



Mortality



With advances in health care, nutrition, public health and other factors, the death rate in Massachusetts and in the US has steadily decreased in the past century. In 2007, approximately one of every 120 Massachusetts residents died. One hundred sixty-one years ago, in 1849, it was one out of every 47 residents.

Massachusetts was the first state to mandate the registration of vital statistics – births and deaths – in 1841.

Causes of death, as well as age, race, gender, educational attainment, marital status, and occupation are collected on the death certificate.

The Department of Public Health uses this information to monitor long-term mortality trends in the Commonwealth, identify groups at greatest risk of death from diseases and injuries, and design and implement programs directed toward these groups.

In order to understand the impact of mortality, both the number of deaths and death rates are important. The number of deaths provides insight into the overall public health burden of specific diseases.

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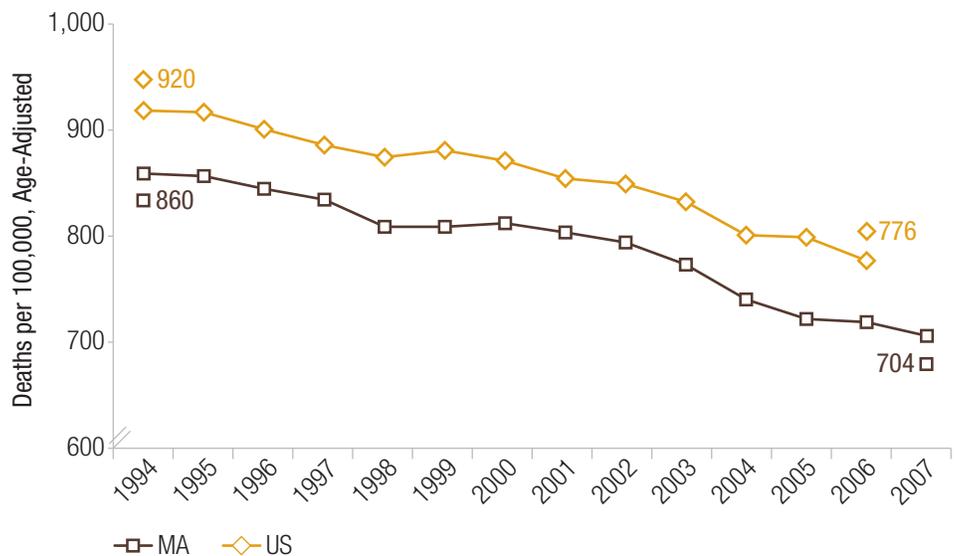
The mortality rates presented in this chapter are age-adjusted.¹ This removes much of the effect of differences in the age distribution when comparing different population groups over time. Mortality rates are presented per 100,000 population.

In addition to risk factors traditionally considered when assessing mortality, variations in death rates may also reflect differences in socio-economic status, access to health care, geography, and other factors.

Overall Mortality

The overall death rate in Massachusetts reached a record low of 704 deaths per 100,000 population in 2007. This compares favorably with the US death rate of 776 per 100,000² (Figure 14.1). Massachusetts death rates have consistently been lower than the US as a whole.

Figure 14.1 Overall Mortality Rates



Massachusetts overall death rates have consistently been lower than the US as a whole.

Source: MDPH Death File, 2007.

Racial and Ethnic Differences

Rates also vary greatly by race and ethnicity, a trend that has been present over time. Blacks have the highest death rate, which is 1.2 times the death rate of Whites, while the rate for Asians continues to be the lowest for all groups.

