



Cancer Incidence in MetroWest

Prepared by:
Lorenz J. Finison, Ph.D.
Research Associate, Boston University School
of Public Health & Principal, SigmaWorks

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COMMUNITY
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Preface

As reported in the 2005 MetroWest Health Data Book & Atlas, cancers are associated with many aspects of genetics, lifestyle, occupational exposures, screening, and treatment.^{1 2} Cancers account for a significant number of deaths each year nationally, in Massachusetts, and in MetroWest. In November 2005, the Massachusetts Cancer Registry (MCR) of the Massachusetts Department of Public Health (MDPH) made available detailed town-level cancer incidence data for 1995-2002 on the MDPH query-based data reporting system, MassCHIP (Massachusetts Community Health Information Profile). The cancer incidence data for MetroWest and comparison communities reported here come from MassCHIP.

Executive Summary

Overall Cancer Rates

- MetroWest's age-adjusted rate for invasive cancer (cancer that has spread beyond its original location in the body) is not significantly different from the invasive cancer rate for Massachusetts, nor different from the rate for MetroWest's peer towns in other regions of Massachusetts.³ Neither are MetroWest's subregions or types of communities significantly different in overall invasive cancer incidence. Among MetroWest's cities and towns, only Northborough, Westborough, and Wellesley appear to have rates significantly below the all-cancer rates for Massachusetts as a whole; Millis and Holliston are significantly high. The town differences should be interpreted with great caution, because when using data from a large number of communities, a few will be significantly different on the basis of chance alone. In addition, the summary figures combine many different types of cancer with different etiologies, so that the search for a *single cause* of the differences is likely to be fruitless. Of the two communities whose overall cancer rates were elevated, Holliston had an elevated rate for breast cancer (214.9 per 100,000 versus 144.7 per 100,000 for Massachusetts as a whole) and Millis had an elevated rate for lung cancer (136.7 per 100,000 versus 73.0 per 100,000 for Massachusetts as a whole).

Cancer Rates by Type

- The most frequent cancers in MetroWest, as in Massachusetts, are prostate cancer, female invasive breast cancer, lung cancer, colorectal cancer, and female non-invasive breast cancer.
- MetroWest as a whole had a slight but statistically significant elevation above state age-adjusted rates for female breast cancer, both invasive and non-invasive; for melanoma; and for *non-invasive* colorectal cancer. The MetroWest rate was significantly lower than the Massachusetts rate for lung cancer. The Eastern/Residential communities were significantly higher than Massachusetts in breast and prostate cancer incidence and low in lung and colorectal cancer incidence.

- Melanoma is consistently higher in MetroWest than in Massachusetts, and this effect remains even when White-alone residents are analyzed separately.

Cancer Rates—Historical Series

- A historical series of cancer data from 1995-2002 suggests slight changes in that period: the balance between invasive and non-invasive breast cancer shifted slightly so that more non-invasive breast cancers were diagnosed, relatively speaking. MetroWest appears to follow the Massachusetts pattern in the ratio of invasive to non-invasive breast cancers. The three years 2000, 2001, and 2002 show a slightly elevated, although not statistically significant, pattern of increase in prostate cancer. However, this increase might have resulted from failure to adequately adjust for an aging population. In any case, this potential trend should be watched. An observed increase in the incidence of melanoma starting in 2001 may have resulted from the addition of dermatologist office and dermatopathology lab reports in that year. But a small year-to-year increase in melanoma also appears to have been occurring since 1995.

Race and Ethnicity Disparities

- Prostate cancer: The Massachusetts rate for prostate cancer among Black men is almost double the rate for White men, with the rate for Hispanic men not different from that of White men, and the rate for Asian men significantly lower than White men's rate. In contrast, the rate for Black men in MetroWest is *not* significantly higher than for White men in their age-adjusted rate of prostate cancer. The rate for Asian men in MetroWest is significantly lower than for White men.
- Breast cancer: The Massachusetts rate for invasive breast cancer is significantly higher for White women than for Black women, who in turn have a significantly higher rate than Hispanic women, who in turn have a significantly higher rate than Asian women. For MetroWest, White women have a significantly higher rate than Black women, while Hispanic and Asian women are not significantly different from either White or Black women.
- Colorectal cancer: The Massachusetts rates for White and Black residents for invasive colorectal cancer are similar. The rates for Hispanic and Asian residents are lower than for either White or Black residents. In MetroWest, White rates for colorectal cancer are significantly higher than for Black or Hispanic residents.
- Lung cancer: The Massachusetts rate for lung cancer is significantly higher for White residents than for Hispanic and Asian residents. For MetroWest, White lung cancer rates are significantly higher than Hispanic rates.

Stage at Diagnosis

- Within the Eastern and Residential communities of MetroWest, a larger percentage of all cancers are diagnosed at the "localized" stage than are cancers in communities in other sub-regions and in the more commercial communities

in MetroWest. This discrepancy suggests a higher rate of screening and/or self-examination.

- Prostate cancer is diagnosed at a slightly later stage in MetroWest than in the peer towns or in Massachusetts as a whole.

Recommendations

- Further examine issues of screening and patient education for prostate cancer, due to the fact that prostate cancer is currently diagnosed at a later stage in MetroWest, and that screening rates are still far below desired levels.
- Continue to examine the reasons for the slight elevation of invasive breast and prostate cancer rates in the Eastern/Residential communities.
- Further examine the deviation in melanoma rates between Massachusetts and MetroWest, to ascertain why MetroWest rates are consistently higher, and examine the potential for improved resident education and screening for skin cancer.
- Convene a panel of oncologists to further examine the data and issues, including the elevated lung cancer rate in Millis, invasive breast cancer rate in Holliston, and prostate cancer rate in Needham.
- Support lifestyle-change programs to reduce cancer incidence, particularly as many of these changes would reduce the incidence of other diseases as well, e.g., metabolic syndrome diseases.

Introduction

This report provides town-level and region-level cancer incidence data for MetroWest (a table appears in Appendix B). The town-level data come from the Massachusetts Department of Public Health (MDPH) Massachusetts Cancer Registry (MCR), which released cancer incidence data for 1995-2002 in late fall 2005 on the MDPH website (www.mass.gov/dph/bhsre/mcr/98/state_report_98_02.pdf). MCR methods are excerpted in Appendix A. The data are also reported on the MDPH query-based system, MassCHIP (Massachusetts Community Health Information Profile).

When town-level rates are based on numbers too small to provide reliable estimates for individual cancer types, towns have been combined into the MetroWest sub-regional groups—Eastern, NorthWest, or SouthWest; classified according to the kind of community group—more residential versus more commercial towns; and compared to similar “peer” towns in Massachusetts, and to Massachusetts as a whole.⁴ In addition, whenever possible, subgroup analyses of race and ethnicity disparities are provided. To enhance the reliability of results, and to provide comparisons to the most current statewide report⁵, all cancers diagnosed from 1998 to 2002 were included in the comparative analyses, and the historical series includes all data from 1995 to 2002. In most cases, to take account of differing age distributions, age-adjusted rates are reported.⁶ Readers should be aware that the calculation of accurate rates depends upon the accuracy of both numerators (incident cancer cases) and denominators (population estimates). Since the population figures for the intercensal years are only estimates, deviations of actual populations from these estimates will create unknown unreliability and biases in the rates.

A Caution on Age-Adjusted Rates

The use of age-adjusted rates for incidence, hospitalization, and mortality is of great importance in examining differences among communities, and especially between race and ethnicity groups. Age adjustment is required because age distributions vary and crude rates give biased estimates. For example, groups with older populations will appear to have higher disease rates. However, in the effort to provide less biased rates by age-adjusting, we create another problem for groups with small numbers. Since age adjustment is based on 18 five-year age intervals (e.g., 20-24, 25-29), populations with small overall numbers will have especially small numbers within the five-year groups. In such cases—for instance, Black, Hispanic, and Asian residents of MetroWest—age-adjusted rate estimates might be unreliable. Age-adjusted rates for specific cancers are particularly problematic for individual towns and sub-regions of MetroWest. Therefore, such rates for specific race/ethnicity groups are provided only for MetroWest as a whole.

Cancer Incidence—Overall

Considering all cancer diagnoses together, as in Figure 1 and Figure 2, MetroWest’s age-adjusted cancer rate is not significantly different from the rate for Massachusetts, nor from the peer towns. Neither are MetroWest’s subregions or types of communities significantly different in overall cancer incidence. Among MetroWest’s cities and towns, Northborough, Westborough, and Wellesley appear to have rates significantly below the rates for Massachusetts and for MetroWest as a whole. Millis and Holliston are significantly high in

comparison with Massachusetts. The town differences should be interpreted with great caution, since with a large number of communities a few will be significantly different on the basis of chance alone.

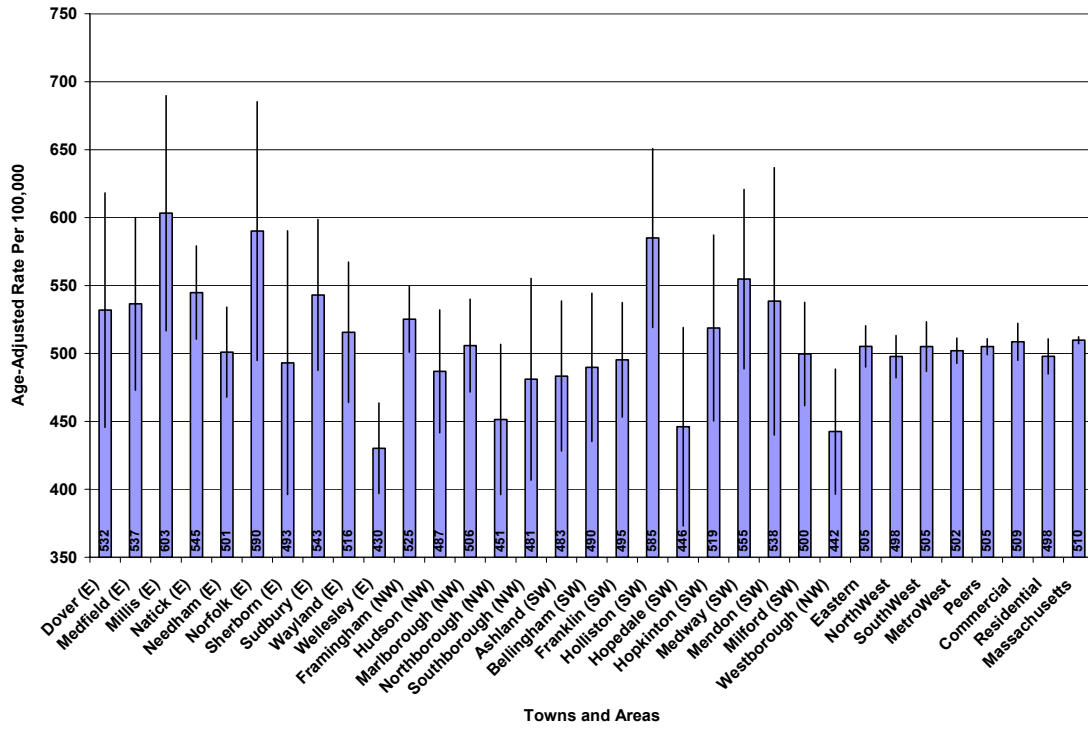


Figure 1: MetroWest Age-Adjusted Cancer Incidence Rates for All Cancer Types by Town, 1998-2002

