State of Illinois
Illinois Department of Public Health

Tobacco-Related Cancer in Illinois

Epidemiologic Report Series 15:02

October 2014

IDPH
Illinois Department of Public Health

Tobacco-Related Cancer in Illinois

A publication of the
Illinois Department of Public Health
Division of Epidemiologic Studies
Springfield, Illinois
October 2014

Prepared by Kyle Garner and Tiefu Shen, Illinois Department of Public Health, Division of Epidemiologic Studies

Suggested Citation

Garner K, Shen T. Tobacco-Related Cancer in Illinois. Epidemiologic Report Series 15:02. Springfield, Ill.: Illinois Department of Public Health, October 2014.

Copyright Information

INTRODUCTION

Tobacco use remains the leading cause of preventable disease and death in the United States.[1] Significant health problems are associated with tobacco use, including heart disease, stroke, emphysema, diabetes and particularly cancer.[2] Currently, a large number of peer reviewed studies around tobacco use have been completed examining and reiterating the harmful effects of tobacco use. It is estimated that 30 percent or more of cancer deaths could be prevented if tobacco use were eliminated.[3]

The U.S. Department of Health and Human Services released "The Health Consequences of Smoking – 50 Years of Progress: A Report to the Surgeon General" in early 2014 that concluded smoking is conclusively linked to lung, oral cavity and pharynx, larynx, esophagus, bladder, pancreas, kidney, cervix, stomach, acute myeloid leukemia, colon and rectum, and liver cancers.[2] Other tobacco products, including chewing tobacco, snuff and cigars, remain strong risk factors for many of these types of cancer, especially mouth and throat cancers.

Passive exposure to cigarette smoking, or secondhand smoke, also is a serious risk. Secondhand smoke is estimated to cause 3,000 lung cancer deaths among non-smokers in the U.S. each year.[4] In 2006, the U.S. Surgeon General released "The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General," which concluded that secondhand smoke is causally related to lung, breast, cervix, and nasopharyngeal cancers.[5]

This report describes the impact of tobacco-related cancers in Illinois from 2006-2010 and what is expected in 2014. This includes cancers determined to be conclusively linked to tobacco by the 2014 U.S. Surgeon General's report. Of course, not all of the cancer diagnoses described in this report can be attributed to tobacco use, but all the cancer sites focused on share a common and significant risk factor, which is tobacco use. This report describes each cancer, the trend and number of Illinoisans newly diagnosed and deceased, the prognosis associated with each cancer site, as well as which racial-ethnic populations are most affected.

ALL TOBACCO-RELATED CANCERS COMBINED

It is estimated that, in 2014, 29,120 Illinoisans will be newly diagnosed with cancer and 14,980 will die from cancers of the oral cavity and pharynx, esophagus, stomach, colon and rectum, liver, pancreas, larynx, lung and bronchus, cervix, bladder, kidney and renal pelvis, and acute myeloid leukemia (Table 1). Between 2006 and 2010, these cancer sites accounted for roughly 44 percent of all newly diagnosed cancers and 60 percent of all cancer deaths. Compared to the nation, Illinois' cancer incidence was higher in both men and women for

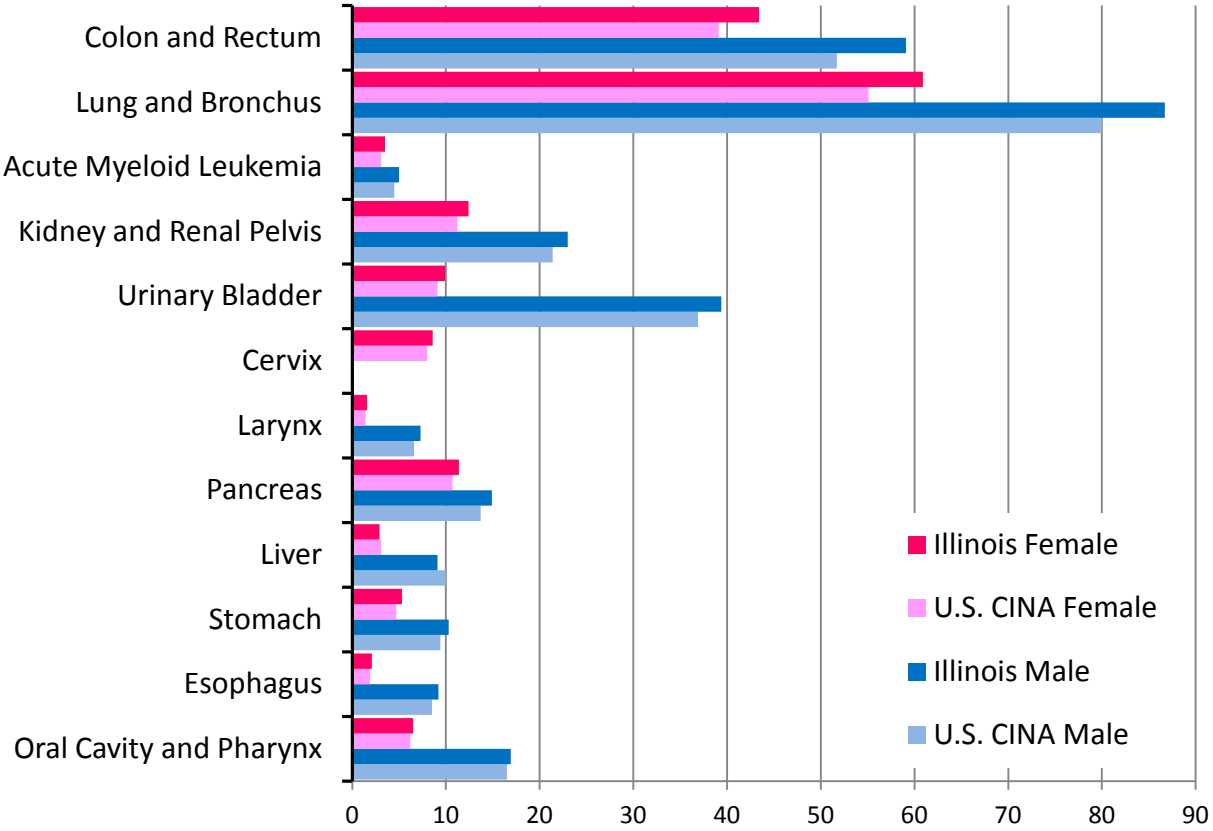
colorectal, lung and bronchus, kidney renal and pelvis, urinary bladder and pancreas (Figure 1). Mortality rates also are higher in Illinois for lung and bronchus and colon and rectum (Figure 2).

Table 1: Projected New Tobacco-Related Cancer Cases and Deaths by Primary Site, Illinois, 2014

	Projected New Cases			Projected Deaths		
Site	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**
All Tobacco-related Sites	29,120	16,660	12,460	14,980	8,310	6,670
Oral Cavity and Pharynx	1,650	1,170	480	260	210	50
Esophagus	690	520	170	630	490	140
Stomach	1,040	650	390	460	290	170
Colon and Rectum	6,590	3,450	3,140	2,430	1,230	1,200
Liver	900	630	270	590	430	160
Pancreas	1,810	910	900	1,590	780	810
Larynx	610	470	140	100	100	0
Lung and Bronchus	9,350	4,860	4,490	6,920	3,730	3,190
Cervix	550	0	550	190	0	190
Urinary Bladder	2,970	2,240	730	600	430	170
Kidney and Renal Pelvis	2,310	1,420	890	540	330	210
Acute Myeloid Leukemia	630	330	300	320	180	140

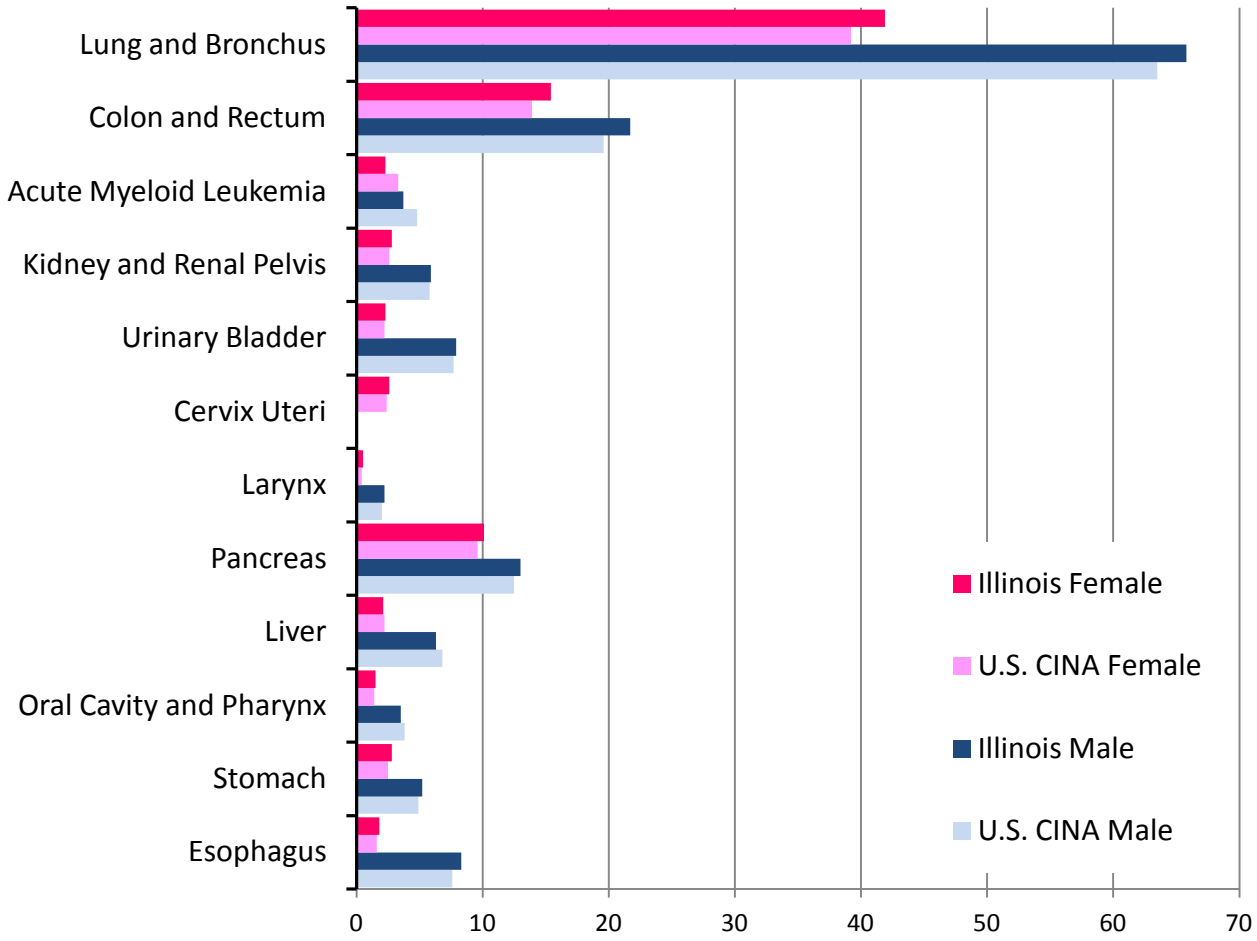
Note: Projected counts are rounded to the nearest 10 events. These counts are offered as a guide and should not be regarded as definitive.
Source: Incidence projections were derived from cancer incidence data from the Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2012. Projected deaths were derived based on mortality rates provided by the National Center for Health Statistics, data as of April 2013.