However, the actual death rates for both Asians and Hispanics may be higher than these rates, and caution is advised when interpreting mortality data for groups with small populations. National studies have shown that Hispanics, Asians and Native Americans may be undercounted in the

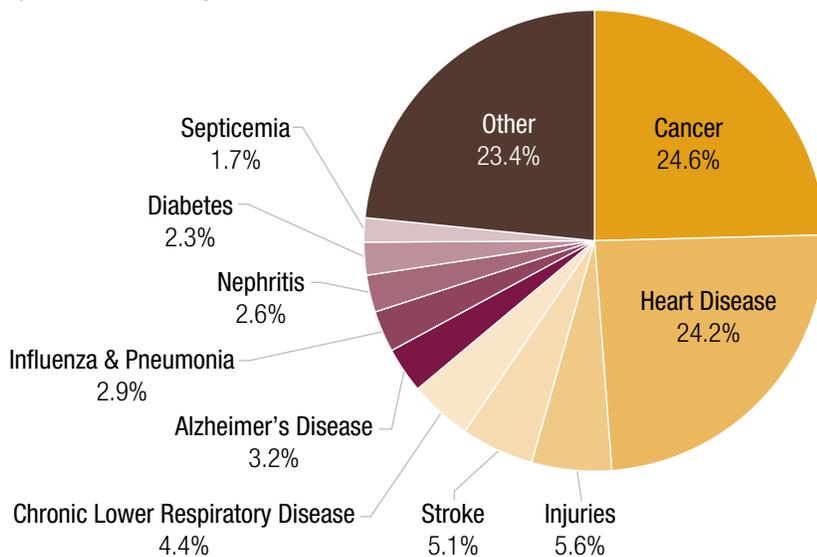
Census and misclassified on death certificates which may also result in artificially low mortality rates.^{3,4,5}

Leading Causes of Death

Ranking the leading causes of death is a useful tool for illustrating the relative burden of cause-specific mortality. Leading causes of death are ranked according to their number, rather than their mortality rate.⁶

Cancer and heart disease account for nearly half of all deaths in 2007, and the top ten leading causes of death account for 75% of deaths. Out of every 100 deaths, 25 are due to cancer, 24 to heart disease, 17 to other chronic diseases, 7 to injuries, and 5 to infections (Figure 14.2).

Figure 14.2 **Leading Causes of Death**



Source: MDPH Death File, 2007.

Leading causes of death also differ by age. In 2007, as in previous years, injuries are the leading cause of death for persons between the ages of 1 to 44, while in older age groups, chronic diseases such as cancer and heart disease are the leading causes of death (Figure 14.3).

In 2007, the two leading causes of death are cancer and heart disease for all race and ethnicity groups. Yet, there are some variations in other leading causes of death according to race and ethnicity.

For example, Alzheimer's disease is among the top 10 leading causes of death only for Whites, and HIV/AIDS is among the top 10 only for Blacks and Hispanics while it ranks 29th for Whites. Homicide is the 7th leading cause of death for Blacks and Hispanics, while it is the 30th for Whites and 21st for Asians (Figure 14.4).

Figure 14.3 Leading Causes of Death by Age

Rank	Age Groups (Number of Deaths)						All Ages
	<1 year	1-14 years	15-24 years	25-44 years	45-64 years	65-74 years	
1	Short Gestation (80)	Unintentional Injuries (20)	Unintentional Injuries (234)	Unintentional Injuries (587)	Cancer (3,149)	Heart Disease (10,798)	Cancer (12,961)
2	Congenital Malformations (63)	Cancer (18)	Homicide (73)	Cancer (317)	Heart Disease (1,655)	Cancer (9,439)	Heart Disease (12,735)
3	SIDS (31)	Homicide (16)	Suicide (50)	Heart Disease (246)	Unintentional Injuries (565)	Stroke (2,475)	Stroke (2,710)
4	Pregnancy Complications (26)	Congenital Malformations (12)	Cancer (35)	Suicide (193)	Chronic Liver Disease (337)	Chronic Lower Respiratory Disease (2,073)	Chronic Lower Respiratory Disease (2,325)
5	Complications of Placenta (20)	Ill-Defined Conditions (9)	Heart Disease (23)	Homicide (64)	Diabetes (249)	Nephritis (1,212)	Unintentional Injuries (2,113)
Total Deaths (Any Cause)	380	124	505	2,023	8,560	41,091	52,690

Source: MDPH Death File, 2007.