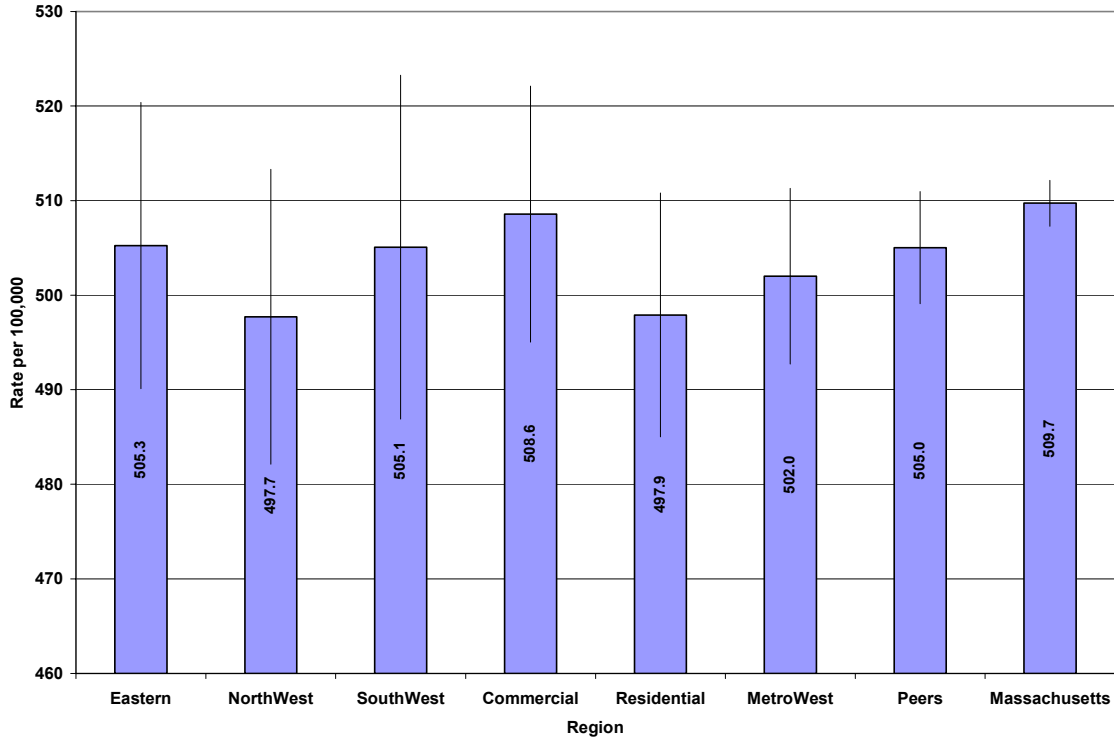


Figure 2: Age-Adjusted Cancer Incidence Rates per 100,000 by Region, Peer Towns, and State, 1998-2002

Cancer Incidence—By Type

The MCR tracks many different cancers. The pattern of statistically significant differences for each of these types of cancers between MetroWest towns, sub-region, and Massachusetts as a whole are presented in Appendix B. The age-adjusted rates for these cancers are shown in Figure 3.

In descending order, the highest rates are prostate, female breast invasive, lung, colorectal, female breast non-invasive, uterine, and melanoma.

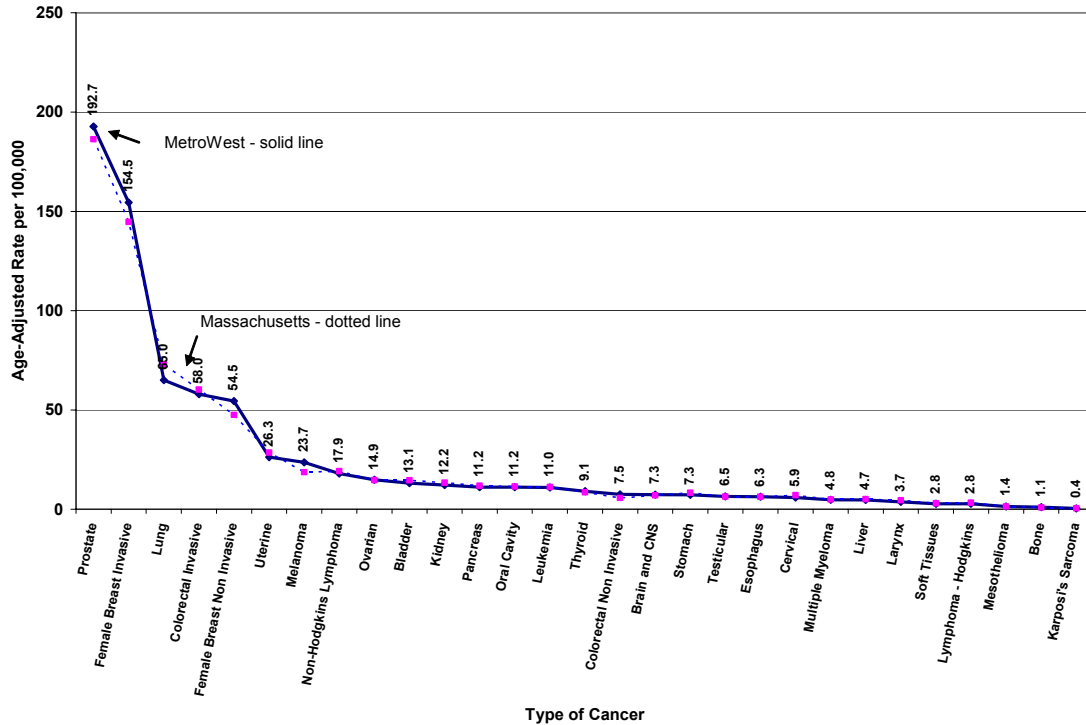


Figure 3: Age-Adjusted Cancer Incidence—Selected Types in Rate Order, 1998-2002

Given the distribution of cancers by type, we focus on the major cancers and those that show a significant deviation from Massachusetts as a whole.

Major cancers include:

- Breast
- Colorectal
- Lung
- Prostate

The figures to follow examine the principal invasive cancers in MetroWest and in Massachusetts. The results for breast cancer (Figure 4) and prostate cancer (Figure 7) indicate an elevation in the Eastern/Residential communities, above Massachusetts' rate. In addition, the Eastern/Residential areas show a significantly *lower* rate for lung cancer (Figure 6) and colorectal cancer (Figure 5).

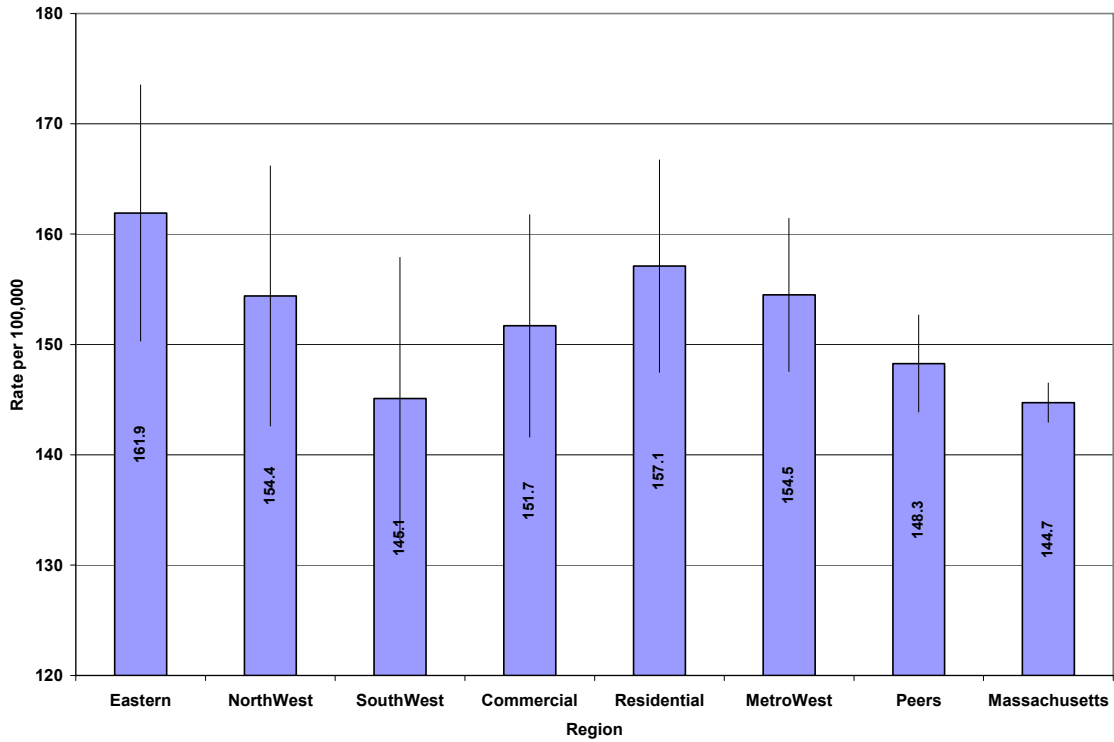


Figure 4: Age-Adjusted Breast Cancer Incidence Rates, 1998-2002

Conclusion: The MetroWest breast cancer rate is higher than that for Massachusetts principally because the rate for the Eastern region of MetroWest is significantly higher than Massachusetts' rate.

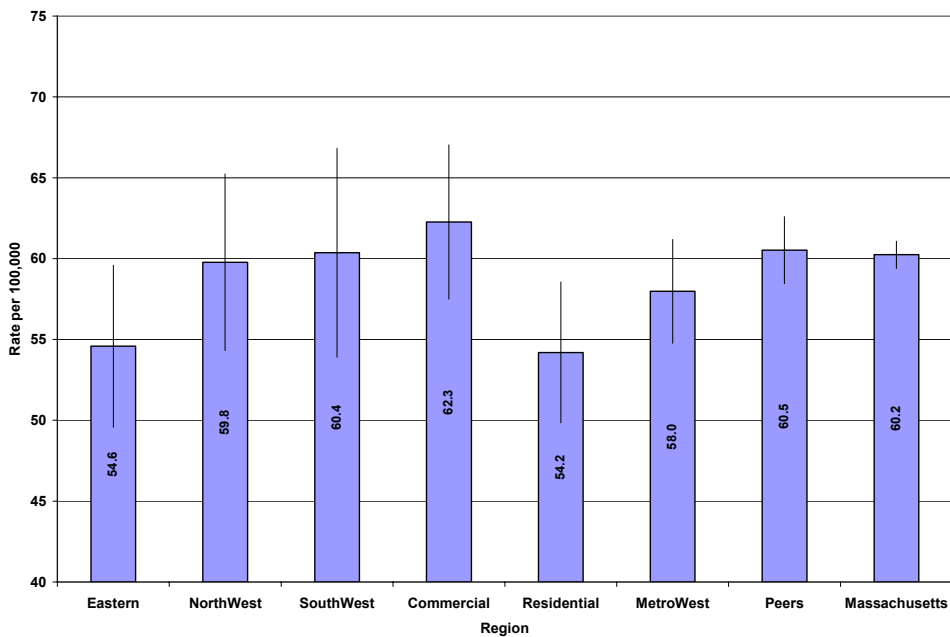


Figure 5: Regional Variation in Age-Adjusted Colorectal Cancer Incidence, 1998-2002

Conclusion: Within the MetroWest region, there is no statistically significant variation in colorectal cancer incidence, although there is a borderline difference between the more commercial and more residential communities.

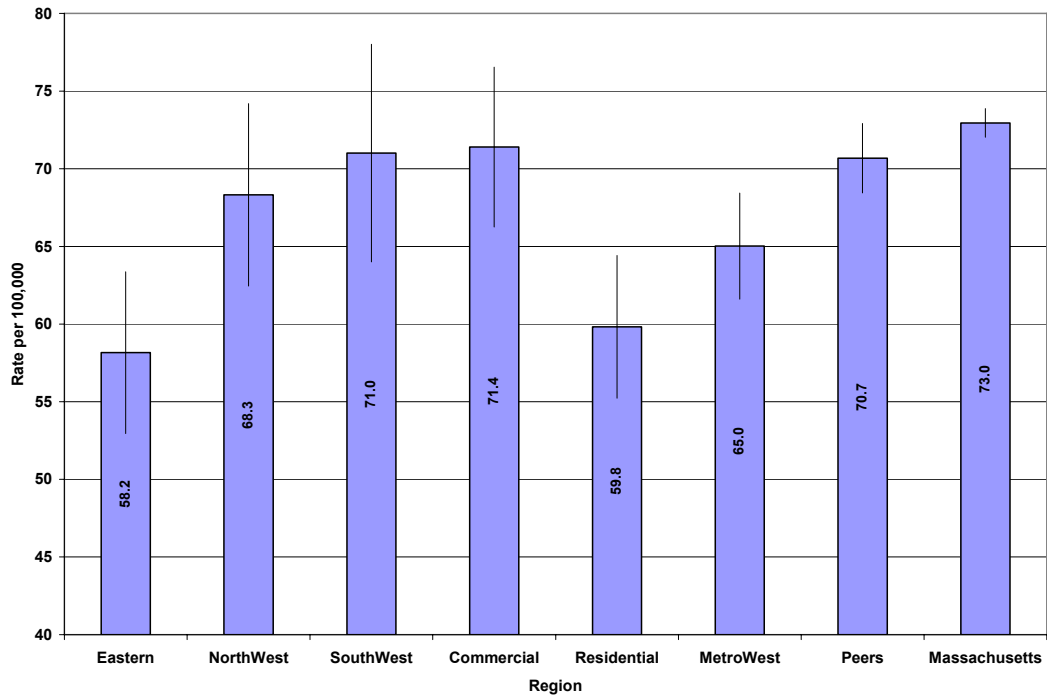


Figure 6: Regional Variation in Age-Adjusted Lung Cancer Incidence, 1998-2002

Conclusion: The MetroWest lung cancer rate is lower than that for Massachusetts principally because the rate for the Eastern/Residential region of MetroWest is significantly lower than Massachusetts' rate.