Figure 1: Tobacco-Related Cancer Incidence, Illinois and U.S., 2006-2010



Source: Illinois: Illinois State Cancer Registry U.S.: North American Association of Central Cancer, Cancer In North America, 2006-2010. Volume One: Registry-specific Cancer Incidence in the United States and Canada, May 2013.

Figure 2: Tobacco-Related Cancer Mortality, Illinois and U.S., 2006-2010



Source: Illinois: Illinois State Cancer Registry U.S.: North American Association of Central Cancer, Cancer In North America, 2006-2010. Volume Three: Registry-specific Cancer Mortality in the United States and Canada, May 2013.

Racial-ethnic disparities can be seen in relation to these tobacco-related cancers. Non-Hispanic blacks in Illinois exhibit statistically higher incidence rates for five of the 12 tobacco-related cancers (colon and rectum, lung and bronchus, kidney, pancreas, and larynx) when compared to other Illinois racial-ethnic groups. Non-Hispanic blacks also displayed statistically higher mortality rates for seven of the 12 tobacco-related cancers (oral, stomach, colon and rectum, pancreas, larynx, lung and bronchus, and cervix).

LUNG AND BRONCHIAL CANCER

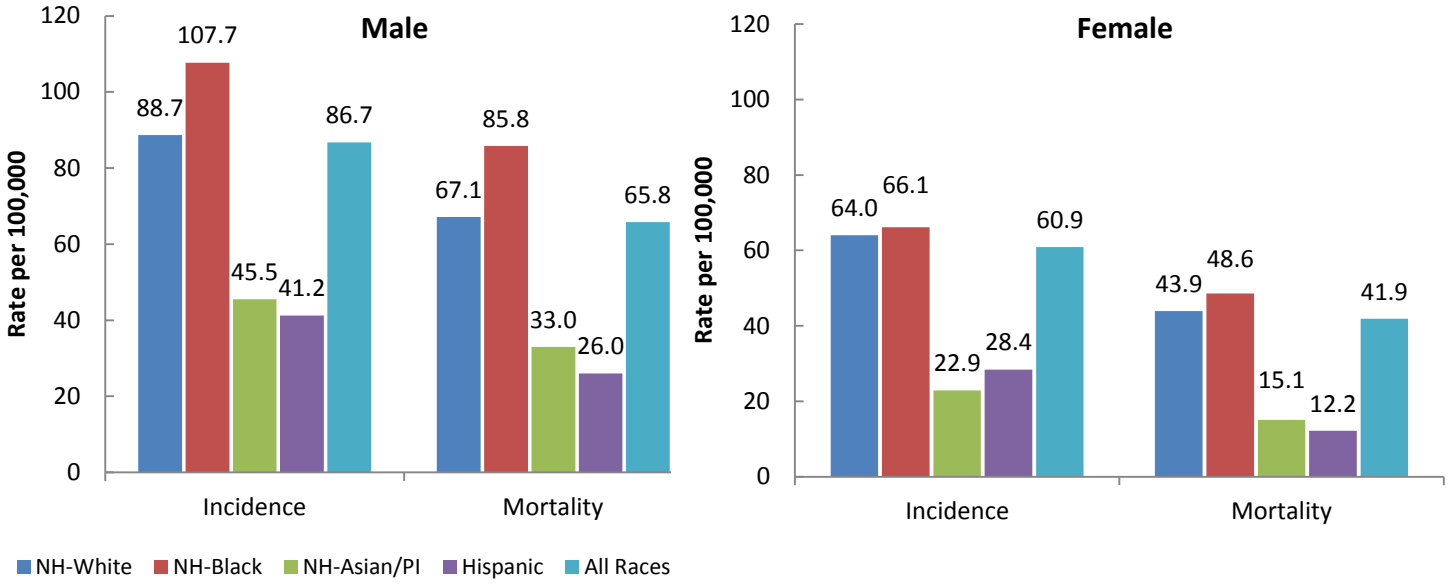
The association between lung cancer and smoking has been well documented. It is estimated that 90 percent of lung cancer deaths are due to smoking.[2] Lung cancer is often fatal and is one of the most difficult cancers to treat. During 2001-2005, only 15.1 percent of

Illinoisans diagnosed with lung cancer survived past five years, and 58 percent died of the disease in the first year after diagnosis.[6]

The best protection against lung cancer is to never begin smoking. It has been shown that non-smokers have much lower rates of lung cancer and other smoking-related cancers. In the case of current smokers, quitting smoking as soon as possible greatly reduces an individual's risk. The idea that "it's too late to quit smoking" because the damage has already been done is not true. While ex-smokers are still at higher risk of lung cancer than nonsmokers, this risk declines with each year of not smoking. After 10 years, the risk among ex-smokers begins to approach that of nonsmokers.[7, 8]

The American Cancer Society estimates in 2014 there will be 224,210 new cases of lung cancer diagnosed in the U.S., and an estimated 159,260 deaths due to lung cancer.[9] For Illinois in this same year, it is estimated 9,350 new cases of lung cancer and 6,920 deaths will occur.[10] Lung cancer is the leading cause of cancer death among both men and women in Illinois, and the second most commonly diagnosed cancer in each gender. Non-Hispanic black men displayed the highest incidence rates of lung cancer among all racial and ethnic groups for the years 2006-2010. Also, non-Hispanic black men had more than two times the mortality of Hispanic men and 27 percent higher than non-Hispanic white men. Among women, non-Hispanic white and non-Hispanic black women displayed similar rates of incidence and mortality, however, both were more than twice that of Hispanic women.

FIGURE 3: Lung and Bronchus Cancer, by Sex, Race, and Ethnicity, Illinois, 2006-2010



Incidence Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2012
Mortality Source: National Center for Health Statistics, data as of April 2013

ORAL CAVITY AND PHARYNGEAL CANCER

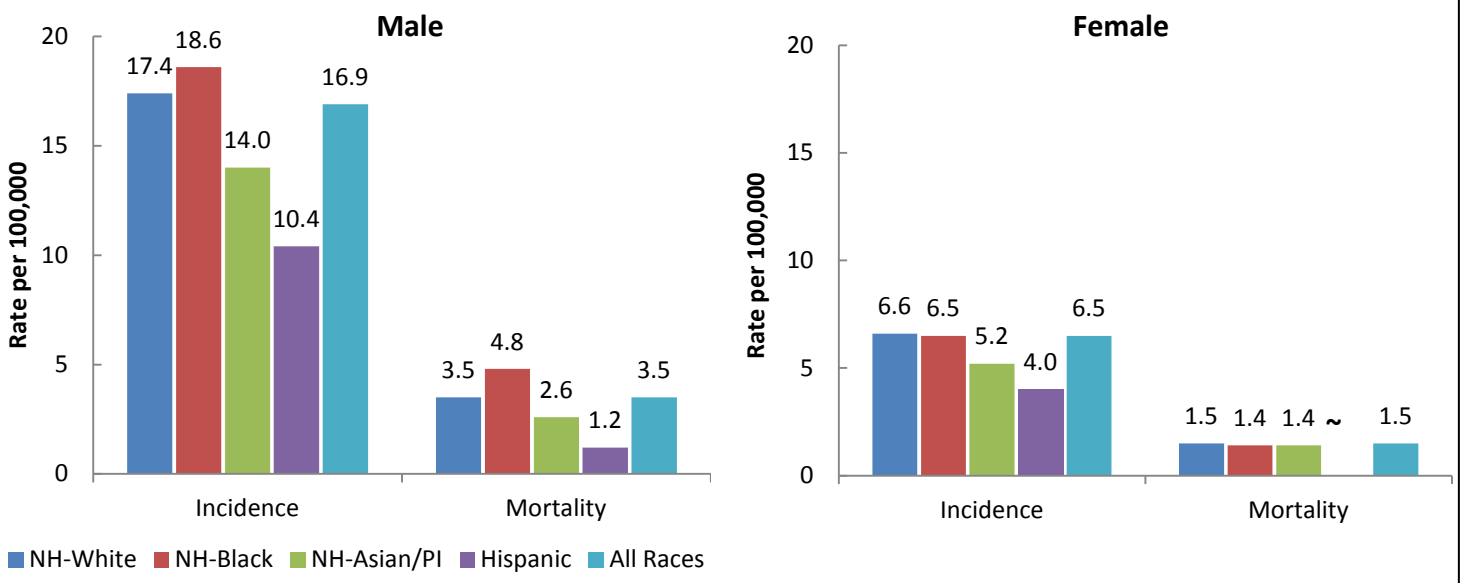
While tobacco is usually associated with lung cancer, it also is a major risk factor for cancers of the head and neck. Two of the most common tobacco-related sites for cancers of the head and neck are the oral cavity (tongue and mouth) and pharynx (throat). Using tobacco products increases the risk of getting head and neck cancers by more than 10 times compared to someone who does not use tobacco.[10] Quitting smoking rapidly decreases a person's risk of developing oral cancer; there is little to no elevated risk for oral cancer in former smokers.[12]

All tobacco use is a major risk factor for oral and pharyngeal cancers. However, the myth that smokeless tobacco is a "safe" alternative to cigarettes is still believed by some. The dangers of smokeless tobacco were specifically highlighted in the 1986 U.S. Surgeons General's Report. The report noted smokeless tobacco represented a significant health risk and is especially true when examining cancers of the oral cavity. The risk of cancers of the cheek and gum are almost 50 times higher in smokeless tobacco users.[13] Another important risk factor for oral and pharyngeal cancers is alcohol. Use of both alcohol and tobacco has been shown to have a synergistic effect, greatly increasing the risk of oral and pharyngeal cancer over either risk alone.[14,15]

The prognosis for cancer of the oral cavity and pharynx is not good. The five-year cause specific survival rate for Illinoisans is only 53.5 percent.[6] Treatment for oral cancer usually involves surgery and sometimes radiation therapy. The surgery can be quite disfiguring to the face, especially for advanced cancers.