Figure 14.4 Rank of Leading Causes of Death by Race and Ethnicity

Leading Cause	White (N=48,518)	Black (N=2,211)	Asian (N=610)	Hispanic (N=1,264)	American Indian (N=40)
Cancer	1	1	1	1	2
Heart Disease	2	2	2	2	1
Stroke	3	6	3	5	–
Chronic Lower Respiratory Disease	4	9	6	16	–
Unintentional Injuries	5	5	5	3	–
Alzheimer’s Disease	6	14	14	15	–
Influenza & Pneumonia	7	15	4	17	–
Nephritis	8	3	8	9	–
Diabetes	9	4	7	4	–
HIV/AIDS	29	8	–	8	–
Homicide	30	7	21	7	–

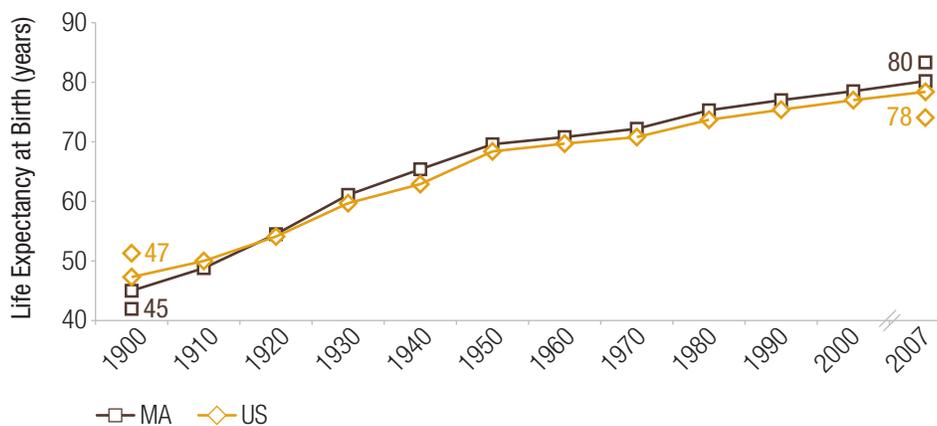
Source: MDPH Death File, 2007.

Life Expectancy

One of the most commonly used measures of the health status of a population is life expectancy. This is expressed as the expected number of years of life at a given age.⁷

Overall, life expectancy reached an all-time high of 80 years in 2007. This means that on average, a person born in Massachusetts in 2007 could expect to live 35 more years than a person born in 1900, when life expectancy was 45 years. Massachusetts life expectancy has been higher than US life expectancy since 1920 (Figure 14.5).

Figure 14.5 Life Expectancy at Birth



Source: MDPH Death File, 2007.

Women of all races live longer than men. For those born in 2007, White women could expect to live 83 years; Black women, 80 years; Hispanic women, 91 years; White men, 78 years; Black men 74 years; and Hispanic men, 83 years. Men who reach age 65 have an additional 18 years life expectancy, while women who reach 65 can expect 21 additional years.⁸

Educational Attainment

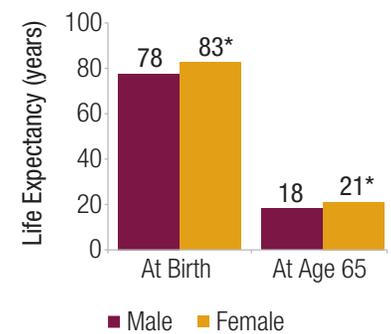
Overall, people with more education have lower death rates. The death rate for those with a high school education or less is almost 3 times higher than the rate for those who have more than a high school education. This is true for each race and ethnicity group.

However, among the more educated, there is enormous variation by race: the rate for more educated Blacks is twice as high as the rate for more educated Whites (359 vs. 181 deaths per 100,000) (Figure 14.7).

Massachusetts life expectancy

reached an all-time high of 80 years in 2007.