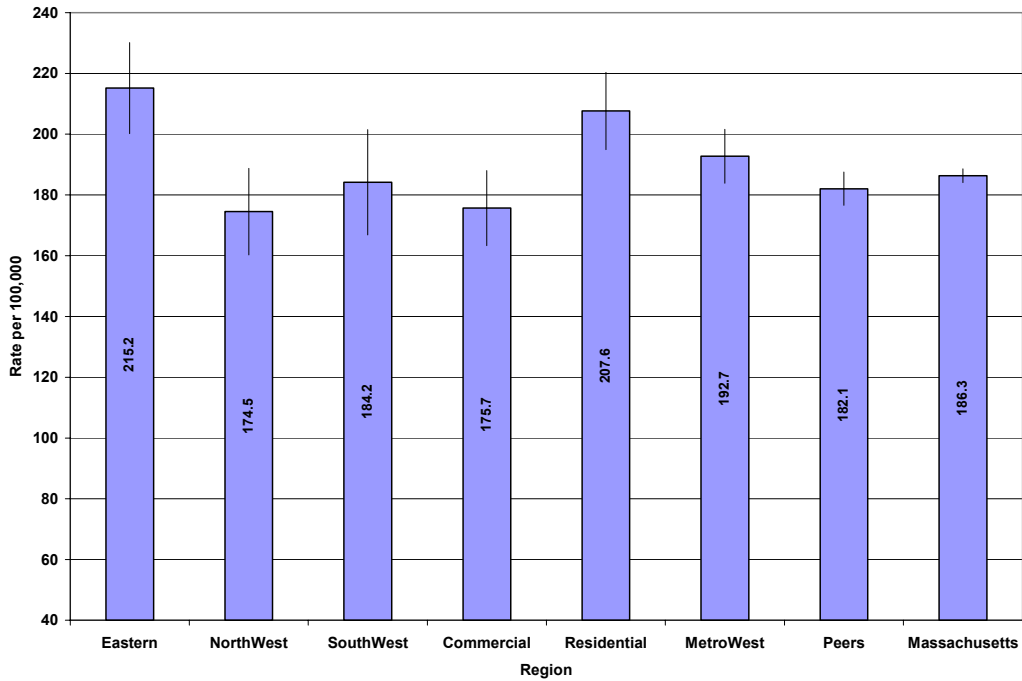


Figure 7: Regional Variation in Age-Adjusted Prostate Cancer Incidence, 1998-2002

Conclusion: The MetroWest prostate cancer rate is higher than that for Massachusetts principally because the rate for the Eastern region of MetroWest is significantly higher than Massachusetts' rate.

Major Cancers: Time Trend

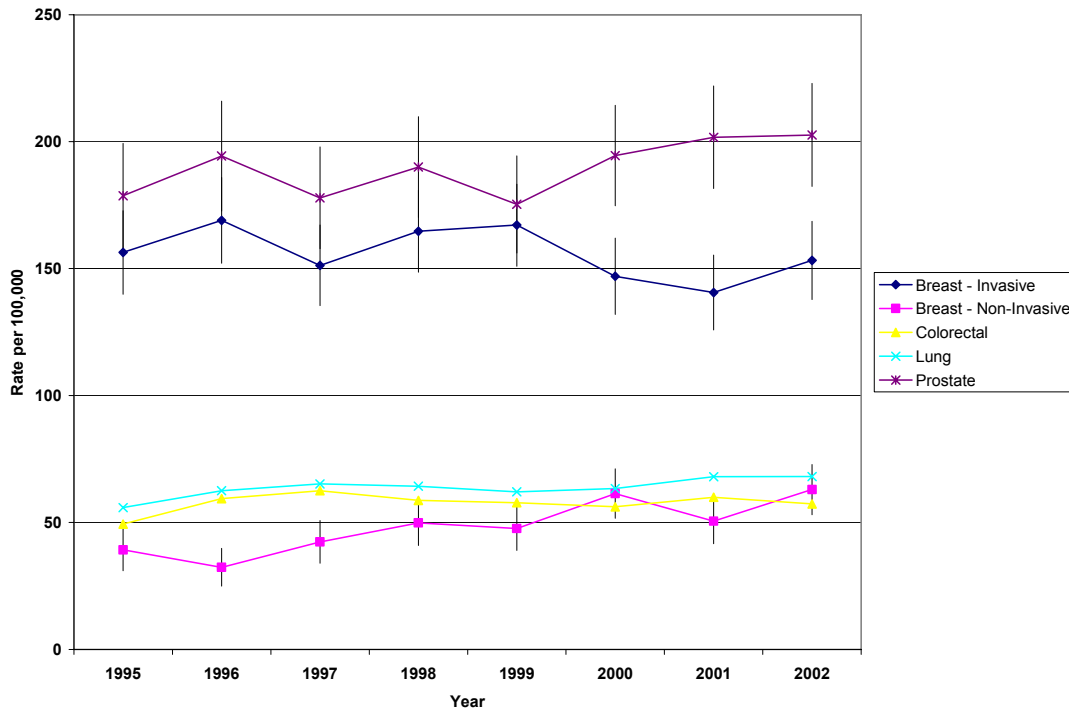


Figure 8: MetroWest Age-Adjusted Trends in Major Types of Cancer

Time trend data do not show major changes over the period 1995-2002 (as shown in Figure 8), but the ratio of invasive to non-invasive breast cancer appears to shift. The statewide ratio drops from over 4:1 in 1995 to under 3:1 in 2002, as illustrated in Figure 9. This shift is statistically significant. It is possible that the decreased ratio occurs in the context of more women being screened. It has been asserted that up to one in five breast cancers detected through screening efforts are non-invasive, or in situ, cancers for which treatment *might not* be indicated.

A report by MCR illustrates an upward trend in data points from 1992, 1996, and 2000 in the percentage of all breast cancer cases to be in situ. Furthermore, the U.S. rates for in situ breast cancer increased from 1992 to 1998 and then appeared to level off, while for Massachusetts the rates were higher and on an increasing trend until 2000, and decreased slightly in 2001. In MCR's discussion of these results, it was pointed out that most in situ cancer is ductal carcinoma in situ—a precancerous condition in the breast's milk ducts—and that most such cases are detectable only through mammography. Thus, the increasing numbers of ductal carcinoma in situ cases may be an indicator of increased mammogram screening rates.

The MCR report points to several factors why Massachusetts rates for invasive breast cancer are also higher than national rates. First, women of higher income and education are more likely to have had a recent mammogram or clinical breast exam. In addition, women of high socioeconomic status are at about twice the risk of breast cancer than women of low

socioeconomic status; this difference may be due to differences in reproductive risk factors. As stated in the report, “In general, women of higher socioeconomic status and higher education have lower fertility, later age at first birth, a greater prevalence of childlessness, shorter duration of breast feeding and later age at menopause, all of which have been associated with an increased risk of breast cancer.”⁷

The MCR discussion also provides some potential explanation about why MetroWest rates are significantly below Massachusetts rates for both invasive and non-invasive breast cancer, an effect produced principally by the Eastern and Residential communities. These areas tend to have the highest educational and income levels, significantly above the statewide averages. In addition, MetroWest and the Eastern and Residential areas specifically have lower rates of teen birth, suggesting later age at first birth—associated with higher breast cancer rates (see the 2005 MetroWest Community Health Data Book for income and educational data).

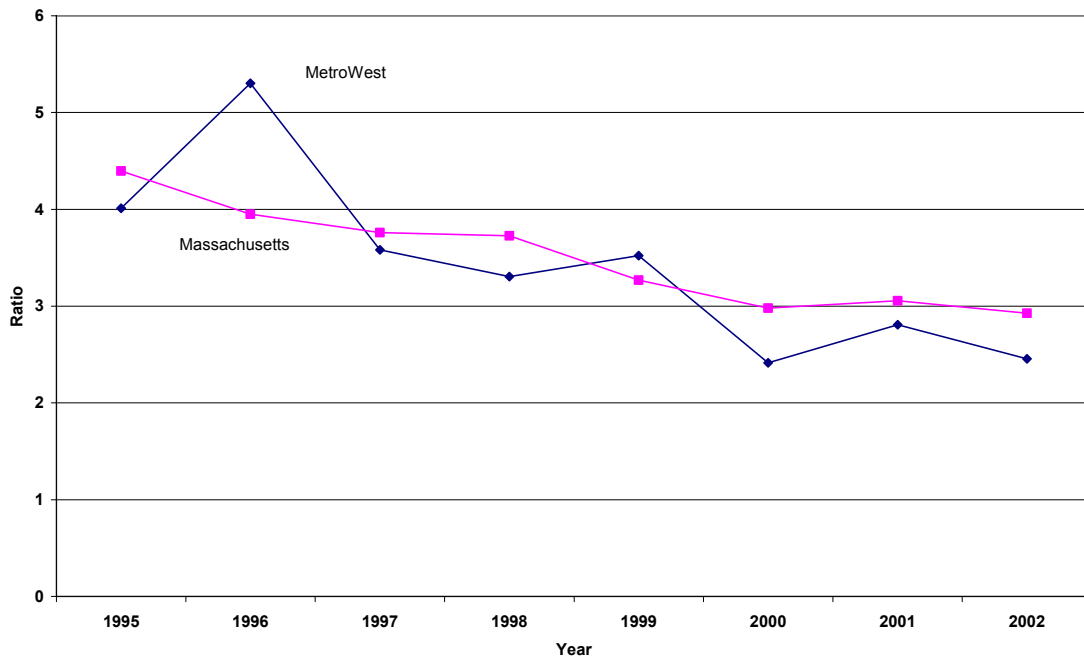


Figure 9: Trend in Ratio of Invasive to Non-Invasive Breast Cancer, MetroWest and Massachusetts

Major Cancers by Race/Ethnicity

The MetroWest Health Data Book & Atlas contains significant discussion of health disparities, especially by race and ethnicity. Included in the discussion are some of the major issues in isolating the causal factors involved: lifestyle; environment; access to and use of quality care; tendencies to follow or not follow medical regimens; genetics; and interactions between genetics, lifestyle, and environmental factors.

As discussed in the Data Book, race and ethnicity groups have become *socially* constructed in recent times, a historical change. For example, in 1920, the U.S. Census used separate race categories of White, Black, Mulatto, Indian, Chinese, Japanese, Filipino, Hindu, Korean, and Other. Race was classified by a census-taker, and only one category could be used. Currently, White, Black, American Indian or Alaska Native, Asian, Native Hawaiian or Pacific Islander, and Other are the race categories checked by the census respondent. More than one race category may be selected. Ethnicity (not Race) is Hispanic or not Hispanic. Because of Office of Management and Budget regulations, health data will increasingly conform to this scheme.