The American Cancer Society estimates there will be 42,440 new cases of oral and pharyngeal cancer in the U.S. in 2014, and an estimated 8,390 people dying of these cancers in that same year.[9] In Illinois, there are 1,650 new cases of oral cancer projected for 2014 and 260 deaths.[10] Illinois Hispanic men and women displayed the lowest rates of oral cancer incidence during 2006-2010 while other races displayed higher rates. However, among men, non-Hispanic blacks had rates of mortality due to oral cancer that were four times those of Hispanic men. Among women, mortality rates due to oral cancer were similar across all races.

FIGURE 4: Oral and Pharyngeal Cancer, by Sex, Race and Ethnicity, Illinois, 2006-2010



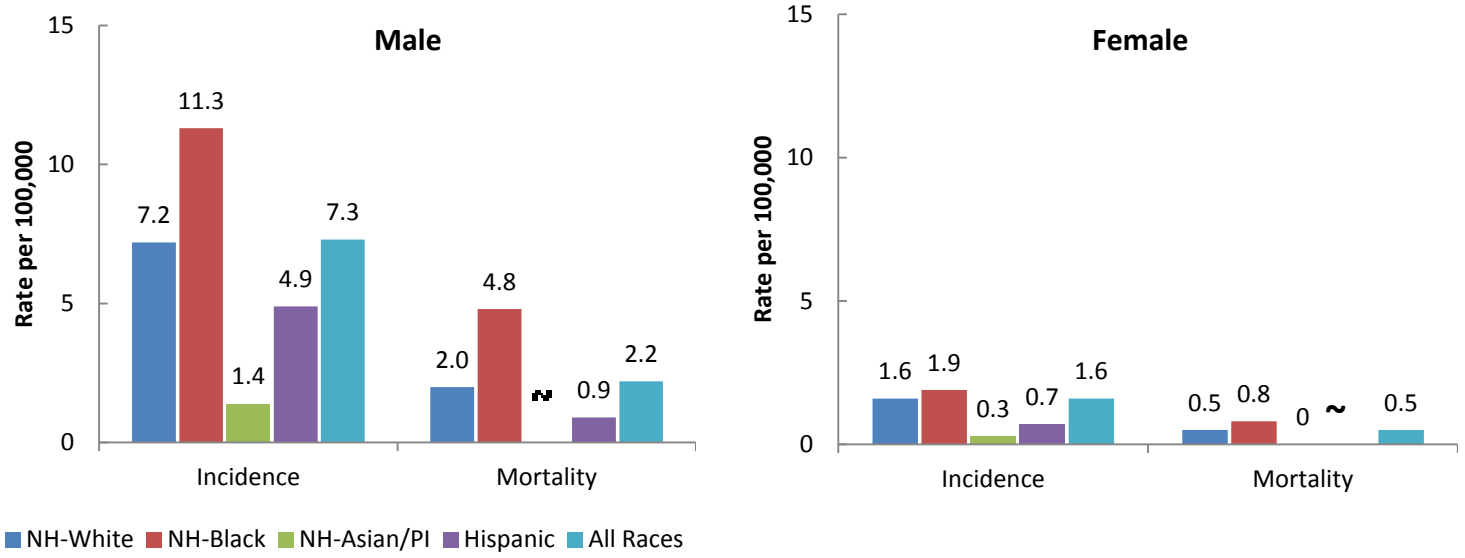
Incidence Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2012
Mortality Source: National Center for Health Statistics, data as of April 2013 ~ Rate could not be calculated due to fewer than 10 cases

LARYNGEAL CANCER

The larynx (voice box) is located just below the throat in the neck and plays a key role in breathing, swallowing and talking. The larynx is another common head and neck cancer with strong associations with tobacco use. Smoking is a major risk factor for cancer of the larynx, and the longer and more frequently a person smokes the greater the risk for cancer. Smokers have up to 10 times the risk for laryngeal cancer than non-smokers. Also, the risk of laryngeal cancer is even greater among people who drink alcohol and use tobacco.[16] The overall five-year cause specific survival rate for laryngeal cancer in Illinois was 56.3 percent.[6] The American Cancer Society estimates there will be 12,630 new cases of laryngeal cancer in the U.S. in 2014 and 3,610 U.S. deaths due to laryngeal cancer. It is estimated that in Illinois during 2014 there will be 610 new cases of laryngeal cancer diagnosed and 100 Illinoisans will die from laryngeal cancer. Illinois non-Hispanic black men displayed significantly higher rates of laryngeal cancer during 2006-2010. The rates for non-Hispanic black men were 1.5 times higher than non-Hispanic whites and 8 times higher than non-Hispanic Asian/PI. Laryngeal cancer incidence rate

for females were less disparate, although non-Hispanic black women did display the highest rates and non-Hispanic Asian/PI had the lowest. Non-Hispanic black men also were more the twice as likely to die from laryngeal cancer compared to other races. Non-Hispanic black women displayed, the highest mortality rates, but the rate was not nearly as disparate as non-Hispanic black men.

FIGURE 5: Laryngeal Cancer, by Sex, Race and Ethnicity, Illinois, 2006-2010



Incidence Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2012
Mortality Source: National Center for Health Statistics, data as of April 2013 ~ Rate could not be calculated due to fewer than 10 cases

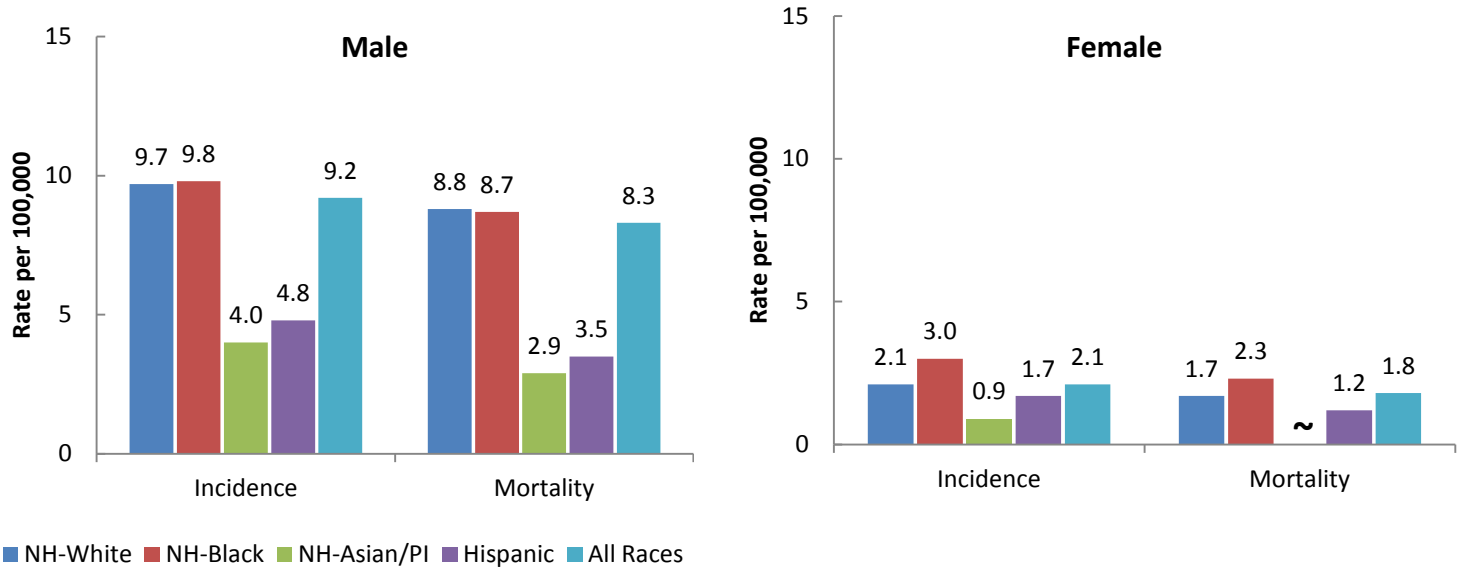
ESOPHOGEAL CANCER

Another cancer strongly associated with tobacco use is esophageal cancer. The esophagus is the tube that carries food from the mouth to the stomach. Cigarette smoking and alcohol are the most common risk factors associated with esophageal cancer. Both factors by themselves are associated with esophageal cancer and pose an even greater risk when combined. Esophageal cancer is a deadly disease and is rarely cured. Only 16.5 percent of Illinoisans diagnosed with esophageal cancer in 2001-2005 survived past five years. Even if diagnosed early (local stage), only 34.6 percent of individuals survive for five years.[6]

The American Cancer Society estimates there will be 18,170 new cases of esophageal cancer in the U.S. in 2014 and 15,450 will die of the disease.[9] In Illinois, it is estimated there

will be 690 new cases of esophageal cancer and 630 deaths from the disease in 2014.[10] Non-Hispanic white and non-Hispanic black men had similar rates of esophageal cancer incidence and mortality, however, both incidence and mortality rates were more than twice as high as non-Hispanic Asian and Hispanic men. Among women, whose rates were substantially lower than men, non-Hispanic black women had the highest rates of incidence and mortality.