Figure 14.6 Life Expectancy

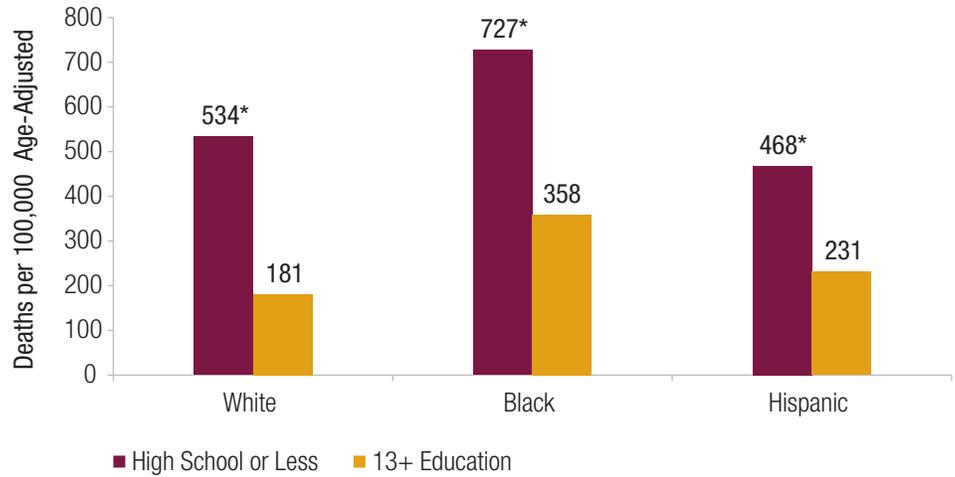


Source: MDPH Death File, 2007.

*Statistically higher than men ($p \leq 0.05$).

Figure 14.7 Mortality Rates, Ages 25-64 Years

Among the more educated, there is enormous variation in death rates by race and ethnicity.



Source: MDPH Death File, 2007.

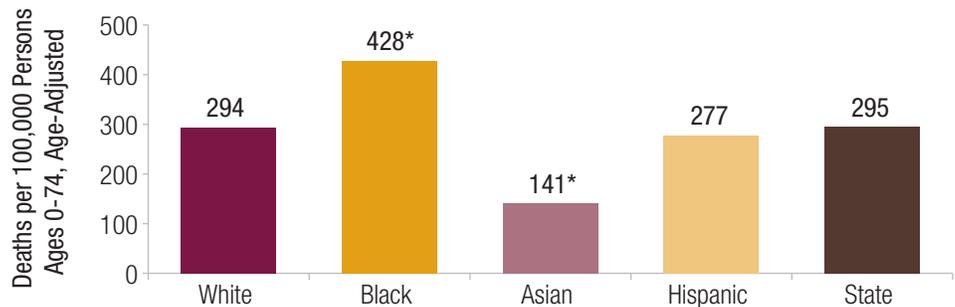
*Statistically higher than those with 13+ yrs of education ($p \leq 0.05$).

Premature Mortality Rate (PMR)

The Premature Mortality Rate (PMR) tells us how many people die before reaching age 75. Though strictly a mortality measure, the premature mortality rate is highly correlated with morbidity indicators (measures of ‘sickness’ rather than death).⁹ Areas where the populations have higher premature mortality rates tend to report poorer general health status, more chronic diseases, and more illness.

The PMR is considered an excellent single measure that reflects the health status of a population, and the need for systematic public health approaches to health promotion and disease prevention. It can help communities identify priority health concerns.

Figure 14.8 Premature Mortality Rates



Source: MDPH Death File, 2007.