But cancer incidence is not correlated with race and ethnicity or genetics in any simple way, but typically by a complex interaction.^a One illustration is contained in the results of a recent report on the Nyanza site in Ashland that “demonstrate a consistent pattern of an increased cancer risk for individuals in the study who reported water contact exposures in specific locations both on and off the Nyanza site property. . . . [A]s a result of this information, the findings suggest that a *gene-environment* interaction may exist among individuals who reported water contact exposures in certain areas of the Nyanza site in the past and had a family history of cancer,” the report says.⁸

^a The relationship of the socially constructed race and ethnicity groupings to genetics is complex in ways that are important for examining variations in cancer incidence. Researchers use terms such as populations, evolutionary lineages, fuzzy sets, clusters, extended families, natural selection, migration, genetic drift, clines, clades, and haplogroups to analyze the historical dispersion of ancestral groups and their characteristics. Y chromosome and mitochondrial DNA data have become important tools in the analytic process. These methods are of vital interest in understanding the underlying dynamics of variation in cancer incidence among population groups and its determination by both genes *and* environment. For example, it has been discovered that there is a cline, or gradient, for skin color that roughly follows the sunlight exposure of population groups in ancient times and that darker skin is protective against melanoma. An elevated rate of melanoma is dependent on both environmental exposure (to sun) and a genetic characteristic (low levels of melanin produce white skin). Therefore, on this basis we can explain the elevated levels of melanoma for persons claiming White race, and even some variation in melanoma *among* persons who are socially identified as “White,” but are of different ancestries.

All Cancers

For all invasive cancers, for Massachusetts as a whole, Black residents have a slightly higher age-adjusted cancer incidence rate than do White residents. Hispanic and Asian residents have far lower rates, as are illustrated in Figure 10. This pattern is slightly different from the pattern in MetroWest. In MetroWest, as shown in Figure 11, White rates are significantly higher than those for Blacks, Hispanics, and Asians, who are not different from each other. Thus, the disparity between Black and White residents observed statewide is reversed in MetroWest.

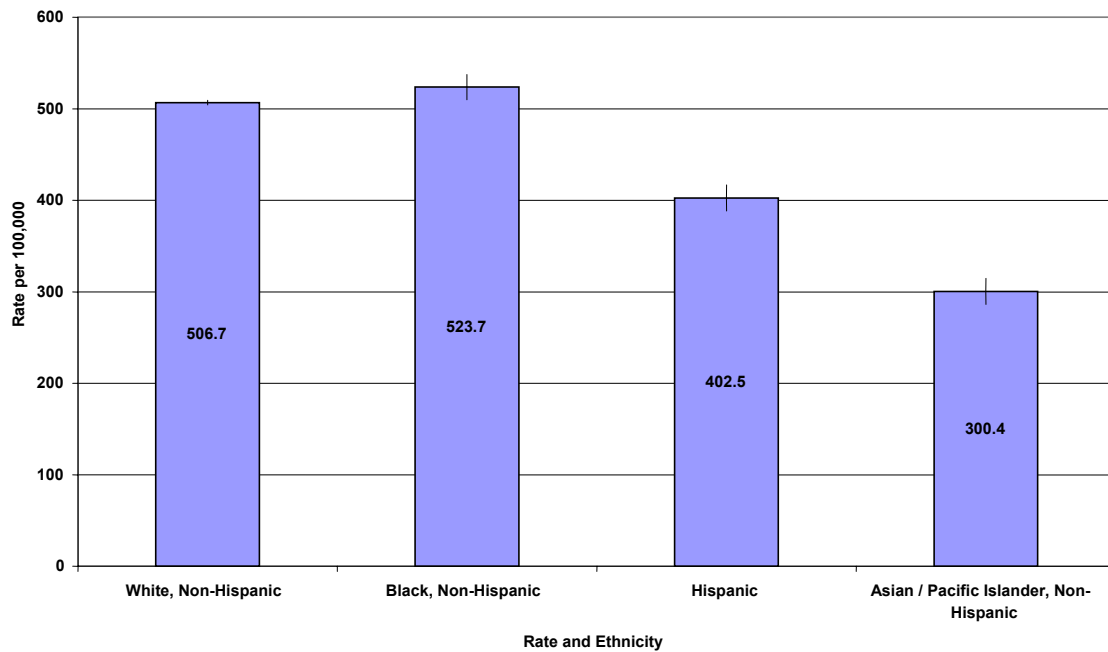


Figure 10: Massachusetts Overall Age-Adjusted Cancer Incidence Rates, By Race and Ethnicity, 1998-2002

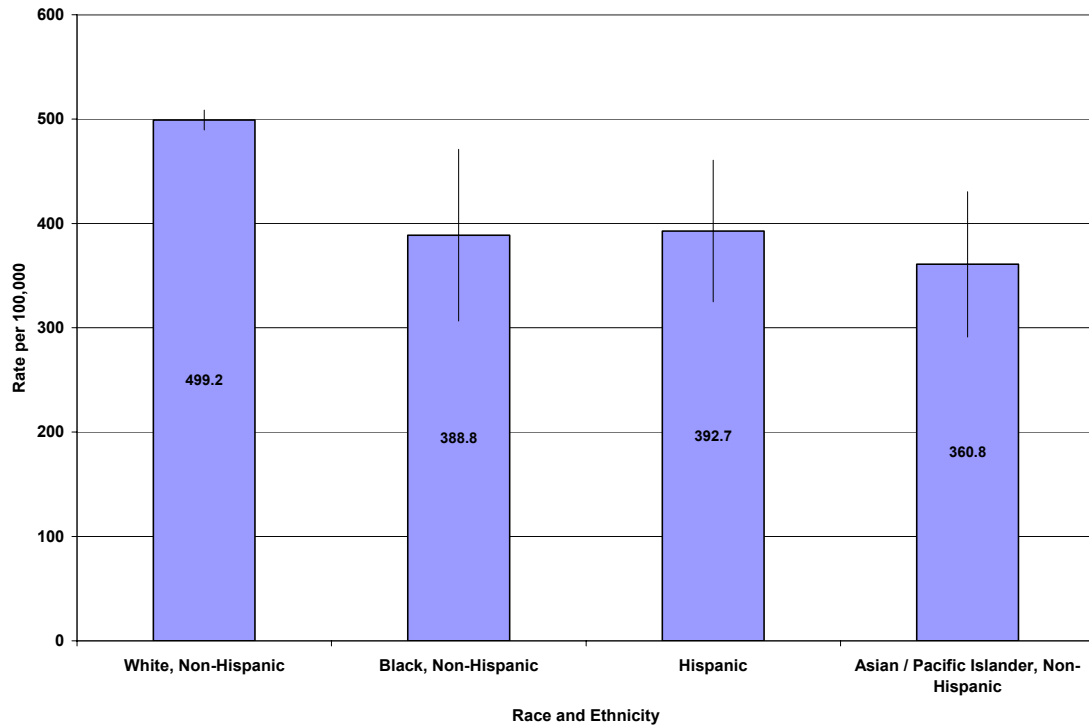


Figure 11: MetroWest Overall Age-Adjusted Cancer Incidence Rates, by Race and Ethnicity, 1998-2002

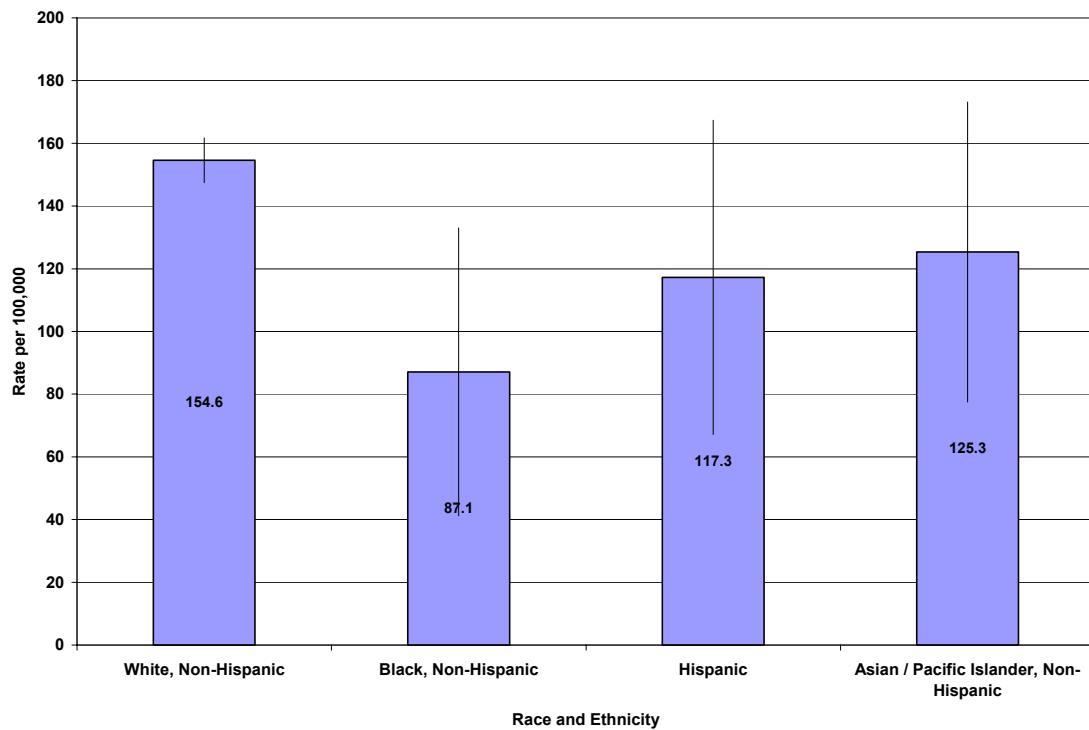


Figure 12: MetroWest Breast Cancer Rate by Race and Ethnicity, 1998-2002

In MetroWest, as illustrated in Figure 12, Black non-Hispanic rates for invasive breast cancer are significantly lower than those for White non-Hispanics. Rates for Hispanics and Asians are not significantly different from the rates for either Black or White residents.

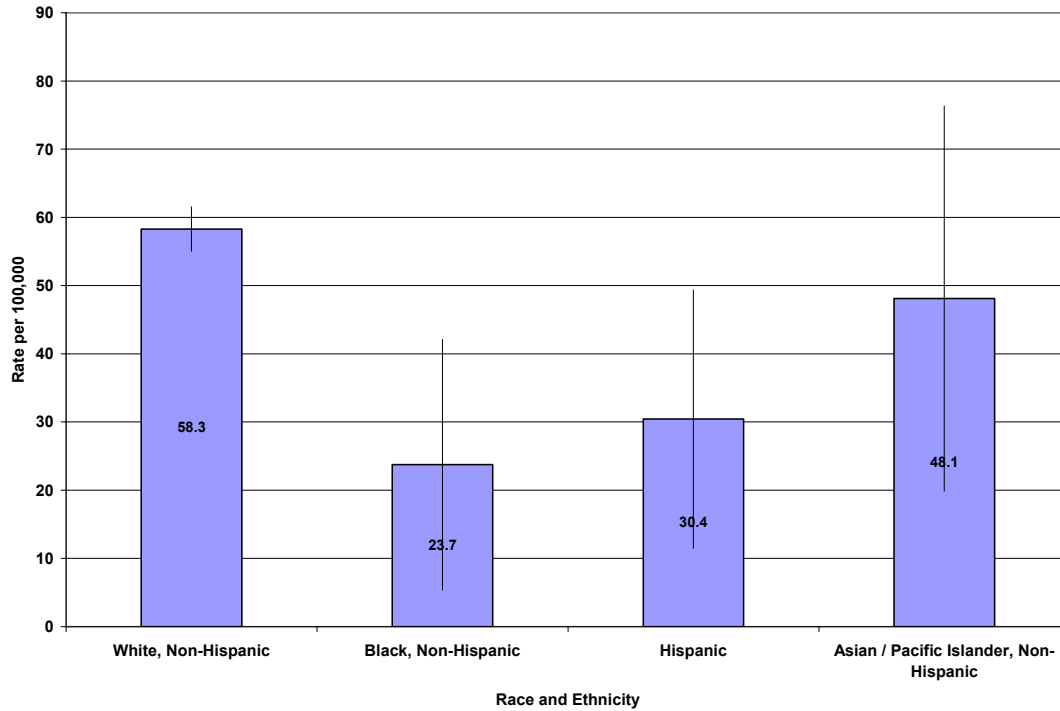


Figure 13: MetroWest Age-Adjusted Colorectal Cancer Rate, by Race and Ethnicity, 1998-2002

Conclusion: MetroWest White non-Hispanic rates of colorectal cancer are significantly higher than Black non-Hispanic and Hispanic rates, but not different from Asian rates, as illustrated in Figure 13.