FIGURE 6: Esophageal Cancer, by Sex, Race and Ethnicity, Illinois, 2006-2010



Incidence Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2012
Mortality Source: National Center for Health Statistics, data as of April 2013 ~ Rate could not be calculated due to fewer than 10 cases

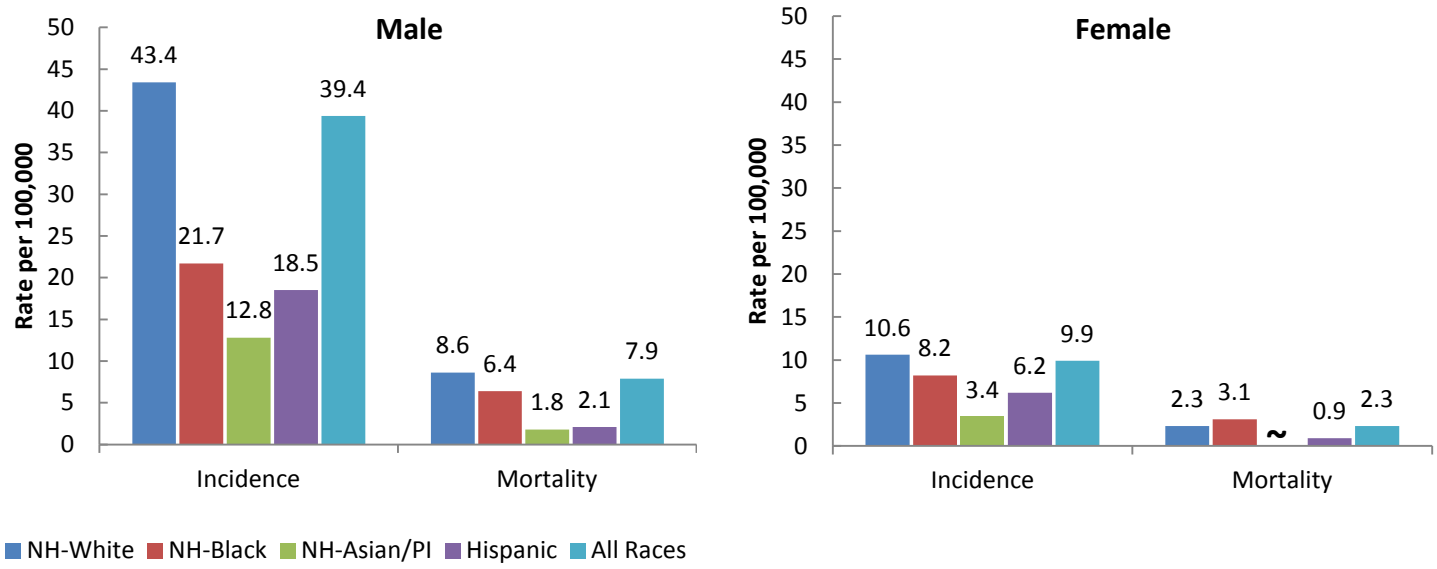
URINARY BLADDER CANCER

Smoking is an important risk factor for bladder cancer. Smokers are three times more likely to develop bladder cancer compared to non-smokers. Smoking may be responsible for as much as 60 percent of bladder cancer cases. Quitting smoking reduces the risk of bladder cancer by as much as 60 percent, and an almost immediate reduction upon quitting.[17]

The five-year survival rate for bladder cancer in Illinois is 64 percent. When detected early, in the insitu stage, the five-year survival rate is 78 percent. It is crucial that bladder cancer be detected early. When detected later in the distant stage, the five-year survival rate drops to 7 percent.[6]

The American Cancer Society estimates there will be 74,690 new cases of bladder cancer in the U.S. in 2014 and 15,580 deaths due to the disease.[9] In Illinois, 2,970 new cases of bladder cancer and 600 deaths are projected for 2014.[10] For the years 2006-2010, non-Hispanic white males had the highest rates of bladder cancer incidence and mortality. Non-Hispanic Asians had the lowest rates of incidence and mortality. In females, non-Hispanic whites had the highest rates of bladder cancer incidence and non-Hispanic black women had the highest mortality rates.

FIGURE 7: Bladder Cancer, by Sex, Race and Ethnicity, Illinois, 2006-2010



Incidence Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2012.
Mortality Source: National Center for Health Statistics, data as of April 2013. ~ Rate could not be calculated due to fewer than 10 cases

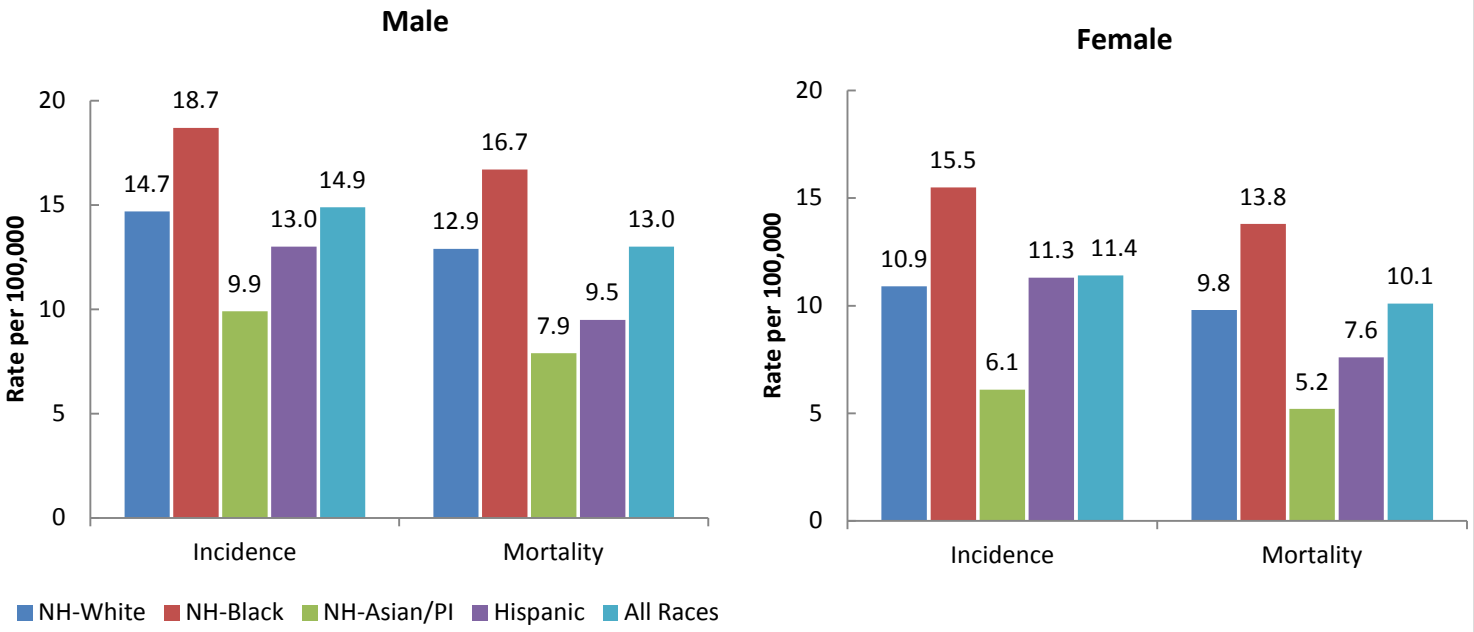
PANCREATIC CANCER

The pancreas is a large gland located near the stomach that is involved in both digestion and the production of hormones, such as insulin. Smoking is a major risk factor for cancer in this organ. Smokers have pancreatic cancer rates twice that of non-smokers and heavy smokers can have upwards of six times the risk for cancer of the pancreas. Studies have shown long-term former smokers have little to no difference in risk for pancreatic cancer compared to non-smokers.[18]

While not as common as other cancers, pancreatic cancer is one of the most deadly. Only 6.8 percent of Illinoisans diagnosed with pancreatic cancer survive past five years, and

only 26.1 percent survive past the first year after diagnosis.[6] The American Cancer Society estimates there will be 46,420 new cases of pancreatic cancer in 2014 and 39,590 deaths.[9] In Illinois, it is estimated there will be roughly 1,810 new cases of pancreatic cancer and 1,590 deaths due to the disease.[10] In Illinois, non-Hispanic black men displayed the highest incidence and mortality rates of pancreatic cancer; both were significantly higher than non-Hispanic white and Hispanic men. While females displayed only slightly lower rates of incidence and mortality, non-Hispanic black women had significantly higher rates of both incidence and mortality when compared to other racial-ethnic groups.

FIGURE 8: Pancreatic Cancer, by Sex, Race and Ethnicity, Illinois, 2006-2010



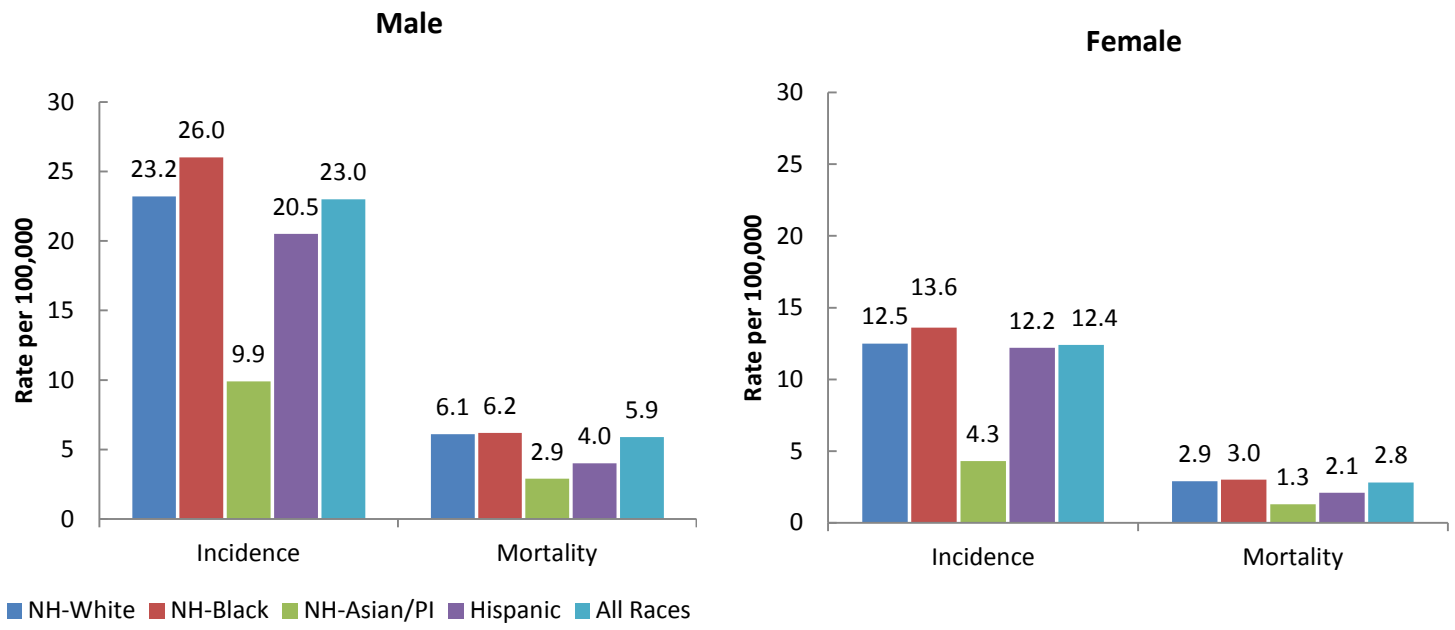
Incidence Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2012.
Mortality Source: National Center for Health Statistics, data as of April 2013. ~ Rate could not be calculated due to fewer than 10 cases

KIDNEY RENAL AND PELVIS CANCER

Harmful carcinogens in tobacco smoke are absorbed into the bloodstream and can become highly concentrated in the kidneys, which make tobacco a major risk factor for kidney cancer. Research shows smokers are more likely to develop kidney cancer and heavy smokers experience twice the risk of non-smokers. The longer a person smokes the higher the risk, but once a person quits the risk does decrease.[19] The five-year survival rate for kidney cancer in Illinois is 62.5 percent.[6]

The American Cancer Society estimates there will be 63,920 new cases of kidney cancer and 13,860 deaths due to the disease in the U.S. in 2014.[9] In Illinois, it is estimated there will be 2,310 new cases of kidney cancer and 540 deaths in 2014.[10] Non-Hispanic black men displayed the highest rates of kidney cancer incidence and slightly higher mortality. Non-Hispanic black females showed the highest incidence and mortality rates.