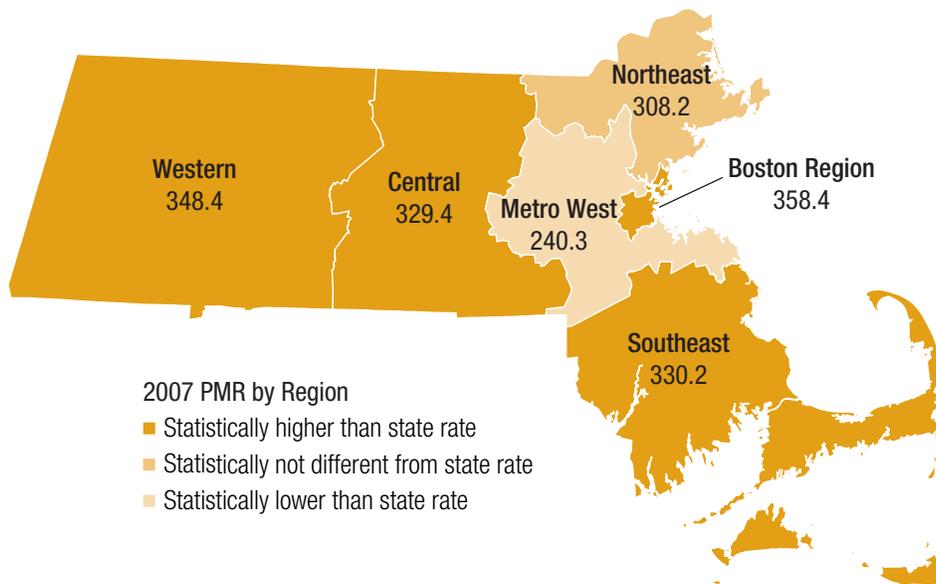
*Statistically different from state ($p \leq 0.05$).

In 2007, the state PMR is 295 deaths per 100,000 persons under age 75 years. Blacks have the highest PMR, experiencing 1.5 times the rate of premature deaths as Whites, while Asians had the lowest PMR (Figure 14.8).

The regions with the highest PMR are the Boston and the Western regions of the state, while the lowest PMR occurs in Metro West (Figure 14.9).

In the Boston Region, the communities with the highest PMR are Chelsea, Revere and Boston. In the Western Region, the communities with the highest PMR are Springfield, Northampton, Holyoke, Agawam, Westfield, West Springfield, Pittsfield and Chicopee.

Figure 14.9 Map of Premature Mortality by EOHHS Regions



Source: MDPH Death File, 2007.

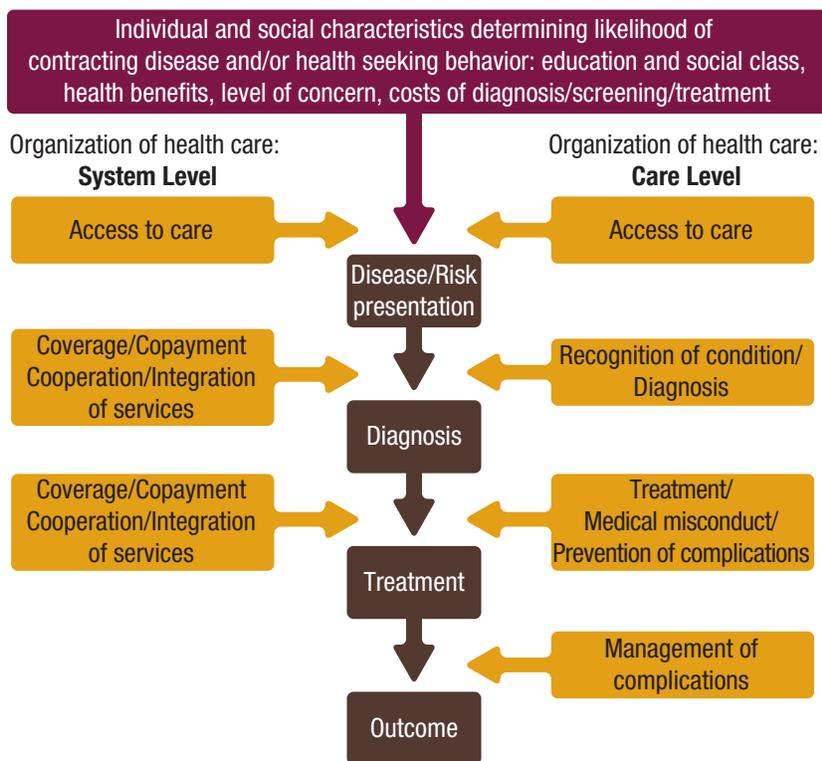
Premature mortality is inversely associated with socioeconomic indicators. Regions with the highest premature mortality rates – Boston and the Western Region – also have the highest proportion of its population with less than a high school education according to the 2000 Census. Accordingly, the region with the lowest PMR – Metro West – has the lowest proportion of its population with less than a high school education in 2000.