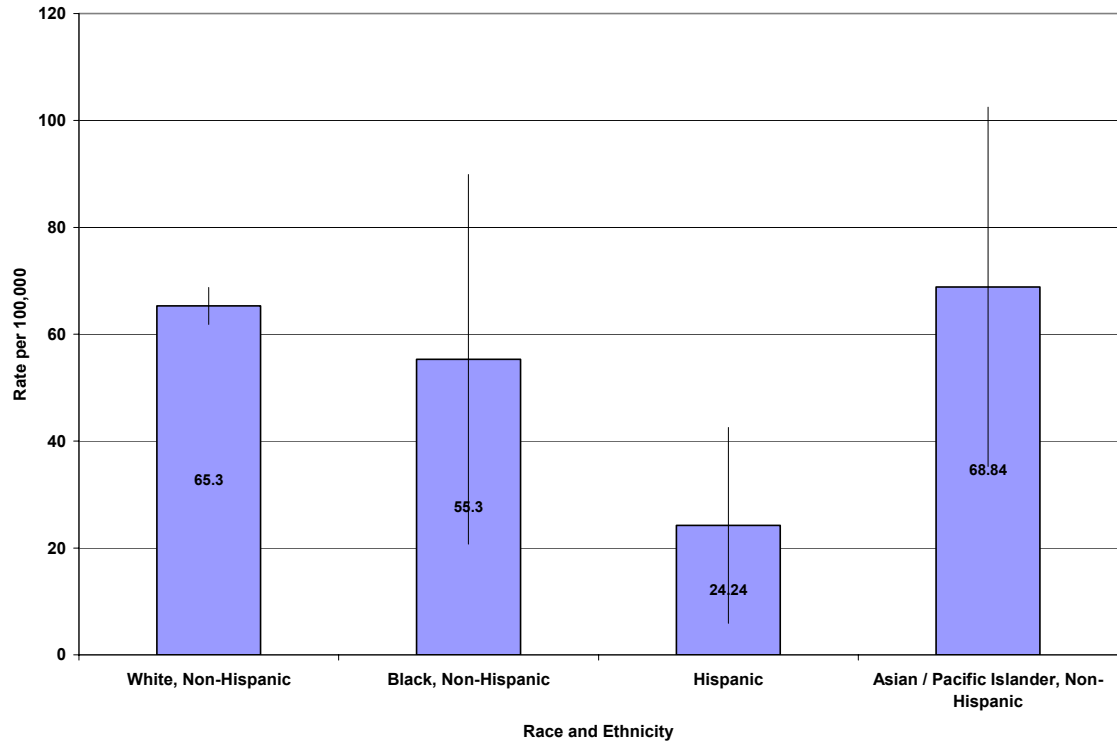


Figure 14: MetroWest Age-Adjusted Lung Cancer Rate, by Race and Ethnicity, 1998-2002

Conclusion: MetroWest lung cancer rates are significantly lower for Hispanic residents than for White residents, as is illustrated in Figure 14. The principal risk factor for lung cancer is smoking.

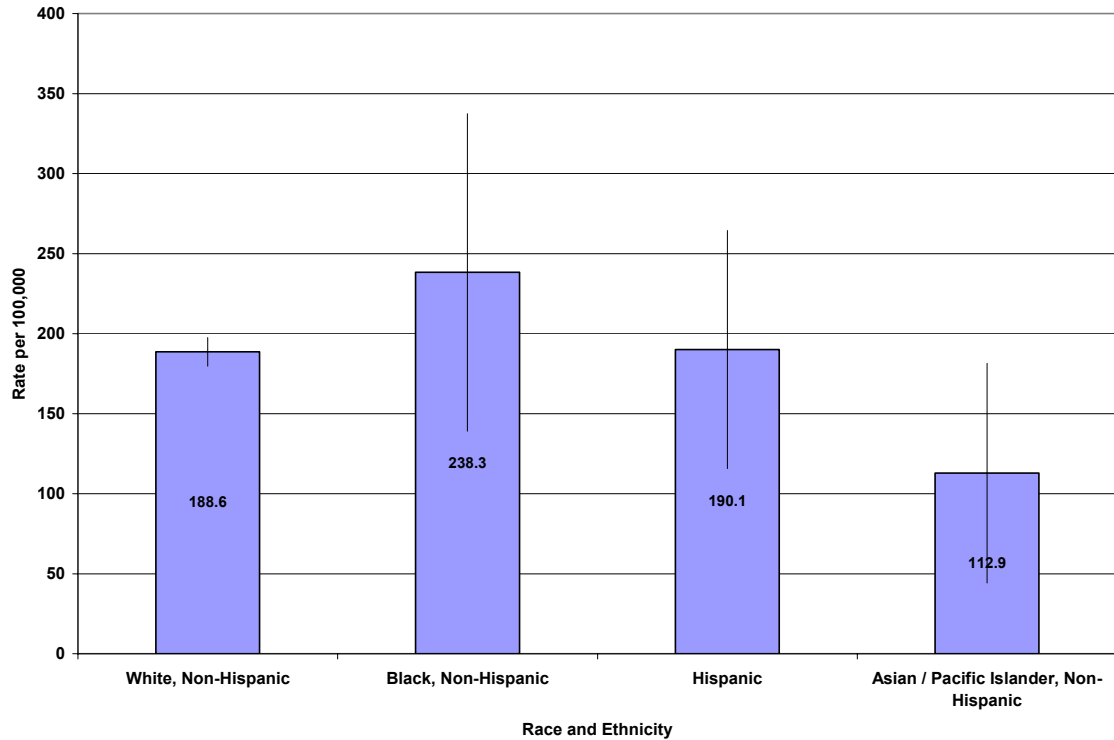


Figure 15: MetroWest Age-Adjusted Prostate Cancer Rate by Race and Ethnicity, 1998-2002

Conclusion: As illustrated in Figure 15, MetroWest rates for prostate cancer are significantly lower for Asians than for Whites. No other results were significantly different from one another.

Summary of Race/Ethnicity Disparity

On the basis of the data available, we must conclude the following:

- Overall, age-adjusted cancer rates are significantly higher for MetroWest White residents than for Black, Hispanic, or Asian residents. No other comparisons are statistically significant. This finding contrasts with results for Massachusetts as a whole, where Black residents have a slightly but significantly higher age-adjusted all-cancer rate, followed by White residents, Hispanic residents, and Asian residents, in descending order.
- Breast cancer rates are higher for White residents than for Black residents. No other differences are statistically significant.
- Colorectal cancer rates are higher for White residents than for Black and Hispanic residents. Rates for Asian residents are not statistically different from those for White residents.
- Lung cancer rates are higher for White residents than for Hispanic residents. No other comparisons are statistically significant.

- Prostate cancer rates for MetroWest race/ethnicity groups are not statistically different.

Data Note

The incidence rates are all age-adjusted to account for the large differences in age distributions for White, Black, Hispanic, and Asian populations. The age-distribution numbers used as the rate denominators are based on the best possible estimates from the U.S. Census. To the extent that an estimated denominator population is too small, the rate for that population will be increased artificially. To the extent that an estimated denominator population is too large, the rate for that population will be decreased artificially. To the extent that a population group is in fact older than the Census estimates provide, that population group will have an artificially high age-adjusted incidence rate. This rate will occur because the more aged population, where most incident cases are detected, will have a truly higher numerator and an artificially low denominator. Combined, these factors produce a higher age-adjusted rate.

Major Cancers by Stage of Diagnosis

The MCR provides data on the *stage* of the cancer *at the time of diagnosis*. This is a potentially important indicator, since to the extent that early treatment is useful, early-stage detection is indicated.⁹ Screening and health-education efforts may result in more early detection of certain cancers. The MCR has defined stage “as the extent to which a tumor has spread at the time of diagnosis. There are four stages presented here: local, regional, distant and unknown. Local disease is confined to the organ of origin. Regional disease has spread to adjacent organs or tissues and/or regional lymph nodes. Distant disease has spread to distant organs or nodes. When stage cannot be discerned the tumor is staged unknown.”¹⁰

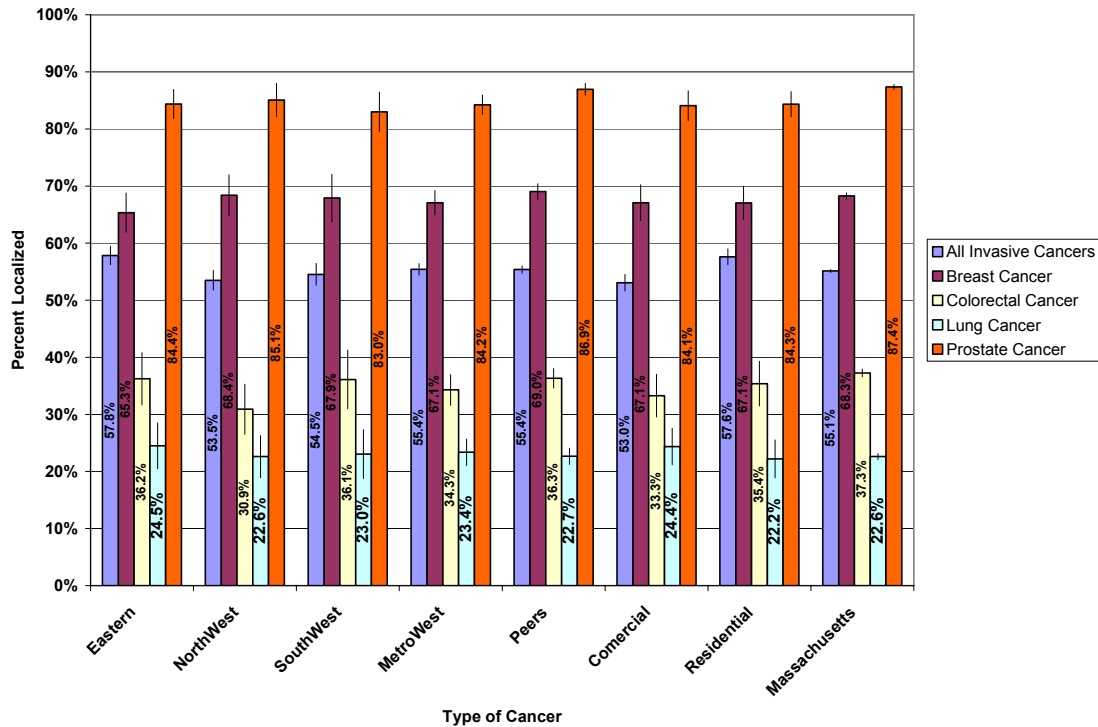


Figure 16: Percent of Localized Stage Cancer, for Major Cancers, 1998-2002

The major findings of the comparative analysis of stage of disease at diagnosis summarized in Figure 16 is that there are major differences in stage by type of cancer, but small differences in different geographic areas. Overall for all cancers, MetroWest has 55.4% diagnosed at the local stage, while Massachusetts has 55.1% diagnosed at the local stage. But for specific major cancers, the results are contradictory. For example, localized stage for prostate cancer is 84.2% for MetroWest but 87.4% for Massachusetts; for colorectal cancer, 34.3% for MetroWest but 37.3% for Massachusetts; for breast cancer, 67.1% for MetroWest but 68.3% for Massachusetts. For lung cancer the difference is reversed—23.4% in MetroWest and 22.6% in Massachusetts—but the difference is slight.

Race and Ethnicity and Stage of Diagnosis

It has been reported that Blacks are diagnosed at a later stage of disease than Whites for certain cancers, i.e., colorectal, lung, breast, cervical, and prostate. A recent careful study using census block-group data indicates that for several of these cancers, the correlation is mostly explained by SES differences. Race plays an independent role in stage at diagnosis only for breast and prostate cancer, and for these cancers, biology may play a role.¹¹ These differences are not observed for “all cancers” in Massachusetts, with the exception that Asians at both the MetroWest regional and state levels are less likely to be diagnosed with localized disease. At the state level, breast cancer is more likely to be diagnosed at the localized stage in White women than in other women. This trend recurs for MetroWest, but the numbers are very small and not statistically significant. Prostate cancer is slightly less likely to be diagnosed at the localized stage in MetroWest among Blacks and Asians than

among Whites and Hispanics, but here too, the numbers are very small. Statewide, there are no significant differences in the stage of diagnosis of prostate cancer for different race and ethnicity groups. One important caveat is that the trends for stage of cancer diagnosis are not adjusted for age.