FIGURE 9: Kidney Renal and Pelvis Cancer, by Sex, Race and Ethnicity, Illinois, 2006-2010



Incidence Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2012.
Mortality Source: National Center for Health Statistics, data as of April 2013. ~ Rate could not be calculated due to fewer than 10 cases

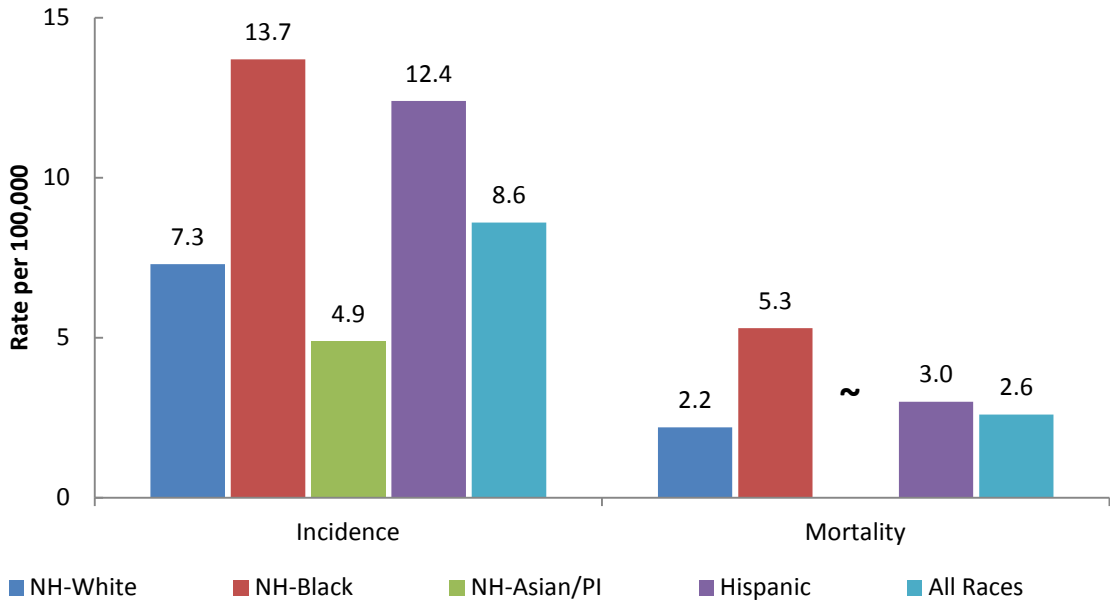
CERVICAL CANCER

While not as commonly associated with smoking as other cancers, female tobacco users have double the risk of developing cervical cancer. Harmful chemicals found in tobacco are absorbed into the bloodstream and carried throughout a woman's body, and have been found in the mucosal linings of the cervix. Human papillomavirus (HPV) also has been shown to be a major cause of cervical cancer, and smoking has been further shown to increase risk in HPV-positive women.[20]

Cervical cancer mortality has been declining due to early detection screening programs. The five-year survival rate for localized cervical cancer is 87.8 percent, but, in Illinois the five-

year survival rate for cervical cancer, regardless of stage, is 67.6 percent. The American Cancer Society estimates in 2014 there will be 12,360 new cases of cervical cancer and 4,020 deaths.[9] In Illinois, it is estimated there will be 550 new cases of cervical cancer and 190 deaths.[10] Non-Hispanic black women in Illinois had the highest incidence and mortality rates during 2006-2010 followed closely by Hispanic women. These rates were 53 percent and 41 percent higher than non-Hispanic white women, respectively.

FIGURE 10: Cervical Cancer by Race and Ethnicity, Illinois Females, 2006-2010



Incidence Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2012.
Mortality Source: National Center for Health Statistics, data as of April 2013. ~ Rate could not be calculated due to fewer than 10 cases

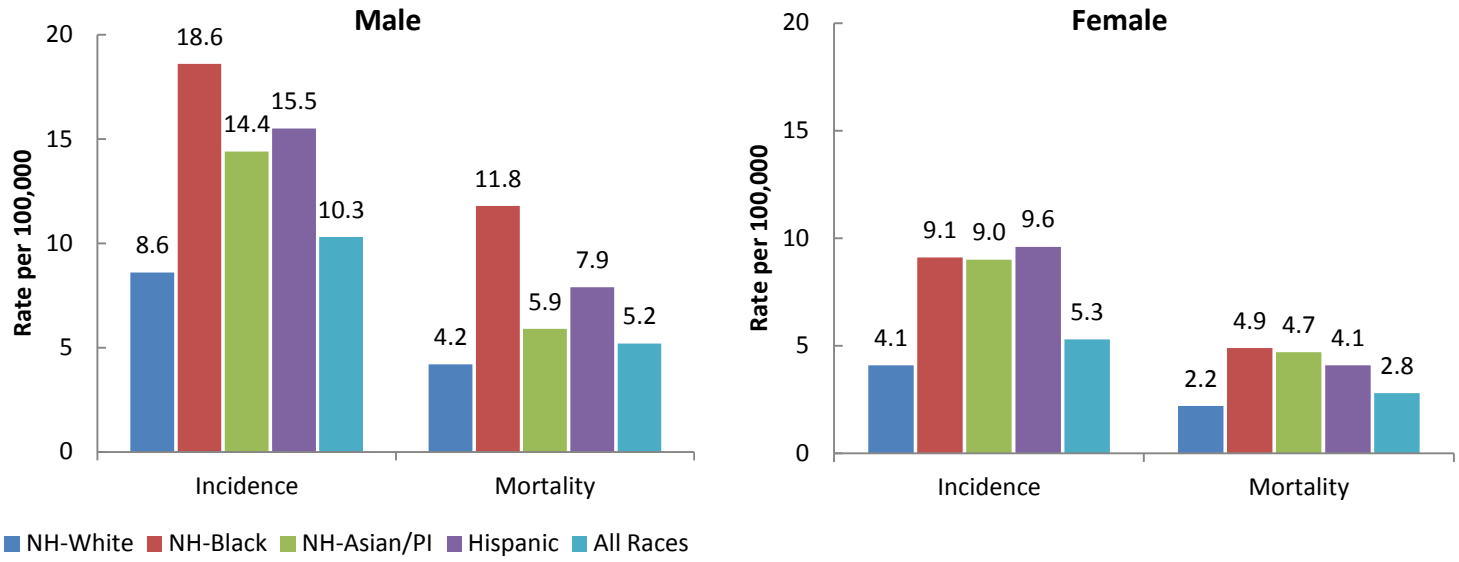
STOMACH CANCER

While stomach cancer has many factors important in understanding the disease's beginnings, smoking has been determined to be a causal risk factor for many stomach cancer cases and deaths.[2] The five-year survival rate for all stomach cancer in Illinois is 24.7 percent.[6]

The American Cancer Society estimates 22,220 new cases of stomach cancer will be diagnosed in 2014, and 10,990 people will die this same year.[9] In Illinois, it is estimated there will be 1,040 new cases of stomach cancer and 460 deaths due to the disease.[10] During 2006-2010 non-Hispanic black males displayed the highest incidence and mortality rates for stomach

cancer. Hispanic women displayed the highest incidence rates and non-Hispanic black women had the highest mortality rates.

FIGURE 11: Stomach Cancer, by Sex, Race and Ethnicity, Illinois, 2006-2010



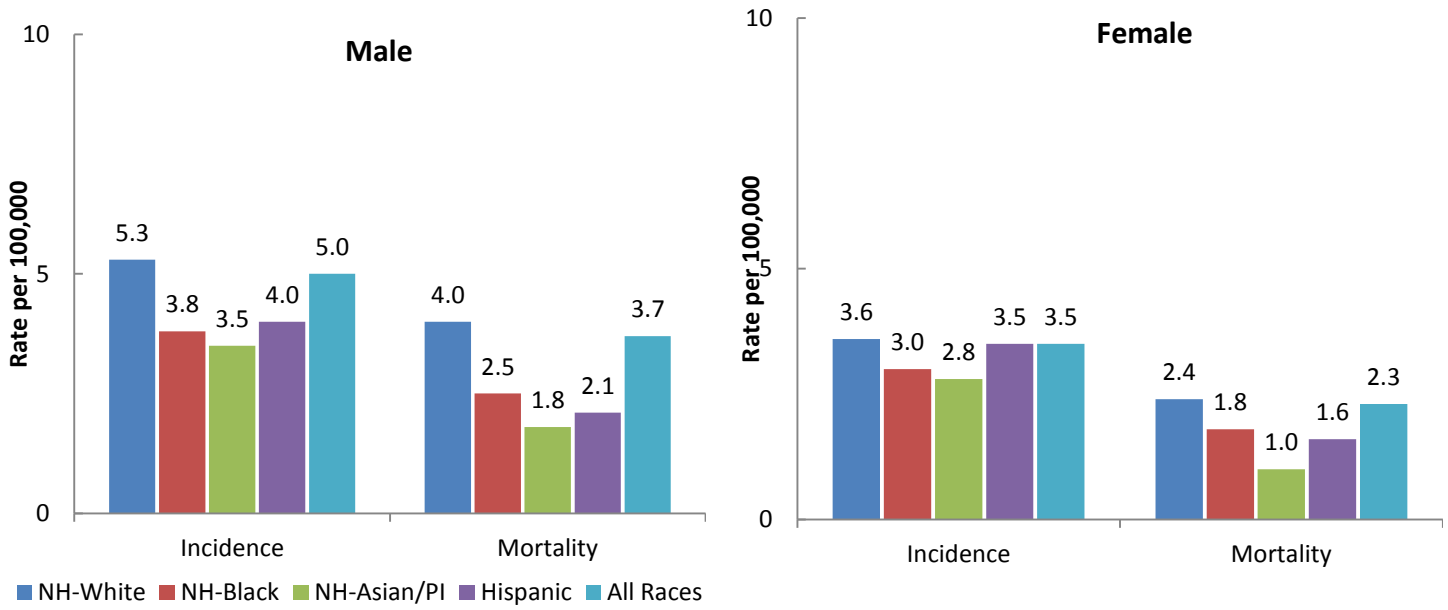
Incidence Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2012.
Mortality Source: National Center for Health Statistics, data as of April 2013. ~ Rate could not be calculated due to fewer than 10 cases

ACUTE MYELOID LEUKEMIA

Acute myeloid leukemia is the most common acute leukemia in adults and starts in a person's bone marrow. Smoking is considered to be causally related to this cancer.[2] However, unlike many other cancer sites, acute myeloid leukemia is more strongly related to the cumulative effects of long-term smoking and risk does not appear to abate after cessation. It has been estimated smoking contributes up to 58 percent of acute myeloid leukemia deaths.[2] The five-year survival rate for acute myeloid leukemia in Illinois is 21.5 percent, considerably lower than other types of leukemia.[6]

In the U.S., the American Cancer Society estimates 18,860 new cases of acute myeloid leukemia will be diagnosed in 2014 and an estimated 10,460 people will die.[9] For Illinois, it is estimated 630 new cases and 320 deaths will occur.[10] Non-Hispanic white men had the highest incidence and the highest mortality rates for acute myeloid leukemia. Among women, non-Hispanic whites also had the highest incidence and mortality rates from acute myeloid leukemia.

