on reducing disparate health outcomes and unequal access to cancer care.

MDPH Bureaus and Programs:

Bureau of Environmental Health, www.mass.gov/dph/environmental_health

Bureau of Substance Abuse Services, www.mass.gov/dph/bsas

Comprehensive Cancer Prevention and Control Program, www.mass.gov/dph/cancer

Men's Health/Women's Health/Care Coordination Program

Tobacco Cessation and Prevention Program, www.mass.gov/dph/mtcp

Occupational Health Surveillance Program, www.mass.gov/dph/ohsp

Office of Healthy Aging, www.mass.gov/dph/healthyaging

Oral Health Program, www.mass.gov/dph/oralhealth

Wellness Unit,

http://www.mass.gov/?pageID=eohhs2terminal&L=5&L0=Home&L1=Government&L2=Departments+and+Divisions&L3=Department+of+Public+Health&L4=Programs+and+Services+T+-+Z&sid=Eeohhs2&b=terminalcontent&f=dph_com_health_g_div_wellness&csid=Eeohhs2

MDPH publications on cancer prevention and screening are available at the Massachusetts Health Promotion Clearinghouse, www.maclearinghouse.com.

Massachusetts Cancer Registry Publications are available through the Massachusetts Cancer Registry, telephone: 617-624-5642 and on the web at www.mss.gov/dph/mcr.