Race and Ethnicity and Mortality

Since the work on the MetroWest Health Data Book & Atlas was completed, an additional year of mortality data has been released. The summary for cancer mortality is as follows:

For no cancers are there statistically significant Black-White differences in the MetroWest region. For “all cancers,” and lung and prostate cancers specifically, White rates are higher than Hispanic and Asian rates in MetroWest.

This summary contrasts with the picture at the state level, where for all cancers, breast, colorectal, and prostate, Black age-adjusted mortality is higher than White mortality. With the exception of lung cancer, at the state level, age-adjusted mortality rates are higher for Whites than for Hispanics and Asians.

Geography	All Cancers	Breast	Colorectal	Lung	Prostate
MetroWest	W>H,A	n.s.	n.s.	W>H,A	W>H,A
Statewide	B>W; W>H,A	B>W; W>H,A	B>W; W>H,A	W>HA	B>W; W>H,A

Figure 17: Massachusetts Race and Ethnicity Differences in Major Cancer Mortality, 1999-2003

Special Notes on Melanoma/Skin Cancer

Malignant melanoma ranks behind the major cancers in age-adjusted incidence rate, and far below these cancers in mortality. Yet as noted earlier in this report, there were significant differences between MetroWest and Massachusetts in the incidence of this disease. The data in Figure 18 demonstrate two things: (1) the persistence of this pattern over time and (2) the increasing diagnosis of melanoma within the past several years. This increase continues a trend noted in reports from the MCR going back to 1989 for both men (melanoma only: 8.4 per 100,000 in 1989 to 14.4 per 100,000 in 1996)¹² and women (melanoma only: 7.0 per 100,000 in 1989 to 9.8 per 100,000 in 1998).¹³

In the years 2001 and 2002, there appears to have been a large jump in age-adjusted rates of melanoma/skin cancer in MetroWest.¹⁴ The increase results, no doubt, from the fact that in 2001 the MCR started to collect reports of incident cases from dermatologists and dermatopathology labs (see Appendix A).

Race/Ethnicity

Melanoma is a disease that affects White residents more than other residents. For example, in 2002 the Massachusetts age-adjusted rate for Asians was 4.7 per 100,000, while for Hispanic residents it was 2.4, for Whites 23.0 and for Blacks 0.0! It is of some interest to determine whether the higher skin cancer rate for MetroWest is due simply to the greater percentage of White residents.

Figure 19 indicates that even for White-alone residents, MetroWest has a higher rate of skin cancer than for Massachusetts as a whole. While for no single year except 2002 were the rates significantly different, the pattern is unmistakable and highly statistically significant.

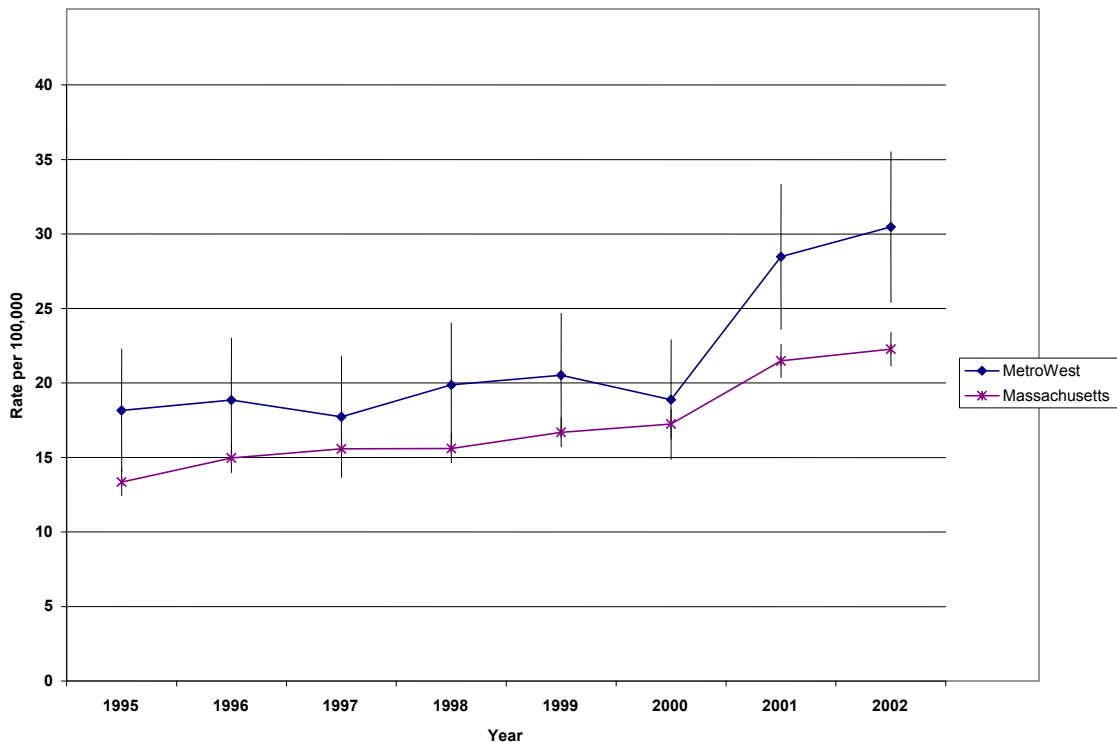


Figure 18 : Trend in Melanoma/Skin Cancer Age-Adjusted Rates, Invasive

There is no clear answer as to why MetroWest should have a consistently higher rate than Massachusetts as a whole. Several hypotheses are reasonable:

Differences in reporting rates for MetroWest acute-care institutions and medical practices. To the extent that MetroWest-area hospitals and dermatologists are more likely to report melanoma, this might increase the case-finding rate for MetroWest.

Differences in exposure. To the extent that MetroWest White residents experience greater exposures than all White residents of Massachusetts, this would produce systematically higher rates for MetroWest than for all state residents. However, no data exists to suggest that differential exposure occurs.

Genetic differences (the melanin deficit hypothesis). To the extent that the White “ethnicity distribution” of MetroWest White residents is different from that of Massachusetts as a whole, this might produce higher rates for MetroWest, even with the same level of exposure. Several risk factors have been proposed in the literature to explain differences within the White population: fairer skin color, hair color, eye color, freckles or a tendency to freckle with sun exposure, tendency to sunburn rather than tan, and specific subgroups within the White population. As noted in a publication of the U.S. Environmental Protection Agency, epidemiologic research has determined, for example, that Hispanic Whites in New Mexico “have much lower rates than those of non-Hispanic Whites; individuals from the Mediterranean countries in southern Europe tend to have lower rates than Caucasians from northern Europe; individuals of Celtic origin in Australia tend to have higher rates than non-Celtic individuals. Variation in the incidence of CMM [cutaneous malignant melanoma] is commonly thought to be a function of variation in genetically-determined pigmentary traits across ethnic groups.”¹⁵ Thus, to the extent that MetroWest White residents are more likely of Celtic and northern European origin than southern European origin, this might explain the difference in rates of melanoma for the White MetroWest and Massachusetts populations.

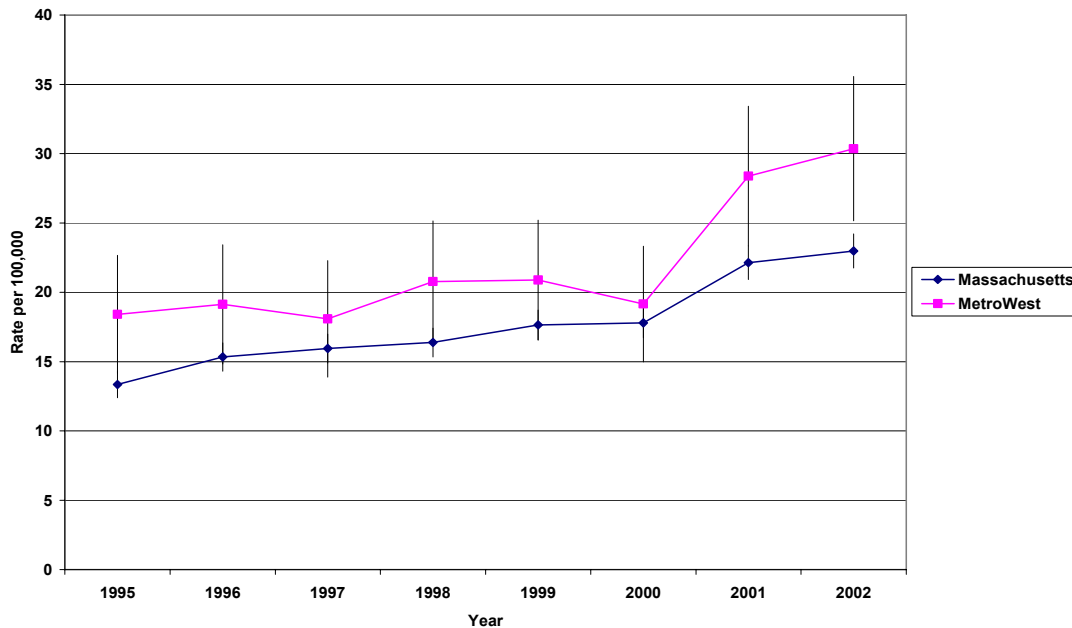


Figure 19: Trend in Age-Adjusted Melanoma/Invasive Skin Cancer Rate, White-Alone Race

MetroWest residents are more likely to be of northern than southern European origin than is true of Massachusetts as a whole. The ratio of MetroWest northern European to southern European ancestry residents, on the basis of the U.S. Census, is 2.37:1, while for Massachusetts as a whole, the ratio is 2.06:1.¹⁶ Figure 19, for White-alone residents of Massachusetts, suggests a slow increase over time in melanoma incidence, even beyond the reporting change occurring in 2001 and 2002. The cause of this trend is unknown.

Stage

Skin cancer is typically diagnosed at an early (local) stage. For both MetroWest and Massachusetts, the rates were approximately 85% local diagnosis from 1995-2002, with some apparently random fluctuation.

Special Note on Early Stages of Colorectal Cancer

Two measures are reported in the Cancer Registry data-set for which there is a distinction between invasive and non-invasive (in situ or stage 0) cancer. Breast cancer shows a pattern of an increasing percentage of stage 0 incidence relative to all breast cancer incidence. Colorectal cancers show a somewhat different pattern, as illustrated in Figure 20. While Massachusetts and MetroWest patterns seem to have tracked closely until 2001, the rates diverge in 2001 and markedly in 2002, with the MetroWest rate percentage lower than that for Massachusetts. Thus, fewer colorectal cancers, relatively, are detected at stage 0 in MetroWest than in Massachusetts as whole. It should be cautioned that these data are based on a relatively small number of non-invasive colorectal cancers; invasive cancers typically represent approximately 90% of all cases.

The MCR has published data on colorectal cancer suggesting that the sum of in situ (stage 0) and localized (stage 1) cancers increased in 1995, 1998, and 2001, and that regional and distant-stage colorectal cancers declined as a percentage of all colorectal cancers. According to the same source, the “age-adjusted percentage of Massachusetts adults age 50 and older who had a sigmoidoscopy or colonoscopy screening for colorectal cancer in the past five years increased from 27% in 1993 to 45% in 2001.” Finally, the MCR report notes that both lifestyle changes and screening may reduce the incidence of and mortality due to colorectal cancer: “There is a 90% chance of survival five years beyond diagnosis if a patient is diagnosed at the earliest, most treatable stage. However, this survival rate drops to less than 10 percent for those diagnosed with advanced disease.”¹⁷

Recommended lifestyle changes to reduce the incidence of colorectal cancer include performing physical activity for at least 30 minutes per day, maintaining a healthy weight, taking a multivitamin with folate every day, limiting alcohol to one drink per day for women and two per day for men, limiting red meat to two servings per week, eating five or more servings of fruits and vegetables per day, not smoking, eating foods that contain calcium or taking a calcium supplement every day, and getting a regular colorectal cancer screening starting at age 50.¹⁸



Figure 20: Trend in Local-Stage Colorectal Cancer as a Percentage of All With Known Stage of Cancer

Special Note on Uterine Cancer

Uterine cancer is ranked sixth of the cancer *rates* reported by MassCHIP, based on MCR data. Uterine cancer was not selected for special focus in this report, since there were no significant town-level differences—except for Sudbury, which had a significantly low rate, and the Residential region as a whole, which also had a significantly low rate. In addition, uterine cancer falls far behind the leading cancers in terms of average annual counts in MetroWest for the period 1998-2003: female breast (383), prostate (374), lung (280), colorectal (252), melanoma (109), non-Hodgkin’s lymphoma (78), uterine (64).