FIGURE 12: Acute Myeloid Leukemia, by Sex, Race and Ethnicity, Illinois, 2006-2010



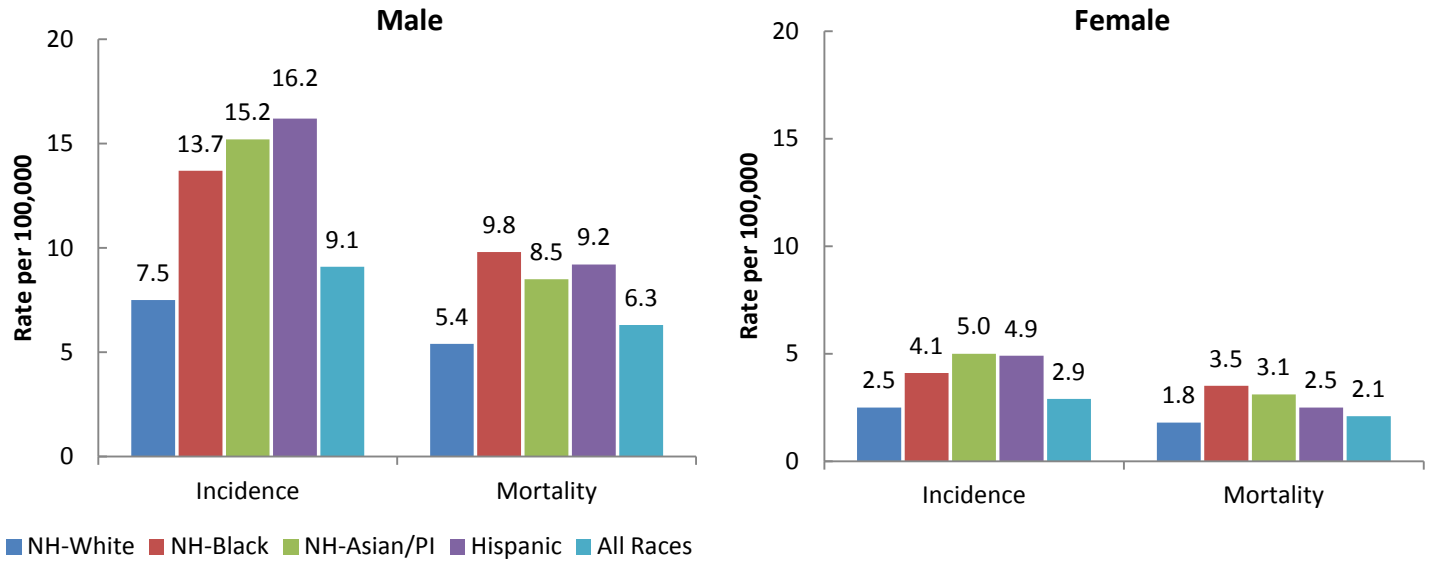
Incidence Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2012.
Mortality Source: National Center for Health Statistics, data as of April 2013. ~ Rate could not be calculated due to fewer than 10 cases

LIVER CANCER

Liver cancer is a deadly disease. The five-year survival rate for cancer of the liver in Illinois is merely 15.6 percent.[6] While the primary risk factors for liver cancer are hepatitis C, hepatitis B, alcohol induced cirrhosis and exposure to aflatoxin (chemical toxins ingested through food contaminated by a particular fungus), the recent report of the U.S. Surgeon General concluded smoking is causally linked to liver cancer with smokers having higher risk for the disease than non-smokers.[2]

The American Cancer Society estimates there will be 33,190 new cases of liver cancer in the U.S. and 23,000 deaths in 2014.[9] In Illinois, it is estimated in 2014 there will be 900 new cases of liver cancer and 590 deaths due to the disease.[10] Hispanic men displayed the highest incidence rates for liver cancer during 2006-2010, whereas non-Hispanic white men had the lowest. Non-Hispanic black and Hispanic men had the highest liver cancer mortality rates.

FIGURE 13: Liver Cancer, by Sex, Race and Ethnicity, Illinois, 2006-2010



Incidence Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2012.
Mortality Source: National Center for Health Statistics, data as of April 2013. ~ Rate could not be calculated due to fewer than 10 cases

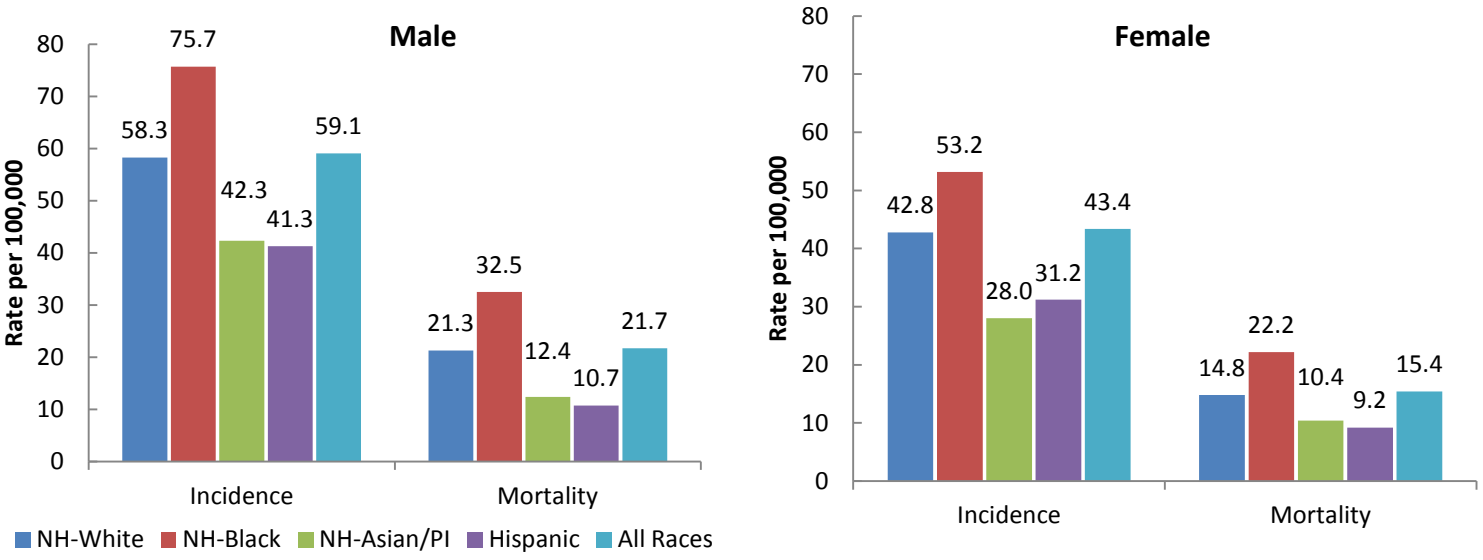
COLON AND RECTAL CANCER

In Illinois, colon and rectal cancer ranked third in incidence and second in mortality compared to other cancer sites. There are many factors that influence the beginnings of colorectal cancer or adenomatous polyps. Risk factors linked to colorectal cancer include smoking, physical inactivity, obesity, low calcium levels, alcohol use, family history of the disease, and a diet high in red meat and low in vegetables, fruits or folate. Evidence clarifying the link between smoking and colorectal cancer began to solidify in the 1990's, however, it was not until the most recent 2014 U.S. Surgeon General's report that smoking was dubbed a modifiable risk factor that can cause colorectal cancer.[2]

The American Cancer Society estimates there will be 136,830 new cases of colorectal cancer in the U.S. in 2014 and 50,310 deaths due to the disease that same year.[9] In Illinois, it is estimated there will be 6,590 new cases of colorectal cancer and 2,430 Illinoisans will die of the disease in 2014.[10] The five-year survival rate for colorectal cancer is 53.5 percent. If diagnosed in the local stage, the cause specific survival rate for colorectal cancer in Illinois is 73.5 percent versus 11.2 percent if caught in the distant or metastatic stage.[6] Non-Hispanic black men

displayed the highest rates of colorectal cancer incidence and mortality. Among women, non-Hispanic black females had the highest rates of colorectal cancer incidence and mortality.

FIGURE 14: Colon and Rectal Cancer, by Sex, Race and Ethnicity, Illinois, 2006-2010



Incidence Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2012.
Mortality Source: National Center for Health Statistics, data as of April 2013. ~ Rate could not be calculated due to fewer than 10 cases

TRENDS IN TOBACCO-RELATED CANCER, 2001-2010

During the 10 years examined, cancer incidence rates significantly decreased for; colon and rectum, larynx, lung and bronchus, bladder and the combined rate for all 12 smoking-related cancers (Table 2). Statistically significant increases were seen in the rates of liver, pancreatic and kidney cancers. While these specific sites have been closely linked to tobacco use, it is important to note all of these sites may have cases influenced by risk factors other than tobacco use.

In addition to the decline in the incidence of tobacco-related cancers, mortality also declined between 2001 and 2010 (Table 3). A decreasing trend in mortality was statistically significant for cancers of the oral cavity, esophagus, stomach, colon and rectum, larynx, lung and kidney. Both men and women saw significant decreases in mortality at these sites as well. Women saw a significant decrease in the trend in mortality rates for cervical cancer. Mortality rates for cancer of the bladder overall remained unchanged, however, they did significantly

increase in women over the time period. Liver and pancreatic cancer saw statistically significant increases in men and women between 2001 and 2010.