Amenable Mortality

Certain causes of premature deaths (deaths before age 75), are referred to as “amenable”, that is, they may not have occurred in the presence of timely and effective health care. This concept was developed in the 1970s in the United

States and has been implemented by many countries as a tool to track changes over time and assess the performance of health care systems.¹⁰ Figure 14.10 shows how timely access to health care and treatment at different stages can reduce the number of deaths for certain diseases.

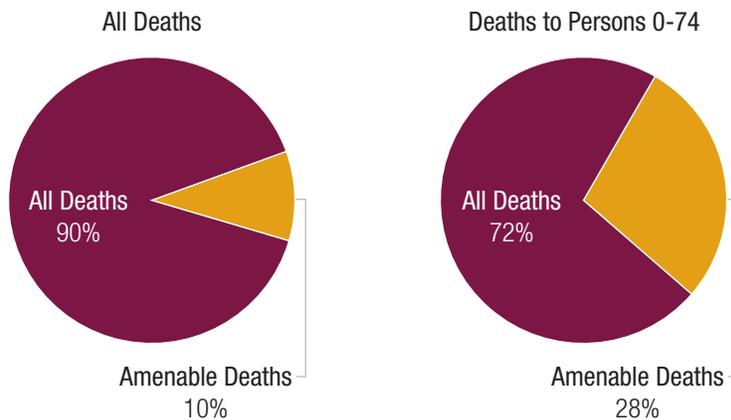
Figure 14.10 Mortality Amenable to Health Care



Amenable mortality helps identify areas where there is room for improvement in access, quality, efficiency and equity in the delivery of health care.

Source: Nolte E, McKee CM. Does Health Care Save Lives? Avoidable Mortality Revisited. London, England: The Nullfield Trust; 2004.

Figure 14.11 Percent Deaths Amenable to Health Care

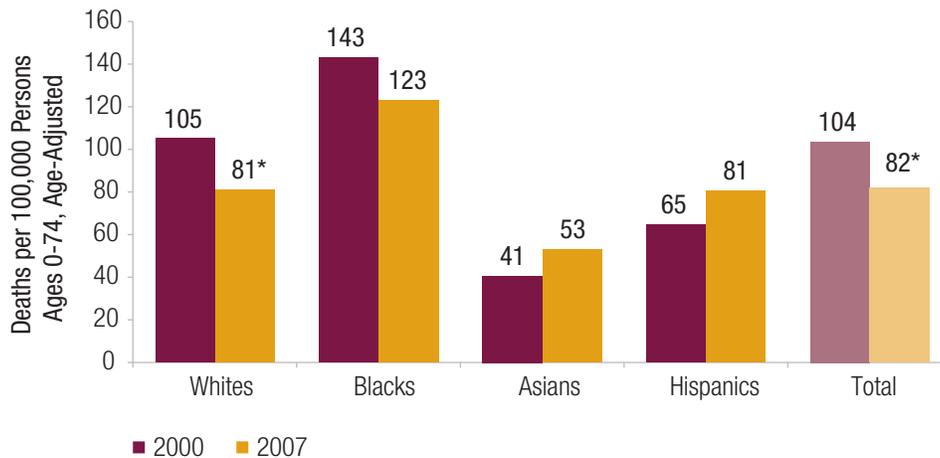


Source: MDPH Death File, 2007.

In 2007, deaths amenable to health care account for 10% of deaths overall. However, they also account for 28% of all premature deaths (Figure 14.11). Since 2000, amenable mortality has declined among Whites and among males and females overall, but there were no statistically significant declines for Blacks or Hispanics (Figure 14.12).