Discussion

The 2005 MetroWest Health Data Book & Atlas showed higher MetroWest rates of hospitalization for breast cancer among Black women than White women, and higher MetroWest rates of prostate cancer hospitalization among Black men than White men. MetroWest Black-White differences in cancer mortality cannot be demonstrated.

The main differences that can be demonstrated to a statistically significant degree are White incidence rates for lung and prostate cancers, which are higher than Hispanic and Asian rates for these cancers.

Statewide, however, there are clear Black-White cancer mortality differences: Blacks have a higher age-adjusted rate than Whites for all major cancers except lung cancer; Whites have higher age-adjusted mortality than Hispanics or Asians for all major cancers.

One has to suspect several different factors working to create the patterns noted in the available data:

- **Genetic predispositions to certain kinds of diseases in certain populations and in certain environments (e.g., prostate cancer, melanoma)**

The research literature suggests a genetic component to the elevation in the prostate cancer incidence rate for African-American men, but lower rates have also been noted among *African* men, so that the causal associations are not clear.¹⁹ The ancestry variation among White populations may account for variation in melanoma rates.

- **Differences in physical environment**

There is no indication in the data on environmental health that one region or another is significantly cancer-genic. The slight increase in skin cancer observed may be related to the gradual trend of ozone-layer depletion—although the limited time frame of the analysis makes this doubtful as an explanation. Alternatively, the rate differences in melanoma may result from increased reporting.

- **Differences in lifestyle (e.g., smoking)**

The Eastern/Residential area has a significantly low rate of smoking and a significantly low rate of lung cancer.

- **Differences in screening (e.g., for breast cancer)**

MetroWest Black women showed a significantly higher hospitalization rate for breast cancer, yet a lower incidence rate than White women. At the state level, breast cancer is more likely to be diagnosed at the localized stage in White women than in other women. This trend recurs for MetroWest, but the numbers

are very small and not statistically significant. However, on the basis of the Behavioral Risk Factor Surveillance System (BRFSS) survey, at the state level, there appear to be no race/ethnicity differences in mammography screening rates. Unfortunately, lab-reported mammography screening data are not collected by race and ethnicity. Thus, no definitive conclusions can be drawn about race disparities in breast cancer in MetroWest—but some indications favor attention to early detection of breast cancer in Black women.

Recommendations

- Further examine issues of screening and patient education for prostate cancer, due to the fact that prostate cancer is currently diagnosed at a later stage in MetroWest, and that screening rates are still far below desired levels.
- Continue to examine the reasons for the slight elevation of invasive breast and prostate cancer rates in the Eastern/Residential communities.
- Further examine the deviation in melanoma rates between Massachusetts and MetroWest, to ascertain why MetroWest rates are consistently higher, and examine the potential for improved resident education and screening for skin cancer.
- Convene a panel of oncologists to further examine the data and issues, including the elevated lung cancer rate in Millis, invasive breast cancer rate in Holliston, and prostate cancer rate in Needham.
- Support lifestyle-change programs to reduce cancer incidence, particularly as many of these changes would also reduce the incidence of other diseases, including metabolic syndrome diseases such as diabetes.

Appendix A

Excerpts from the Massachusetts Department of Public Health Cancer Incidence Report²⁰

METHODS

Data Sources

Cancer Incidence

The MCR collects reports of newly diagnosed cancer cases from all Massachusetts acute care hospitals and one medical practice association (76 reporting facilities in 2002). In the year 2001, the MCR started to collect reports from dermatologists' offices (about 230 offices) and dermatopathology laboratories (2 laboratories), particularly on cases of melanoma. In the year 2002, the MCR started to collect reports from urologists' offices and a general laboratory. 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.

In addition, the MCR identifies previously unreported cancer cases through death certificate clearance to further improve case completeness. This process 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 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.

...

Each year, the North American Association of Central Cancer Registries (NAACCR) reviews cancer registry data for quality, completeness, and timeliness. . . . For 1998-2001, 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 as well as in six other certification elements for each year from 1998-2001. Certification results for the year 2002 have not yet been released.

The Massachusetts cancer cases presented in this report are primary cases of cancer diagnosed among Massachusetts residents during 1998-2002 and reported to the MCR as of October 27, 2004. These data include late reported cases that were not included in the previous report. Cancer site/types were grouped according to coding definitions adapted from the National Cancer Institute's (NCI) Surveillance, Epidemiology, and End Results (SEER) program . . . Most of the Massachusetts data presented are invasive cancers, with the exception of urinary bladder and breast cancer. Both *in situ* and invasive cancers are presented for these sites. 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. The breast *in situ* data are presented separately from the breast invasive data and are not added into the totals for all cancer sites combined. Due to the specific nature of the diagnostic technique and treatment patterns, *in situ* and invasive cancer of the urinary bladder are combined, and *in situ* urinary bladder is added into the totals for all cancer sites combined.

The national incidence data are from NAACCR. The NAACCR incidence rates include data from 28 states and 5 metropolitan areas and cover 55% of the United States population including Massachusetts.^a At the time of publication, 2001 was the latest diagnosis year from NAACCR available for public use. As a result, the NAACCR incidence rates cover the time period 1997-2001.

Definitions

Population Estimates

All of the population data were obtained from the Massachusetts Department of Public Health (MDPH) using the Massachusetts Community Health Information Profile (MassCHIP) demographic/census files. The 1998 data are based on estimates from the Massachusetts Institute for Social and Economic Research (MISER). The 1999 data are based on a linear interpolation between the 1998 MISER population estimates and MDPH 2000 population estimates. The 2000-2002 data are based on the Massachusetts Census file abstracted from the *Census 2000 SF1* file. Census data were reallocated to create mutually exclusive race categories consistent with the race categories used to collect cancer incidence and cancer mortality data. . . .

Race/Ethnicity

The MCR uses an algorithm developed by NAACCR called the NAACCR Hispanic Identification Algorithm (NHIA) to help classify Hispanic ethnicity. The algorithm is only applied to cases with an unknown Spanish/Hispanic origin or cases that have been classified

^a McLaughlin CC, Hotes JL, Wu XC, et al. (eds). *Cancer in North America, 1997-2001. Volume Two and Three: NAACCR Combined Incidence Rates*. North American Association of Central Cancer Registries, Springfield, IL, April 2004.

as Hispanic based on a Spanish surname only. The algorithm uses last name, maiden name, birthplace, race, and sex to determine the ethnicity of these cases.

The race/ethnicity categories presented in this report are mutually exclusive. Cases and deaths are only included in one race/ethnicity category. The race/ethnicity tables include the categories: White, non-Hispanic; Black, non-Hispanic; Asian, non-Hispanic; and Hispanic. The total population in Massachusetts also includes unknown races/ethnicities and American Indians. As a result, the number of cases for the total population is not the sum of cases by race/ethnicity.

Statistical Terms

- *Age-Specific Rates*—age-specific rates were calculated by dividing the number of people in an age group who were diagnosed with cancer or died of cancer in a given time frame by the number of people in that same age group overall in a given time frame. They are presented as rates per 100,000 residents and are site- and sex- specific.
- *Age-Adjusted Rates*—an age-adjusted incidence or mortality rate is a weighted average of the age-specific rates, where the weights are the proportions of persons in the corresponding age groups of a standard 100,000 population. The potential confounding effect of age is reduced when comparing age-adjusted rates for different age-structured populations. The 2000 U.S. Bureau of the Census population distribution was used as a standard. Rates were age-adjusted using 18 five-year age groups. Age-adjusted rates can only be compared if they are adjusted to the same standard population. It is also important to note that differences in methodologies used in calculating rates, such as number of age groups used, may cause slight variations in results.

...

Interpreting the Data

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Cases Diagnosed in Non-Hospital Settings

During the time period covered by this report, the MCR's information sources for most newly diagnosed cases of cancer were 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 new reporting sources may elevate the incidence of melanoma diagnosed in the year 2001 and 2002. In 2002, urologist offices and a general laboratory were added as reporting sources. Some types of cancer in this report may be under-reported because they are diagnosed primarily by private physicians, private laboratories, health maintenance organizations or radiotherapy centers that escape the case identification systems used by hospitals. The extent of this 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.

Definition of Cancer Sites

Note: Including in situ cases in urinary bladder cancer incidence has elevated both the number of cases and rates for this site and for all sites combined compared to reports prior to 1997-2001.

The implementation of ICD-O-3 coding in 2001, and corresponding cancer site recodes, has changed the incidence of some types of tumors, especially ovarian cancer, leukemias, and lymphomas. These changes may affect annual site-specific incidence, causing a drop or spike in 2001-2002 rates, as well as the incidence of all sites combined and average annual incidence rates. Therefore, caution should be exercised when comparing rates in 2001-2002 with those for previous years, as well as when comparing this report with previous ones.

Trends

Trend data should be interpreted with caution. Apparent increases or decreases in cancer incidence over time may reflect changes in diagnostic methods or case reporting rather than true changes in cancer occurrence. Also, cancer incidence trends may appear more favorable than they actually are because they have not been adjusted for reporting error or delay.^A Typically, statewide Massachusetts cancer incidence data are released about two years after a diagnosis year; for example, data for 2001 diagnoses are released for the first time in 2004. The MCR continues to receive case reports on an ongoing basis even after the data are released. The delayed case reports, as well as corrections to cases based on subsequent details from the reporting facilities, result in reporting delay and error; the more recent diagnosis years may be less complete than the earlier diagnosis years. Finally, the following should be considered when interpreting trend data:

- The source of the population estimates differs between 1998 and 1999-2002.
- The EAPC [estimated annual percent change] assumes that the change in rate is the same over the entire time period examined, which may or may not be true for the trends examined in this report.
- If the percent difference in rates between year 2002 and year 1998 is small, the statistical significance of the EAPC may have no practical importance.

Race/Ethnicity

Race/ethnicity data for cancer cases are based on information in the medical record. Race/ethnicity data for cancer deaths are based on information from death certificates as reported by next-of-kin and funeral directors. Errors in these source documents may lead to incorrect classification of race/ethnicity. Also, completeness of the race/ethnicity data may

^b Clegg LX, Feuer EJ, Midthune DN, Fay MP, Hankey BF. Impact of reporting delay and reporting error on cancer incidence rates and trends. *Journal of the National Cancer Institute* 2002; 94:1537-1545.

be different for cancer cases and cancer deaths. Some race/ethnicity categories may be under-reported if race/ethnicity is not available for all cases. Counts and rates may under-represent the true incidence of cancer in some racial/ethnic populations. The NAACCR Hispanic Identification Algorithm (NHIA) has been implemented in this report to help classify Hispanic ethnicity.

Appendix B

Town-Level Analysis of Cancer Rates

See the chart on the following two pages.