Table 2: Tobacco-Related Cancer Incidence Annual Percent Change by Site and Gender, Illinois, 2001-2010

Site	Total	Male	Female
All Sites	-0.8	-1.3*	-0.4
Oral Cavity and Pharynx	0.9	0.7	1.1
Esophagus	-0.8	-0.9	-1.6
Stomach	-0.7	-1.2*	-0.2
Colon and Rectum	-2.8*	-3.1*	-2.6*
Liver	3.5*	3.5*	2.9*
Pancreas	0.7*	0.5	0.8
Larynx	-1.9*	-2.4*	-0.8*
Lung and Bronchus	-0.7*	-1.9*	0.6
Cervix			-2.1*
Urinary Bladder	-0.6*	-0.8*	-1.3
Kidney and Renal Pelvis	1.7*	1.2*	2.2*
Acute Myeloid Leukemia	-0.1	-1.1	0.3
All Other Sites	-0.2	-1.0	0.4

Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2013
*Annual Percent Change statistically significant at the 0.05 level.

Table 3: Tobacco-Related Cancer Mortality Annual Percent Change by Site and Gender, Illinois, 2001-2010

Site	Total	Male	Female
All Sites	-1.4*	-1.7*	-1.2*
Oral Cavity and Pharynx	-1.3*	-1.3*	-1.6*
Esophagus	-0.6*	-0.5*	-1.5*
Stomach	-2.9*	-3.2*	-2.7*
Colon and Rectum	-2.9*	-3.0*	-3.0*
Liver	2.1*	2.4*	0.7*
Pancreas	0.5*	0.4*	0.5*
Larynx	-2.3*	-2.6*	-2.3*
Lung and Bronchus	-1.7*	-2.5*	-1.0*
Cervix			-1.5*
Urinary Bladder	0.1	0.2	-0.6*
Kidney and Renal Pelvis	-1.0*	-1.0*	-1.3*
Acute Myeloid Leukemia	0.3*	0.4*	-0.1
All Other Sites	-1.8*	-1.9*	-1.7*

Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2013
*Annual Percent Change statistically significant at the 0.05 level.

Have tobacco-related cancer incidence and mortality declined at the same pace as non-tobacco-related cancers? To answer this question the annual percent change of these two groups of cancer sites between 2001 and 2010 was examined. Racial/ethnic groups also were examined within tobacco and non-tobacco-related cancer groups to see if trends were consistent for all racial-ethnic groups. Table 4 displays the annual percent change values for each racial-ethnic group between 2001 and 2010. Declines in overall cancer incidence appear to be driven by statistically significant declines in tobacco-related cancer incidence since non-tobacco-related sites as a whole did not realize much change during the time period. Most racial-ethnic subgroups, except for non-Hispanic Asians, saw statistically significant declines in tobacco-related cancer incidence. In contrast, mortality rates for both tobacco-related and non-tobacco-related cancers decreased significantly. Annual percent change figures do show a steeper decline in tobacco-related cancer mortality versus non-tobacco-related cancer mortality. The universal decline in tobacco-related cancers reflects the return on public health investment in anti-tobacco legislation, tax policies and education campaigns, and it provides clear and strong evidence progress has been made in reducing the burden of tobacco-related cancers.

Table 4: Trends in Incidence and Mortality for Tobacco-related Cancers Combined and Non-tobacco-related Cancers Combined by Race and Ethnicity, Illinois, 2001-2010				
Incidence by Race-Ethnicity	**All tobacco-related sites combined APC (95 percent CI)**		**All other sites (non-tobacco-related) APC (95 percent CI)**	
All Races	-0.8*	(-1.3, -0.4)	-0.2	(-0.9, 0.5)
Non-Hispanic White	-0.7*	(-1.1, -0.2)	-0.1	(-0.8, 0.7)
Non-Hispanic Black	-1.1*	(-1.7, -0.4)	0.01	(-0.9, 0.9)
Non-Hispanic Asian	-0.7	(-2.0, 0.5)	0.7	(-0.3, 1.8)
Hispanic	-1.4*	(-2.1, -0.7)	-0.1	(-1.0, 0.9)
Mortality by Race-Ethnicity				
All Races	-1.8*	(-2.0 , -1.6)	-1.4*	(-1.5, -1.3)
Non-Hispanic White	-1.5*	(-1.7, -1.2)	-1.2*	(1.3, -1.1)
Non-Hispanic Black	-2.4*	(-2.7, -2.1)	-2.0*	(-2.2, -1.9)
Non-Hispanic Asian	-2.0*	(-2.3, -1.8)	-1.3*	(-1.6, -0.9)
Hispanic	-2.3*	(-2.6, -2.0)	-1.3*	(-1.5, -1.0)
Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2013 *Annual Percent Change statistically significant at the 0.05 level.				

RACIAL AND ETHNIC DISPARITIES

Data in this report have detailed incidence and mortality rates by gender and by race-ethnicity for smoking related sites. In this section, the disparities observed in data presented earlier are summarized. Compared to women, men in Illinois have higher incidence and mortality rates for all tobacco-related cancers combined, as well as, specific sites within this group.

Overall, non-Hispanic blacks experienced the highest tobacco-related cancer incidence compared to other racial-ethnic groups (Table 5). This held true for both non-Hispanic black males and females. Non-Hispanic blacks also had the highest incidence rates for most of the tobacco-related cancer sites outside of liver, bladder and acute myeloid leukemia. In men, non-Hispanic blacks had the highest incidence rates in seven of the 11 tobacco-related sites. The rates in six of the sites were significantly higher than the next closest rate. Non-Hispanic black females also displayed some of the highest tobacco-related cancer incidence rates by topping seven of the 12 cancer sites with three significantly higher than the closest rate.

Illinois racial-ethnic groups experienced tobacco-related mortality in much the same way as incidence. Overall, non-Hispanic blacks had a significantly higher mortality rate for

tobacco-related cancers compared to other racial-ethnic subgroups (Table 6). This held true for both men and women. Of the 12 specific tobacco-related sites, non-Hispanic blacks topped 10 of them (excluding bladder and acute myeloid leukemia), seven of which were significantly higher than the next closest mortality rates. In males, non-Hispanic blacks again displayed mortality rates above that of other racial-ethnic counterparts. Of the 12 tobacco-related cancer sites, non-Hispanic black men had the highest rates in eight sites, and of these six were significantly higher than other racial-ethnic groups. In women, non-Hispanic blacks had the highest rate in 10 of the 12 tobacco-related sites, and six of these were significantly higher than other racial-ethnic counterparts.

Table 5: Rate Comparisons, Highest Incidence Rates for Smoking Related Cancers, 2006-2010

Site	All	Males	Females
All Tobacco-related Sites	Black*	Black*	Black*
Oral Cavity and Pharynx	Black	Black	White
Esophagus	Black	Black	Black*
Stomach	Black	Black	Hispanic*
Colon and Rectum	Black*	Black*	Black*
Liver	Hispanic	Hispanic	Asian
Pancreas	Black*	Black*	Black*
Larynx	Black*	Black*	Black
Lung and Bronchus	Black*	Black*	Black
Cervix	~	~	Black
Urinary Bladder	White*	White*	White*
Kidney and Renal Pelvis	Black*	Black*	Black
Acute Myeloid Leukemia	White*	White	White

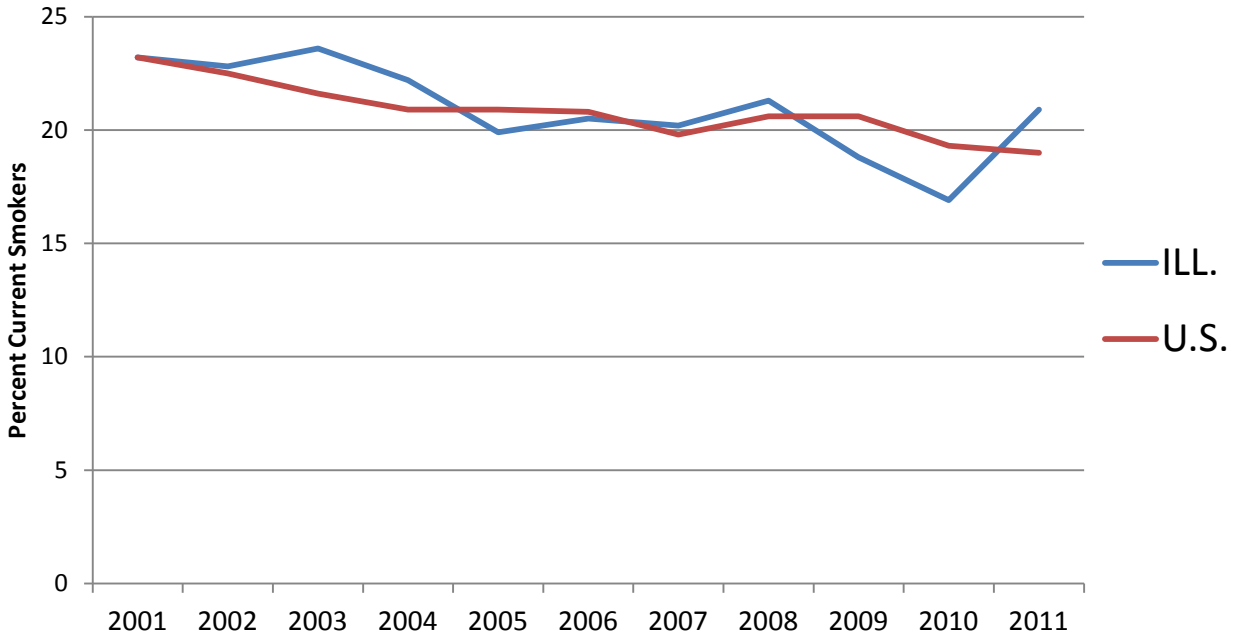
Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2013
*Rate significantly higher at the 0.05 level.

Table 6: Rate Comparisons, Highest Mortality Rates for Smoking Related Cancers, 2006-2010			
Site	**All**	**Males**	**Females**
All Tobacco-related Sites	Black*	Black*	Black*
Oral Cavity and Pharynx	Black*	Black*	White
Esophagus	Black	White	Black
Stomach	Black*	Black*	Black
Colon and Rectum	Black*	Black*	Black*
Liver	Black	Black	Black
Pancreas	Black*	Black*	Black*
Larynx	Black*	Black*	Black*
Lung and Bronchus	Black*	Black*	Black*
Cervix	~	~	Black*
Urinary Bladder	White	White*	Black*
Kidney and Renal Pelvis	Black	Black	Black
Acute Myeloid Leukemia	White*	White*	White
Source: Illinois Department of Public Health, Illinois State Cancer Registry, data as of November 2013 *Rate significantly higher at the 0.05 level.			