With the implementation of health care reform, amenable mortality may be a useful measure to examine the impact of increased access to medical care.

Figure 14.12 **Amenable Mortality by Race and Ethnicity**



Source: MDPH Death File, 2007. Paper presented at: Public Health Council Meeting; April 2009; Boston, MA.

*Statistically different from 2000 ($p \leq 0.05$).

Summary

In 2007, Massachusetts mortality continues to compare favorably with the US and there are continued declines in many of the leading causes of death. Yet, disparities persist by age, gender, race, ethnicity, geography, and education.

Premature mortality and amenable mortality are frameworks that have been developed to enhance the utility of mortality data. An attractive feature of these frameworks is that they move away from considering single causes or single risk factors of death to taking a broader community perspective.

Premature mortality may be related to socioeconomic status, and its correlates, such as environmental conditions, housing, education, and stress, higher rates of smoking, substance abuse, violence, obesity, and lack of access to care.

Amenable mortality is a useful tool to begin discussions that allow policy makers, community advocates, and public health professionals, to consider more effective and cost efficient approaches to improving the quality of life and health of the public.

FIGURE NOTES

Figure 14.1: Please note that 2007 US data was not available at the time of this release, 2006 US data used.

Figure 14.4: (–) indicates number of deaths was less than 5.

Figure 14.5 & Figure 14.6: Years of Life Remaining calculated using the Greville Abridged Life and Table Method. Source: Dublin LI. Length of Life – A Study of the Life Table. Ronald Press Co. New York.

Figure 14.7: Note that 2000 denominator figures are used since these are the latest number available for population by age and education. Following NCHS presentation of mortality data by education, rates are shown only for ages 25-64 years because persons under age 25 may not have completed their education.

Figure 14.9: Note that PMR for EOHHS Regions are calculated using MDPH population estimates for 2005, which are the most-up-to-date information available on the number of persons by age, race, and sex at the sub-state level. PMR are age-adjusted to the 2000 US Standard Population for persons ages 0-74 years.

ENDNOTES

- 1 Also called age standardization, is a technique used to better allow populations to be compared when the age profiles of the populations are quite different.
- 2 Massachusetts Department of Public Health. *Massachusetts Deaths 2007*. Boston, MA; 2009.
- 3 Rosenberg HM, Maurer JD, Sorlie PD, et al. Quality of death rates by race and Hispanic origin: A summary of current research, 1999. *Vital and Health Statistics*. 1999; 2(128):1-13.
- 4 Arias E. Quality of race and Hispanic origin reporting on death certificates in the United States. Paper presented at: 2004 NCHS Data Users Conference; July 14, 2004; Washington, DC.
- 5 Sorlie, P. D., Rogot, E., Johnson, N. J. Validity of the Death Certificate. *Epidemiology*. 1992; 3(2): 181-184.
- 6 The National Center for Health Statistics (NCHS) publishes a list of 113 selected causes of death from which we select 57 causes and order them by their number of deaths.
- 7 Years of Life Remaining calculated using the Greville Abridged Life Table Method Dublin Li. Length of Life – A Study of the Life Table. New York, NY: Ronal Press Co;1949.
- 8 Please note that another potential ramification of the undercount and misclassification of deaths among Asians, Native Americans, and Hispanics, discussed previously is that Hispanics showed an exceptionally high life expectancy. Hispanics are expected to have a shorter life span, since they are more likely to have characteristics, such as low educational attainment and living in poverty, which are associated with adverse health outcomes. The method of calculating life expectancy here does not count younger deaths as heavily.
- 9 Black C, Roos NP, Fransoo R, Martens PJ. *Comparative Indicators of Population Health and Health Care use for Manitoba's Regional Health Authorities: A POPULIS Project*. Winnipeg, Manitoba: Manitoba Centre for Health Policy and Evaluation; 1999.
- 10 Nolte E and McKee CM. Measuring The Health of Nations: Updating An Earlier Analysis. *Health Affairs*; 2008; 27(1): 58-71.