Geography	All Types (Invasive)	Bladder	Bone	Brain and CNS	Female Breast (Invasive)	Female Breast (Non-Invasive)	Cervical	Colorectal (Invasive)	Colorectal (Non-Invasive)	Esophagus	Karposi's Sarcoma	Kidney	Larynx	Leukemia	Liver	Lung	Lymphoma, Hodgkin's	Lymphoma, Non-Hodgkin's	Melanoma/Skin	Mesothelioma	Multiple Myeloma	Oral Cavity	Ovary	Pancreas	Prostate	Soft Tissue	Stomach	Testis	Thyroid	Uterine
Dover(E)	NS	NS	0	NS	NS	L05	0	NS	NA	0	0	NA	NA	NA	0	L01	0	NS	NS	NS	NA	NS	NA	NA	NA	NA	0	NS	NA	
Medfield(E)	NS	NS	NA	NS	NS	NS	NA	NS	NA	NA	0	NS	NA	NS	NA	NS	0	NS	NS	NS	0	NA	NA	H05	0	NA	0	NS	NS	
Millis(E)	H05	NS	NA	0	NS	NS	NA	NS	NA	NS	0	NS	0	NA	L01	H01	NA	NS	NS	NS	0	NA	NA	NS	NA	NS	NA	NA	NA	
Natick(E)	NS	NS	NA	NS	NS	H05	NS	NS	NS	NS	0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
Needham(E)	NS	NS	0	NS	NS	NS	L05	NS	NS	NS	0	NS	NA	NS	NS	L01	NA	NS	NS	NS	NS	L01	NS	H01	NS	L01	NA	NS	NS	
Norfolk(E)	NS	NS	NA	NA	NS	NS	NA	NS	NA	NA	0	NS	NA	NA	0	NS	NA	NA	H05	0	L01	NA	NS	H05	0	NA	NA	NA	NS	
Sherborn(E)	NS	NS	0	NA	NS	NS	0	NS	NA	0	NA	NA	0	NA	0	L01	0	NA	NS	NS	NA	0	NA	NS	NS	0	0	NA	NA	
Sudbury(E)	NS	NS	NA	NS	NS	H01	NA	NS	NS	NA	0	NA	L05	NA	NA	NS	NA	NS	H05	NA	NA	NS	NS	NS	NA	NS	NA	NS	L05	
Wayland(E)	NS	NS	0	NS	NS	NS	NA	NS	NA	NS	0	NS	NA	NS	NA	L01	NS	NS	NS	0	NA	NA	NS	NS	NS	NS	NS	NA	NS	
Wellesley(E)	L01	L05	NA	NS	NS	NS	NA	NS	NS	NS	NA	NS	NA	NS	NS	L01	NS	NS	H05	NA	NA	NS	NS	NS	NS	NS	NS	NS	NS	
Framingham(NW)	NS	NS	NA	NS	NS	NS	NS	NS	NS	NS	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
Hudson(NW)	NS	NS	NA	NS	NS	NS	NS	NS	NA	NS	0	NS	NS	NS	NA	NS	NA	L01	NS	NA	NA	NS	NS	NS	NA	NA	NA	NS	NS	
Mariborough(NW)	NS	NS	NA	NS	NS	NS	NS	NS	NS	NS	NA	NS	NS	NS	NS	NS	NS	NS	L01	NA	NS	NS	NS	NS	NA	NS	NS	NS	NS	
Northborough(NW)	L05	NS	0	NA	NS	NS	NA	NS	NA	NA	NA	NS	0	NA	NA	NS	0	NS	L05	NA	NA	NS	NA	NS	NA	0	NA	NA	NS	
Southborough(NW)	NS	NS	NA	NA	NA	H05	NA	L05	NS	NA	0	NS	0	NS	NA	L01	NA	NS	NS	0	NA	NA	NA	NS	NA	NS	NA	NA	NA	
Westborough(NW)	L01	L05	0	NS	NS	NS	NA	L05	NA	NA	0	NS	NA	NS	NA	NS	NA	NS	NS	0	NS	NS	NS	NS	NA	NA	NA	NA	NS	
Ashland(SW)	NS	NS	NA	NS	NS	NS	NA	H05	NS	NA	0	NS	NA	NS	NA	L05	NA	NS	NS	NA	NA	NS	NS	NS	NA	NS	NA	NS	NS	
Bellingham(SW)	NS	NA	0	NS	L01	NS	NA	NS	NS	NA	0	NS	NA	NS	NA	NS	NA	NS	NS	NA	NA	NS	NS	NS	NA	NS	NS	NS	NS	
Franklin(SW)	NS	NS	0	NS	NS	NS	NS	NS	NS	NS	0	L05	NA	NS	NA	NS	NA	NS	NS	NA	NS	NS	NS	NS	NA	NS	NS	NS	NS	
Holliston(SW)	H05	NS	NA	NA	NA	H01	NS	NS	NS	NS	0	NS	NA	NS	NS	NS	NA	NS	NS	0	NS	NS	NS	NS	NA	NS	NS	NS	NS	
Hopedale(SW)	NS	NA	NA	NA	NS	NS	NA	L05	NA	NA	NA	NS	NA	NA	NA	NS	0	NA	NA	0	NA	NA	NS	NS	0	0	NA	NA	NA	
Hopkinton(SW)	NS	NA	NA	NA	NS	NS	NA	NS	H	NA	0	NA	NA	NS	NA	NS	NA	NS	NS	NA	NA	NS	NS	NS	0	NA	NA	NS	NS	
Medway(SW)	NS	NS	NA	NA	NS	NS	NA	NS	NS	NS	0	NS	NA	NA	0	NS	NA	NS	NS	NA	0	NS	NA	NS	NA	NA	NA	NA	NS	
Mendon(SW)	NS	NA	0	NA	NS	NS	NA	NS	NA	NA	0	NA	NA	NA	NA	NS	NA	NS	NS	0	NA	NA	NA	NS	NA	NA	NA	NA	NS	
Milford(SW)	NS	NS	NA	NS	NS	NS	NA	NS	NS	NS	0	NS	NS	NS	NS	NS	NA	NS	NS	NA	NS	NS	NS	NS	NA	NA	NA	NA	NS	

Geography	All Types (Invasive)	Bladder	Bone	Brain and CNS	Female Breast (Invasive)	Female Breast (Non-Invasive)	Cervical	Colorectal (Invasive)	Colorectal (Non-Invasive)	Esophagus	Karposi's Sarcoma	Kidney	Larynx	Leukemia	Liver	Lung	Lymphoma, Hodgkin's	Lymphoma, Non-Hodgkin's	Melanoma/Skin	Mesothelioma	Multiple Myeloma	Oral Cavity	Ovary	Pancreas	Prostate	Soft Tissue	Stomach	Testis	Thyroid	Uterine	
Eastern	NS	NS	NS	NS	H05	H01	L01	NS	NS	NS	NA	NS	L05	NS	NS	L01	NS	NS	H01	NS	L05	NS	NS	NS	H01	NS	NS	NS	NS	NS	NS
NorthWest	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
SouthWest	NS	NS	NS	NS	NS	NS	NS	NS	H01	NS	NA	NS	NS	NS	NS	NS	NS	NS	H05	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MetroWest	NS	NS	NS	NS	H05	H01	NS	NS	H05	NS	NS	NS	NS	NS	NS	L01	NS	NS	H01	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Peers	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	L05	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Commercial	NS	NS	NS	NS	NS	H05	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Residential	NS	NS	NS	NS	H05	H05	NS	L05	H05	NS	NA	NS	L05	NS	NS	L01	NS	NS	H01	NS	NS	NS	NS	H01	NS	NS	NS	NS	NS	NS	L05
	High(.05)				High(.01)			Low (.05)					Low (.01)			NS: Not statistically significant					NA: Suppressed										0: No Cases in 1998-2002

Source: Massachusetts Cancer Registry and MassCHIP. Rates for 1998-2002.

End Notes

¹ MetroWest Community Health Care Foundation. *MetroWest Health Data Book and Atlas*. September 2005. Available at: <http://www.mchcf.org/publications/specialreports.html> Accessed July 18, 2006.

² Several sections of the *MetroWest Health Data Book & Atlas* discussed health risks (e.g., heavy drinking and smoking (see page 48) that are related to cancer; environmental risks (see pages 78-97); screening tests such as mammograms, PSA tests, sigmoidoscopy, blood stool, and pap smears (see page 67); hospitalizations for colorectal, prostate, lung and breast cancer (see page 103); mortality for these same cancers (see pages 110-114); and disparities in several of these rates (see pages 129-131).

³ The test for significance applied here was to examine the individual town or regional rates versus the overall state rate, and the associated confidence intervals. If the confidence intervals did not overlap, then the difference between the individual town or region and Massachusetts was labeled statistically significant. This is a somewhat “conservative” test of significance.

⁴ More commercial towns include Ashland, Framingham, Hudson, Marlborough, Milford, Natick, and Westborough. The remaining MetroWest towns are classified as “more residential.” Peer towns are listed in Appendix C of the *MetroWest Health Data Book and Atlas*.

⁵ Center for Health Information, Statistics, Research, and Evaluation. Massachusetts Department of Public Health. Cancer Incidence and Mortality in Massachusetts, 1998-2002: Statewide Report. May 2005. Available at: www.mass.gov/dph/bhsre/mcr/98/state_report_98_02.pdf Accessed April 20, 2006.

⁶ MassCHIP uses Massachusetts Institute of Social and Economic Research (MISER) intercensal estimates from 1995-1999 and 2000 census denominators from then on. (Saul Franklin, e-mail communication, April 19, 2006)

⁷ Massachusetts Cancer Registry, Massachusetts Department of Public Health. Data Report on *In Situ* Breast Cancer in Massachusetts. Available at: www.mass.gov/Eeohhs2/docs/dph/cancer/registry_data_breast_cancer.pdf Accessed August 1, 2006.

⁸ Massachusetts Department of Public Health. DPH Releases Ashland Nyanza Health Study. April 25, 2006. Available at:

http://www.mass.gov/?pageID=pressreleases&agId=Eeohhs2&prModName=dphpressrelease&prFile=pr_060425_ashland_nyanza.xml Accessed August 14, 2006.

⁹ Staging is described further by the American Cancer Society. Available at: http://www.cancer.org/docroot/ETO/content/ETO_1_2X_Staging.asp Accessed June 30, 2006.

¹⁰ Massachusetts Department of Public Health MassCHIP v3.00 r314. Extended note on cancer staging available with data download. Accessed April 20, 2006.

¹¹ Schwartz KL, Crossley-May H, Vigneau FD, Brown K, Banerjee M. Race, socioeconomic status and stage at diagnosis for five common malignancies. *Cancer Causes Control*. 2003 Oct;14(8): 761-6.

¹² Massachusetts Department of Public Health. *Selected Cancers in Massachusetts Men, 1982-1996*. March 2000. Available at: http://www.mass.gov/Eeohhs2/docs/dph/cancer/registry_men_cancer_82_96.pdf Accessed August 1, 2006.

¹³ Massachusetts Department of Public Health. *Cancer in Massachusetts Women: 1989-1998 Data Report*. August 2002. Available at: http://www.mass.gov/Eeohhs2/docs/dph/cancer/registry_data_women_cancer_89_98.pdf Accessed August 1, 2006.

¹⁴ There are three forms of skin cancer: melanoma, basal cell, and squamous cell. Yearly reports from the MCR include melanoma. Reports available through MassCHIP combine all three types.

¹⁵ Longstreth JD (Ed). Ultraviolet radiation and melanoma—with special focus on assessing the risks of stratospheric ozone depletion. Vol. 4, Appendix A of *Assessing the risk of trace gases that can modify the atmosphere*. Washington, D.C.: U.S. Environmental Protection Agency. 1987. Available at www.ciesin.org/docs/001-545/001-545-C10.html Accessed April 24, 2006.

¹⁶ A key variable for melanoma/skin cancer, such as skin color, changes fairly rapidly in evolutionary time—in comparison with skeletal structure, for example—so that several ancestrally different groups might share the same skin color without being related at all, at least not in modern human times.

¹⁷ Massachusetts Cancer Registry, Massachusetts Department of Public Health. *Data Report on Colorectal Cancer in Massachusetts*. Available at: www.mass.gov/Eeohhs2/docs/dph/cancer/registry_data_colorectal_cancer.pdf Accessed June 30, 2006.

¹⁸ Ibid.

¹⁹ Elevations are noted for Black race; older than age 60; paternal family history of prostate cancer; multiple sex partners; high testosterone levels; benign prostatic hypertrophy; and exposure to high dietary fat and cadmium metal. From Cancer Group Institute, Prostate Cancer. Available at: www.cancergroup.com/em12.html Accessed August 1, 2006.

²⁰ Available at: http://www.mass.gov/dph/bhsre/mcr/98/state_report_98_02.pdf Accessed August 1, 2006.