TOBACCO USE IN ILLINOIS

Based on data from the Behavioral Risk Factor Surveillance System (BRFSS), in 2011 an estimated 2 million Illinoisans, or 20.9 percent of the adult population, were current smokers, which was slightly higher than that of the U.S. (18.1 percent). In adult men, 24.2 percent are estimated to be current smokers, while 17.8 percent of women were current smokers. The prevalence of smoking in Illinois men and women was slightly higher than national estimates, 20.5 percent and 15.8 percent respectively. It was estimated that non-Hispanic black residents of Illinois have the highest prevalence of smoking at 22.5 percent in 2012, while non-Hispanic Asians have the lowest at 12.9 percent. Fortunately, smoking has been on the decline in Illinois and the U.S. for many years (Figure 15).

FIGURE 15: Estimate of Current Smokers, Illinois, 2002-2011



Source: Illinois Behavioral Risk Factor Surveillance System, http://app.idph.state.il.us/brfss/

Tobacco use exacts a heavy toll. The annual cost of tobacco use in Illinois is estimated to be in excess of $5.4 billion for direct health care costs (not including lost productivity), with approximately $2.2 billion covered by Medicaid.[21] Currently, Illinois only spends 8.1 percent, or $12.7 million of the $157 million CDC recommends dedicating to tobacco prevention programs. The money spent on tobacco prevention efforts pales in comparison to the $340.4 million spent by tobacco companies marketing to Illinois residents.[21]

SUMMARY

Tobacco use remains the leading preventable cause of death and disease in Illinois and is a major risk factor for a number of cancers that affect thousands of Illinoisans every year. In 2014, it is estimated that 14,980 Illinoisans will die (59 percent of expected cancer deaths) and 29,120 will be diagnosed (44 percent of total expected diagnoses) with a tobacco-related cancer. Although not all the cases and deaths can be attributed solely to tobacco use or second-hand smoke, tobacco contributes to the large majority.

Racial-ethnic disparities can be seen in relation to these tobacco-related cancers. Non-Hispanic blacks in Illinois exhibit statistically higher incidence rates for five of the 12 tobacco-related cancers (colon and rectum, lung and bronchus, larynx, pancreas, and kidney). Non-

Hispanic blacks also displayed statistically higher mortality rates for seven of the 12 tobacco-related cancers (oral, stomach, colon and rectum, pancreas, larynx, lung and bronchus, and cervix) when compared to other racial-ethnic groups.

Although much is known about the significant social and economic toll, tobacco use remains a significant public health problem in Illinois. More than 10 years after the Tobacco Master Settlement Agreement, Illinois' smoking rates have seen a decline, but have yet to meet the Healthy People 2010 goal. Current trends in incidence and mortality of tobacco-related cancers provide evidence that comprehensive tobacco prevention programs are working to reduce the burden of tobacco-related cancer in Illinois. However, more can be done to further accelerate the declines in tobacco-related cancer incidence and mortality. Adequately funded comprehensive tobacco prevention programs, which address smoke-free policies, smoking cessation and prevention of tobacco initiation in youth, are needed to meet tobacco reduction and cancer prevention goals.

TECHNICAL NOTES

Cancer incidence data are from the Illinois Department of Public Health, Illinois State Cancer Registry (ISCR), the only source of population-based cancer incidence data for the state. Identification of cancer cases in the ISCR is dependent upon reporting by hospitals, free-standing clinics, radiation treatment facilities, laboratories and physician offices, as mandated by state law. Additional information on data quality, site definitions and population data used can be found at http://www.idph.state.il.us/cancer/14/state_rpt/State_Overview_and_Technical_Notes.pdf.

Average annual incidence and mortality rates were age-adjusted using the direct method. All rates in this report are age-adjusted to the 2000 U.S. standard populations utilizing 19 age groups. Incidence and mortality rates were calculated using SEER Stat software. More information on this software can be found on the SEER website: http://seer.cancer.gov/seerstat. To make comparisons of statistical differences in rates, the rates were generated along with their 95 percent confidence intervals, and the confidence intervals were compared. Overlapping rates were not considered statistically different. If the confidence intervals did not overlap, they were considered statistically different.

Projected incidence and mortality rates provided in this report should not be regarded as definitive. Additional information on the methods and interpretation can be found at: http://www.idph.state.il.us/cancer/pdf/projections/v18_Methods_no_examples_updated_for_2012-2015.pdf .

Cause-specific survival is a net survival measure representing survival of a specified cause of death in the absence of other causes of death. Estimates are calculated by specifying the cause of death which, for this report, was death due to malignant cancer. Individuals who die of causes other than the one specified are considered to be censored. This requires a cause-of-death variable that accurately captures all causes related to the specific cause. The ISCR utilizes SEER algorithms to process causes of death from death certificates in order to identify a single, disease specific, underlying cause of death. In some cases, attribution of a single cause of death may be difficult and misattribution may occur. For example, a death may be attributed to the site of metastasis instead of the primary site.[22]

To capture deaths related to the specific cancer but not coded as such, cause-specific death classification is defined by taking into account causes of deaths in conjunction with tumor sequence (i.e., only one tumor or the first of subsequent tumors), site of the original cancer diagnosis, and comorbidities (e.g., AIDS and/or site-related diseases).[23] To learn more on this topic visit: http://seer.cancer.gov/causespecific/. The ISCR engages in passive follow-up of cancer cases, meaning cancer cases are linked to Illinois death certificates to ascertain death

information. Recent research has shown that in comparison to active follow-up, passive follow-up displays small differences in survival statistics, but complete ascertainment of the cause of death should generally be sufficient for survival analysis.[24]

REFERENCES

1. Stewart SL, Cardinez CH, Richardson LC, Normal L, Kaufmann R, Pechacek TF, Thompson TC, Weir HK, Sabatino SA. Surveillance for cancers associated with tobacco use – United States, 1999-2004. Morbidity and Mortality Weekly Report, Surveillance Summaries, 2008; 57 (SS08):1-33.

2. U.S. Department of Health and Human Services. The Health Consequences of Smoking—50 Years of Progress. A Report of the Surgeon General. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2014.

3. Doll R, Petro R. The Causes of Cancer, Quantitative Estimates of Avoidable Risks of Cancer in the Unites States Today. Journal of the National Cancer Institute, 1981;June; 66 (6):1191-1308.

4. Armou BS, Woolery T, et al. Annual Smoking Attributable Mortality, Years of Potential Life Lost and Productivity Losses – Unites States, 1997-2001. Morbidity and Mortality Weekly Reports 54 (25):625-628, July 1, 2005.

5. U.S. Department of Health and Human Services. The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2006.

6. Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Illinois State Cancer Registry cases 1986-2010, released November 2012.

7. Centers for Disease Control and Prevention (CDC). Cigarette smoking attributable morbidity- United States 2000. MMWR Morbidity and Mortality Weekly Reports. 2003;52(35) 842-844.

8. Office of the U.S. Surgeon General. The Health Benefits of Smoking Cessation: A Report to the Surgeon General. Centers for Disease Control and Prevention (CDC), Office of Smoking and Health. 1990.

9. American Cancer Society. Cancer Facts and Figures 2014. Atlanta: American Cancer Society; 2014.

10. Illinois Department of Public Health, Illinois State Cancer Registry. Projected Invasive Cancer Incidence, Illinois, 2011-2014, Version 17, released April 2013.

11. Blot WJ, McLaughlin JK,Winn DM et al. Smoking and drinking in Relation to oral and pharyngeal cancer. Cancer Research, 1988;48:3282-3287.

12. Blot WJ, McLaughlin JK, Devesa SS, Fraumeni JF, Jr. Cancers of the Oral Cavity and Pharynx. In: Shottenfeld D and Fraumeni JF (eds). Cancer Epidemiology and Prevention (Second Edition) New York: Oxford Press, 1996. Pp. 666-680.

13. U.S. Department of Health and Human Services. The Health Consequences of Using Smokeless Tobacco: A Report to the Advisory Committee to the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, National Institutes of Health, National Cancer Institute; 1986.

14. Blot WJ, McLaughlin JK,Winn DM, Austin DF, Greenburg RS, Preston-Martin S, Berstein L,Schoenberg J, Stemhagen A, and Fraumeni JF. Smoking and drinking in relation to oral and pharyngeal cancer. Cancer Research, 1988;48:3282-3287.

15. Hashibe M, Brennan P, Chuang S, et al. Interaction between tobacco and alcohol use and the risk of head and neck cancer: Pooled analysis in the International head and neck cancer epidemiology consortium. Cancer Epidemiology. Biomarkers Prevention, 2009;18(2):541-550.

16. Austin DF, Reynolds P. Laryngeal Cancer. In: Shottenfeld D and Fraumeni JF (eds). Cancer Epidemiology and Prevention (Second Edition) New York: Oxford Press, 1996. Pp. 681-706.

17. Silverman DT, Morrison AS, Devessa SS. Bladder Cancer. In: Shottenfeld D and Fraumeni JF (eds). Cancer Epidemiology and Prevention (Second Edition) New York: Oxford Press, 1996. Pp. 1156-1179.

18. Anderson KE, Potter JD, Mack TM. Pancreatic Cancer. In: Shottenfeld D and Fraumeni JF (eds). Cancer Epidemiology and Prevention (Second Edition) New York: Oxford Press, 1996. Pp. 725-793.

19. McLaughlin JK, Blot WJ, Devesa SS, Fraumeni JF. Renal Cancer. In: Shottenfeld D and Fraumeni JF (eds). Cancer Epidemiology and Prevention (Second Edition) New York: Oxford Press, 1996. Pp. 1130-1155.

20. Plummer M, Herrero, R Franchesi S, Miejer CJ, Sniders P, Bosch FX, de Sanjose S, Munoz N, IARC Multi-centre Cervical Cancer Study Group. Smoking and Cerivcal Cancer: Poole Analysis of the IARC mutli-centric case-control study. Cancer Causes and Control, 2003; 14(9):805-814.

21. Tobacco Free Kids. Fact Sheets: State Tobacco–Related Costs and Revenues. http://www.tobaccofreekids.org/facts_issues/fact_sheets/toll/

22. Percy C, Stanek E, Gloeckler L. Accuracy of cancer death certificates and its effect on cancer mortality statistics. *Am J Public Health* 1981;71: 3242-3250.

23. Howlader N, Ries LAG, Mariotto AB, Reichman ME, Ruhl J, Cronin KA. Improved estimates of cancer-specific survival rates from population-based data. *J Natl Cancer Inst* 2010;102:1-15.

24. Johnson J, Weir HK, Daixin Y, Xiaoling N. The Impact of Patient Follow-up on Population-based Survival Rates. *Journal of Registry Management* 2010;37(3):86-103.